Monografico

DOI: http://dx.doi.org/10.25115/eea.v39i3.4125

Estudios de Economía Aplicada
Volumen:39-3 // ISSN: 1133-3197

Green Bond Finance in Europe and the Stock Market Reaction

JUAN LABORDA[1], ÁLVARO SÁNCHEZ-GUERRA[2]
[1]Department of Business Administration, UNIVERSITY CARLOS III, ESPAÑA. E-mail: jlaborda@emp.uc3m.es
[2]Department of CAPITAL MARKETS. BANK OF SABADELL. E-mail: sanchezguerraa@bancsabadell.com

ABSTRACT

This paper examines the increasing importance of green, social and sustainable bonds in the financial markets. We first detail the theoretical framework, introducing sustainable development and green finance; relating green bonds to both ecological economics literature, and the central banks perspective; and, finally, analyzing the green bonds efficiency as a financial resource. Afterwards, we estimate the effect of green bond issues on the companies share's price. So we collect the companies share' prices around the announcement of the issue. Then we build an event time window with different time ranges before and after the announcement with the accumulated returns in order to be able to observe the reaction in the market in different stages. We demonstrate that the announcement of a green bond has a positive reaction in the market by increasing the return on shares of green bond issuing.

Keywords: Green bonds; Ecological economics; Central Banks; Announcement of the green bond issue; Shares' prices reaction.

JEL Classification: C22, E58, G12, G32, O44

Recibido: 13 de Noviembre de 2020
Aceptado: 17 de Diciembre de 2020

1. Introduction

This research paper refers to the new way of green, social, and sustainable financial projects. This type of financing has undeniable importance. Many institutional investors and debt issuers have paid close attention to this type of bonds in order to finance many of the United Nations' Sustainable Development Goals and the commitments made in the Paris Convention. Given the growing interest in the environment, climate change, and the fight to educate and improve government, economic and social systems, these long-term investments focused on improving these sectors give us the opportunity to reorient ourselves and create strategies towards sustainable global growth.

The main objective of this study is to understand the importance of green, social and sustainable bonds that are gaining so much weight in the market and what are the main differences, advantages and disadvantages they have compared to non-green bonds. We will analyze the evolution that has taken place in the world towards a more sustainable economy to try to mitigate the problems that will soon be irreversible due to climate change. We will focus at the transformation from the appearance of the first sustainable bond in the world and its journey to date. Therefore, we will take into account the factors that have been relevant to its evolution, as well as the change in mindset of investors, companies and the transition towards a sustainable form of financing. We will study the objectives that large global organizations have established to guide the growth of countries towards a cleaner lifestyle, and which entities help determine the levels of sustainability and the ESG (Environmental, Social and Governance) rating of companies for investors.

The methodology we use in this paper is divided into two parts. Section 2 refers to theoretical framework in which we will introduce sustainable development explaining its evolution towards green financing. We will then comment on the viewpoint of green bonds in ecological economics, how this affects central banks, governments and financial institutions. We will close this framework by talking about green bonds in the financial markets and their efficiency as a financial resource. Section 3 will be an empirical analysis where the field study will be conducted in the context of the effect of green bonds on the share price of companies issuing a green bond. Showing in the way the source of all the data obtained for the study to be carried out, the methodology and finally the results obtained from the empirical test. Finally, the main conclusions are summed-up, aimed at answering the key questions of this work.

2. Theoretical Framework

2.1. Sustainable development

The idea of sustainable development emerged in the late 1980s in response to the growing social and ecological problems of our planet (Jackson, 2012). With globalization, inequalities between rich and poor countries are increasing and population growth projections are alarming as the ability to feed 9 billion people by 2050 is being questioned (Huston, 2017). We must therefore ensure for everyone access to clean water, health care, education and training, protect biodiversity and take concrete actions against climate change, and ensure that industrial development is a source of progress for everyone. The proposed solution is a new type of development, which is in fact a variation of the traditional method called sustainable development (Yvon Chouinard, 2011).

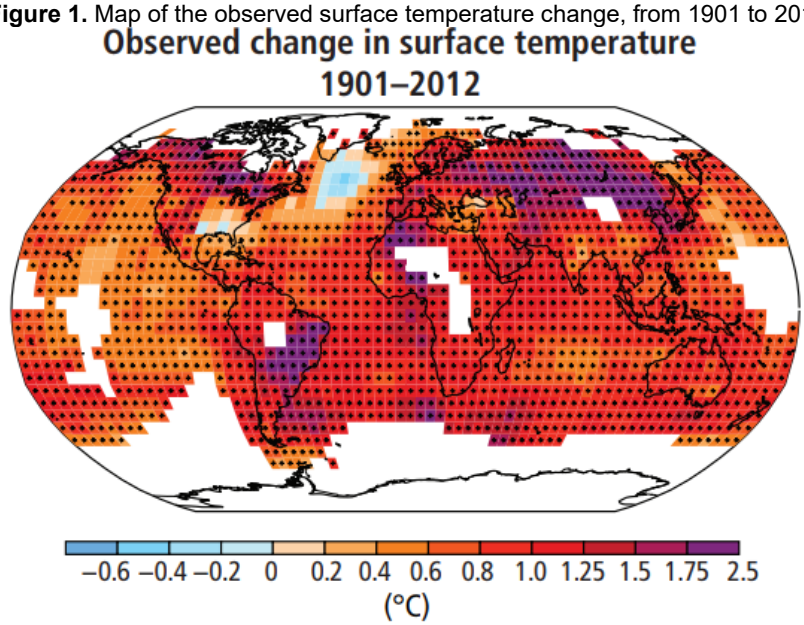
One of the most influential people in the financial world to implement awareness of the evolution towards more sustainable financing has been Mark Carney. He was Governor of the Bank of England from 2013 until this year and chaired the G20 Financial Stability Board (FSB) until 2018, a body that seeks to coordinate the activity of regulators at the global level. The FSB published the recommendations of a working group created to promote greater transparency in the information on climate change provided by companies and financial institutions. The purpose of this initiative is for listed companies to provide investors with more details about their potential risks in this area and the measures taken to address them. In doing so, it aims to begin a transition to a decarbonized economy

where governments will be responsible for establishing the basis and the private sector will be responsible for securing the necessary investments (Carney, 2016).

In the case of banking, the governor pointed to a "risk of transition", since paradoxically, a rapid shift in corporate policies and strategies to deal with climate change can emerge into a Minksy Moment. To avoid this, Carney suggests that the sooner companies start reporting on the potential effect of this shift, the better for the stability of the international financial system.

There is now a broad consensus that there is a global warming above 2°C, relative to pre-industrial levels (as we can see in the Figure 1), that will have significant economic and social consequences. Since the end of World War II, there have been significant changes in terms of atmospheric and ocean temperatures, ice reduction and sea-level rise, as noted by the Intergovernmental Panel on Climate Change in its Fifth Assessment Report (IPCC, 2014). According to climate scientist Hans-Otto Pörtner (2018), “if action is not taken, it will take the planet into an unprecedented climate future if we compare to what has happened in all of human evolutionary history. Climate change is shaping the future of our civilization”.

Figure 1. Map of the observed surface temperature change, from 1901 to 2012



Source: IPCC, Climate change synthesis report

The concept of sustainable development was officially defined in 1987 as part of the preparations for the Earth Summit in Rio de Janeiro. The main purpose of the Bruntland Commission was to cover the issues of economic development and environmental stability were it was defined for the first time the concept of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations General Assembly, 1987). In other words, growth must be achieved with respect for nature and human beings.

Sustainability is achieved when all the economic, social responsibility and environmental protection objectives are met. Companies can have environmental respect, social equality and commercial success if they have a sustainable development while generating value. To demonstrate this fact, we can use as an example a study carried out by the company the Dutch company, LeasePlan Corporation (2019). This exercise is based on the comparison of the TCO between electric vehicles (EVs) and internal combustion engine (ICE) cars. The case was conducted by comparing different car brands (Table 1) in 13 different countries with their respective tax costs, consumer demand, labour costs, etc.

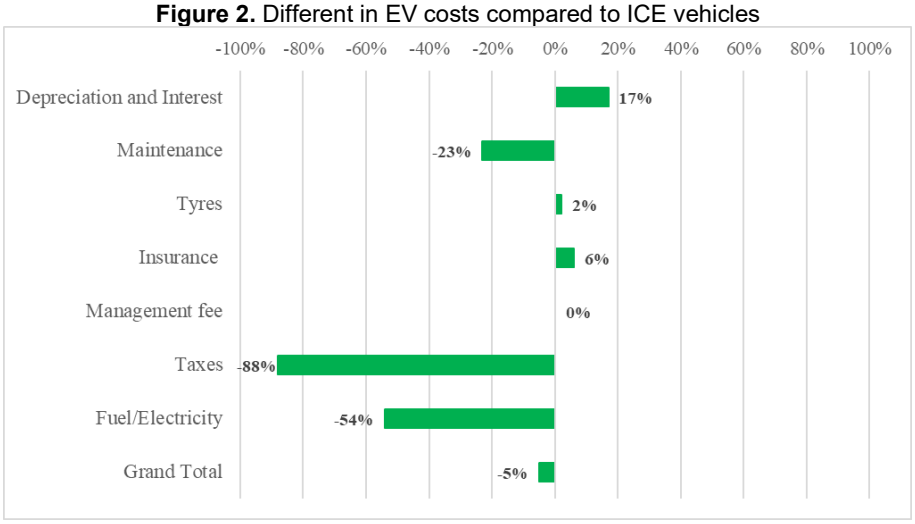
Table 1. Different ICE vehicles and EVs used in the TCO

ICE vehicle	# scenarios included	Electric vehicle	# scenarios included
Peugeot 208	111	Renault Zoe	111
Volkswagen Golf	119	Nissan Leaf	119
BMW 3 series	106	Tesla model 3	106
Mercedes GLE	120	Audi E-Tron	120
ICE total	**456**	**Electric total**	**456**

Source: Own Elaboration and LeasePlan Corporation internal study

As a result, exhibit in Figure 2, we can see that after comparing the different scenarios in each country the final conclusion is that, on average, the total costs of the EV are 5% less than the ICE vehicle. With all this information, we can confirm that the path to development and evolution towards sustainability provides us growth. This improvement is reflected by developing eco-friendly products granting a reduction of costs, in this case the reduction of energy for a company's transport fleet, also in the emission of polluting gases, of total annual costs, among many others.

Figure 2. Different in EV costs compared to ICE vehicles



Source: Own elaboration and LeasePlan Corporation internal study

Not only economic and environmental objectives are important in sustainable development. Paying attention to employees, improving their quality of life at work and helping them to develop their skills are factors that reinforce their commitment. This social investment must be based on the well-being of the workers. According to James (2013), workers value other things than just the money they are paid. An employee will never leave a company in which he is happy and which is growing for another in which he receives slightly higher wages. He concludes a series of statements that workers want more than just a raise: they want to feel proud of their jobs, to be treated fairly and equitably, they want to be respected by their boss and respect him back, to be heard, to have a personal life, among other things. All these qualities can be achieved by investing in social growth in order to create value in the company, building greater loyalty to the company, causing them to become more involved in their work and desire to improve in all work environments of the company.

From another point of view, development focused on sustainability opens up new business opportunities and markets. This sustainable approach is characterized by the tendency to look for new markets other than the traditional ones. The needs of low-income populations are neglected while those of the middle and high-income population are saturated. “Four billion low-income consumers, a majority of the world’s population, constitute the base of the economic pyramid (BOP)” (Hammond, et al., 2007). This data suggests that there are significant business opportunities in various markets to improve their needs, increase productivity and help them enter a formal and stable economy. Creating

products and services that are accessible to the world's poorest people means opening up new markets, precisely those whose population' growth will be faster between now and 2050. Emerging country markets show various sectoral opportunities, such as in the agricultural sector, to achieve agricultural productivity by adapting to climate change; in the construction and housing sector, to develop materials and services for self-construction; the creation of collective transport platforms and low-consumption vehicles are necessary in these countries because of their usefulness and productivity; the development of renewable energies in areas where access to the electricity network is impossible.

Sustainability gives a great competitive advantage within the business vision, as it is a strategic backbone for inclusive business. Since the initiative of this economic activity is the improvement of the social and environmental ecosystem obtaining a profitable economy, would benefit the business sector and the low-income communities. This kind of development affects everything, and more and more companies understand that they have important economic, social and environmental responsibilities and are committed to make a difference. Those that take advantage of this opportunity to generate value will find that their success is sustainable.

2.2. Green finance and ecological economics

To make all these changes within a company, it is necessary to get funding in some way; to transform a production chain by using renewable energy to emit less gas; to change the method of packaging by reducing the size and using only what is necessary with ecological materials; to change the way of providing its services to consumers by improving the quality of those. This is why the economic and financial system has been evolving in line with the needs of consumers and institutional investors.

Prieto-Sandoval (2018) defines green economics as science that studies the feasibility in terms of sustainability of the economic model, through the flows of materials, energy and waste that are needed. Unlike conventional or neoclassical economics, which aims to pursue economic growth through the optimal use of inputs and production factors. Ecological economics is not a branch of economic theory but a transdisciplinary field of study, derived from the need to study the relationship between natural ecosystems and the economic system, which requires the participation not only of economists but also of natural scientists and other disciplines.

The theory of ecological economics was consolidated during the 1970s and 1980s and in response to 2 problems. On the one hand, it pretends to be a theoretical response to a real problem: that of the environmental crisis that since the sixties begins to be understood as serious, and in great part because of human activities. On the other hand, it tries to build a wider theoretical framework than that which the hegemonic neoclassical-environmental economy has. In other words, the ecological economy is constructed as a critic to the neoclassical-Keynesian environmental economy (Macchione Saes & Ribeiro Romeiro, 2019).

The conventional world economy is based on the illusion of continuous growth, as an unquestionable fact and necessary for everything to continue working. However, we live on a planet of finite resources where nothing can grow indefinitely. Meadows (1972) warned about the ecological unfeasibility of the planet Earth if the inertia of production, consumption and generation of pollutants of those times were followed. The study was based on the computer simulation that recreated the population increase, industrialization and economic growth, in the following 100 years, according to the data available at that time. The main thesis of the study is that, on a limited planet, the dynamics of exponential growth (population and product per capita) are not sustainable. However, everything indicates that we have lost more than 40 years of putting the brakes on this economy that has generated an eco-social crisis that threatens life as we know it.

Many environmentalists around the world believe that the steps being taken to slow climate change and move towards a sustainable economy are not the right ones and are destructive. Movements like Greenpeace, criticize that the policies being taken by central banks "are either too weak or still need

to be pieced together" (Greenpeace European Unit, 2019). The global effort to reduce greenhouse gas emissions began in 1997 with the Kyoto Protocol, now ratified by 183 nations, with some encouraging strategies, but some proved to have fatal effects. Apparently complying with the Kyoto Protocol, many governments established "caps" on greenhouse gas emissions in their countries, but industries willing to evade this government imposition of limits, instead of responsibly reducing their emissions, can completely avoid their environmental commitment by buying "carbon credits" from other industries in different parts of the world, that is, by purchasing the CDM credits traded by the World Bank (Vox, 2020).

Not only is the way in which institutional entities are acting, but there are also numerous criticisms of improvement towards the sustainable development goals of the United Nations. Certainly, the SDG presents an agenda as extensive as it is ambitious, but it is full of rhetoric, political cynicism and technical incoherence, which is reflected in numerous objectives that are impossible to meet in light of the agreements and decisions adopted by the governments of many countries (Swain, 2017). Let's remember that Goal 16 commits all states to "promote peaceful societies", when the Western countries that signed the agreements are the main weapon sellers in the world, or Goal 13 that forces them to "adopt urgent measures to combat climate change", while there are countries that even deny that this phenomenon exists (United Nations, 2015).

For significant progress to be made, the SDG needs clear decisions and precise political commitments that will transform empty rhetoric and hollow, worthless words into effective transformation measures. It is worth to highlight a unique scientific study carried out by two prestigious agencies based in France, the International Council for Science (ICSU) and the International Social Science Council (CISS), Review of targets for the Sustainable Development Goals: The science perspective, in which an independent academic review of the SDGs is carried out by 40 researchers from 21 different countries. The extensive analysis carried out determines that of the 169 targets, 49 are well designed (29%), while another 91 require specific development (54% of the targets) and 29 more are imprecise and need much more precision work (17% of the total) (ICSU & ISSC, 2015). The report provides a detailed overview of key elements, such as coherence, applicability, measurability, the role of science, local contexts, or their interrelationships, proposing useful recommendations, together with an operational metric for the commitments set out in the SDGs. We are thus faced with a scientific roadmap for navigating the complex world of formulating valid public policies to implement the SDGs.

From a technical point of view, five critical elements can be identified in the application of the SDGs, in the light of the studies and research that have been carried out to date, which would include improving technical knowledge and information for officials, civil society and specialized organizations, working to obtain precise commitments from governments, generating scientific knowledge about the SDGs and their application, solving the problems of the lack of data and clarifying the goals and objectives for their correct implementation, together with a precise delimitation of responsibilities and economic, political and technical commitments regarding them.

These elements are critical for a successful transformation to the world of green finance. Today, the vast majority of analysts agree that the existing information and data deficit is one of the barriers to further development of the fight against climate change and the necessary funding for it. The Economist remembered it recently. This lack of transparency and communication to the market in the area of sustainable financing, resource use and implementation of commitments prevents sustainable investments from reaching their potential (The Economist, 2019). An investigation carried out by Deutsche Bank even stated that therefore and to make up for this lack, the use of Artificial Intelligence tools to capture data is spreading among certain investors and analysts (Deutsche Bank Research, 2018).

2.3. Green bonds and Central Banks

Climate change is a reality that is affecting a large number of professional agents in the economy such as central banks, national governments or private institutions. These entities are in charge of observing those macroeconomic variables that can affect the short and long term, in order to create an economic and political plan to fight climate change in the best possible way.

European Central Bank (ECB) President Christine Lagarde says climate change risk assessment must be incorporated into economic models and monetary policies (Masdeu, 2019). This issue is not new to central banks but it is starting to manifest itself more and is subject to extensive debates in which the implementation of policies to fight climate change is questioned, as stated by the governors of the Bundesbank or the Bank of Italy (Koranyi & Canepa, 2019).

Central banks (CBs) must integrate climate change into monetary policy as well as into financial stability and supervision policies. Climate change and policies to mitigate it affect productivity, long-term economic growth and financial stability and should therefore be included in the macroeconomic analysis that shapes monetary policy decisions, pointed out by Fed Governor, Lael Brainard, at the Federal Reserve Bank's Congress in San Francisco (Brainard, 2019).

The reserve bank can also take proactive actions by encouraging the mobilization of resources to finance investments that enable a transition to an environmentally sustainable economy, known as green finance, which is one of the objectives of the Paris Agreement. In Paris, the main central banks and regulators founded the Network for Greening the Financial System (NGFS), which “purpose is to help strengthening the global response required to meet the goals of the Paris agreement and to enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments” (NGFS, 2019). The NGFS currently includes most of the G20 central banks, including the European Central Bank (ECB) and the People's Bank of China.

A good way to penetrate green finance lies with central banks. They can provide more favourable financial terms to banks that encourage financing through green loans or even quotas, such as those set by the Reserve Bank of India (RBI) (Marqués & Romo González, 2018), which calls on commercial banks to allocate a proportion of their lending to priority sectors, including renewable energy. To encourage sustainable financing, a regulatory change is needed, being a responsibility of the European institutions that are already leading in Brussels, but the ECB can and should use its expertise to help design the regulations needed to ensure this transition.

In recent years, there has been progress, still insufficient, in the development of new products, with green bonds being the most developed green financing instrument. The financial risks that climate change and the transition to a low-carbon economy imply affect the balance sheet of financial institutions and are also systemic in nature. This makes it necessary to carry out a far from an easy process of assessing these risks and their exposure. There are still obstacles and challenges to overcome, such as the lack of taxonomy on what is "green" and what is "brown", the lack of information and knowledge of appropriate methodologies.

In this regard, central banks must integrate climate change aspects into their supervisory practices, requiring information from supervisors on their exposure to climate risks, on the management of these risks and on their policy and governance with regard to climate change and the transition to a low-carbon economy in their supervisory work. Since the “Breaking the Tragedy of the Horizon: Climate Change and Financial Stability" speech by Bank of England Governor Mark Carney in 2015, central banks have increasingly recognized the need to incorporate the implications of climate change into their financial stability analyses and into their financial system resilience exercises (Carney, 2015).

The risks of this transition will be lower if the transition is done gradually and in time. If policies are introduced late and abruptly, the transition will lead to a fall in the value of assets, particularly those of fossil fuel-related companies and those heavily dependent on their use (Carney, 2015). In this regard, the Prudential Regulatory Authority of the Bank of England (BoE) warns that the wide range of opportunities for an orderly transition is finite and getting smaller (Bank of England, 2018).

From the second quarter of 2021, the European Central Bank (ECB) will allow financial institutions to save up to 25% in capital consumption if they demonstrate their support for the low-carbon economy (European Commission, 2019). To benefit from this optimization, they will have to show sufficient analysis that will lead to potential impacts on rating and pricing. Nowadays, companies are obliged to disclose information on environmental, social, and personnel issues, human rights, or on the fight against bribery and corruption. These non-financial reporting requirements allow companies to achieve greater awareness and understanding of risks, a more diverse investor base and potentially lower cost of capital, more constructive dialogue with stakeholders and an enhanced reputation for the company.

What they want to achieve with this transition is to fulfil the aim of becoming the world's first climate-neutral bloc by 2050. To this end, in December 2019 the European Union presented the "European Green Deal Investment Plan and Just Transition Mechanism", devised by Ursula von der Leyen. This is a document that attempts to accelerate the European Union's ecological transition to a CO2-neutral, the goal of protecting the natural habitat to improve the well-being of people and businesses and to take leadership in climate action around the planet by creating a new growth strategy for all participants. Among the measures, it has been marked as a priority to increase the objectives of reduction of polluting emissions of the European Union in 2030 to at least 50%. To achieve the goal of 2030, an investment of 265 billion euros per year will be required. The aim of the plan is for the public sector to take the lead in financing the ecological transition, but for the private sector to end up providing the bulk of the funds, an idea with which the Chambers of Commerce agree (European Commission, 2019). The main idea is to mobilize the private sector that has the most important role. That is why the public sector, through these European funds and public investments from the Member States, will serve as an incentive to encourage them to participate. These infrastructure investments promote climate mitigation and adaptation, along with the development of new technological solutions and infrastructure for renewable energy. Therefore, the economy is in the transition from a fossil economy to a more sustainable economy. This environmental effort at the end of the next decade will be an impulse to reach climate neutrality in 2050, which means that the EU will not emit more CO2 than it is capable of absorbing in its territory.

Part of the European Commission's green package that have been presented is also aimed at helping the regions that will be most affected by the ecological transition, especially those countries whose economies are most dependent on fossil fuels, and at helping workers in the sectors that are most vulnerable to this change so that in addition to being ecological, the transition will be fair. The Just Transition Mechanism (JTM) would therefore allocate a fund of €100 billion based on specific criteria, such as the number of people working in coal or shale gas mining in a given region. The EU could spend money on training workers or investing in new productive activities, which would require the Member States to submit plans to restructure their economy along low carbon lines, which would have to be approved by the Commission, according to the Green Deal (2019).

2.4. Green bond finance for resource-efficient investments

With the countdown to climate change set in motion, it is necessary to become aware and live, in all aspects of our lives, in a more respectful and responsible way with the environment. Investment is one of the fields where these values can be expressed and little by little, investors have more means to bring this concern to their investment decisions, one of them being green bonds. Green bonds are a financial product with profitability, maturity and risk rating. The resources collected by these bonds are used exclusively to finance or refinance projects eligible as 'green'. The International Capital Market Association (ICMA) established at the time the principles that should govern the issuance of green bonds. The so-called Green Bond Principles (GBP) place special emphasis on information transparency, accuracy and integrity in procedures (ICMA, 2018). In contrast, the OECD does not hesitate to define the basis of the green bond, but analyses new infrastructure networks in response to climate change and how to quantify their carbon and climate change efficiency (OECD, 2018).

A green bond is like any other conventional bond, except that the money raised by the issuer is used to finance green projects, i.e. environmentally friendly assets or business activities. Green bonds

can finance projects in the fields of renewable energy, reduction of greenhouse gas emissions, energy efficiency systems and infrastructures, sustainable land use and waste management, biodiversity conservation or clean transport, water cleanliness, etc. Moreover, these bonds meet the criteria established by the Paris Agreement on Climate Change of December 2015, for the containment of the increase in temperatures by 2ºC (United Nations: Climate Change, 2015). All the member states of the European Union and 96 other countries in the world subscribed to the document. However, government bonds, for example, are intended to finance the public deficit. In the case of green bonds, the final destination has to be some project of a sustainable nature that contributes to improving the conditions of the planet.

Bonds have been and continue to be a financing instrument for banks, companies and public administrations, and a source of profitability for investors. They are a way of obtaining capital by contracting a debt with individuals or groups of investors: the issuer puts its product on the market, the interested parties acquire it and after a time they recover the investment with the corresponding interest. However, the world has evolved and investors do not only think in terms of profitability; they want their contribution to be allocated to projects that benefit society. That is the concept of the so-called green bond, a financial product that has become extremely popular in recent years.

The history of green bonds began in 2007, when the European Investment Bank (EIB) and other international banks bet on this financing formula, issuing a 600-million-euro Climate Awareness Bond, to create sustainable projects. Since then, growth has been overwhelming as a wide variety of financial and non-financial corporate issuers have turned to the markets to issue this type of debt, accelerating the growth of a market that reached a volume of $255 billion in 2019, according to OFISO records (2020).

The real growth of green bonds began with the Paris Agreement and the publication of the Sustainable Development Goals (SDG) by United Nations, since then the market has grown very rapidly. The United Nations General Assembly adopted the 2030 Agenda for Sustainable Development in September 2015 (United Nations, 2015). It sets out 17 Sustainable Development Goals (SDGs) with 169 integrated and indivisible targets covering the economic, social and environmental spheres. This is a series of a plan of action in favour of people, planet and prosperity, which also intends to strengthen universal peace and access to justice. The States members of the United Nations adopted a resolution recognizing that the greatest challenge in today's world is the eradication of poverty and affirming that without it there can be no sustainable development. These goals substitute the Millennium Development Goals (MDGs) of 2000, to create a set of global objectives. They were launched in January 2016 and will guide the United Nations Development Programme (UNDP) policy and funding for the next 15 years.

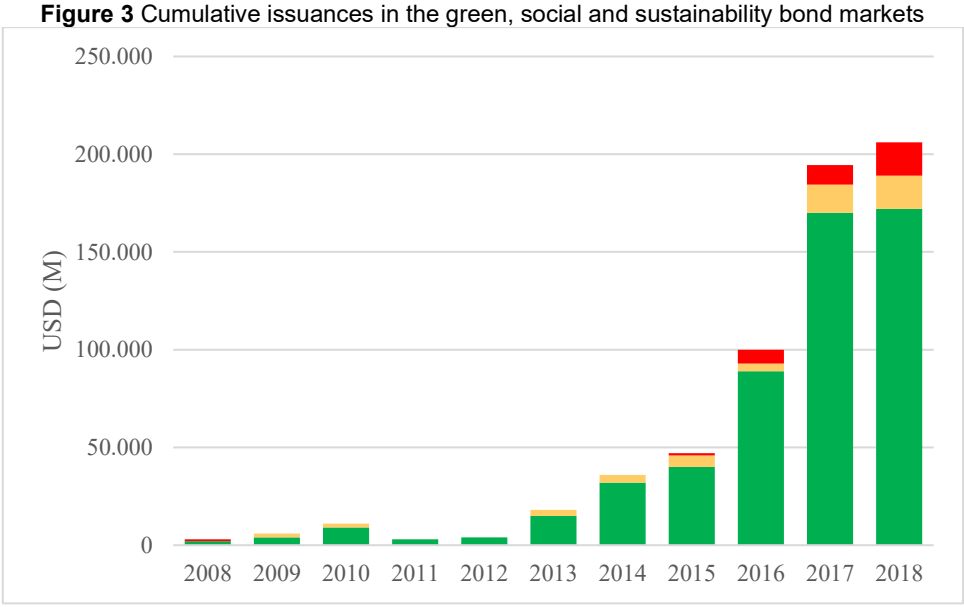
The market for sustainable financing is undergoing major changes in just over a decade of existence (Independent Group of Scientists appointed by the Secretary-General, 2019), in search of innovations and new formulas that respond to the growing demand and the urgency that the fight against climate change seems to demand. It is clear that sustainable financing is a very dynamic vector, which is fundamental for the transition to a low-carbon or totally decarbonized economy, insofar as it is the instrument for channeling the resources needed to carry out the projects and business activities required by this process, all of which demands a high level of commitment from the financial sector and the investment world to provide these resources which, for the time being, are insufficient to meet the objectives of the Agreement of Paris in terms of reducing global warming.

Like any other bond, a green bond is a fixed income financial instrument issued for the purpose of raising capital from investors through the debt capital market. Generally, the issuer offers a fixed amount of capital to investors over a set period of time, or maturity, repaying the capital, or principal, when the bond matures and paying the agreed interest rate for it through the life of the issue. A green bond differs from a normal bond by the certification "green" obtained through the bond issuer itself, but it can also be certified by a third party, which commits the issuer to use the capital obtained by selling the green bond (the principal) in a transparent and exclusive manner to finance or refinance green projects or assets with an environmental benefit. Green certification leads to entities such as

Bloomberg, generating market indicators for this type of asset, which allows its analysis and measurement.

An increase in companies marketing their products as 'green' (Figure 3) has been found without having made any real commitment to greening their operations. This is why third-party certification is important; that is, to recognize and measure, where possible, the actual changes and impact a company has on its green business practices. Great managers and representatives of companies are recognized for doing their best, for playing with the best tools and for being able to make the right decisions. One of the most effective ways to send that message is by choosing certification. Certification demonstrates to those around any company that it can set goals and achieve objectives.

Figure 3 Cumulative issuances in the green, social and sustainability bond markets



Source: Own elaboration and Sustainable Loan Insight

A green certificate is a document that endorses or certifies the sustainability of a project in relation to its respect for the environment, its saving of resources, its comfort, the quality of life of its inhabitants or users, its compatibility with the environment and the materials used. In the case of green bonds dedicated to combating climate change, the Climate Bonds Initiative has developed a scheme of standards and certifications to verify the credentials of these bonds (Climate Bond Initiative, 2019). The standard expands on the ICMA's Green Bond Principles (GBP), with details more specific to climate change (project selection, issuance and performance reports, resource use, resource segregation, project taxonomy, and issuance and implementation certification, among others). This is a good example of commercial operations that try to monetize the interest in these emissions, issue their own criteria, and then sell the certifications. However, they can contribute to confusion in the sector. With respect to the Project Evaluation and Selection Process, the issuer of a Green Bond must disclose to the market and the various investors the eligibility of the project's criteria, whether it meets the category of green, including any type of risk, whether environmental or social, that may be associated with the project. That is why the issuer of a green bond must communicate to investors the environmental sustainability objectives in a transparent manner and allow for external assessment and review. Different types of reviews can be observed for pre-issue reviews such as "Third Party Assurance" (i.e. KMPG and the Deloitte Assurance Report), "Second Party Opinion (SPO)" (i.e. Sustainalitycs, Vigeo Eiris, Oekom), "Green Bond Rating" (i.e. Moodys and S&P) (Climate Bonds Initiative, 2020). In Spain, ADIF launched a 600-million-euro green bond in 2019, to commit to its strategic plan to transform the Transport Infrastructure company, based on the UN SDGs. This issue was verified by the firm Sustainalytics, which values the aspects of ESG (Environmental, Social and Governance) (ADIF, 2019).

In the green market, we can find a great lack of information and existing data as a barrier to developing more dynamically the fight against climate change and such funding. The weight that ESG

factors bring to the market depends on the information and transparency that they have regarding their management and strategies. This is key to assessing the degree of commitment that a company or financial entity has with respect to sustainability and the willingness to contribute not only to decarbonising and meeting the Paris objectives but also to creating a fairer, more inclusive society that respects the SDGs, according to the Institute for Climate Economics (2016).

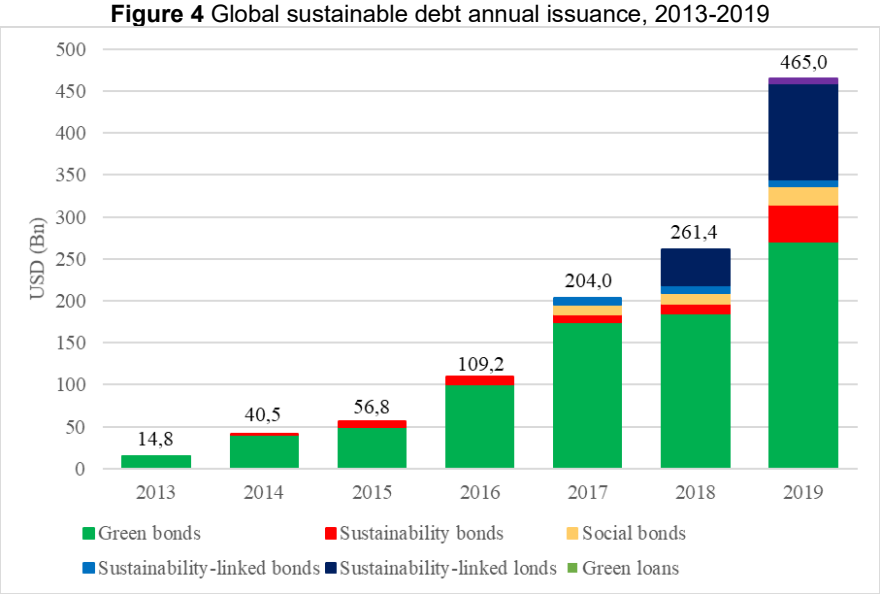
Partly, in order to address possible confusion from the proliferation of criteria, the European Union, using its power to regulate activities on its territory, is considering a recommendation from the expert group on sustainable finance for the establishment of official standards for green bond issues and the creation of a European label or certificate to prove them as such (EU Technical Expert Group on Sustainable Finance, 2020). Obviously, adopting these recommendations will contribute to the credibility of bond issues, but it will reduce comparability between different regions of the world.

In December 2019, the institutions of the European Union reached a political agreement on the creation of a European taxonomy, a matter of particular importance (Council of the EU, 2019). This is an indispensable pillar of the leadership strategy that the European Union has been adopting in the fight against climate change, as it could contribute to increased investment for sustainable projects. The proposed Regulation on Taxonomy provides the framework for the consequent development of taxonomy through delegated acts. These delegated acts will specify which economic activities can be considered environmentally sustainable. It offers a classification system with a twofold objective: to avoid fragmentation in the European market and to curb the so-called 'greenwashing' of some activities that are attributed the label of being environmentally sustainable without having any accreditation to justify it.

The proposed regulation project concerns measures taken by Member States with requirements for financial market participants or issuers of financial products to be made available with the classification of environmentally sustainable. The proposed legislation states that, to be considered sustainable, an activity must contribute significantly to one of the following six objectives: “climate change mitigation; adaptation to climate change; sustainable use and protection of water and marine resources; transition to a circular economy, with waste prevention and recycling; pollution prevention and control; and protection and recovery of biodiversity and ecosystems” (EU Technical Expert Group on Sustainable Finance, March 2020).But additionally, it must not cause any impairment to any of the other five and must comply with minimum social standards and technical criteria yet to be established.

The strong support that the climate transition is receiving marks a turning point for investors, but the market still has difficulty in providing transparent information that clearly demonstrates the positive impact. Despite this, 2019 is a record year for green bond issuance with $323 billion (292 billion euros), with an increase of 78% with respect to the $261,400 million of 2018. As we can see in Figure 4, the Green bonds represent more than 50% of the total sustainable debt market with $271,000 million, compared to other sustainable bonds. However, we can observe that Social and Sustainable bonds had tripled their volume in 2019. This increase is the cause of this growing demand from investors in assets oriented not only towards environmental but also social activities.

Figure 4 Global sustainable debt annual issuance, 2013-2019

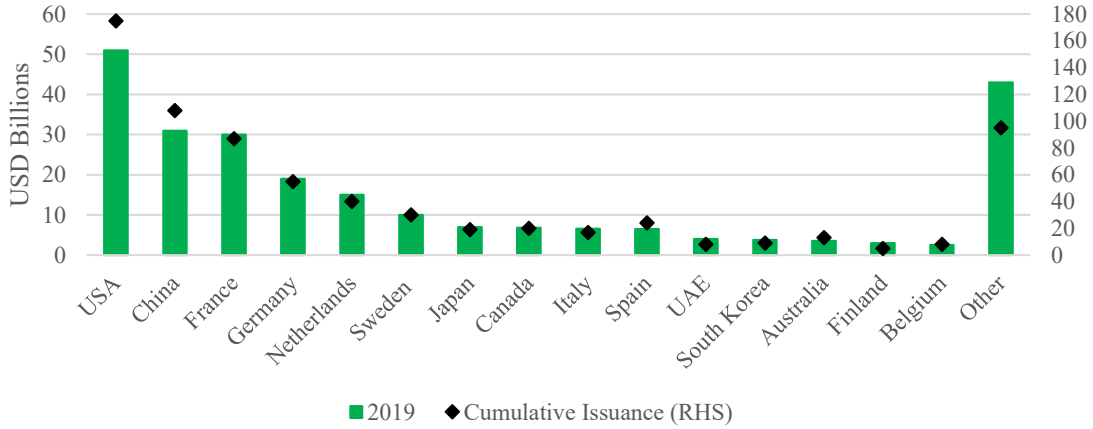


Source: Bloomberg NEF, Bloomberg L.P.

In recent years, a trend has emerged in Spain that has been developing internationally since 2008 and has proliferated in the world's most important economies in recent years. Spanish entities, both private and public, have set to work and have placed Spain among the ten countries with the highest green bond issues. So they offer financing for renewable energy projects, energy efficiency, clean transport, pollution prevention and control, sustainable management of natural resources, land use and sustainable water management. This market for receivables seeks to encourage economic flows that will help to achieve the commitments made in the Paris Agreement and to translate them into the European Union's (EU) Agenda 2030. Green bonds can be issued by governments, banks or municipalities, and are developed under different debt issuance formats. The United States, China and France are the markets with the largest volume and public-private entities are the main support in all of them.

The fact is that green emissions, along with social and sustainable ones, are on the rise and becoming more accessible. According to Moody's (2020), they are expected to reach values of over $400 billion (365 billion euros) globally during 2020, an increase of 24% over last year. According to the Climate Bonds Initiative, Spain is the seventh-largest market in terms of volume issued, ahead of Japan, Canada and Italy (see Figure 5). To date, thirteen Spanish issuers have issued a green bond in 2019, financial companies such as BBVA and Santander, telephone operators such as Telefónica, electricity companies such as Iberdrola, public entities such as Adif or the ICO or autonomous communities such as Madrid and the Basque Country have launched green bond issues. By sector of activity, we can highlight that the most important is Corporations with 38.6% of the total volume issued with 3,771 million Euros, followed by Finance and SSA (Sovereign, Subsovereign and Agencies) with 3,035 million and the 31.1%, and 2,950 million with 30.2%, respectively (OFISO, 2020).

Figure 5 .2019 Green Bond issuance: top 15 countries



Source: Own elaboration and Climate Bond Initiative

During 2019, green and social bond issues in Spain placed 19 operations, around 9,756 million euros, representing 65.1% 13 green operations; 4 sustainable emissions represent 19.5%; and the remaining 2 social operations, 15.4%, according to the last annual report made on this subject by OFISO (2020). Thus, after some delay in joining the group of sustainable financing, it has begun to be placed at the level of countries like Belgium. In Spain, Iberdrola was the first company to issue a green bond, in April 2014. Since then, it has continued to appeal to this type of financing and has become a world reference in the field of sustainable finance, with € 9.5 billion of green bonds issued (Iberdrola, 2019), becoming the largest private issuer of this type of financial instrument in the world during 2016, 2017 and 2018. On the other hand, the first public institution in Spain to issue sustainable financing instruments was the Autonomous Community of Madrid during August 2016, with a placement of 48 million euros.

Institutional investors mostly require that their investments are made in assets listed on official markets, ensuring transparency and liquidity of the investments. This is the case with Green Bonds, which are mostly issued and listed on official stock markets. In this sense, at least eleven international stock exchanges list this type of asset or have created specific segments for them in recent years. These are the Oslo Stock Exchange, the Stockholm Stock Exchange, the London Stock Exchange, the Mexican Stock Exchange, the Luxembourg Stock Exchange, the Italian Stock Exchange, the Shanghai Stock Exchange, the Taipei Stock Exchange, the Johannesburg Stock Exchange, the Japanese Stock Exchange, in Spain, BME, which lists this type of bond on the AIAF, between others.

3. Empirical Analysis

After reviewing the research focused on studies of the effect of green bonds on the market, as well as the methodology used by each of them, we will proceed to present the design of the empirical research taking as a reference Flammer (2019). Therefore, first, an explanation is given regarding the data sources from which the analysis has been made, as well as the final sample of data and a presentation of the empirical results achieved.

As can be seen from the work previously done, we are facing a growing popularity of green bonds, although many financial institutions and investors doubt their efficiency. Their doubts lie in whether green bonds are beneficial to issuers, or even whether they actually lead to improvements in environmental performance. Because it is a growing trend and defining standards, public regulation of green bonds has not yet been created. Therefore, the governance of green bonds falls on the private sector. In this sense, these bonds are certified by independent third parties to avoid this lack of enforceability. But because each certifier is governed by its own standards, the reliability of these can be undermined.

The main objective of this study is to highlight the green bond market over time, in all European countries and in all industries, highlighting the rapid development of this market by observing the "green bond boom". Also, using the different prices of each company for their respective day and for the market they belong to on a given date, we examine the effect that the issuance of the green bond has on the variations of the shares.

We will begin by documenting the growing popularity of green bonds, information previously obtained from the study. Then we examine the effectiveness of green bonds by focusing on the subgroup of green bonds issued by private companies. We first conduct an event study that examines the stock market's reaction to the announcement of green bond issuance. We found a significant and positive stock market response in the three-day event window around the announcement, with a cumulative abnormal return (CAR) of 0.28%. This shows how green bonds are gaining value and weight in the market and therefore are beneficial to companies.

3.1. Data sources, sample and variables analyzed

The data obtained about the bonds have been taken from the Bloomberg database. We get all bonds issued between January 1, 2007 and December 31, 2019. This gives a total of 628,783 bonds. To distinguish between green bonds and ordinary bonds, we use Bloomberg's Green Bond Indicator which informs whether a bond is labeled green. Of the 628,783 bonds issued during the sample period, 351 are green bonds.

In Table 2 we can see, year by year, the numbers obtained on the issue of green bonds. The first column shows us the number of green bonds, while the second column reports in billions of euros the volume. These results demonstrate the trend of the green bond boom. Over a 6-year period, green bond issuance soared from 1.97€ billion in 2013 to 70.92€ billion in 2019 (see Table 2).

Table 2. Amount (in B€) and number (#) of green and ordinary bonds year by year between January 1st, 2007 and December 31st, 2019

Year	# Green bonds	B€ Green bonds	# Ordinary bonds	B€ Ordinary bonds	Share of green bonds (€)	Share of green bonds (#)
2019	145	70,92	63.313	2.445,63	2,818%	0,228%
2018	78	36,90	80.680	1.605,69	2,246%	0,097%
2017	53	29,08	64.164	1.415,80	2,013%	0,083%
2016	34	18,30	52.200	1.119,76	1,608%	0,065%
2015	29	9,36	54.929	937,71	0,988%	0,053%
2014	10	7,49	54.738	865,36	0,858%	0,018%
2013	2	1,97	52.939	491,02	0,399%	0,004%
2012	0	0,00	42.918	395,36	0,000%	0,000%
2011	0	0,00	33.848	313,48	0,000%	0,000%
2010	0	0,00	28.649	208,61	0,000%	0,000%
2009	0	0,00	31.892	94,31	0,000%	0,000%
2008	0	0,00	37.771	51,96	0,000%	0,000%
2007	0	0,00	30.742	138,60	0,000%	0,000%
Total	351	174,01	628.783	10.083,29	10,930%	0,548%

Source: Own elaboration and Bloomberg

The following columns show us the amount and number of ordinary bonds in the European market over the years. In the last two columns, we can see the share of green bonds in billions of euros and the number of issues relative to the overall European bond market. We can observe how green bonds are still a small fraction of the market with a share in 2019 of 0.228%.

Table 3 provides a summary of the green bonds across European countries. As we can see, Germany is the main issuer with 45.08 billion €, followed by the Netherlands with 38.26 billion €, France 36.41 billion € and Spain 12.74 billion €. There is something remarkable in some countries like Netherlands, France and Spain, and is that the share of green bonds with respect to the whole bond market is closer to 1%.

Table 3. Amount (in B€) and number (#) of green and ordinary bonds issued by country between January 1st, 2007 and December 31st, 2019

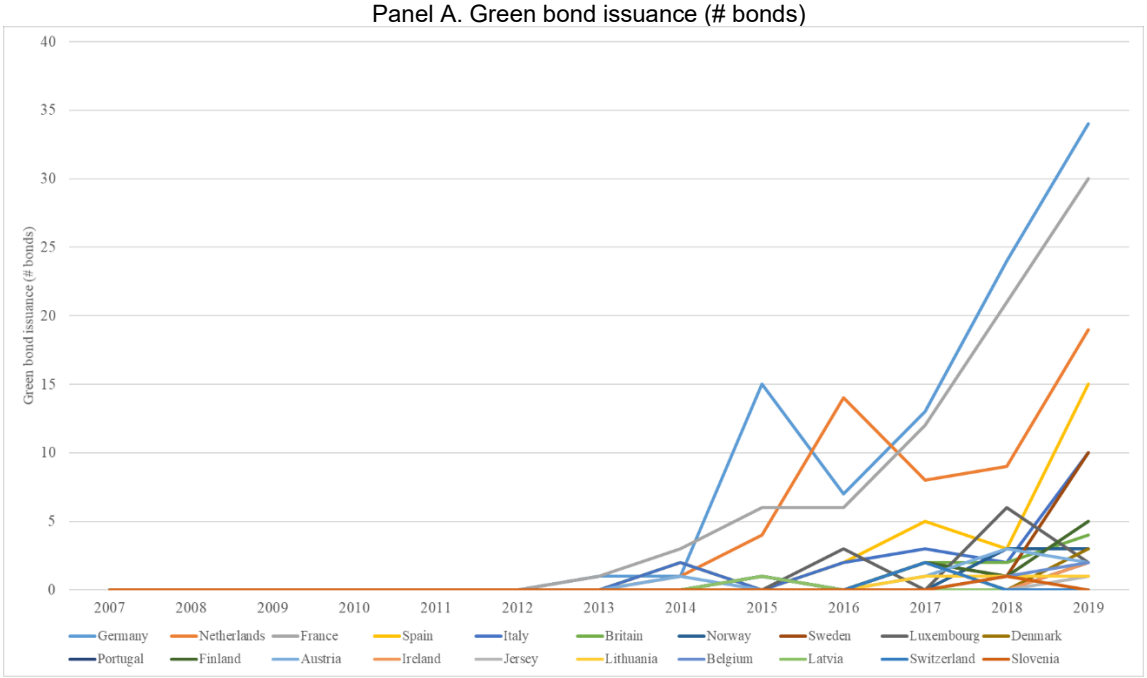
Country	# Green bonds	B€ Green bonds	# Ordinary bonds	B€ Ordinary bonds	Share of green bonds (€)	Share of green bonds (#)
Germany	95	45,08	331.858	-	-	0,029%
Netherlands	55	38,26	8.867	-	-	0,616%
France	79	36,41	9.695	-	-	0,808%
Spain	27	12,74	2.778	-	-	0,963%
Italy	19	10,46	53.104	-	-	0,036%
Britain	9	6,00	44.769	-	-	0,020%
Norway	6	4,69	10.327	-	-	0,058%
Sweden	13	3,00	13.964	-	-	0,093%
Luxembourg	11	3,65	7.100	-	-	0,155%
Denmark	6	3,47	4.434	-	-	0,135%
Portugal	2	1,21	1.721	-	-	0,116%
Finland	8	2,63	1.355	-	-	0,587%
Austria	7	2,52	12.008	-	-	0,058%
Ireland	2	1,13	2.666	-	-	0,075%
Jersey	1	1,11	184	-	-	0,541%
Lithuania	3	0,72	56	-	-	5,085%
Belgium	4	0,64	937	-	-	0,425%
Latvia	1	0,11	85	-	-	1,163%
Switzerland	2	0,11	121.879	-	-	0,002%
Slovenia	1	0,09	89	-	-	1,111%
Total	351	174,01	628.783	-	-	0,056%

Source: Own elaboration and Bloomberg

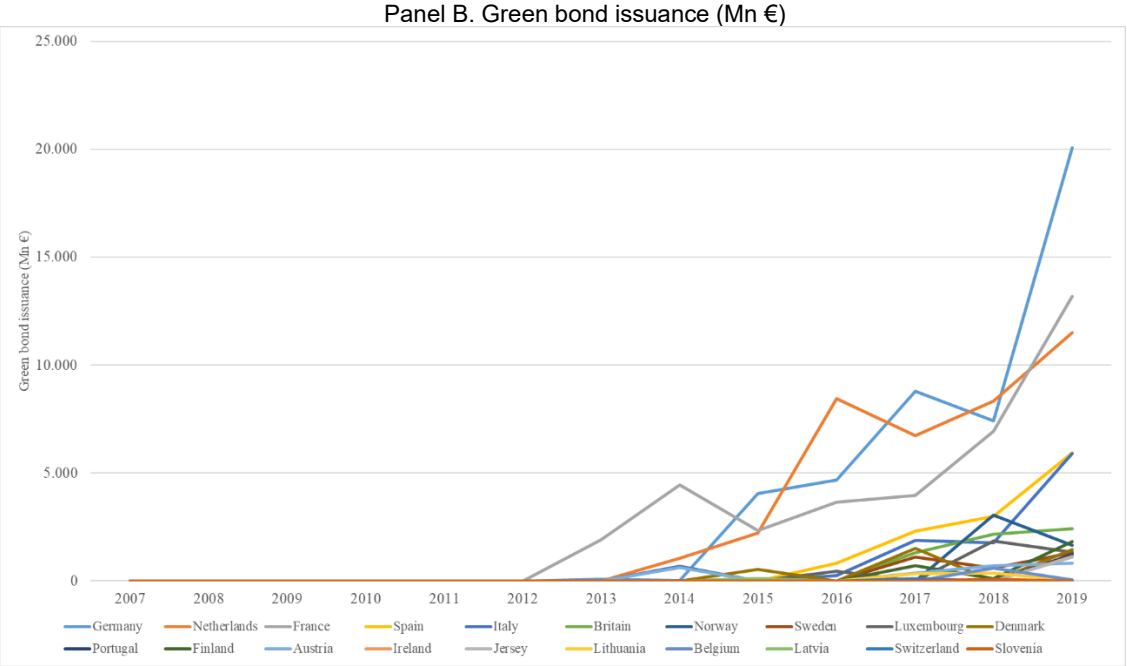
Figure 6 is showing us two different panels. In Panel A we can observe the evolution in the number of green bonds in the European market. We can see that the market is responding positively and increasingly since 2012. Therefore, we can confirm the growing trend in the number of green bonds issued in the European market. Also, this trend can be seen in Panel B where the volume of the green bonds issuance is shown by country and in millions of euros.

Figure 6. Evolution of green bonds across European countries from 2007 to 2019

Panel A. Green bond issuance (# bonds)



Panel B. Green bond issuance (Mn €)



Source: Own elaboration and Bloomberg

Table 4 provides information about the issues across sectors. Bloomberg provides a code depending on the industry classification system. The results show that the main issuers are industrial with 89.88 billion €, followed by banks (42.29 billion €), financials (34.38 billion €) real state (5.82 billion €) and insurance (1.65 billion €), but is almost worth nothing in the bond market with a share of 0.263%.

Table 4. Amount (in B€) and number (#) of green and ordinary bonds issued by industry between January 1st, 2007 and December 31st, 2019

Industry	# Green bonds	B € Green bonds	# Ordinary bonds	€ Ordinary bonds	Share of green bonds (€)	Share of green bonds (#)
Industrial	189	89,88	901	-	-	17,339%
Bank	86	42,29	445.246	-	-	0,019%
Financial	51	34,38	123.901	-	-	0,041%
REIT	23	5,82	3.361	-	-	0,680%
Insurance	2	1,65	759	-	-	0,263%
Others	0	0,00	54.615	-	-	0,000%
Total	351	174	628.783	-	-	0,056%

Source: Own elaboration and Bloomberg

In Table 5 we find a series of statistics on green bonds and ordinary bonds that are summarized in a way that they can be compared. As can be seen, green bonds tend to be smaller in this case since the average green bond issue is 497 million euros compared to 732 million euros for ordinary bonds. On the contrary, the maturity is higher for green bonds of an average of 7 years compared to 5.68 years for ordinary bonds. From this, we could assume that green bonds are used to finance long-term projects. Also, it can be noticed that the coupon rate is smaller for green bonds (1,72%) compared to ordinary (2.02%). According to Julia Kapraun & Christopher Scheins (2019), there are lower prices for green bonds since investors require a lower return.

Finally, but not least, we can say that green bonds are safer than ordinary bonds because 40% of green bonds have a range of AAA to A- rating compared to 19.17% of the ordinary bonds. This information is obtained from the credit rating composite of Bloomberg. In addition, we can find that never, a green bond has been rated in the C or D range in Europe.

Table 5. Summary statistics of green and ordinary bonds

	Green bonds	Ordinary bonds
# bonds	351	433.410
Issuance Amount (M€)	497,18	732,26
Maturity (years)	7,02	5,68
Coupon (%)	1,72	2,02
Bloomber rating		
AAA	5,00%	5,11%
AA+	2,73%	1,04%
AA	0,45%	2,07%
AA-	4,09%	2,21%
A+	3,64%	4,02%
A	5,45%	2,25%
A-	18,64%	2,47%
BBB+	10,91%	3,66%
BBB	8,64%	3,52%
BBB-	10,00%	1,96%
BB+	1,36%	1,04%
BB	1,36%	0,43%
BB-	0,91%	0,35%
B+	0,00%	0,37%
B	2,73%	0,59%
B-	0,91%	0,51%
NR	23,18%	68,39%

Source: Own elaboration and Bloomberg

3.2. Stock market reaction

3.2.1. Methodology

First, with respect to the sample, we have eliminated some bonds because they were heavily influenced by events that were more relevant than the announcement of the issue. Those bonds that we have discarded showed spectacular drops in the period from October to December 2018. As the well-known US economist Carmen Reinhart explains, this period is affected by the worsening credit quality of corporate debt issues and the deterioration of corporate balance sheets (Reinhart, 2018). Some companies like General Electric foresaw this problem with a profit warning who put the notice on a lot of corporate debt (Kilgore, 2018). In addition, we've eliminated those bonds that were affected by the recent pandemic (COVID-19) that influenced the global economic system. The difficulty in curbing the spread of the epidemic has forced governments to implement extraordinary measures, such as closing public buildings, businesses and shops, as well as limited mobility. As a result, production, consumption and tourism have been reduced in most affected countries. Moreover, that has economic consequences. For example, the S&P 500 index, in 16 days has descended more than 20% recording it as the fastest decrease ever (Nikiforos, 2020)

After discarding the affected bonds for these events, we ended up with a sample of 134 corporate green bonds issued to study how the stock market responds to the announcement of the green bond issue. From the point of view of studying the events, the date I will take as a reference is that of the announcement and not the day of issue, as this is the date on which the information is transmitted to the market.

As a reference for the study of different events, we will use day 0 as the date of announcement of each of the bonds. I then calculate the abnormal returns several days before and after the event date.

Specifically, for each company *i*, we calculate the abnormal returns (AR) using the market model. The a_i and b_i coefficients of the market model are estimated by the Ordinary Minimum Squares using 200 trading days. These days start 20 days before the event date followed by the remaining 180 days after the event date. The following formula is what I use to estimate the subsequent regression:

$$r_{it} = a_i + b_i \times r_{mt} + e_{it},$$

where r_{it} is the return of company *i* shares on day *t*; r_{mt} is the daily market return; and e_{it} is the residual. The daily returns of the shares of each company are obtained from Bloomberg for each of the different issuers of a green bond. The daily r_{mt} market returns are country-specific, so we use the major stocks in the market index country, for example, the CAC 40 index for France, for Germany I use DAX 30, Norway OSE, FTSE 100 for the UK and so on for each of the other countries.

During the study of these series of financial returns, we have been able to find common problems in this type of study in the presence of conditionally heteroskedastic temporal outliers. Introducing conditional distributions with wide tails does not allow to fully explaining the high kurtosis frequently observed in the residuals of the conditional heteroskedasticity models, which could be caused by the existence of outliers (Ruiz, et al., 2001). The simultaneous presence in a time series of conditional heteroskedasticity and outliers is a complicated problem since the effects of both phenomena can be confused. An isolated outlier biases all correlation coefficients of squared observations towards zero, and series of outliers generate correlations in the squares of the series, which can lead to spurious detection of conditional heteroskedasticity. I have monitored correlation, heteroskedasticity and normality and I observe that the yields of these series are not normal, they pose fat tails and the probability around the average is higher.

Therefore, we have fixed the regression with Arch and Garch (1,1) models, because when we model the variance of the residual we put it as a function of past residuals and also past variances.

Then, we calculate the estimated returns of the shares of each company *i* on day *t* given by:

$$\hat{r}_{it} = \hat{a}_i + \hat{b}_i \times r_{mt}$$

Finally, we calculate the cumulative abnormal returns (CAR). To be able to observe the reaction of the stock market to corporate news due to the announcement of the issue of a corporate green bond, we have used time intervals. To make them symmetrical around day 0 (announcement date) so that:

$$\underbrace{[-10,-6],[-5,-2]}_{\text{days } \textit{prior} \text{ to event}}, [-1,+1], \underbrace{[+2,+5],[+6,+10]}_{\text{days } \textit{past} \text{ event}}$$

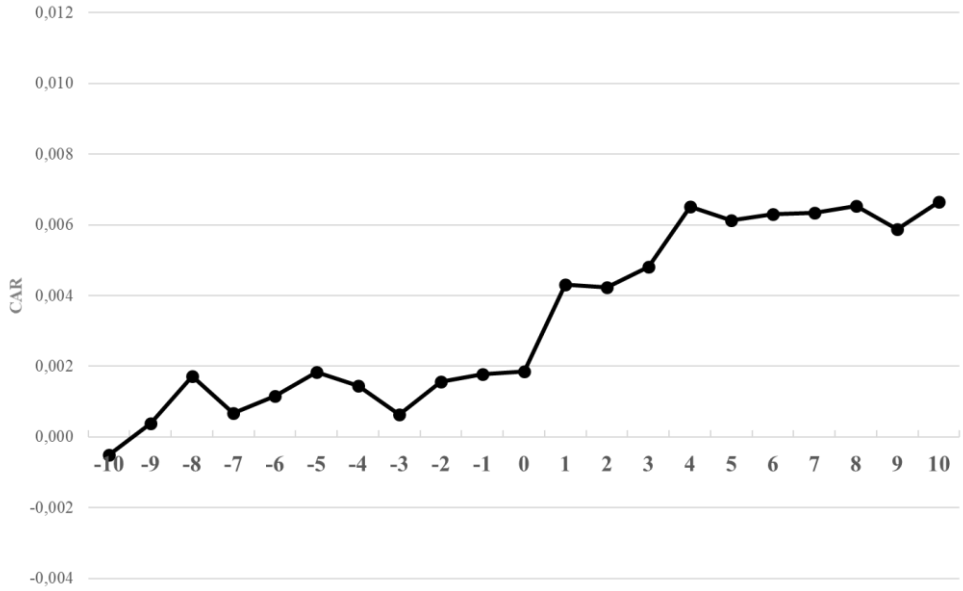
For each company, calculate the cumulative abnormal returns (CAR) using the market model by adding up the abnormal returns at event time, for example, the CAR from t_1 to t_2 is obtained as:

$$CAR_i(t_1, t_2) = \sum_{\tau=t_1}^{t_2} AR_{i\tau}$$

3.2.2 Results

In the table below we can see all the cumulative abnormal returns (CARs) plotted in a linear graphic ten days before and after the announcement date of the green bonds. We can see that the prior dates are not representative since they are close to zero. The significant increase can be seen in the three-day event window between (-1,1) with an average CAR of 0.28%, which is statistically significant since the t-ratio coefficient is 1.97 different from 0 at the 95% confidence level.

Figure 7. Stock market reaction to the issuance of green bonds



Source: Own elaboration

Table 6. Event time window table with respective CAR and Std. Err.

	Event Time	CAR	Std. Err.
	[-10,-6]	0,12%	0,31%
	[-5,-2]	0,04%	0,18%
Announcement	[-1,+1]	0,28%	0,14%
	[2,5]	0,18%	0,18%
	[6,10]	0,05%	0,23%

Source: Own elaboration

Economists who have studied the problems experienced with common stocks have found that the announcement of a capital increase generally results in a decrease in the price of the stock. While the opposite effect occurs with the announcement of green bonds, what we could call the "green bond effect" (Holmes et al., 2008).

4. Conclusions

Technological changes, environmental requirements and changes in social standards will be the long-term drivers for ESG investment and corporate sustainability. These global trends seem irreversible and governments may accelerate or delay it, but not stop it. ESG investments seem to become the new normality as we have seen in this study.

As we have seen throughout the document, there is still ambiguity in some parts like regulation, certification, rating, performance, but as the empirical part has shown, the news of a company issuing a green bond is beneficial to the company. Not only at an economic level by improving the price of the share, also the reputation of the company. Above all, institutional investors are investing in environmentally sustainable projects, and in this way are encouraging the development of activities that produce benefits for society and the economy as a whole.

As our analysis has shown in the European market, the “green bond boom” is in full swing. In the last few years, the number of green issuers has increased exponentially and private investors are increasingly interested in sustainable financing. That is why, in order to analyze how the markets behave when a green issue is announced, it has been necessary to collect the prices of the shares of each company around the announcement of the issue and the information of the market to which it belongs depending on the country where it is quoted. We have built an event time window with different time ranges before and after the announcement with the accumulated returns in order to be able to observe the reaction in the market in different stages. It has been possible to demonstrate that the announcement of a green bond has a positive reaction in the market by increasing the return on shares of green bond issuing companies as it produces additional value and are safe in the long term.

Therefore, it could be deduced from the data obtained that the incorporation of this type of asset into the portfolio of a fixed-income investor should not change the risk/return profile. However, this is a study that we leave open for further work to confirm the hypothesis that green bond issuers experience improvements in long-term financial performance and environmental performance.

References

1. ADIF (2019). Investor Newsletter. http://www.adifaltavelocidad.es/es_ES/empresas_servicios/doc/NewsletterN2.pdf
2. Bank of England (2018). Annual Report and Accounts. https://www.bankofengland.co.uk/annual-report/2018
3. Brainard, G. L. (2019). Why Climate Change Matters for Monetary Policy and Financial Stability. Speech at the Federal Reserve Bank of San Francisco Conference: the Economics of Climate Change. https://www.federalreserve.gov/newsevents/speech/brainard20191108a.htm
4. Carney, M. (2015). Breaking the tragedy of the horizon – climate change and financial stability. Speech at Lloyd’s of London, London, 29 September 2015. https://www.bis.org/review/r151009a.pdf
5. Carney, M. (2016). Resolving the climate paradox. Speech at the European Commission Conference: A global approach to sustainable finance. https://www.bis.org/review/r160926h.pdf [Last Access: April 2020].
6. Climate Bond Initiative (2019). Climate Bonds Standard V3.0. https://www.climatebonds.net/files/files/climate-bonds-standard-v3-20191210.pdf
7. Climate Bonds Initiative (2020). External Review. https://www.climatebonds.net/market/second-opinion
8. Council of The EU (2019). Sustainable finance: EU reaches political agreement on a unified EU classification system. European Council Press, 18 December.
9. Deutsche Bank Research (2018). Big data shakes up ESG Investing. Konzept 14. Deutsche Bank https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000478852/Big_data_shakes_up_ESG_investing.pdf
10. EU Technical Expert Group on Sustainable Finance (2020). Usability Guide: EU Green Bond Standard. EU Technical Expert Group on Sustainable Finance. https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-green-bond-standard-usability-guide_en.pdf
11. EU Technical Expert Group on Sustainable Finance (2020). Taxonomy: Final report of the Technical Expert. EU Technical Expert Group on Sustainable Finance. https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf
12. European Commission (2019). The European Green Deal. https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

13. Flammer, C. (2019). Green Bonds: Effectiveness and implications for public policy. NBER Working Paper No. 25950. https://www.nber.org/system/files/working_papers/w25950/w25950.pdf
14. Greenpeace European Unit (2019). European Green Deal misses the mark. Greenpeace. https://www.greenpeace.org/eu-unit/issues/climate-energy/2517/european-green-deal-misses-the-mark/ [Last access: 16 March 2020].
15. Hammond, A. L. & others (2007). The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid. Washington: World Resource Institute.
16. Holmes, G., Sugden, A. & Gee, P. (2008). Interpreting company reports and accounts. 10th Edition. Prentice Hall.
17. Huston, T. (2017). How do we feed the planet in 2050? in The Guardian Labs. September.
18. I4CE (2016). Beyond transparency: unlocking the full potential of green bond. https://www.cbd.int/financial/greenbonds/i4ce-greenbond2016.pdf
19. Iberdrola (2019). Iberdrola receives the biggest ever green loan granted by the ICO, worth €400 million in Iberdrola News. 30 May.
20. ICMA (2018). Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds. https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/
21. ICSU & ISSC (2015). Review of Targets for the Sustainable Development Goals: The Science Perspective. https://council.science/publications/review-of-targets-for-the-sustainable-development-goals-the-science-perspective-2015/
22. Independent Group of Scientists Appointed By The Secretary-General (2019). Global Sustainable Development Report 2019: The Future is Now-Science for Achieving Sustainable Development. New York: United Nations publication.
23. IPCC (2014). Climate Change Synthesis Report. https://archive.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf
24. Jackson, J. T. R. (2012). Occupy World Street: A Global Roadmap for Radical Economic and Political Reform. Vermont: Chelsea Green Publishing, p. 305.
25. James, G. (2013). 10 Things Employees Want More Than a Raise in Inc.com, 7 October.
26. Kapraun, J. & Scheins, C. (2019). (In)-Credibly Green: Which Bonds Trade at a Green Bond Premium? Available at SSRN 3347337.
27. Kilgore, T. (2018). "GE replaces CEO and investors cheer, despite a profit warning and huge charge" in Market Watch, 02 October.
28. Koranyi, B. & Canepa, F. (2019). "ECB's Lagarde will struggle to fulfill self-imposed climate mission" in Reuters, December.
29. Leaseplan Corporation (2019). The Total Cost of Ownership of electric vehicles. https://www.leaseplan.com/en-ix/global-fleet-insights/tco-ev/
30. Macchione Saes, B. & Ribeiro Romeiro, A. (2019). Ecological macroeconomics: a methodological review. Economia Sociedade, 28 (2): 365-392. https://www.scielo.br/pdf/ecos/v28n2/1982-3533-ecos-28-02-0365.pdf
31. Marqués, J. M. & Romo González, L. (2018). The risk of climate change for financial markets and institutions: challenges, measures adopted and international initiatives. Financial Stability Review, Bank of Spain, 34: 111-134. https://www.bde.es/f/webbde/GAP/Secciones/Publicaciones/InformesBoletinesRevistas/RevistaEstabilidadFinanciera/18/MAYO/Articulo_Marques__Romo-en.pdf
32. Masdeu, J. (2019). "Lagarde quiere incorporar el clima a la política del BCE" in La Vanguardia.
33. Meadows, D. H., 1972. The limits to growth. s.l.: A potomaca asssociates book.
34. Kuchtyak, M. & Davison, A. (2020). "Green, social and sustainability bond issuance to jump 24% in 2020 to $400 billion" in Moody's Investors Service. https://www.moodys.com/research/Moodys-Green-social-and-sustainability-bond-issuance-to-jump-24--PBC_1212910
35. NGFS (2019). A call for action. https://www.banque-france.fr/en/financial-stability/international-role/network-greening-financial-system

36. Nikiforos, M. (2020). When Two Minskyan Processes Meet a Large Shock: The Economic Implications of the Pandemic. Police Note 1. Levy Economics Institute of Bard College. http://www.levyinstitute.org/pubs/pn_2020_1.pdf
37. OECD (2018). Climate-resilient Infrastructure. http://www.oecd.org/environment/cc/policy-perspectives-climate-resilient-infrastructure.pdf
38. OFISO (2020). Informe Anual. http://www.ofiso.es/descargas/Informe-Anual-OFISO-2019.pdf
39. Prieto-Sandoval, V. (2018). Towards a consensus on the circular economy. Journal Cleaner Production, 1: 605-615.
40. Reinhart, C. M. (2018). "The Biggest Emerging Market Debt Problem Is in America" in Project Syndicate, 20 December.
41. Ruiz, E., Carnero, A. & Peña, D. (2001). Outliers and conditional autoregressive heteroscedasticity. Working Paper 7. Statistics and Econometrics Series 04. University Carlos III. https://e-archivo.uc3m.es/bitstream/id/145/ws010704.pdf/
42. Swain, R. B. (2017). "A Critical Analysis of the Sustainable Development Goals" in Handbook of Sustainability Science and Research, pp. 341-355.
43. The Economist (2019). "Climate change has made ESG a force in investing" in The Economist, 7 December.
44. United Nations General Assembly (1987). Our Common Future. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf
45. United Nations: Climate Change (2015). Paris Agreement. https://unfccc.int/es/process-and-meetings/the-paris-agreement/el-acuerdo-de-paris
46. United Nations (2015). Sustainable Development Goals. https://www.un.org/sustainabledevelopment/sustainable-development-goals/
47. United Nations (2015). United Nations Development Programme. https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
48. Irfan, U (2020). “Can you really negate your carbon emissions? Carbon offsets, explained" in Vox, February. https://www.vox.com/2020/2/27/20994118/carbon-offset-climate-change-net-zero-neutral-emissions
49. Yvon C., Ellison J. & Ridgeway, E. (2011). The Sustainable Economy. Harvard Business Review. https://blog.movingworlds.org/wp-content/uploads/2012/03/Sustainable-Economy-HBR-Oct-2011.pdf