

Comparative Studies of Green Bonds Investment in the United States and Europe: Responding to Social Concern on Climate Change

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Abstract: The oil and gas industry's responsibilities regarding climate change are still debated on both sides of the Atlantic. Despite this debate, two-thirds of carbon dioxide emissions into the atmosphere are released from oil and gas related industries. In order to keep rising temperature down to Paris climate targets, global oil companies face numerous difficulties because they require larger investments to develop new technologies for a broader energy mix. Studies show that climate change is the biggest risk in terms of impacts on the global economy. Realizing the truth, some countries have already managed to break the link between economic growth and carbon dioxide emissions, but more decisive policies are needed to break the link by capable economies such as the United States and Europe. In that context, this paper explores the recent green investment trends in the US and Europe to see how public opinion influences green investment to reduce climate change risks. This study focuses on green bond investment, describing its progress and variation from 2016 to 2019 in the United States and Europe. I use Excel spreadsheets to give graphical and numerical output in descriptive analysis. In conclusion, I found that public opinion on climate change significantly influenced green bond investment in both the US and Europe.

Keywords: Carbon dioxide emissions, Climate change, Green bond, Oil and gas, Social concern

1. Introduction

Global societies are now recognised that climate change is a major threat affect their communities, environmental and economies. The direct damage cost to health alone is estimated to be between 204 billion dollars per year by 2030 (WHO 2018). World Health Organisation states that the human activities – particularly burning fossil fuel have released carbon dioxide and other greenhouse gases that causes climate change. Fifty percent of global risks are related to greenhouse gas emissions and climate change (Boffo and Patalano 2020). The oil and gas sector is considered a major contributor to global warming and climate change, although it has played a great role in the growth of all major economies and provided great benefits to society and business (Frumkin, Hess and Vindigni, 2009). The oil and gas industry and economic growth have been unconditionally linked since industrialisation begin (Heede 2014; Soewarno, Tjahjadi and Firdausi, 2018). Now the world is recognising climate change as the darker side of fossil fuels. Climate change poses great risks to societies and business by limiting economic growth in contrast to traditional economic growth model. To restrict future climate change risks to the Paris climate agreement is technically feasible human society require to decouple growth from carbon emissions (Schroder and Strom, 2020). The biggest barrier to avoiding the climate change risks is the present prevalent socioeconomic system based on high carbon economic growth and elevated level of resource consumption (Malm, 2016; McNeill and Engelke, 2016).

Climate stabilisation requires a paradigm shift of hydrocarbon energy, production, and transportation infrastructures, a social concern on oil and gas consumption and larger scale public investment describes (Schroder and Strom, 2020). Studies have identified climate change as the biggest risk in terms of impacts to the world economy and as the widest ranging market failure ever seen, because climate change is an economic externality, meaning that whoever causes emissions does not pay the full costs of the damage (Rehn, 2020). Realising this truth and the public concern about climate change caused by oil and gas industry emissions, some countries have already managed to weaken the link between economic growth and emissions, but more decisive policies are needed to break the link in most economies. The solution suggested is to finance renewable energy instead of financing non-renewable energy originating from coal, oil, and gas. The transition to delink this relationship requires a lot of capital, as demonstrated by Rehn. The estimated amount accumulates yearly, and the action plan is regulation which aims to provide incentives through green financing to fill the accumulating gap. The objective of regulation is to ease accumulating financial risks by lowering bank capital loans to the environmentally damaging business sector of coal, oil, and gas. This process promotes renewable energy investments that reverse climate change risks. Against this backdrop, this paper explores the effectiveness of green finance in the United States and Europe and find whether public attitudes about renewable energy influence the mitigation of climate change risks. It is a comparative study of the effectiveness of green finance trends and public attitudes to mitigate climate change risks caused by oil and gas industry emissions, which measures renewables investment trends and variations in the United States and Europe. Therefore, the main consideration is

environmental performance related to climate change, although social performance is equally important to financial performance and is a considerable part of green finance. Empirical evidence from literature reviews and our time-series descriptive analysis shows that public attitudes to renewables significantly positively influence green finance objectives by way of greater investment in green bonds which mitigate climate change impacts.

The next section of this paper discusses the wide range of literature on green finance, then attention is narrowed to the green bond by describing its progress and variations from 2016 to 2020 in the United States and Europe. Then I present a time-series graph based on secondary data obtained from the World Economic Forum (WEF), University of London, and Union Credit bank with the time-series descriptive analysis method. The Methods and Results section discusses the overall progress of the green bond as one of the effective tools of the green finance platform to mitigate climate change risks. This section includes interpretation of data with time-series analysis displaying the underlying influence of public attitudes on climate change issues on both sides of the Atlantic. In this study, I assume that social reality, which is human experience and its social contexts in the US and Europe, is best studied via social-historic trends. Therefore, I use an interpretive paradigm because this research assumes green finance trends are based on social reality and on an understanding of environmental degradation as a human experience in social contexts that influence government policy on environmentally sustainable investment. Therefore, it is best studied within its socio-historic background by interpretation of subjective meanings influencing both US and European investment in green bonds, which is a proxy indicator of the effectiveness of public attitudes to alter public policy on climate change risks regarding renewable investments to reduce carbon dioxide emissions. The paper concludes with the limitations involved.

2. Literature Review

Global societies now understand that the major threat to societies and economies is climate change and recognised the carbon dioxide emissions need to drop to avoid future climate change risks. The Intergovernmental Panel on Climate Change (IPCC) has revealed that emissions from oil and gas are the major cause of climate change. It further states that 89% carbon dioxide emissions came from oil and gas industry in 2018 (Client Earth, 2018). Forbes 2020 reveals that oil and gas sector still supply 84% of world energy according to their analysis on British Petroleum (BP)'s annual review. It is well documented that oil and gas sector has played a great role in the growth of all major economies and provided great benefits to business and society (Frumkin, Hess and Vindigni, 2009; Soewarno, Tjahjadi and Firdausi, 2018). As a result, the sector has emitted great amounts of carbon dioxides and other greenhouse gases into the planetary environment, exceeding its carrying capacity, and the very same world economies which have benefited ignore the carbon accumulated in the atmosphere over the past centuries (Rehn, 2019). Now the time has come to reverse the damage caused by use of non-renewable fossil fuels. Offsetting emitted carbon means replacing non-renewable with renewable energy, mainly from solar and wind power. Investment in renewables is one of the main solutions to mitigate and adapt to climate change risks, as described by Boffo and Patalano (2020). However, technology and tax incentives alone are not adequate to accomplish this, as demonstrated by Rehn (2019), but they play a moderating role. This idea was focused on at the 21st Paris Climate Summit in 2015, which considered the growing risks of climate change and adopted an agreement to keep global temperature rises well below 2°C, preferably below 1.5°C (IEA, 2016, Pearce, 2016, Schroder and Strom, 2020). Accordingly, the United Nations has outlined Sustainable Development Goals. Achieving the objectives of the Paris Agreement will require substantial public and private investments, mainly in the energy sector (Boffo and Patalano, 2020). It is estimated that around USD 6.9 trillion of annual infrastructure investment is required before 2030 to meet climate change related development needs globally. This a great global challenge for all world economies and studies show that USD 4 trillion is required in emerging and developing economies, with a global annual gap of USD 2.5-3 trillion currently (Boffo and Patalano, 2020). To bridge this gap, it is suggested that co-operative efforts are required from both public and private sectors. Mobilising private capital helps this process by financing renewable energy projects. The predominant financial instruments in green finance are debt and equity. Again, these are not without financial risks. The Global Financial Crisis drove climate policy discussion into the political context for a decade, as described by Rehn (2020) and he stated green finance should not repeat that same mistake but should ensure financial stability. Financial stability can be achieved by using the triple bottom-line of people, profit, and plant. Accordingly, a firm's responsibility lies with stakeholders instead of shareholders in the sense that it should focus on stakeholder interests instead of only maximising shareholder interests. Globally, this approach has never been incorporated into business strategy, but the 2015 Paris climate change agreement paved the way for solutions to meet the new reality. This has become a trend and now people are seeking to work more sustainably and buy more sustainably. Studies reveal that the US economy grew by 10% while also dropping carbon dioxide emissions from its energy sector by 9.5% (Phelan, 2017, Schroder and Strom, 2020). This decoupling of energy sector emissions and economic sector trends further confirms the studies by Shuai et al. (2017) of 160 countries, by Messinis (2018) of OECD countries, and by Apergis, Christou, and Gupta (2017) of the United States. The International Energy Agency (IEA) also stressed a similar view based on past data that showed global carbon emissions can remain stable even with the decoupling of economic growth from fossil fuel use.

These views are plausible if more countries switch to renewable energy by investing in green finance anticipating the Paris agreement. In line with view, firms integrate sustainable development goals into their strategies not only to attract and retain staff, but also to encourage all stakeholders investing in green financing to meet the Paris climate agreement. At this point it is worthwhile to briefly discuss a few definitions of green finance, because it represents a wider frame than just green investment. In 2019, Landberg, Massa and Pogkas defined green finance as money pouring into any kind of asset labelled green or sustainable. Terzo (2020) defines green finance as a combination of the world of finance and business with environmentally friendly behaviour. Green finance can happen differently depending on the participants and it may be led by financial incentives, a desire to preserve the planet, or a combination of both. Chen (2019) demonstrated that green finance may fit well under the umbrella of what is traditionally referred to as socially responsible investing (SRI), even though it is fundamentally much more specific. Hohne *et al.* (2011) describe green finance as a wider term that can refer to financial investments in sustainable development projects and initiatives, environmental products, or policies that encourage development of a more sustainable economy. Zadek and Flynn (2013) define green finance as representing a wider lens than green investment. It includes capital cost, but unlike green investment it also includes operational costs such as project preparation and land costs. Price Waterhouse Cooper Consultants (2013) define green finance as financial products and services which consider environmental factors throughout lending decision-making, monitoring, and risk management to promote environmentally responsible investment in low carbon technologies, industries, and business. Bohnke *et al.* (2015) define green finance as comprising all forms of investment or lending that consider environmental impact and enhancement of sustainable development agenda.

Majority of these definitions have some link to conventional SRI definitions, and it is hard to find a clear definition of green finance, as described by Lindenberg in 2014. This may create some illusions about the terms sustainability, sustainable development, green investment, green finance, and other climate finance terminology. Some use green investment and green finance interchangeably. There are many interpretations of green finance, most commonly around renewable energy and energy efficiency, pollution prevention and control, biodiversity and conservation, circular economy initiatives, and sustainable use of natural resources and land (Fleming, 2020). This type of green finance loan is used to promote the proliferation of renewable energy, for instance, a lender could finance the development of solar or wind power generation. Some argue that fossil fuel companies are not interested in green finance projects, but evidence shows that oil and gas companies have already committed to reduce their emissions by investing in renewable energy projects in the United States and Europe. Green finance refers to any form of finance which integrates environmental, social, and governance (ESG) factors. It consists of numerous variant financial instruments such as bonds, loans, revolving credit facilities, and more. Green finance is a broad topic with multiple stakeholders. In the case of bonds, there are different types of bonds available in green financing, such as green bonds, social bonds, sustainability-linked bonds, and green loans (Landberg, Massa and Pogkas, 2019). Oil and gas companies traditionally been skeptical about renewables niches now moving beyond their core oil and gas business (Shojaeddini *et al.*, 2019). It seems to be beginning to invest in renewables more heavily, whether the growth continuous remains to be seen described by Shojaeddini *et al.*, 2019.

Empirical studies reveal that several developments have contributed to the growth of green financing, firstly social demand by non-investors (Boffo and Patalano 2020). It reflects a transition that shift the traditional shareholder model to a broader stakeholder model challenging firms to serve stakeholders' interests and extend the growth of corporate social responsibility in business and government entities. Secondly, greater demands by social investors related to good corporate practices, and thirdly demands by green finance investors for more sustainability perspectives aligning with risk management aspects, social concern and values. These distinctive developments positively influenced green financing (Boffo and Patalano, 2020). Considering these facts, I have taken a third driver, social values, of green bond investment trends and will explore the relationship of public attitudes to renewable energy and green bond investment trends in the United States and Europe, to compare the progress of green finance initiatives. In the next section, I will discuss green bonds and investment trends in the US and Europe.

Accordingly, this paper discusses green finance, a broad topic, in the single area of green bonds and explores comparative studies of public attitudes on climate change and the effectiveness of their influence on green bond investments in the US and Europe from 2016 to 2019. Investing in green bonds may have led to reduced carbon dioxide emissions by oil and gas companies during the same period. The outcome will tell us about the relationship between public attitudes on climate change and green bond investment trends in the US and Europe, comparatively. It also reflects on the players who are dominating the green horizon and proactively leading the way to reduce carbon dioxide emissions and mitigate climate change risks.

3. Green bonds

Green bonds reside to a broader classification of bonds known as climate line-up bonds. This is a

Kind of bond meant to use to finance low carbon infrastructure (Wang, 2018). There are two types of green bonds—green labelled bonds and green unlabelled bonds. Green labelled bonds are used to finance green assets by their issuers while green unlabelled bonds finance green projects and low carbon economy(Wang, 2018). Today green bonds are used by both public and private sector corporations globally to finance green projects (Paulson, 2016). IRENA 2020 report claims that current global \$ 95 million cost investment plan to decarbonization-path reaching \$110 trillion will creates enormous socioeconomic benefits including 52 million of renewable energy related jobs in 2050 while increasing a global GDP by 2.4% higher than under the current fossil fuel scenario (Vitter, 2020). Studies of green financing show that green finance seeks to generate a positive social return that is measurable and reportable alongside the financial return (OECD, 2019). Landberg, Massa and Pogkas (2019) describe green finance as now growing, with sustainable asserts reaching USD 14 trillion in Europe and USD 12 trillion in the USA in 2018. This shows that the private sector has taken climate change risks seriously, even drawing pension funds to back new renewable projects by electricity power developers which offer steady yields. This led to the creation of green bonds and green loans. Additionally, more funds have been diverted by the oil and gas sector to accommodate renewables and have a wider product mix of oil, gas with solar and wind energy, as illustrated by Landberg, Massa and Pogkas (2019). This energy transition can lead to achieving Paris sustainable development goals to mitigate climate change risks caused by the oil and gas industry. Studies show that Europe is the largest contributor of sustainable bonds, with 57% market share, while the USA reached 22% in 2020 (Ramel and Michaelsen, 2020).

Considering this development, this paper explores the effectiveness of green bond growth in the United States and Europe. The green bond market started in 2007 and has seen continuous market growth to date (Rooney,2019).

The World Bank defines a green bond as a debt security issued to raise capital specifically to support climate-related or environmental projects. This definition is well aligned to the economic theory that the policy should be to replace wrong incentives with better incentives. In that sense the green bond, also known as climate bond, is a solution to mitigate climate change risks posed by the oil and gas sector which encourages the sector to diversify their product portfolio to accommodate renewable energy such as solar and wind power. Green bonds are issued to raise finance for climate change solutions and are issued in numerous types, such as government and government-backed entities, financial institutions, and non-financial corporates (OECD, 2019). In the 2019 financial system, regulatory and investor responses to climate change contributed to annual green debt finance exceeding USD 200 to USD 250 billion (Climate Bond Initiatives, 2020). Figure 1 of the methods and results section of this paper clearly shows the green bond growth trend globally. In line with this development and increasing public concern about climate change, both social and sustainability bonds have grown steadily, which is not explored in this study.

4. Methods and Results

To identify the effectiveness of green bonds, we have obtained secondary data from UniCredit Bank, Munich about the green bond supply and social concern about climate change during the period from 2016 to 2019. We also obtained data from social surveys conducted by the University of London within the same period to investigate the relationship between public attitudes on renewable investment and green bond investment in the US and Europe. Globally, green bond issues have been increasing steadily. Figure 1 shows global trends in green bond issues since 2016. This time-series data and graph are based on the secondary data obtained from World Economic Forum (WEF) publications. In 2016, green bond value reached USD 82 billion and then steadily grew to USD 257.7 billion in 2019 (Lo Giudice, 2017). Public interest in climate bond investment growth grew not only in the US and Europe, but also in other developing nations as well. The green bond market has risen because the green bond simultaneously achieves financial returns as well as positive effects against climate change impacts on society (Lo Giudice, 2017). The climate bond market predominantly allocates finance to renewable energy and environmental protection projects and is viewed as niche. Figure 1 shows that this niche market has been upscaled yearly with growth of public concerns on climate change risks. Berensmann *et al.* 2017 illustrated that a scale-up of green investment will not only mitigate climate change, but it will also foster economic growth and job creation. This paper focuses on this trend in the United States and Europe. Figure 2 shows public attitudes on renewable energy. They in turn may influence the green bond supply in the US and Europe which is shown in Figure 4. Figure 3 data has taken from google trends from 2016 to 2019 and the graph shows that European concern about investments in green finance while Americans are less convinced. However, green bond issues in the United States and Europe increased between 2016 and 2019. Figure 2 shows that trends in public attitudes on climate change by way of accepting renewables clearly mirror trends in green bond supply shown in Figure 4. Although this association is high and entails a positive relationship between public attitudes and green bond investment, there are several variables omitted here, as indicated in the limitations section of this paper. The other point in this paper is that growing public concern about renewable energy means growing public concern about

climate change risks. Figure 5 shows further evidence of growth in green bond volumes in Euro and US currency yearly between 2016 and 2019.

In contrast to the US, the European green bond investment trend has been robust over the last four years, due to continuous European government encouragement of climate finance, as opposed to US speculation on climate change.

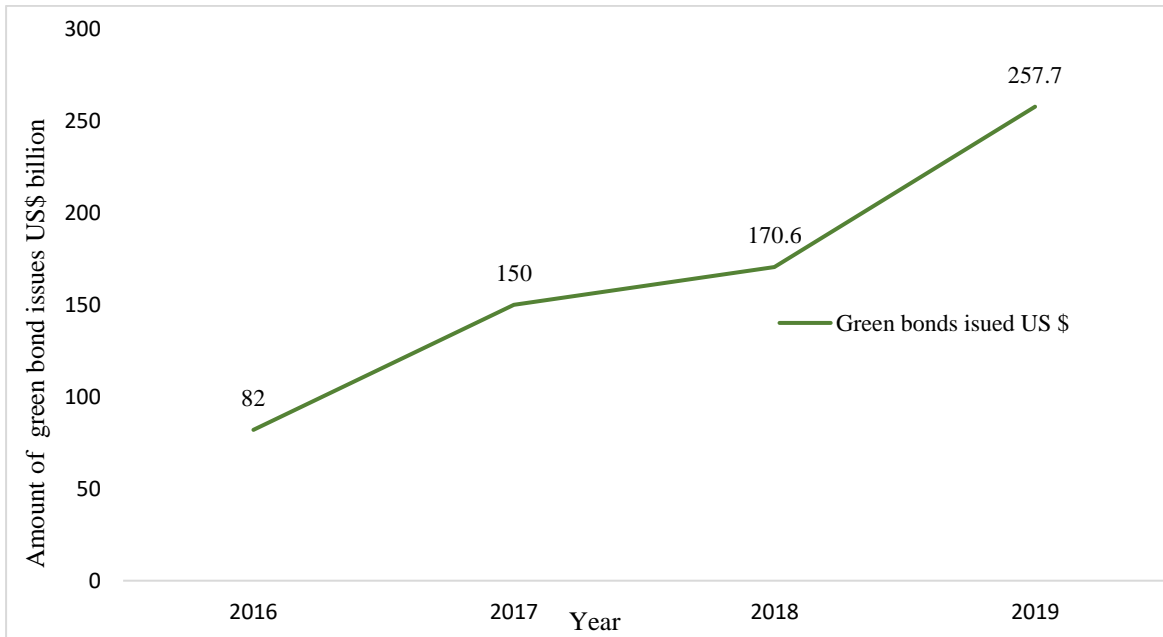
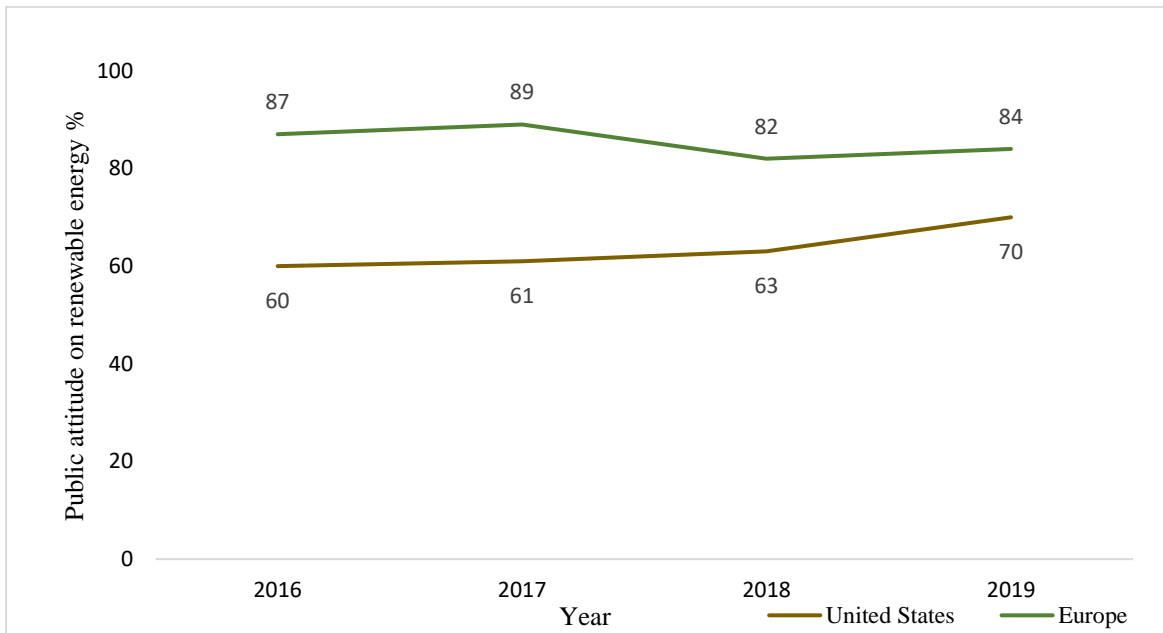


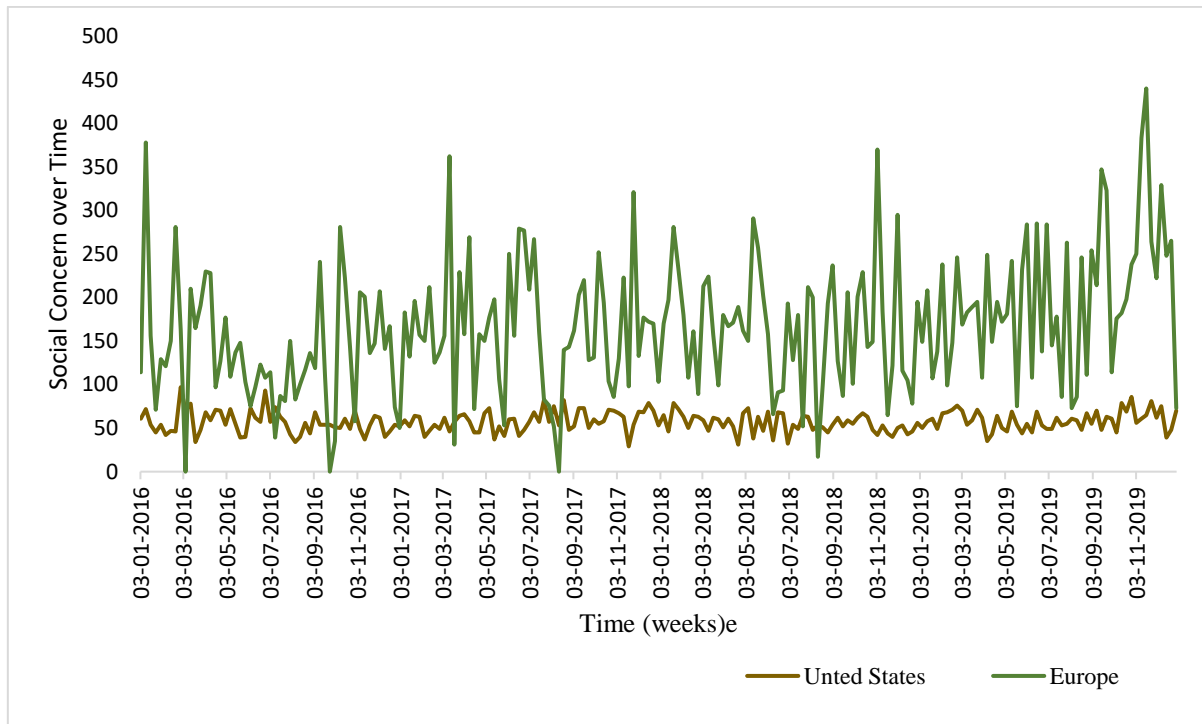
Figure 1. Value of global green bond issues 2016 to 2019

Source: WEF 2020



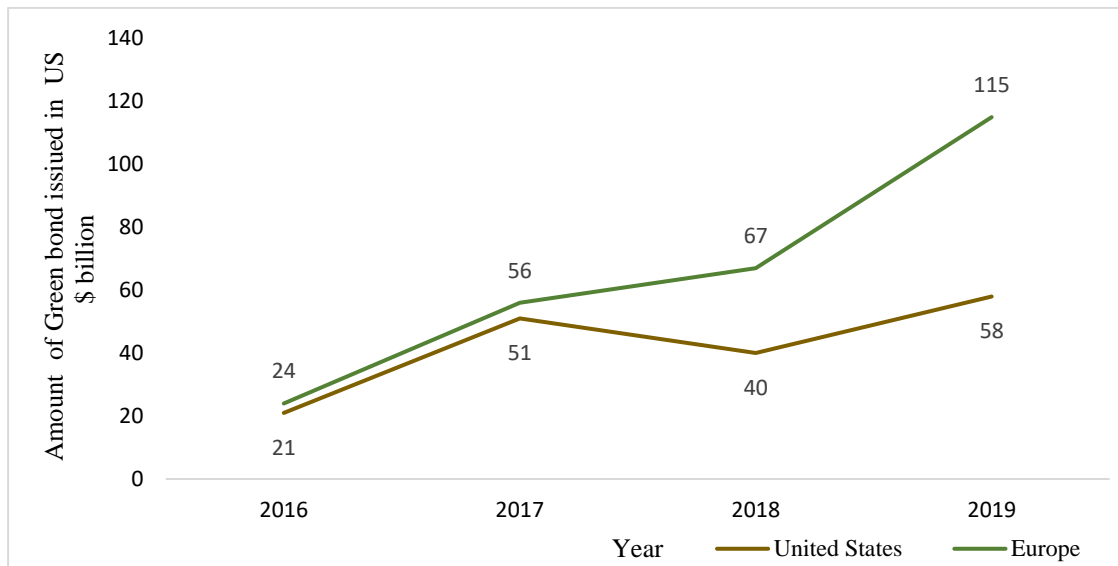
Source: University of London, European Commission

Figure 2. Public attitudes on renewable energy sources in the United States and Europe



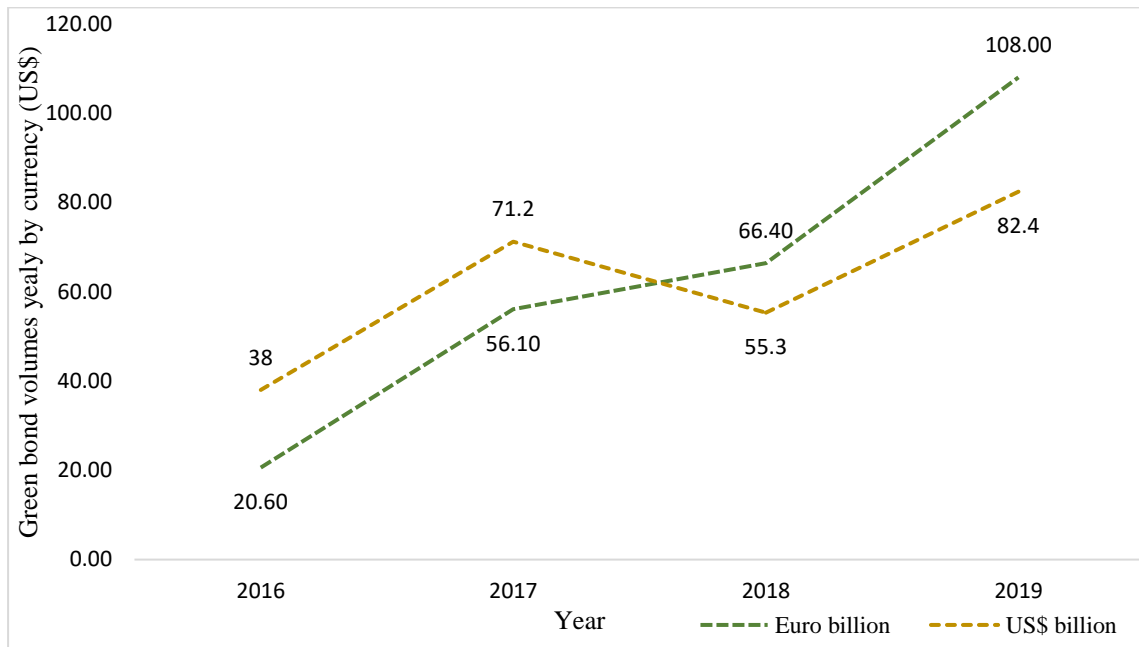
Source: Google 2020

Figure 3. Green Finance Trends 2016-2019 in the United States and Europe



Source: UniCredit Bank, Munich

Figure 4. Green bond supply in US\$ billions in the United States and Europe 2016-2019



Source: OECD 2019

Figure 5. Green bond volumes yearly by currency (USD) in millions 2016-2019

5. Discussion and Conclusion

At a time of social concern spikes are high world policy regimes shifted towards low carbon emissions as well as oil and gas energy prices. This paradigm shift attracts financial instruments to advance the energy transition by accommodating renewables. Empirical studies show that in the US green bond market operates and regulate on self-regulatory mechanism in contrast to the European green bond market (Wang, 2018). As such, American responses towards climate bonds were less effective comparatively. In this paper, I analyse this trend which is the central objective to measure the effectiveness of social concern about climate change and its influence on green bonds investment in the United States and Europe. To achieve this objective and ensure high quality data, I obtained secondary data from independent research bodies and industry publications. These two streams of data enabled identification of the influence of public attitudes to renewable energy on investment in green bonds to alleviate climate change risks. The increase in green bonds constitutes a proxy indicator of environmental performance to mitigate climate change risks. Time-series analysis shows that higher levels of green bond investment are possibly related to higher levels of public concern about climate change risks. The results suggest that in the United States public attitude on climate change is lower than in Europe, and in turn green bond investment is less in the United States than in Europe. Further, the results suggest that public investment in green bonds could be a strong predictor of the degree of public influence to mitigate climate change risks. The results also show that overall Europe has become more publicly aware of climate change risks and that Europeans are playing a leading role in mitigating climate change risks, in contrast to the United States. These societal trends mirror a growing recognition of the importance of global investment in climate bonds.

Lastly, the outcome of the results largely consistence with past findings of Brody *et al.* (2008), Kellstedt *et al.* (2008) that more public concern on renewables is more likely influence higher environmental performance. In conclusion, I found that public attitudes on climate change significantly influence green bond investment in both the United States and Europe. However, this study has several limitations, mainly that I considered only green bond investments, but social and sustainability bond investments are also influenced by public attitude. Furthermore, social media platforms also play a moderating role in influencing green bond investments, which is fruitful ground for future research work.

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