

LUISS



Dipartimento di Economia e Finanza

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# Financing Net Zero Transition and the Green Determinants of Equity Returns

Luana Zaccaria

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RELATORE

Giulia Serafino

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CANDIDATO

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## **Abstract**

Given the current climate change situation, financial markets play a crucial role when considering green investments. Recent findings provide evidence that companies highly rated in terms of Environmental score report higher excess returns and lower volatility, when compared to other businesses. This general belief is supported by the assumption that ESG factors, especially the Environmental factors, are considered as a good proxy for firms' financial soundness by market agents. Nevertheless, the findings of the following analysis do not seem to support this statement, since the companies' performance of the corporations analyzed does not prove to be affected by their efforts in terms of Environmental commitments. On the other hand, the study reveals a plausible relationship between price index returns and climate change news. More specifically, price returns appear to incorporate climate change news, although the direction of the former respect to the latter seems to differ depending on the country considered. To further investigate the outcome, the analysis is repeated on representative U.S. and E.U. firms. The results obtained are later discussed, suggesting some plausible explanations to the findings.

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# Introduction

Nowadays, the world's climate is changing. Global climate is expected to keep mutating exponentially in the upcoming years. Increasing trends in globally averaged temperatures, sea level rise, land-based ice melt and other climate variables provide consistent evidence of a warming planet. As the global surface temperature increases, the likelihood and intensity of natural disasters will also increase, leading to a disruptive scenario surrounded by uncertainty. Financial markets would face disorderly asset prices adjustments, disruptive projections to the proper functioning of the financial system and potential spillovers to other sectors of the economy.

Greenhouse gas concentrations and global warming have been proven to be largely attributable to human activity. Governments and institutions are collaborating to slow the pace of global warming down; still, the process requires long term efforts, involving a remarkable green investment's increase and very high costs to be sustained. More specifically, the overall cost of climate change will be equal to at least 5% of the global gross domestic product each year, 30% of which involves public investments, and the remaining 70% private investments.

Consequently, the role of low environmental impact sustainable stocks has become crucial in financial markets. Investors are likely to demand positive environmental impact from the corporations they invest in; recourse to green bonds, new environmental standards and green certificates are just a few of the many actions and services corporations and financial institutions are implementing to meet this growing trend. Therefore, the question comes spontaneously, are monthly equity prices affected by the green sustainability of the single corporation, implying that firms investing more in environmental sustainability are likely to receive higher investors' perceptions? Or do they fluctuate because of other climate change external factors?

With the net zero pledge constantly calling for more mitigation actions, it is curious to understand the effectiveness of green financial instruments on price returns, as well as the impact that mitigation policies have in the topic. In Chapter 1, I provide the financial markets application to the environmental challenge, through the description of innovative financial services and products, such as green bonds and sustainability linked ETFs, as well as the huge impact on insurance services. To further assess how markets' engagement in the net zero transaction is carried out, I provide a non-exhaustive overview

on the evaluation methodology behind environmental scores, identifying the main challenges arising and showing how institutions try to overcome these difficulties by implementing some reference indexes. Additionally, greenwashing scandals are mentioned to describe how prices seem to be affected by market cheating in terms of climate change initiatives.

Once the current green finance situation has been explained, Chapter 2 questions whether all these corporate efforts towards the net zero transition matter in terms of price index fluctuations. In the analysis, I scrutinize the potential relationship between the environmental ranking score and the price evaluation of the firm, by considering different corporations operating in various industries and located in multiple countries. At the same time, I include a climate change news index in the regression, to account for potential effects of environmental related news on returns. By accounting both for the climate change news index alone and for the combination with the firm's environmental score, I investigate these variables' effects on businesses' prices. Eventually, I apply the same procedure on E.U. and U.S. firms, by considering the excess returns on the corresponding reference markets.

Consequently, Chapter 3 discusses the results obtained in the data analysis. More specifically, it investigates the reasons why a neutral relationship between corporations' environmental sustainability scores and the corresponding price returns seems to exist. Similarly, the chapter describes possible explanations for the discrepancy arising between the general regression outcome and the US specific outcome, since the former shows a positive effect of climate change news on equity returns, while the latter proves a negative effect. A potential clarification could be provided by the emerging countries balancing effect present in the general analysis, given the disequilibrium in terms of climate change impact on developing countries compared to developed countries. At the same time, the mutable political situation in U.S. is suggested to be contributing to the negative effect of climate change news on price returns, affected by the general decreasing green sentiment shown by investors. The New U.S. Climate Disclosure Rules are briefly explained in support of the theory suggested, together with the green investment consequences in case of a Trump second mandate in autumn 2024.

# Chapter 1

## 1.1 Climate Change Challenge in Financial Markets

As indicated in the Global Risk Report 2023<sup>1</sup> of the World Economic Forum, six out of ten most significant global risks in terms of relevance in the next ten years are linked to climate change. Therefore, it is normal that investors care about the matter and they are interested in hedging it, leading to a revolution in financial markets.

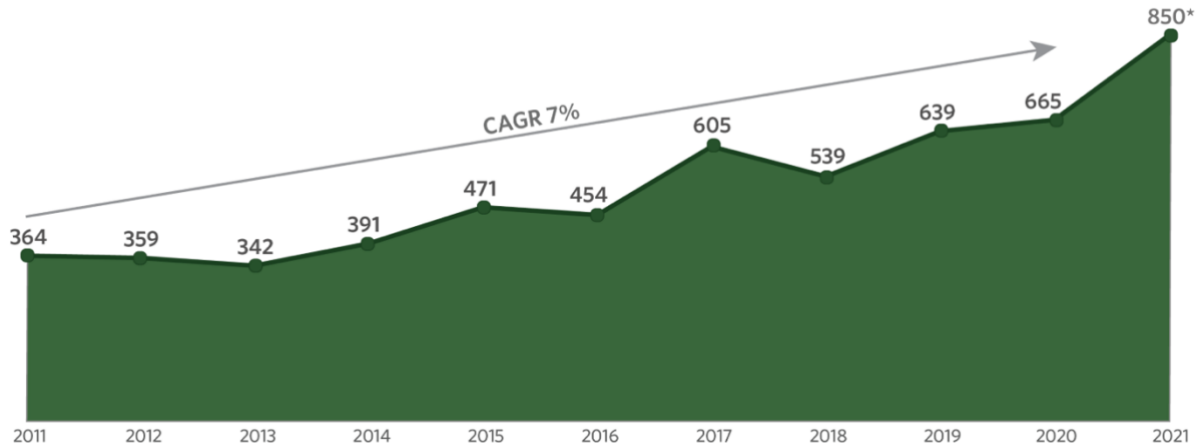
The transition to a low carbon economy requires substantial investments; the financing gap is estimated to be \$2.5 trillion per year, considering developing countries alone. The COVID 19 pandemic has contributed to the green transaction costs, requiring substantial investments from the private sector, which is in continuous evolution towards long term value innovations and opportunities, rather than risk management practices. In spite of this, there are many challenges to overcome: the mismatch between long term green investments and relatively short-term time horizons of investors, the inefficient collaboration between governments and greenwashing limit the effective reaching of the SDG settled. According to the Climate Policy Initiative's Global Landscape of Climate Finance 2021<sup>2</sup>, climate finance has steadily increased over the last decade, but its flows have slowed in the last recent years, probably due to the concerning trend provided by the COVID 19 on financial markets.

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<sup>1</sup> World Economic Forum (2023). *Global Risks Report 2023*. [online] World Economic Forum. Available at: <https://www.weforum.org/publications/global-risks-report-2023/>.

<sup>2</sup> CPI. (n.d.). *Global Landscape of Climate Finance 2021*. [online] Available at: <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2021/>.

**Figure 1.** Global Climate Finance over the period from 2011 to 2021 (in USD billions)



Public and private climate finance almost doubled between 2011 and 2020, although climate objectives requires climate investment to grow at least seven times by the end of the decade.  
Data source: Climate Policy Initiative

Nowadays, green finance growth is expected to move inequivalent depending on the country considered. In the US, presidential elections bring a level of uncertainty due to the unexpected measures the government will take with regards to regulations and whether local institutions still have the courage to keep promoting green investments. On the other hand, emerging economies show a positive growth momentum; China's commitment to decarbonization and green economy development is impressive, followed by India and Brazil latest alignment with green policies.

Green finance aims to internalize environmental externalities and to reduce risk perceptions, promoting green investments rather than unsustainable growth patterns. In accordance with this, financial markets are characterized by a steep increase in the development of innovative products; many alternatives are offered, in order to support corporations' integration and transition towards a green business. Green finance covers a wide range of financial products and services, which can be divided into investment (Green ETFs), banking (Green Bonds) and insurance products. These products, practices and tools have the potential to improve information flow, price discovery and liquidity in support of a low carbon transition, as well as redirect investments to parts of the market that will efficiently contribute to the transition. Within this, it is important to consider two factors. First, investors and markets need accurate comparable information about companies' environmental performance to assess whether these support the investment strategy they have in place; this regards the green business' definition. Second, they also

need products that accurately integrate information on how companies are assessing and responding to risks posed to their operations in both a medium and a long term prospective, as a result of carbon transition; this second statement involves the firm's climate resiliency.

### **1.1.2 Green Bonds**

Green bonds are debt securities issued by an organization for the purpose of financing projects and investments that contribute positively to the environment. Green bonds, also known as "Climate bonds", are fundamentally the same as standard bonds: a loan made by an investor to an organization to finance a project, with the investor receiving the principal amount on the maturity date, plus interest payments throughout the loan's time period. The specific difference relies on the underlying project financed with the proceeds; green bonds are issued exclusively to finance investments generating positive impact in terms of green transaction. Another important characteristic of green bonds relies on the presence of a so called "second part" opinion, meaning that the effectiveness of the green project is assessed by an external independent agent. Green bonds are different from sustainability linked bonds; the former is strictly linked to the project, while the latter were launched by Enel in 2019 and they provide some sustainability related corporate objectives, usually about greenhouse gases emission. Sustainability linked bonds are usually preferred by shareholders because they are tailored on the corporate strategy, while green bonds remain separate from the business strategy and hence, they are more suitable for funds' investors. Moreover, green bonds may offer tax incentives, aimed at attracting investors to finance projects that benefit the environment. The first green bond was issued in 2007 by the European Investment Bank; since then, the green bonds' market is growing exponentially, given the countries' efforts to reduce carbon emissions. In 2023, the value reached of \$575 billions<sup>3</sup> in green bond sales from

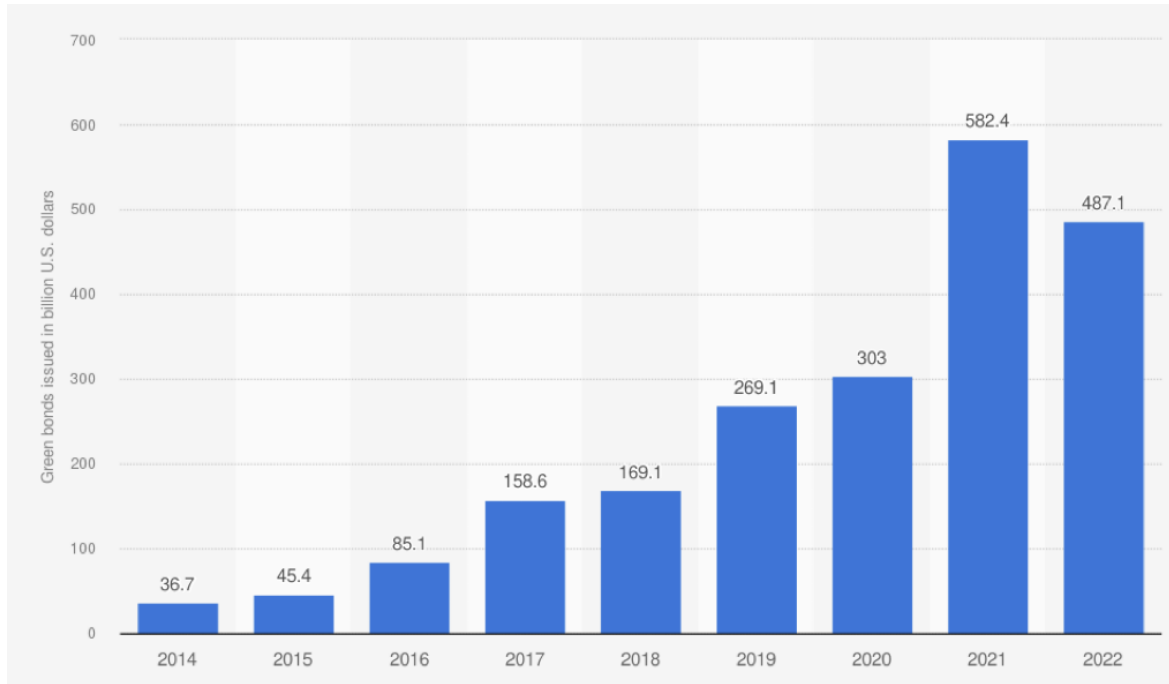
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<sup>3</sup> Green bonds reached new heights in 2023 | Insights. (2024). *Bloomberg Professional Services*. [online] 8 Feb. Available at: <https://www.bloomberg.com/professional/insights/trading/green-bonds-reached-new-heights-in->.



corporates and governments established a new record, stepping up from previous years valuations.

**Figure 2.** Value of green bonds issued worldwide from 2014 to 2022 (in billion \$)



The graph shows the value growth of green bonds over the period of time from 2014 to 2022, globally. Data source: Statista, Climate Bonds Initiative

A major example is provided by China; the country is currently competing against the western countries to be first in the green transition. China is supporting ambitious climate policies to become carbon neutral by 2060, even if it is the biggest emitter of greenhouse gases by volumes today. This long-term strategy implies a huge amount of investments in green projects, as shown by the relevant growth in green bonds market within the country. In fact, China's green bond indexes have outperformed the country's broad based bond indexes due to longer durations, stronger credit, and other sector specific factors; the great performance has attracted more international interest, leading to the conclusion that the growing trend will drive further.

Nevertheless, transparency remains the main problem when talking about green bonds; greenwashing consist in making misleading claims about the green credentials of a company. To validate green bonds' legitimacy, third party organizations are usually involved, and regulators disclose guidelines in order to assess the effective corporation's

green standard, such as the Green Bond Principles<sup>4</sup>, indicating how the proceeds should be used and managed.

## 1.1.2 Carbon Markets

The transition to a low carbon economy has led to the creation of a specialized type of financial market, where carbon credits can be traded. Essentially, carbon credits are permits allowing the purchaser to emit a certain amount of carbon dioxide or other greenhouse gas; one carbon credit is equivalent to one tonne of gas emission. In emission trading systems (ETS), governments and groups of governments cap emissions at a certain overall level and set a limit to certain entities, such as corporations and countries. An entity not employing all the carbon credits it has been issued, can sell them to one that expect to exceed its limits, so that companies or individuals are incentivized to remove or reduce greenhouse gas emissions.

There exist two types of carbon markets, compliance and voluntary. The former is created as a result of any regulatory requirement or international policy; thus, it is controlled by government bodies. The latter engages mainly private entities, interested in buying and selling carbon credits to create profit out of them.

The first international carbon market was launched by the European Union in 2005; still, the most relevant ETS is provided by China, which launched the world's largest ETS in 2021, covering around one seventh of the global carbon emissions from the burning of fossil fuels. However, forest rich countries are the most relevant players in carbon markets. Brazil accounts for 3% of global emissions and half of its emissions are from deforestation that releases carbon stored in trees and plants, while a quarter of those are related to agriculture. The country has proposed its first carbon market in December 2023, the Brazilian Greenhouse Gas Emissions Trading System (SBCE)<sup>5</sup>; the planned

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<sup>4</sup> Green Bond Principles Voluntary Process Guidelines for Issuing Green Bonds. (2021). Available at: <https://www.ifc.org/content/dam/ifc/doclink/2022/the-green-bond-principles-202206.pdf>.

<sup>5</sup>WHAT YOU NEED TO KNOW ABOUT THE PROPOSED BRAZILIAN CARBON MARKET. (n.d.): [https://insightplus.bakermckenzie.com/bm/attachment\\_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJswJiCH2WAWuU9AaVDeFglosrDzUghbw&nav=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJsbuwyypnpZjc4%3D&attdocparam=pB7HEsg%2FZ312Bk8OIuOIH1c%2BY4beLEAekfIpGzH%2FIKI%3D&fromContentView=1](https://insightplus.bakermckenzie.com/bm/attachment_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJswJiCH2WAWuU9AaVDeFglosrDzUghbw&nav=FRbANEucS95NMLRN47z%2BeeOgEFCt8EGQJsbuwyypnpZjc4%3D&attdocparam=pB7HEsg%2FZ312Bk8OIuOIH1c%2BY4beLEAekfIpGzH%2FIKI%3D&fromContentView=1).

rules impose reporting requirements on companies and installations emitting more than 10,000 tonnes of CO<sub>2</sub> equivalent annually, while entities emitting more than 25,000 tonnes will be required to comply with some obligations. Nevertheless, the Brazilian ETS does not account for the agricultural emissions; this lack of efficiency is complementary to the current situation in the ETS markets in general. Carbon markets have been proven to be less efficient than expected, probably due to the lack in transparency and investors' skepticism. This mostly apply to voluntary ETS, where misleading information circulate easily; hence, the number of compliance markets is much larger than the voluntary markets one, as more countries are currently expanding the industry types to which the rules apply to. In conclusion, carbon markets alone cannot contribute efficiently to the green transaction.

### **1.1.3 Green ETFs**

Nowadays, Exchange Traded Funds (ETFs) allows investors to incorporate environmentally friendly strategies into their investment decisions. Green ETFs focus on companies that support or are directly involved with environmentally responsible technologies, such as alternative and renewable energy. Each ETF has precise standards in the stock selection; hence, the investor is left to decide whether the ETF standard recognizes the same green standard he seeks to accomplish or not. A clear example is given by the oil and auto companies securities present in ETFs: those are included because they are committed to a more sustainable energy development, but it is up to the investor to evaluate the accuracy of the statement.

Green ETFs are evaluated on the financial performance compared to the benchmark index of reference, as happens for standard ETFs, because the instrument must generate some profit to be considered successful, even if it has a positive impact on the environment. Simultaneously, environmental impact metrics are examined; they might measure the carbon intensity of the ETF's holdings, the renewable energy capacity or the energy portfolio derived from renewable resources. Sustainable ratings, as the MSCI ESG ratings, might be scrutinized, combined with innovation and technology boosted by the corporations hold. Successful green ETFs may prioritize businesses investing in clean energy development, such as innovative waste management solutions or advanced energy

storage. The different types of green ETFs are the following: broad clean energy ETFs, wind power ETFs, solar power ETFs and nuclear energy ETFs. Among those, the Global X Uranium ETF<sup>6</sup> is considered extremely relevant, since it replicates the performance, before fees and expenses, of the Solactive Global Uranium & Nuclear Components Total Return Index; it focuses on uranium mining, with heavy weight on Canadian companies. Nevertheless, it is important to mention the higher expense ratios compared to standard ETFs, explained by the additional research the fund's managers must carry out to determine the truly satisfaction of the fund's environmental criteria, when choosing investments, as well as the typical volatility of those stocks which requires the fund to be frequently rebalanced.

In conclusion, green ETFs are extremely valuable for investors interested in green investing: they offer diversified exposure to companies and industries focused on sustainability, while contributing to both financial and ethical goals. These instruments redirect investments towards a low carbon economy, investing in research and development as well.

#### **1.1.4 Insurance industry adaptation to climate change challenges**

Given the more severe frequency with which unexpected climate related disasters take place, businesses, private and public assets must be hedged from new risks. Beyond providing financial protection, insurance can play an important role in identifying assets at risk, while encouraging risk reduction and adaptation. Consequently, the insurance sector develops risk analytics and catastrophe models that account for climate change. These models apply catalogues of hazard events to inventories of exposure, together with vulnerability measurements, coverage terms and conditions aimed at estimating the potential financial losses. Additionally, the catalogue of hazard events is based on a mix of past and simulated catastrophe events, updated on a regular basis to incorporate more recent events. To account for specific countries uncertainties, the catastrophe model

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<sup>6</sup>Global X ETFs. (n.d.). *Uranium ETF*. [online] Available at: <https://globalxetfs.co.jp/en/funds/ura/#:~:text=The%20Global%20X%20Uranium%20ETF>.

provides country-based emission scenarios. The Representative Concentration Pathway (RCP)<sup>7</sup> represents a series of climate change scenarios, projecting future greenhouse gas emissions. More specifically, it is widely used to estimate the potential impact of climate change related events, as in the case of the US hurricane model<sup>8</sup> which considers the potential impact of changes in hurricane frequency and severity sea level rise on loss distributions for major U.S. cities in 2050. The model considers the storm's forward velocity, maximum wind speed, and water depth, all of which play an important role in determining both the magnitude and the spatial distribution of waves.

These models are being enhanced by a number of new artificial intelligence and machine learning techniques to develop risk scores and more precise estimations. Similarly, the insurance industry contributes to climate adaptation by incentivizing policyholders' risk reduction and adaptation through premium pricing, resilient solutions and providing advice on risk reduction to governments. However, it must be considered the near-term climate risk assessment of the estimations, the limited policy holders' appetite for investment in risk reduction and adaptation, as well as the lack of awareness of risk reduction options, costs, and benefits. That said, the availability of climate related event sets and modelling outcomes is increasing. The insurance sector has the risk analytical capacity to provide estimates of future losses under different emissions and socio-economic scenarios; thus, it can be concluded that innovations in the sector will enhance insurance contribution to green finance development.

## 1.2 Environmental Score Evaluation

Thanks to the green financial instruments and products just described, firms are able to invest in environmentally friendly actions and scale up in green rankings, where scores are associated to corporations based on the specific firm environmentally sustainable commitment.

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<sup>7</sup> tntcat.iiasa.ac.at. (n.d.). *RCP Database*. [online] Available at: <https://tntcat.iiasa.ac.at/RcpDb/dsd?Action=htmlpage&page=welcome>.

<sup>8</sup> The AIR Hurricane Model for Offshore Assets. (n.d.). Available at: <https://www.air-worldwide.com/siteassets/Publications/Brochures/documents/AIR-U-S--Hurricane-Model-for-Offshore-Assets/>.

Environmental rankings are widely used by market participants to integrate green sustainability into their investment strategies. Corporations showing a higher Environmental score are likely to be better positioned in climate change risk management, reach a better financial performance, and have a lower default risk. This translates into a positive reputation for the business, leading to a series of benefits such as higher probabilities of better interaction with stakeholders, as well as less expensive and easier access to credit. As a result, environmental pillar scores can be potentially useful in driving the disclosure of valuable forward-looking information on companies in line with climate transition risks.

Nevertheless, in practice, there are a number of challenges that may undermine the use of environmental rankings. The multitude of metrics employed to compute the pillar scores, consider many environmental related factors, such as carbon emissions, climate change mitigation, adaptation, water biodiversity, renewable energy innovations and green opportunities. Still, different green sustainable rankings providers apply metrics in distinct ways, using different sources of data and weightings, producing inconsistent valuations, difficult to assess. These challenges might compromise market integrity and investors' confidence perception, impeding the pace and scale of capital reallocation needed to achieve tangible progress in line with the low carbon transition. Another issue regards the positive correlation of some E pillar scores with high carbon emissions, present for some ESG rating providers. This contradiction is given by the credit the rating provider place on transition plans, rather than on a more comprehensive analytical observation consistent with science-based targets. Therefore, the combination of these opacity of E rating methodologies, reduces the ability of users to assess how externalities from climate change may affect markets and separately, how issuers' collective actions contribute to such externalities. To solve this lack of transparency, institutions and governments have collaborated to develop certain indexes, used as benchmark when evaluating the environmental commitment of the business.

### **1.2.1 Dow Jones Sustainability World Index**

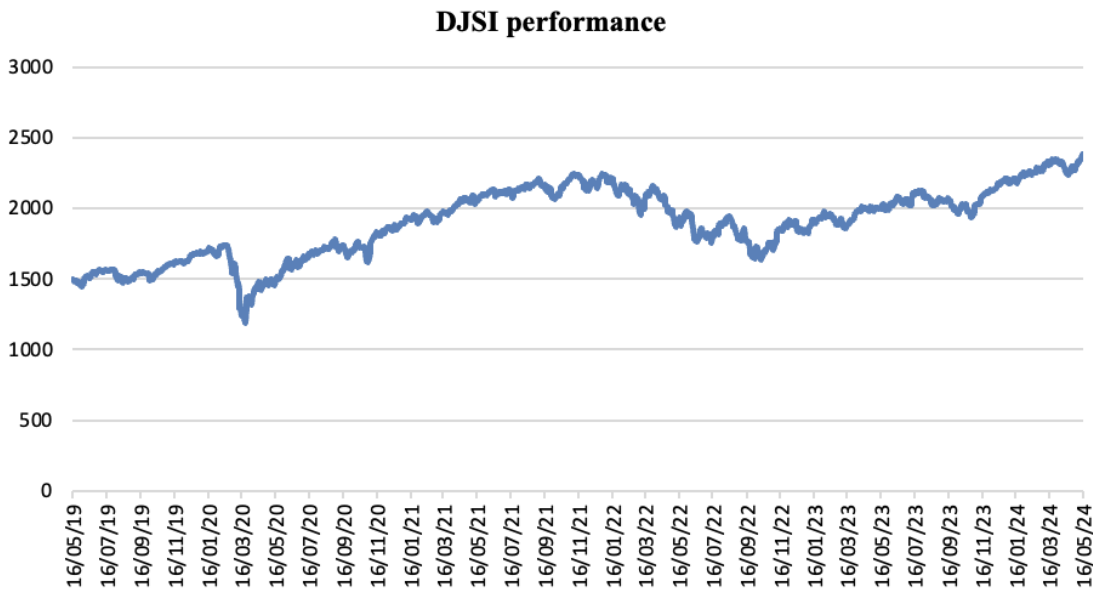
The Dow Jones Sustainability World Index (DJSI) was created in 1999, out of the need for a global benchmark for leading companies in the environmental, social and

governance performance. The selection process draws from over 13,000 businesses who were invited to participate in the S&P's Global Corporate Sustainability Assessment (CSA)<sup>9</sup>, a score-based analysis of their sustainability commitment which allows to compare corporations by assessing a mix of 80-100 cross industry and industry specific questions. In 2023, only 3,500 of the world's largest companies were eligible for the inclusion in the DJSI; only the top ranked companies within each industry have access to the inclusion and no industries are excluded from this process. Additionally, in the latest DJSI's release, it was remarkable how three of the world's largest pharmaceutical companies renowned for COVID-19 vaccine, were removed from the list (Novartis, American Amgen, and AstraZeneca), while additional corporations were included in the list (tech company Tencent Holdings, tobacco company Philip Morris International, and cloud computing ServiceNow).

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<sup>9</sup>Spglobal.com. (2024b). Available at: [https://www.spglobal.com/esg/csa/?utm\\_source=google&utm\\_medium=cpc&utm\\_campaign=Brand\\_ESG\\_Search&utm\\_term=s%26p%20global%20csa&utm\\_content=534418150272&gclid=Cj0KCQjw3ZayBhDRARIsAPWzx8rCQBce5QWPrh0-uNvEasc3F7ULtuis6jC1eK20hJtdCoVx2RAj\\_GkaAsimEALw\\_wcB](https://www.spglobal.com/esg/csa/?utm_source=google&utm_medium=cpc&utm_campaign=Brand_ESG_Search&utm_term=s%26p%20global%20csa&utm_content=534418150272&gclid=Cj0KCQjw3ZayBhDRARIsAPWzx8rCQBce5QWPrh0-uNvEasc3F7ULtuis6jC1eK20hJtdCoVx2RAj_GkaAsimEALw_wcB).

**Figure 3.** Dow Jones Sustainability World Index<sup>10</sup> from 2019 to May 2024



The figure shows the fluctuations of the DJSI Index from 2019 to 2024, which indicates the top ranked companies within each industry in terms of sustainability commitment

Data source: S&P Global historical database

Given the rigorous approach that has supported the growth of the index towards a leading corporate sustainability database, the DJSI aims at establishing reliable data analyses on each corporation's ESG performance, providing investors with a more transparent evaluation.

### 1.2.1 The Climate Change Performance Index (CCPI)

The Climate Change Performance Index (CCPI)<sup>11</sup> is not corporate specific as in the case of the DJSI, but it is important for investors to understand the climate protection efforts made by individual countries to derive also better estimates on future expectations for the business. The CCPI is an independent monitoring tool, aiming at enhancing transparency in international climate politics in 63 countries plus the EU and covering more than 90% of the global greenhouse gas emissions. Renewable Energy is one of the key elements

<sup>10</sup> www.spglobal.com. (n.d.). *Dow Jones Sustainability World Index | S&P Dow Jones Indices*. [online] Available at: <https://www.spglobal.com/spdji/en/indices/esg/dow-jones-sustainability-world-index/#overview>.

<sup>11</sup> Anon, Climate Change Performance Index |. Available at: <https://ccpi.org>.



considered in the CCPI, as the renewable expansion plans require a completely rethinking of current investment practices. Renewable investments are steadily growing, but investments in fossil fuels remain high, although fossil fuels should not be part of any sustainable long-term strategy towards the decarbonization process. Some countries share ambitious 100% renewable electricity targets for 2030, such as New Zealand, Austria, and Denmark, while others have lower, but still relevant targets as for Portugal, Sweden, Spain, and Germany. Nevertheless, no country was able to access the “very high” rating denomination this year, although Denmark remains the top ranked country in the “high” rating. The CCPI lists countries based on general environmental performance, as well as in categorial rating tables about Greenhouse Gas Emissions, Renewable Energy, Energy Use Efficiency and Climate Policy.

### **1.3 Environmental Scandals**

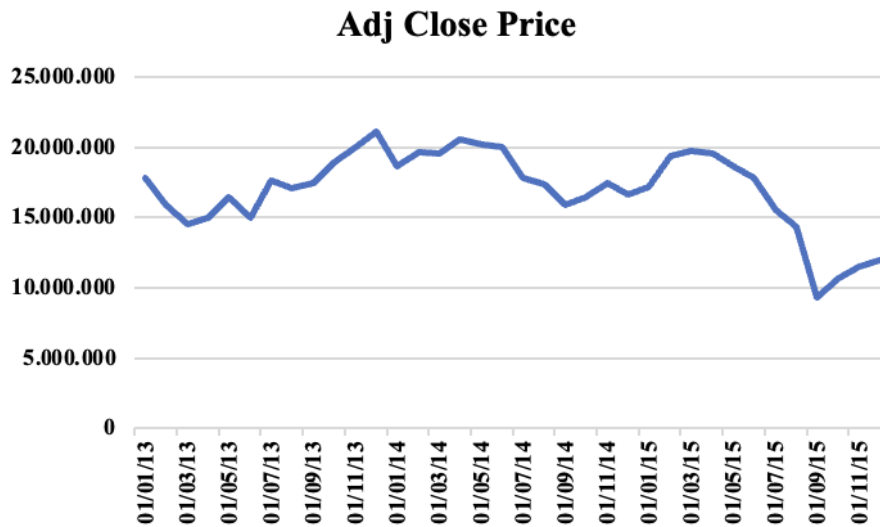
The growing demand for sustainable products and services may represent a business opportunity for most corporations, or a forced road that causes them to face higher costs and manage new varieties of risks, especially environmental driven issues. Thus, business scandals arise. Greenwashing consists in conveying false or misleading information about activities, procedures, products, or services having a positive impact on the environment. The absence of an effective market-based mechanism to help prevent greenwashing behavior contributes to the growing trend phenomenon, undermining the importance of clear policy guidance by regulators, market credibility, as well as investors and consumers’ confidence. Likewise, companies that incorporate real sustainability are also harmed because greenwashing creates unfair competition, by causing a general distrust sentiment in the market.

Business reputation is ruined by greenwashing allegations, which tend to concentrate in a few main sectors, including the financial sector. Asset owners should set forth sustainable investment policies and be responsible for monitoring the work of asset managers who must ensure that investment policies are properly implemented by firms, while design and classify financial products in a way that reflects the sustainability profile of the underlying investments.

### **1.3.1 Volkswagen emission scandal**

In September 2014, many Volkswagen cars sold in U.S. were found to be installed with a software in their diesel-powered cars, allowing the vehicles to cheat on the emissions tests and improve the performance results. In fact, the system was built in such a way that it did not operate under controlled laboratory conditions, but once on the road, the engines switched out of this test mode and emitted up to 40 times above the emission standards permitted in United States. The firm had performed a major push to sell diesel cars in the U.S., supported by a huge marketing campaign based on cars' low emissions. Additionally, the Environmental Protection Agency (EPA) found that the scandal was bigger than it seemed: it affected more than 11 million vehicles worldwide, not just the United States. To limit the scandal, Volkswagen returned \$250 million to its customers but this was not enough, and the company was obliged to buy back vehicles from customers under certain conditions. Meanwhile, some senior individuals resigned and the price tag for the scandal doubled compared to the initial estimation, reaching \$18 billion. The consequences of the scandal were reflected also in the price evaluation, which substantially dropped around the months following September 2014.

**Figure 3.** Volkswagen AG monthly Adjusted Closing Price from 2013 to 2015<sup>12</sup>



The graph describes the fluctuations in the monthly prices of the VWAGY title during 2013 until 2015, displaying how the equity price fell in September 2014.

Data source: Yahoo Finance historical database

To deal with the issue, and improve Volkswagen reputation, the company made decarbonization the central strategy, embracing a fundamental shift towards clean, e mobility technology and complying with tightening industry emission regulations across the world. A proof of VW's radical change is provided by the company support to the banning of the sale of new internal combustion engines by 2035 in Europe; similarly, VW observed ambitious car greenhouse gas standards during the Trump administration, despite legal threats from the White House and it is currently standing against oil industry complaints, supporting President Biden administration.

<sup>12</sup> finance.yahoo.com. (n.d.). *VOLKSWAGEN AG (VWAGY) Stock Price, News, Quote & History - Yahoo Finance*. [online] Available at: <https://finance.yahoo.com/quote/VWAGY>.

## **Chapter 2**

### **2.1 Data Analysis**

Given the ongoing global market transformation towards a net-zero world as previously described, it is interesting to test whether these environmentally friendly actions taken by corporations actually contribute to the price evaluation of the corporation itself. In principle, higher stock returns should correspond to a better management of Environmental factors, since companies are perceived to be able to improve the firm's market position from a long run point of view, by avoiding disruptive scandals or bad managerial decisions in relation with environmental choices. Thus, it can be assumed that Environmental factors, as other traditional variables, affect a firm's returns and they are considered by market agents as a proxy for the firm financial future performance. More specifically, it is important to consider that the preference for firms with high Environmental scores depends on the investment's horizon, as firms having higher Environmental Pillar Scores are preferred over other firms only in long term investments. However, this assumption could be proved wrong by data analysis, since it could be inferred that investors care less than we imagine about the sustainability of a firm they invest in, or the general sentiment about climate change might be more relevant just in certain periods, as environmental policies are released, or new green related innovations are made. To assess the validity of the assumptions just considered, the following data analysis is performed.

### **2.1 Data Source**

In order to investigate the effects of climate change news on stock returns, based on the corporations' ESG ranking, the data I use is provided by the following sources:

- The server BoardEx/MSCI<sup>13</sup> provides an opinion of companies' management of financially relevant ESG risks and opportunities, through the MSCI ESG Ratings. Each rating considers the company's exposure to potentially material ESG risks, the quality of management systems and governance structures to limit potential ESG risks and, where possible, positioning to meet market demand for the provision of products and services that have a positive environmental or social commitment. MSCI ESG Ratings are industry relative measures determined at the company level, since each company is evaluated based on the exposure to potentially material ESG risks, which are driven by factors specific to the industry and the market where it operates. It is important to highlight the difference between Environmental ratings and Environmental scores: a higher rating indicate a less relevant corporation's exposure to Environmental risks and a better ability to manage them, while the Environmental scores do not provide a risk assessment; they measure the Environmental attitude of the company, offering a valuation of how virtuous the company has been and currently is in managing the Environmental factors.

More specifically, the MSCI ESG Ratings are evaluated on a selection of two to seven Environmental and Social Key Issues. Particularly, the excel datasets downloaded, provide users of ESG Ratings with specific insights; in the analysis performed, I make use of the Environmental Pillar Score ( $E\_RANKING_t$ ), which represents the weighted average of all the Key Issues that fall under the Environmental Pillar, such as Climate Change, Natural Capital, Pollution & Waste, Environmental Opportunities. The Environmental Pillar Score ranges from 0 to 10, with zero indicating low/no commitment to the Environmental cause and implying potential risks in terms of environmental sustainability, while 10 considers the firm very effective in the risk management of environmental sustainability issues and evaluates great efforts in terms of environmental awareness.

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<sup>13</sup>Anon, (n.d.). *MSCI ESG Ratings Methodology*. [online] Available at: <https://www.msci.com/documents/1296102/34424357/MSCI+ESG+Ratings+Methodology+-+Board+Key+Issue.pdf/01ddf79e-9db3-e785-9c61-cedc033a9ede?t=1666182592028>.

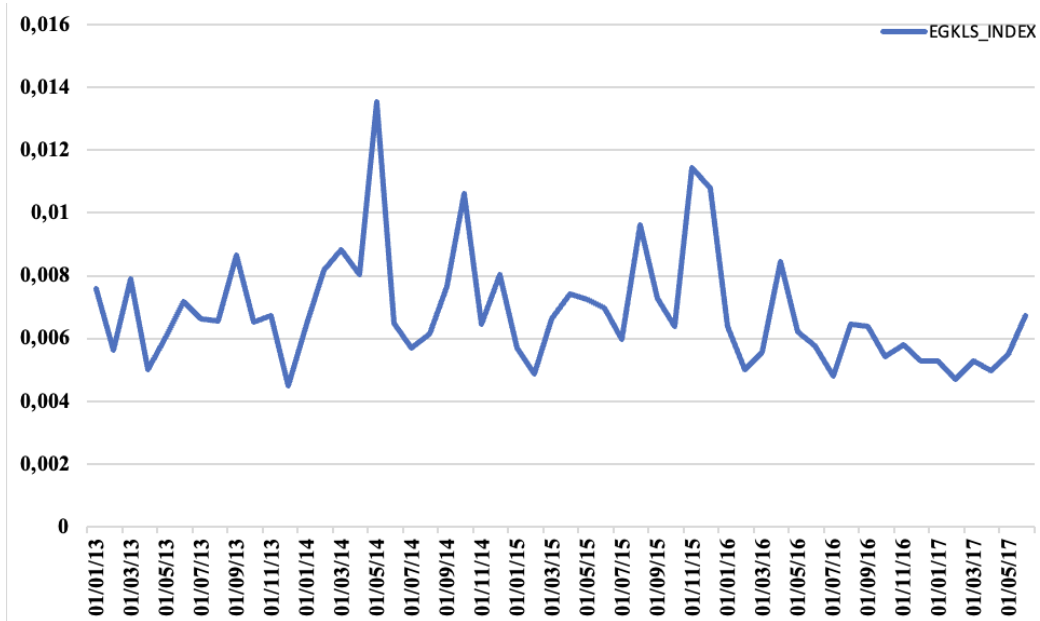
- The Global Industry Classification Standards (GICS)<sup>14</sup> is a common global classification standard, widely accepted as an industry analytical framework for investment research, portfolio management and asset allocation. Companies are classified quantitatively and qualitatively; each firm is assigned a single GICS Classification at the subindustry level according to its principal business activity. Revenues, earnings, and market are the major factors in the determination of the principal business activity, for a total of 11 sectors, 25 industry groups, 74 industries and 163 subindustries, in order to offer the most flexible structure possible. For simplicity, I account for the 11 sectors only.
- The EGKLS Index (Engle Giglio Kelly Lee Stroebe)<sup>15</sup>, also known as the WSJ Climate Change News Index, is measured as the correlation between texts in the Wall Street Journal and the climate change vocabulary. In fact, the WSJ is among the most salient media outlets for market participants, so that the index constructed captures the intensity of climate change disclosure that is accessible to the investment community. The climate risk index spikes during salient climate events, such as the adoption of global climate treaties. An example is provided by the steep increase starting at the end of year 2015, probably due to the Paris Agreement on Climate Change signed on December 2015.

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<sup>14</sup> MSCI (2023). *GICS - Global Industry Classification Standard*. [online] [www.msci.com](http://www.msci.com). Available at: <https://www.msci.com/our-solutions/indexes/gics>.

<sup>15</sup> <https://drive.google.com/file/d/1pCHmcebmOwrVCFim78ALhB51c3h1qt2T/view>.

**Figure 4.** EGKLS Index Monthly Fluctuations<sup>16</sup> from 2013 to 2017



The graph plots the values taken by the WSJ Climate Change News Index throughout the years from 2013 to 2017, showing peaks alternated by lower falls.

Data source: Stefano Giglio | Yale SOM

## 2.2 Sample

By accessing the server BoardEx/MSCI, I select the excel datasets pertaining to the time period from 2013 to 2017, expressed on a yearly base. Each initial dataset I download, is heavily loaded with many information I am not considering in my analysis. Therefore, I first extrapolate the data I need from each file, and then I standardize the different industry types; industries were mixed with subindustries, creating confusion when analyzing the data. Hence, I construct a conversion table to rewrite the mix of industries and diverse subindustries present into a standardized industry type classification according to the Global Industry Classification Standards (GICS). By doing so, I create five excel files, one for each year, containing the following columns: ISSUER\_NAME, ISIN, E\_RATING<sub>t</sub>, COUNTRY and GICS\_CLASSIFICATION. Finally, I merge the five datasets, imposing a R Studio code stating that the final file had to contain only the corporations for which data was provided along the entire time period. Therefore, I

<sup>16</sup> sites.google.com. (n.d.). *Stefano Giglio | Yale SOM - Data & Code*. [online] Available at: <https://sites.google.com/view/stefanogiglio/data-code>.

generate a random sample of about 1500 issuing corporations located in more than 60 countries and operating in eleven different industries. Through Refinitiv, I am able to employ the ISIN to download monthly frequency data about price indexes in the respective local currencies and total asset amounts relative to each corporation during the time period considered. To account for the climate change news impact on the equity prices, I add to the sample randomly created the EGKLS Index, constructed on monthly frequency.

Subsequently, I customized the Excel file to conform to the STATA format, ensuring its compatibility with the software. To do so, I convert the  $E\_RANKING_t$  values into dummies; if the value associated is greater than the median, then the dummy is equal to 1, while it is 0 otherwise. I add a new column called “COMBINED\_VAR”, whose values are found by multiplying the “E\_RANKING\_DUMMY” and the “EGKLS\_INDEX” together and observe their behavior. Finally, I compute the returns on price indexes on STATA (RETURNS\_PRICEINDEX), using the following formula:

$$(Price\ Index)_n - (Price\ Index)_{n-1} / (Price\ Index)_{n-1}$$

## 2.3 General Regression Analysis

This analysis consists of running, for all 1227 corporations remaining after data cleaning, a multiple linear regression in which monthly stock returns are the dependent variable; the preliminary model is:

$$\begin{aligned} RETURN\_PRICE\_INDEX = & \alpha + \beta_1 \times COMBINED\_VAR + \beta_2 \\ & \times E\_RANKING\_DUMMY + \\ & \beta_3 \times EGKLS\_INDEX + \beta_4 \times (i.TIME\_PERIOD\#i.COUNTRY\_cat) + \\ & \beta_6 \times LOG\_ASSETS + \beta_7 \times i.GICS\_CLASSIFICATION + \epsilon \end{aligned}$$

(1)

where:

- COMBINED\_VAR = interaction between the EGKLS Index and the E Ranking (dummy)



- E\_RANKING\_DUMMY = binary value determined by the level of E\_RANKING
- EGKLS\_INDEX = monthly value determined by the amount climate change news
- TIME\_PERIOD = monthly dates from 01/01/2013 to 01/06/2017
- COUNTRY\_cat = categorical variable for the country specific
- LOG\_ASSETS = total assets transformed in logarithm form to account for normalization
- GICS\_CLASSIFICATION = industry type

In order to avoid the historic market conditions of specific countries affect the model, I include a control interaction between TIME\_PERIOD and COUNTRY\_cat. Similarly, the GICS\_CLASSIFICATION, the COUNTRY and the TIME\_PERIOD variables are regarded as dummy variables when regressing. More detailed results are contained in the summary table shown in Table 1, section “Appendix” .

### **2.3.1 Empirical Findings in the General Regression Analysis**

The analysis shows that the linear correlation between the Environmental Pillar Score and stock returns, at least for the sample observed, is very weak or absent, highlighting that the volatility of returns is still to be found in other factors, or it might be attributable to a nonlinear relation between the two variables. This statement is supported by a very low coefficient estimation

(-0.0001), and a p value (0.9678) which is substantially greater than the standard significance level (0.05); thus, the observation is not statistically significant, leading to the conclusion that the Environmental Pillar Score alone does not seem to have a meaningful impact on corporations’ returns.

The combined variable estimation results show the same situation, implying that neither the relationship between the Environmental Pillar Score and the EGKLS Index influence corporations’ returns.

Similarly, the size of a corporation has approximately zero impact on the monthly returns of the latter; the estimated coefficient (0.0001) is not accurate given the negligible standard deviation value (0.0003) and the p value (0.6029) shows no statistical

significance. Therefore, total assets alone do not seem to have a meaningful impact on a corporation's returns.

However, the data analysis demonstrates that the EGKLS Index instead, has a positive effect on returns, showing a probable increase in returns, as the EGKLS Index increases. The p value (0.0001) suggests that the relationship is unlikely to be random and the observation is statistically significant: one unit change in EGKLS Index, seems to provide an increase of 41.3680 on returns, with a standard error of 10.3003. It is observed that, when a salient climate event takes place, provoking an increase in the value of the EGKLS Index, corporations' returns are likely to increase as well. This statement assumes that newspapers extensively cover news related to the environmental challenge, such as global climate treaties, climate mitigation policies and technological improvements in the sustainability field.

## **2.4 Country Specific Regression Analysis**

To conduct a more specific study, I select from the merged excel file previously created, the corporations located in Europe and in United States. After creating two distinctive excel file, one for each country of reference, I follow the same steps as for the excel file preparation process employed for the general regression but considering the returns on the reference market as well. In the case of Europe, I use the EURO STOCK as market index parameter, while for U.S. I employ the S&P 500. This time I consider excess returns instead of simple returns as dependent variable, and I do not account for country's specific historic market conditions since all the dependent variables refer to a country specific only. Additionally, I run the regression considering the reference market performance in the equivalent period, instead of the TIME\_PERIOD variable.

### **2.4.1 E.U. Regression Analysis and Findings**

$$\text{EXCESS\_RETURN} = \alpha + \beta_1 \times \text{COMBINED\_VAR} + \beta_2 \times \text{E\_RANKING\_DUMMY} + \beta_3 \times \text{EGKLS\_INDEX} + \beta_4 \times \text{RETURNS\_EUROSTOCKXX} + \beta_5 \times \text{LOG\_ASSETS} + \beta_6 \times \text{i.GICS\_CLASSIFICATION} + \epsilon$$

(2)

Most of the results from the analysis are not statistically significant. This anomaly could be due to the relatively small size analyzed. In fact, the sample includes only 108 corporations for which complete data is available, and this assumption is supported by the low R squared value (0,0229) observed. Nevertheless, similar conclusions as for the general regression can be drawn. First of all, the Environmental Pillar Score alone does not seem to have a meaningful impact on corporations' returns. The combined variable estimation shows the same condition. In the case of the limited sample analyzed, it can be demonstrated that neither the relationship between the Environmental Pillar Score and the EGKLS Index influence corporations' returns.

Similarly, the size of a corporation alone do not seem to have a meaningful impact on a corporation's returns. It is interesting to notice how the EGKLS Index seems to have a negative effect on excess returns of European corporations; though this result cannot be considered statistically significant at any level of significance and affirming a different effect on excess returns compared to the general analysis could be too unrealistic.

To conclude, it is observable how the EURO STOCK returns seems to have a significant negative impact on E.U. corporations' excess returns. This can be explained by several factors, rooted both in market dynamics and region-specific events, such as adjustments in risk premiums, geographic tendencies, competitive dynamics and changing investors' expectations. However, in this case the result is not relevant for the purpose of the analysis. The observed results are displayed in the "Appendix" section in Table 2.

### **2.4.1 U.S. Regression Analysis and Findings**

$$\text{EXCESS\_RETURN} = \alpha + \beta_1 \times \text{COMBINED\_VAR} + \beta_2 \times \text{E\_RANKING\_DUMMY} + \beta_3 \times \text{EGKLS\_INDEX} + \beta_4 \times \text{RETURNS\_SP500} + \beta_5 \times \text{LOG\_ASSETS} + \beta_6 \times \text{i.GICS\_CLASSIFICATION} + \epsilon$$

(3)

Once again, the sample considered presents no significant relationship between the environmental pillar score of the corporation and its excess returns. Thus, by looking at these U.S. corporations' representatives, the degree to which the business is committed to the environmental action is not proven to contribute positively to the firm's returns. On

the contrary, climate change news seems to have an impact, in negative terms, on excess returns, as shown by estimate coefficient (- 3,2475), having a low standard error equal to 0,36258 and a statistically significant level. As the size on climate change news increases, returns on American corporations decrease; this statement contradicts the results obtained in the previous general analysis, where the relationship between the two variables was proven to be positive. This outcome is particularly surprising, as it shows some discrepancy between the global apparent situation versus the U.S. focused circumstances. When running the E.U. specific regression, a similar conclusion had been drawn; still, the sample was too small to be generalized to the E.U. population, and the estimation was not significant. Nevertheless, the U.S. situation is different, probably due to green related policy actions or investment sentiment. Moreover, U.S. market performance registers a significant effect on U.S. corporations' excess returns, showing how excess returns seem to move positively with the market index. Hence, the S&P 500 index impacts positively excess returns, probably because of U.S. specific factors since the result on European corporations affirms the opposite relationship. More detailed observations are shown in Table 3, in the section "Appendix".

## Chapter 3

### 3.1 Environmental Scores and Investors' Sentiment

Data has shown a neutral effect of corporate environmental pillar scores on price returns. Though the popularity of corporate environmental ratings has accelerated significantly, so has the criticism around their merit in driving rational investment decisions. Corporate sustainability ratings face relevant challenges, as the lack of standardization. Missing definition and subsequent different perception are the main causes for this issue; thus, it is difficult for investors to decide which labels to trust and how to compare competing labels. The complexity of the matter is caused by the need of a long term prospective, the importance of externalities and the consideration not just of internal measures, but also the impact on the external environment. Some rating systems are performance based, while others are risk or disclosure based, creating a relevant problem in terms of consistency and accurate comparison.

Information asymmetries makes it more difficult to verify the sustainability claims made by companies, leading to another environmental ratings critic which involves lack of transparency. In extreme cases, companies may be incentivized to pass on false information to improve their reputation, so that sustainability commitments are hard to verify, and sustainability-oriented companies may in the worst case be crowded out of the market, although they actually offer what investors are looking for. Therefore, environmental sustainability ratings' credibility may be questioned, just like the reliability of the corporations to be examined. Transparency is hard to improve, since raters try to generate and maintain competitive selling positions, without revealing much about the methods applied in the rating.

Lack of credibility of information is directly related to the lack of data availability, since most of the information required by ratings are sensitive and not publicly published. Data availability is challenged by the disparity across industries, with better quality data available for higher carbon sectors, such as oil and gas, and a lack of data for other sectors, such as agriculture and forestry.

Consequently, ratings also lack independence because public information are not enough to assign ratings; rating organizations need to rely on self-disclosure of

companies, which make contact between raters and firms unavoidable, but in order to guarantee an objective assessment, the relation should not be closer than necessary.

Bias are also likely to be present in corporate environmental performance ratings. As emphasis on economic issue is a result of the increasing interest of analysts in sustainability, corporations may have only little interest in the environmental practices integration within the business because of their finance-oriented background.

To conclude, price returns might be logically unaffected by the specific firm's green level stated in corporate environmental ratings, since investors are aware of the limits and inaccuracy of these ratings in mirroring the effective corporation's long-term commitment to the net zero transition. Things might change in the future, if greater and more defined disclosure will be promoted.

### **3.2 Climate Change News on Equity Returns**

The data analysis across different countries has shown a positive effect of climate change news on price returns, implying that green regulations and environmentally sustainable policies are perceived positively by investors worldwide. However, the effect takes the opposite direction, when analyzing specific countries, as in the case of U.S. and Europe. Although Europe result is not significant, the negative effect of climate change related news on price returns is made clear in the U.S. observation. It can be inferred that this discrepancy is partially caused by country specific factors, such as the importance of particularly polluting sectors in certain regions, confusion in net zero transition regulations, less efficient facilities and so on. Generally speaking, investors' perception about new green regulations might be limited to a short term prospective, since these policies usually imply huge investments and very high adaptability capacities; hence, climate change news are negatively reflected on price returns. On the contrary, corporations located in countries heavily affected by disruptive physical phenomena caused by climate change might observe higher returns on their equity prices. Investors expect to receive an additional return (risk premium) for holding stocks that are affected by climate related factors and they perceive climate friendly policies or developments as beneficial.

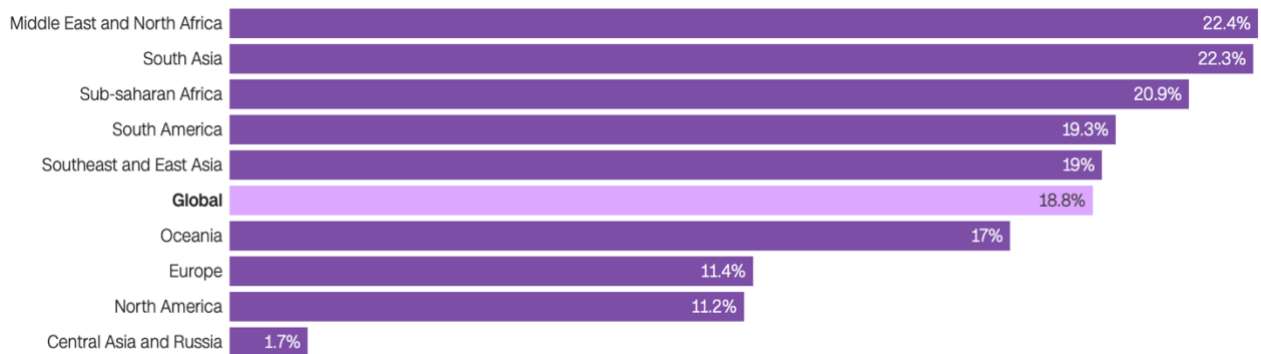
### 3.2.1 Climate Change News in Emerging Countries

The sample considered contains, many firms located in economically developing countries as China, India, Mexico, South Africa, and Turkey. Emerging economies' growth trajectories are deeply shaped by climate change. Their vulnerability is due to physical exposure to the environmental issue, implying the direct consequences of a long-term environmental change or extreme weather event. Emerging economies are largely located near the equator, where ecosystems are much more vulnerable to temperature changes. Similarly, the sectoral composition of the economy itself makes emerging countries more exposed to climate change risks, since they usually depend on affected sectors, particularly the primary sector including farming and manufacturing. Given the heavy weight of agriculture and farming, environmental disruptions affect a larger share of GDP and labor employment. An example is provided by Nigeria, where the agricultural sector accounts for roughly one quarter of GDP and three quarters of labor employment; hence, increasing desertification in the region has posed a significant threat on food availability. It is estimated that, if sea levels continue to rise as it is currently happening, 75% of the arable land in Nigeria will be lost by 2100<sup>17</sup>. Additionally, these countries are likely to have a lower adaptability capacity, due to the low-quality infrastructure, drinking water access, institutional inefficiency, and the poor health sector performance. Vulnerability to climate changes also contributes to the low rating creditworthiness, and thus, risk of default tends to rise for developing countries compared to advanced economy. Yet, greenhouse gas emissions in these countries are significantly below the amount emitted by advanced economies, measured on per capita basis and historic emissions. This disproportion between causes and consequences results from geographical and economic characteristics of emerging and developing countries. International cooperation and financial support are crucial for a better future perspective; in accordance with this, the Paris Climate Accords in 2015, have proposed a framework enhancing cooperation towards a more rapid assistance towards climate objectives to ensure that the world's most vulnerable countries are able to adapt and mitigate the climate change impacts, although they are hardly responsible for them.

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<sup>17</sup> www.afd.fr. (n.d.). *A scoping review of the vulnerability of Nigeria's coastland to sea-level rise and the contribution of land subsidence*. [online] Available at: <https://www.afd.fr/en/ressources/scoping-review-vulnerability-nigerias-coastland-sea-level-rise-and-contribution-land-subsidence#:~:text=Nigeria>.

**Figure 5.** Expected median regional income loss due to climate change by 2049



The Middle East, North Africa and South Asia are the regions most likely to see the largest income reductions due to the effects of climate change in the next 25 years.

Data source: CNN - report in the journal Nature.<sup>18</sup>

Therefore, the disproportional impact of climate change across countries could be a plausible explanation for the discrepancy between U.S. results and the rest of the world. News about technological innovations and global sustainability agreements tend to have a greater relevance when reached in favor of countries suffering more because of the climate change challenge; this proves how the net zero transition involves many opportunities as well. International awareness about the green sustainability issue, combined with the willingness to solve the problem through global collaboration, sustainability treaties and green initiatives carried out by developed nations create an incentive for international investors, who might decide to move their long-term investment strategy in favor of economically developing nations.

### **3.2.1.1 Green Hydrogen Investments in South Africa**

South Africa detains the competitive advantage to produce and export green hydrogen energy. Abundance of renewable energy potential in the form of wind and solar power, relatively cheap land for renewable energy production, combined with the largest reserve of platinum group metals in the world, with platinum being a major component of

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<sup>18</sup> Delouya, S. (2024). *Climate change will make you poorer, according to a new report* | CNN Business. [online] CNN. Available at: <https://edition.cnn.com/2024/04/17/business/climate-change-disasters-economic-cost/index.html>.



hydrogen fuel cells, reasonably explain the importance of the country in terms of net zero transition. South Africa aims at reducing its resilience on fossil fuels, while accelerating access to electricity for millions of citizens and attracting foreign direct investments. Hydrogen enables efficient storage and utilization of energy from renewable sources which can be more intermittent, ensuring a reliable supply. In accordance with this strategy, the SA-H2 Fund<sup>19</sup> has been launched, between South Africa and Denmark. The innovative blended finance fund focuses on accelerating the development of a green hydrogen sector and circular economy in South Africa, enhancing the mobilization of funding towards the development and construction of large-scale green hydrogen infrastructure assets across South Africa. The fund involves both domestic and international institutions, collaborating with private and public entities. The development of this new industry will support the longer-term energy security priority and the socio-economic development within the nation, positioning South Africa as a globally competitive player.

### **3.2.2 Climate Change News in Europe**

Although the results obtained in the data analysis for the European representatives' regression are not statistically significant, probably due to the small size of the sample, the coefficient for the climate change news index is still negative. This similarity between Europe and U.S. is surprising, since the European corporations' returns are reasonably expected to be positively related to climate change initiatives, given all the undergoing green reforms and treaties.

Regularly, new environmental disclosure rules and regulatory updates are announced, making it difficult for European businesses to keep up with the latest reforms. This difficulty is particularly stressed in Europe, given the presence of multiple nations under a unique regulatory body. Once agreements are reached in Bruxelles, the single nation needs to implement them and ensure compliance with the E.U.; still, the process might be complicated due to the size of the number of corporations involved. Therefore,

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<sup>19</sup> News, E. (2023). *Giornata internazionale delle forze di pace delle Nazioni Unite*. [online] ESG News. Available at: <https://esgnews.com/it/i-paesi-bassi-la-danimarca-lanciano-un-fondo-per-1%27idrogeno-verde-da-1-miliardo-in-sudafrica/>.

climate change news may cause complications and additional compliance costs, leading to lower price returns. This effect is particularly interesting in Italy, where the exhausting number of small and medium businesses are more involved because they usually have no technical knowledge about the latest European regulations and thus, they incur in even higher costs due to consulting services and customized adaptive measures.

External crises also explain the negative effect of climate change news on price returns in Europe. Green sustainable investments are profitable in the medium and long term, but external crisis require immediate liquidity. This may cause a decline in green investment demand, combined with the fact that the environmental transition involves huge costs. European governments are facing competition in allocating scarce public budgets between digital transition, military expenditures, and social infrastructure investments, while balancing high inflation and interest rates; hence, the political will to invest in the green transition may fall short in light of these competing factors.

### **3.2.2.1 ESG Funds Decline in Europe**

European institutional funds have decided to step back from investing totally in environmental assets, implementing both green and not green investments within their portfolios to not depend too much on the mutating regulatory developments in the environmental sector. To understand better the phenomenon, it is useful to observe the decline that is currently happening for the ESG Funds in Europe, since these funds rely heavily on the environmental factor. Initially, European funds investing in ESG were mostly identified in “Article 9”, which meant that the funds reflected very strict criteria about ESG investments, and they were factor specific. Nowadays, there have been a shift towards more flexible ESG criteria, and most European funds are categorized as “Article 8”, not requiring to be identified only with the environmental factor, or the social and governmental factors, but offering a more differentiated exposure<sup>20</sup>. This change is mostly due to the confusion generated by the exhausting regulations released in the latest years, boosting investors’ concerns about greenwashing accusations. When not correctly interpreting the updated climate change news, greenwashing accusation’s risk is very

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<sup>20</sup> [https://www.axa-mpsfinacial.ie/c/document\\_library/get\\_file?uuid=690f762b-739b-de3d-4ca1-782be56c03a4&groupId=715674](https://www.axa-mpsfinacial.ie/c/document_library/get_file?uuid=690f762b-739b-de3d-4ca1-782be56c03a4&groupId=715674)

high, and “Article 8” offers more margin of error to fund investors. An example is provided by DWS, which was accused by the SEC in 2021 of misleading statements in its annual report over the size of its ESG assets and it has been subjected to a payment fee of 21 million.

### **3.2.3 Climate Change News in U.S.**

The negative impact of climate change news on equity returns in the U.S. market proves a curious phenomenon in contrast with the one just described above; this effect could be explained by a multitude of country specific factors, such as the political environment and investors sentiment deriving from it. The United States is the world’s largest and deepest market for investors, but when it comes to environmental investing, it lags behind Europe. The regulatory framework surely contributes to this lack of green responsibility, as a clearer general government support and a more favorable legislative environment need to be implemented.

U.S. green regulations have gone back and forth a few times in the last decade, due to the changing political directions undertaken by the respective political parties and presidents elected. Obama’s presidency encouraged investors to pursue environmentally sustainable investment, through the American Business Act on Climate Pledge<sup>21</sup> implemented in 2015, which grouped 154 businesses committed to support the Paris Climate Agreement process, the American Recovery and Reinvestment Act<sup>22</sup> supporting the largest single investment addressing the decarbonization process in history and launched other initiatives aimed at combatting climate change, while growing the economy. On the other hand, Trump administration reversed the progresses made, discouraging sustainable investment, and reducing environmental protections. The President’s clear anti green political path was made even more transparent by the U.S. withdrawal from the Paris Agreement on climate change in 2017. Additionally, he encouraged U.S. energy independence based on fossil fuels and released favorable

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<sup>21</sup> The White House. (n.d.). *American Business Act on Climate Pledge*. [online] Available at: <https://obamawhitehouse.archives.gov/climate-change/pledge#:~:text=Take%20the%20American%20Business%20Act%20on%20Climate%20Pledge>.

<sup>22</sup> The White House. (n.d.). *About the Recovery Act*. [online] Available at: <https://obamawhitehouse.archives.gov/recovery/about>.

regulations for oil companies to intensify their polluting activities. By the end of Trump's term, his administration had rolled back 98 environmental rules and regulations. President Biden election in 2021, made the environmental sustainability political scenario even more contradictory and confusing for investors. From 2021 on, the Securities and Exchange Commission (SEC) has become way more demanding in terms of environmental policies. Biden's ambitious domestic agenda is part of the Inflation Reduction Act of 2022<sup>23</sup>, designed to reduce US deficit and lower the inflation rate, while promoting the investment in domestic energy production and the reduction of carbon emissions. Companies have been required to invest significant amounts of money on upgrading polluting facilities, installing emission control systems, and innovating to comply with the new legal sustainability requirements. Energy and utility companies are the businesses most involved in this expensive transition since they operate using refineries and power plants. Similarly, cap and trade policies have been set to lower carbon emissions and place an upper limit on the amount of pollution a business can emit, while allowing firms to trade the unused allowance on carbon markets.

Nevertheless, the SEC has to face a complex policy scenario, since there is a multitude of factors that companies should consider when being aligned with the undergoing net zero transition and industry specific considerations must be made. The mutable political scenario described above, has heavily contributed to the change in public and private perception, as well as investment strategies choices. The negative investment sentiment towards more restrictive sustainability policies, which are generally perceived as business obstacles instead of opportunities, have been associated with the high costs usually attached. In fact, the risk of litigation is a common threat in U.S., where regulations are written in such a way that shareholders can easily file a suit against the trustees, who are required to prove ESG investing does indeed generate better performance. In fact, the firm's objective in U.S. corporate law is to generate profit for shareholders and thus, the outdated perception that embracing environmentally sustainable practices comes at the cost of financial returns disincentive long term green investment strategies.

Nowadays, Wall Street has been registering a growing trend, involving the retreating from earlier environmental commitments amid rising political divisions and

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<sup>23</sup> Probasco, J. (2022). *Inflation Reduction Act of 2022*. [online] Investopedia. Available at: <https://www.investopedia.com/inflation-reduction-act-of-2022-6362263>.

financial pressure. Several Republican governed states introduced legislation aimed at limiting financial institutions' ability to include environmental considerations in their investment strategies, so that major banks for example do not act against polluting activities, such as new coal mines financing and they keep financing states that are openly declared not to be committed to the climate change challenge. There is evidence that sustainability broadly remains popular for consumers and investors, but investors still focus more on financial calculus and rarely mention a social agenda.

### **3.2.3.1 The New U.S. Climate Disclosure Rules**

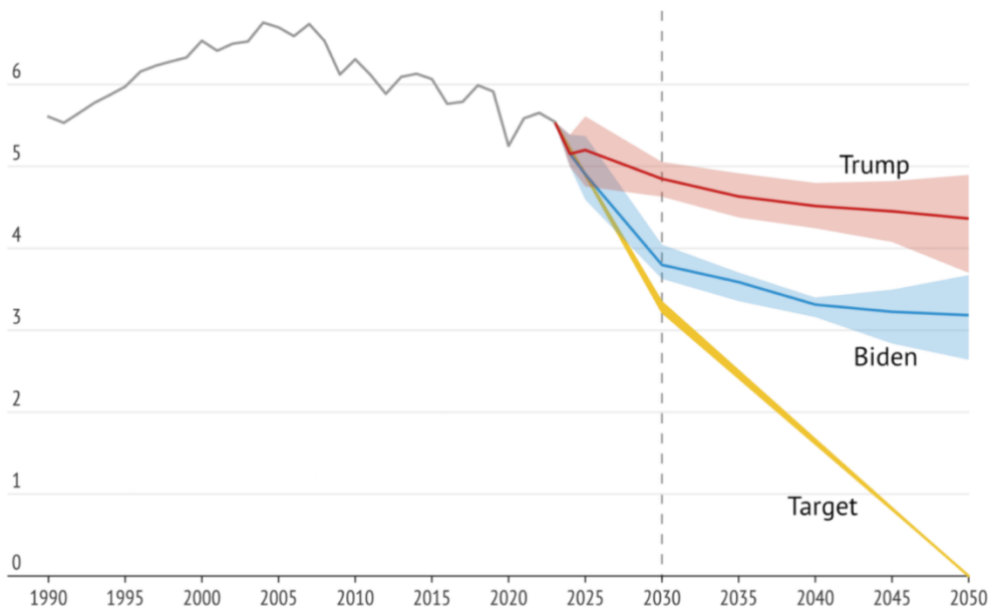
The Securities and Exchange Commission has approved the new climate risk disclosure rules, requiring large public companies to disclose some aspects of their carbon footprint, together with how climate change could hit their bottom lines. The new rules have probably been watered down after some critics made by business leaders, who were particularly worried about their own business reputation and costs. In comparison to earlier draft versions, the finalized rules require fewer businesses to comply and also do not require most indirect carbon emissions to be disclosed. According to the rules, only large companies, with at least \$75 million value in public investors' hands, need to disclose this information and still, they are not obliged to report indirect emissions, which usually account for 90% of their total emission footprint. Moreover, it is expected that the new rules will be both politically and legally challenged by agents who demand more disclosure and transparency, as well as by other groups opposing this type of regulation. Generally speaking, the New U.S. Climate Disclosure Rules are not perceived positively by investors, who could be worried about the negative effect on corporations' evaluations and prices.

### **3.2.3.2 Trump's reelection and Green Investments**

As described in the previous paragraph, a rise in green policy intervention or new disclosure regulations probably cause more harm than benefit for U.S. investors since they find themselves constantly readapting to the momentaneous political green path. This year's Presidential Elections are expected to bring U.S. political uncertainty even further, with potential disruptive consequences for investors environmental sentiment.

Assuming the validity of the assumptions inferred from the data analysis, climate change news should be limited by Trump anti-environmental sentiment; Trump allies' involvement and Republican donors could be a threat for environmental sustainability and their implementation in financial markets. Recently, he has asked oil and gas executives to contribute to his presidency campaign expenses by donating \$1 billion in exchange for beneficial rollbacks to environmental regulations enacted by President Biden, allowing these polluting giants to keep drilling in Mexico and Alaska. In the Trump scenario, Biden's key climate policies would be eliminated, generating a more disruptive scenario both for the environment and for green investments, which would be declining even more.

**Figure 6.** Projected U.S. emissions under the Trump scenario



Black line: historical U.S. greenhouse gas emissions 1990-2022 in billions of tonnes of CO<sub>2</sub> equivalent  
 Red line: projected emissions under the Trump scenario, in which Biden's key climate policies are eliminated

Blue line: projected emissions under the Biden scenario in which climate policies are kept

Yellow line: U.S. climate target trajectory initially set by Biden administration

The graph suggests that the target is not reached either way, but Trump reelections could have even more harmful consequences for greenhouse gas emissions

Data source: Carbon Brief analysis of Bistline et al (2023) and Rhodium Group (2023)<sup>24</sup>

<sup>24</sup> Staff, C.B. (2024). *Analysis: Trump election win could add 4bn tonnes to US emissions by 2030*. [online] Carbon Brief. Available at: <https://www.carbonbrief.org/analysis-trump-election-win-could-add-4bn-tonnes-to-us-emissions-by-2030/>.

Green investment sentiment in U.S. could still be partially saved from a steep fall by Biden's key climate change regulations, the Inflation Reduction Act (IRA)<sup>25</sup> and the Chips Act<sup>26</sup>. These two Acts are primarily industrial policies before being climate policies; thus, they have gained support from both Republicans and Democrats. The current geopolitical situation has caused U.S. to rethink its strategy in some industries, especially the ones where China is dominant. Therefore, Trump will unlikely repeal the Chip Act, since it invests in a critical business as the semiconductor manufacturing, and neither the IRA because it is part of the "America First" agenda espoused by the Republicans. Undoubtedly, uncertainty about the future is very high.

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<sup>25</sup> The White House (2022). *Inflation Reduction Act Guidebook*. [online] The White House. Available at: <https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/>.

<sup>26</sup> The White House (2022a). *FACT SHEET: CHIPS and Science Act Will Lower Costs, Create Jobs, Strengthen Supply Chains, and Counter China*. [online] The White House. Available at: <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/>.

## Conclusion

Today's world needs to embrace change towards a more environmentally sustainable future. The finance sector is contributing to the net zero transition through innovative green financial services and products, together with financial contribution to environmentally sustainable projects. Finance role is crucial in the low carbon economy transition, and it needs to be supported by investors, who are already considering green investments in their portfolios. Nevertheless, green equity selection is challenged by many limitations, imposed by a general lack of transparency characterizing corporations' environmental ratings. These environmental scores assigned to businesses worldwide need to be more consistent and reliable in order to be properly applied in investors' evaluations, as proven by investors' neutral sentiment towards environmental pillar scores shown in the data analysis. Generally speaking, no matter how much a business is committed to the environmental sustainability cause, the return on prices seems not to be affected in the long run by such efforts, at least in a global prospective. In fact, greenwashing scandals have an immediate negative impact on price returns, but intuitive business strategies, such as rebranding, can easily solve the price fall in the long term and save the corporation's reputation from investors' demand decline.

Although equity prices might respond differently to climate change news based on the corporation's country exposure to the climate change risk, price returns are proven to be inevitably linked to climate change events, as described by their statistically significant relationship with the release of new sustainable innovative solutions and green policies. U.S. example efficiently resemble investors' concerns about green investments profitability, while emerging countries' sentiment proves how beneficial green initiatives can be for the economy.

The sample employed in the analysis has been constructed in such a way to be as differentiated in terms of geography and industries as possible; similarly, it examines environmentally pillar scores taken from reliable sources and scrutinize an overall consistent period of five years. Nevertheless, it is important to consider the potential limitations of the analysis. It might be argued that the results obtained are in continuous evolution, and they do not account for the current period, since many technological innovations in the net zero transition have been made. It would be interesting to expand



the climate change news index applied in the data analysis to today's scenario and observe whether the same results hold.

In conclusion, the finance industry shows the ability to shape agents' behavior through price adjustments in financial markets, detaining a fundamental role in the net zero transition.

# Appendix

**Table 1. General Regression Analysis Summary Table**

Variable	Coef.	St. Err.	p-value
COMBINED_VAR	0.1302	0.4862	0.7889
E_RANKING_DUMMY	-0.001	0.0035	0.9678
EGKLS_INDEX	41.3680	10.3003	0.0001
LOG_ASSETS	0.001	0.0003	0.6029

The table shows the results obtained from regression (1), where the dependent variable RETURN\_PRICE\_INDEX captures the returns of 1500, representative corporations spread in different industries worldwide. The sample covers the period of time from January 2013 to June 2017.

**Table 2. European Representatives Regression Analysis Summary**

Variable	Coef.	St. Err.	p-value
COMBINED_VAR	-0.6738	1.0059	0.5030
E_RANKING_DUMMY	0.0040	0.0072	0.5736
EGKLS_INDEX	-0.3049	0.7139	0.6693
RETURNS_EUROSTOCKXXX	-0.2308	0.0213	0.0000
LOG_ASSETS	0.001	0.0006	0.1110

The table shows the results obtained from regression (2), where the dependent variable captures the returns of representative corporations located in Europe only. The sample covers the period of time from January 2013 to June 2017. The R squared value of 0.0466 indicates that independent variables analyzed, partially explain price returns fluctuations, given that they are explained only by 4.66%. This low explanatory percentage could be due to the small size of the sample.

**Table 3. American Representatives Regression Analysis Summary**

Variable	Coef.	St. Err.	p-value
COMBINED_VAR	0.369	0.521	0.479
E_RANKING_DUMMY	-0.003	0.004	0.387
EGKLS_INDEX	-3.248	0.363	0.000
RETURNS_S&P500	0.193	0.014	0.000
LOG_ASSETS	0.0000	0.0000	0.411

The table shows the results obtained from regression (3), where the dependent variable captures the returns of representative corporations located in U.S. The sample covers the period of time from January 2013 to June 2017. The R squared value of 0.0645 indicates that independent variables analyzed, partially explain price returns fluctuations, given that they are explained only by 6.45%.

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