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Course of *Financial Reporting and Performance Measurement*

Sustainable Investing and ESG Integration: An Analysis of  
Market Performance and Corporate Impact

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## ABSTRACT

This paper analyses how investing research and choices include ESG considerations. These indexes have evolved to reflect investor demand for ethical and sustainable investments. According to the report, ESG indexes originated in the 1960s and 1970s socially responsible investment (SRI) movement, which focused on ethics.

As SRI expanded to include governance and environmental factors, "sustainable investing" emerged in the 1990s. This greater awareness of ESG variables led to the formation of various ESG indexes that score corporations by ESG compliance.

The Dow Jones Sustainability Index (DJSI) and other ESG indexes inspired financial institutions and index providers worldwide to create ESG benchmarks in the late 1990s. These indexes rank corporations by ESG principles including carbon emissions, board diversity, working conditions, and civic activity.

The analysis highlights the growing awareness that companies with good ESG practices outperform their rivals over time. Legislation, demand for sustainable investments, and environmental and social awareness have helped it gain attention. ESG indices are often used as benchmarks for sustainable investing strategies and help align investments with sustainability goals.

The study addresses the fundamental topic of whether a company's quantifiable social and environmental impacts—positive or negative—directly affect market-competitive financial returns. As market players learn more about ESG dynamics and their impact on investment results, ESG indexes change, and new approaches and frameworks emerge.

The article demonstrates how ESG investment may entail active interaction with businesses and positive screening in addition to negative screening. ESG investment is growing due to several factors, including the inverse relationship between ESG variables and company financial performance, institutional investors' need for ESG integration, and legislative initiatives supporting ESG reporting openness.

The worldwide sustainable investing sector has grown due to greater sustainable assets under management. The constant positive correlation between ESG variables and financial success favors ESG integration.

The research cites a rising interest in ethical investment in Europe, as seen by increased participation in the Principles for Responsible Investment (PRI). The Global Sustainable Investment Alliance (GSIA) reports that sustainable investments have expanded dramatically, highlighting their global relevance.

The paper, which examines stakeholder theory, suggests that organizations should consider all stakeholders, not just shareholders, to maximize value. It examines the relationship between ESG-measured corporate social performance (CSP) and financial performance, highlighting the potential benefits of CSR initiatives, such as increased employee productivity, corporate reputation, risk management, and stakeholder relationships.

The study examines how ESG ratings impact Euro Zone stock market performance. It hypothesizes that companies with better ESG scores would see their share prices rise over time due to a statistically significant association.

The study focuses on STOXX Europe 600 index company share price patterns from 2014 through 2022. The study accepts the model's flaws while finding statistically

significant connections between variables. Based on the determination coefficients, only a tiny part of share price movements are due to the factors under discussion.

Strong data quality, large data sources, and effective data management are important in investment research. It also stresses the need of evaluating market conditions, industry trends, and macroeconomic data to increase prediction accuracy.

The thesis emphasizes sustainable practices for long-term resilience and reputation-building, effective risk management, modelling adaptability, and ongoing evolution. It recognizes that market conditions and corporate dynamics may change, requiring constant updates and research to prove linkages.

Results illuminate the intricate relationship between a company's ESG score and share price performance over time. Even if the notion is partially confirmed, the substantial year-to-year swings show how dynamically ESG affects share prices. The study emphasizes ESG integration in investment strategies and advances sustainable investing research.

# **1. THEORETICAL BACKGROUND**

## **1.1. THE ESG INDEX**

Environmental, social, and governance considerations are included into the investment research and decision-making process via the ESG (Environmental, Social, and Governance) Index, a form of stock market index. With shifting investor tastes and a rising understanding of the significance of sustainable and responsible investment, the idea of ESG investing and the creation of ESG indexes have developed through time.

## **1.2. THE ORIGINS OF ESG INDEX**

The socially responsible investment (SRI) boom of the 1960s and 1970s is when the ESG Index first emerged. SRI seems to have started in the 1940s, when government organizations and labor unions avoided making investments in firms that they believed used unfair labor practices (Martin, 1986). SRI concentrated on steering clear of investments in businesses engaged in contentious sectors like tobacco, weapons, or South Africa during the apartheid period. The scope of socially responsible investment has grown over time to take into account elements like as governance and the environment in addition to ethical concerns.

The phrase "sustainable investing" first appeared in the 1990s, indicating a wider view on including governance, social, and environmental considerations into investment choices. Investors sought strategies to identify and monitor businesses that outperformed the industry average on ESG criteria as interest in sustainability expanded. This prompted the creation of several ESG indexes with the goal of evaluating the performance of businesses with effective ESG policies.

The Dow Jones Sustainability Index (DJSI), introduced in 1999 by S&P Dow Jones Indices and RobecoSAM, is one of the early instances of an ESG index. The DJSI monitors the financial success of the world's top sustainability-focused businesses. Since then, a number of other financial organizations and index providers, including MSCI, FTSE Russell, and Bloomberg, among others, have created their own ESG indexes.

Evaluating corporations according to certain ESG criteria, such as carbon emissions, board diversity, labor practices, or community participation, is normally how ESG indexes are created. Companies are included in the index if they achieve certain ESG benchmarks or show progress in their ESG performance; otherwise, they may be omitted.

The acknowledgment that businesses with sound ESG practices may benefit in the long run has contributed to the expansion of ESG investing, which has been fueled by rising environmental and social awareness, legislative reforms, investor demand for sustainable investments, and investor demand for sustainable investments. ESG indices are now widely used as benchmarks for sustainable investing strategies and as tools for investors who want to match their portfolios with their values and sustainability objectives.

The key issue is not whether or not businesses have quantifiable positive or negative social or environmental effects, but rather whether or not an investor can generate competitive financial returns and more quantifiable social or environmental benefits than would have otherwise happened if they deliberately pursue specific positive social and environmental returns.

It's crucial to remember that ESG indexes continue to grow and evolve, and new approaches and frameworks keep appearing as market players improve their comprehension of ESG aspects and their effects on investment results.

### **1.3. ESG AND ITS FOOTPRINT, WHY WE NEED HIM NOW**

Because it motivates companies and organisations to adopt sustainable practises and accept accountability for their environmental effect, ESG (Environmental, Social, and Governance) influence is essential for the environment. Environmental concerns, such as lowering pollution, preserving resources, and preventing climate change, are the emphasis of the "E" in ESG. Here are some reasons why ESG impact is crucial for the environment and how it might aid in lowering pollution:

- ESG encourages businesses to think about the long-term effects of their decisions on the environment. This entails implementing sustainable practices in their supplier chains, product development, and operations. Businesses may lessen their ecological impact and support environmental protection by encouraging sustainability.
- Risk management: Businesses and communities face serious risks from environmental problems including pollution and climate change. Businesses that include ESG factors into their plans are better able to recognize and control these risks. For instance, using cleaner manufacturing techniques may lower the danger of regulatory fines and reputational harm brought on by pollution.
- Resource Efficiency: ESG practices often place a high priority on resource efficiency, which aids in resource conservation and lowers waste production.



Companies may reduce their environmental effect and pollution levels by maximizing resource utilization and putting recycling programmers in place.

- Technology and Innovation: Adopting ESG principles encourages the development of innovative eco-friendly products and services. Businesses that make investments in green technology, clean energy, and sustainable infrastructure might influence sectors to adopt more environmentally friendly practices, which will reduce pollution.
- Engagement of Stakeholders: ESG also entails interaction with stakeholders, such as clients, staff members, investors, and neighborhood communities. Companies that respond to stakeholder concerns about the environment may develop a favorable reputation, win people over, and garner support for their sustainability initiatives.
- Compliance with restrictions: To reduce pollution and safeguard ecosystems, several areas have put in place environmental restrictions. ESG-integrated businesses are more likely to abide by these rules, avoiding legal issues and penalties for non-compliance.
- Capital Access: When making investment choices, financial institutions and investors are increasingly taking ESG considerations into account. As investors look for opportunities that correspond with their sustainability aims, businesses with outstanding environmental performance may have easier access to funding.
- Global Cooperation: ESG programs encourage cross-border cooperation in the face of environmental concerns. To address problems like climate change,

pollution, and biodiversity loss, businesses, governments, and organizations collaborate, promoting a coordinated effort towards a more sustainable future.

Companies may have a beneficial influence on the environment by lowering pollution, saving resources, and supporting sustainable practices by incorporating ESG concepts into company strategy and operations. In tackling environmental issues and fostering a greener and more sustainable society, this joint effort is crucial.

Today, everyone seeks a clearer, happier picture of themselves as well as a high rate of return on their investments. This is the reason why ESG is now given so much consideration.

#### **1.4. THE MAIN THEORIES OF ESG INDEX**

The development and implementation of ESG indexes is supported by a number of major ideas and methodologies. Three popular hypotheses are listed below:

Harry Markowitz's Modern Portfolio Theory (MPT) serves as the cornerstone for several investing strategies, including ESG-focused ones. MPT contends that by diversifying assets across several asset classes and securities, an investor may achieve the best possible risk-return tradeoff for their portfolio. In relation to ESG indices, MPT suggests that by selecting businesses with better long-term sustainability prospects and reduced exposure to ESG-related risks, adding ESG considerations into the investing process might improve risk-adjusted returns.

These dangers are connected to the three components of the ESG Index:

- **Environmental Risks:** These dangers are brought on by things like ecological harm, resource shortages, pollution, and climate change. For example, businesses that rely largely on fossil fuels may be at danger from tighter restrictions, rising carbon pricing, or a move towards renewable energy sources. A company's operations, supply networks, and long-term sustainability may be impacted by environmental issues.
  
- **Social Risks:** Social risks include a broad variety of topics, including community connections, product safety, labor practices, human rights, and consumer pleasure. Companies that have lax labor standards or have been involved in disputes involving abuses of human rights, for instance, may suffer reputational harm, boycotts, legal action, or regulatory fines. Such risks may have an effect on a company's market share, customer trust, and brand value.
  
- **Governance Risks:** Concerns with corporate governance, CEO remuneration, board diversity, shareholder rights, and ethical business behavior all provide governance risks. Poor decision-making may result from weak governance practices, which include lack of openness, conflicts of interest, and ineffective risk management. Financial mismanagement, legal issues, or reputational loss may all be caused by governance concerns.

These ESG-related risks may affect a company's financial performance in both a direct and indirect way, affecting things like profitability, operational effectiveness,

cost structure, market access, and competitive positioning. ESG considerations in investment research make it easier to find businesses with sustainable business strategies and good risk management.

In terms of a portfolio, diversification across firms with various ESG risk profiles may lessen the effect of certain ESG-related risks. Investors may create more resilient portfolios that are better equipped to address the difficulties and possibilities posed by a shifting ESG environment by taking ESG risks into account alongside conventional financial risks.

The sustainable development theory acknowledges the connection of social advancement, economic growth, and environmental preservation. It claims that to achieve sustainable development, decision-making processes must take economic, social, and environmental factors into account. According to this notion, ESG indexes seek to find and invest in businesses that do well financially while simultaneously making significant contributions to society and the environment. They work to advance ethical business practices and have a good influence on society and the environment.

According to the literature, we can make the following deductions regarding this theory's knowledge level and ESG Score:

- Consistent with the ideals of sustainable development, ESG indexes combine environmental, social, and governance issues into investing choices. These elements include a wide variety of standards, such as corporate governance, social responsibility, and environmental effect, all of which are crucial in meeting the requirements of the current generation without jeopardizing the capacity of future generations to do the same.

- ESG and Financial Performance Have a Positive association: Empirical research, including meta-analyses, consistently demonstrates a positive association between good ESG performance and better financial results. Higher ESG rated companies often have stronger risk management and financial success. According to this conclusion, businesses that emphasize ESG practices are more likely to adhere to sustainable business practices, which may provide better long-term financial returns.

ESG ratings have an impact on corporate behavior, according to research, and encourage businesses to adopt more sustainable practices. Companies are encouraged to improve their performance across environmental, social, and governance aspects by integrating ESG concerns into their decision-making, further supporting the goals of sustainable development.

According to the research, businesses are becoming more and more aware of the value of ESG factors, which is partly due to investor preferences for sustainable investment. The link between ESG indices and sustainable development theory is strengthened by this acknowledgement, which demonstrates how businesses are increasingly paying attention to ESG concerns and the desire for sustainable practices. ESG indexes are instruments that investors may use to include sustainability issues in their portfolios, promoting responsible investing. ESG indexes may help investors find firms with good ESG practices, promoting responsible investing and advancing more general sustainability goals. Investors looking to match their investments with sustainable development goals can utilize these indexes to do so.

In conclusion, ESG indexes are associated with sustainable development theory because they represent the incorporation of ESG considerations into investment choices, which are consistent with sustainable development ideals. The link between ESG indices and sustainable development goals is further supported by the favorable association between ESG performance and financial results, the effect on company behavior, and the rising acknowledgment of ESG standards. ESG indexes are essential for encouraging responsible investing and accelerating progress towards a more sustainable future as sustainable practices acquire popularity in the financial industry:

- Stakeholder Theory: According to Stakeholder Theory, businesses should take into account the needs and interests of all parties involved, including shareholders, consumers, suppliers, and staff. According to this notion, organizations that demonstrate excellent governance practices, support fair labor standards, aid in community development, and have open and responsible management are given priority in ESG indexes. These indexes aim to encourage businesses to operate ethically and generate long-term value for all parties concerned by taking a wide variety of stakeholders into account.
- Shareholder Theory: In terms of Environmental, Social, and Governance (ESG), shareholder theory refers to the incorporation of ESG factors into corporate decision-making while maintaining a constant emphasis on maximizing shareholder value. ESG metrics are a group of non-financial measurements that are used to evaluate a company's social responsibility, corporate governance, and environmental impact. To ensure that businesses not only make profits for shareholders but also take into account their wider

social and environmental effect, ESG elements are being included into shareholder theory in an effort to build a more holistic and sustainable approach to corporate governance.

Companies may link their business practices with long-term sustainability and ethical behavior by incorporating ESG factors into shareholder philosophy.:

- Risk management: Recognizing and mitigating ESG risks may assist businesses in averting possible monetary and reputational losses. For instance, identifying environmental risks, such as those brought on by the effects of climate change or changes in regulatory requirements, may help businesses adjust to changing market circumstances and protect shareholder investments.
- Value Creation: Supporting ESG activities may result in innovation and cost savings, adding value for the business and its shareholders. Sustainable business practices often draw socially responsible investors, which may enhance stock performance.
- Trust among Stakeholders: Addressing social and governance concerns encourages trust and adherence among a variety of stakeholders, including clients, staff members, and investors. Stakeholders who are happy with the firm are more inclined to support its expansion and profitability, which benefits shareholders.
- Reputation and Brand: ESG factors have a big influence on a company's reputation and brand perception. By demonstrating a commitment to ESG principles, businesses may draw in customers and investors who favor doing

business with socially conscious companies, hence increasing shareholder trust.

## **1.5. ESG INVESTMENT OVERTIME**

ESG investments have significantly expanded and changed over time. At first, it mostly concentrated on negative screening, barring businesses engaged in contentious activities. The ESG investing environment has, however, grown recently to encompass positive screening, the inclusion of ESG considerations in investment decision-making, and active involvement with businesses to promote positive change.

According to research, there are many reasons why ESG investment has become more popular. First off, there is mounting evidence that organisations with high ESG performance often have superior long-term financial success. According to studies (Khan et al., 2016) (Kotsantonis et al., 2019), there is a positive correlation between ESG variables and corporate financial performance. As a result, investors may see greater returns from businesses that prioritise sustainability.

Second, investor demand and legislative changes have had a significant impact on the development of ESG investing practises. For instance, institutional investors have been pushed to include ESG factors into their investing procedures via the United Nations-backed Principles for Responsible investing (PRI) project. ESG reporting and investment products are becoming more transparent and standardised according to the Sustainable Finance Disclosure Regulation (SFDR) and Taxonomy Regulation of the European Union (European Commission, 2021).



Furthermore, investors now have access to standardised measures and tools to evaluate the ESG performance of firms thanks to the advent of ESG ratings and frameworks like the Sustainability Accounting Standards Board standards (SASB) and the MSCI ESG Ratings.

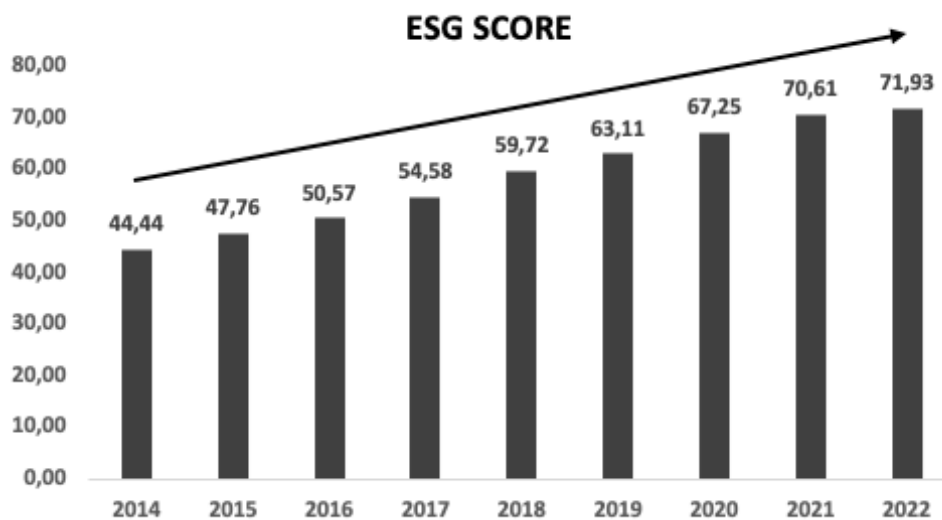


Figure 1: STOCXX EUR 600 ESG Score mean (2014-2022)

## 1.6. ESG INVESTMENT IN THE LAST YEARS

Global sustainable investment assets have grown significantly, from \$13.3 trillion in 2012 to \$22.9 trillion in 2016, a stunning 68% rise (Clark et al., 2015). This study highlights how popular sustainable investing strategies are becoming globally.

A further 2,200 empirical papers were examined for this analysis by Friede, Busch, and Bassen (2015), which discovered a persistent positive correlation between ESG variables and financial success. Their thorough investigation indicates that include ESG factors in investing choices may have financial advantages. This conclusion

illustrates how investors are beginning to understand the importance of ESG integration.

We see a noticeable upward trend in the use of ESG considerations in investment choices in the European setting. According to reports, there has been a considerable rise in the number of Europeans who have signed the PRI, which is backed by the United Nations, demonstrating a rising interest in responsible investing practises in the area (Scholtens et al., 2013).

Additionally, a 2019 study from the Global Sustainable Investment Alliance (GSIA) showed a significant increase in sustainable investment. According to the research, sustainable investing grew at a 15% compound annual growth rate (CAGR) between 2014 and 2018, when it managed \$30.7 trillion in global assets. This increased trend is a result of institutional investors and asset managers adopting ESG investing methods at an increasing pace.

Arabaci, Goergen, and Zhu (2020) studied the connection between ESG traits and investment flows in a more recent research. They discovered a substantial correlation between ESG ratings and investment inflows, indicating that investors are directing more funding towards businesses that exhibit good ESG performance.

ESG considerations are having an increasingly significant impact on the investment landscape, as evidenced by the significant rise in sustainable investment assets globally, the positive correlation between ESG factors and financial performance, and the rising adoption of responsible investment practises by institutional investors.

## **1.7. ESG AND EURO-ZONE**

Businesses and the stakeholder groups they serve are becoming more aware of the importance of non-financial performance and corporate social responsibility (CSR) in particular (Gramlich and Finster; 2013). Corporate social performance (CSP) of businesses is commonly operationalized and evaluated using environmental, social, and governance elements (ESG factors) (Bassen and Senkl 2011;) (PRI; 2015). According to Reverte et al. (2012), a high CSP may be able to improve a company's value by boosting its corporate financial performance (CFP), or cash flows, and/or by lowering its cost of capital. Thus, if firm risk is a key factor influencing the cost of capital, CSP will influence shareholder value if it modifies firm risk. Sustainable investments made up about 26% of all professionally managed assets in Europe, the US, Canada, Australia, New Zealand, and Asia two years prior, according to McKinsey, demonstrating the importance of ESG principles to corporations and investors in the capital markets. In 2014, more than USD 21.4 trillion was sustainably invested in global assets, with more than 60% of that amount being in Europe (OECD; 2015). Following the Covid-19 epidemic, policymakers more recently began emphasizing the value of making sustainable investments. The European Commission, for example, previously recognized the necessity to include sustainable energy efforts as a green path to recovery from the Covid-19 crisis.

The European Commission, the EU's executive body, launched the European Green Deal in December 2019. It is a comprehensive and ambitious policy package. It outlines the EU's goal of making Europe the first continent to be carbon neutral by 2050 while addressing a broad range of environmental, economic, and social problems. The EU's plan for transforming its economy and society to guarantee a

sustainable future is known as the European Green Deal which diversifies into various fields:

- Reaching climate neutrality by 2050: Which calls for a decrease of the EU's net greenhouse gas emissions to zero, is the major goal. Carbon emissions must be drastically decreased in order to do this, and carbon removal operations must be accelerated.
- Economic Transition: The Green Deal intends to facilitate a sustainable economic transition by boosting green technologies, innovation, and investments. This entails encouraging sustainable agriculture, the ideas of the circular economy, and clean energy.
- Environmental and biodiversity protection: The initiative aims to halt the extinction of species and restore ecosystems throughout the EU. This includes initiatives that promote pollution reduction, sustainable agriculture, and the preservation and restoration of forests.
- Resource Efficiency: The Green Deal is focused on reducing resource consumption, promoting recycling, and putting circular economy principles into practice in order to reduce waste and promote sustainable consumption and production practices.

A "just transition," defined as the management of the economic and social repercussions of the transition to a green economy in a manner that benefits workers and communities and ensures that no one is left behind, is a key component of the European Green Deal:

- Research and Innovation: The goal of the project is to promote the quest for truth and the development of cutting-edge technologies that promote environmental sustainability.
- Sustainable Mobility: The Green Deal promotes the creation of zero-emission transport systems, including expanding the infrastructure for electric vehicles, putting money into public transit, and promoting cycling and walking.
- Renewable Energy: The plan advocates for phasing out fossil fuels while accelerating the switch to renewable energy sources including wind, solar, and hydropower.

The European Green Deal, which is comprehensive and integrated, is the EU's response to climate change, environmental degradation, and sustainable development. It addresses a wide range of civilizational aspects, including commerce, agriculture, energy, and transportation. The Green Deal can only be implemented if member states, institutions, and other stakeholders change their policies, regulations, investments, and collaborations.

## **1.8. EUROPE CORPORATE SUSTAINABILITY REPORTING DIRECTIVE**

On January 5, 2023, the Corporate Sustainability Reporting Directive (CSRD) came into force. This new rule has modernized and tightened the criteria controlling the social and environmental data that firms are expected to furnish. Now, in addition to listed SMEs, a larger spectrum of big corporations is required to report on sustainability.

The new regulations will make sure that everyone who is interested, including investors, has access to the data they need to evaluate how firms damage both people and their environment. Additionally, investors will be able to evaluate the financial potential and risks associated with climate change and other sustainability-related problems.

The European Sustainability Reporting Standards (ESRS) must be followed when reporting by companies subject to the CSRD. The EFRAG developed the principles, and the standards will be modified to fit EU policy while simultaneously advancing and advancing global standardisation activities. Directives will also allow for the digital taxonomy of sustainability information and demand assurance on the sustainability information that businesses provide (European Commission; 2022). New laws were created by the Non-Financial Reporting Directive. Up until firms are compelled to abide with the new CSRD laws, the Non-Financial Reporting Directive (NFRD)EN restrictions remain in force. The NFRD requires large firms to publish information about:

- environmental matters.
- social matters and treatment of employees.
- respect for human rights.
- anti-corruption and bribery.
- diversity on company boards (in terms of age, gender, educational and professional background).

Major public-interest organizations with more than 500 employees are subject to these limitations. This comprises more than 11.700 large businesses and organizations from around the EU, including:

- listed companies.
- banks.
- insurance companies.
- other companies designated by national authorities as public interest entities.

### **1.8.1. THE CSRD TIMELINE**

The "Disclosure of Non-Financial and Diversity Information by Large Companies and Groups" has been a topic of discussion for the European Commission since 2014. The European Union (EU) passed the "DIRECTIVE 2014/95/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" (European Commission, 2014), sometimes referred to as the Non-Financial Reporting Regulation (NFRD), on October 22, 2014. Major firms and collections of public interest corporations must follow the regulation when they publish non-financial information in the EU.

In essence, the order requires public interest businesses with more than 500 employees to provide information about their business-related risks, performance, and environmental, social, employment, and human rights policies. Since it has no bearing on the company's financial performance, this kind of information is sometimes referred to as "non-financial information."

The main objective of the directive is to increase enterprises' accountability and transparency towards a range of stakeholders, including investors, clients, employees, NGOs, and regulators. Companies subject to the directive must provide such information in their annual reports or other reports.

The directive's goal is to get firms to consider their decisions more thoroughly in terms of how they influence not just financial aspects but also social and

environmental ones. This should increase business sustainability and stakeholders' understanding of non-financial business variables.

Then, in 2016, a public consultation was held with the aim of gathering opinions from stakeholders on non-binding guidance on methodology for reporting non-financial information by certain large companies across all sectors. This was done in accordance with Article 2 of Directive 2014/95/EU on Disclosure of Non-Financial and Diversity Information by Certain Large Undertakings and Groups.

Commission non-financial reporting requirements were developed in 2017. The Non-Financial Reporting Directive (2014/95/EU) mandates that large public interest enterprises (listed corporations, banks, and insurance companies) with more than 500 employees provide particular non-financial information. As required by the directive, the Commission has issued non-binding recommendations to help businesses disclose relevant non-financial information in a more consistent and comparable manner. The recommendations of the Financial Stability Board's taskforce on climate-related financial disclosures (TCFD) are included into the criteria for declaring climate-related information, which also consider the future taxonomy on sustainable activities that is now being established.

Companies may choose to employ worldwide, European, or national criteria in accordance with their unique qualities or business environment; these standards are not required.

More rules were amended in June 2019 to improve the amount of information provided.



A study on two proposals was presented by the Directorate-General for Financial Stability, Financial Services, and Capital Markets Union in March 2021 with the aim of taking a significant step forward in the development of corporate sustainability reporting across the EU (European Commission, 2021).

The first report proposes a timeline for the creation of a comprehensive set of EU sustainability reporting criteria. It was composed by a multi-stakeholder work group under the direction of the European Financial Reporting Advisory Group (EFRAG).

A second study presents suggestions for improvements to the governance structure of EFRAG to ensure that future EU sustainability reporting standards are established using an inclusive and comprehensive methodology. For instance, it describes how national and European agencies will take part while ensuring sure the procedure also takes use of the expertise of the business sector and civil society.

In April 2021, the actual proposal was made. On April 21, 2021, the European Commission adopted a comprehensive and ambitious set of policies with the aim of improving the flow of finance for sustainable projects within the EU; these actions will be crucial in keeping Europe carbon neutral by 2050.

The Corporate Sustainability Reporting Directive (CSRD) proposal, which would change the NFRD's current reporting standards, is based on the following key points:

- Expands the scope to include all major corporations and all listed entities on regulated markets, with the exception of listed microenterprises.
- Demands the verification (assurance) of the data that was reported.
- Creates a need for reporting in accordance with obligatory EU sustainability reporting standards, as well as other specific reporting obligations.

- Urges companies to digitally "tag" the supplied data so that it may be processed by machines and flows into the single access point for Europe predicted by the Capital Markets Union Action Plan.

The European Sustainability Reporting Standards (ESRS) were adopted by the Commission in July 2023 for use by all enterprises subject to the Corporate Sustainability Reporting Directive (CSRD). With this, the shift to a sustainable EU economy has proceeded.

The standards address every aspect of environmental, social, and governance issues, including those related to climate change, biodiversity, and human rights. Investors may utilise the data they provide to better understand how investing in certain companies will affect sustainability.

This was the whole legal process used to create new social, environmental, and governance legislation in Europe. All of these ideas provide us a glimpse of how the European Union feels about the influence that businesses have on the globe.

The impact of what we have seen in the preceding paragraphs can also be viewed from various angles, such as the influence a company may have on the lives and opinions of other individuals, such as shareholders who are directly involved in company activity and stakeholders who may be swayed by any of the impactful decisions the company may make at any given time.

The first objective that the European Commission mentioned in the first instant will continue to grow and expand along with his jurisdictional compound of laws because, as we know from today, the directives have changed in the previous two decades and will continue to evolve in the next years.

## **1.9. THE RESOURCE ALLOCATION THEORY**

Resource allocation theory is not linked to a specific individual or inventor, unlike certain economic theories. Rather, it is a theory that has developed through time in the fields of economics, management, and decision science, drawing on a number of ideas and beliefs from each. Researchers in the domains of management and operations research have developed a number of models and frameworks for optimising resource allocation in organisations. These models usually make use of decision theory and mathematical optimisation methods.

Economics has long focused on how to allocate scarce resources among conflicting purposes within the framework of market economies, with classical economists like Adam Smith and David Ricardo examining this issue. Resource allocation theory has developed into an interdisciplinary concept that draws ideas from operations research, management science, economics, and other pertinent fields. Instead of being the work of a single author, it represents a body of collective wisdom and strategies for handling resource allocation issues under various conditions. Resource allocation theory is continually being developed and expanded by academics and practitioners in various fields to meet current concerns and opportunities.

Resource Allocation Theory, which is commonly related to management and economics, looks at how limited resources are distributed among competing needs or demands. This theory is used to understand decision-making processes in a range of contexts, including as industry, government, and project management. The challenges of allocating resources effectively and economically to maximize outcomes or achieve specific objectives are covered by resource allocation theory.

The following are some fundamental concepts and characteristics of resource allocation theory:

- The core principle of resource allocation theory is that resources are limited or scarce. These resources might be in the form of cash, people, time, materials, tools, and other things.
- Diverse conflicting demands are routinely placed on the same set of resources, according to the idea of resource allocation. Organisations or individuals must decide how to allocate these resources among several possibilities.
- Trade-offs: Decision-makers must consider trade-offs while allocating resources. The performance or outcomes may deteriorate if resources are devoted to one project or area at the cost of another.
- Decision-Making Criteria: Decisions about resource allocation are influenced by a number of variables, such as ROI, cost-benefit analysis, the ranking of critical activities, risk assessment, and strategic alignment with organizational goals.

### **1.10. THE OHLSON MODEL**

We may consider the Ohlson model as the primary model to be taken into account when we want to compare ESG index investments and financial performance index since the thesis's ultimate objective is based on the relationship between financial performance index and financial performance index.

The Ohlson model, often referred to as the Ohlson-Beta model or the Ohlson-O-J model, is a valuation method based on accounting that is used to determine a

company's intrinsic worth. The concept was created by accounting expert James Ohlson and was initially presented in his key 1995 work titled "Earnings, Book Values, and Dividends in Equity Valuation".

The core concepts of accounting and finance provide the theoretical foundation of the Ohlson model. It expands on the idea that a company's worth is determined by its predicted future profits and book equity value. To calculate the firm's intrinsic worth, the model takes information from the financial statements into account.

The Ohlson model states that the book value of equity and the present value of anticipated future anomalous profits may be combined to reflect the worth of a firm's equity. The anomalous earnings measure the profits variance from the forecasted earnings based on the book value of the company and market expectations. The model takes into consideration the time value of money and represents the market's perception of the firm's risk and growth potential by discounting the anomalous profits back to the present.

The Ohlson model is often used in empirical study and valuation work. It has shed light on the connections between business value and accounting indicators including profits, book value, and dividends.

We can therefore consider the fact that the Ohlson model provides us with a deeper contribution to our ultimate goal, which is to try and find any correlation between financial performance index and ESG companies and to seek out whether or not those companies will have some sort of return in terms of dividends and performance.

## **1.11. ESG, MARKETS AND PERFORMANCE**

The link between ESG Scores and market values on the financial market will be discussed in this chapter, but first we must evaluate what the CSR committee is and what is its primary function inside a firm.

The task of managing and directing an organization's CSR operations falls within the purview of a CSR committee, also referred to as a corporate social responsibility committee. CSR describes the voluntarily undertaken measures of an organisation to solve social, environmental, and ethical challenges and make a good contribution to society.

Senior executives, board members, and other significant stakeholders with a stake in advancing ethical business practises often make up the CSR committee. The committee's main responsibility is to offer strategic supervision, direction, and decision-making for the company's CSR initiatives.

Depending on the size, sector, and CSR goals of the organisation, a CSR committee's precise duties may change. However, typical duties of a CSR committee include of:

- Setting CSR objectives and strategies
- Developing CSR policies and frameworks
- Monitoring and reporting
- Stakeholder engagement
- Resource allocation
- Integration of CSR into business practices

Companies may show their dedication to ethical and sustainable business practises by forming a CSR committee. The committee serves as the primary driving force behind the creation, execution, and supervision of the company's CSR efforts, ensuring that they are in line with the company's values, satisfy stakeholders, and have a good influence on society.

We have seen how CSR committee activities have influenced company forms in the last years, and we anticipate that they will contribute to the pursuit of a CSP (Corporate Social Performance) that is more focused.

According to Broadstock et al. (2019), managers nowadays are increasingly concerned with leaving a "greener" imprint in terms of ESG, and some of their practices are even designed to advance their own interests or reputation.

We can be certain that occasionally leaving a “greener” imprint will greatly assist businesses. In this instance, we can see that various outcomes happened in the case of Brazilian listed firms. The studies carried out by Lourenço, Branco, Osarto, and others shed light on the variables affecting Bovespa stock market listed firms to be included in the CSI index. Both studies look at the reasons why organizations are included in this ranking despite employing distinct research approaches.

According to Lourenço and Branco, Brazilian businesses that succeed in sustainability are often bigger and have greater returns on capital. However, Osarto et al. used surveys to discover other reasons why businesses join the CSI index, such as the simplicity of obtaining capital, reputational benefits, and the search of competitive advantages. They specifically emphasized the value of environmental motives based on protecting the environment.

Santis et al. (2016) undertook an investigation of the financial and economic performance of CSI index firms in comparison to those listed in the selective index (Ibovespa), adding to the conversation on sustainability in finance. Surprisingly, they could not discover any significant variations in the economic and financial performance of businesses belonging to any of the studied indexes. It is interesting to note that investments in sustainable projects were shown to have less of an impact on organizations' economic and financial success than other aspects, such as industry categorization.

More recently, Garcia et al. (2015) examined whether the financial profile of Brazilian listed businesses corresponds with stronger corporate governance, social, and environmental performance using the Thomson Reuters Eikon database. Their research showed a strong correlation between the environmental performance of listed Brazilian firms and their financial success. It is interesting to note, nevertheless, that the converse of this correlation shows that businesses with superior environmental performance often have lower profits.

As a result, these studies provide important light on the connection between sustainability and the financial success of businesses listed on the Bovespa stock market. While some studies show a favorable relationship between financial metrics like improved returns on capital and sustainability leadership, other research emphasise a variety of reasons for firms to join the CSI index, including environmental concerns. Additionally, the study reveals that criteria other than sustainability activities, such industry categorization, have a bigger impact on how profitable and successful organizations are. Sustainability and financial success are



intricately linked, calling for more study and consideration from firms, investors, and politicians alike.

Even if we look broadly, we can see that in recent years, further references from other studies have given us a larger perspective; however, this time, it is being contrasted with the traditional profit-seeking investment. Derwall et al.'s (2011) study, which examines the investing practises of social investors that place a high priority on ESG considerations, serves as the example. Their performance is compared to that of traditional profit-seeking investors in the research. The authors discover that ethical investors that take into account ESG aspects in their investing choices do not exhibit worse financial results. They may even beat traditional investors in certain circumstances, proving that ESG factors need not reduce profits.

Many scholars have presented research indicating a negative and significant correlation between the performance achieved in social activities and financial outcomes. Not only did those studied demonstrate some sort of performance boost, but we also have other flows that give us another perspective, like Damodaran, who supports that "The evidence supporting the integration of social responsibility into market pricing is limited."

In a 2016 study by Nollet (et al.), the researchers investigated how Corporate Social Performance (CSP) and Corporate Financial Performance (CFP) for the S&P 500 companies from 2007 to 2011 related using both accounting-based and market-based financial performance indices. Their findings showed that taking CSP into account had a notable negative impact on return on capital.

Similar to this, Pava and Krausz (1996) also looked into the same trend, incorporating risk and firm-specific indices into their analysis. Their study looked at 53 firms designated as "socially responsible" by the Council on Economic Priorities between 1985 and 1991, and they came to the conclusion that these companies did not demonstrate a significant performance advantage compared to other companies.

Jakobsson and Lundberg (2018) showed a negative correlation between CSP and CFP in terms of price volatility, and Brammer et al. (2006) discovered a similar negative correlation when looking at stock returns. Other studies have also highlighted a negative association between CSP and CFP in various aspects.

Gladyssek and Chipeta (2012) looked at companies listed in the South African JSE SRI Index from 2004 to 2009 to investigate the relationship between firm inclusion in Corporate Social Responsibility (CSR) indices and benefits to share prices. They found that even when companies were included in CSR indices, there were no observable benefits in terms of share price.

Similarly, Becchetti et al. (2012) examined the Domini 400 Social Index, which spanned the years 1990 to 2004, and found a significant adverse impact on returns for corporations soon after their introduction in the prior index.

All things considered, these research show to a complicated link between CSP and CFP, with some studies indicating adverse impacts on financial performance measures.

## **2. METHODOLOGIES**

### **2.1. THEORETICAL BACKGROUND AND DEVELOPMENT OF HYPOTHESIS**

In accordance with the definition provided by the European Commission, corporate social responsibility (CSR) is "the responsibility of enterprises for their impacts on society [...] to integrate social, environmental, ethical, human rights, and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders." (European Commission; 2011).

Both the capital market (Bassen and Senkl; 2011) and research (Chang et al. 2014; Eccles et al. 2014) generally embrace the use of ESG variables to capture CSP ESG elements are used, for instance, by rating agencies and participants in the Principles for Responsible Investment program, which is backed by the United Nations (PRI; 2015). We are specifically interested in the link between ESG Score and stock market performance of the companies in the Euro zone.

Moving on, the financial performance of the company can be explained by the value or performance overtime of the share price of the company. The more a company performs in the right way and the more the share price tends to increase his value, all this considering the other variables that affect the shares market (Clarke, et al; 2001). Particularly, the stakeholder theory (Clarkson 1995; Donaldson and Preston 1995; Freeman 2010) is widely used to provide a theoretical justification for the positive impact that CSP has on corporate value. It contends that the management of organizations must take into account the demands of all stakeholders, not just shareholders, and that this is essential since meeting the needs of these stakeholders directly increases value for shareholders (Freeman 2010).

According to Freeman (2010, page 25), a stakeholder is "any group or individual who can affect or is affected by the achievement of the firm's objectives." Along with creditors, employees, customers, suppliers, public interest groups, and governmental bodies, shareholders are one category of a company's stakeholders. Consumers and suppliers are other categories of stakeholders.

Indeed, research has aided in the advancement of the notion of value enhancement. In other words, corporate social responsibility benefits a business both directly and indirectly, boosting its competitive edge and shareholder value. In fact, a company that participates in CSR activities stands to gain a number of advantages, such as an increase in employee productivity (Valentine, Fleischman; 2008), an improvement in corporate reputation (Menon, Kahn; 2003), advantages in the capital market (Dhaliwal, et al; 2012)(Godfrey; 2005), improved risk management (Dhaliwal, et al; 2012), an assurance of better operating performance, an expansion of the product market, and a strengthening of its relationship with its society and stakeholders.

Waddock and Graves (1997) state that a powerful CSP may also be seen as a sign of great managerial talents in a person. When taken as a whole, the findings of the research suggest that superior CSP lowers financial risks, which in turn lowers stock market risk and minimizes the likelihood of company crises (Oikonomou et al. 2012).

Furthermore, most extant studies demonstrate direct and positive association between CSR and a

firm's financial performance (Han, Kim; 2016) (Porter, Kramer; 2012). Margolis et al. conducted a meta-analysis of 251 studies that analyzed the relationship between CSR and performance. They conclude that the overall effect of a firm's CSR on its performance is positive.

Our study and the value-enhancing impact of CSR can be linked most directly. The higher quality of social and environmental practices that organizations adopt can directly improve their worth by favorably affecting the returns on stock markets, claims a review by Malik (2015) that summarizes studies on the value-creating capacities of CSR activities.

It is easy to understand that if a company starts to focus mainly of its CSR and so to increase its ESG Score over the years it will have a positive impact on the shareholders' and stakeholders' point of view and by saying this it is easy to understand that the companies with the highest ESG score might have a positive impact on their market share performance.

Since the literature has brought us to a mixed idea of what is the financial performance of companies that pursue superior ESG index scores we now must analyze the effect of the ESG index and the performance drivers of the companies on the market.

By saying that resources are scarce, we now must think of where those resources are invested and how the company reacts to those investments; if a company wants to pursue major ESG impact on its performance, it could sacrifice something in other areas of their activity such as financial area.

Furthermore, studies have concentrated on the analysis of developed countries and not so much on a complete asset of companies that perform at the highest level in the Eur Stoxx 600. This study will analyze the influence that ESG Score makes on stock market in the last eight years in the Euro Zone.

By saying this we can now move on to our hypothesis formulation and dimensions choice that will be taken into account in the quantitative analysis and regression.

## **2.2. LINEAR REGRESSION**

Regression analysis is a statistical analysis technique that aims to identify the relationship between a "target" variable (dependent variable) and a set of explanatory variables (independent variables).

Empirically, the relationship between dependent variable and explanatory variables (independent and control) can be known unless an error is made; probabilistic models such as the regression model should be used.

The regression model can have several objectives and can be divided into 3 categories, depending on each of its purposes:

- EXPLANATORY: Estimate the influences of each variable.
- PREDICTIVE: Estimate the score of the dependent variable starting from the absolute values from the independent variables.
- COMPARATIVE: Compare the ability of several independent variables, or several sets of independent variables, to influence an dependent variable.

The objective of the analysis is EXPLANATORY because the objective is to estimate whether the ESG Score or other factors are capable of influencing the equity value of companies in the market index (EUR STOXX 600).

In case you want to study the relationship between Y (dependent variable) and p independent variables  $X_1 \dots, X_p$ ; an index t is introduced to indicate the time to which the measurements on the variables are related.

In the most general form, the regression model can be written as:

$$y_t = f(x_t, b) + e_t$$

Where f is a mathematical function of p independent variables and of unknown parameters b.

The above model is written in probabilistic form; the fundamental assumptions are:

- The mean error (zero) and the variance are constant and not dependent on t.
- Errors are unrelated.
- Error distribution is normal.

Below are some particular cases of the general regression model:

- $Y_t + e_t$  (*Constant Mean Model*)
- $Y_t + b_0 + b_1 * x_1 + e_t$  (*Simple Linear Model*)
- $Y_t = b_0 + b_1 * t + e_t$  (*Linear Trend Model*)
- $Y_t = b_0 * \exp(b_1 * x_1) + e_t$  (*Exponential Growth Model*)
- $Y_t = b_0 + b_1 * x_1 + b_2 * x_1^2 + e_t$  (*Squared Model*)
- $Y_t = b_0 + b_1 * x_1 + \dots + b_t * x_t^2 + e_t$  (*General Linear Model*)

The regression model used in the analysis is a simple linear model of multiple type as more than one independent variable (Number of Employees, ESG Score) will be inserted.

The multiple regression model is proposed by the main statistical application software such as, in this case, SPSS.

- One of the important points of regression analysis is to understand how much of the variability of the y-dependent variable is grasped by the variation of the explanatory variables, or, how influential the explanatory variables are in determining the trend of the dependent variable.
- Consider the variability of observations around the mean

$$\sum (y^t - \bar{y})^2$$

- This quantity is called total sum of squares (corrected for the average) and is indicated with SSTO; the idea is to break down SSTO into two parts.

The replacement of the estimate  $\hat{b}$  in the above model leads to the estimated values.

The differences between the estimated values and the observed values of the dependent variable are the residues:  $\hat{e} = y - \hat{y}$

- $SSTO = \sum (y_t - \bar{y})^2$  (Total square sum)
- $SSR = \sum (\hat{y}_t - \bar{y})^2$  (Square sum given by the regression)
- $SSE = \sum (y^t - \hat{y})^2$  (Square sum given by the error)
- $SSTO = SSR + SSE$

As a measure of goodness of interpolation, we can use the coefficient of

determination  $R^2 = \frac{SSR}{SSTO} = 1 - \frac{SSE}{SSTO}$ .

This index can take values between 0 and 1 and measures how much of the total variability of observations around their mean is explained by the model; a value close



to one indicates that a large part of it is explained, while a value close to 0 indicates a situation of substantial linear independence.

#### MULTIPLE LINEAR MODEL

Origin	Square sum	Freedom Degrees	Square average	F test
Regression	SSR	P	MSR = SSR/p	MSR/MSE
Error	SSE	n-p-1	MSR = (SSE)/n-p-1	
Total	SSTO	n-1		

- Note that residue estimation is usually not known, it is, however, possible to estimate it using the standard error.
- The linear regression model contains p+1 parameters to be estimated, so SSE is divided by n-p-1 because it can be shown that there are p+1 constraints between n residues; the degrees of freedom are therefore the number of independent components in SSE.

#### CONFIDENCE BOUNDARIES AND HYPOTESIS TEST

The statistical test for verifying the zero hypothesis  $H_0: b_i = b_{i0}$  against the alternative  $H_1: b_i \neq b_{i0}$  dove  $b_{i0}$  is a specified value of particular interest, it is given by:

$$t = \frac{\hat{b}_i - b_{i0}}{\hat{s}_{\hat{b}_i}}$$

Se  $|t| > t_{\frac{\alpha}{2}} * (n - p - 1)$ , we reject  $H_0$  in favour of  $H_1$  a  $\alpha$  level of significance.

T Test is used to verify the significance of each explanatory variable individually. In addition, it is also possible to define a test on the global significance of the model  $H_0: b_1 = b_2 = \dots = b_p = 0$  against alternative  $H_1$  that at least one  $b_i$  is non-zero. If this assumption is true, none of the independent variables has a significant influence on  $y$ , which is therefore best predicted by its average.

It is possible to prove that, if the null hypothesis is true, the F-test  $F = \frac{MSR}{MSE} = \frac{n-p-1}{p} * \frac{R^2}{1-R^2}$

It follows a distribution F with  $p$  and  $n-p-1$  degrees of freedom.

If  $F > F_{\alpha}(p, n-p-1)$  we reject the null hypothesis at the level of alpha significance.

From an operational point of view, tests  $t$  and  $F$  are conducted considering the  $p$ -value corresponding to the observed test statistics

Then, leaving the statistical theory behind and moving on to the development of our hypothesis, according to the theoretical background exposed in the previous paragraphs and basing our view on the previous literature and theory we can suppose that companies with high ESG Score have a different approach on the risk management and might appear different in the eyes of Shareholders and Stakeholders, so more people will invest into companies with a high ESG Score:

H1: "There is a statistically significant relationship between a company's ESG score and its share price performance, with companies' ESG Score exhibiting a positive impact of Share Price over the years."

So, by saying that our  $H_0$  becomes: “There is no statistical relationship between a company’s ESG score and its share price performance, with companies’ ESG Score exhibiting a positive impact on Share Price over the years”.

According to our literature, companies’ ESG Score might have positive share price performance over time justified by the influence that it makes on the market preference of investors.

### **2.3. ESG AND FINANCIAL INDEX DATABASE**

ESG ratings may be obtained from a variety of different sources. The following is a list of well-known websites and other places where you may find ESG ratings:

- MSCI ESG Research: Is the preeminent source of ESG ratings and data, and MSCI ESG Research is one of its most prominent offerings. Their ESG Research platform offers ratings on tens of thousands of businesses all around the globe, in addition to in-depth assessments on the ESG performance of those businesses.
- Sustainalytics: Sustainalytics provides ESG research and evaluations to clients in the business world, including businesses and investors. They evaluate businesses based on a broad variety of environmental, social, and governance (ESG) issues and then give ratings as well as assessments of how well those businesses are doing.
- Bloomberg's Environmental, Social, and Governance Data: Bloomberg's terminal platform offers ESG data as well as ratings.

Users get access to company-specific ESG scores and evaluations, in addition to other data pertaining to ESG.

- ESG Data Provided by Refinitiv: Refinitiv provides ESG data and ratings, including scores that are based on a number of different ESG aspects. Their website offers in-depth information on the environmental policies and procedures of various businesses.
- CDP (previously known as the Carbon Disclosure Project): CDP is an organization that mainly focuses on environmental issues and offers ratings and statistics pertaining to businesses' carbon emissions, initiatives for addressing climate change, and water management practices.
- Dow Jones Sustainability indexes (DJSI): The Dow Jones Sustainability Indices (DJSI) are a collection of indexes that assess corporations based on the success of their sustainability initiatives. S&P Dow Jones indexes works closely with RobecoSAM to produce the indexes you see here.
- FTSE4Good Index Series: The FTSE4Good Index Series, which is administered by FTSE Russell, evaluates the environmental, social, and governance (ESG) performance of firms. It also comprises indexes that monitor companies that fulfil certain ESG criteria.

These are a few instances of several platforms and indexes that give ESG ratings.

There are many more. It is essential to keep in mind that various rating organisations

may use a variety of distinct procedures and standards. This is the reason why data was acquired from Refinitiv for the purpose of this article.

Investors have access to a broad variety of resources and information thanks to Refinitiv, a company that is generally regarded as a reliable and all-encompassing source of financial data.

When it comes to retrieving ESG (Environmental, Social, and Governance) score data, Refiitv offers several advantages:

- **Comprehensive Coverage:** Refinitiv provides comprehensive coverage of businesses and sectors, as well as ESG data for a broad range of organizations with global presences. Investors may get ESG ratings for a wide range of companies thanks to the comprehensiveness of this coverage, allowing for more precise ESG research and comparisons.
- **A dedication to high standards of data accuracy and quality** Refinitiv is renowned for its commitment to upholding strict standards of data accuracy and quality. Bloomberg's environmental, social, and governance (ESG) statistics go through rigorous validation processes that guarantee the accuracy and reliability of the data. For investors, this is crucial since they require accurate information to make informed investment decisions.
- **ESG Ratings and Metrics** Investors may assess the ESG performance of a company from a variety of angles thanks to Refinitiv's wide range of ESG measures and ratings. Environmental impact, social

responsibility, workforce diversity, carbon emissions, and corporate governance practices are just a few examples of the measurements that could be included in this area. By using the many indicators and ratings at their disposal, investors may get a thorough understanding of a company's ESG profile.

- Tools for Analysis Customers of Refinitiv may examine and compare ESG data across enterprises, sectors, and geographical locations using the analytical tools that Refinitiv provides. The availability of these tools makes it simpler to incorporate environmental, social, and governance factors into investment strategies since they enable investors to do in-depth analysis, spot trends, and make insightful comparisons.
- Market Integration: The Refinitiv ESG data is seamlessly linked into the company's bigger financial platform. Investors have access to environmental, social, and governance (ESG) data via this link in addition to other kinds of financial information such stock prices, financial statements, news, and market data. This comprehensive integration greatly facilitates the research process and supports a comprehensive approach to investment analysis.

## **2.4. SAMPLE SELECTION**

The emphasis of sampling in this research is on how the ESG (Environmental, Social, and Governance) score affects the share prices of firms that are part of the STOXX Europe 600 index. This choice of sample is important to the study since it provides

the framework for analyzing how ESG ratings have affected the value dynamics of firms between 2014 and the latest year available, 2022.

The year 2014 was chosen as the beginning year, and this is crucial for a number of reasons. The European Union Directive 2014/95/EU, which mandated that big European corporations include non-financial information, including ESG data, in their corporate reports, was introduced in 2014, in particular. The knowledge and openness of ESG practices among enterprises in the European region have significantly increased as a result of this crucial regulatory move.

The STOXX Europe 600 Index provides a broad and representative sample of top European businesses from a variety of sectors, sizes, and regions. By concentrating on a limited fraction of certain sectors or market areas, this diversified strategy reduces the likelihood of distortions. Additionally, it guarantees that our findings apply to a variety of firms, enhancing the results' external validity.

We may evaluate how ESG practices have changed in the context of the expanding demands for corporate reporting and social responsibility thanks to the choice of the 2014–2022 period, which enables us to gauge the effects of this significant legislation. We also obtain a thorough understanding of how these practices have changed financial performance over the course of almost a decade of data.

## **2.5. VARIABLES CHOICE**

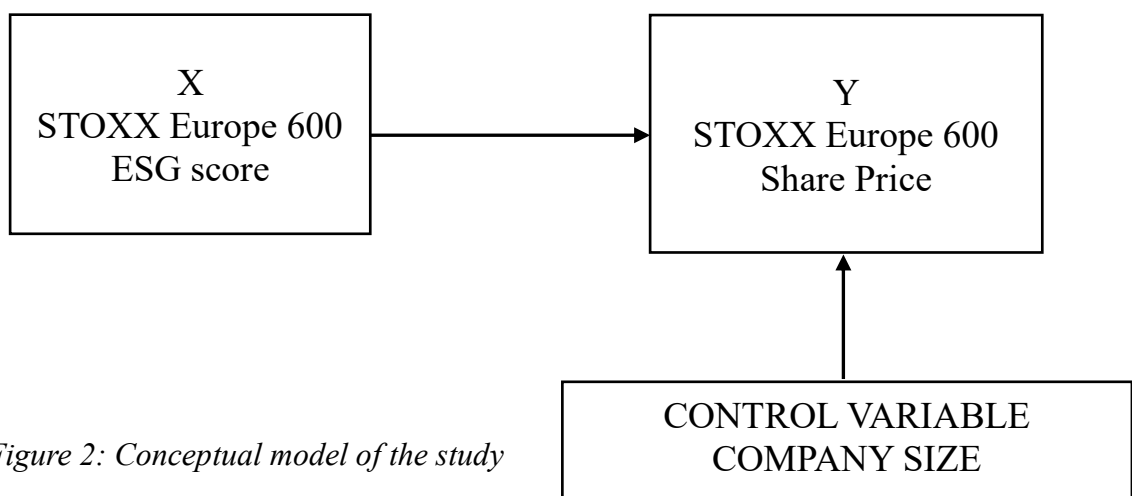
ESG ratings have gained a lot of recognition in recent years because of its importance as a tool for evaluating a company's performance in terms of ethics and sustainability. In the context of the research, the aim is to investigate how ESG ratings affect a range of dependent variables, such as the performance of the stock market. ESG ratings will

serve as the independent variable in this experiment. This choice was selected since it is increasingly understood that companies with higher ESG ratings are not only more socially and ecologically conscious, but they may also perform better financially and have a different approach to risk. Investors, decision-makers, and business stakeholders could be affected positively by this. The final goal is to use rigorous analysis and empirical research to illuminate the relationship between ESG ratings and the specific outcomes that are being looked at. This will provide insightful information into the bigger discussion around sustainable business practices and ethical investing.

The dependent variable that will be the major focus of my inquiry will be the share price of the Euro Stoxx 600. On the other hand, the independent variable that will get the bulk of my focus will be the member businesses' ESG (Environmental, Social, and Governance) score. A well-known benchmark for evaluating the performance of European stocks is the Euro Stoxx 600 index. As a result, it provides a crucial indicator of both the overall economic health of the Eurozone and the sentiment of investors there. The goal is to examine the many variables and determinants, with a particular emphasis on ethical and environmental issues, that have an influence on the swings in the share price of the Euro Stoxx 600 index by utilizing the ESG score as the independent variable. The goal is to investigate and investigate these drivers and aspects. Statistical and econometric techniques will be applied to examine the connection between ESG ratings and the price of shares in the Euro Stoxx 600 index. These techniques will be integrated with other independent factors, such as market conditions globally and economic indicators. This research will provide insightful information on the intricate dynamics of the European equity markets. Making



informed investment decisions will be made simpler because of having a better understanding of the factors behind local stock price variations and their relationship with ESG Score of the company that are inside of the Index. A critical decision in the entire scope of the inquiry is which firm size to utilize as a control variable. Because it reduces the likelihood of confusing effects, the size of the firm, which is typically expressed by measures like total assets, revenue, or market capitalization, plays a crucial function as a control variable in the research. To fully take into consideration, the impact that the independent variable, firm size, has on the dependent variable, the study will consider the major connections of interest, such as the effect of ESG ratings on the share price of the Euro Stoxx 600 index. This is achieved by incorporating the study's control variable—company size—as a factor. Because larger firms may naturally exhibit different dynamics and market behaviors compared to their smaller counterparts, it is crucial to account for company size. Controlling for firm size is crucial since failing to consider this variance might inject bias into the results. This control variable adds more rigor and depth to the analysis, providing a more precise evaluation of the correlations being evaluated and boosting the reliability of the study's conclusions.



*Figure 2: Conceptual model of the study*

## 2.6. EMPYRICAL ANALYSIS

In this paragraph results of the linear regression will be discussed. The analysis will go through from year  $t-7$  to year  $t$ , so the analysis will take place from year 2015 to year 2022 (last available year in the dataset). The analysis will go through the following tables:

- Variables Entered
- Model Summary
- ANOVA<sup>a</sup> table
- Coefficients
- Collinearity Diagnostics

All the tables' results will be broken down and analyzed and in the end conclusions will be made.

### ***YEAR t-7***

The model was launched by setting the classic block method to test the significance of the aggregate F test (Method ENTER as we previous discussed).

The independent variables applied in the model are the ESG Score per year -8 (where -8 means the year of the last survey 2022 minus 8 years, so 2014), the number of employees in year -7 (so 2015) and the share price in year -7 (so 2015).

The reason, as explained in the previous paragraphs, is that, since the ESG score is from European companies (our sample), reliable data has been introduced since 2014 from directive (2014/95/EU). The remaining variables, namely "Number of Employees" and "Share Price" will be taken the following year compared to the 'ESG Score' of the reference year of the analysis to guarantee that the stock market reacts

to the effect of ESG Score that have been exhibited in the previous year and the company dimension is the one that is currently available to the market in the moment that stakeholders and shareholders react to the ESG Score disclosed in the previous year.

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	ESG Score -8, Number of Employees -7 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -7

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 1.6% of the Variance of the Share Price per year -7 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,139 <sup>a</sup>	,019	,016	881,618656

a. Predictors: (Constant), ESG Score -8, Number of Employees -7

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is significant at 5% (P-Value = 0.003 with  $\alpha=0.05$ ) we can therefore reject the null hypothesis H0 of the regression (All regression

coefficients are equal to zero). Therefore, independent variables contribute to the explanation of the dependent variable. Thus, it was possible to accept the alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9201272,637	2	4600636,319	5,919	,003 <sup>b</sup>
	Residual	464019118	597	777251,455		
	Total	473220391	599			

a. Dependent Variable: SHARE PRICE -7

b. Predictors: (Constant), ESG Score -8, Number of Employees -7

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are significant at  $\alpha/2$  so at 5%, because we ran a T-Test. In particular, the ESG Score -8 impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 4,285 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The VIF serves as a double check to verify the Statistical significance of x against y.

The most relevant effect is given by "ESG Score -8" because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.155 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	225,813	64,089		3,523	<,001		
	Number of Employees -7	-,001	,001	-,086	-1,986	,048	,866	1,155
	ESG Score -8	4,285	1,282	,146	3,342	<,001	,866	1,155

a. Dependent Variable: SHARE PRICE -7

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

Multicollinearity is a phenomenon according to which two or more independent variables are highly correlated with each other, and therefore this would lead to a problem of redundancy in the information contained within the analysis of linear multiple regression.

The VIF is equal to 1/tolerance, and the tolerance is equal to 1- R<sup>2</sup>.

Therefore, following this definition for very high values of the coefficient of determination (R<sup>2</sup>) we have very low values of tolerance and therefore very high values of VIF that involve problems of multicollinearity.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Number of Employees -7	ESG Score -8
1	1	2,284	1,000	,05	,08	,05
	2	,553	2,033	,12	,85	,03
	3	,164	3,736	,83	,07	,92

a. Dependent Variable: SHARE PRICE -7

### **YEAR t-6**

Moving on to the second year, we changed our variables into ESG Score -7, which has been published at the end of 2015 and Number of Employees and Share Price from the next year, so the effect that ESG Score made to those two variables in 2016.

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -6, ESG Score -7 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -6

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 2% of the Variance of the Share Price per year -6 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,154 <sup>a</sup>	,024	,020	905,598218

a. Predictors: (Constant), Number of Employees -6, ESG Score -7

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is significant at 5% (P-Value < 0.001 with  $\alpha=0.05$ ) we can therefore reject the null hypothesis H0 of the regression (All regression coefficients are equal to zero). Therefore, independent variables contribute to the explanation of the dependent variable. Thus, it was possible to accept the alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11874318,5	2	5937159,252	7,239	<,001 <sup>b</sup>
	Residual	489604555	597	820108,132		
	Total	501478874	599			

a. Dependent Variable: SHARE PRICE -6

b. Predictors: (Constant), Number of Employees -6, ESG Score -7

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are significant at  $\alpha/2$  so at 5% (Number of Employees -6 is significant at 5,8% but in this case, since the number is still close to 5%, it is counted as significant), because we ran a T-Test. In particular, the "ESG Score -6" impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 4,970 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by the "ESG Score -7" because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.138 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	192,200	69,869		2,751	,006		
	ESG Score -7	4,970	1,324	,162	3,752	<,001	,879	1,138
	Number of Employees -6	-,001	,001	-,082	-1,899	,058	,879	1,138

a. Dependent Variable: SHARE PRICE -6

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -7	Number of Employees -6
1	1	2,294	1,000	,04	,04	,07
	2	,561	2,022	,10	,03	,86
	3	,144	3,986	,86	,93	,06

a. Dependent Variable: SHARE PRICE -6

**YEAR t-5**

Examinations of the third year of our analysis will be considering the effect that ESG Score published in year t-6 had during year t-5, so 2017, with the firm's dimension as control variable.

**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -5, ESG Score 6 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -5

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 1.9% of the Variance of the Share Price



per year -5 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,149 <sup>a</sup>	,022	,019	1045,75002

a. Predictors: (Constant), Number of Employees -5, ESG Score 6

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is significant at 5% (P-Value = 0.001 with  $\alpha=0.05$ ) we can therefore reject the null hypothesis H0 of the regression (All regression coefficients are equal to zero). Therefore, independent variables contribute to the explanation of the dependent variable. Thus, it was possible to accept the alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14799035,2	2	7399517,605	6,766	,001 <sup>b</sup>
	Residual	652875088	597	1093593,112		
	Total	667674123	599			

a. Dependent Variable: SHARE PRICE -5

b. Predictors: (Constant), Number of Employees -5, ESG Score 6

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha=10\%$  both variables are significant at  $\alpha/2$  so at 5%, because we ran a T-Test. In particular, the ESG Score -8 impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 5,593 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by “ESG Score -6” because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.125 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	213,925	86,051		2,486	,013		
	ESG Score 6	5,593	1,567	,153	3,569	<,001	,889	1,125
	Number of Employees -5	-,001	,001	-,087	-2,033	,043	,889	1,125

a. Dependent Variable: SHARE PRICE -5

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score 6	Number of Employees -5
1	1	2,305	1,000	,04	,04	,07
	2	,569	2,013	,08	,03	,87
	3	,126	4,276	,88	,93	,05

a. Dependent Variable: SHARE PRICE -5

### ***YEAR t-4***

Examinations of the third year of our analysis will be considering the effect that ESG Score, published in year t-5, had during year t-4, so 2018, with the firm’s dimension as control variable.

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -4 <sup>a</sup> ESG Score -5 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -4

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 1% of the Variance of the Share Price per year -4 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,115 <sup>a</sup>	,013	,010	949,930327

a. Predictors: (Constant), Number of Employees -4, ESG Score -5

Furthermore, regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is significant at 5% (P-Value = 0.018 with  $\alpha = 0.05$ ) we can therefore reject the null hypothesis  $H_0$  of the regression (All regression coefficients are equal to zero). Therefore, independent variables contribute to the explanation of the dependent variable. Thus, it was possible to accept the

alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7255401,519	2	3627700,760	4,020	,018 <sup>b</sup>
	Residual	538713473	597	902367,626		
	Total	545968875	599			

a. Dependent Variable: SHARE PRICE -4

b. Predictors: (Constant), Number of Employees -4, ESG Score -5

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are significant at  $\alpha/2$  so at 5% (Number of Employees -4 is significant at 6,7% but in this case, since the number is still close to 5%, it is counted as significant), because we ran a T-Test. In particular, the “ESG Score -5” impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 4,046 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by “ESG Score -5” because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.121 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	224,749	88,046		2,553	,011		
	ESG Score -5	4,046	1,531	,114	2,642	,008	,892	1,121
	Number of Employees -4	-,001	,001	-,079	-1,838	,067	,892	1,121

a. Dependent Variable: SHARE PRICE -4

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -5	Number of Employees -4
1	1	2,325	1,000	,03	,03	,07
	2	,578	2,006	,06	,02	,87
	3	,098	4,879	,91	,95	,06

a. Dependent Variable: SHARE PRICE -4

### ***YEAR t-3***

Analysis moves on to year t-3, where we will be considering the effect that ESG Score, published in year t-4, had during year t-3, so 2019, with the firm's dimension as control variable.

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -3 ESG Score -4 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -3

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 0,4% of the Variance of the Share Price per year -3 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,086 <sup>a</sup>	,007	,004	1219,04024

a. Predictors: (Constant), Number of Employees -3, ESG Score -4

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is not significant at 5% (P-Value = 0.10,9 with  $\alpha = 0.05$ ) we can therefore not reject the null hypothesis H<sub>0</sub> of the regression (All regression coefficients are equal to zero). Therefore, independent variables don't fully contribute to the explanation of the dependent variable. Thus, it was not possible to accept the alternative hypothesis H<sub>1</sub> of regression (not all regression coefficients are

equal to 0), even though even if not under 5% we can see that at 89,91% the independent variables explain the dependent variable, so not a fully uncorrelated linear regression.

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6621544,810	2	3310772,405	2,228	,109 <sup>b</sup>
	Residual	887177287	597	1486059,107		
	Total	893798832	599			

a. Dependent Variable: SHARE PRICE -3

b. Predictors: (Constant), Number of Employees -3, ESG Score -4

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are not significant at  $\alpha/2$  so at 5% ("ESG Score-4" is significant at 7,7% but in this case, since the number is still close to 5%, it is counted as significant), because we ran a T-Test. In particular, the "ESG Score -4" impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 3,911 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by "ESG Score -4" because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.108 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	321,686	135,358		2,377	,018		
	ESG Score -4	3,911	2,210	,076	1,770	,077	,902	1,108
	Number of Employees -3	-,001	,001	-,071	-1,646	,100	,902	1,108

a. Dependent Variable: SHARE PRICE -3

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -4	Number of Employees -3
1	1	2,343	1,000	,02	,02	,07
	2	,590	1,993	,04	,02	,88
	3	,067	5,905	,94	,96	,05

a. Dependent Variable: SHARE PRICE -3

### **YEAR t-2**

Furthermore, moving on to year t-2, where we will be considering the effect that ESG Score, published in year t-3, had during year t-2, so 2020, with the firm's dimension as control variable.

**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -2 ESG Score -3 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -2

b. All requested variables entered.



Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 0% of the Variance of the Share Price per year -2 is explained by the independent variables, the model cannot detect any response variable fluctuations. Thus, the model cannot fit the data or find a link between independent factors (predictive variables) and dependent variables.

R-squared measures the proportion of variance in a dependent variable revealed by model independent variables. An R-squared = 0% means that all fluctuations in the dependent variable are driven by causes other than the independent variables in the model or that the model cannot identify any association.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,061 <sup>a</sup>	,004	,000	1383,42057

a. Predictors: (Constant), Number of Employees -2, ESG Score -3

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is not significant at 5% (P-Value = 0.32,4 with  $\alpha = 0.05$ ) we can therefore not reject the null hypothesis H0 of the regression (All regression coefficients are equal to zero). Therefore, independent variables do not contribute to the explanation of the dependent variable. Therefore, it was not possible to accept the alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4323254,695	2	2161627,348	1,129	,324 <sup>b</sup>
	Residual	1142569932	597	1913852,482		
	Total	1146893186	599			

a. Dependent Variable: SHARE PRICE -2

b. Predictors: (Constant), Number of Employees -2, ESG Score -3

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are not significant at  $\alpha/2$  so at 5%, because we ran a T-Test. In particular, the "ESG Score -3" impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 2,568 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by "Number of employees" because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.113 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	409,778	180,286		2,273	,023		
	ESG Score -3	2,568	2,835	,039	,906	,365	,899	1,113
	Number of Employees -2	-,001	,001	-,061	-1,425	,155	,899	1,113

a. Dependent Variable: SHARE PRICE -2

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is  $<10$ , the problem did not occur.

### Collinearity Diagnostics<sup>a</sup>

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -3	Number of Employees -2
1	1	2,356	1,000	,02	,01	,07
	2	,596	1,988	,02	,01	,87
	3	,048	6,985	,96	,97	,06

a. Dependent Variable: SHARE PRICE -2

### YEAR t-1

Moving to t-1, we will be considering the effect that ESG Score, published in year t-2, had during year t-1 to our dependent variable, so 2020 Share Price of STOXX Eur 600 companies, with the company's dimension as control variable.

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	Number of Employees -1 ESG Score -2 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -1

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 0,2% of the Variance of the Share Price per year -1 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,041 <sup>a</sup>	,002	,002	1861,87054

a. Predictors: (Constant), Number of Employees -1, ESG Score -2

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is not significant at 5% (P-Value = 60,1 with  $\alpha=0.05$ ) we can therefore not reject the null hypothesis  $H_0$  of the regression (All regression coefficients are equal to zero). Therefore, independent variables do not contribute to the explanation of the dependent variable. Therefore, it was not possible to accept the alternative hypothesis  $H_1$  of regression (not all regression coefficients are equal to 0).

### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3533788,754	2	1766894,377	,510	,601 <sup>b</sup>
	Residual	2069537465	597	3466561,917		
	Total	2073071253	599			

a. Dependent Variable: SHARE PRICE -1

b. Predictors: (Constant), Number of Employees -1, ESG Score -2

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha=10\%$  both variables are not significant at  $\alpha/2$  so at 5%, because we ran a T-Test. In particular, the "ESG Score -2" impacts negatively (because the non-standard Beta has a negative value). This implies that if the ESG decreases by one Unit, the share price increases by -1,189 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by “Number of employees” because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.096 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	746,545	283,783		2,631	,009		
	ESG Score -2	-1,189	4,213	-,012	-,282	,778	,912	1,096
	Number of Employees -1	-,001	,001	-,036	-,842	,400	,912	1,096

a. Dependent Variable: SHARE PRICE -1

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is <10, the problem did not occur.

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -2	Number of Employees -1
1	1	2,360	1,000	,01	,01	,07
	2	,605	1,976	,02	,01	,88
	3	,035	8,173	,97	,98	,05

a. Dependent Variable: SHARE PRICE -1

### **YEAR 0**

The model was launched by setting the classic block method to test the significance of the aggregate F test (Method ENTER).

In the last analysis, variables used are the ESG Score per year -1, where -1 means the year of the last survey (2022) minus 1 year, so 2021, Number of Employees 0 (2022) and Share Price 0 (2022).

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	Number of Employees 0, ESG Score -1 <sup>b</sup>	.	Enter

a. Dependent Variable: SHARE PRICE -0

b. All requested variables entered.

Moving on to the Model Summary, since we have performed a multiple linear regression analysis (composed by multiple independent variables) we looked at the Adjusted R-Square value that explains that 0,2% of the Variance of the Share Price per year 0 is explained by the independent variables. As the result is low, it may lead to results that are not entirely robust.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,030 <sup>a</sup>	,001	,002	1414,04042

a. Predictors: (Constant), Number of Employees 0, ESG Score -1

Regarding the ANOVA table after performing the F-Test it is possible to demonstrate that at the aggregate level the model is not significant at 5% (P-Value = 75,8 with  $\alpha=0.05$ ) we can therefore reject the null hypothesis H0 of the regression (All regression coefficients are equal to zero). Therefore, independent variables do not contribute to the explanation of the dependent variable. Therefore, it was not possible to accept the alternative hypothesis H1 of regression (not all regression coefficients are equal to 0).

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1108812,580	2	554406,290	,277	,758 <sup>b</sup>
	Residual	1193707649	597	1999510,299		
	Total	1194816461	599			

a. Dependent Variable: SHARE PRICE -0

b. Predictors: (Constant), Number of Employees 0, ESG Score -1

As for the table "Coefficients", considering a coefficient interval of 90% and a reference value  $\alpha = 10\%$  both variables are not significant at  $\alpha/2$  so at 5%, because we ran a T-Test. In particular, the "ESG Score -1" impacts positively (because the non-standard Beta has a positive value). This implies that if the ESG increases by one Unit, the share price increases by 0,511 Units.

In contrast, having a statistical significance between "share price" and "number of employees", as a unit of workers increases, the share price will decrease by -0.01.

The most relevant effect is given by "Number of employees" because looking at the Column of Beta standardized, we compare the beta in absolute value regardless of the Sign to indicate the most relevant effect against the y.

A VIF analysis was also conducted to find the problem of multicollinearity. Since there is a score of 1.105 there is no problem, as this score should be less than 2.

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	491,580	259,745		1,893	,059		
	ESG Score -1	,511	3,707	,006	,138	,890	,905	1,105
	Number of Employees 0	-,001	,001	-,032	-,739	,460	,905	1,105

a. Dependent Variable: SHARE PRICE -0

The problem of multicollinearity arises when the VIF (Variance Inflation Factor) is greater than 10.

In this case, since the VIF is  $<10$ , the problem did not occur.

### Collinearity Diagnostics<sup>a</sup>

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ESG Score -1	Number of Employees 0
1	1	2,367	1,000	,01	,01	,06
	2	,609	1,972	,01	,01	,87
	3	,024	9,888	,98	,99	,07

a. Dependent Variable: SHARE PRICE -0



## **3. CONCLUSIONS**

### **3.1. SUMMARY**

In this comprehensive analysis, we examined the relationships between ESG (Environmental, Social, and Governance) scores, the number of employees, share prices, and their combined impact on STOXX EUR 600 firms. Our primary objective was to obtain a nuanced comprehension of these variables and their changing influence on share prices from t-7 to 0 (2015 to 2022).

### **3.2. ESG SCORE AND STOCK PRICES**

Our analysis consistently revealed a positive correlation between ESG scores and stock prices, particularly in the earlier years (t-7 to t-3). This indicates that as companies enhanced their ESG performance, their share prices increased. This correlation between ESG performance and market valuation demonstrates the growing significance of sustainability in investment decisions during this time frame. Investors were compensating businesses with superior ESG practices, reflecting a growing awareness of the long-term financial benefits of responsible business practices.

However, it is notable that as the years progressed, particularly after t-4, the intensity of this positive relationship showed symptoms of deterioration. This could be attributed to a saturation effect, wherein companies that initially made significant improvements in their ESG scores may have experienced diminishing returns in terms of share price impact. Additionally, other market dynamics and external factors may have had a greater impact on share prices during this period.

### **3.3. NUMBER OF EMPLOYEES AND SHARE PRICE**

The negative correlation between the number of employees and share prices was an additional finding that persisted over time. In other words, as companies added employees, their stock prices tended to decrease. Several factors can account for this seemingly counterintuitive relationship. A growing workforce can result in higher operating expenses and lower profit margins, which could have a negative effect on share prices. In addition, it may reflect market expectations regarding a company's capacity to manage and develop its human resources in a sustainable manner; it is important to say that it is a very low number so even though this relationship remained stable over the years, it is essential to note that the impact was relatively minor. The incremental decline in share prices caused by an increase in employee count was minimal. Nonetheless, it demonstrates the intricate relationship between work force management and market valuations, highlighting the need for businesses to establish a balance between growth and efficiency.

### **3.4. MULTIPLE CORREL. AND MODEL SIGNIFICANCE**

Multicollinearity, which refers to the degree of correlation among independent variables in a regression model, was an essential component of our analysis. Variance Inflation Factors (VIF) well below the threshold of 10 indicated that there were never any significant multicollinearity concerns in our analysis. This guaranteed the accuracy of our regression models, allowing us to derive meaningful conclusions from the data.

Even though our models lacked multicollinearity, it is essential to note that their explanatory power was comparatively weak. This was demonstrated by the Adjusted R-Square values, which indicated that the selected independent variables (ESG scores and Number of Employees) could only explain a small portion of the variance in share prices. This indicates that significant contributions from unaccounted-for factors were made to share price fluctuations during the examined years.

### **3.5. FROM YEAR T-2 TO YEAR 0 (2020-2022)**

From Year t-2 (2020) to year 0 (2021-2022) is a crucial juncture in our analysis that merit closer inspection. In year t-2, neither environmental, social, and governance (ESG) scores nor the number of employees had a significant impact on share prices. This finding is especially noteworthy, as it suggests that factors other than “ESG Score” and “Number of Employees” became the primary determinants of share price fluctuations during this period. The turbulent events of 2020, such as the COVID-19 pandemic and economic disruptions, probably played a significant role in reshaping the market dynamics.

In Year 0 (2021-2022), the relationship between our selected independent variables and share prices remained insignificant. This supports the notion that the post-pandemic recovery and ongoing macroeconomic conditions have considerably influenced the behavior of the stock market.

In addition, it emphasizes the need to consider a broader range of economic and geopolitical factors when analyzing share price movements over the past decade.

### **3.6. CONCLUSION**

In conclusion, our analysis provides valuable insights into the complex relationship between ESG scores, Number of employees, and Share Prices for STOXX Eur 600 companies over time. In earlier years, there was a significant positive correlation between ESG performance and share prices; however, this correlation weakened over time. In contrast, the negative impact of a growing workforce on stock prices remained relatively constant and minimal.

While our models lacked multicollinearity, their explanatory power was limited, highlighting the impact of other unobserved variables on share price dynamics. The deviations from established market trends in years t-2 and t0 highlight the importance of external factors in recent market behavior.

This analysis provides investors, policymakers, and corporate leaders with valuable insights for navigating the ever-changing landscape of sustainable finance and corporate performance. It emphasizes the significance of adapting investment strategies and business practices to the shifting global economic dynamics, ESG considerations, and labor market conditions. In the current complex financial environment, additional research and a broader set of variables may be required to develop more comprehensive models that encompass the multifaceted character of share price fluctuations.

### **3.7. LIMITATIONS**

Even if the research revealed some statistically significant correlations between the variables, it should be highlighted that the R-square and Adjusted R-square determination coefficients are frequently lower than 2%. This means that only a small

portion of the change in the price of the transactions can be explained by the variables considered. This could mean there are more factors influencing the price of the company's stock that were not considered in the investigation.

It's also critical to keep in mind that the study is based on historical data and that market conditions and business dynamics may change over time. This indicates that further updates and study may be necessary to establish the validity of the links revealed in this analysis and that they may not be long-lasting.

The conclusions of this analysis may not generalize to other geographic or industrial markets, it should be highlighted, as it focuses on a set of European enterprises. Accordingly, the validity of the results drawn from this analysis may be impacted. Market dynamics and business conditions may fluctuate dramatically from one place to the next and between different industries.

Moreover, influence of the global financial crisis brought on by the COVID-19 pandemic, particularly on the analysis period beginning in 2019 (Year t-3), must be considered in the studies conducted. It is important to notice that the statistical association between the variables considered has changed dramatically in 2019 from how it appeared in the early years of this period. It is possible to link this variance to the consequences of the global financial crisis. Prior to 2019, the data revealed pertinent statistical reports, however as of 2019 and beyond, the situation appears to have substantially changed. This oddity may have been caused by the financial crisis's heightened volatility and unpredictability, which may have obscured or changed the statistical connections between the variables and made it harder to spot long-term trends or meaningful correlations throughout the relevant time frame.

### **3.8. MANAGERIAL IMPLICATIONS**

Some managerial implications can be made after the analysis has been broken down. The findings have various significant management ramifications for businesses and decision-makers in the context of this study. First, it becomes clear that a strict commitment to data quality and variety is a basic requirement. The trustworthiness of financial information is based on the quality and completeness of the data sources, which necessitates a sizable investment in effective data collecting and management procedures. Given the significant explanatory power of our regression model, its limitations call for a fuller understanding of share price factors. To increase prediction accuracy, elements such as market conditions, industry trends, and macroeconomic indicators should be thoroughly investigated in addition to the variables under consideration. Even if the statistical importance of ESG ratings may differ, it is still advised to stick with sustainable practices because they promote long-term resilience and reputation-building. In view of the model's shortcomings, effective risk management techniques, such as portfolio diversification and thorough risk assessments, should be employed. Modelling must be flexible and subject to ongoing modification and improvement to remain relevant in the changing financial environment. Working together with data analytics and financial modelling professionals can improve the model's knowledge and efficacy. The managerial guidelines are complemented by long-term investment goals, open communication of ESG activities, and a dedication to lifelong learning. Finally, scenario studies offer a prospective viewpoint and aid in the planning of various market scenarios.

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