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The relationship between ESG Performance and Financial Stability: are sustainable companies less likely to fail?

European evidence

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ABSTRACT :
The purpose of this thesis is to study if high ESG performance is related to firm performance, specifically their bankruptcy probability, which is measured by Altman Z-Score in European countries.
The sample includes 1740 different companies during the period 2011-2021. Moreover, this thesis aims to study whether there are ESG pillars that impact a firm's financial performance the most.

The importance of corporate sustainability and responsibility has grown in recent decades, driven by factors such as environmental and societal concerns, including climate change and human rights issues, legislative changes, and shifts in public sentiment.. Consequently, companies are trying to improve their way of employing and disclosing sustainability strategies and environmental, social, and governance (ESG) information. This has caused the need for fundamental changes in business models and management.

However, previous literature has not come yet to a solid conclusion on whether ESG Performance (ESGP) and corporate financial stability are related or not. Many studies suggest that this relationship is positive, others, on the other end, found a slightly negative correlation or a non-linear link.

This thesis aims to investigate if the financial performance of European companies is related to their ESG ratings for the years 2011-2021. The FDR (Financial Distress Risk) is measured with the Altman Z''-Score, a statistical method used to calculate the probability of firms' bankruptcy, while the Refinitiv ESG Combined Score is used as a proxy for environmental, social, and governance performance. The results, once again, prove that the link between these two variables is not as simple and linear as one may think. The ESGP-FDR relationship is influenced by numerous factors, and the outcomes appear to be relatively neutral and diverse. Consequently, based on the findings of this thesis, it is challenging to definitively assert whether high ESG scores exert a more positive or negative impact on firms' financial performance in Europe.

KEYWORDS: Environmental, social, governance (ESG), Altman Z-Score, Financial stability, Bankruptcy probability, ESG Score, firm performance

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Acronyms

CFP Company financial performance

CSR Corporate social responsibility

EBIT Earnings before tnterest and taxes

ESG Environmental, social, and governance

ESGP Environmental, social and governance performance

EU The European Union

FDR Financial distress risk

MDA Multiple discriminant analysis model

MSCI Morgan Stanley Capital International

ROA Return on assets

ROCE Return on capital employed

ROE Return on equity

US The United States

1. Introduction

In the past several years, the interest in environmental and social sustainability has begun to rise among customers, investors, and consequently companies (Brockett & Rezaee, 2012). The number of companies implementing sustainability strategies and disclosing information related to environmental, social, and governance (ESG) is steadily increasing, and this practice is bound to spread also due to the increasing regulations set by governments and institutions. This has caused the need for fundamental changes in business models and management.

Three are the main theories that debate what the final purpose of companies should be and who should benefit from it. These are the shareholder, the stakeholder, and the agency theory. The first one, introduced by Friedman (1970), claims that the only goal for companies should be to improve financial performance and maximize the shareholders' profits. On the other hand, Freeman (1984) argues that business executives should take into consideration the interest of all stakeholders, internal and external, because that is the only way in which firms can secure long-term success. Then again, Jensen and Meckling (1976) suggested that the separation of ownership and control in a company can lead to agency problems, which arise when the interests of the principal (such as shareholders) and the agent (such as management) are not aligned. Therefore, managers will always try to benefit themselves at the expanse of shareholders if not monitored. These debates have developed over the years and now concern the question of whether investing in ESG activities is a profitable action for some stakeholders and if the company can also gain advantages by doing it. This thesis aims to answer that question using two main parameters, the Altman Z-Score and the Refinitiv ESG Combined Score.

The Altman Z-score is a financial ratio that is used to predict the probability of a company going bankrupt within the next two years. It was developed by Edward Altman, a professor at New York University's Stern School of Business, in the 1960s. This model was found to have a correctness rate of about 78% by Begley et al. (1996) and a recent

article has shown an overall success rate of 87,3% in Italian companies in the year before economic failure and of 66,6% three years before it (Celli, 2014).

Moreover, this score is considered to be a good indicator of a company's financial performance because it takes into account five different financial ratios that are known to be important indicators of a company's financial health. For example, the ratio of working capital to total assets is an indicator of a company's ability to pay its short-term debts, while the ratio of retained earnings to total assets is an indicator of a company's ability to generate profits over the long term. By combining these and other ratios into a single score, the Altman Z-score provides a quick and easy way to gauge a firm’s financial distress risk (FDR) and a company financial performance (CFP).

In fact, financial stability and financial performance are often correlated because a company that is financially stable is more likely to be able to achieve good financial performance. Osamor and Adenbanjo (2020, pp. 137-138) assert in their study that the financial stability of a firm is intricately linked to its capacity to generate profits, enhance the value of invested capital, and concurrently repay its short and long-term liabilities. This is because financial stability provides a company with the resources and flexibility to invest in its business, such as through research and development or marketing efforts, which can improve its financial performance. For this reason, in the following pages, we will often use corporate financial performance (CFP) and corporate financial stability as interchangeable terms.

The indicator used for assessing the company’s ESGP is the Refinitiv ESG Combined Score, which is a measure of a company's environmental, social, and governance performance. It is calculated by Refinitiv, a financial markets data provider, and is based on publicly available information on a company's ESG performance. The score is intended to provide investors with a quick and easy way to understand a company's ESG performance and compare it to other companies. The score is expressed as a number on a scale from 0 to 100, with higher scores indicating better ESG performance. The score is based on a variety of factors, including a company's greenhouse gas emissions, labor practices, and corporate governance.

Several studies have found that companies with strong ESG practices are less likely to experience financial distress or go bankrupt. For example, Gao et al. (2015) found that companies with higher ESG scores were less likely to go bankrupt, particularly in industries with high environmental regulations. Liu et al. (2017) also found that companies with strong ESG practices had lower credit risk and were less likely to default on their bonds, which is a strong predictor of bankruptcy. In addition to its impact on financial distress risk and bankruptcy probability, research has also suggested that strong ESG practices may be related to improved financial performance. Denis et al. (2015) found that companies with better ESG practices were able to attract and retain top talent, which can lead to improved financial performance. Moreover, companies with strong ESG practices may have strong relationships with stakeholders, which can provide a cushion in times of financial stress and lower the likelihood of bankruptcy (Liu et al., 2017).

Other research, such as the one of Chan et al., (2017), examines the effect of Corporate Social Responsibility (CSR) on the level of financial liquidity/distress of firms. Chan et al.'s results confirmed the view of Campbell (2007), that there is a significant negative association between CSR activities and the level of financial distress or constraints. The term corporate social responsibility (CSR) refers to a company's commitment to being a good corporate citizen and to taking responsibility for its impact on society and the environment. ESG and CSR are two distinct, yet related, concepts that address the sustainability and ethical impact of a company (Bhattacharya et al., 2009). ESG refers to three criteria that investors use to evaluate a company's performance, including its environmental impact, its treatment of employees and other stakeholders, and the effectiveness of its governance practices (Orlitzky et al., 2003; Dahlsrud, 2008). CSR, on the other hand, involves a company's commitment to being a good corporate citizen and to taking responsibility for its impact on society and the environment (Carroll, 1991). Both ESG and CSR focus on sustainability and corporate responsibility (Helfat et al., 2016), but ESG is often used as a measure of a company's performance by investors (Sustainable Investing, 2021), while CSR is typically used to describe a company's efforts to be socially and environmentally responsible (Smith, 2011). Additionally, ESG criteria

are often more specific and quantifiable than CSR efforts (Sustainable Investing, 2021), which can make it easier to compare the performance of different companies (Brunnermeier et al., 2016). However, overall, they are closely related and can be considered as two sides of the same coin and are both important considerations for companies seeking to be more sustainable, responsible, and accountable (Deloitte, 2019). For this reason, in the following pages, these two terms will often be used as synonyms, as also Helfat et al. (2016) suggest.

However, not all studies have found a consistent relationship between ESG performance and financial distress risk or bankruptcy probability. Some studies have found non-linear or inconclusive relationships between the two (Kwok et al., 2014; Zhang et al., 2020). Additionally, the relationship between ESG performance and financial distress risk or bankruptcy probability may vary depending on the industry and other factors (Bruna et al., 2021)

To sum up, from the many studies that have investigated ESGP and CFP relationship (Benabou & Tirole, 2010; Cohen, 1988; Rosenthal & Rosnow, 1991; Friede et al., 2015; Xie et al., 2017; Velte, 2017; Bruna et al., 2021; Batae et al., 2021; Atan et al., 2018; Jyoti and Khanna, 2021; Damers et al., 2021), two are the most common results obtained. On the one hand, according to the Porter hypotheses (Porter & van der Linde, 1995), ESG activities bring innovation which creates extra income that can cover the additional costs, so a proper ESG strategy can lead to an increase in CFP. The majority of empirical studies display a positive link between ESG and CFP (Orlitzky et al., 2003; John, 1992; Deng et al., 2013; Margolis et al., 2009). On the other hand, ESG activities bring additional costs caused by inefficient resource allocation, which may put a firm in difficulty and therefore make ESGP negatively related to CFP. Moreover, non-linear and neutral relationships have also been found between the company ESG Performance (ESGP) and CFP (Xie et al., 2017; Velte, 2017; Bruna et al., 2021). The ambiguity in the findings leaves unresolved questions.

The failure to develop a consensus on the implications of ESG for CFP can be attributed to a number of factors including lack of standardization and agreement on what

constitutes "good" ESG performance, lack of data and transparency, and differing opinions on the trade-offs between financial performance and ESG consideration (Lee & Kim, 2023). Additionally, the field of ESG and CFP is relatively new and constantly evolving, making it difficult to reach a consensus. It also has been a debate between short-term financial performance vs long-term sustainability.

For example, the large range of CFP indicators makes it impossible to draw broad conclusions about this issue because each indicator measures different aspects of financial performance and uses different methods and data sources. This can lead to inconsistent or conflicting results when comparing companies and/or industries. Additionally, some CFP indicators are based on historical data while others are based on forward-looking projections, which further complicates the comparison. The main two types of indicators used are market-based measures, such as share price, mutual fund returns, and market value (Peloza, 2009), and accounting-based metrics like return on assets (ROA) and return on equity (ROE) (Ferrell et al., 2016; Lee et al., 2014). However, these two indicators are influenced by different factors, for instance, share price variations may be influenced by news and by the perception of a company among investors and the broader public. Positive ESG performance can improve a company's reputation and brand image, which can lead to increased investor confidence and higher share prices. On the other hand, ROA and ROE are not directly affected by public opinion and a sustainable company may not be performing well financially due to other factors such as economic conditions or intense competition.

Moreover, commonly used metrics often miss the mark when it comes to ESG implications. In addition to that, there are a lot of ESG scores and indicators that can be used to assess corporate sustainability. Each of them focuses on different areas and data and could, therefore, lead to a different ESG rating for the same company. For all these reasons, studies that use different types of ESG and CFP metrics may get different results about the ESG–CFP relationship. Thirdly, as highlighted by Barnett and Salomon (2006), there is no rigidly defined positive or negative correlation between Corporate Financial Performance and Environmental, Social, and Governance Performance . Many are the studies that proved a nonlinear relationship between the two variables (Trumpp &

Guenther, 2017; Fujii et al., 2013), because the relationship can depend on a variety of factors such as industry, specific ESG issues, geography, size and ownership structure and time.

In this thesis, we investigate whether this link between environmental, social and governance factors and corporate financial performance in European companies either exists or not. The firms investigated are listed in 35 different European countries and are analyzed for the period from 2011 to 2021, the study takes into consideration both well-performing businesses and distressed ones (Altman Z''-Score < 1.81). Since most of the studies focus on the stock performance, more than on the real financial situation of the company and the bankruptcy probability, we decided to calculate the CFP with accounting and financial data, by using the Altman Z-Score as an indicator. As previously said, instead, the ESGP is measured with the Refinitiv ESG Combined Score.

The findings of this study could be useful for investors, managers, and policymakers to make decisions related to ESG pillars. For example, investors by understanding the relationship between ESG and financial performance can make more informed decisions about where to allocate their capital, decide to consider ESG pillars in their investment decisions, and potentially benefit from the better financial performance of companies that are more sustainable and responsible. For managers, on the other hand, knowing the nature of the link between ESGP and CFP can help them identify opportunities to improve the sustainability and ethical performance of their company and by focusing on ESG issues, they can potentially improve their company's reputation, attract and retain top talent, reduce risks and costs associated with environmental and social issues (ESG Investing, 2021) and make the company more profitable overall. Furthermore, policymakers can use this information to better develop policies and regulations that encourage companies to adopt more sustainable and responsible practices. By encouraging companies to prioritize ESG issues, policymakers can help to create a more sustainable and equitable society, while also potentially supporting the financial performance of companies.

In the following chapters, we will illustrate the theoretical background, the previous literature and the hypotheses. After that, the data collection method is described with the applied methodology. Then, the regression model used is explained together with its results. In the end, a summary of the analysis and its limitations are given.

2. Literature Review and Theoretical Background

This chapter presents the previous theories and studies on the subject. First, the three main theories about companies' strategies and purpose are illustrated: the shareholder theory, the stakeholder theory, and the agency theory. Then, the concepts of ESG and Altman Z-Score are explained, these two concepts are crucial for the development of this thesis. After that, the previous researches concerning the relationship between ESGP and CFP/financial stability are described. The aim of this chapter is to offer a comprehensive overview of various perspectives and lay the groundwork for subsequent chapters, providing a thorough background for further exploration.

First, we introduce the three theories about corporations' objectives and responsibilities. These debate whether companies should only care about profit maximization, or whether they should also consider having non-economic, social, and environmental goals as well.

2.1 Shareholder Theory

The Friedman doctrine, also known as the shareholder theory, claims that companies' goal should only be to maximize their profit. Friedman views the shareholder as the economic engine of the organization and therefore, as the only group for which the firm should care. It is not the company's responsibility to take part in social initiatives, since it will be the single shareholder to decide for themselves in which social or environmental project invest in (Friedman, 1962).

Friedman first introduced this theory in his book *Capitalism and Freedom* (1962), and then in a later essay titled "Social Responsibility of Business" (1970). In the first formulation, he says that the only obligation of businesses that operate in open and free competition without deception or fraud is to maximize their value.

> *"In such an economy ["a free economy"], there is one and only one social responsibility of business-to use its resources and engage in activities designed to· increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."*

While, in the second formulation, he states that business executives have to follow the wishes of shareholders while obeying the laws (Carson, 1993).

According to Carson, in a free-enterprise, private property system, a corporate executive serves as an employee of the business owners. Their primary responsibility is to fulfil the wishes of their employers, typically centred around maximizing profits within the framework of societal rules, encompassing both legal statutes and ethical conventions. Carson acknowledges that, in some instances, the objectives of employers may diverge, such as when a group establishes a corporation for philanthropic purposes, like a hospital or a school. In such cases, the manager's focus shifts from profit to the provision of specific services.

Moreover, Friedman (1962) argues that corporate social responsibility (CSR) may deteriorate the free-enterprise system and move society towards a more centrally controlled system. That is because, if companies start to take socially responsible actions, such as setting a minimum wage or buying raw materials only from environmental-friendly businesses, the price of the final product will rise and will lead to product shortages, grey markets, or black markets. All these actions can only be taken by the government, but if it does so, it will lead to a centrally controlled system.

In addition to that, Friedman (1970) sees the view that firms should have a social conscience, as a "pure and unadulterated socialism" and argues that the businessmen who are pro-social advocates are "unwitting puppets of the intellectual forces that have

been undermining the basis of a free society these past decades" (Friedman, 1970). To support his view, he claims that companies investing in social initiatives are spending someone else's money for general interest, and this surely does not profit the investors. Furthermore, these actions may reduce shareholders' gain, raise the product prices for customers, and lower some employees' wages.

In conclusion, companies should only care about shareholders' interests and spend their money on investments that provide a return for them. Any other action that does not directly benefit the shareholders is an inefficient allocation of capital and a decrease in the degree of freedom in society.

However, the world has changed a lot in the last 50 years, and the Friedman theory could be seen as not relevant as it was before. Shareholders nowadays care more and more about social and environmental factors, and many stakeholders investigate the ESG value of companies before investing in them (Ruf et al., 2001).

This is why the Friedman doctrine has attracted criticism over the years, especially since the financial crisis of 2007–2008, which was triggered by various financial institutions that in order to maximize stakeholders' profit engaged in excessive risk, resulting in the collapse of the American real estate market and a global economic crisis. An opposite view is offered by Freeman (1984) in his book *Strategic Management: A Stakeholder Approach*, in which he theorized the Stakeholder theory.

2.2 Stakeholder Theory

The stakeholder theory offers a different view of businesses and their goals. It states that there are various constituencies that impact and are impacted by companies like employees, suppliers, local communities, creditors, investors, and others. Therefore, a firm should try to create value for all its stakeholders, not just for the shareholders. This is because the corporate environment functions like an ecosystem of interconnected groups, all of which must be taken into account and satisfied to maintain the company's long-term health and success.

The stakeholder view of strategy combines elements of both the resource-based and market-based views, incorporating an additional socio-political dimension. It does not only concentrate on profit-maximizing, but it also addresses morals and values in managing an organization, like those related to CSR, social contract theory, and market economy.

This theory was first introduced by R. Edward Freeman in his book Strategic Management: A Stakeholder Approach (1984), in which he illustrates a comprehensive framework for managers to run a company in the current fast-evolving business environment. The book identifies all the different kinds of stakeholders and suggests methods on how to manage their interests. This is the difference between the stakeholder approach and the traditional way of doing business, the owners of the company are not anymore, the only important group to pay attention to and increase value for, now other parties are also involved and must be considered. The Stakeholder theory encourages managers to generate value and collaborate with both internal and external forces.

Another important principle of the Stakeholder theory is the jointness of stakeholders' interests. Even if it is impossible that the interests of all groups are satisfied at all times, managers should understand the relationships between the different stakeholders and look for an equilibrium between them.

Stakeholder management requires an integrated approach to strategic decision-making. Instead of formulating strategies on a stakeholder-by-stakeholder basis, managers should strive to simultaneously satisfy multiple stakeholders. Successful strategies embrace the perspectives of all stakeholders rather than pitting them against each other. This approach acknowledges that not all constraints can be turned into win-win situations through detailed understanding, as stakeholders may not uniformly benefit. Despite a nuanced grasp of stakeholder relationships, strategies often entail both benefits and drawbacks for various groups. Ensuring long-term support from all

stakeholders requires developing strategies that balance harm distribution. Over time, cohesive management of stakeholder interests becomes essential.

To sum up, when making a decision, business executives have to take into account the interest of all stakeholders, both internal and external, because they are critical for the long-term success of the company. The objective is to generate maximum value for key stakeholders and align the shared interests of seemingly disparate groups. Businesses can pursue a purpose beyond profit maximization, fostering collaboration among diverse stakeholders towards a common goal.

However, some criticism arose also from this theory, for example, the political philosopher Charles Blattberg criticized the stakeholder theory for assuming that it is always possible to balance the interests of the various stakeholders and not create discord between them. He argues that stakeholders represent such a large and diverse group that is impossible to please them all, one or more stakeholders will have to take a backseat to others.

Moreover, if allocating some of the corporation's profits to various stakeholders contributes to the company's long-term profits, it means that the firm has not traded off some of its profits in order to meet the needs of non-shareholding stakeholders, but rather, it has simply sacrificed some short-term gain for a long-term benefit. Therefore, meeting the needs of non-shareholding stakeholders has improved shareholder profit anyway. The final goals remain, then, the profit and this means that there is little significant difference between the shareholder and stakeholder approaches (Blattberg, 2004).

However, the stakeholder theory, viewed as stakeholder management, facilitates the integration of social demands and long-term value maximization (Crane et al., 2013). Given this perspective, the theory appears to be a robust theoretical framework to elucidate the emerging ideology that emphasizes the significance of investing in social responsibility as a means to maximize profits and surpass competitors in the long run.

Another theory that explains how sustainability is related to a firm's financial success is the agency theory.

2.3 Agency Theory

Another theory regarding the contrasting relationship between company shareholders' priorities and the company executives' main concerns is called the Agency Theory. This theory was first cited by Alchian and Demsetz (1972) and Jensen and Meckling (1976) and it describes the relationship between managers (seen as agents) and shareholders (called principals), where principals hire agents to perform a service on their behalf.

However, this relationship can rise some issues: managers and shareholders may have different goals, have different levels of risk aversion, and have an information asymmetry. For example, management might aim to expand a business into new markets, prioritizing short-term profitability and elevated compensation. However, a risk-averse group of shareholders, more concerned about long-term earnings growth and share price appreciation, may find this strategy unattractive.

Therefore, the theory argues that it is necessary to restrain firm managers from using their power to maximize their own benefits instead of the ones of the firm, and this can be done through appropriate incentives and adequate monitoring. There are several suggestions to "reduce agency loss", which is the cost to the shareholder that arises as a consequence of managers not acting in the best interest of the owners (Jensen & Meckling 1976). One of the best-known strategies is offering incentives to managers, such as giving them stock options and tying part of their compensation to shareholder returns.

However, there is a concern that management might compromise long-term business growth in a bid to boost immediate earnings and their personal compensation. This is often evident in budget planning, where management lowers annual budget predictions

to meet performance targets. In response to such concerns, an alternative compensation plan has emerged, where executive pay is partially deferred and tied to long-term objectives.

Agency theory does not have only implications for the company, but also for society. One of the significant challenges stemming from agency theory is a lack of accountability, as shareholders bear responsibility for the company's actions, while management is the decision-maker. This creates a scenario where a company can generate negative impacts on the environment and society without clear internal accountability. Furthermore, companies often seek to externalize costs to maximize profits, shifting environmental impact expenses onto others. These externalities contribute to sustainability issues as they affect people surrounding the company. Fortunately, there is a shift in shareholders' mindset as they increasingly recognize the impacts, risks, and opportunities associated with sustainability (Boffo & Patalano, 2020).

Moreover, many studies, such as those by Shleifer and Vishny (1989 and 2000), highlight that agency problems can manifest through investment choices that do not maximize value. Additionally, ESG expenses are often viewed as a form of investment, as suggested by McWilliams and Siegel (2001). In the context of Environmental, Social, and Governance Practices (ESGP), the agency problem can be characterized as managers having the incentive to invest in ESG activities that may not align with shareholders' preferences and may not maximize their benefits. In general, managers may allocate more investments to ESG initiatives than the optimal amount for maximizing firm value, influenced by social pressure and/or altruistic motives.

This occurs because ESG activities tend to be more advantageous for managers than shareholders. Managers incur minimal costs when investing in ESG activities, yet they personally benefit by building a reputation for promoting responsibility. Consequently, managers may advocate for overinvestment in ESG, potentially at the expense of shareholders. ESG investments, in this context, can be perceived as instances of agency conflicts between management and the firm's shareholders (Goss et al., 2011).

However, in line with the stakeholder, agency and information asymmetry theory, managers who reveal their ESG practices can mitigate the exposure of the company to future risks. This, in turn, creates value for investors and other stakeholders by fostering the sustainability of long-lasting business models. Numerous studies, including those by Lopatta et al. (2016), Hsu and Chen (2015), Fombrun and Shanley (1990), and Kim and Kim (2014), have explored the connection between Environmental, Social, and Governance (ESG) practices and agency costs. Their findings indicate that engaging in ESG activities helps decrease agency costs by significantly mitigating the information asymmetry between external and internal stakeholders. ESG disclosure is recognized as providing additional nonfinancial information for investors, creditors, and regulators. Consequently, higher levels of ESG engagement are anticipated to reduce the cost of debt, as increased information availability about the firm benefits creditors.

In summary, the theories propose that a delicate balance must be struck between the potential financial benefits and drawbacks of ESG activities. Firms, however, should exercise caution to avoid overinvesting in ESG practices, as this could exacerbate the agency problem.

To conclude, the interest in ESG and sustainability issues by shareholders, stakeholders and managers have increased in the last few years. More and more companies are trying to adapt to this trend by participating in social initiatives, getting certified, and reducing their carbon footprint.

In the next chapter, the previous studies related to ESG-CFP and ESG-Financial Distress Risk (FDR) relationship are presented. In the past several years, the interest in corporate sustainability has increased and the number of firms that employ sustainability strategies and disclose environmental, social, and governance information continues to rise. However, the gain from investing in ESG activities are often not explicitly reflected in a firm's financial disclosure. Their benefits and costs typically do not appear distinctly in profit and loss statements, nor is their accumulated value or impact clearly outlined on balance sheets. However, due to the increasing societal pressure for companies to

engage in socially responsible practices, it is important to investigate whether ESG activities improve the profitability and the financial performance of a firm. For this reason, many researchers have investigated the impact of ESG elements on firms' performance. This chapter illustrates the findings of some of these previous studies, which are, however, often different from each other, some show positive relationships, other negatives, and other non-decisive results.

2.4 The link between ESG pillars and Corporate Financial Performance

The relationship between Environmental, Social, and Governance Performance and Corporate Financial Performance (CFP) has been widely studied, and the majority of the research suggests a statistically significant positive correlation between the two variables. This finding is consistent with the theoretical expectations of a null to modestly positive link, as described by Benabou and Tirole (2010). Despite this positive correlation, the scale of this relationship is typically modest (Cohen, 1988; Rosenthal & Rosnow, 1991), with some studies finding no correlation, mixed results, or even a negative link (Xie et al., 2017; Velte, 2017; Bruna et al, 2021; Batae et al., 2021; Atan et al., 2018; Jyoti & Khanna, 2021; Damers et al., 2021). However, it is important to note that even a small change can have a significant impact in a globally competitive market (Friede et al., 2015).

Moreover, the integration of Environmental, Social, and Governance considerations into corporate decision-making has gained significant traction in recent years, as a result of the growing recognition of their impact on not only the financial performance of companies, but also on the well-being of their stakeholders. The diverse nature of ESG initiatives has resulted in some stakeholders benefiting more from these sustainable initiatives, while others may experience reduced benefits or even be negatively impacted.

Given this, it raises the question of the alignment of investing in ESG activities with the two prevailing theories of corporate social responsibility: the shareholder theory propounded by Milton Friedman in 1970 and the stakeholder theory articulated by R. Edward Freeman in 2002.

The shareholder theory argues that the primary purpose of a corporation is to maximize shareholder value, and that corporate social responsibility activities should only be pursued if they align with this goal. Conversely, the stakeholder theory posits that corporations have a broader set of obligations to all their stakeholders, including employees, suppliers, customers, and communities, and that these obligations should be balanced with the goal of maximizing shareholder value.

As such, this raises the question of whether investing in ESG activities aligns with either, or both, of these theories. Many companies have adopted a hybrid approach, balancing the interests of shareholders and stakeholders by investing in ESG activities that not only improve the company's reputation and contribute to a more sustainable future, but also have the potential to generate long-term financial benefits, such as reducing costs and improving operational efficiency. Therefore, overall, these two theories may even not be as diametrically opposed as one may think, a middle ground can probably be found, where managers create shared value between the firm’s shareholders and a broader set of stakeholders including employees, suppliers, customers and communities (Huang, 2021; Porter & Van der Linde, 1995; Porter & Kramer, 2011).

However, despite significant research, a definitive answer regarding the relationship between ESGP and CFP and the profitability of ESG initiatives has not been found yet, but rather just fragmented insights that provide only partial understanding of an unseen larger picture. (Galbreath & Shum, 2012). In the following paragraphs, previous literature on the subject is presented and divided into three main categories: the research that observed a positive link, a negative link, and mixed/non-decisive results.

2.4.1 ESGP-CFP Positive Link

Many studies have found a positive link between ESGP and CFP, proving the stakeholder's theory and the benefit of a greener way of conducting business.

For example, Garas and El-Temtamy (2020), observed that a higher and more objective environmental disclosure improves the firm financial performance. It also positively influences the firm's market value and reduces the company's market risk. To prove their hypothesis, they analysed 577 publicly listed companies from Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE over a ten-year period (2008–2017). The sample is comprised of 4963 observations and all data have been acquired through the Bloomberg database, both for the financial information and for the ESG scores that have been used as a proxy to measure the CSR. They used accounting and financial measures such as return on assets (ROA) and Tobin's Q, which is calculated as the market value of a company divided by its asset's replacement cost, to evaluate the firm financial performance. A similar result was also obtained by A.W. Wirawan et al. (2020) who analysed listed companies in Hong Kong and found that CSR disclosures have a positive effect on firm value. However, the result may vary from country to country, especially between nations with very different laws and regulations.

For US non-financial institutions, a study has been conducted by Atif and Ali (2021), which also found that environmental, social, and governance disclosure is positively related to Merton's distance to default. Merton's (1974) structural models utilize option pricing methods to compute a probability of default, relying on the level and volatility of the market value of assets. Within this framework, the strike price aligns with the face value of the firm's liabilities, as indicated by Bharath and Shumway (2008). A greater positive distance between the firm's value and its liabilities corresponds to a lower probability of default. Moreover, the authors also analyzed the relationship between ESG disclosure and credit default swap spread, they turned out to be negatively related. These results suggest that firms with a higher ESG disclosure have lower default risk. This is probably due to increased profitability and reduced performance variability and cost of debt. Though, this relationship seems to exist only for mature and older firms. A

possible explanation may be, as previous studies showed (Hasan et al., 2018; Ullmann, 1985; Shaukat and Trojanowski 2017; McWilliams & Siegel, 2001), larger firms face greater scrutiny compared to smaller ones, therefore, they are expected to disclose more ESG information.

Nevertheless, ESG disclosure may not reflect entirely the real environmental, social and governance efforts made by the companies. In fact, corporations are often guilty of greenwashing, pinkwashing or rainbow washing, and are not always completely transparent about their real policy and ESG actions (Boffo & Patalano, 2020; Kreca & Spitzer, 2022). For this reason, it is important to evaluate the corporates' ESG performance also with external indexes calculated with real independent data.

For instance, Trung et Vo (2023) used the Thomson Reuters ASSET4 to assess the firm's ESG performance level. The Thomson Reuters ASSET4 is a comprehensive database for ESG performance that comprises data for many companies from all over the world. It offers measures of environmental performance, social performance, corporate governance, and economic performance that have been calculated independently. In his study, Do (2002) observed that ESGP is negatively linked with the probability of default and this relationship is stronger in the long term than in the short run. This happens because ESG activities, apparently, can improve access to external financing, reduce transaction costs and increase competitive advantages by enhancing customer loyalty. These results support the pay-off hypothesis, which assumes that the costs of ESG activities are marginal, and firms may profit from ESG actions in terms of employee morale, productivity, and attraction of new customers (Solomon and Hansen, 1985; Moskowitz, 1972; Shaukat & Trojanowski, 2017; Waddock & Graves, 1997).

Another study by Lin Dong (2018) showed that companies with a strong track record of positive Corporate Social Responsibility engagement are less likely to file for bankruptcy when facing severe financial distress. Additionally, these firms are more likely to undergo a quicker and more effective recovery process from such financial challenges. Moreover, companies with high ESG score seems to be less likely to be in financial distress, as Boubaker et al.'s (2020) study found. In their paper, they examine the

situation of 1.201 US-listed firms during the period 1991–2012, recording their CSR level and their financial distress risk (FDR). The authors measured the CSR level using the MSCI ESG score and the FDR with Altman Z-Score (Altman et al., 2017) and Merton's model (Merton, 1974). It seems like having a better ESGP gives firms more creditworthiness and better access to financing, which results in fewer bankruptcy cases. This correlation is more pronounced in companies with robust governance mechanisms and intense competition in the product market. The effect is heightened for less distressed firms and is particularly evident during non-crisis periods.

Moreover, from the research of Rehman et al. (2020) and Chan et al. (2017), the financial performance of the businesses seems correlated with the firm's ESGP. In both studies, they collected ESGP information from the MSCI database, but they used different measures for CFP. Rehman et al. (2020) used ROA to measure the firm financial performance, while Chan et al (2017) used KZ index scores and Altman's Z-scores. Despite this and the different countries of the firms' samples (US for the first article and Asian and European for the second one), the final results are similar: ESG positively impacts firm performance and negatively affects firm risk. These findings are also confirmed by Gangi et al. (2020) study, which also showed that the positive influence of CSR on the firms' financial performance which is more pronounced in SMEs than in large firms. Additionally, the research of Rehman et al. (2020), which examined data from companies listed on Fortune's Most Admired Countries for the period 2014–2018, also discovered that CSR has a significant positive influence on firm reputation and that firm reputation partly mediates CSR-performance relationship.

Furthermore, according to Okafor et al. (2020), investing in ESG activities can also cause general growth for companies. In particular, the US tech companies that from 2017 to 2019 spent the most on ESG actions have experienced a corresponding increase in revenue and profitability. The research demonstrates that as an organization allocates more resources to ESG activities, its overall value is positively impacted. Simultaneously, the study indicates that investments in ESG initiatives have a discernible influence on an organization's return on assets and stock value.

This may also be linked to the fact that ESG investing may also suggest innovation as Martinez-Conesa et al.'s (2017) research suggests.

As we can see, the previous research has quite extensively analysed the ESGP-CFP relationship, however, not every research reaches the same positive results. Several studies have presented a contrasting perspective from what has been discussed thus far. In the following subchapter, we illustrate some of the articles that report a negative or not-positive link between the two variables.

2.4.2 ESGP-CFP Negative link

While many studies claim that ESG activities make the company more innovative and generate extra revenue that can cover the additional costs, and therefore, that CFP can be positively influenced by an appropriate ESG strategy, other empirical studies show that ESG and CSR initiatives bring additional costs caused by agency problems and ineffective resource allocation, which can put the firm in a bad position in the market.

According to Batae et al.'s (2021) study, this could be partially true for European banks. In fact, despite observing a positive correlation between emission reductions and financial performance, the study found that an improvement in the quality of a bank's corporate governance system had a negative impact on CFP. This implies that corporate governance quality has a negative effect on accounting performance and market valuation, contradicting the expectations of agency theory. The study utilizes data from the Refinitiv database, covering 39 European banks over the period 2010-2019. To evaluate the ESG performance of the companies they used the ESG rates of the Refinitiv database using around 150 indicators that range across ten different areas. Then, to evaluate the corporate financial performance, the authors used three different variables: ROA, Return on Equity (ROE), and Tobin's Q. The negative relationship found by this research could mean that banks' actions in social responsibility initiatives are not taken into consideration by market investors and they do not endorse the adoption of best governance practices that could reduce the riskiness of a bank's portfolio. In particular, the authors found that there is a significant negative relationship between

these ESG area and financial performance: the CSR strategy dimension and stock market returns (SMR); lagged product responsibility and ROA; the change in Soc_PRD and the change in ROA; corporate governance quality and SMR; the CSR strategy dimension and SMR and between the change in the management and oversight score and the change in ROA.

Another report by Atan et al. (2018) investigates the relationship between companies' ESG pillars and their financial performance in Malaysia. They noticed that there is no significant relationship between individual and combined factors of ESG and firm profitability (measured with ROE) as well as firm value (measured with Tobin's Q). This non-existent correlation implies that companies that have high ESG initiatives may perform equally as well or as poorly as the ones that have low ESG rates. In addition, ESG is also not perceived as increasing firm value. These results may be caused by the short period spam analysed (2010-2013), since usually, the relationship between sustainability and financial performance is only significant in the long term and not in the short term as argued by Eccles et al. (2014). Moreover, the stakeholders in developing countries may have a lower interest in ESG activities as the ones in US or Europe. They still have to gain more confidence in the corporations' ESG initiatives that could eventually lower their cost of capital, as found by Ming et al. (2013) and it is also true that ESG data may not be used extensively by the capital market in determining the cost of capital yet (Park & Jang, 2013).

Similar results are found in the study of Jyoti and Khanna (2021) which investigates the influence of a firm's ESGP on the CFP of companies from the service sector listed on the Bombay Stock Exchange. The findings reveal a noteworthy negative correlation between the Environmental score and both Return on Assets and Return on Capital Employed (ROCE) for the sample companies. Conversely, only the Social score exhibits a significant negative association with ROE. Furthermore, the combined score for ESG also demonstrates a negative and significant relationship with both ROCE and ROA.

Moreover, a recent article written by Damers et al. (2021) on the indicators of share price resilience during COVID-19 crisis, showed that companies with better ESG scores

did not experience greater returns during the pandemic, once industry relation and market and accounting factors of returns have been properly controlled for. They argue, on the other hand, that what could actually explain the price resilience during COVID-19 of some stocks, is the firms' investments in internally developed intangible assets. This suggests that the flexibility derived from a large stock of innovative assets was more important than the firm's social capital during this global pandemic, at least for what concerned stock's price resistance. This would mean that the claim that ESG is particularly valuable as a risk mitigation strategy and as a protection in periods of crisis is not true. However, this does not mean that in the long-run ESG investment does not create value for both shareholders and communities.

Not all studies, though, offers a clear view on the relationship between CFP and ESGP. Several research papers show contrasting results. Some of those are presented in the following chapter.

2.4.3 Non-decisive results

Mixed results were found in the study of Xie et al. (2017) who used the Bloomberg Environmental, Social, and Governance Database and the DEA model to evaluate the relationship between ESG disclosure and corporate efficiency. The authors found out that a moderate level of ESG disclosure has a significant and positive effect on corporate efficiency, contrary to a high or low disclosure level. The strongest positive relationship is found for governance disclosure followed by social disclosure and environmental disclosure. A similar result can be found in another research conducted in Germany by Velte (2017) for the business years 2010-2014, which showed that the governance performance is the area that has the strongest impact on CFP.

In contrast, a low level of disclosure has a detrimental impact on corporate efficiency, with the exception of environmental information disclosure, which has shown a relatively weak positive relationship with corporate efficiency. A high disclosure level also negatively affects corporate efficiency, especially environmental disclosure. These results suggest that the relationship between ESG disclosure and corporate efficiency is

not a simple linear relationship. For example, the authors found a positive relationship between cost-cutting policies, such as green building, sustainable packaging, and environmental supply chain, and CFP. However, there were no significant results observed in the relationship between climate change policies and financial performance. However, no significant results are found between climate change policies and financial performance. For what regards social activities, firms that try to offer training programs equally and reduce demographic discrimination tend to outperform their peers. In terms of governance activities, an important role is played by independent directors in lowering agency costs and maximizing shareholder value, and this leads to better CFP. Including women on the board also have a strong positive relationship with financial performance.

A non-linear relationship has also been observed by Bruna et al. (2021), which highlights the existence of a non-linear relationship between ESGP and CFP. For almost all the companies they analysed, a decreasing trend is observed in CFP up to a mid-value of ESGP, then, CFP shows a moderate increase. This means that ESG commitment is negatively associated with financial performance until a certain level of ESGP, after that, further efforts are recompensed with a partial improvement of financial results.

Supporting that, Sahut and Pasquini-Descomps (2015), wrote that the function linking a stock's performance to its ESG-score changes is probably non-linear. They came to this conclusion after measuring the monthly stocks' changes performance over a five-year period for numerous US, Swiss and UK companies and their related news-based ratings in different ESG categories. They noticed a slightly positive relationship between ESGP and stock's price only in UK companies and the results were highly dependent on the year and sector.

This means that, even if the literature around ESGP and CFP link is widely spread, further analysis has still to be conducted to better understand the dynamics of that relationship. It is important to know if it changes from country to country and if it is influenced by firm industry or size or by any other relevant factor. For both investors and stakeholders, it is fundamental to know whether green investing is actually a profitable choice that

will bring them a higher value in the future. This study, therefore, aims to better analyse the link between ESGP and financial distress in European countries.

3. Hypotheses

According to Baird (1987), bankruptcy occurs when a financially distressed firm is unable to meet its obligations, including repaying its due liabilities, and as a result, enters a collective proceeding to settle the competing claims of its creditors. Financial distress can arise from various sources, such as internal failure, industry decline, or economic distress (Wruck, 1990), including global financial crises and pandemics such as COVID-19. The incidence of bankruptcy is influenced by economic cycles, with fewer firms facing financial distress during times of economic prosperity, and many firms experiencing difficulties due to external factors during periods of economic downturn (Wruck, 1990).

The first question we try to answer in this paper, is whether ESG pillars may influence bankruptcy probability of the firm.

Investments in environmental measures and sustainability can have a positive impact on a firm's financial performance by reducing the risk of reputation loss and increasing supply chain resilience. Liang and Renneboog (2017) argue that sustainable investments improve environmental performance, thereby reducing business risk. Additionally, sustainability investments can foster stability when dealing with emerging distress by promoting loyalty and reliability among stakeholders, especially suppliers (Vishwanathan et al., 2020). Moreover, consistent investments in social measures can enhance employee motivation and collaboration, leading to a decrease in the risk of internal failure due to higher management motivation and social awareness (De Roeck et al., 2016; Edmans, 2011; Scheidler et al., 2019). Furthermore, improving internal governance structures can increase transparency and enable early detection of potential distress situations (Cheng et al., 2014). Transparent structures can also decrease the possibility of poor and short-term-oriented management, thereby reducing the risk of distress (Vishwanathan et al., 2020). Transparent structures can also foster mutual trust among stakeholders, including banks, leading to improved access to financing for high ESGP firms (El Ghoul et al., 2017). These hypotheses are confirmed by Chan et al. (2017)

which confirm a significant negative association between CSR activities and the degree of financial distress.

Based on the results of previous research, our first hypothesis aims to assess if there is a relationship between financial distress and ESG pillars in European listed companies.

H1: A company with a high ESG performance is less likely to incur in bankruptcy the following years, this means that there is a positive link between ESG score and the Altman Z''-Score.

The second research question is whether there is an ESG pillar that influences the most the financial performance of the firms, this may be the environmental, social, or governance factor. Previous studies have shown different results, for example, Xie et al. (2017) found that governance disclosure has the strongest positive relationship with CFP, and a similar result can be found in the study conducted in Germany by Velte (2017). In the article of Jyoti and Khanna (2021), the authors write that while a significant negative relationship between the Environment score with ROA and ROCE is found in the selected companies, only the social score shows a significant negative association with the ROE. Moreover, as the research of Huang (2021) explains, the correlation may varies between the different ESG pillars and the CFP measures. For example, the Environmental factor usually has a stronger correlation with all type of CFP measures. Meaning that environmental investment may benefit more the financial performance of a firm than the social and governance ones.

Therefore, according to the previous studies, the second hypothesis is the following:

H2: The firms' financial performance is affected in a different way by the environmental, social or governance pillars.

4. Data and Methodology

The purpose of this chapter is to provide a thorough presentation of the data and methodology utilized in this research for the master thesis. The first section provides a description of the regression models applied to the sample, which will be used to test the research hypotheses. The second part outlines the process of data collection for European companies, along with an overview of the sample's characteristics. In the end, the Altman Z-Score formula and the ESG score used in the analysis are discussed in detail.

4.1 Regression Model

In this chapter, we will present a regression analysis to test the relationship between the ESG combined score and the Altman Z''-score. The purpose of this analysis is to investigate whether there is a statistically significant correlation between these two variables, and to identify any potential control variables that may influence this relationship. In the next subsections we will explain and describe the variables included in the model.

4.1.1 Regression Model

$$Altman\ Z'' - Score_{i,t} = \alpha + \beta_1 ESG_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 ROA_{i,t} + \beta_5 LEVERAGE_{i,t} + COUNTRY_i + INDUSTRY_i + YEAR + e$$

Where ESG is the ESG combined score; SIZE is the natural logarithm of total assets; ROA is the return on assets; LEVERAGE is long term-debt on total assets; COUNTRY is the GDP per capita; INDUSTRY and YEAR are dummy variables; ε is the error term.

To assess the sensitivity of our results, we conduct additional analyses using different ESG score components, including the Environmental Pillar Score, Social Pillar Score, and Governance Pillar Score, to determine which ESG score has the most significant impact on corporate performance. Moreover, we examine whether the

effect of ESG investments takes longer to manifest by testing the model using ESG Combined Scores of the prior year, five years before, and ten years before.

This study follows a quantitative research approach, similar to the methodology employed by Habermann and Fischer (2021). The choice of this approach aligns with the study's objective, which is to examine the influence of ESG scores on bankruptcy probability. The quantitative research method enables the exploration of potential relationships between variables and the derivation of meaningful conclusions from the results (Saunders et al., 2016). However, it is crucial to acknowledge certain limitations associated with quantitative research. One primary constraint is its potential to exclude significant in-depth knowledge that cannot be easily translated into quantifiable forms (Choy, 2014).

The multiple regression model chosen is the Ordinary Least Squares (OLS), following the example of Habermann & Fischer (2021). Multiple regression analysis is a widely accepted statistical technique that allows us to examine the simultaneous influence of multiple independent variables, such as various ESG components and time frames, on our dependent variable, which is corporate financial performance.

We chose multiple regression analysis because it provides a rigorous and systematic approach to assess these relationships, controlling for potential confounding factors. This method allows us to quantify the impact of different ESG components and assess whether certain time frames are more critical for companies seeking to improve their financial performance.

By employing this method, we aim to provide robust empirical evidence on the link between ESG performance and corporate financial performance. We believe that this approach will enable us to identify which specific ESG components and time frames are more significant for companies looking to enhance their financial performance. This methodological choice aligns with the goal of our study, which is to contribute valuable insights to the field of corporate sustainability and finance,

4.1.2 Dependent Variable

Altman Z''-Score

The Altman Z-Score will be used to calculate the bankruptcy probability of firms (Habermann & Fischer, 2021; Altman et al., 2017). Following the methodology of), Magnanelli et al. (2017) , Erragragui (2018) and Sengupta (1998) a lag time effect of one year, five years and ten years is applied between the dependent variable and the independent variable of ESG rating. This is attributed to the assumption that alterations in firms' ESG actions are likely to yield an impact over an extended period rather than having an immediate effect.. We expect the ESG Score to have a positive relationship with the Altman Z''-Score, therefore the higher the ESG company's performance the better its financial situation.

4.1.3 Independent Variables

ESG Combined Score

Refinitiv ESG score will be used to assess the environmental, social and governance performance of the firm. A high ESG score means that the company is performing well under that aspect. This study has chosen the ESG score of Refinitiv Eikon as it is the most trusted data source of ESG metrics (Batae et al., 2021). ESG Combined score of Refinitiv is widely used by researchers in their studies (Ioannou and Serafeim, 2012; Shakil et al., 2019; Eccles et al., 2014; ; Batae et al., 2021; Bae et al., 2021).

This metrics is discounted for significant ESG controversies impacting the corporations, for this reason it will be equal or lower then the normal ESG Score, as we can see in the Figure 16.

Environmental Pillar Score

In order to better understand if any ESG has a different influence on the financial performance of the firm, we will conduct three different regression analyses with which one of the ESG scores. The first one is the environmental score that measures the effect

that a firm has on the environment, it consists of three categories that are resource use, emissions, and innovation (Refinitiv, 2022).

Pillars	Catagories	Themes	Data points	Weight method
Environmental	Emmission	Emissions	TR.AnalyticCO2	Quant industry median
		Waste	TR.AnalyticTotalWaste	Quant industry median
		Biodiversity*		
		Environmental management systems*		
	Innovation	Product innovation	TR.EnvProducts	Transparency weights
		Green revenues, research and development (R&D) and capital expenditures (CapEx)	TR.AnalyticEnvRD	Quant industry median
	Resource use	Water	TR.AnalyticWaterUse	Quant industry median
		Energy	TR.AnalyticEnergyUse	Quant industry median
		Sustainable packaging*		
		Environmental supply chain*		

Figure 1. Environmental pillar score matrix

Social Pillar Score

The social score evaluates the interaction between the firm and its employees, customers, and society, assessing the firm's capacity to generate shareholder value through trustworthiness and reputation. This score is further categorized into four aspects: workforce, human rights, community, and product responsibility, offering a comprehensive examination of the company's social performance (Refinitiv, 2022).

Pillars	Catagories	Themes	Data points	Weight method
Social	Community	Equally important to all industry groups, hence a median weight of five is assigned to all		Equally important to all industry groups
	Human rights	Human rights	TR.PolicyHumanRights	Transparency weights
	Product responsibility	Responsible marketing	TR.PolicyResponsibleMarketing	Transparency weights
		Product quality	TR.ProductQualityMonitoring	Transparency weights
		Data privacy	TR.PolicyDataPrivacy	Transparency weights
	Workforce	Diversity and inclusion	TR.WomenEmployees	Quant industry median
		Career development and training	TR.AvgTrainingHours	Transparency weights
		Working conditions	TR.TradeUnionRep	Quant industry median
		Health and safety	TR.AnalyticLostDays	Transparency weights

Figure 2. Social pillar score matrix

Governance Pillar Score

The governance score serves as an assessment tool for evaluating a firm's performance in corporate governance matters. It scrutinizes the firm's management and reporting processes to ascertain that leadership aligns with the best interests of the firm's owners. Within the Refinitiv database, the governance score is subdivided into three categories: management, shareholders, and CSR strategy. (Refinitiv, 2022).

Pillars	Catagories	Themes	Data points	Weight method
Governance	CSR strategy	CSR strategy	Data points in governance category and governance pillar	Count of data points in each governance category/all data points in governance pillar
		ESG reporting and transparency		
	Management	Structure (independence, diversity, committees)	Data points in governance category and governance pillar	Count of data points in each governance category/all data points in governance pillar
		Compensation		
	Shareholders	Shareholder rights	Data points in governance category and governance pillar	Count of data points in each governance category/all data points in governance pillar
		Takeover defenses		

Figure 3. Governance pillar score matrix

In the following graph we can see the evolution of the different ESG pillar scores from 2011 to 2021. The scores illustrated in the table are calculated yearly as the average of all available scores.

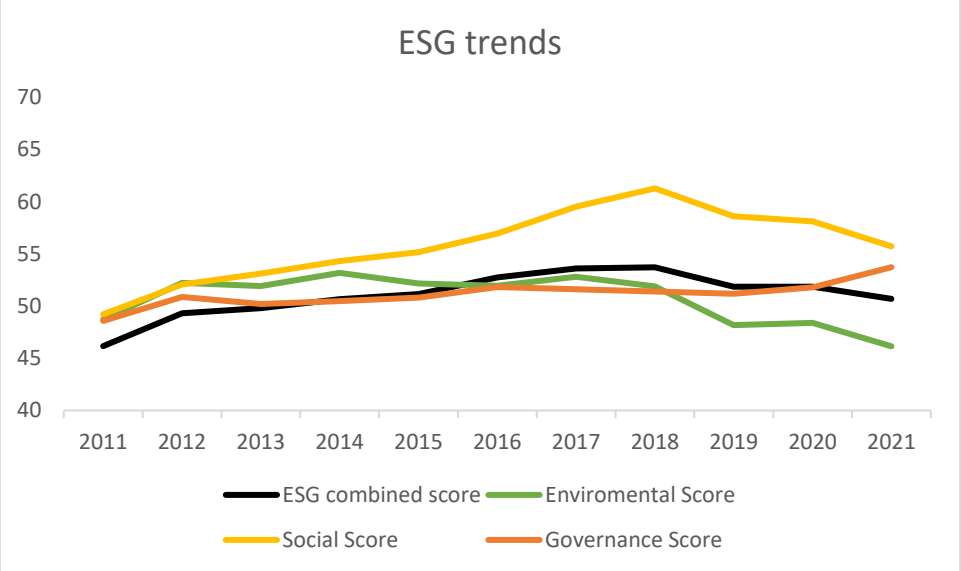

Figure 4. Evolution of ESG scores from 2011 to 2021.

4.1.4 Control Variables

In the regression analysis we control for other factors that have been identified as significant determinants in past research (Kabir et al., 2020; Kabir et al., 2021, Nadarajah et al., 2020; X. Zhang et al., 2020; Baboukardos & Rimmel, 2016; Erragragui 2018; Cheng et al. 2014; Kang et al., 2021, Wang and Qian, 2011; Habermann & Fischer, 2021).

Size

In alignment with prior research methodologies, firm size is quantified using the natural logarithm of total assets, as demonstrated in studies by Baboukardos and Rimmel (2016), Erragragui (2018), and Cheng et al. (2014). The transformation to logarithm is employed to address distributional normality issues associated with the variable, as noted by Setó-Pamies (2015). Controlling for firm size is crucial, as evidenced in earlier studies such as Goss et al. (2011), which indicate that larger firms exhibit lower risk compared to their smaller counterparts (Magnanelli et al., 2017; Benlemlih and Girerd-Potin, 2017). Aoudadi and Marsat (2018) asserted that company size has been directly linked to company value, but there is no agreement on whether company size has a positive or negative impact on firm value. Conversely, Alareeni and Hamdan (2020) discovered that company size has a positive influence on CFP.

ROA

Another proxy of financial performance is the return on assets. Return on Assets (ROA) serves as a profitability ratio, assessing a company's return on investment. It specifically measures a company's operational efficiency independently of its financial structure, irrespective of the degree of leverage employed by the company. The calculation involves dividing a company's net income before financing costs by its total assets (Wang & Qian, 2011). We use ROA as a control variable to assess whether the Z-Score is a reliable proxy for financial performance. ROA is expected to have a negative impact on the firm's default risk and therefore to be positively correlated with the Altman Z-Score. Firm-level data on ROA were collected from Refinitiv database. ROA has been used frequently for measuring firms' financial outcomes in ESG research (Kang et al., 2021, Wang and Qian, 2011; Kabir et al., 2021).

Leverage

Leverage is defined as the ratio of the sum of long-term debt to book assets (Kabir et al., 2021). Leverage amplifies the companies' financial risk and is expected to exhibit a positive relationship with default risk. Scholars highlight that debt has a significant impact on the behavior of managers. On one hand, debt serves as a disciplinary mechanism, motivating managers to make decisions that align with the organisation's best interests. On the other hand, the restraints imposed by debt, reducing managerial flexibility, can limit opportunities for exploring new business ventures, potentially having a negative impact on profitability. The debt ratio represents the fraction of a company's assets that are funded by debt. If the ratio is higher than 1, it indicates that the company has more liabilities than assets, which poses a risk of default if interest rates increase abruptly. In essence, a high debt ratio implies that a significant portion of a company's debt is supported by its assets. We use debt ratio as a proxy for companies' leverage and management's risk tolerance. Drawing from existing studies, Waddock and Graves (1997) posit that a company's attitudes toward risk activities can yield savings, incur both present and future costs, and impact its market position by either enhancing or diminishing it. However, it's acknowledged that all firms inherently bear some level of risk, and occasionally embracing risks, such as increasing debt, might ultimately enhance a firm's profitability and value, as noted by Brealey, Myers, and Allen (2011).

Industry

According to Ruf et al. (2001), previous studies provide evidence that financial performance differs across industries. Controlling for industry is crucial, as firms within a specific industry need to satisfy similar types of stakeholders and respond to their demands more effectively than competitors. This suggests that stakeholders and their expectations can differ between industries, leading to variations in both financial and sustainability performance. Waddock & Graves (1997) and Setó-Pamies (2015) also suggest that the type of industry might influence sustainability behavior. Failing to control for different industries might obscure the main effects of overall differences in sustainability performance. Therefore, we used a sector (TRBC Business Sector Name)

as a control variable, employing a dummy variable to differentiate sensitive (Utilities, Oil and Gas, and Basic materials) and non-sensitive (all others) industries (Tarquinio et al., 2018).

Country

Gross Domestic Product (GDP) per capita is a metric used to gauge a country's economic output, taking into consideration its population size. It is often used as a proxy for the level of economic development of a country or region. Given that the factors influencing corporate ESGP should encompass macroeconomic considerations (Gillan et al., 2021), this study draws on previous research (Ren et al., 2023; Apergis et al., 2022; Eliwa et al., 2021; Li et al., 2018). It utilizes GDP per capita (PGDP) as a measure of economic development and incorporates economic policy uncertainty to account for variations across countries (Ren et al., 2023).

Year

To control whether the Covid-19 has influenced the financial performance of the firms we use the year as a dummy variable. Therefore, we consider “1” the years 2020 and 2021 and “0” all the others.

4.2 ESG pillars

Companies are under increasing pressure to “do good”, meaning to operate not only for their financial gain but also in order to help the communities and the environment, or at least, to not damage it. However, despite the society increasing attention on this manner and the decades of academic research, there is still a significant gap in understanding how ESG is considered, the motivations behind its adoption, which are the benefits, who benefit from it and where it might lead.

By environmental, social, and governance criteria we mean a set of standards to evaluate a company’s non-financial performance. Environmental criteria assess how a company fulfills its role as a steward of nature. Social criteria scrutinize how it handles relationships with employees, customers, suppliers, and the communities in which it operates. Governance encompasses a firm’s leadership, executive compensation, audits, shareholder rights and internal controls (Investopedia, 2022).

In the figure below we can see how the CFA Institute (2022) defines these three concepts:

Figure 5. ESG pillars (CFA Institute, 2022)

However, there is not a standard definition for ESG pillars, and, therefore, there is no standardized method to measure them either. Different companies and websites provide an ESG rating for businesses. An example is the MSCI ESG Rating which is one of the most widely referenced ESG rating systems. It scores about 8,500 firms and more than 680,000 fixed income and equity securities worldwide, including ESG funds. The

MSCI ESG score measures risk across 10 categories of environment, social, and governance areas and rates the companies on a scale from leader (AAA, AA), average (A, BBB, BB) to laggard (B, CCC). This rate employs a rules-based methodology to identify industry leaders and laggards based on their exposure to Environmental, Social, and Governance risks and their proficiency in managing those risks compared to their peers (MSCI, 2022).

Other indicators are the KLD-index, the Dow Jones Sustainability Index and the ASSET4. The latter has a leading role in providing objective, comparable and auditable non-financial information about publicly listed firms. Unlike KLD, ASSET4 does not eliminate firms in "sin" industries, which are involved in, for example, alcohol, tobacco, or defence and focuses on more preeminent firms. In this thesis, we will use the Refinitiv rate, since their database offers one of the most complete ESG databases covering over 6,000 public firms, across more than 400 different ESG metrics, with a history going back to 2002.

The Thomson Reuters ESG Scores are designed to measure firms' ESG performance transparently and objectively across ten areas (emissions, shareholders, environmental product innovation, human rights, etc.) based on company-reported data. The score grades go from a D- to A+ and are also available in percentages. The ESG score used is the one called "Thomson Reuters ESG Score" which measures firms' ESGP based on company reported data in the public domain (corporate website, annual reports, ESG reports, bylaws, code of conduct, etc.) across ten categories as illustrated in the Figure 6 (Refinitiv, 2022).

To calculate the 11 categories, a percentile rank scoring methodology is adopted. It relies on ranking and is consequently not highly responsive to outliers. The distribution of scores produced with the percentile rank score is nearly uniform. As a result, the

average and standard deviation of the scores derived from the percentile rank score are not particularly informative.

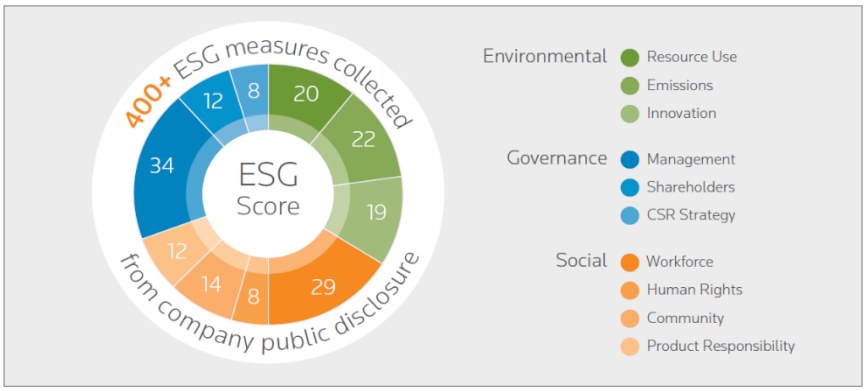

Figure 6. Refinitiv ESG score (Refinitiv.com, 2022)

Each category score is determined by the equally weighted sum of all the indicators used in its creation. Normalized weights are calculated, excluding indicators with no available data in the public domain. The number of measures within each category determines its weight. The overall ESG Score is derived as a weighted average of the underlying 10 category scores (Refinitiv, 2022). Additionally, each score can be translated in a grade that goes from D- to A+, as shown in the pictures below.

Pillar	Category	Indicators in Rating	Weights
Environmental	Resource Use	20	11%
	Emissions	22	12%
	Innovation	19	11%
Social	Workforce	29	16%
	Human Rights	8	4.50%
	Community	14	8%
	Product Responsibility	12	7%
Governance	Management	34	19%
	Shareholders	12	7%
	CSR Strategy	8	4.50%
TOTAL		178	100%

Figure 7. Refinitiv ESG score formula

Score range	Description	
0 to 25	First Quartile	Scores within this range indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly.
> 25 to 50	Second Quartile	Scores within this range indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly.
> 50 to 75	Third Quartile	Scores within this range indicates good relative ESG performance and above average degree of transparency in reporting material ESG data publicly.
> 75 to 100	Fourth Quartile	Score within this range indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly.

Figure 8. ESG score quantiles

Score range	Grade	Description
0.0 <= score <= 0.083333	D -	'D' score indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly.
0.083333 < score <= 0.166666	D	
0.166666 < score <= 0.250000	D +	
0.250000 < score <= 0.333333	C -	'C' score indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly.
0.333333 < score <= 0.416666	C	
0.416666 < score <= 0.500000	C +	
0.500000 < score <= 0.583333	B -	'B' score indicates good relative ESG performance and above-average degree of transparency in reporting material ESG data publicly.
0.583333 < score <= 0.666666	B	
0.666666 < score <= 0.750000	B +	
0.750000 < score <= 0.833333	A -	'A' score indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly.
0.833333 < score <= 0.916666	A	
0.916666 < score <= 1	A +	

Figure 9. ESG Grades

In this thesis we will use the Refinitiv ESG Combined Score as an indicator of ESGPThe The ESG Controversies (ESGC) score is computed as the weighted average of the Environmental, Social, and Governance (ESG) scores and ESG controversies score for each fiscal period, with recent controversies impacting the latest completed period. Therefore, where companies are not entangled in ESG controversies, the ESGC score is equal to the ESG score. The ESG controversies score is computed based on 23 ESG controversy topics. Throughout the year, if a scandal occurs, the implicated company is penalized, affecting its overall ESGC score and grading. The impact of the event may persist into the following year if there are new developments in the negative event, such

as fines, lawsuits or ongoing legislative disputes. All new media materials are taken into consideration as the controversy progresses. Additionally, the controversies score addresses the market cap bias that large-cap companies may face, adjusting scores based on a firm's size to mitigate the disproportionate media attention larger companies receive compared to smaller ones. The calculation of these ESG scores is well explained in the figures below.

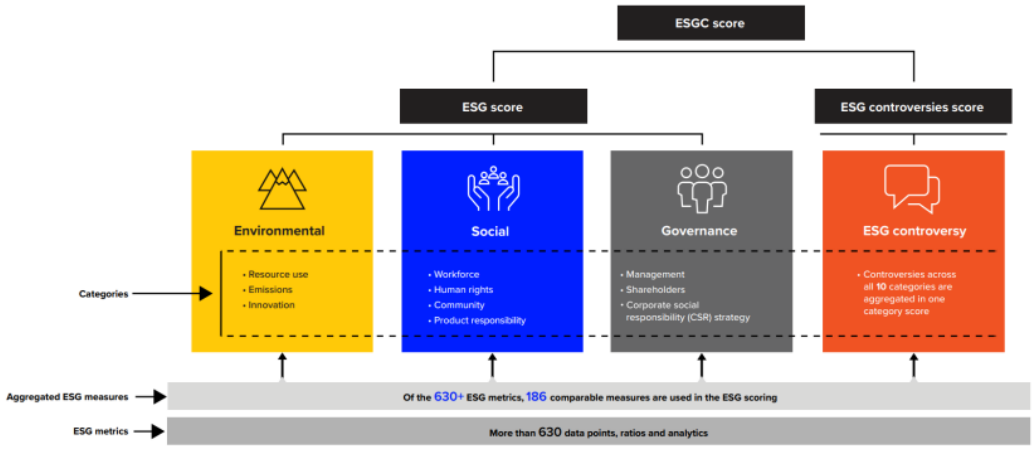

Figure 10. ESG Score categories

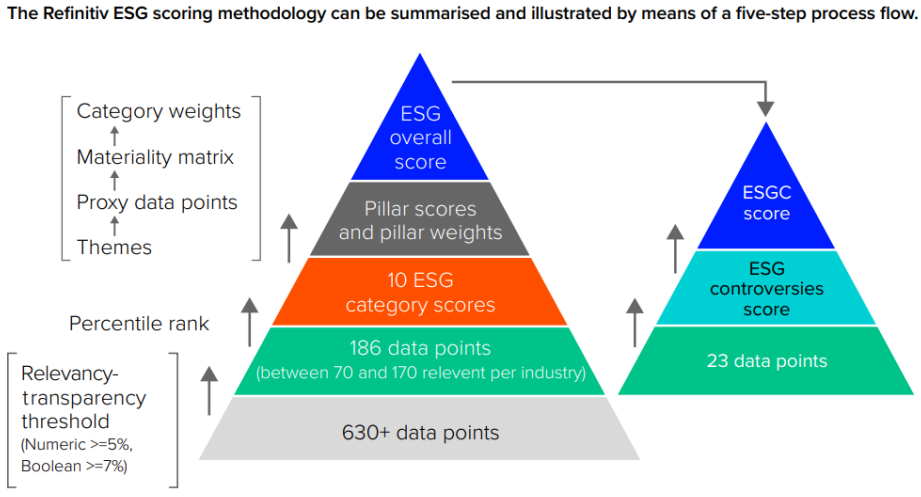

Figure 11: Refinitiv ESG scoring methodology

However, there are some limitations in ESG ratings, for example, as Berg et al. (2019) explained in their paper, there is a divergence between many of the most common ESG

ratings. Their results show that ESG rating discrepancy is not only a matter of different definitions but a fundamental disagreement about the underlying data. Some of this difference is explained by the fact that those different rates do not have the same view on which categories are most important in ESG evaluation, however, Measurement divergence is an issue when considering that ESG ratings should ideally rely on easily discernible and objective observations. The authors also found the main differences in the following categories: Corporate Governance, Climate Risk Management., Environmental Management System, Product Safety, and Corruption and that the disagreement between ESG scores is even more marked in specific sub-categories. Another problem in ESG rating is that there is a so called “rater effect”, which means When a rating agency assigns a positive score to a company in one category, there is a tendency to do the same in other categories as well.

4.3 The Altman Z-Score

Many bankruptcies prediction models have been developed over time, some are univariate models, or risk index models, others are conditional probability models, some use market-based data, and others accounting-based information. Despite the perfect model does not exist yet and that each one’s efficacy may vary from country to country or between industries, many have proven to be quite effective. In this chapter, we will briefly illustrate some of them and then concentrate on the Altman Z-Score (Altman, 1986), which is still a widely used tool to predict bankruptcy or financial distress both in research and in practice (Altman et al., 2017).

Despite what someone may think, the history of credit scoring models dates back to the 1800s when money lenders needed to have information about the lender’s credibility. The first credit reporting agencies were small, local merchants’ associations that over the years developed into bigger and more structured companies that sold borrowers’ info to banks (Point Editorial, 2022). In the 19th century, then, the importance of credit scoring rose together with the growing market of loans. Suddenly, information about creditability was crucial and needed to be more accurate and not subjective, this is when the rating system took steps toward a quantitative analysis. The approach used for

bankruptcy prediction has evolved over time and it was in 1983 that Altman proposed that the management of distressed firms can employ the Z-Score model as a tool for guiding financial turnaround.

However, one of the first to accurately predict the bankruptcy probability of a company was Beaver (1966, 1968). He used univariate analysis to research the relationship between financial ratios and firm financial distress. His study scored an important academic advancement since he demonstrated that financial ratios could be used to foresee financial distress before it happens. This opened the path for further research on this matter. One of these was, in fact, the research of Edward I. Altman, a Professor of Finance at New York University's Stern School of Business who theorized the Altman Z-Score.

Another model is the one developed by James Ohlson in 1995 (Ohlson, 1995) called the Ohlson O-score. The model is based on the idea that a company's value can be divided into two components: the value of its assets and the value of its earnings power. The Ohlson O-score is calculated using a combination of financial ratios that measure a company's asset value and earnings power, such as the price-to-book value ratio and the price-to-earnings ratio. Companies with an Ohlson O-score below a certain threshold are considered to be at high risk of bankruptcy.

Moreover, the Springate model, which was developed by Philip Springate in 2002 (Muzanni & Yuliana, 2021), is based on the idea that bankruptcy risk is determined by a combination of financial and non-financial factors. The Springate model offers a score to a company depending on its level of risk after identifying the characteristics most closely linked to bankruptcy risk using multiple regression analysis. Companies are regarded as having a high risk of bankruptcy if their score is higher than a specific level. This model uses multiple regression analysis to identify the factors that are most strongly associated with bankruptcy risk and assigns a score to a company based on its risk level. Companies with a score above a certain threshold are considered to be at high risk of bankruptcy. Similarely, the Zmijewski model introduced by Mark Zmijewski in 1984 (Zmijewski, 1984) use a multiple regression analysis to identify the financial ratios

that are most strongly associated with bankruptcy risk and assigns a score to a company based on its risk level.

Overall, failure prediction models were relevant at the time as much as they are now. They are important tools for investors, bankers, asset managers, rating agencies, and even distressed firms. Banks, for example, since are the main provider of financing in the economy, need bankruptcy prediction models to minimize the level of non-performing loans (Altman et al., 2017) and also in order to meet the requirements of the Basel Accords which limits the bank's exposure to non-performing loans and securities (Said, 2013). Investors, on the other hand, need an efficient model to minimize their risk and maximize their profits. This means that it is important both for investors and banks to find a reliable accounting-based model to analyse the firms' financial performance and the Z-Score model has become a prototype for many of these models.

The Altman Z-score has been widely used as a financial distress risk indicator in the literature. For example, Apoorva (2019) found that the model was 85% accurate and effective for three years prior to the occurrence of the event of bankruptcy for companies listed on the Bombay Stock Exchange. Hou (2018) also used the Altman Z-score to predict financial distress for listed companies in Taiwan and found that it performed well compared to other models.

While the Altman Z-score is primarily used as a financial distress risk indicator, it has also been used in the literature as a measure of financial performance. For example, one study (Luo, Wang, & Zhang, 2015) found that the Altman Z-score was positively related to a company's financial performance, as measured by return on assets and return on equity. Another study (Liu & Zhang, 2023) found that the Altman Z-score was significantly correlated with a company's profitability, as measured by net income and net profit margin.

However, the relationship between the Altman Z-score and financial performance is not always straightforward. Some studies have found that the relationship between the two is non-linear, with companies in the middle range of Z-scores having the highest financial performance (Kwok et al., 2014). Additionally, the relationship between the Altman Z-

score and financial performance may vary depending on the industry and other factors (Gao et al., 2015).

4.3.1 Classic Altman Z-Score Model

The Altman Z-Score (Altman, 1986) is a statistical model developed in 1968 for evaluating the financial health of listed companies. In his study, the author tested 22 possible ratios on a sample of sixty-six companies both bankrupt and non-bankrupt, to find which were the most appropriate ones to predict financial distress. Most of the companies were manufacturing firms with an asset size that ranged from $1 million to $25 million, this is why this first theorized Z-Score Model is mostly used for listed companies in the manufacturing industry. This multiple discriminant analysis model (MDA), which uses the five best-performing ratios over the 22 ratios sample, is the following:

$$Z\text{-}Score = 1{,}2A + 1{,}4B + 3{,}3C + 0{,}6D + 1{,}0E$$

Where:

A = working capital / total assets. This is the liquidity index. It measures how much working capital can be generated using the company's assets. The value tends to decrease under crisis conditions. The working capital is calculated as current assets minus current liabilities.

B = retained earnings / total assets. It measures the ability of a firm to self-financing, that is of investing the income gained (totally or partially) in new business projects. This ratio determines how much earnings can be generated using the assets and the ability of earnings to compensate for the total assets. This is a profitability indicator.

C = earnings before interest and tax / total assets. This index measures returns on any type of invested capital (risk or financial investment) in the business.

D = market value of equity / total liabilities. This ratio indicates the strength of the company in repaying its debts with equity capital. Market value can be found by

multiplying the number of shares outstanding by the common stock price, this value is therefore available only for listed companies. This is a solvency indicator.

E = sales / total assets. This parameter calculates the ability of total assets to generate earnings, it is also called the asset turnover ratio.

A company is considered safe when the Z-score is above 2,99 and in distress when is under 1,81 (Altman, 1968). The author introduces the concept of a "grey area" or "uncertainty area" characterized by a Z-score falling between 1.81 and 2.99. Within this range, making a definitive assessment of the company's operating difficulties, whether inherent or potentially leading to default, becomes challenging. Further data and information are deemed necessary to classify the company clearly into either of the two aforementioned groups (Celli, 2014).

Altman's model is a widely used tool, not only for its easy application and interpretability nature but also for its accuracy (Qiu et al., 2020). In a previous study, Begley et al. (1996) estimated that the correctness rate was about 78%, while a recent article has shown an overall success rate of 87,3% in Italian companies in the year before economic failure and of 66,6% three years before it (Celli, 2014). The effectiveness of the Altman Z-Score for US-listed companies has also been tested many times, and, for example, Alkhatib and Al Bzour (2011) found an accuracy rate of 95% one year prior to default, of 83% two years prior to default and at 62% three years prior to default. The success rate, however, seems to vary between countries, for example, in Finland, the success rate is about 78% for private manufacturing firms (Lindstedt, 2019), while for companies quoted on the Greek market the rate was 66% one year before and only 52% two years prior bankruptcy (Gerantonis, Vergos, & Christopoulos, 2009). For companies listed on the Jordanian market, the accuracy rate of the model differs, as indicated by Alareeni and Branson (2013): the Z-score effectiveness has been evaluated at 87% one year prior to default, 94% two years prior to default, and 89% three years prior to default.

The main limitation of this model is the fact that it was proven to be reliable only for manufacturing companies, quoted in the market, and with assets over 1$ million. This is

why Altman later developed other versions of the same Z-score model to adapt it to different types of industries and to private companies.

4.3.2 Altman Z'-Score and Z"-Score Models

Since the original Z-Score model l relied on the market value of the firm, it was initially applicable solely to publicly traded companies, Altman over the years continued to reevaluate his model and to upgrade it to make it more comprehensive. From 1969 until 1975, he analyzed 86 firms in distress, then 110 from 1976 to 1995, and finally 120 from 1996 to 1999, discovering that the Z-score had an accuracy of between 82% and 94%.

In 1983, Altman created two other models to investigate smaller private manufacturing companies, and then in 2012, he developed

an updated version called the Altman Z''-score that can be used to evaluate public and private companies, manufacturing, and non-manufacturing companies, and U.S. and non-U.S. companies. In this model, he substituted the market value of equity with the book value of equity in D.

The Altman revised Z'-Score model is:

$$Z'\text{-}Score = 1{,}717A + 0{,}847B + 3{,}107C + 0{,}430D + 0{,}988E$$

where D = Book value of equity/Book value of total liabilities, with the other variables the same as those in the original (1968) Z-Score model.

The Altman Z''-Score Model, instead, is:

$$Z''\text{-}Score = 6{,}56A + 3{,}26B + 6{,}72C + 1{,}05D$$

This model omits the Sales/Total assets ratio (E) in the revised version due to the potential influence of industry effects, especially when incorporating an industry-sensitive variable such as asset turnover (Altman et al., 2017). The turnover ratio is expected to be notably higher for retail and service firms compared to manufacturing firms. Consequently, utilizing the original model to predict bankruptcy in non-

manufacturing firms could result in underestimating the risk, given their lower capital intensity (Hodge & Hughes, 2010).

In this research, I will use the Altman Z''-Score to evaluate the financial performance of the companies' sample since it has the widest scope, it is intended for both privately held and publicly listed firms and for both manufacturing and non-manufacturing firms.

4.4 Data collection and description

The data for this research is acquired through Refinitiv database. Refinitiv Eikon is one of the world's largest providers of financial markets data and infrastructure, serving over 40,000 institutions in about 190 countries. The balance sheets and the financial data provided by the databases are used to apply the Altman Z-Score. ESG variables will then be investigated by using the Refinitiv ESG Combined Score.

The initial data set retrieved covers data on European publicly listed companies over a life span of 10 years, from 2011 to 2021, and consists of 26740 firm-year observations. However, from the initial sample, all the companies with missing data have been eliminated, resulting in 9880 observations. Following the example of previous research (Viale et al., 2002; Brav, 2009; Eliwa et al., 2021; Kim et al., 2014), we also excluded financial institutions due to their unique capital structure, different treatment of leverage and regulation applied. The final sample is therefore composed of 9422 observations with 1740 different companies.

As we can see from the following table, in the sample about 5077 companies are ESG positive, meaning with a score equal to or over 50 (A+, A, A-, B+, B, B-), while the remaining 4345 do not follow sustainability standards well enough (D-, D, D+, C- rate).

Table 1. ESG sample distribution

Number of firms	ESG Combined Grade	ESG Combined Score
1032	A	from 100 to 75
4045	B	from 75 to 50
3434	C	from 50 to 25
911	D	from 25 to 0

The table below provides a comprehensive overview of the financial health of the sample companies, as measured by their Altman Z''-Score. As shown in the table, the majority of the firms (44,7%) fall within the safe zone, with an Altman Z''-Score of greater than 3. This indicates that these companies have a low risk of bankruptcy and are financially stable. However, it is also noteworthy that a considerable number of companies, namely 2980, fall within the distress zone, indicating a high risk of bankruptcy. Additionally, 2225 companies are in the grey zone, which implies that they are at moderate risk of bankruptcy and require close monitoring.

Table 2. Altman Z''-Score sample distribution

Number of firms	Z-score
4217	Safe Zone >=3
2980	Distress Zone <=1,8
2225	Grey zone

The companies analysed in this paper have their headquarters in Europe, specifically in 33 different European countries, as the following table shows. Previous research in this area has often focused on US-listed companies or singular countries, for instance, Alareeni and Hamdan (2020) conducted a study examining the impact of ESG pillars on the performance of US firms listed on the S&P 500. However, given the growing importance of ESG considerations in the global financial landscape, it is crucial to investigate the relationship between ESG scores and financial performance for European companies as well. This will provide a more comprehensive understanding of the impact of ESG pillars on corporate financial performance in a global context.

Table 3. Country distribution of the sample

Country	Number of firms
United Kingdom	2544
Germany	978
France	842
Sweden	768
Switzerland	749
Spain	429
Italy	382
Netherlands	351
Ireland; Republic of	329
Finland	301
Denmark	265
Belgium	253
Norway	215
Poland	191
Austria	182
Russia	138
Luxembourg	133
Greece	118
Portugal	74
Hungary	36
Jersey	28
Cyprus	27
Malta	17
Guernsey	11
Isle of Man	14
Ukraine	12
Czech Republic	11
Monaco	7
Gibraltar	5
Iceland	4
Slovenia	4
Faroe Islands	3
Romania	1

The United Kingdom accounts for the largest proportion of the sample, with 2544 companies or approximately 27% of the sample. Germany and France are the next most represented countries, with 978 (10.4%) and 842 (8.9%) companies respectively. A significant number of firms in the sample are also from Sweden, Switzerland, Spain, Italy, the Netherlands, and Ireland, each accounting for more than 3% of the sample. Other countries represented in the sample include Portugal, Hungary, and Ukraine, which account for smaller proportions of the sample.

Overall, the sample represents a diverse range of countries, this diversity is important in ensuring the findings of this thesis are applicable and relevant to a broad range of countries and contexts. However, we will exclude from our sample the countries with less than 5 companies in the regression model, since they are not statistically significant, therefore the total sample will be of 9410 firms.

Moreover, this study follows the example of Habermann and Fische (2021) in including a wide range of industries in the sample. The following table provides an overview of the distribution of companies based on their TRBC Business Sector Name. This breakdown is essential in understanding the composition of the sample and the sectors that are most prevalent in the examination of the relationship between ESG scores and the Altman Z''-Score. Out of the initial total sample of 9422 companies, Industrials have the largest representation with 2150 companies, accounting for 22.8%. Consumer Cyclicals follow with 1680 companies, making up 17.8%, while Basic Materials and Technology have 1092 and 1214 companies respectively, representing 11.6% and 12.9% of the sample.

Table 4. Industry distribution of the sample's companies

TRBC Business Sector Name	Number of firms
Industrials	2150
Consumer Cyclicals	1680
Technology	1214
Basic Materials	1092
Consumer Non-Cyclicals	814
Healthcare	787
Energy	657
Real Estate	572
Utilities	453
Academic & Educational Services	3

4.4.1 Altman Z-Score as a proxy for financial performance

For this sample of companies, the financial data has been acquired from the Refinitiv database in order to calculate the Altman Z''-Score. The selected variables are the following:

- Total Assets: Total Assets [ATOT] represents the total assets reported by a company. In case the Total assets is not reported, it will be the sum of the following items: Total Current Assets [XTCA], Total Non-Current Assets [XNCA].
- Total Liabilities: Total Liabilities [STLB] refers to all current & non-current liabilities including short term and long-term debts. It excludes shareholders equity.
- Working Capital: Working Capital [SWCAP] represents a difference between the total value of current assets (Total Current Assets [STCA]) and the total value of current assets (Current Liabilities - Total [SCLT]).
- Retained Earnings/Total Assets: Retained Earnings - Total to Total Assets [RRETA] represents the ratio of Retained Earnings - Total [TR.F.RetainedEarnTot] divided by the value of Total Assets [TR.F.TotAssets].
- Ebit/Total Assets: Earnings before Interest & Taxes (EBIT) to Total Assets [SEBIT2TotAst] represents Earnings before Interest & Taxes (EBIT) [TR.F.EBIT] / Total Assets, PoP Avg [TR.F.TotAssetsPoPAvg]. Denominator should be positive. The data item is calculated for Annual periodicity only.
- Equity: Total Shareholders' Equity, it includes Minority Interest & Hybrid Debt [STLE] represents total equity after minority interest. It includes debt which has the characteristic of both debt and equity reported in the equity section, non-controlling Interest included within equity, and Total Shareholders' Equity Attributable to Parent Shareholders.

The following figure illustrates the descriptive statistics of the variable considered for the calculation of the Altman Z''-Score.

	Total Assets	Total Liabilities	Equity	RE/TA	Ebit/TA	Working Capital
Mean	12.247,05*	760,35*	4.644,41*	0,23	0,08	559,23*
Median	3.235,00*	1.871,46*	1.253,95*	0,25	0,07	161,28*
Maximum	497.114,00*	368.331,00*	213.115,77*	40,39	2,99	32.543,64*
Minimum	9,56*	-1.453,88*	-5.457,77*	- 7,47	- 1,97	-21.793*
Std. Dev.	30.723,93*	19.997,15*	12.340,99*	0,56	0,13	2.288,99*
Skewness	6,48	7,06	7,66	36,91	6,60	3,51*
Kurtosis	61,17	77,79	86,92	2.751,73	184,22	36,74*
Jarque-Bera	1,39*	2,27*	2,85*	2968,31*	12,96*	0,46*
Probability	-	-	-	-	-	-
Sum	115.391.785,27*	71.640.441,83*	43.759.694,02*	2.169,03*	784,45*	5.269.128,28*
Sum Sq. Dev.	8,89	3,77	1,43	2.991,30	152,75	4,94
Observations	9.422	9.422	9.422	9.422	9.422	9.422

* The numbers are expressed in units of thousands.

Table 5. Variables Descriptive Statistics

As previously explained, the Altman Z''-Score is calculated as:

$$Z''\text{-}Score = 6{,}56A + 3{,}26B + 6{,}72C + 1{,}05D$$

Where:

A = WC / TA

B = RE / TA

C = EBIT / TA

D = EQUITY / TL.

The Altman Z''-Score is used in this study to evaluate the financial stability of companies. A firm with an overall score of above 3 is considered safe, while a company with a score under 1.8 is considered in financial distress. In our sample of firms, 45% can be considered “safe”, while 33% are in “financial distress” and about 24% are in the “grey zone”.

The countries with the highest percentages of companies in the Safe Zone are Switzerland (72.6%), the United Kingdom (56.6%), and Denmark (70.8%). The countries with the highest percentages of companies in the Distress Zone are Spain (47.2%), Greece (44.2%), and

Portugal (15.6%). The countries with the highest percentages of companies in the Grey Zone are Austria (55.5%), Italy (25.1%), and the Netherlands (23.8%). The table below shows the distribution of companies across the three financial health categories (Safe Zone, Distress Zone, and Grey Zone) based on their Altman Z-scores in various countries.

Country	Safe Zone	Distress Zone	Grey Zone
United Kingdom	1230	788	526
Germany	436	274	268
France	248	379	215
Sweden	392	179	197
Switzerland	515	100	134
Spain	103	226	100
Italy	100	211	71
Netherlands	100	164	87
Ireland; Republic of	149	88	92
Finland	131	69	101
Denmark	176	22	67
Belgium	90	113	50
Norway	106	58	51
Poland	84	68	39
Austria	69	32	81
Russia	100	19	19
Luxembourg	49	42	42
Greece	41	59	18
Portugal	13	56	5
Hungary	10	5	21
Jersey	13	8	7
Cyprus	19	3	5
Malta	7	5	5
Guernsey	9	0	2
Isle of Man	6	2	6
Ukraine	12	0	0
Czech Republic	0	0	11
Monaco	0	7	0
Gibraltar	1	2	2

Table 6. Altman Z''-Score by country

The total average Altman Z''-Score of the 9.410 observation was 3.21, with the highest value being 132.39 and the lowest being -38.00, as we can see in the following figure. In the context of the Altman Z''-Score model, a mean Z''-Score of 3.21 suggests a relatively moderate level of financial health or solvency on average for the entities or companies in the sample.

Table 7. Altman Z''-Score Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Altman Z''-Score	3,21	2,73	132,39	- 38,00	4,36	12,94	347,19

However, based on the table of the average Z-scores per year and industry, it can be observed that there are variations in the Z-scores among different industries and years. The highest average Z-score value is observed in the Healthcare sector in 2016, with a value of 4.57, followed by the Basic Materials sector in 2011. However, from the graph we notice that, overall, the sector with the highest Z-score value over the years has been the Consumer Cyclicals. Conversely, the lowest average Z-score values are observed in the Energy sector in 2021, with a score of 1.86, and in the same sector in 2020, with a score of 2.94. These low scores suggest a high risk of bankruptcy within the Energy sector during those years, this may be caused by the fact that in 2020 there was a significant drop in oil prices due to the COVID-19 pandemic and the resulting decrease in demand for oil, which could have affected the Energy sector's financial performance.

Table 8. Average Altman Z''-Score per year and industry

Industry	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Utilities	2,29	1,95	1,92	1,80	1,76	1,62	1,70	1,87	1,60	1,90	1,99
Consumer Cyclicals	3,84	3,82	4,25	4,25	4,31	4,21	4,10	4,38	4,29	3,44	3,00
Energy	3,70	3,77	3,84	4,09	3,56	3,39	3,15	3,33	3,40	2,94	1,86
Basic Materials	4,56	4,06	4,03	3,70	3,93	3,69	3,86	3,98	3,80	3,53	3,59
Industrials	2,64	2,52	2,53	2,59	2,51	2,52	2,52	2,71	2,88	2,73	3,00
Technology	3,17	2,94	2,89	3,01	2,73	3,20	3,02	3,58	3,57	3,13	3,39
Consumer Non-Cyclicals	2,78	2,67	2,57	2,61	2,40	2,88	2,50	2,74	2,96	2,68	3,01
Healthcare	4,29	3,80	3,75	4,19	4,11	4,57	4,09	3,75	3,94	3,59	3,61
Real Estate	2,29	2,16	2,37	2,21	2,72	2,78	2,79	2,98	3,00	2,73	2,60

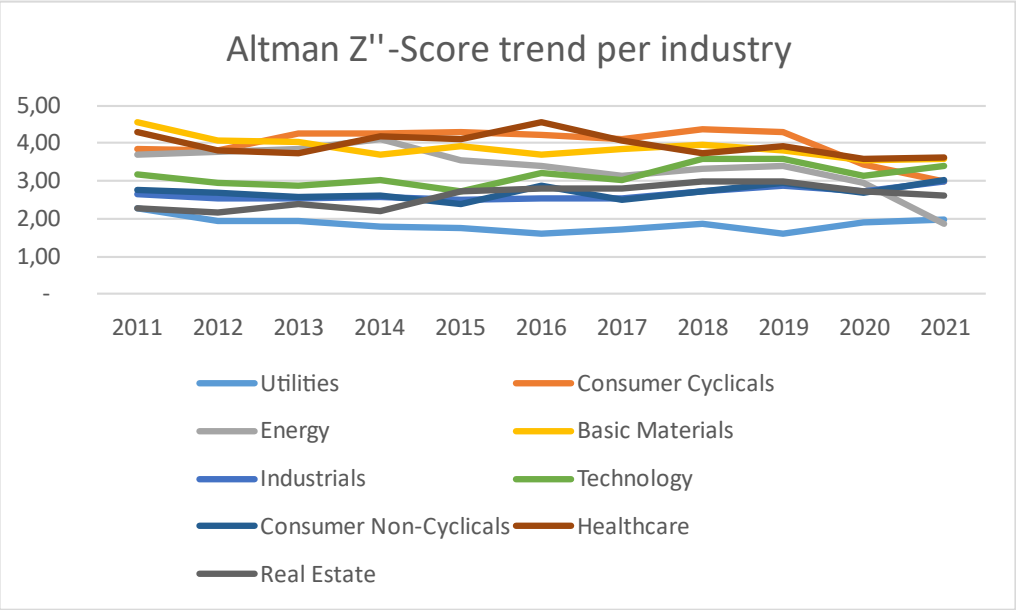

Figure 12. Trend of the Altman Z''-Score per industry over years

Overall, the average Altman Z''-score has fluctuated over the years but has remained relatively stable. It started at 3.34 in 2011, decreased slightly in 2012 and 2015, and reached its peak in 2019 with a score of 3.41 which may reflect the fact that in 2019 the global economic environment was relatively stable, with many economies experiencing growth. However, the lower Altman Z-score was registered in in 2020 with a score of 3.05, this could be due to the COVID-19 pandemic which caused significant economic disruption, with many businesses facing financial challenges due to lockdowns, reduced consumer spending, and supply chain disruptions.

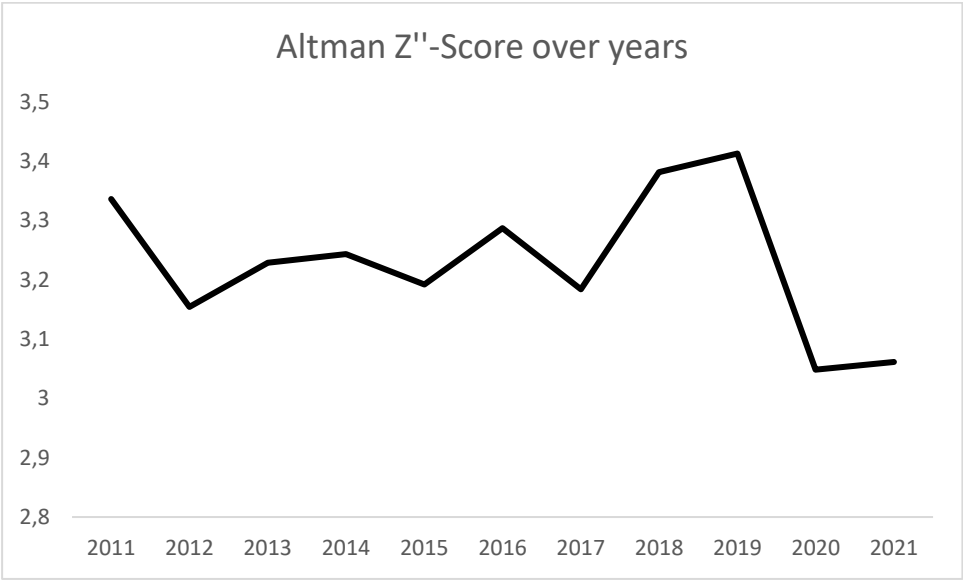

Figure 13. Trend of the Altman Z''-Score over years

4.4.2 Refinitiv ESG Combied Score as a proxy for ESG Performance

For what concerns the enviromental, social and governance sustainability of the companies, the Refinitiv ESG Combined Score is used as an index. As previously illustrated, the firms with a score above 50 are considered with a relative good ESG perfomance, while the ones with a lower value are regard as insufficiently transparent about their policies. The ESG Combied Score is described by the Refinitiv database as “a comprehensive company score derived from the reported information in the environmental, social, and corporate governance pillars (ESG Score), with an ESG Controversies overlay.” Three other ESG score are taken into consideration to see which of the Enviromental, Social or Governance factors influence more the financial perfomance of the company. These are:

The Environmental Pillar Score assesses a company's impact on living and non-living natural systems, encompassing air, land, water, and complete ecosystems. It assesses the extent to which a company utilizes best management practices to address environmental risks and capitalize on opportunities, with the overarching goal of creating long-term shareholder value.

The Social Pillar Score evaluates a corporation's ability to build trust and loyalty with its customers, employees and society through the implementation of best management practicesIt mirrors the firm’s reputation and the robustness of its license to operate, crucial factors influencing its capacity to create lasting shareholder value.

The Governance Pillar Score concentrates on the systems and processes within a company, guaranteeing that its board members and executives act in the best interests of long-term shareholders. This score underscores the company's capability, through the adoption of best management practices, to navigate and oversee its rights and responsibilities. By establishing incentives and implementing checks and balances, the company aims to generate long-term shareholder value.

In our sample, the average ESG score is 53.34, slightly higher than the average ESG Combined Score (51,24), as expected. Among the three ESG Pillars, the Social Pillar Score has the highest average of 56.34, indicating that companies tend to perform better in that area. However, the maximum score can be found in the Environmental Pillar Score, reaching 99.21. On the other hand, the Environmental Pillar Score also has the minimum value of 0, indicating that there is a wide range of performance among the companies in this pillar. This is proved by the fact

that this Pillar also exhibits the highest standard deviation, suggesting that this is the area where the performance of firms varies the most. We can observe the descriptive statistics of the ESG Scores and its pillars in the figure below.

	Mean	Median	Maximum	Minimum	Std. Dev.
Enviromental Pillar Score	49,93	51,63	99,21	-	26,64
Governance Pillar Score	51,50	51,95	98,58	0,48	22,08
Social Pillar Score	56,34	57,82	98,46	0,26	23,29
ESG Score	53,34	54,43	95,30	0,63	19,91
ESG Combined Score	51,24	51,81	93,92	0,62	18,78

Table 9. ESG Scores Descriptive Statistics

Moreover, the ESG scores change for different industries and over the years. As we can see from the tables below, the average ESG combined score steadily increased from 46.16 in 2011 to 53.71 in 2018, after which it began to decline to 50.69 in 2021. Moreover, the average Environmental score peaked at 53.17 in 2014, and then showed a general declining trend with a significant drop to 46.14 in 2021. The average Social score, on the other hand, displayed a continuous upward trend from 49.21 in 2011 to 61.27 in 2018, followed by a slight decline in the past two years. The average Governance score, after a brief peak of 51.82 in 2016, remained relatively stable at around 51.0, except for a significant increase to 53.72 in 2021.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Average ESG combined score	46,16	49,30	49,81	50,66	51,14	52,74	53,59	53,71	51,86	51,85	50,69
Average ESG score	49,12	52,06	52,22	53,14	53,29	54,31	55,57	55,95	53,63	53,66	52,67
Average Enviromental Score	48,74	52,21	51,91	53,17	52,14	51,94	52,81	51,87	48,16	48,38	46,14
Average Social Score	49,21	52,07	53,11	54,32	55,16	56,94	59,53	61,27	58,59	58,12	55,70
Average Governance Score	48,58	50,87	50,18	50,48	50,81	51,82	51,62	51,38	51,18	51,79	53,72

Table 10. Average ESG Scores per year

Overall, the data highlights the increasing importance of ESG practices in recent years, but also suggests some variations and fluctuations in the individual E, S, and G scores. The largest increase was observed in the Social score, while the Environmental score had the largest decrease over the years.

This Table 10 shows the ESG (Environmental, Social, and Governance) combined scores for different industries over the period from 2011 to 2021. We notice that the Utilities sector consistently had the highest ESG combined score throughout the years, with a high of 58.07 in 2014. This indicates that the Utilities sector has been the most sustainable industry over the years. On the other hand, the Healthcare and Technology sectors have the lowest average ESG

scores over the years, with scores ranging from 39.87 to 49.85 and from 44.62 to 47.56, respectively. This suggests that these sectors have performed relatively poorly in terms of environmental, social, and governance practices. The reasons for this could vary, but it may be due to the nature of the industries, as healthcare companies the Healthcare sector has faced various controversies related to drug pricing, patient safety, and ethical issues surrounding clinical trials while technology companies have a significant impact on the environment through the production, use, and disposal of electronic devices, and have been criticized for its lack of diversity and inclusion, with a lower representation of women and people of colour in leadership positions compared to other sectors.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Utilities	52,85	55,67	56,18	58,07	57,10	56,99	56,89	57,42	55,67	55,65	55,18
Consumer Cyclicals	47,63	51,50	50,20	50,64	51,39	50,69	53,21	53,71	52,25	53,13	51,06
Energy	45,58	50,87	50,47	51,41	49,59	50,36	50,59	52,40	53,21	52,80	49,06
Basic Materials	49,38	50,34	51,37	51,79	54,83	57,09	57,62	57,16	55,91	55,36	55,09
Industrials	44,74	47,82	48,57	50,06	49,83	52,58	51,86	51,78	49,41	49,63	48,47
Technology	44,62	46,82	49,21	49,12	49,03	51,58	53,21	53,07	50,24	49,26	47,56
Consumer Non-Cyclicals	46,36	47,26	49,04	50,36	51,77	54,65	56,66	56,12	52,26	53,25	54,77
Healthcare	39,87	46,11	46,67	48,17	48,28	50,40	50,41	50,72	50,28	50,07	49,85
Real Estate	44,28	50,02	48,75	48,83	50,78	52,84	54,48	54,83	53,40	54,03	54,96

Table 11. Average ESG Combined Score per year and industry

From the Table 11, we can see that the average ESG combined score has been increasing gradually from 46.16 in 2011 to 52.74 in 2016. This indicates that companies were becoming more conscious of their ESG performance and were taking steps to improve it. However, the trend seems to have slowed down in recent years, with the average score decreasing to 50.69 in 2021.

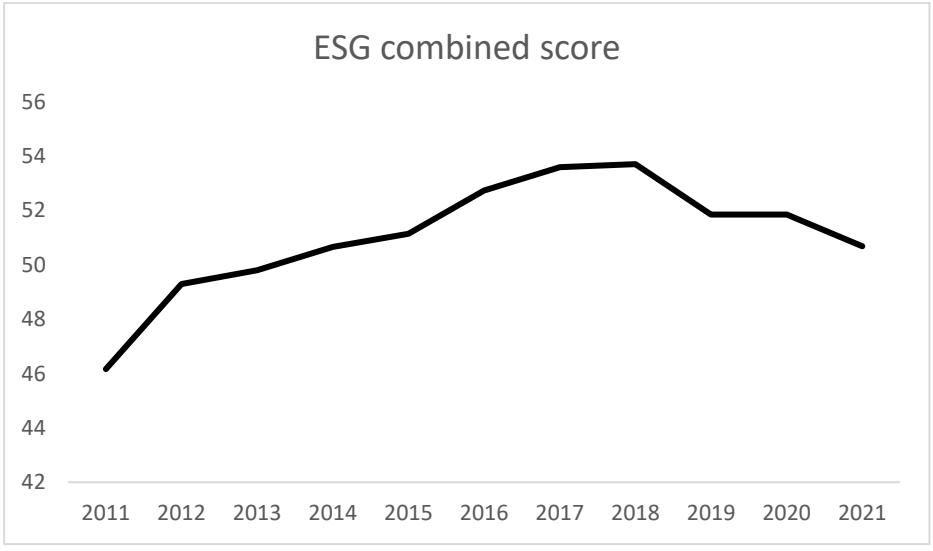

Figure 14. Trend of the ESG combined score over years

Below we can see the comparison of the Altman Z-score and the ESG combined score over the years. From the table, we can see that both scores fluctuated over the years. The Altman Z-score started at 3.34 in 2011, decreased to 3.15 in 2012, and fluctuated between 3.15 and 3.41 in the subsequent years, with the lowest score recorded in 2020. On the other hand, the ESG combined score started at 46.16 in 2011, increased to 53.59 in 2017, and fluctuated between 50.69 and 53.71 in the following years, with the lowest score recorded in 2021. By comparing the two average scores, we can see that there is no clear relationship between them. In some years, the Altman Z-score and the ESG score moved in the same direction, while in other years, they moved in opposite directions. Consequently, further analysis is needed to understand the factors that influence both scores and the relationship between them.

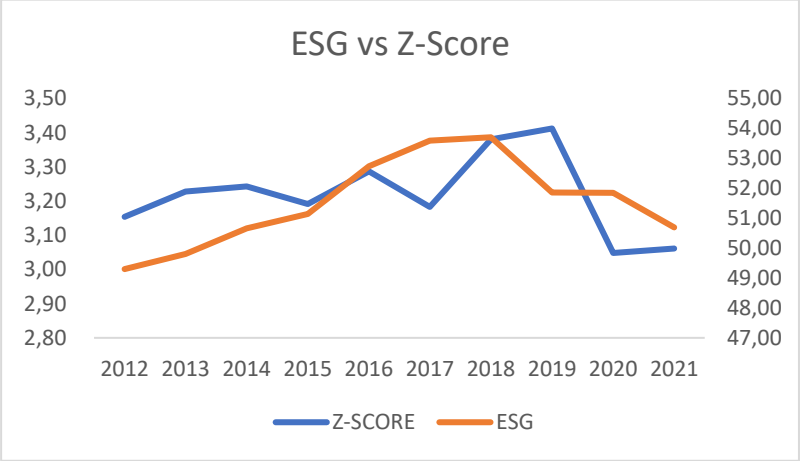

Figure 15. Comparison between ESG Score and Altman Z''-Score over the years

In the following figure we can observe the correlation between the Z-Score and the ESG Pillars Score. As we can see, the ESG Pillars score have a quite strong correlation with each other, in particular, the Social Pillar Score shows a moderate positive correlation with environmental, and governance scores, indicating that companies with stronger social performance often perform well in the other areas too. However, we notice that the Altman Z''-Score seems to have a weak negative correlations with all the other scores, suggesting a slight tendency for companies with higher Altman Z''-Scores (lower bankruptcy risk) to have lower scores in the ESG scores. However, this may be caused by the fact that the positive effect of investing in ESG matters may be delayed. ESG considerations often involve long-term sustainability efforts, such as reducing environmental impact, improving corporate governance practices, and fostering positive social impacts. These initiatives may take time to yield measurable

results and translate into improved financial performance or risk management. Therefore, it is possible that the positive effects of investing in ESG matters are not fully captured by the correlation coefficients in the table. It is important to consider the time lag between implementing ESG practices and observing their impact on financial indicators or other metrics. We will do that in the following chapter, by analysing the data with a regression analysis.

In the table we also consider the Return on Asset (ROA), which measures a company's profitability by determining the amount of profit generated relative to its total assets. It is an important financial ratio that is widely used by investors, analysts, and stakeholders to evaluate a company's efficiency and profitability. It is also used to compare the financial performance of different firms within the same industry or across industries. This score can also be used to evaluate whether Altman Z-Score is reliable in calculating the firms' probability of bankruptcy. As we would expect, the ROA seems to be positively correleted with the Z-Score, indicating that companies with higher profitability tend to have a lower probability of bankruptcy.

	Enviromenal Pillar Score	Governance Pillar Score	Social Pillar Score	ESG Combined Score	Altman Z''-Score	ROA	Total asset	Leverage	GDP per capita	Industry	Year
Enviromental Pillar Score	1,00	0,34	0,69	0,76	-0,10	0,19	0,38	0,01	0,02	0,09	0,00
Governance Pillar Score	0,34	1,00	0,31	0,56	0,05	0,18	0,28	0,05	0,08	0,06	0,12
Social Pillar Score	0,69	0,31	1,00	0,77	-0,02	0,17	0,35	0,05	0,10	-0,03	0,05
ESG Combined Score	0,76	0,56	0,77	1,00	-0,02	0,08	0,18	0,04	0,08	0,01	0,06
Altman Z''-Score	-0,10	-0,05	-0,02	-0,02	1,00	-0,13	-0,12	0,42	0,93	-0,07	-0,04
ROA	0,19	0,18	0,17	0,08	-0,13	1,00	0,57	0,03	-0,02	0,14	0,05
Total asset	0,38	0,28	0,35	0,18	-0,12	0,57	1,00	0,04	0,07	0,23	0,00
Leverage	0,01	0,05	0,05	0,04	-0,42	0,03	0,43	1,00	-0,02	0,80	0,09
GDP per capita	0,02	0,08	0,10	0,08	0,93	-0,02	0,07	-0,02	1,00	-0,13	0,16
Industry	0,09	0,06	-0,03	0,01	-0,07	0,14	0,23	0,08	-0,13	1,00	0,00
Year	0,00	0,12	0,05	0,61	-0,04	0,05	0,00	0,09	0,16	0,00	1,00

Table 12. Correlation table

5. Empirical Analysis

The regression model in this chapter aims to analyze the relationship between ESG scores and CFP while controlling for other significant factors identified in prior research. The determinants considered in the regression model are based on the studies conducted by Kabir et al. (2020), Nadarajah et al. in (2020), Zhang et al. (2020), Baboukardos and Rimmel I (2016), Erragragui (2018), Cheng et al. (2014), Kang et al. (2016), Wang and Qian (2011), and Habermann and Fischer (2021).

By including these determinants as control variables, the aim is to isolate the specific impact of ESG scores on CFP while accounting for the influence of other relevant factors. The regression analysis will provide insights into the magnitude and significance of the relationship between ESG scores and CFP, shedding light on the potential effects of environmental, social, and governance practices on financial performance.

The chapter will present the results and analysis of the regression model and the findings, which will contribute to the understanding of how ESG scores relate to CFP while considering the effects of other determinants that have been previously identified in the literature.

5.1 Regressions results

The regressions results are shown in the figure below. There we can see that most of the variables have a p-value lower than 0.01, this indicator indicates the likelihood of observing the t-statistic if the true population coefficient is zero (i.e., if there is no relationship between the independent variable and the dependent variable). A low p-value (typically less than 0.05) suggests that the relationship between the variable and the dependent variable is statistically significant, which is the case for most of the variables in our regression except for the industry one. On the column to the right, we can than see the t-statistic which is calculated by dividing the estimated coefficient by its standard error. It helps determine whether the estimated coefficient is significantly different from zero. The greater the t-statistic, the stronger the evidence against the null hypothesis (that the coefficient is zero).

The initial regression analysis results reveal a subtle negative relationship between the Altman Z-Score at time t and the ESG Score at time t. This unexpected finding suggests that a higher ESG Score is associated with a slight decrease in the Z-Score, approximately around -0.01.

This outcome, while not aligning with our initial expectations, could potentially be attributed to several factors. One possible explanation is that the positive effects of ESG investments on a firm's financial health might require a longer time horizon to materialize fully. Such impacts might not be immediately evident within the scope of this analysis, thus accounting for the observed negative correlation.

Additionally, it's worth considering the modest size of the sample used in this analysis. With a limited sample size, the observed correlation might not accurately capture the broader reality of the relationship between ESG Scores and the Altman Z-Score.

	Altman Z''-Score	t-Statistic
Constant	2,213 ***	-3,574
Esg Combined Score	-0,017 ***	-6,962
Size	0,068 **	2,277
ROA	11,747 ***	29,692
Leverage	-7,305 ***	-29,441
GDP per capita	0,000 ***	6,060
Industry	-0,815	-0,554
Year	0,423 ***	4,828
R-squared	0,185	
Adjusted R-squared	0,184	
F-Statistic	287,921	

*p < 0.1, **p < 0.05, ***p < 0.01. T-statistics are reported in parentheses.

Table 13. Z''-Score regression results for ESG Combied Score

Regarding the firms' size within the sample, the positive coefficient (0.06753) indicates that larger companies, characterized by greater size or total assets, tend to exhibit a higher Altman Z''-Score. This pattern may stem from larger companies having a more diverse revenue base, increased access to capital resources, and other factors that bolster their financial stability.

As anticipated, the positive relationship between Return on Assets (ROA) and the Altman Z''-Score aligns with expectations. The substantial positive coefficient (11.7471) underscores that a heightened ROA is robustly linked to an elevated Altman Z''-Score. This observation implies that companies yielding greater profitability relative to their assets typically command higher scores, signalling improved financial health. Given ROA's role in assessing financial performance, its alignment with the Altman Z-Score strengthens its standing as a reliable gauge of financial robustness.

Likewise, the expected inverse correlation between leverage and the Altman Z''-Score is substantiated by the negative coefficient (-7.304757). This finding underscores that elevated debt levels escalate the likelihood of bankruptcy. This resonates with the notion that companies burdened by substantial debt could face heightened financial distress, potentially jeopardizing their capacity to meet loan obligations.

Conversely, GDP per capita's near-neutral coefficient of 0.000 suggests that a nation's economic condition has a relatively modest impact on firms' bankruptcy probabilities—especially within Europe. This might be attributed to the overall stability and similarity of European countries' economic conditions, which mitigates pronounced discrepancies.

Turning to industry dummy variables, certain sectors such as Utilities, Oil and Gas, and Basic Materials appear to exhibit higher vulnerability to failure, yet the lack of statistical significance necessitates cautious interpretation. Importantly, the analysis indicates that, despite the challenges posed by the COVID-19 pandemic, the Altman Z''-Score did not exhibit a significant reduction among the sampled firms during this period.

In general, for this regression model an R-squared value of 0.185 is observed. The R-squared represents the proportion of the variance in the dependent variable (Altman Z''-Score in this case) that is explained by the independent variables included in the regression model. It's a measure of how well the model fits the data. In this case, an R-squared value of 0.185 means that approximately 18.5% of the variability in the Altman Z''-Score is explained by the independent variables (ESG scores, size, ROA, leverage, etc.) included in the model. A higher R-squared value indicates a better fit, but it's important to note that R-squared alone doesn't tell you if the model is statistically significant or if the independent variables are causally related.

In conclusion, the observed relationships between the various variables largely align with expectations, except for the unexpected link between the ESG Score and the Altman Z''-Score. However, this could be a result of various factors that warrant further exploration. Future research might delve into longer-term trends and a more extensive dataset to better comprehend the intricate interplay between ESG practices and financial health. Hence, in the subsequent regression analyses, we aim to examine the connection between the ESG Score and the Altman Z-Score while introducing a time lag between the two variables. This strategic approach seeks to capture potential delayed effects and more accurately assess how changes in ESG practices might eventually impact the Altman Z-Score. By extending the time frame between measurements, we anticipate gaining deeper insights into the temporal dynamics of this relationship and better understanding the potential influence of ESG initiatives on a company's financial health. This methodological shift will contribute to a more comprehensive exploration of the intricate interaction between ESG practices and the Altman Z-Score, allowing us to uncover potentially hidden patterns that might not have been evident in the initial analysis.

In addition to exploring the temporal relationship, we will also conduct analyses to dissect the impact of individual E, S, and G scores on the Altman Z-Score. By examining each aspect

separately, we seek to determine which specific facet—Environmental (E), Social (S), or Governance (G)—exerts a more pronounced influence on the Altman Z-Score.

Through this granular approach, we aim to discern whether any one of these dimensions holds a stronger sway over the financial health of the company, as indicated by the Altman Z-Score. This nuanced examination will provide valuable insights into which aspect of ESG practices might be particularly critical in shaping a company's overall financial stability. Such insights could guide organizations and policymakers in focusing their efforts more effectively to enhance financial performance through targeted ESG improvements.

Below, we present the outcomes of the regression model using individual ESG Scores in separate figures. Each figure illustrates the results when exclusively considering one of the ESG Scores.

	Altman Z''-Score	t-Statistic
Constant	0,845	1,227
Enviromental Pillar Score	-0,009***	-3,650
Social Pillar Score	-0,009***	-3,643
Governance Pillar Score	-0,006***	-2,915
Size	0,159***	4,709
ROA	10,883***	29,450
Leverage	-7,772***	-30,840
GDP per capita	0,000***	5,969
Industry	-0,180	-1,188
Year	0,414***	4,580
R-squared	0,192	
Adjusted R-squared	0,190	
F-Statistic	239,418	

*p < 0.1, **p < 0.05, ***p < 0.01.

Table 14. Z''-Score regression results for each ESG Pillar Score

All Pillar Scores demonstrate a marginal negative correlation with the Altman Z''-Score, with the Social Pillar Score with the Governance Pillar Score exhibiting the highest magnitude of influence. However, it's noteworthy that the coefficient of determination (R-squared) for these specific regressions falls below 0.2.

This outcome indicates that a relatively small proportion of the variability in the Altman Z''-Score can be elucidated by the variations in the individual Pillar Scores. The modest R-squared values imply that other factors, beyond the Pillar Scores, contribute significantly to the financial health of the companies. While the observed negative relationships between the Pillar Scores and the Altman Z''-Score are noteworthy, their limited explanatory power calls for a comprehensive exploration of additional variables that may collectively shape a company's financial stability.

If we take into consideration a time lag of one year, between the ESG $Score_{t-1}$ and the Altman Z''-$Score_t$, we find that the ESG Combined Score exhibits a positive relationship with the Altman Z''-Score, contrasting with previous regressions where the relationship was negative, as we can see in the following figure.

	time lag of 1 years		*time lag of 2 years*		*time lag of 5 years*	
	Altman Z''-Score	t-Statistic	Altman Z''-Score	t-Statistic	Altman Z''-Score	t-Statistic
Constant	9,504 ***	11,123	9,512 ***	11,033	6,9233 *	5,897
ESG Combined Score	0,007 **	2,349	0,005 **	2,124	-0,0009	-0,219
Size	-0,277 ***	-6,802	-0,271 **	-6,729	-0,153 ***	-2,807
ROA	-0,000 **	-2,210	0,000 **	-2,323	0,000 **	-2,109
Leverage	-6,275 ***	-18,183	-6,287 ***	-18,218	-6,506 ***	-14,225
GDP per capita	0,000 ***	4,524	0,000 ***	4,448	0,000 ***	4,461
Industry	-0,238	-1,676	-0,240 *	-1,695	0,104	0,404
Year	-0,200	-1,811	-0,178	-1,623	-0,116	-0,855
R-squared	0,220		0,189		0,202	
Adjusted R-squared	0,217		0,189		0,197	
F-Statistic	68,156		303,252		38,212	

*p < 0.1, **p < 0.05, ***p < 0.01.

Table 15. Altman Z''-Score regression results for a time lag of 1, 2 and 5 years.

This discrepancy underscores the temporal dimension's importance, as the time lag appears to invert the relationship's direction. A plausible explanation is that ESG initiatives might take time to materialize into tangible financial impacts, hence the observed shift from a negative association without the time lag to a positive one with it. These results underscore the dynamic nature of ESG pillars and their intricate interplay with financial health, offering valuable insights for both scholarly discourse and practical decision-making.

A comparable outcome emerges when incorporating a two-year time lag. In this scenario, the coefficient value for the ESG Combined Score remains positive at 0.005, though slightly lower than its prior counterpart. This suggests that the ESG investment's efficacy might peak after a year and subsequently exhibit a gradual decline over time. Intriguingly, with a five-year time lag, the coefficient value takes on a negative stance, measuring -0.0009. Nonetheless, its associated p-value of 0.82 indicates a lack of statistical significance. This implies that, within the given time frames, the ESG's potential influence on the Altman Z''-Score might not maintain a significant pattern over extended periods.

For what concern the regression model with a time lag of 10 years, the results are not statistically significant.

5.2 Summary of results and limitations

The regression results provide valuable insights into the relationship between various factors and the Altman Z''-Score, a measure of a firm's financial health. Most of the variables exhibit statistically significant relationships with the Altman Z''-Score, with p-values below 0.01, indicating their importance in understanding financial stability.

Notably, the study unveils an unexpected negative relationship between the ESG Score and the Altman Z''-Score, suggesting that a higher ESG Score is associated with a slight decrease in the Z-Score. This counterintuitive finding may be attributed to the potential time lag required for the positive effects of ESG investments on financial health to materialize fully. However, a critical and illuminating discovery emerges when introducing a time lag between the ESG Score at time t-1 and the Altman Z''-Score at time t. This strategic approach reveals a positive relationship, thereby partially confirming our hypotheses. This shift in the relationship suggests that the beneficial impact of ESG initiatives on financial health might manifest with a delay, challenging the notion of immediate returns.

Moreover, the analysis reveals that larger firms tend to exhibit higher Altman Z''-Scores, indicating greater financial stability. The expected positive relationship between Return on Assets (ROA) and the Altman Z''-Score aligns with financial theory, highlighting the importance of profitability in financial health assessment. Conversely, the negative relationship between leverage and the Altman Z''-Score underscores the potential risk of elevated debt levels in contributing to financial distress.

Regarding the impact of GDP per capita on bankruptcy probabilities, the near-neutral coefficient suggests that, within the European context, economic conditions may not significantly affect firms' financial stability, likely due to overall economic stability in European countries.

While certain industries appear to have higher vulnerability to failure, the lack of statistical significance necessitates cautious interpretation. Importantly, the study indicates that the Altman Z''-Score did not significantly decrease among the sampled firms during the COVID-19 pandemic.

However, the overall explanatory power of the regression model, as indicated by an R-squared value often lower than 0.20, suggests that the variables considered in the model explain only a limited portion of the Altman Z''-Score's variability. This underscores the importance of investigating additional factors that contribute to financial stability.

In conclusion, the study's findings, while generally aligning with expectations, reveal intriguing insights, particularly the complicated and flexible relationship between ESG Scores and the Altman Z-Score. To delve deeper into this complex matter, further study needs to explore longer-term trends and a larger dataset and using different financial index to assess if there is a strong relationship between CFP and ESGP.

This study most important finding is that it recognizes the influence of temporal dynamics, where a time lag can invert the direction of relationships. This underscores the importance of considering the time dimension in assessing the impact of ESG initiatives on financial health. While the results provide valuable insights for both academia and practical decision-making, further research is needed to fully comprehend the intricate relationship between ESG practices and financial stability, accounting for various time frames and dimensions of ESG performance.

6. Conclusions

In conclusion, this thesis tried to unravel the intricate relationship between Environmental, Social, and Governance (ESG) practices and corporate financial health, as measured by the Altman Z''-Score. Through a comprehensive analysis of a diverse set of variables, including ESG Scores, firm size, Return on Assets (ROA), leverage, industry characteristics, and economic conditions, our study has provided valuable insights into the multifaceted nature of this connection.

The initial findings, showed an unexpected negative relationship between the ESG Score and the Altman Z''-Score. This counterintuitive result prompted a deeper exploration, revealing that when a time lag is introduced, the relationship turns positive. This revelation underscores the dynamic nature of ESG initiatives and their intricate interplay with financial health, suggesting that the benefits of ESG investments may materialize gradually over time.

Additionally, our analysis has confirmed several established relationships, such as the positive association between firm size and financial stability, the expected positive correlation between ROA and the Altman Z''-Score, and the negative link between leverage and financial health. These findings reinforce the significance of these variables in assessing corporate financial robustness.

Despite these valuable insights, this study recognizes certain limitations, including the use of a modest sample size and the need for more extensive data to capture longer-term trends accurately and to test a possible non-linear relationship between the variables. Furthermore, the complex nature of ESG practices warrants further investigation into the individual impacts of Environmental (E), Social (S), and Governance (G) scores on financial health.

In light of these findings and limitations, this research points to a dynamic and evolving landscape where ESG practices play an increasingly critical role in shaping corporate financial health. As the world grapples with sustainability challenges and heightened awareness of corporate responsibility, understanding the intricate interplay between ESG practices and financial stability becomes ever more vital.

Future research should explore more extended timeframes, delve into specific industry dynamics, test a possible non-linear relationship, and analyze the nuanced effects of E, S, and G scores separately to build a more comprehensive understanding of this relationship. Such insights will not only contribute to scholarly discourse but also guide organizations and policymakers in harnessing the potential of ESG initiatives to enhance financial performance and sustainability in an ever-changing business landscape.

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