Assessing the Influence of Sustainability on Financial Distress: An Empirical Study of Listed Companies in the UK

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Abstract:

Recently, there has been significant interest in environmental, social, and governance (ESG) factors as a means to achieve sustainability and foster competitiveness among companies. Therefore, is the incorporation of ESG (Environmental, Social, and Governance) factors essential in preventing financial distress? The main objective of this research is to determine the effect of sustainability, specifically in terms of Environment, Social, and Governance (ESG) scores, and other firm-specific determinants on the Altman Z score within the London Stock Exchange (LSE). To achieve this objective, the study used a sample of 1,814 non-financial companies in the UK, comprising 31,847 observations from 2002-2021. The research employed the Altman Z score to measure financial distress. The sample was divided into financially distressed companies and non-financially distressed companies. The results reveal a significant difference between financially distressed and non-financially distressed companies regarding ESG. For financially distressed companies, poor governance practices, low profitability, and high leverage significantly contribute to financial distress, while tangibility and firm size negatively affect financial distress. For non-financially distressed companies, lower environmental scores pose regulatory risks, but higher social scores, profitability, and liquidity enhance financial stability. Therefore, higher profitability, social score, low debt ratio, and liquidity decrease the likelihood of financial distress for non-financial companies.

Keywords: environment score, social score, governance score, financial distress, sustainability.

"تقييم تأثير الاستدامة علي التعثر المالي للشركات؛ دراسة تطبيقية على الشركات المدرجة بالبورصة في المملكة المتحدة"

المستلخص:

لقد ظهر في الاونة الأخيرة اهتمام كبير بالقضايا البيئية والاجتماعية وحوكمة الشركات (ESG)، وذلك بهدف تحقيق الاستدامة التي تمثّل عنصرا ضروريا في تحقيق الميزة التنافسية بين الشركات. فهل يمكن ان يساعد تحقيق الاستدامة في منع حدوث التعثر المالي للشركات؟. لذلك ، فإن الهدف الرئيسي من هذه الدراسة هو قياس تأثير الاستدامة– من حيث المحددات البيئية و الاجتماعية وحوكمة الشركات– وغيرها من المحددات الخاصة بالشركة على التعثر المالي التي تم قياسه باستخدام Altman Z score للشركات المسجلة في بورصة لندن. وفي سبيل تحقيق هدف الدراسة، تم استخدام الدراسة النظرية والتطبيقية باستخدام عينة من الشركات غير المالية المدرجة في بورصة لندن، والتي تتكون من ٣١٨٤٧ ملاحظة لـ ١٨١٤ شركة من الفترة ٢٠٠٢ إلى ٢٠٢١ ، وتم تقسيم العينة الي شركات متعثرة ماليا وشركات غير متعثرة ماليا وفقا لـ Altman Z score. ومن اهم النتائج التي توصلت لها الدراسة هي اولا؛ ان هناك اختلاف ذات دلالة معنوية للمحددات البيئية والاجتماعية وحوكمة الشركات في الشركات المتعثرة ماليا عن الشركات الغير متعثرة ماليا. ثانيا؛ بالنسبة للشركات المتعثرة ماليا، فان ممارسات حوكمة الشركات السيئة وانخفاض الربحية، وارتفاع معدل الرفع المالي تساهم بشكل كبير في زيادة التعثر المالي. ثالثا؛ بالنسبة للشركات غير المتعثرة ماليا، فإن النتائج البيئية المنخفضة تشكل مخاطر تنظيمية، ولكن ارتفاع نتائج المحددات الاجتماعية، والربحية، والسيولة تعمل على تعزيز الاستقرار المالي وتساهم في تقليل التعثر المالي .

الكلمات المفتاحية: المحددات البيئية، المحددات الاجتماعية، محددات حوكمة الشركات، التعثر المالي، الاستدامة، المسئولية الاجتماعية للشركات، Altman Z score، ESG، الاداء المالي، الاستقرار المالي، الشركات المتعثرة ماليا، الشركات الغير متعثرة ماليا.

1- Introduction

"Be cautious of minor expenditures, as a small drip can ultimately cause a significant vessel to founder". Financial distress prediction has drawn the attention of researchers worldwide during the last fifty years. It is a useful method for identifying risk and is crucial for managers, investors, and policymakers. It has been extensively used in both academic and professional domains (Tang, 2020). Financial challenges can escalate a company's situation to a more critical state known as financial distress. Financial distress is characterized by a decline in performance attributed to inadequate management or a financial crisis. Predicting financial distress holds significant importance for companies in the current era of globalization. Typically, financial distress begins with mounting liquidity pressures (Affandi, 2015), then it progresses with diminishing assets, CEO resignations, reduced dividends, plant closures, layoffs, and a decline in stock prices (Sodo, 2015). Ultimately, it may culminate in an inability to meet financial obligations, pushing the company toward bankruptcy (Shumway, 2001). Hence, accurately predicting financial distress is crucial for companies in today's era of globalization.

Financial distress is a pressing issue across global markets, with the term gaining prominence, particularly in the United States since the 1930s (Kawshala, 2018). Often associated with poor financial structure and introducing financial risk to companies (Liu Wu, 2020), it signifies a stage of deteriorating financial conditions preceding bankruptcy or liquidation (Choy, 2011). This state is typically characterized by shipping delays, declining product quality, and deferred bill payments from banks (Ufo, 2015). Additional definitions highlight its occurrence when a company fails to meet creditor commitments, and its operations are on the verge of cessation (Binti, 2010). Similarly, Thakor (2015) proposes four categories for companies' financial distress: performance decline, failure, insolvency, and default. While insolvency and default are primarily associated with liquidity issues, a decline in performance and failure impact the firm's profitability (Ikpesu, 2020).

In the corporate realm, sustainability is commonly expressed using the phrases corporate responsibility and corporate sustainability. Under the

umbrella of business sustainability, the idea of corporate responsibility encompasses environmental, social, and governance aspects. The notion of ESG emerged as a result of the 2008 Global Financial Crisis, which showed the need of governance on a systemic level and its addition to corporate responsibility (Pålsson, 2021). ESG disclosure has grown in significance as an investment decision-making tool for institutional investors in recent years. Moreover, (ESG) factors have gained significant importance in recent years as investors recognize the need to consider sustainability and responsible corporate behavior. Beyond ethical considerations, ESG factors have also been found to have a direct impact on financial performance and risk management. Therefore, even though there exists separate literature on financial distress and ESG, limited research has delved into the correlation between financial distress and ESG (Boubaker, 2020). This paper explores the effect of sustainability on the financial distress in the United Kingdom, highlighting the growing relevance of ESG integration in investment decision-making.

The remainder of the paper is organized as follows. Section 2 presents the literature review and hypotheses development, Section 3 presents the empirical methodology employed, including sample, data collection, and measurement of variables. The results of the empirical analysis are reported in Section 4, while Section 5 concludes the paper.

2- Literature review and hypotheses development:

2-1- Financial distress:
Several theories serve to delineate the characteristics of a financially distressed firm, select predictors, and substantiate the functional relationship among these predictors. These theories include the Liquidity and Profitability, Theory Liquid Asset Theory, Credit Risk Theory, Liquidity Risk Theory and **pecking order theory** as proposed by Altman in 1993. **Liquidity and profitability theory** proposes that the firm can fail even if the profitability is worthy. If the firm's growth rate is expressively greater than the inner rate of return, its revenue flow can be insufficient to fund the expenditures and the firm is incapable to pay its obligations. Thus, the firm's profitability should be more than the company's growth rate (Isayas, 2021). According to (Thim, 2011), there is a negative relationship between

financial distress and liquidity (Ufo, 2015). On the same vein, **According to the credit risk theory,** when companies do not appropriately manage their credit risk, it will be financially distressed. Therefore, one of the early signs of financial distress is high credit risk.

On the other hand, The **Liquid Asset Theory**, in particular, elucidates financial distress within the context of cash flow. It posits that net cash flows relative to current liabilities should be the primary criterion for describing a company's financial distress condition. As per this theory, a firm is expected to face bankruptcy when the current year's profit or net cash flow is negative or falls below the level of debt obligations, termed "technical insolvency" (Isayas, 2021). Hence, negative cash flow stands as a warning sign for financial distress. Consequently, a firm is considered financially distressed when it experiences sustained periods of negative cash flows, where cash outflows exceed inflows, leading to inadequate operating cash flow to meet current obligations. This necessitates actions such as mergers and acquisitions (Kawshala, 2018), issuing additional capital, and engaging in restructuring and renegotiation of loan agreements (Arif Darmawan, 2018). **Furthermore, Liquidity risk theories** Indicates that the cycles of liquidity risk closely mirror business cycles, meaning that a deteriorating economy is likely to be succeeded by an increase in downgrades and defaults.

Leverage reflects the degree to which a company's operational activities are funded through debt. In accordance with the **pecking order theory**, an elevated leverage ratio heightens the risk of the company being unable to meet its financial obligations. This suggests that the corporate financial performance is suboptimal or indicative of financial distress, potentially resulting in a decline in the firm's overall value. Findings from studies conducted by Jaafar (2018) and Jiming (2011) provide evidence that the leverage variable significantly contributes to financial distress. In essence, a higher leverage indicates a greater likelihood of the company facing a situation of financial distress (Ufo A., 2015).

Numerous studies have explored the factors contributing to financial distress in companies, attributing them to either internal or external influences (Muigai, 2016; Ikpesu, 2018). Internal factors encompass issues such as poor management, over-trading, inadequate working capital management, managerial decision-making, and weaknesses directly or indirectly associated with management practices (Handoko et al., 2020; Kawshala, 2018). External factors include shifts in market demand, leverage, competition, fluctuations in commodity prices, and the loss of confidence among investors, creditors, and suppliers, along with weak corporate governance, among other aspects (Ikpesu, 2020). The causes of financial distress vary between developing or transitional economies and developed, flourishing economies (Karugu, 2018). In developing countries, financial distress often stems from insolvency, low liquidity, and insufficient cash flow, coupled with high leverage levels and a lack of future plans to address these challenges. In contrast, financial distress cases in developed countries often arise from decisions to finance projects through debt instead of equity, typically due to mismanagement. Financial distress can manifest in two main consequences for any business: insufficient cash flow to cover liabilities and a high level of debt on the liabilities side of the financial statement (Ikpesu, 2020).

Various distress prediction models have been employed in the literature, including the traditional Z-score (Altman E. I., 1968), then O-score (Ohlson, 1980), then probit model (Zmijewski, 1984), then hazard model (Shumway, 2001), and D-score model (Blum, 1974). The Altman Z-score, introduced by Altman in 1968, has been widely utilized as a measure of financial distress, especially when examining the relationship between a firm's financial risk and sustainability (Kristanti, 2017; Harymawan, 2021; Al- Hadi, 2019; Boubaker, 2020; Cooper, 2019). In the current research, we applied the Altman Z″-score model, as it is commonly used to assess the likelihood of financial distress (Kiraci, 2019).

2-2 Sustainability:

Several theories of corporate sustainability are discussed in the literature, and the most important three main theories- the stakeholder, legitimacy, and signaling theories -form the basis of ESG literature (Santamaria, 2021). Based on the **stakeholder theory**, the possibility for long-term success through interaction with different stakeholders (such as

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employees, customers, creditors, society, and the environment) is the emphasis of stakeholder theory. By satisfying the needs of many different stakeholders, nonfinancial data may help businesses thrive and stay afloat. However, other experts contend that dissatisfaction among stakeholders can undermine productivity and endanger a company's future. Growing economic performance is strongly encouraged by the satisfaction of various stakeholder groups (Orlitzky, 2003). The stakeholder concept holds that relationships between various stakeholders are related to a company's commitment to reporting non-financial characteristics. By involving stakeholders, businesses can choose the proof to include in their sustainability report more effectively. Moreover, the theory posits that increased investments in Corporate Social Responsibility (CSR) can generate moral capital or goodwill. This accrued moral capital and goodwill serve as a protective mechanism, functioning like insurance to mitigate the firm's exposure to risks (El Ghoul, 2017).

In addition, one of the most well-known methods in social and environmental accounting is **legitimacy theory**. There is an implicit social agreement between certain businesses and the society in which they operate (Suchman, 1995). Companies employ transparency tactics to improve their overall societal acceptability. Moreover, legitimacy is a state or circumstance in which an entity's values are in line with those of the larger social system to which it belongs (Saini, 2023). As a result, this theory suggests that businesses make social contracts with other businesses and agents in an open system. Non-financial disclosures in corporate reports are one strategy for establishing credibility in this environment (Lindblom, 1994).

Moreover, in line with **signaling theory**, corporations participate in ESG initiatives as a strategy to minimize information asymmetry and establish a low-risk position in market perceptions. Elevated information asymmetry tends to breed skepticism about a company's operations, causing investors to hesitate in making investments or demand a higher risk premium, perceiving greater riskiness. In empirical terms, companies implementing responsible practices often display higher beta or systematic risk values, indicating that their stocks might be more sensitive to market fluctuations (Charlo, 2015).

Nonetheless, they still demonstrate less volatility compared to overall stock market fluctuations. It's essential to recognize that the stability of a company's stock market performance does not necessarily align with its inclination to engage in socially responsible activities (Saini, 2023).

Sustainability has been identified as a means to mitigate risk (Pålsson, 2021). Companies exhibiting elevated sustainability levels are observed to face reduced financial distress risk (Boubaker, 2020) and a diminished likelihood of bankruptcy (Cooper, 2019). In the first place, environmental concerns involve safeguarding the environment and encompass aspects such as climate change, carbon emissions, pollution, waste management, and water usage. Conversely, social initiatives reflect the efforts businesses make in supporting human rights, diversity, inclusion, consumer satisfaction, and even data security. Meanwhile, governance structures assess optimal business practices, considering factors like board composition, executive compensation, audit committee arrangement, lobbying, and corruption. Since the beginning of the last decade, stakeholder interest—spanning politics, investors, employees, and the general public—in sustainability issues has surged significantly. There has been a notable increase in both the demand for sustainable practices and the dissemination of information regarding business sustainability efforts (Antunes J. W., 2023).

2-3- The sustainability and financial distress:
2-3-1- Distressed and non- distressed companies:
In recent years, the idea of ESG has changed to accommodate societal demands related to the benefits and hazards of corporate sustainable action. Additionally, there is a lot of discussion about ESG-related company-level issues (Boffo & Patalano, 2020). Therefore, the company in a weakened financial position is less inclined to undertake corporate social responsibility (CSR) investments (Campbell, 2007). This reluctance stems not from a lack of intention but rather from insufficient capital (Harymawan, 2021). A financially distressed company may find itself compelled to adopt a cost-cutting strategy, and the apprehension of potential resource loss diminishes its motivation to attain enhanced sustainability performance.

Conversely, other scholars posit that companies with robust sustainability practices experience reduced downside risk and exhibit greater resilience during periods of turmoil (Broadstock, 2021; Hoepner, 2018) such as time of COVID-19 pandemic, companies with more robust ESG portfolios typically demonstrate better performance compared to those with lower ESG portfolios. This suggests that the implementation of corporate sustainability practices helps alleviate financial distress risk during financial crises (Ferrero- Ferrero, 2015; Broadstock, 2021), through the utilization of ESG investments to augment product differentiation and provide diversification in their product portfolios, companies can mitigate their exposure to systematic risks. Hence, companies experiencing financial distress exhibit a sense of disorientation, leading to seemingly arbitrary decisions in their financial structure choices. Conversely, non-distressed companies maintain their current debt levels as a result of a gradual adjustment toward target debt ratios (Permatasari, Komalasari, & Septiyanti, 2019). Furthermore, the patterns of cash holding differ between distressed and non-distressed companies during financial periods, with distressed companies more inclined to retain cash flow compared to their non-distressed counterparts (Julio Pindado, 2006). Additionally, distressed companies face higher costs of capital, weaker credit ratings, limited access to external funding sources, and an increased propensity for risk-taking, compelling them to engage in risky behaviors and adopt aggressive tax avoidance strategies (Guilherme Freitas Cardoso, 2019).

According to the previous studies, the subsequent hypotheses are suggested:

H1: The environmental score exhibits a significant difference between the distressed companies and non-distressed companies

H2: The social score exhibits a significant difference between the distressed companies and non-distressed companies

H3: The governance score exhibits a significant difference between the distressed companies and non-distressed companies

2-3-2- Environment pillar and financial distress:

To our knowledge, some studies have examined the association between financial distress and a firm's ESG performance. Certain studies have identified a negative relationship

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between corporate environmental performance and financial distress. In a study involving Australian companies, Jia (2022) observed that enhanced environmental performance not only strengthens ties with various stakeholders but also signifies the availability and efficient allocation of resources and high management quality. This fosters goodwill and positive perceptions among stakeholders (Godfrey, 2009), leading to positive environmental practices that mitigate corporate risk (Cai, 2016; Godfrey, 2009; Harjoto, 2018; Albuquerque, 2019). Consequently, this improvement contributes to enhanced financial performance, sustainability, and a reduced likelihood of financial distress (Jia, 2022).

Furthermore, CSR is linked to lower financial distress and default risks, creating a favorable corporate environment and bolstering financial stability for companies (Boubaker, 2020). Higher environmental risk, conversely, diminishes a corporation's financial stability and elevates default risk. Investing in resources to mitigate these risks may ultimately enhance the firm's overall value (Glover, 2016). Consequently, improvements in environmental risk management lead to a lower cost of capital (Sharfman, 2008), fewer capital constraints (Cheng, 2014), and an increased likelihood of receiving higher credit ratings (Attig, 2013), ultimately contributing to high environmental performance and corporate financial success (Friede, 2015; Malik, 2015).

On the contrary, some studies have found that the environmental score has a significantly positive effect on financial distress. Thus, companies with lower environmental scores may encounter heightened regulatory and compliance risks. The escalation of regulations, penalties, and compliance costs could adversely affect the financial health of these companies. The additional financial burden associated with environmental compliance might negatively impact the assessment within the Altman Z score. Additionally, actions taken to mitigate environmental risk, such as reducing emissions or resource consumption, may increase the probability of experiencing financial distress (Shi, 2023). Moreover, investing in environmental commitments could involve significant and prolonged expenses, encompassing activities like waste disposal, emissions treatment, and remediation costs (Chollet, 2018). It is plausible that the expenditures

associated with establishing an environmentally friendly image may not be recouped (Shi, 2023).

According to the previous studies, the subsequent hypotheses are suggested:

H4: The environmental score was negatively affect the financial distress in the financially distressed companies

H5: The environmental score was negatively affect the financial distress in the non-financially distressed companies

2-3-3- Social pillar and financial distress:

Several investigations have demonstrated an inverse correlation between the social dimension and financial distress (Pålsson, 2021; Shi, 2023). Hence, perspectives related to social considerations play a pivotal role in shaping corporate investments within the United Kingdom (Zhang, 2022). Companies embracing social responsibility tend to attract a greater number of investors, consequently mitigating the company's risk (Lee, 2009). Additionally, Corporate Social Responsibility (CSR) exhibits a positive association with firm competitiveness through a cycle of learning and innovation (Sun, 2013). Firm competitiveness encompasses aspects such as financial performance, product/service quality, productivity, innovation, and image/reputation (Kapelko, 2021). Engaging in CSR can, therefore, be advantageous for companies by bolstering their reputation, providing a form of insurance-like protection, enhancing shareholder wealth, improving risk management, meeting market demands from customers, increasing disclosure and reporting transparency, and facilitating better access to financial resources (Guillamon-Saorin, 2018). Consequently, a higher social risk diminishes a corporation's financial stability, elevates default risk, and investing in resources to mitigate these risks may augment the overall value of the firm (Glover, 2016).

Conversely, certain studies have identified a positive correlation between the social dimension and financial distress (Dumitrescu, 2020), suggesting that the influence of stakeholders on financial distress does not stem from managerial shortsightedness. Moreover, companies facing fewer constraints, particularly during non-crisis periods or those with a low cash operating cycle (COD), are more susceptible to the adverse consequences of engaging

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with social stakeholders in terms of financial distress. Furthermore, companies with readily available external financing are more prone to partake in corporate greenwashing practices.

According to the previous studies, the subsequent hypotheses are suggested:

H6: The social score was negatively affect the financial distress in the financially distressed companies

H7: The social score was negatively affect the financial distress in the non-financially distressed companies.

2-3-4- Governance pillar and financial distress:

Various studies have delved into the negative relationship between corporate governance and financial distress (Lee T. S., 2004; Younas, 2021; Antunes J. W., 2023). It is theorized that effective corporate governance, encompassing transparent business contracts, ethical standards, legal and constitutional agreements, sound decision-making, and accurate financial disclosure, contributes significantly to a company's prosperity. A well-governed company is prone to experience fewer negative shocks, incur lower capital costs, and encounter reduced default risk, thereby mitigating downside risk (Wang, 2015).

In contrast, deficient corporate governance heightens the likelihood of controlling shareholders diverting value from the firm for personal gain. This resulting decline in corporate value increases the probability of facing financial distress (La Porta, 2000).

According to the previous studies, the subsequent hypotheses are suggested:

H8: The governance e score was negatively affect the financial distress in the financially distressed companies

H9: The governance e score was negatively affect the financial distress in the non-financially distressed companies

3- Research Methodology:

3-1 Population and Samples

The aim of this research is to determine the effect of sustainability, in terms of Environment, Social, and Governance (ESG) scores, and other firm-

specific determinants on the Altman Z score within the London Stock Exchange (LSE). Financial companies are excluded from the study, resulting in a sample of 1,814 companies in the UK, with 31,847 observations. The research used the Altman Z score. Previous studies have employed the Altman Z-score as an indicator of the risk of financial distress when investigating the relationship between ESG disclosure and financial distress (Pålsson, 2021; Kaur, 2021). The sample was categorized into three groups based on the Altman Z score, classifying companies into the red area, grey, or green area. This classification was done due to differing characteristics, as distressed companies appear disoriented, and their financial structure choices seem random. Conversely, non-distressed companies maintain current debt levels as a result of a gradual adjustment toward target debt ratios (Permatasari, Komalasari, & Septiyanti, 2019). The companies in the red area represent financially distressed companies, while those in the grey and green areas represent non-financially distressed companies.

3-2 Data Collection

Environment, social, governance and the firm-specific determinants and the variables related to the Altman Z score model are obtained from Datastream databases. The data covers 20 years, from 2002 to 2021, for all variables.

3-3 Variables Measurement

Table 1 provides an overview of the measured variables in this study. Panel (A) encompasses independent variables, including sustainability determinants and other firm-specific determinants. Panel (B) comprises the dependent variable, the Altman Z score.

Table 1   Measurement of variables

Panel A: Independent variables		
Sustainability determinants		
Variables	**Abr**	**Measurement**
Environment Pillar Score	Env	Score of the company's environment performance
Social Pillar Score	Soc	Score of the company's social performance
Governance Pillar Score	Gov	Score of the company's governance performance
Other firm specific determinants		
Growth	Gro	Market value of equity to book value of equity
Profitability	ROA	Net Income / total assets
Tangibility	Tan	Net fixed asset over total asset
Liquidity	Liq	Current assets over current liabilities
Taxation	Tax	Tax Paid / Operating Income
Leverage	debt	Total debt / Total assets
Firm Size	FSiz	Natural Log of Total Assets
Panel B: Dependent variables		
Capital Structure variables		
Altman (1968) Altman Z score model	Z score	WCTA: working capital/ total asset
		RETA: retained earnings/ total assets
		EBITTA: Earnings before interest and taxes /total assets
		MCTL: Market value of equity / Book value of total liabilities
		STA: Sales/ Total asset
		Z=1.2WCTA+1.4RETA+3.3BITTA+0.6MCTL+1STA

3-4- Model Specification:

The current research employed panel data analysis (Baum 2006; Torres-Reyna 2010), a method frequently utilized, whereas pooled regression is a common approach.

The models employed are as follows:

$$Z_{it} = \beta_0 + \beta_1 \text{ Env }_{it} + \beta_2 \text{ Soc }_{it} + \beta_3 \text{ Gov }_{it} + \beta_4 \text{ Gro }_{it} + \beta_5 \text{ ROA}_{it} + \beta_6 \text{ Tan }_{it} + \beta_7 \text{ Liq }_{it} + \beta_8 \text{ Tax }_{it} + \beta_9 \text{ debt }_{it} + \beta_{10} \text{ FSiz }_{it} + \varepsilon_{it}.$$

Where Z signifies the extent of financial distress, quantified by the Z-score (Altman et al. 1986); Env denotes the environmental pillar score; Soc stands for the social pillar score; Gov represents the governance pillar score; Gov represent the growth, ROA represents the profitability, Tan represent tangibility, Liq represents the liquidity ratio, tax represent tax ratio, debt

represents the leverage ratio; and FSiz signifies firm size, for the period from 2002 to 2021. This study employed the SPSS statistical computing software to conduct panel data analysis.

3-5- Data analysis:

3-5-1 Descriptive statistics:

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Env	22824	0	99	46.99	29.085
Soc	22824	0	98	54.46	23.266
Gov	22830	0	99	54.53	22.457
z score	26746	-979	9300	3.9598	58.924
Gro	29161	-5115	3889	2.7621	53.591
ROA	31028	-1110	5771	5.8136	34.968
Tan	31756	0.0000	1	.62573	.25122
Liq	27512	0.0000	55320	3.8468	333.529
Tax	31829	-151	3405	.308116	19.3311
debt	31756	0.0000	4.0518	.26277	.20669
FSiz	11157	2.49	9.89	6.9498	0.7209

Table 2 displays descriptive statistics, including mean, median, maximum and minimum values, and standard deviation, for the dependent variable, represented by the Altman Z score, and the independent variables encompassing the Environmental, social, and governance pillars, and the control variables were seven firm-specific determinants (growth, ROA, tangibility, liquidity, tax, debt ratio, and firm size). The table shows that the average environmental score is 47, the average social score is 54, 4, and the average governance score is 5. Additionally, the average of Altman Z score is 3.9 which refers that the majority of the companies have low likelihood for bankruptcy.

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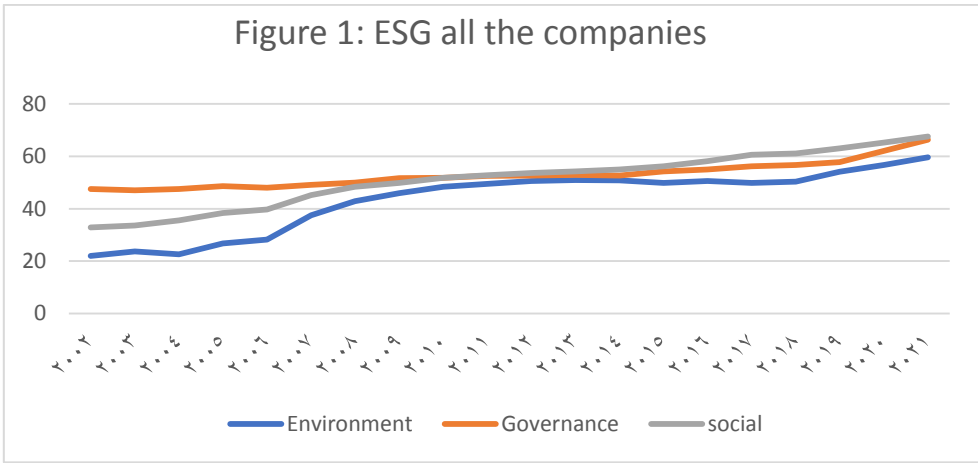
Figure 1: ESG all the companies

Figure (1) depicts the Environmental, Social, and Governance (ESG) pillar scores for all companies from 2002 to 2021. The illustration reveals that the companies' environmental performance remained steady between 2002 and 2005, suggesting adherence to prevailing environmental regulations and standards, ensuring consistent performance. Subsequently, there was a gradual increase until 2012, possibly due to the implementation of eco-friendly practices, adoption of sustainable technologies, or heightened awareness of environmental issues. It then maintained stability until 2018, with companies likely maintaining established practices or facing regulatory stability during this period. This was followed by a subsequent increase until 2021, reflecting a growing emphasis on environmental sustainability, increased regulations, or a shift in consumer preferences towards eco-friendly businesses.

Furthermore, the governance performance of companies showed stability with minimal changes from 2002 until 2014, indicating strong corporate governance practices or compliance with existing regulations and guidelines. Subsequently, governance performance began to increase, reaching its peak in 2021. This increase may be attributed to possible improvements in governance structures, increased transparency, adoption of best practices, or a response to evolving governance standards.

Additionally, the social performance of companies exhibited a gradual increase from 2002 until 2021, reflecting the implementation of socially responsible initiatives, community engagement, diversity and inclusion

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efforts, or heightened awareness of social issues. It is essential to note that the reasons behind ESG scores can be multifaceted, influenced by regulatory changes, market dynamics, stakeholder expectations, and evolving corporate philosophies. Company-specific strategies, policies, and responses to societal and environmental challenges can also contribute to the observed trends in ESG performance over time.
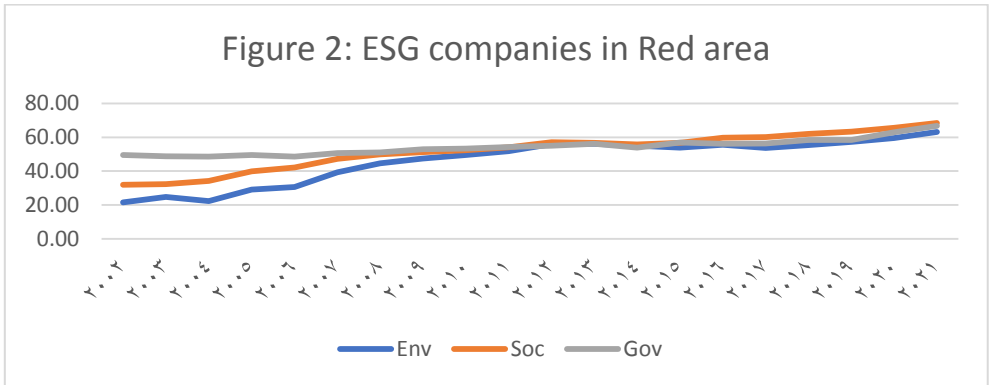

Figure 2: ESG companies in Red area

Figure (2) depicts the Environmental, Social, and Governance (ESG) pillar scores for the companies in the Red area from 2002 to 2021. The figure shows that the environmental score increased until 2003, then decreased in 2004, followed by an increase until 2011. It remained stable until 2017 and then increased again until 2021. As for the social score, it remained stable until 2004, then increased steadily until 2021. The governance score was approximately stable until 2019, then experienced an increase in 2021.

Figure 3 : ESG companies in Grey area

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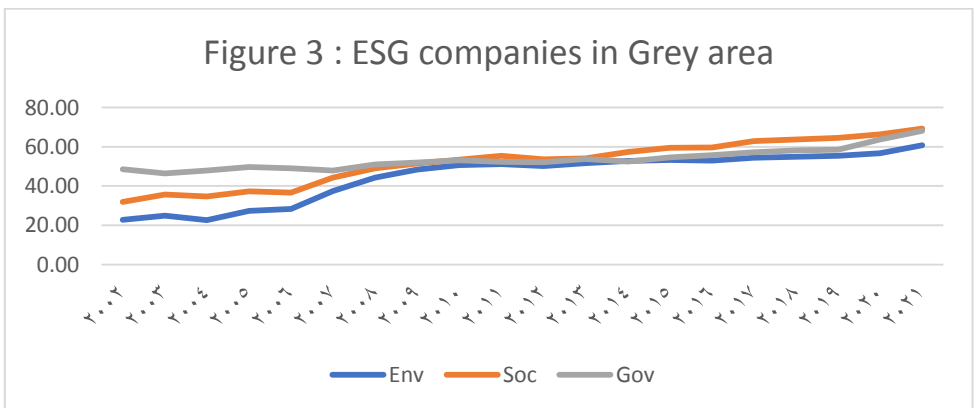**Companies in the UK**   **Rehab EmadEldeen**

Figure (3) illustrates the Environmental, Social, and Governance (ESG) pillar scores for the companies in the Grey area from 2002 to 2021. The figure shows that the environmental score increased until 2003, then decreased in 2004, followed by an increase until 2011. It remained stable until 2016 and then increased until 2021. The social score increased until 2003, then decreased in 2004, followed by an increase until 2012. It remained stable until 2014 and then increased until 2021. The governance score was approximately stable until 2014, then gradually increased until 2021.

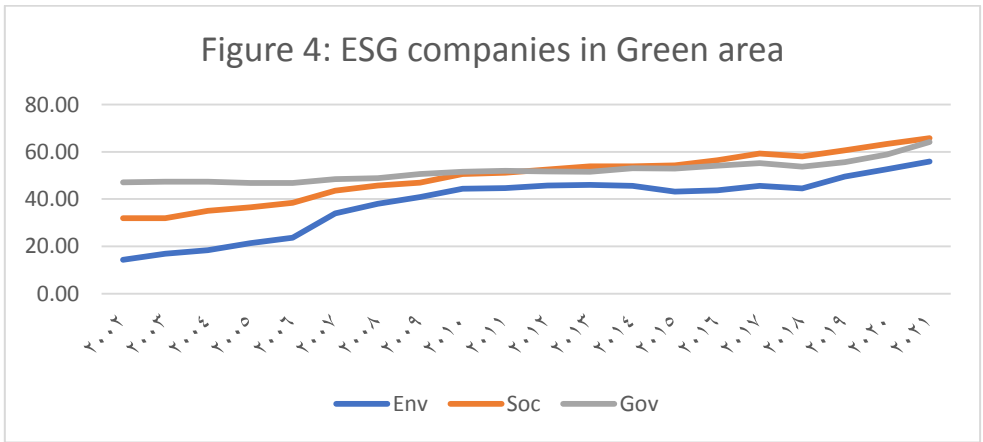Figure 4: ESG companies in Green area

Figure (4) depicts the Environmental, Social, and Governance (ESG) pillar scores for the companies in the Green area from 2002 to 2021. The figure shows that the environmental score increased until 2010, then remained stable until 2014, decreased until 2015, and increased again until 2021. The social score increased until 2010, then remained stable until 2016, and increased until 2020. The governance score was approximately stable until 2018, then gradually increased until 2021.

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Figure 5: level of bankruptcy

0.327903121

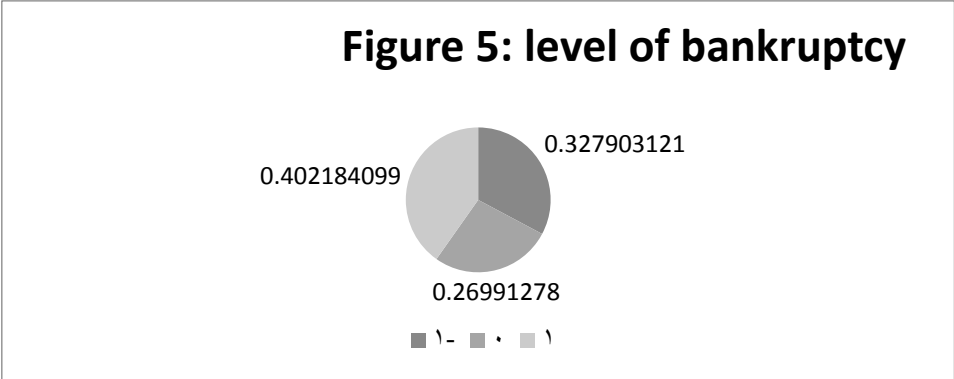0.402184099

0.26991278

■ ١- ■ ٠ ■ ١

Figure (5) illustrates the level of bankruptcy. To achieve this, we divided the sample into three groups. The first group, represented by the red area, consists of companies with an Altman Z score less than 1.8, which are typically considered to have a higher likelihood of facing financial distress or bankruptcy. The second group, depicted in the grey area, includes companies with Altman Z scores ranging from 1.8 to 3. Companies falling within this range are not immediately in distress but may be at risk, and caution should be exercised. It suggests a moderate risk of financial difficulties. The third group, denoted by the green area, comprises companies with Altman Z scores exceeding 3, and are generally considered financially stable, with a lower risk of bankruptcy. The figure reveals that 32% of the sample fell into the red area, 27% in the grey area, and 40% in the green area.
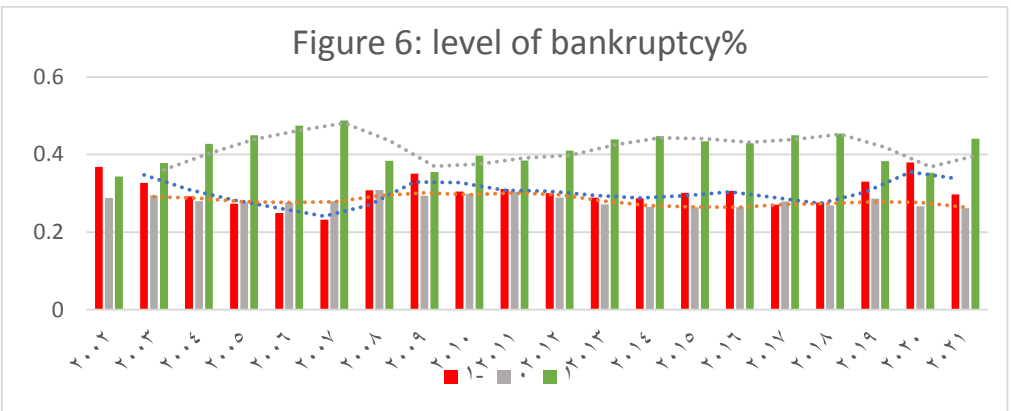
Figure 6: level of bankruptcy%

Figure (6) illustrates a graphical representation of cross-tabulated data showcasing the bankruptcy percentages for all companies each year from 2002 to 2021. In 2002, the highest percentage is associated with companies in the red area, representing 37%. This indicates that 37% of the companies in that year recorded a Z score less than 1.8. However, from 2003 to 2021, the majority of companies in each year were situated in the green area, constituting an average of 45% of total companies annually. Considering the entire sample during this period, the companies in the red area are roughly equal to those in the grey area, with the exception of 2020. In 2020, the companies in the red area surpassed those in the green area, comprising 37% of the companies for that year.

3-5-2 Correlation analysis:

Table 3: Correlations analysis:

	z score	Env	Gov	Soc	Gro	ROA	Tan	Liq	Tax	Debt	FSize
z score	1.000										
Env	-.054***	1.000									
Gov	-.022***	.392***	1.000								
Soc	-.026***	.748***	.405***	1.000							
Gro	-.125***	-.007	-.014**	-.005	1.000						
ROA	.125***	-.014**	.003	-.002	.022	1.000					
Tan	-.108***	.160***	.146***	.129	-.019	-.123	1.000				
Liq	.265***	-.158***	-.082***	-.137	.007	.079	-.335	1.000			
Tax	-.001	.008	.001	.008	.000	-.004	-.003	-.003	1.000		
debt	-.144***	.090***	.065***	.088	-.028	-.118	.368	-.203	-.009	1.000	
FSiz	-.065***	.411***	.275***	.354***	-.003	-.076***	.293**	-.160***	.003	.146**	1.000

Where *, **, *** Represent significance at 0.1, 0.05 and 0.01 levels, respectively

Table 3 illustrates the correlation matrix between the dependent variable, Z Score (a measure of financial distress), and the independent variables, namely sustainability performance. The determinants of sustainability include environmental, social, and governance scores. Additionally, control variables encompass firm characteristic variables such as growth, profitability, tangibility, liquidity, tax ratio, leverage, and firm size. The table also presents the correlation matrix among the independent variables themselves. Multicollinearity may be present if the correlation between independent variables exceeds 0.80. The correlation matrix in Table 4 indicates the absence of multicollinearity among the independent variables.

The minimum correlation, 0.00, is observed between many independent variables, while the maximum correlation, 0.748, is noted between the environmental score (Env) and the social score (Soc).

Table 4 : Kruskal Wallis test:

Panel (A): The environment score in the different level of bankruptcy:		
Kruskal-Wallis H	**Df**	**Asymp. Sig. (2- tailed)**
377.577	2	.000
Panel (B): The social score in the different level of bankruptcy		
Kruskal-Wallis H	**Df**	**Asymp. Sig. (2- tailed)**
99.807	2	.000
Panel (B): The governance score in the different level of bankruptcy		
Kruskal-Wallis H	**Df**	**Asymp. Sig. (2- tailed)**
79.614	2	.000

Table (4) displays the results of the Kruskal-Wallis test used to assess differences in environmental performance for all companies, including those in the red, grey, and green areas, across the period from 2002 to 2021 in Panel (A). Similarly, Panel (B) presents results for social performance, and Panel (C) for governance performance. The test revealed significant differences in ESG scores among all companies, including those in the red, grey, and green areas, throughout the period from 2002 to 2021 in Panels (A), (B), and (C). According to that, we will **accept H1, H2, and H3.**

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3-5-3 Regression analysis:

Table (5): Regression analysis:

	z score less than 1.8		z score from 1.8 to 3		z score more than 3		Total	
	B	Std. Error	B	Std. Error	B	Std. Error	B	Std. Error
(Constant)	-2.486	.650	2.667	.024	-.074	.935	-.843	.483
Env	.008	.006	-.001***	.000	-.043***	.011	-.021***	.005
Soc	.005	.008	.001***	.000	.052***	.014	.028***	.007
Gov	-.009*	.006	-2.361	.000	.006	.011	-.001	.005
Gro	-.052***	.001	.000	.000	.005	.004	-.030***	.002
ROA	-.068***	.014	.015***	.001	.259***	.026	.169***	.012
Tan	2.782***	.639	-.167***	.026	1.882	1.183	1.551***	.550
Liq	-.261**	.131	.049***	.006	2.817***	.113	2.367***	.072
Tax	-3.038	.002	.001	.001	-.413*	.231	.000	.004
debt	-3.727***	.681	-.347***	.029	-9.086***	1.375	-7.443***	.600
FSiz	.427**	.176	-.036***	.007	-.371	.363	-.216	.162
R Square	.285		.09		.093		.106	
F	203.815		52.328		86.902		222.193	
Sig.	.000^b		.000^b		.000^b		.000^b	

Where *, **, *** Represent significance at 0.1, 0.05 and 0.01 levels, respectively

The sample, as previously mentioned, was divided into three groups based on the Altman Z score, placing companies in either the red area, grey, or green area. Table 5 presents regression analysis results. For the first group (companies in the red area), the environmental and social scores show no significant effect on the Altman Z score. Therefore, we will **reject H4, and H6.** However, governance exhibits a significant negative effect, therefore, we **reject H8.**

Furthermore, growth, profitability, liquidity, and leverage have a significant negative impact on Altman Z score in these companies. Conversely, tangibility and firm size show a significant positive effect on Altman Z score.

For the second group (companies in the grey area), the environmental score has a significant negative effect on Altman Z score, therefore, we will **reject H5.** Furthermore, the social score has a significant positive effect on Altman Z score, therefore, we will **accept H7.** In contrast, governance shows no

significant effect on Altman Z score. Therefore, we will **reject H9.** Moreover, profitability and liquidity exhibit a significant positive impact on Altman Z score in this group.

For the third group (companies in the green area), have a similar result for those in the grey area regarding environmental score, social score, and Governance score. In contrast to the grey area, tax ratio and leverage have a significant negative effect on Altman Z score. Moreover, Profitability and liquidity show a significant positive impact. Growth, tangibility, and firm size have no significant effect on Altman Z score, suggesting that companies in the green area may not be significantly affected by these factors.

Analysis and discussion:

The study separates financially distressed companies from non-financially distressed companies, showing that companies with an Altman Z-score of less than 1.8 fall into the red area (financially distressed companies). Companies with an Altman Z-score of more than 1.8 are placed in the grey and green areas (non-financially distressed companies).

For the financially distressed companies, the environmental and social scores show no significant effect on the Altman Z score. However, governance exhibits a significant negative effect, potentially linked to ineffective risk management. Poor governance practices may lead to insufficient oversight, hindering identification and mitigation of financial risks, heightening susceptibility to Altman Z score. According to that, the governance score has a positive effect on the financial distress.

Furthermore, growth, profitability, liquidity, and leverage have a significant negative impact on Altman Z score in these companies. Companies with Z scores less than 1.8 may already be facing financial challenges, and rapid or unsustainable growth can strain resources and increase financial risk. Moreover, companies with poor profitability are less capable of generating consistent earnings to cover their expenses and debt obligations. Low profitability ratios, such as low net profit margins or return on assets, can contribute to a negative impact on the Altman Z score. This is because weak profitability signals a reduced ability to service debt and maintain financial stability. Furthermore, companies with Z scores less than 1.8 may already be

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facing liquidity challenges. Insufficient liquidity can hinder a company's ability to meet its short-term obligations, leading to financial distress. Therefore, low liquidity ratios, such as a low current ratio or quick ratio, can have a negative effect on the Altman Z score for companies with a higher risk of financial distress. In addition, an excessively high level of debt relative to equity can worsen their financial distress risk. High leverage increases interest expenses and financial vulnerability. The Altman Z score may assign a negative weight to high leverage, reflecting the increased likelihood of financial distress for companies that are already in a precarious financial position. The result is consistent with Liquidity and profitability theory that proposes that the firm can fail even if the profitability is worthy. Thus, the firm's profitability should be more than the company's growth rate (Isayas, 2021).

Conversely, tangibility and firm size show a significant positive effect on Altman Z score. Therefore, Tangible assets can act as a form of collateral, providing a safety net for creditors in case of financial distress. Higher tangibility may be seen as a positive indicator of a company's ability to secure debt with physical assets.

In the Altman Z score model, if higher tangibility is associated with a lower risk of financial distress, it could contribute positively to the overall Z score for companies facing distress. This assumes that the model attributes a positive weight to tangible assets as a protective factor. Moreover, larger companies often have diversified operations across different markets or product lines. This diversification can mitigate risks associated with economic downturns or industry-specific challenges, potentially enhancing the company's resilience against financial distress. Additionally, the tax ratio exhibits no significant effect on Altman Z score.

For the non-financially distressed companies, the environmental score has a significant negative effect on Altman Z score , therefore, companies with lower environmental scores might face heightened regulatory and compliance risks. Increased regulations, penalties, and compliance costs could negatively impact the financial health of these companies. The additional financial burden associated with environmental compliance may contribute to a less favorable assessment within the Altman Z score. In

addition taking actions to mitigate environmental risk, such as lowering emissions or resource consumption, raises the probability of experiencing financial distress (Shi, 2023). Also, Investing in environmental commitments might involve significant and prolonged expenses, encompassing activities like waste disposal, emissions treatment, and remediation costs (Chollet, 2018). It is plausible that the expenditures associated with establishing an environmentally friendly image may not be recouped. The result is consistent with (Shi, 2023). According to that the environment score in the non-financially distressed companies have a significant positive effect on the financial distress**.**

Furthermore, the social score has a significant positive effect on Altman Z score, Companies with higher social scores may be perceived as socially responsible and ethical. This positive image can lead to enhanced stakeholder relations, including stronger customer loyalty, positive investor sentiment, and a favorable reputation in the broader community. The resulting benefits may contribute to improved financial stability and, in turn, a more positive assessment within the Altman Z score for companies falling within 1.8 to 3. The result is consistent with (Pålsson, 2021; Shi, 2023) and inconsistent with (Dumitrescu, 2020) who found that the social pillar increases financial distress. According to that the social score in the non-financially distressed companies have a significant negative effect on the financial distress**.**

 In contrast, governance shows no significant effect on Altman Z score. The result is consistent with (Pålsson, 2021), and inconsistent with (Dumitrescu, 2020; Shi, 2023) who found that there is a negative effect. According to that the governance score in the non-financially distressed companies have no significant effect on the financial distress**.**

Moreover, profitability and liquidity exhibit a significant positive impact on Altman Z score in this group. Higher profitability and liquidity contribute to a stable financial foundation for companies that have the Z more than 3. Improved profitability ratios, such as net profit margins, indicate the company's ability to generate earnings relative to its revenue. Meanwhile, strong liquidity ratios, like the current ratio, demonstrate the capacity to meet short-term obligations. A combination of higher profitability and

liquidity enhances the company's financial resilience, potentially leading to a positive impact on the Altman Z score by reflecting a healthier financial position.

Moreover, the leverage have a significant negative effect on Altman Z score, elevated leverage for companies with Z scores exceeding 1.8 may be interpreted as indicators of financial stress. Concurrently, excessive leverage increases the financial risk by amplifying interest expenses. In this scenario, the Altman Z score may assign a negative weight, reflecting the increased financial strain associated with leverage, thereby contributing to a less favorable assessment for companies with Z scores beyond 1.8. The result is consistent with the **pecking order theory,** that states that the greater the company's probability of being in a financial distress situation. In addition, Growth has no significant effect on Altman Z score in the non- financially distressed companies.

There is a few difference between the non-financially distressed companies in the grey and green areas. For the companies in the green area, tax ratio has a significant negative effect on Altman Z score, a high tax ratio and elevated leverage for companies with Z scores exceeding 3 may be interpreted as indicators of financial stress. A high tax ratio implies that a significant portion of the earnings is allocated to taxes, leaving less available for debt service or reinvestment. The results show that the tax ratio has no significant effect on financial distress in the companies in the grey area.

In addition, the tangibility and firm size have a negative significant effect on the Altman Z-score for companies in grey area, these variables may reflect a higher proportion of tangible assets relative to total assets and a smaller firm size, which could indicate a lesser ability to generate profits or withstand financial downturns, thus negatively impacting the Altman Z-score. However, for companies in green area, they may already demonstrate strong financial stability, rendering the influence of these variables less significant in predicting financial distress.

Summary and conclusion:

The main objective of this research is to determine the effect of sustainability, in terms of Environment, Social, and Governance (ESG)

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scores, and other firm-specific determinants on the Altman Z score within the London Stock Exchange (LSE). Financial companies are excluded from the study, resulting in a sample of 1,814 companies in the UK, with 31,847 observations. The research used the Altman Z score model to measure financial distress. The sample was then divided into three groups based on that score. The first group, represented by the red area, consists of companies with an Altman Z score less than 1.8, typically considered to have a higher likelihood of facing financial distress or bankruptcy. The second group, depicted in the grey area, includes companies with Altman Z scores ranging from 1.8 to 3. Companies falling within this range are not immediately in distress but may be at risk, suggesting a moderate risk of financial difficulties. The third group, denoted by the green area, comprises companies with Altman Z scores exceeding 3, generally considered financially stable, with a lower risk of bankruptcy.

In summary, for the financially destressed companies, poor governance practices, low profitability, and high leverage significantly contribute to financial distress, while tangibility and firm size negatively affect the financial distress. For the non-financially distressed companies, lower environmental scores pose regulatory risks, but higher social scores, profitability, and liquidity enhance financial stability. Therefore, higher profitability, social score, low debt ratio, and liquidity decrease the likelihood of financial distress for non- financially companies.

Based on the research findings, several recommendations for managers, executives, and policymakers, they should integrate sustainability practices into strategic decision-making processes to enhance governance, profitability, and resilience, particularly for financially distressed companies, while addressing regulatory risks and promoting supportive frameworks for sustainable business practices. For future research, it is recommended to delve deeper into the specific mechanisms through which environmental, social, and governance (ESG) factors impact financial distress across different risk zones. Exploring the dynamics of governance practices and their direct influence on the Altman Z score in companies with low scores could provide valuable insights into effective governance strategies to mitigate financial risks. Additionally, further investigation into the relationship between environmental scores and regulatory risks in the grey area can shed light on specific environmental factors that pose challenges and how companies can proactively address them.

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