AOSIS

The relationship between sustainability and financial performance of South African companies

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Orientation: Environmental, social and governance (ESG) performance remains crucial information required by stakeholders as they are interested in monitoring whether companies contribute to sustainability or not.

Research purpose: The study's purpose was to determine how the sample companies scored on the three pillars of ESG performance and to determine the relationship between ESG scores and the financial performance of selected South African listed companies, with special reference to the impact of coronavirus disease 2019 (COVID-19) on that relationship.

Motivation for the study: Because of crises such as the COVID-19 pandemic, companies tend to focus on their ESG-impact, resulting in them investing in sustainable operations.

Research approach/design and method: Linear mixed-effect regression analysis models were developed to determine the relationship between ESG scores and financial performance. The sample consisted of 104 companies listed on the Johannesburg Stock Exchange (JSE) from 2017 to 2022.

Main findings: We found that companies do not equitably score on the ESG performance pillars. We also found the following significant relationships: (1) Return on equity (ROE) positively impacts governance performance, (2) ESG positively impacts Tobin's Q and (3) governance performance positively impacts ROE. Furthermore, the results show that sustainability and financial performance before and after COVID-19 are mainly not meaningful.

Practical/managerial implications: New insights are revealed in the interests of shareholders, potential investors and company management regarding how to interpret the relationship between ESG pillars and financial ratios.

Contribution/value-add: We contribute to the theory as a conceptual framework was developed to interpret the results within the shareholder's theory.

Keywords: COVID-19; environmental, Social and Governance (ESG) performance; financial performance; shareholder theory; South Africa; sustainability.

Introduction

Companies report sustainability performance by referring how well they score on environmental, social and governance (ESG) activities (Brogi & Lagasio 2018). They reveal their ESG activities and performance within integrated reports, or by issuing separate reports (Mervelskemper & Streit 2016). Regardless of where companies report, their ESG performance remains crucial information required by stakeholders as they are interested in monitoring whether companies contribute to sustainability or not (Arvidsson & Dumay 2021). Because of crises such as global warming and the coronavirus disease 2019 (COVID-19) pandemic, companies tend to focus on their ESG-impact, which causes them to invest in sustainable operations (Chen & Xie 2022).

Coronavirus disease 2019 severely impacted the financial performance of many South African companies (Department Statistics South Africa 2020). The financial performance of companies can be analysed through the analysis of financial ratios (Hefer & Walker 2020), such as return on equity (ROE) as an accounting-based measure and Tobin's Q as a market-based ratio. As COVID-19 impacts the financial performance of companies, the financial ratio analyses of companies before and after COVID-19 are likely to differ (Alsamhi et al. 2021; Li et al. 2021).

The central theme of this study is that companies' primary objective is to maximise shareholders' wealth; however, in order to do so, companies are faced with a decision: do they only focus on increasing profits or do they invest in sustainable operations that, in return, might or might not

increase their profits (Scholtens & Zhou 2008). Therefore, from the shareholders' perspective, it is essential to know whether sustainability contributes to shareholder's wealth by increasing financial performance, or whether it is only a fruitless expense at shareholders' costs (Dočekalová et al. 2022). Some researchers argue that companies with an ESG score are superior to those without an ESG score because ESG scores signal to stakeholders that a company's operations are sustainable, thereby attracting stakeholders (Arvidsson & Dumay 2021). Consequently, as stakeholders are more likely to support firms with a high ESG score, these firms' financial performance outperforms that of firms with low or no ESG scores (Clément, Robinot & Trespeuch 2022). An opposing argument, according to Janah and Sassi (2021) and Zumente and Bistrova (2021), is that sustainability operations negatively impact companies' financial performance because these operations come at a cost to companies – they reduce profits, leading to reduced distributions to shareholders and, as a result, shareholder wealth is not maximised.

The COVID-19 outbreak, which originated in China, was announced in December 2019. Following the rapid spread of this highly contagious virus, the World Health Organization (WHO) declared a global pandemic on 12 March 2020 (Ciotti et al. 2020). This pandemic has posed significant threats to low- and middle-income countries, including South Africa (Lone & Ahmad 2020). Coronavirus disease 2019 poses many challenges to companies (Almeida, Santos & Augusto Monteiro 2020). As this is a South African study, companies listed on the Johannesburg Stock Exchange (JSE) were the preferred subjects of investigation. The JSE companies are classified according to the Industry Classification Benchmark method, which is broken up into ten industries, 19 super sectors and 41 sectors (Listcorp 2023).

Previous studies have investigated the relationship between financial and sustainability performance. For example, Carnini Pulino et al. (2022), Giannopoulos et al. (2022), Hussain, Rigoni and Cavezzali (2018), Hwang, Kim and Jung (2021), Kalia and Aggarwal (2023), Saygili, Arslan and Birkan (2021), Velte (2017) and Zhao et al. (2018) use financial performance as the dependent variable and ESG as the independent variable to determine the impact of the latter on financial performance. Chams, García-Blandón and Hassan (2021) and Hamdi, Guenich and Ben Saada (2022) use ESG as the dependent variable and financial performance as the independent variable to determine the impact of financial performance on ESG. Only Brogi and Lagasio (2018) and Jha and Rangarajan (2020) have engaged to revere causality analysis, investigated these relationships using both approaches (directions). Most of those studies investigated countries with developed socio-economic status, and their results were inconsistent, revealing mixed relationships. Achim et al. (2021), Almatrooshi et al. (2022), Alsamhi et al. (2021) and Li et al. (2021) do not explicitly link sustainability performance to COVID-19. However, all agreed that COVID-19 has had a

severe financial impact on companies. In this regard, Hwang et al. (2021) examined the relationship between financial performance and ESG before and during the COVID-19 pandemic.

Considering the above literature and the financial performance–ESG relationship, most studies approached the relationship only from one direction, yielded mixed results, were mainly from developed economies and rarely from South Africa and very few incorporated the impact of COVID-19. The novelty of this study is that it differs from previous research as its primary purpose was to address those issues simultaneously by determining, from both directions, the relationship between financial performance and sustainability performance of JSE-listed companies (which operate in sectors that were severely affected by COVID-19) before and after the COVID-19 pandemic. From a shareholder's perspective, a secondary purpose was also essential to determine how well JSE companies scored on the pillars of ESG. Data were sourced from InvestVerte to perform an analysis of variance (ANOVA) on 104 JSE-listed companies from 2017 to 2022 to analyse how the means of the three pillars – environment, social and governance differ. The aforementioned data and financial statement data from the Identification of Requirements for Enterprise Social Software (IRESS) database were incorporated into several linear mixed effect regression analysis models to conclude the relationship study.

This study provides a valuable update and statistical analysis of the relationship between sustainability and financial performance during recent years that include the COVID-19 phenomenon as a major shock event. What is outstanding in this study is that the results of the primary and secondary purposes were combined. The study found that companies do not equitably score on the ESG pillars. Furthermore, ROE impacts governance performance positively and vice versa; ESG impacts Tobin's Q positively and vice versa and social performance impacts Tobin's Q somewhat negatively. The practical value is that we developed a conceptual framework based on shareholder theory to interpret the results and reveal new insights into the interests of shareholders, potential investors and company management.

The remainder of this article is organised as follows. The next section provides a perspective on the COVID-19 crises in South Africa, sustainability performance and financial performance. This is followed by a literature study that first explains the conceptual scope, based on shareholders' theory, which was applied as a frame wherein the results were interpreted, a review of related studies testing the relationship between financial and sustainability performance and finally, setting hypotheses. After that is an explanation of the methods and materials used, followed by the results and discussion, after which the study is concluded.

Background: The coronavirus disease 2019 crisis in South Africa

In this study, the outbreak of the COVID-19 pandemic was used as an example of a crisis affecting countries and businesses. External situations constitute factors beyond an entity's control. This includes the case of natural hazards. The impact of natural hazards on developing countries is more significant than on developed countries. This is because developing countries face a shortage of resources, infrastructure and readily available systems to react to these crises (Watson, Gayer & Connolly 2007). South Africa is a developing country (International Statistical Institute 2023) and is thus vulnerable to the impact of natural hazards.

Coronavirus disease 2019 poses several challenges (Almeida et al. 2020). Achim et al. (2021) stated that COVID-19 had a severe financial impact on the performance of the business and commerce sector, thus confirming that companies struggled during this time. Businesses are forced to close their doors or scale down their operations and retrench employees, thereby disrupting many industry sectors (Donthu & Gustafsson 2020). This crisis was also an inevitable threat to South African companies' survival. Bulled and Singer (2020), supported by Almatrooshi et al. (2022), indicated that country-specific efforts, effective management and resources are needed to overcome the threats imposed by COVID-19. This includes managing companies from a sustainability perspective and investing in sustainability activities, as this will provide resilience to companies during a crisis such as COVID-19 (Broadstock et al. 2021).

Sustainability performance

In South Africa, JSE-listed companies are required to provide integrated reports when issuing their financial statements, or, if no reports are issued, provide an explanation for not doing so (Setia et al. 2015). Krzus (2011) observes that an integrated report is a single report that illustrates the interrelationship between a company's financial and sustainability performance. It was further noticed that an integrated report reflects an entity's environmental, social, governance and economic circumstances, which can be used by management for decision-making purposes and can also guide companies in a crisis, such as COVID-19. Consequently, a firm's integrated report can explain its understanding of its financial and sustainability performance (Pavlopoulos, Magnis & Iatridis 2019).

A company's sustainability performance can be measured by using ESG scores, which is a numerical or letter rating that quantitatively measures a company's sustainability activities (Clément et al. 2022). According to Dincă, Vezeteu and Dincă (2022), it is essential to analyse the three ESG pillars separately, as they can have opposite impacts on a company's performance. A short description of each of the three ESG score pillars is as follows:

- Environmental score: The Environmental score (E-score) provides a rating to a company based on its environmental impact, which includes, among other factors, a company's carbon emissions, water usage, waste production, biodiversity and land-use, supply chain and materials, and climate change (Amel-Zadeh & Serafeim 2018; Bissoondoyal-Bheenick, Brooks & Do 2023; JSE 2024).
- Social score: The Social score (S-score) rates the company based on its social impact. That is, the company's actions influence the community (Bissoondoyal-Bheenick et al. 2023). The S-score pertains to a company's involvement with its people, such as its actions towards health and safety of employees, labour standards, customers responsibility, human rights and community development (Amel-Zadeh & Serafeim 2018; JSE 2024).
- Governance score: The Governance score (G-score) provides a rating to a company based on how the company is governed, which includes, among other things, the board of directors' actions, leadership, political situations, ethical behaviour, tax transparency and anti-corruption schemes implemented by the company (Amel-Zadeh & Serafeim 2018; Bissoondoyal-Bheenick et al. 2023; JSE 2024).

The ESG rating providers inspect companies' disclosures (e.g., integrated reports), conduct interviews with those charged with governance and analyse and compare their findings to other companies and the industry to generate an E-score, S-score and G-score, which together constitute an overall ESG score. According to D'Amato, D'Ecclesia and Levantesi (2022), ESG scoring is one of the most favoured methods for measuring a firm's sustainability performance. This is confirmed by Halid et al. (2023), who state that ESG scores are a modernised way of evaluating a firm's performance. Furthermore, as independent external ESG rating providers compile ESG scores, they are a reliable measure of sustainability performance (Halid et al. 2023). Subsequently, ESG scores were used to measure sustainability performance.

It is also important to observe that there are shortcomings using ESG ratings. The ESG ratings are criticised by many researchers, for example, Charlin, Cifuentes and Alfaro (2022) found that ESG scores between four ESG rating agencies differ significantly. Somelar (2024) agrees hereto and mentions that this is the result of a lack of standardisation in the agencies' rating. The consequence is that investors who need to make an investment decision based on ESG ratings will come to different conclusions depending on the agency's rating that is chosen.

Financial performance

Previous related studies applied accounting- and market-based profitability measures to evaluate financial performance from more than one perspective. Accounting-based measures are internal measures of how well a company performs. Examples of accounting-based profitability measures applied in related studies include return on assets (ROA) by Hamdi et al. (2022), Hwang et al. (2021), Giannopoulos et al. (2022) and Velte (2017); return on capital employed (ROCE) by Zhao et al. (2018); earnings before

interest and taxes (EBIT) and ROA by Carnini Pulino et al. (2022); ROA and ROE by Elmghaamez, Nwachukwu and Ntim (2023), Hussain et al. (2018), Jha and Rangarajan (2020) and Kalia and Aggarwal (2023). We selected ROE as a measure because it summarises a combination of several financial ratios in the DuPont analysis to determine how successfully a company manages its shareholders' funds to generate profits (Kijewska 2016).

Financial performance can also be measured using market-based methods. This external measure discounts future profits by shareholders (the market); for example, Tobin's Q ratio (Fu, Singhal & Parkash 2016). Related studies, such as Chams et al. (2021), Elmghaamez et al. (2023), Giannopoulos et al. (2022), Jha and Rangarajan (2020), Saygili et al. (2021) and Velte (2017), all applied Tobin's Q. This ratio evaluates a company's success from an investment perspective (i.e., whether a company is overvalued or undervalued), and is used by potential investors to predict the value of a company's growth and future investments (Fu et al. 2016). Tobin's Q focuses on the market value and replacement value of a company and can be calculated as follows (Fu et al. 2016): the market value divided by total asset value, where market value refers to the sum of the market value of a company's shares (issued shares multiplied by the value per share on the stock exchange) and the market value of a company's debt (Kyere & Ausloos 2021), total asset value refers to the replacement costs of assets, that is, the present value of costs to be incurred to replace the total assets of a company (Fu et al. 2016).

Literature review
Theoretical framework

To unravel the relationship between sustainability and financial performance in the context of the COVID-19 pandemic it is important to understand whether the relationship changed after the pandemic. The results need to be interpreted by a preselected theoretical context. Theories are statements that anticipate certain outcomes in specific circumstances and provide a frame in which the results are interpreted. Kessler (ed. 2013) identified various theories that can predict reality, such as the relationship between sustainability and financial performance, including stakeholder, stewardship and signalling theories. From the above list, shareholder theory, which Milton Friedman introduced in 1970 (Friedman 1970), was selected as the theoretical framework for this study. Some studies that made use of shareholder theory in explaining a relationship similar to our research, include studies by Przychodzen and Przychodzen (2013), and Salehi and Arianpoor (2021). Friedman's theory states that a company's only responsibility is towards its shareholders, that is, maximising shareholder wealth (O'Connell & Ward 2020). Shareholders invest in companies to receive returns in the form of dividends. Therefore, shareholder wealth is maximised when companies' profits increase, resulting in an increase in the returns (dividends) distributed to shareholders (How, Lee & Brown 2019).

Shareholder theory is based on three assumptions (Mansell 2013):

- Shareholders are entitled to own property
- Because companies use shareholders' funds to invest in assets, shareholders are the owners of companies' assets (property)
- The relationship between shareholders and management is a contract in which the management commits to managing shareholders' assets.

Thus, it is evident that companies must act in the best interests of shareholders by increasing the value of their property, increasing returns and ultimately maximising shareholder wealth (Mansell 2013). The results of this study were interpreted according to two opposing arguments discussed further in the text.

Investigating the relationship between financial and sustainability performance, the question of endogeneity arises. In other words, what comes first? The chicken or the egg? Relevant to the study, the question is do ESG scores impact financial performance or does financial performance impact ESG scores? In other words, to tests for causality, which of the above should be the dependent (y) or the independent variable (x)? Or should reverse causality be considered where two models use the same dependent and explanatory independent variable interchangeably? The Granger causality test can be helpful to decide on the preferred direction by testing which of the financial or sustainability performances can be predicted with greater accuracy by past values of the other one (Asteriou & Hall 2016). However, Mans-Kemp and Van der Lugt (2020) suggest a mutually supportive interaction relationship between variables such as sustainability and financial performance. Also, in this vein Gujarati and Porter (2010) explain that the answer to the above causality issue should not necessarily be obtained from how strong the relationship is according to statistical analysis, but rather from the theory and literature. We found arguments in the literature from both sides to be interpreted in context of shareholders theory.

Firstly, Janah and Sassi (2021) and Zumente and Bistrova (2021) view that sustainability operations negatively impact companies' financial performance because these operations come at a cost to companies – they reduce profits, leading to reduced distributions to shareholders and, as a result, shareholder wealth is not maximised.

Secondly, Arvidsson and Dumay (2021) and Clément et al. (2022) argue that stakeholders are more likely to support firms with a high ESG score; these firms' financial performance outperforms those of firms with low or no ESG scores, and vice versa.

The above-mentioned arguments are in one direction: financial performance is the dependent variable impacted by sustainability performance or ESG. We developed the following conceptual framework for the above two opposing scenarios in shareholder theory:

1. Sustainability performance negatively impacts financial performance; that is, financial performance moves in the opposite direction as sustainability performance, concluding that ESG activities come at a cost to the company and its shareholders (and vice versa).
2. Sustainability performance positively impacts financial performance (i.e., financial performance moves in the same direction as sustainability performance), concluding that the company and its shareholders are financially rewarded for ESG performance (and vice versa).

The conceptual framework was also extended, where sustainability performance was the dependent variable. The following two scenarios are applicable:

3. Financial performance negatively impacts sustainability performance, that is, sustainability performance moves in the opposite direction of financial performance, concluding that companies do not distribute their retained profits equitably, which is at the disadvantage of ESG activities but favours shareholders (and vice versa).
4. Financial performance positively impacts sustainability performance; that is, sustainability performance moves in the same direction as financial performance, concluding that companies distribute their retained profits equitably at the advantage of ESG activities and shareholders.

The relationship between financial and sustainability performance

Companies must be conscious of the relationship between their financial and sustainability performance as their ESG activities impact financial performance. This information is helpful for management as it guides them in determining what actions need to be implemented to improve the company's financial performance, whether during a crisis or not (Hussain et al. 2018).

According to Halid et al. (2023), there are disagreements regarding the relationship between firms' financial and sustainability performance, as some studies have concluded that there is a positive correlation, while others indicate a negative correlation or no correlation at all. Mans-Kemp and Van Der Lugt (2020) conclude that ESG activities increase South African firms' financial performance. Their study measured the quality of companies' integrated reports from 2013 to 2018 using the EY Excellence in Integrated Reporting Awards and financial and sustainability performance in terms of Bloomberg's measures. However, Kalia and Aggarwal (2023) concluded that in developing economies such as South Africa, the sustainability operations (ESG scores) of firms have a minimal impact on firms' financial performance. Kalia and Aggarwal (2023) reached their conclusion by conducting a correlation and multivariate regression analysis to determine the impact that 468 companies' ESG scores (as obtained from Thomson Reuters) in total and separately (E-score, S-score and G-score) had on their financial performance in 2020.

This controversy is also evident in global studies. Velte (2017) performed a correlation and regression analysis to determine

the relationship between German companies' ESG activities, ROA and Tobin's Q. It was concluded that there is a positive correlation between a company's ROA and ESG activities; however, there is no correlation between Tobin's Q and ESG activities. German companies' performance was also mainly impacted by their governance activities and not by environmental or social activities. Hussain et al. (2018) considered 31 studies that investigated the relationship between financial and sustainability performance; 11 of these studies concluded that there is a negative correlation between financial performance and ESG, 14 studies reported a positive correlation, four studies indicated an insignificant correlation and the other two studies reported a U-shaped and inverted shape correlation, respectively.

The above evidence of mixed results continues, as some researchers found a positive relationship between sustainability performance and financial performance, while others found the opposite. For example, Zhao et al. (2018) found that the ESG score has a positive and significant impact on ROCE, and Carnini Pulino et al. (2022) found that the ESG score positively and significantly impacts EBIT. Hamdi et al. (2022) found that ROA positively and significantly impacts ESG. In contrast, Jha and Rangarajan (2020) found that ESG has a significantly negative impact on ROA and an insignificant negative impact on Tobin's Q. Carnini Pulino et al. (2022) found that ESG has a negative but insignificant impact on ROA, and Chams et al. (2021) found that Tobin's Q impacts ESG insignificantly.

A second kind of mixed result is notable, where accounting-based and market-based performance measures contradict each other. Velte (2017) found that ESG and its pillars have a significant positive impact on ROA but an insignificant impact on Tobin's Q. Giannopoulos et al. (2022) found the opposite: ESG impacts ROA negatively but positively impacts Tobin's Q. Jha and Rangarajan (2020) found a positive relationship between ROE and ESG but a negative relationship between Tobin's Q and ESG. Jha and Rangarajan (2020) showed a positive relationship between ROE and ESG but a negative relationship between Tobin's Q and ESG. A third kind of mixed results is also notable where ESG in total and the individual pillars 'E', 'S', and 'G' are differently related to financial performance measures (Carnini Pulino et al. 2022; Chams et al. 2021; Hussain et al. 2018; Jha and Rangarajan 2020; Kalia & Aggarwal 2023; Velte 2017).

The aforementioned studies considered the relationship between financial and sustainability performance during a non-crisis period; however, there is limited research on the impact of ESG on companies' financial performance before and after a time of crisis (Broadstock et al. 2021). According to Assous (2022), companies with high ESG scores were more resilient to the impact of COVID-19 than companies that did not invest in sustainability operations. However, further consideration is needed to confirm whether sustainability performance impacts financial performance during times of crisis (Broadstock et al. 2021) – which supports the fact that this study made use of the relationship between financial and

sustainability performance of South African JSE-listed companies before and after the COVID-19 crisis.

Hypothesis development

What was learnt from the literature review revealed that the pillars of ESG correlate differently with financial performance measures. This implies that the companies' E-, S- and G-scores may differ significantly. To understand how South African JSE-listed companies differently score on the ESG performance pillars, the first null hypothesis is as follows:

> H_1: There is statistically no significant difference between the three ESG pillars scores.

The second hypothesis addresses what is learned from the literature review regarding the mixed results between financial performance measures (accounting- and market-based ratios) and the total ESG scores and the individual scores of the ESG pillars:

> H_{2a}: ESG does not significantly impact ROE
>
> H_{2b}: E-, S- and G-score do not significantly impact ROE
>
> H_{2c}: ESG does not significantly impact Tobin's Q
>
> H_{2d}: E-, S- and G-scores do not significantly impact Tobin's Q

The third hypothesis is similar to the second, but with a change in direction:

> H_{3a}: ROE does not significantly impact ESG
>
> H_{3b}: ROE does not significantly impact the E-, S -and G-score
>
> H_{3c}: Tobin's Q does not significantly impact ESG
>
> H_{3d}: Tobin's Q does not significantly impact E-, S- and G-scores.

A probability (p-value) of more than 0.1 indicates no relationship, a p-value of less than 0.1 indicates a weak relationship between variables, whereas a p-value of less than 0.05 indicates a strong relationship and a p-value of less than 0.01 indicates a very strong relationship; however, only a p-value of < 0.05 is appropriate to reject a null hypothesis (Saunders, Lewis & Thornhill 2019).

In addition to the above hypotheses, this study aimed to determine the impact of COVID-19 on companies' sustainability and financial performance. That is to determine the difference between the 'before' and 'after' the COVID-19 data.

Research design and materials
Data

Data were needed for the population that consists of JSE-listed companies that trade in industries that were more severely impacted by the COVID-19 pandemic, that is, Basic Materials, Telecommunication, Consumer Goods, Consumer Services and Industrials (Department Statistics South Africa 2020), including the 193 companies within these industries that constituted the study population (Listcorp 2023). Note that InvestVerte classified the above 193 companies into Basic Materials, Communication Services, Consumer Cyclical, Consumer Defensive and Industrials.

Secondary panel data were used as this study investigated the relationship between financial and sustainability performance per year and before and after COVID-19, that is, a cross-section and longitudinal time horizon. Therefore, the data for this study were divided into two parts: the period before COVID-19 and a period after COVID-19. Few studies have been conducted before and after the analysis of the impact of COVID-19. However, after considering two particular studies performed by Radivojević, Dimovski and Miti (2023) and Travergård and Pettersson (2023), the following was gathered about the COVID-19 period: The WHO declared the COVID-19 pandemic a global pandemic in March 2020 (Ciotti et al. 2020). Furthermore, 2020 is considered the year in which COVID-19 had the most devastating impact on companies, that is, the peak of the COVID-19 pandemic (Radivojević et al. 2023). According to the studies performed by Radivojević et al. (2023) and Travergård and Pettersson (2023), the period before 2020 is considered to be pre-COVID-19, while periods after 2020 are considered recovery periods from COVID-19 (hereafter referred to as after and post-COVID-19).

As companies' financial and sustainability data for 2023 are yet to be finalised, 2023 was not included in this study. Consequently, the post-COVID-19 period was defined as 2021–2022. To align with the post-COVID-19 period, the pre-COVID period also constituted 2 years, that is, 2018–2019, while 2017 was used as the base year when regression analyses were performed. As 2020 was the peak of the COVID-19 pandemic, this year was excluded because it was not representative of a period before or after, that is, recovering from COVID-19:

- Before COVID-19: 2018–2019
- After COVID-19: 2021–2022

In total and per pillar, sustainability performance data, that is, ESG scores, were acquired from InvestVerte, an ESG rating provider. InvestVerte uses an impact-based approach to determine ESG scores; that is, ESG drivers are chosen based on their impact on a company's financial ratios (quantitative model) and other ESG elements (qualitative model), and two scores are generated: a quantitative score and a qualitative score. A multiple ordinal logistic regression then combined these two scores to provide an overall ESG score and score per pilar. The scores ranged from 0 to 100, where 0 is the worst score and 100 is the best score to be obtained. Only 115 of the 193 companies were included in the database. This is because the researchers did not have control over the missing data and had to settle for a convenience sample of 115 companies. Financial performance data (ROE and Tobin's Q) and the control variables' data were extracted from IRESS. In limited cases, where some financial data were missing, the data were directly extracted from a company's website. In several cases, data could not be obtained, especially for Tobin's Q. Eleven more companies were omitted, bringing a

total of 104 companies. Some of the 104 companies only have data for some of the years, totalling 508 data points (98 for 2017, 204 for 2018–2019 and 206 for 2021–2022). Table 1 provides a summary of the 104 companies per industry.

Variables and the ANOVA

Testing H_1 requires a technique to determine whether there is a statistically significant difference between the means of the three ESG pillars. We adopted the principles of ANOVA, a technique to determine the differences between the means of three or more groups on a single quantitative measure, such as the ESG score (Pietersen & Maree 2021). We used the E-, S- and G-scores for the different groups, calculated the means and determined whether there was a significant difference between the means. This is followed by Levene's test, that is, a test of homogeneity of variance based on the mean, which indicates a significant difference between the variances of the three pillars. Therefore, three samples were obtained from populations with different variances (DATAtab 2023).

Further analyses were conducted to determine whether the differences between the pillars were statistically significant, that is, when the ANOVA p-value was less than 0.05. Larger samples yielded relatively easier and statistically significant evidence. Therefore, we tested the results for their practical significance. We tested the effect size to determine if the differences between the pillars are significant in practice by using the Eta-squared point of estimate, where $\eta^2 = 0.01$ small; 0.06 medium; 0.14 large (National University 2023).

Variables and the base regression model

The dependent variable for the regression analysis, testing H_2 and H_3, is similar to the studies performed by Brogi and Lagasio (2018) and Jha and Rangarajan (2020), who investigated the direction of the relationship between financial and sustainability performance from both sides. The dependent variable is a company's ROE/Tobin's Q, in which the impact of ESG on financial performance is investigated. Thereafter, the dependent variable was a company's ESG score and its pillars, and the impact of financial performance on sustainability performance was investigated.

Consequently, the exploratory independent variable is first a company's ESG score and, alternatively, the individual pillars of ESG, whereby the impact of ESG on financial performance is investigated. Thereafter, the exploratory independent variable was a company's ROE/Tobin's Q, and the impact of

TABLE 1: Sample companies per industry.

Industry	Number of companies included
Basic materials	18
Communication services	11
Consumer cyclical	27
Consumer defensive	16
Industrials	32
Total companies	**104**

Source: InvestVerte

financial performance on sustainability performance was investigated.

Previous studies have also investigated the relationship between financial and sustainability performance using various control variables. Jha and Rangarajan (2020) tested the relationship between ROA and Tobin's Q against ESG in both directions, including control variables, such as firm size, sector, firm age, research and development (R&D) intensity and risk (beta value). Brogi and Lagasio (2018) also investigated the relationship between both sides and only included firm size as a control variable. Hussain et al. (2018) determined the impact of ESG on ROA, ROE and Tobin's Q. They include the industry in which a firm operates, firm size (total assets), capital, R&D intensity of the firm, sales growth and the debt-to-equity ratio of the firm as control variables. Similarly, Saygili et al. (2021) included firm's size, debt-to-equity ratio and current ratio as control variables when determining the effect of environmental disclosure on ROE and Tobin's Q. Hwang et al. (2021) examined the relationship between ROA and ESG before and after COVID-19 and included firm size, leverage, sales growth, cash holdings and the COVID-19 period as control variables. Considering the above, the control variables for the scenarios stated above, (a) and (b), are selected as they were frequently used in previous related articles as follows:

- Firm size
- Leverage
- Liquidity
- Sector
- Before or after COVID-19.

Two base models were developed to determine the direction of the relationship between financial performance and sustainability performance:

- Financial performance = alpha + sustainability performance (beta) + control variables
- Sustainability performance = alpha + financial performance (beta) + control variables

Regarding the former, four models are needed: ROE and Tobin's Q are alternatively the dependent variables, where ESG in total and the individual pillars serve as independent variables in each case. For the latter, four more models are needed, where ESG, 'E', 'S' and 'G' are alternatively the dependent variables, with ROE and Tobin's Q the independent variables.

Method of regression estimation

The fixed effect and Random effect regression models (FEM and REM) are suitable models for panel data. FEM allows for different constants for each company, whereas REM treats the constants for each company not as fixed, but rather as random parameters (Asteriou & Hall 2016). The fixed effect regression model captures effects that are specific to a company. Therefore, it allows for different constants that is unique to each individual company, for

example ROE, Tobin's Q and ESG scores. Random effect regression model assumes that that effects that are specific to a company may or may not correlate with the independent variables (Omotoso, Schutte & Oberholzer 2022).

To summarise, the random component is a variable that has a varying impact on outcomes, whereas the fixed component is a variable that constantly impacts outcomes (Peng & Lu 2012). A linear mixed-effects regression model was found to be applicable for data analysis as both fixed and random effects were considered. In this study, the random component includes the companies because the inclusion of any other sample of companies will have a different impact on the outcome; all other variables are fixed components. In this model, the degrees of freedom are estimated using Satterthwaite's method.

The mixed effect, similar to REM (Asteriou & Hall 2016) is appropriate when data are unbalanced, that is, when some years have missing data points and when the data are longitudinal (Peng & Lu 2012). In this study, the data are unbalanced because each year's data (selected companies) are different, which makes the linear mixed-effect model suitable. A mixed-effects model comprises random and fixed components. Certain assumptions are associated with linear mixed-effects models (similar to ordinary least squares models) (Peng & Lu 2012). The assumptions tested were as follows:

- Multicollinearity: This occurs when at least two independent variables are highly correlated. Multicollinearity is measured by a generalised variance inflator factor (GVIF), and a high value (more than 10) indicates a strong correlation between independent variables, which then requires one or more independent variables to be removed to eliminate multicollinearity (Alin 2010).
- Normality: This indicates whether the data are normally distributed and can be illustrated using a quantile-quantile (Q-Q) plot that shows the distribution of data (in quantiles) compared to theoretical quantiles. A linear pattern indicates that the data are normally distributed (Das & Imon 2016).
- Homoscedasticity: This indicates the distribution of residuals, that is, whether the data points for the dependent and independent variables have equal variance. If residuals are plotted on a scatterplot and are equally distributed (thus, not a coned-shape pattern), then the data are homoscedastic (Osborne & Waters 2019; Saunders et al. 2019).

Lastly, the system generalised method of moments (SGMM) estimator is also suitable for panel data and controls for endogeneity as the lagged dependent variable is also included in the model (Omotoso et al. 2022). However, we did not consider this method as the post-COVID-19 model (2021 and 2022) would require the 2020 dependent variable – the year that we purposefully omitted to investigate the pre- and post-COVID-19 effect.

Ethical considerations

Ethical clearance to conduct this study was obtained from the North-West University, Economic and Management Sciences Research Ethics Committee (EMS-REC) (NWU-00734-23-A4).

Results
Spread of data

The primary purpose of this study is to determine the relationship between sustainability and financial performance before and after the COVID-19 pandemic. A visual inspection of the data indicated that the data points had similarly spread before and after COVID-19. Scatterplots illustrating the spread of data between the ROE/Tobin's Q and ESG scores before and after COVID-19 are presented next.

The two graphs in Figure 1 contain 410 data points, 204 pre- and 206 after post-COVID-19, showing slight differences between the two periods. Similar scatter plots were obtained for each ESG pillar. These are not shown because of space restrictions. This visual inspection is very similar to the graphs in which the individual pillars of the ESG were used. Based on the advice of a statistician from the Statistical Consultation Services at North-West University (NWU), we concluded that the differences between pre- and post-COVID-19 were too small and not sensible for further analysis.

Correlation analysis

Using Bakdash and Marusich's repeated measure correlation, analyses were conducted to identify the relationship between different dependent and independent variables and whether the correlations were statistically significant. Correlation analyses were performed for all the companies in all sectors identified and for each sector individually.
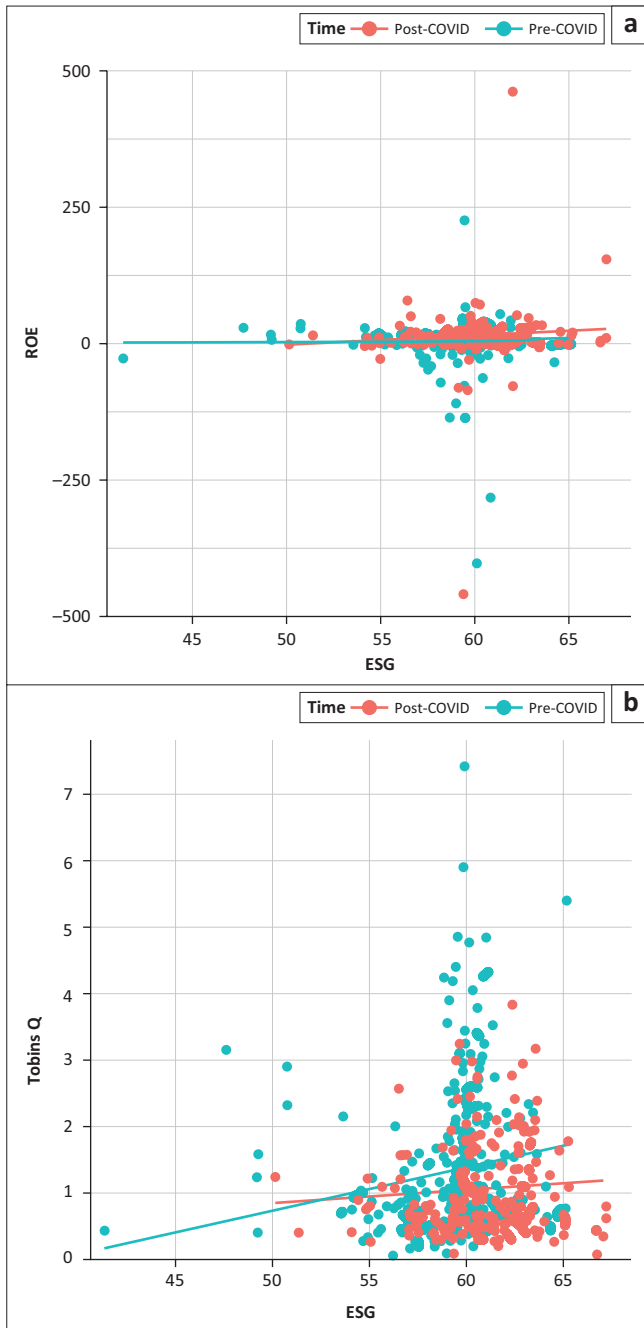
After consideration of the above correlations, it was clear that 'All sectors' provide the best correlations between variables: 'All sectors' have six correlations at significant levels, whereas the individual sectors only have five or fewer correlations at significant levels. Because of space restrictions, only the correlations between financial performance and sustainability performance for 'all sectors' are shown in Table 2.

Table 2 helps to develop the regression models. Note that there is no statistically significant correlation between ROE and the S-score or between Tobin's Q and the G-score; these variables were not included simultaneously in the same model.

Adjusted regression model

On advice from the NWU Statistical Consultation Services, the following adjustments were made:

- 'All sectors' revealed the most significant relationship between the dependent and independent variables

TABLE 2: Correlations between dependent and exploratory independent variables (All sectors).

Performance	Environmental	Social	Governance	ESG
ROE				
Coefficient (*r*)	0.0760	0.009	0.104	0.098
P	0.0366**	0.801	0.004***	0.006***
Tobin's Q				
Coefficient (*r*)	-0.082	-0.113	-0.029	-0.103
P	0.024**	0.002***	0.431	0.005***

ROE, return on equity; ESG, environmental, social and governance.
ESG, *, **, ***, Significance level at 0.1, 0.05 and 0.01.

After considering these facts, together with the correlation between the variables presented in Table 2, the models identified were adjusted as follows, where financial performance is the dependent variable (Models 1–4) and sustainable performance is the dependent variable (Models 5–8):

Model 1: $ROE_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Size_{it} + \beta_3 LEV_{it} + \beta 4LIQ_{it} + \mu_{it}$

Model 2: $ROE_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 G_{it} + \beta_3 Size_{it} + \beta_4 LEV_{it} + \beta_5 LIQ_{it} + \mu_{it}$

Model 3: $LogTobin'sQ_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Size_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \mu_{it}$

Model 4: $LogTobin'sQ_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 S_{it} + \beta_3 Size_{it} + \beta_4 LEV_{it} + \beta_5 LIQ_{it} + \mu_{it}$

Model 5: $ESG_{it} = \beta_0 + \beta_1 ROE_{it} + \beta_2 Tobin'sQ_{it} + \beta_3 Size_{it} + \beta_4 LEV_{it} + \beta_5 LIQ_{it} + \mu_{it}$

Model 6: $E_{it} = \beta_0 + \beta_1 ROE_{it} + \beta_2 Tobin'sQ_{it} + \beta_3 Size_{it} + \beta_4 LEV_{it} + \beta 5LIQ_{it} + \mu_{it}$

Model 7: $S_{it} = \beta_0 + \beta_1 Tobin'sQ_{it} + \beta_2 Size_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \mu_{it}$

Model 8: $G_{it} = \beta_0 + \beta_1 ROE_{it} + \beta_2 Size_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \mu_{it}$

where ROE_{it}, $LogTobin'sQ_{it}$, ESG_{it}, E_{it}, S_{it} and G_{it} denote the dependent variable and the independent exploratory variable alternatively, with ''' for a company and '*t*' in a year; *Size* represents the firm size in terms of the book value of total assets; *LEV* represents the leverage in terms of the debt and/or asset ratio; *LIQ* represents the liquidity in terms of the current ratio. β_1, …, β_5 represent the coefficients of the exploratory and control variables. B_0 is the constant parameter. μ_{it} is the scalar of the disturbance as follows (Equation 1):

$$\mu_{it} = C_i + \gamma_t + \varepsilon_{it} \qquad \text{[Eqn 1]}$$

where C_i represents company-specific fixed effects, γ_t is the time-specific effect and ε_{it} is the error term with a zero mean and variance over time and across companies.

Assumptions

The data were verified based on the following three assumptions. The first is the GVIF value used to test for multicollinearity. The results of this study are presented in Table 3.

Table 3 shows that all the GVIF values are far smaller than the benchmark of ten. Therefore, there was no need to eliminate any independent variables.

The second assumption was that the data would be tested for normality. Normality Q-Q plot analysis was performed.

Source: Bakdash, J.Z. & Marusich, L.R., 2023, *rmcorr: Repeated measures correlation*, R package version 0.6.0, viewed 11 October 2023, from https://CRAN.R-project.org/package=rmcorr
ROE, return on equity; ESG, environmental, social and governance.

FIGURE 1: Spread of ESG and ROE/ Tobin's Q data (*N* = 204 pre- and 206 post-COVID-19).

(Table 2); only 'All sectors' were included in the models, and therefore 'Sector' was ruled out as a control variable.

- Visual inspection of the data revealed that they were similarly distributed before and after COVID-19. COVID-19 was excluded as a control variable (Figure 1); however, regressions were still conducted for each year to enable the interpretation of results.
- Because of the data being shattered, the variable Tobin's Q was substituted by log transformation *LogTobin'sQ* to reduce the skewness of the data and to come closer to a normal distribution.

TABLE 3: Generalised variance inflator factor values to test for multicollinearity.

Independent variable	Model							
	1	2	3	4	5	6	7	8
ROE	-	-	-	-	1.05	1.05	-	1.03
Tobin's Q	-	-	-	-	1.21	1.18	1.22	-
ESG	1.27	-	1.60	-	-	-	-	-
Environment	-	1.21	-	1.41	-	-	-	-
Governance	-	1.22	-	-	-	-	-	-
Social	-	-	-	1.16	-	-	-	-
Data	1.28	1.40	1.67	1.67	1.30	1.24	1.32	1.07
Debt and/or Asset	1.04	1.08	1.07	1.07	1.07	1.07	1.06	1.06
Current ratio	1.03	1.03	1.06	1.06	1.05	1.04	1.05	1.04
Total assets	1.01	1.02	1.09	1.08	1.04	1.03	1.06	1.03

ROE, return on equity; ESG, environmental, social and governance.

The third assumption was to test the homoscedasticity of the data. The spread of data was then plotted. For both the second and the third assumptions, the tests were performed using R Core Team (2022) and Bates et al. (2015). The researchers and statistician of the NWU performed a visual inspection to firstly determine whether the data were normally distributed against the benchmark of a linear pattern and, secondly, evenly distributed. Very few outliers were detected and we concluded that the data were suitable for further regression analyses.

Descriptive statistics

Table 4 summarises all variables using descriptive statistics. Considering ROE and Tobin's Q, it is clear that the standard deviation of the former is much more widespread than the latter. Both variables include outliers because the minimum and maximum scores are distant from the mean. The ESG pillar scores indicate that the S-score (70.10%) has a much higher mean than the G-score (64.94%) in second place and the E-score (43.74%) in third place. The last three are control variables, with evidence that the data spread is relatively wide for the current ratio and total assets.

Analysis of variance to test H_1

Table 5 further analyses the means of the individual E-, S- and G-scores for 2017–2022 (2020 is excluded). Levene's test revealed $p < 0.001$, indicating unequal variances between the data of the three pillars. Furthermore, the ANOVA statistics indicate that the difference 'Between groups' is statistically significant with $p < 0.001$.

Table 5 shows that the three means fall in different subsets measured against a p-value of < 0.05, meaning that the mean S-score is statistically significantly higher than the means of the G-score and E-score and that the G-score's mean is also statistically significantly higher than the mean of the E-score. This is sufficient evidence to reject H_1, implying that the alternative hypothesis is true: there is a significant difference. These mean differences are also significant in practice, as the eta-squared point of the estimate is $\eta^2 = 0.881 > 0.14$, indicating a very large effect.

TABLE 4: Descriptive statistics for variables ($N = 508$).

Variable	Mean	Standard deviation	Coefficient of variance	Minimum	Maximum
ROE (%)	10.41	23.78	2.28	-280.53	77.27
Tobin's Q	1.22	0.97	0.79	0.05	7.42
ESG (%)	59.82	2.83	0.05	41.40	67.17
Environment (%)	43.74	6.35	0.15	19.27	60.29
Social (%)	70.10	2.98	0.04	62.80	86.95
Governance (%)	64.94	1.93	0.03	36.70	71.93
Debt and/or assets	0.50	0.26	0.52	0.00	2.03
Current ratio	2.84	13.74	4.48	0.26	248.25
Total assets (Rmil.)	26521	57080	2.15	41	469968

ROE, return on equity; ESG, environmental, social and governance.

TABLE 5: Tuckey's honestly significance difference (HSD) to categorise means in subsets.

Pillars of ESG	N	Subset for alpha = 0.05		
		1	2	3
Environment	508	43.74	-	-
Governance	508	-	64.94	-
Social	508	-	-	70.10

Note: Means for groups in homogeneous subsets are displayed.
ESG, environmental, social and governance.

Regression analysis: Linear mixed effect model

Table 6 summarises the regression analysis for Models 1–4 to test H_2. Model 1 shows that the relationship between ESG and ROE is insignificant, implying that ESG does not affect ROE. Model 2 shows that governance performance positively affects ROE, but its relationship with environmental performance is insignificant. Model 3 shows that ESG impacts Tobin's Q positively and significantly, and Model 4 shows that social performance negatively impacts Tobin's Q. It is only weakly significant ($p = 0.09 > 0.05$), but its relationship with the environment is insignificant. Test H_2 was as follows:

H_{2a}: ESG does not significantly impact ROE – support.

H_{2b}: E-, S- and G-scores do not significantly impact ROE – support for E and S; reject G.

H_{2c}: ESG does not significantly impact Tobin's Q – reject.

H_{2d}: E-, S- and G-scores do not significantly impact Tobin's Q – support (note that S weakly impacts ROE).

The Data2018–2022 variables represent the time aspect of the models. This indicates what happens to the dependent variables over time. In Models 1 and 2, the whole package of independent variables does not affect ROE significantly before COVID-19 and the pattern is continued until 2021; however, Data2022 acts somewhat differently, with a weak significant relationship with ROE. Models 3 and 4 exhibit the same pattern before and after COVID-19, as the entire package of independent variables highly negatively affected Tobin's Q each year.

When considering the control variables, the current ratio was not applicable as it was insignificant in Models 1 and 2, with ROE as the dependent variable; however, it was applicable in Models 3 and 4, with Tobin's Q as the dependent variable. Firm size (Total assets) was statistically significant in all four models, but it is the leverage ratio (debt and/or Assets) that is prominent, where it is significantly negatively related to

TABLE 6: Panel regression results of environmental, social, and governance and its pillar's impact on financial performance.

Independent variable	Dependent variable: ROE				Dependent variable: *Log*Tobin's Q			
Model	1		2		3		4	
	Estimate†	*p*§	Estimate	*p*	Estimate	*p*-value	Estimate	*p*
(Intercept)	-18.95	0.522	-92.08	0.035**	-0.64	0.067*	0.86	0.080*
ESG	0.47	0.344	-	-	0.01	0.023**	-	-
Environment	-	-	-0.12	0.554	-	-	0.00	0.541
Governance	-	-	1.63	0.014**	-	-	-	-
Social	-	-	-	-	-	-	-0.01	0.090*
Data2018‡	2.57	0.454	4.16	0.236	-0.11	< 0.000***	-0.11	< 0.000***
Data2019	-4.45	0.194	-3.87	0.261	-0.21	< 0.000***	-0.23	< 0.000***
Data2021	2.71	0.425	2.73	0.421	-0.28	< 0.000***	-0.28	< 0.000***
Data2022	5.96	0.098*	6.32	0.081*	-0.38	< 0.000***	-0.36	< 0.000***
Debt and/or Asset	-4.93	< 0.000***	-5.50	< 0.000***	0.06	0.026**	0.06	0.022**
Current ratio	-0.87	0.450	-1.02	0.375	0.02	0.053*	0.02	0.083*
Total assets	2.71	0.060*	2.90	0.043**	0.08	0.051*	0.08	0.033**

ROE, return on equity; ESG, environmental, social and governance.

*, **, ***, Significance level at 0.1, 0.05 and 0.01.

†, 'Estimate' refers to the regression coefficient, which indicates how the dependent variable changes for every 1% change in the specific independent variable (Saunders et al. 2019); ‡, 'Data' refers to the combination of variables in the specific model, that is, the results for each year (2018, 2019, 2021, 2022) considering the independent and control variables applicable to that specific model. 'Data' thus represents the time aspect of the model and indicates how the dependent variable changes over time, considering the exploratory independent variable and the control variables. The year 2017 was used as the base year; §, 'p-value' refers to the significance of the relationship between variables. A *p*-value of less than 0.1 indicates a weak relationship, a *p*-value of less than 0.05 indicates a strong relationship and a *p*-value of less than 0.01 indicates a very strong relationship (Saunders et al. 2019).

TABLE 7: Panel regression results of financial performance impact on environmental, social and governance and its pillars.

Independent variable	ESG		Environment		Social		Governance	
Model	5		6		7		8	
	Estimate	*p*	Estimate	*p*	Estimate	*p*	Estimate	*p*
(Intercept)	59.36	< 0.000***	43.36	< 0.000	70.22	< 0.000***	65.11	< 0.000***
ROE	0.00	0.304	0.00	0.612	-	-	0.00	0.029**
*Log*Tobin's Q	0.22	0.064*	-0.20	0.506	-0.14	0.203	-	-
Data2018	-0.50	0.003***	-0.57	0.229	0.02	0.880	-1.19	< 0.000***
Data2019	-0.86	< 0.000***	-1.61	< 0.001***	-0.59	< 0.001***	-0.71	< 0.000***
Data2021	0.06	0.729	-0.04	0.938	0.07	0.664	0.02	0.892
Data2022	2.32	< 0.000***	5.14	< 0.000***	0.71	< 0.000***	0.77	< 0.000***
Debt and/or Asset	0.10	0.458	-0.19	0.585	0.12	0.369	0.08	0.461
Current ratio	-0.19	0.005***	-0.44	0.017**	-0.02	0.698	-0.00	0.975
Total assets	0.34	0.065*	-0.11	0.780	-0.29	0.113	0.11	0.391

ESG, environmental, social and governance; ROE, return on equity.

*, **, ***, Significance level at 0.1, 0.05 and 0.01.

ROE and positively related to Tobins Q at $p < 0.05$. It seems that leverage could have been more than a control variable; however, it was not considered to treat it as an exploratory independent variable as it will distort the focus of the study.

Table 7 displays that in Model 5, Tobin's Q is significantly positively related to ESG, but $p = 0.064 > 0.05$ is insufficient to reject the null hypothesis. Return on equity is the only financial performance measure that relates significantly to governance performance in Model 8 with $p = 0.029 < 0.05$, sufficient to reject the null hypothesis. Testing H_3 is as follows:

H_{3a}: ROE does not significantly impact ESG – support.

H_{3b}: ROE does not significantly impact E-, S-, and G-score – support for E and S; rejection for G.

H_{3c}: Tobin's Q does not significantly impact ESG support (Tobin's Q weakly affects ESG).

H_{3d}: Tobin's Q does not significantly impact E-, S- or G-score support.

The Data2018–2022 variables differ before and after COVID-19. The 'before', Data2018, relates significantly negatively to ESG (Model 5) and G-score (Model 8), and Data2019 is significantly negative to ESG, E-, S- and G-score (Models 5 to 8). However, the 'after' Data2021 relates insignificantly to ESG and E-, S -and G-score (Models 5 to 8), but Data2022 relates significantly positively to ESG and E-, S- and G-score (Models 5 to 8).

Regarding the control variables, the current ratio is significant in Models 5 and 6, and the total assets are significant in Model 5. The control for leverage (debt and/or asset) is not applicable when sustainable performance measures are dependent variables.

Discussion

The secondary purpose of this study is to determine whether JSE companies scored on the different pillars of ESG. We find that companies scored differently on the three pillars of ESG performance. The literature review referred to studies that found that the pillars of ESG relate differently to financial performance (Carnini Pulino et al. 2022; Chams et al. 2021; Hussain et al. 2018; Jha & Rangarajan 2020; Kalia & Aggarwal

2023; Velte 2017). As Dincă et al. (2022) concluded, these studies agree that there are significant differences between the pillar scores. Our results support them. We found significant differences (Table 5) in the order that the social pillar (70.10%) was valued statistically significantly higher by companies than the other two, followed by the governance pillar (64.94%), which was valued statistically significantly higher than the environmental pillar (43.74%).

The order is clear; therefore, these three pillars are not equally important to companies. The reason for such great differences is unclear because we did not investigate it. However, stakeholders who are part of society (e.g., employees, customers, communities, etcetera) benefit more from companies than the issues of how the companies are governed and their environmental impact. Furthermore, how companies are governed is more critical than their environmental impacts. Nevertheless, it seems that the social performance plays a special role in the companies.

The primary purpose was to determine the relationship between JSE-listed companies' financial performance and sustainability performance; that is, financial performance impacts sustainability performance and vice versa. Thus, three null hypotheses were rejected. In Model 2, we firstly found that the governance pillar positively impacted ROE. These results correspond with those of Carnini Pulino et al. (2022), Elmghaamez et al. (2023), Hamdi et al. (2022), Velte (2017) and Zhao et al. (2018), who found that an accounting-based performance measure affects sustainability performance. Therefore, the results disagree with those of Jha and Rangarajan (2020), who find that ESG significantly negatively impacts ROA. To conclude, point 2 of our shareholder theory conceptual framework is applicable: 'Sustainability performance positively impacts financial performance', indicating that companies are financially rewarded for how they are governed (and vice versa).

Secondly, in Model 3, we find that ESG impacts Tobin's Q. This is in agreement with Giannopoulos et al. (2022) and contradicts the findings of Jha and Rangarajan (2020) and Velte (2017). To conclude this result, point 2 of our shareholder theory conceptual framework is again applicable: 'Sustainability performance impacts financial performance positively', indicating that shareholders are financially rewarded for companies' sustainability performance (and vice versa).

Thirdly, in Model 8, we find that ROE positively affects governance performance. Although the direction is different from that discussed earlier (governance impacts ROE), the same related literature is still relevant because, in both cases, the relationships are positive. Interpreting the latter against the theoretical framework, point 4 of it is applicable, 'financial performance impacts sustainability performance positively', – concluding that companies distribute their retained profits fairly at the advantage of both governance activities and shareholders (and vice versa).

Although the null hypothesis was not rejected, the study also found that the social pillar impacts Tobin's Q at a significance level of $p > 0.05$ and < 0.1 in Model 4. This implies a weak relationship. Using point 1 of the theoretical framework, 'sustainability performance negatively impacts financial performance', concluding that social performance *somewhat* comes at a cost to shareholders (and vice versa). This finding is opposed to what the shareholder theory supports. The context of this finding is important as there is no point to favour shareholders at the cost of other stakeholders. For example, to maximise shareholder wealth at any cost while other stakeholders suffer. It is also important to realise that companies have legal obligations towards stakeholders and especially employees.

There was also a weak positive impact of ESG on Tobin's Q, as found in Model 5. Using point 4 of the theoretical framework, 'financial performance positively impacts sustainability performance', concluding that companies' shareholders *somewhat* agree to distribute retained profits at their loss but to the advantage of ESG activities.

Studies by Almeida et al. (2020) and Achim et al. (2021) concluded that the financial ratio analyses of companies before and after COVID-19 are likely to differ. Hwang et al. (2021) used data up to 2020 and found positive associations between financial performance and ESG performance during COVID-19. This study differs from that discussed earlier and tested whether the financial and sustainability performance relationship was affected differently by COVID-19 during the 'before' and 'after' periods. This discussion is presented in two sections. Firstly, we consider the relationship between financial and sustainability performance measures before and after the COVID-19 pandemic. From Figure 1 and its discussion, it was found that the data before and after COVID-19 showed small differences between ROE/Tobin's Q and ESG and its pillars. Therefore, the decision was made to omit 'COVID-19' as a dummy variable in regression analysis. Consequently, we conclude that the relationship between financial performance and sustainability performance was not significantly affected by COVID-19.

Secondly, we examine how the package of independent variables relates to the dependent variable annually before and after COVID-19 (Models 1 to 4). Where ROE/Tobin's Q is the dependent variable and the data package is the independent variable (ESG/ESG pillars plus the control variables), the results are inconclusive when ROE is the dependent variable. This is because there is a non-significant positive, negative and positive relationship in 2018, 2019 and 2021, respectively, and a positive relationship that is significant at the 10% level in 2022. Where Tobin's Q is the dependent variable, the conclusion is clear: the data package affected Tobin's Q significantly negatively in all years before and after COVID-19. Therefore, there is no difference in how Tobin's Q is affected by COVID-19. Therefore, we conclude that, where the financial performance is the dependent variable, the sustainability and financial performance relationship did not change after the COVID-19 pandemic.

ESG/ESG pillars are the dependent variable, with the independent variables ROE/Tobin's Q plus the control variables as the data package (Models 5 to 8). The study concludes that, where sustainability performance is the dependent variable, the data before and after COVID-19 differ significantly. Therefore, the COVID-19 pandemic affected the sustainability and financial performance relationship. Models 5–8 show seven out of eight negative relationships (of which six are significant) before COVID-19 and seven out of eight positive relationships (of which four are significant). The fact that mainly the negative relationships before COVID-19 changed to positive after the pandemic, implies that COVID-19 indeed moved stakeholders as confirmed by Arvidsson and Dumay (2021) and Clément et al. (2022) that they are more likely to support firms with a higher ESG score as these firms' financial performance outperforms those of firms with lower ESG scores.

Lastly, the leverage ratio (debt and/or Assets) was significantly ($p < 0.05$) negatively related to ROE, but positively related to Tobin' Q. It implies that companies that are higher leveraged have a lower accounting performance, but a higher market performance.

Conclusion

The study's novelty lies in the fact that it simultaneously investigated the impact of COVID-19 on the impact of sustainability performance on financial performance, and vice versa, of selected South African listed companies. This is a valuable update of the relationship between sustainability and financial performance during recent years that include the COVID-19 phenomenon as a major shock event. This makes a valuable contribution by considering the E-, S- and G- dimension scores separately in relationship with financial performance, which was interpreted within the shareholder theory. This study's unique results are all interpreted from the developed framework with the principle that companies are only responsible for their shareholders, that is, maximising shareholder wealth.

The results regarding the statistically significant ($p < 0.05$) relationship between sustainability performance and financial performance are that: (1) governance impacts ROE positively, (2) ESG impacts Tobin's Q positively, (3) ROE impacts governance positively. Statistically significant ($p < 0.1$) results show that (4) Tobin's Q *somewhat* impacts ESG positively, and (5) social performance *somewhat* impacts Tobin's Q negatively. Those results are noteworthy to shareholders, potential investors and companies' management, as: (1) it is evident that spending on governance is fruitful as it promotes companies' profitability; (2) spending on ESG activities is fruitful and promotes shareholders' wealth, (3) it implies that this is a priority for companies ploughing profits back to improve governance further; (4) shareholders are somewhat optimistic and support spending on ESG and (5) they are somewhat hostile to spending on social activities.

Further results show that sustainability performance and financial performance before and after COVID-19 are not meaningful, except where the packages of ROE, Tobin's Q, debt and/or asset ratio, current ratio and total assets mainly negatively affected sustainability performance before COVID-19 but positively affected it after that. The value hereof is that it brings light to a better understanding of the impact of COVID-19 on the relationship between sustainability and financial performance, as per our shareholder theory framework. In the pre-COVID-19 period, sustainability performance is negatively related to financial performance, implying that ESG activities come at a cost to the company and its shareholders. In the post-COVID-19 period, sustainability performance is positively related to financial performance, implying that companies distribute their retained profits equitably to the advantage of both ESG activities and shareholders.

The outstanding result of this study is the combination of primary and secondary results. The fact that companies do not equitably score on these pillars may be problematic. Meagre scoring and/or spending on companies' environmental impact may increase profits to shareholders; however, it may negatively impact their legitimacy, harming future profits. Shareholders may be pleased with any spending on improving governance because they help safeguard their investment. Scoring and/or spending on governance, which is relatively moderate, is evident in this study as it promotes profits. The extremely high scoring and/or spending on the social pillar may concern shareholders, as this may excessively reduce profits and lead to shareholders' wealth not being maximised.

The study's results are reliable, as only secondary data from independent sources were used. The validity is that the objectives are met, and 104 companies' sustainability and financial performance data were analysed for the 2 years before and after COVID-19. The limitation of the study is that it only applied data for 4 years: two before and two after COVID-19, and the fifth as a base year. This was a convenient sample, as the sample selection was mainly based on the data received from the ESG data agency. Finally, data from another ESG rating agency could yield different results. A convenient sample size may hinder the generalisation of the findings. Future studies should address these limitations. Furthermore, leverage can be selected as an exploratory variable to financial performance measures.

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Competing interests

The authors declare that they have no financial or personal relationship that may have inappropriately influenced them in writing this article.

Authors' contributions

I.D. and M.O. wrote the entire article. S.v.R and M.O. were the supervisors for this study.

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

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