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Impact of the Covid-19 pandemic on the relationship between financial performance and the ESG of Brazilian publicly traded companies

Impacto de la pandemia de Covid-19 en la relación entre el desempeño financiero y los ESG de las empresas públicas brasileñas

Impacto da pandemia de Covid-19 na relação entre o desempenho financeiro e o ESG das companhias abertas brasileiras

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Abstract

Purpose: To analyze the impact of the Covid-19 Pandemic on the relationship between ESG (Environmental, Social and Governance) scores and the financial performance of Brazilian publicly traded companies.

Methodology: The sample of this study consists of 100 Brazilian non-financial companies listed on B3 (Brasil, Bolsa, Balcão) with information about ESG. The data collection spanned a time series from 2018 to 2021. ESG scores were collected from the Refinitiv Eikon® database, using ROA (Return on Assets) as a proxy for financial performance. Two research hypotheses were tested: the first regarding the association between ESG and financial performance, and the second examining the effect of Covid-19 on this relationship. The hypotheses were tested using the Ordinary Least Squares (OLS) regression model, with controls for time and sector.

Results: The results show that the financial performance of firms with ESG Score, Combined, and Environmental classifications demonstrated a positive and significant relationship, meaning that firms with higher ESG scores offered better financial performance on average. However, the non-significant result for the relationship between financial performance and ESG during the Covid-19 period indicates that it cannot be said whether firms with higher ESG scores were more or less impacted by this pandemic period.

Contributions of the Study: This study utilized three types of ESG scores (Score, Combined, and Controversies), as well as the ESG pillars: Social, Governance, and Environmental. This allowed for a more comprehensive examination of the ESG indicators available to investors in the selection of companies for resource allocation. This joint analysis also contributes to the advancement of recent literature by analyzing all available ESG indicators for publicly traded companies in Brazil.

Keywords: Covid-19. ESG. Financial Performance.

Resumen

Objetivo: Analizar el impacto de la pandemia de Covid-19 en la relación entre los puntajes ESG (ambiental, social y de gobierno) y el desempeño financiero de las empresas públicas brasileñas.

Metodología: La muestra de este estudio está compuesta por 100 empresas brasileñas no financieras que cotizan en B3 (Brasil, Bolsa, Balcão) con información sobre ESG. La recolección de datos abarcó una serie temporal desde 2018 hasta 2021. Las puntuaciones de ESG se obtuvieron de la base de datos Refinitiv Eikon®, utilizando el ROA (Retorno sobre Activos) como proxy para el desempeño financiero. Se probaron dos hipótesis de investigación: la primera sobre la asociación entre ESG y el desempeño financiero, y la segunda sobre el efecto de la Covid-19 en esta relación. Las hipótesis se probaron utilizando el modelo de regresión de Mínimos Cuadrados Ordinarios (OLS), con controles para el tiempo y el sector.

Resultados: Los resultados muestran que el desempeño financiero de las empresas con clasificación ESG Score, Combinada y Ambiental presentó una relación positiva y significativa, lo que significa que las empresas con mayores puntuaciones ESG ofrecieron un mejor desempeño financiero en promedio. Sin embargo, el resultado no significativo para la relación entre desempeño financiero y ESG durante el período de Covid-19 indica que no se puede afirmar si las empresas con mejores puntuaciones ESG fueron más o menos afectadas por este período pandémico.

Contribuciones del Estudio: Este estudio utilizó tres tipos de puntuación ESG (Puntuación, Combinada y Controversias), así como los pilares ESG: Social, Gobernanza y Ambiental. Esto permitió un examen más amplio de los indicadores ESG disponibles para los inversores en la selección de empresas para la asignación de recursos. Este análisis conjunto también contribuye

al avance de la literatura reciente al analizar todos los indicadores ESG disponibles para las empresas que cotizan en bolsa en Brasil.

Palabras clave: COVID-19. ASG. Rendimiento Financiero

Resumo

Objetivo: Analisar o impacto da Pandemia de Covid-19 na relação entre as pontuações em ESG (*Environmental, Social e Governance*) e o desempenho financeiro das companhias abertas brasileiras.

Metodologia: A amostra deste estudo é composta por 100 companhias brasileiras não-financeiras listadas na B3 (Brasil, Bolsa e Balcão) com informações sobre ESG. A coleta de dados abrangeu uma série temporal dos anos de 2018 a 2021. As pontuações em ESG foram coletadas no banco de dados do *Refinitiv Eikon*® e tendo ROA (Retorno sobre Ativos) como *proxy* para desempenho financeiro. Foram testadas 2 hipóteses de pesquisa, a primeira quanto a associação entre ESG e desempenho financeiro, e a segunda que analisa o efeito da Covid-19 nessa relação. As hipóteses foram testadas por meio de regressão *Ordinary Least Squares* (OLS) com controle de tempo e setor.

Resultados: Os resultados evidenciam que o desempenho financeiro das firmas com classificação ESG Score, Combinado e Ambiental apresentaram uma relação positiva e significativa, ou seja, as firmas com maiores pontuação ESG ofereceram melhor desempenho financeiro, em média. Contudo, com o resultado não significativo para a relação entre desempenho financeiro e ESG no período da Covid-19, não se pode dizer que as firmas com melhores pontuação ESG foram mais ou menos impactadas por esse período pandêmico.

Contribuições do Estudo: O presente estudo utilizou os três tipos de pontuação em ESG (Score, Combinado e Controvérsias), além dos pilares ESG Social, Governança e Ambiental. Isso permitiu um exame mais abrangente dos indicadores ESG disponíveis aos investidores na seleção de companhias para alocação de recursos. Essa análise conjunta também contribui para o progresso da literatura recente ao analisar todos os indicadores ESG disponíveis para as empresas abertas do Brasil.

Palavras-chave: Covid-19. ESG. Desempenho Financeiro.

1 Introduction

In recent decades, sustainability has become one of the central variables in the definition of the management guidelines of large corporations (Cristófalo, Akaki, Abe, Morano, & Miraglia, 2016). In search of gaining competitive advantage, managers are beginning to appreciate the need to promote corporate sustainability initiatives to differentiate themselves from their competitors, as well as reduce the costs of conducting business and risks associated with operations (Schaltegger, & Burritt, 2005).

The increased relevance of corporate sustainability in the financial markets has had a direct impact on the disclosure of information by corporations. For an entity to be sustainable, it cannot focus only on the disclosure of financial information or only on the disclosure of necessary information to the financing stakeholders. Sustainability requires the disclosure of a broader spectrum of information, with companies adopting integrated reporting to do so (Buitendag, Fortuin, & De Laan, 2017).

In the context of corporate sustainability, an acronym in English has become quite popular in the financial market, ESG. Coined in 2004, in a report by the United Nations (UN) Global Compact, the acronym stands for *Environmental*, Social, and *Governance* (G) (Bertão, 2022). It is generally used to measure a company's environmental, social, and governance practices (Leite, 2020).

In the first months of 2020, there was the beginning of a global financial crisis, resulting from the health crisis caused by the Covid-19 Pandemic, whose proportions resonate close to the Great Depression (1929) and the Subprime Crisis (2007/2008) (Broadstock, Chan, Cheng, & Wang, 2021). Covid-19, by itself, has produced repercussions and impacts, on a global scale, of a biomedical, epidemiological, social, economic, political, cultural, and historical nature (Fiocruz, n.d.).

It is not uncommon for studies to test the relationship between ESG and financial performance of companies. According to the bibliometric analysis by Friede, Busch and Bassen (2015), from a sample of 2,200 individual studies on the subject, from different countries, approximately 90% of the studies found a positive relationship between ESG and financial performance. In its own analysis, research from several countries was found, with diversified results. There were studies that showed a positive relationship (Alexandrino, 2020; Almeyda, & Darmansya, 2019; Aybars, Ataünal, & Gürbüz, 2019) and, others, negative relationship (Nirino, Miglietta, & Quaglia, 2021; Duque-Grisale, & Aguilera-Caracuel, 2019; Saygil, Arslan, & Birkan, 2022). In other words, there is still no consensus on what type of relationship exists between ESG scores and financial performance.

Regarding studies that seek to analyze the impact of the Covid-19 pandemic on the relationship between companies' ESG and financial performance, only one study on the topic was found (Hwang, Kim, & Jung, 2021). Thus, with the aim of deepening and diversifying the literature on this topic, the following research problem is presented: **What is the impact of the Covid-19 Pandemic on the relationship between the financial performance and ESG of Brazilian publicly-held companies?** To answer this problem, the present study aims to investigate the impact of the Covid-19 Pandemic on the relationship between financial performance and ESG score of Brazilian publicly-held companies listed on B3 (Brasil, Bolsa, Balcão).

Finally, sustainability is perceived as a valuable protection in bad times (Ferriarini, & Natoli, 2020). The fact that companies continue to invest in ESG even during the external shock of the COVID-19 crisis (Savio, D'Andrassi, & Ventimiglia, 2023), reinforces this. Therefore, understanding how ESG criteria affect financial performance during the COVID-19 pandemic is not only relevant for long-term corporate sustainability, but also for understanding the ability to adapt in the face of global crises.

2 Literature review

2.1 Corporate sustainability

The terminologies ESG and corporate sustainability have a strong relationship with each other. In Brazil, for example, the term ESG (Environment, Social, and Corporate Governance) is often used as a synonym for corporate sustainability. Therefore, a theoretical revision about it is necessary.

The origin of the concept of corporate sustainability is linked to the definition of sustainable development proposed by the Brundtland Report, Our Common Future, published in 1987 by the World Commission on Environment and Development (Montiel, & Delgado-Ceballos, 2014). And corporate sustainability gained prominence from the 1990s onwards,

when academics and professionals began to argue that for sustainable development to be maintained, it must satisfy the environmental, social and economic dimensions (Montiel, 2008).

In this context, the concept of the *Triple Bottom Line* (also known as the Tripod of Sustainability), created by British sociologist John Elkington in 1994, is pioneering. The *Triple Bottom Line* establishes a sustainability model that segregates performance into three dimensions: social, environmental, and economic (Elkington, 1994). These dimensions are commonly referred to as the 3Ps: *people*, *planet*, and *profits* (Slaper, & Hall, 2011). Figure 1 presents a graphic representation of this concept, the Venn diagram, in which the sustainability model is established by the intersection of the social, environmental and economic dimensions.

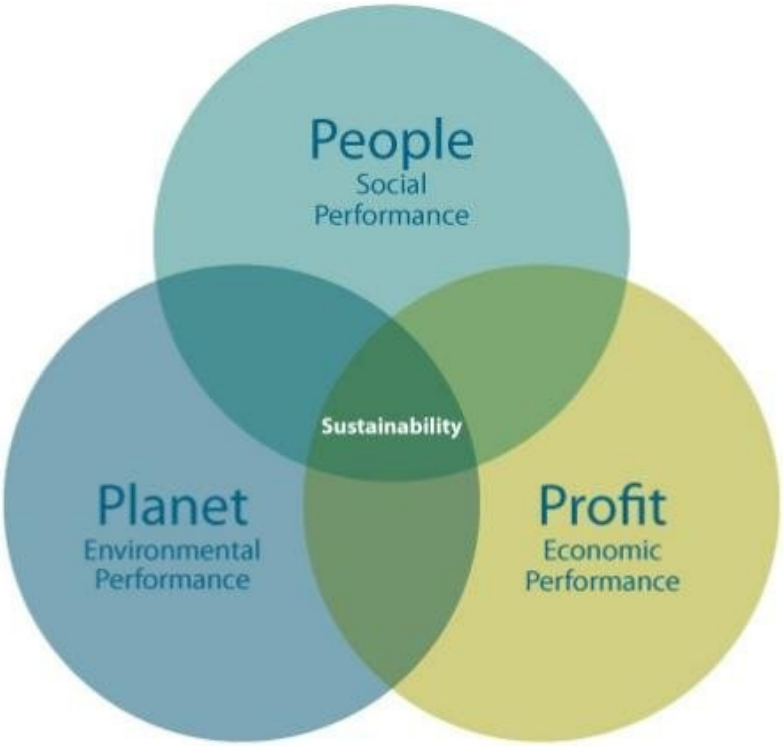

Figure 1 Dimensions of the *Triple Bottom Line*: graphical representation.
Source: *survey data.*

According to Rafi (2021), some of the main reasons for implementing sustainability in companies are: adding value and competitive advantage, meeting consumer demand for sustainability, increasing efficiency, attracting talent to be employees, and creating new business opportunities. This statement is in line with the Stakeholder Theory, developed by philosopher Robert Edward Freeman and published in his book *Strategic Management: A Stakeholder Approach*, in 1984, where it gained relevance (Bazanini, Adra, Rubeo, Lanix, & Barbosa 2020). This theory predicts that companies must consider the interests of all those involved with the operation of the company, that is, all individuals or groups of individuals directly or indirectly related to the purpose of the organization, the stakeholders (Verdeyen, Put, & Buggenhout, 2004; Sousa, Ferreira, & Mario, 2022).

The definition of *stakeholders* encompasses a diverse range of individuals. Figure 2 presents Freeman's view (1984 apud Bazanini et al. 2020) that the company (positioned in the center) is involved in its context of action by several *stakeholders* (who are linked to the company).

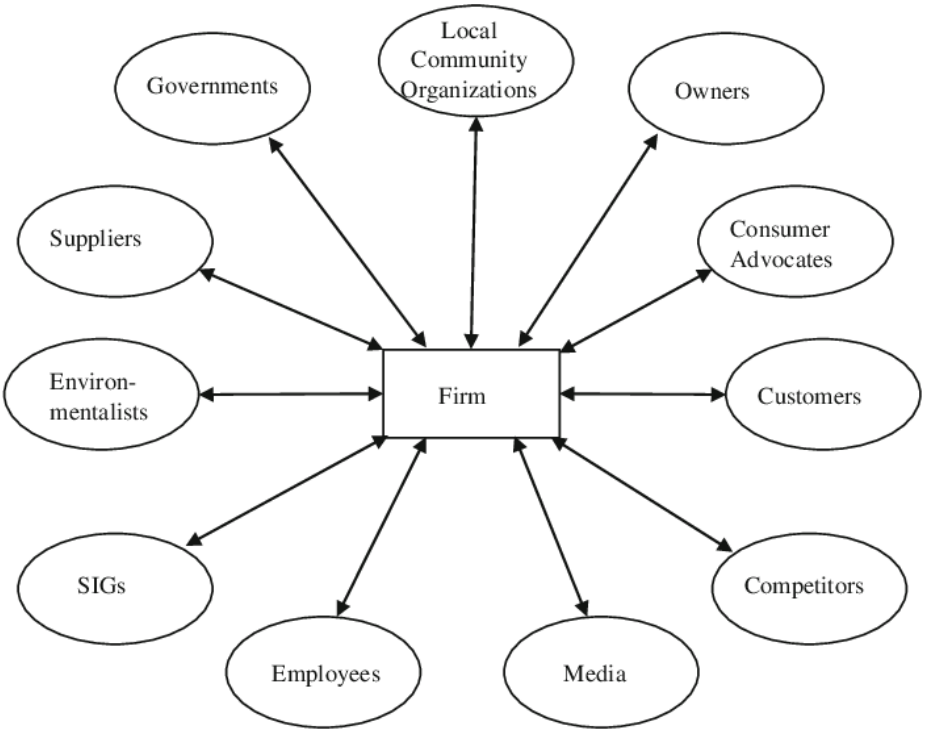

Figure 2 *Freeman's (1984) initial stakeholder model.*
Source: *Adapted from Bazanini et al. (2020) and Freeman (1984, p. 25).*

The Stakeholder Theory is a counterpoint to the Firm Theory, which emerged in the eighteenth century, being developed by several works throughout the twentieth century. Based on this view, shareholders would be the most important part of the organization, and management should be responsible for ensuring and satisfying their interests.

According to Kraemer (2005), corporate responsibility, associated with the tripod of sustainability, has become an important element in the development of business and in the establishment of positive relationships with *stakeholders*. With companies being driven to adopt new postures in the face of issues related to ethics and the company-society relationship. For example, the disclosure of a Sustainability Report, separately and on a voluntary basis, can be seen as a strategy to communicate the company's performance and efforts to be sustainably responsible to *stakeholders* (Caesaria, & Basuki, 2017).

2.2 ESG

The term emerged in 2004, in the publication called *Who Cares Wins*, by the Global Compact in partnership with the World Bank. ESG is an acronym for *Environmental*, *Social,* and *Governance*. It corresponds to the environmental, social and governance practices of an organization (GLOBAL PACTO, n.d.). Figure 3 presents the graphic representation of the three pillars that make up the concept of ESG, the environmental, social, and corporate governance pillar.

Figure 3 *ESG Graphical Representation*
Source: *survey data.*

Because ESG is subjective and relative, its measurement in quantitative terms is complex and non-uniform. Several entities try to establish rankings of leading companies in ESG. Recently, in Brazil, B3 released its own ranking, composed of 73 companies, leaders in ESG (Brazilian Association of Publicly-Held Companies, 2023). In academic research, ESG measurement has also gained relevance. According to Alexandrino (2020, p. 23) "ESG performance metrics have been increasingly used by scholars who understand these measures to be essential".

Finally, the Covid-19 Pandemic served as a catalyst for the implementation of ESG strategy, becoming a topic of urgency, given the difficulties imposed by the pandemic period (Martins, & Zibas, 2020).

2.3 COVID-19 pandemic and financial performance

The Covid-19 pandemic brought consequences, which reverberate to this day, in the economic, social, and health spheres, all over the world. It was caused by the coronavirus (SARS-CoV-2) and began to be contaminated at the end of 2019 in China, spreading quickly throughout the world (Werneck, & Carvalho, 2020).

Countries were not prepared to deal with the latent spread of the new coronavirus. Due to the lack of preventive or therapeutic measures for the disease, the World Health Organization (WHO) recommended that governments around the world adopt measures of individual scope; such as hand washing, use of masks and social restriction; environmental outreach, such as routine cleaning of environments and surfaces; and, community outreach, restriction or prohibition of the operation of schools, universities, places of community life, public transport and other areas where there may be large gatherings of people (WHO, 2020 apud Malta, Szwarcwald, Barros, Gomes, Machado, Souza Júnior, & Gracie 2020).

Restrictive measures had a strong impact on the countries' economies, generating ethical and moral questions (Michie, 2020). According to the World Bank (2020), the Covid-19

Pandemic threw the global economy into the worst post-World War II recession, affecting several countries, including the United States.

According to the CBPP report (2021), the most visible socioeconomic impact was unemployment, which caused financial difficulties for people, especially ethnic minorities. Because of this, Governments of several countries have provided financial aid to the population as a way to stimulate the economy and reduce the adverse effects of the crisis, such as, Emergency Aid, in Brazil, and the American *Rescue Plan Act*, in the USA.

Regarding the financial market, stock markets around the world experienced moments of panic, marked by significant falls and increased interest rates (Fia Business School, 2020). There is a lot of discussion about how sustainability influences the performance of organizations. Mainly discussing the issue of creating value in the short and long term through sustainability.

According to the studies by Alshehhi, Nobanee & Khare (2018) and Alexandrino (2020), research on the evaluation of economic and financial performance has used various types of financial measures to verify the impact of sustainability practices on organizations. These authors state that the financial performance metrics used focus on profitability, ROA (Return on Assets), ROE (Return on Equity), ROI (Return on Investments), and ROS (Return on Sales), while market measures focus on Tobin's Q, price per earnings, earnings per share, and cash flow. In addition, they found in their study that 78% of the 132 articles analyzed show a positive relationship between corporate sustainability and financial performance (Alshehhi et al., 2018).

According to Chladek (2019), sustainability initiatives can contribute to an organization's overall success, with studies showing that more sustainable companies are also more profitable. This would justify a positive relationship between the financial performance and the ESG score of companies.

On the other hand, Duque-Grisales and Aguilera-Caracuel (2021) found a negative relationship between financial performance and ESG scores. They state that this implies that companies with the best ESG scores tend to be less profitable, presenting with justification that the costs related to the implementation of ESG initiatives are not reflected in a company's financial performance because these initiatives are not carried out correctly or because there is not enough institutional support to make them more visible, thus not ensuring the approval of stakeholders and alternatively, when these companies make high investments in ESG, they can sacrifice their cash flow and divert resources necessary for their operation, reducing their performance.

In line with the objective of the study, this work tests two hypotheses. The first aims to verify the association between ROA and ESG scores, and the second hypothesis seeks to analyze the impact of Covid-19 on this relationship.

In more detail, research hypothesis 1 aims to verify whether there is a positive relationship between financial performance (ROA) and ESG scores. Such a relationship is expected, as it was observed in Alexandrino (2020) and Velte (2017), as well as stated in most of the studies reviewed in a bibliometric analysis carried out by Friede, Busch and Bassen (2015). In view of these results of the studies mentioned above, the following hypothesis is defined:

Hypothesis 1 (H1): There is a positive and significant relationship between financial performance (ROA) and companies' ESG scores.

It is also relevant to analyze the relationship between financial performance and scores of ESG pillars. Velte (2017) found positive relationships between financial performance and ESG pillars scores. Therefore, financial performance is expected to have positive relationships

with scores in the three pillars of ESG (Environmental, Social, and Corporate Governance). In addition, this study gave importance to the analysis between financial performance and the ESG *Controversies Score*, as well as the combined score between ESG and its controversies (*ESG Combined Score*), as it is a better adjusted metric and is a fact that ESG controversies impact organizations as much as ESG practices (Passos, & Campos-Rasera, 2022).

Hwang, Kim and Jung (2021) found in their study that the initial impact of the Covid-19 Pandemic was the significant reduction in companies' earnings, to which those that performed better in ESG initiatives had a smaller drop in earnings. In addition, they found that the dependent variable ROA had a negative and significant correlation with the independent variable Covid and a negative and significant correlation with the variable of interaction Covid x ESG. In this sense, this study defines the following hypothesis:

Hypothesis 2 (H2): The period of the Covid-19 Pandemic had a negative and significant impact on the relationship between ROA and companies' ESG scores.

3 Methodological procedures

3.1 Research Strategy and Method

Following the classification of Martins (2010), the present research can be classified as an empirical-analytical study, aiming to analyze the relationship between ESG and the financial performance of Brazilian publicly-held companies. From the set of data collected about the sample used in the study, it is sought to establish relationships between financial performance, ESG and the period of the COVID-19 pandemic.

The statistical software used for all data analysis was Stata®. The methodology section of this study is segregated into three parts: sample, data collection and research variables, applied statistical methods.

3.2 Population or Sample

Initially, the sample consisted of 1,623 observations about non-financial companies headquartered and trading shares in Brazil. However, from this initial sample, observations were removed, considering the time section used, about companies without data on the ESG score (1,284), without data on total average assets (13), with fiscal year (financial year) divergent from the calendar year (7), without data on the beta coefficient of shares (9) and without data on total debt (1). This resulted in a sample of 309 observations, as shown in Table 1.

Table 1
Sample Definition

Non-financial companies with headquarters and trading in Brazil	1.623
(-) Companies without ESG Score in the Study Period (2018-2021)	(1.284)
(-) Companies without Total Average Assets (2018-2021)	(13)
(-) Companies with a Fiscal Year (Fiscal Year) Divergent from the Calendar Year	(7)
(-) Companies without Beta Coefficient of Shares Data	(9)
(-) Companies without Total Debt	(1)
Total Sample	309

Source: *Adapted from Refinitiv (2022).*

The observations of companies operating in the financial sector were not included in the sample, since they have financial and operational characteristics that are different from those of companies not operating in this sector. According to Cooke (1989) and Murcia and Santos (2009), observations about banks, insurance companies and financial companies in general are considered to be excluded from the sample due to the particularities of their operations and their impacts on financial indicators.

Table 2 shows the distribution of the companies, and the respective observations that make up the sample as to the sector to which they belong. The companies belong in greater number, respectively, to the sectors of Non-Essential Goods and Consumption (25), Industry (16), Public Services (16), Consumer Goods (12), Raw Material (11), Health (6), Energy (5), Real Estate (4), Communication Services (3) and Information Technology (2).

Table 2
Sample description by sector

Sector	Companies	%	Observations	%
Communication Services	3	3,00	9	2,91
Non-essential consumer goods	25	25,00	72	23,30
Consumer Goods	12	12,00	38	12,30
Energy	5	5,00	18	5,83
Health	6	6,00	20	6,47
Industry	16	16,00	51	16,50
Information Technology	2	2,00	5	1,62
Raw material	11	11,00	37	11,97
Real estate	4	4,00	9	2,91
Utilities	16	16,00	50	16,18
Total	100	100	309	100

Source: *survey data.*

3.3 Definition of Variables and Database

The data used in the research were collected from the Refinitiv Eikon® database. According to CEPECONF (n.d.), it is "the most comprehensive and detailed Financial Accounting research database", containing financial and market data from companies listed on stock exchanges in more than 150 countries.

3.3.1 Dependent Variable

The dependent variable ROA was used as a *proxy* for financial performance. Return *on Assets* (ROA) is a profitability indicator that reveals the return produced by the total investments made by a company in its assets (Assaf Neto, 2014). The interpretation of this indicator is that, compared to companies, the higher the ROA, the better the profitability.

According to *Refinitiv Eikon* (n.d.), the database where the collection was made, the ROA value for a given period is calculated by dividing the Profit After Tax and the Average Total Assets and is expressed as a percentage. Average Total Assets is the average of Total Assets at the beginning and end of the year. This can be seen in the formula (1).

$$\text{ROA (\%)} = \frac{\text{Lucro Depois dos Impostos}}{\text{Ativo Total Médio}} \text{ x } 100 \qquad (1)$$

3.3.2 Independent Variables

3.3.2.1 ESG Measures

The ESG score of companies was collected from the *Refinitiv Eikon® database, which has its own methodology for measurement. Refinitiv Eikon* (n.d.) defines the ESG *Score* as an overall company score based on self-reported information in the environmental, social and corporate governance pillars.

According to *Refinitiv* (2022), in its own material released about its methodologies, the score in the three pillars of ESG (*Environmental Pillar Score, Governance Pillar Score and Social Pillar Score*) and the final score (ESG *Score*) are based on self-reported information arranged in 10 categories. These categories are represented in the homonymous column of Table 3, which also includes the reference pillar and related themes.

Table 3
Categories ESG Score (Refinitiv Eikon ®)

Pillar	Categories	Themes
Environmental	Emissions	Emissions
		Waste
		Biodiversity
		Environmental Management Systems
	Innovation	Product Innovation
		Green Recipes, Research and Development
		(R&D) and Capital Expenditures
	Use of Resources	Water
		Energy
		Sustainable Packaging
		Environmental Supplement Chain
Social	Community	-
	Human rights	Human rights
	Product Responsibility	Responsible Marketing
		Product Quality
		Data Privacy
	Workforce	Diversity and Inclusion
		Career Development and Training
		Working Conditions
		Health and Safety
Corporate Governance	CSR Strategies	Social Responsibility Strategies
		Corporate
		ESG Reporting and Transparency
	Management	Structure (Independence, Diversity, Committees)
		Compensation

	Shareholders	Shareholders' Rights
		Takeover Defense

Source: *Adapted from Refinitiv (2022).*

According to *Refinitiv* (2022), the pillar score is given by the sum of the weights of each category, which vary by sector for the categories belonging to the social and environmental pillars and remain constant for the categories belonging to corporate governance. In addition, the ESG score and its pillars are based on a scale of 0 to 100.

According to *Refinitiv* (2022), ESG *Controversies* reflect the significant controversies that impact corporations. It is calculated based on 23 ESG controversy topics, and systematically reflects penalties for scandals that companies are involved in and their negative impacts, such as lawsuits, ongoing legislative disputes, and fines. The *ESG Combined* score, in turn, reflects the ESG score of companies, discounting the effects of ESG controversies.

3.3.3 Control Variables

Table 4 presents the control variables used in the regression models based on the analysis of previous studies, with the exception of the proxy for Covid-19.

Table 4
Control Variables

Proxy	Description	Authors
Covid-19	Yes (1) for the years 2021 and 2020 and No (0) for the years 2019 and 2018	Authorship by the authors
Size	Natural Logarithm of Total Assets	Velte (2017) and Alexandrino (2020)
Debt	Total Debt/Average Total Assets	Velte (2017) and Alexandrino (2020)
Beta	Beta coefficient	Velte (2017)

Source: *survey data.*

According to Martins and Zibas (2020), the Covid-19 Pandemic served as a catalyst for the implementation of ESG strategy, gaining a theme of urgency, given the difficulties imposed by the pandemic period. Consequently, Covid-19 is expected to have an influence on ESG and company performance. In this study, the Covid-19 variable is treated as a *dummy variable*, assuming a value of 1 in the pandemic period and 0 in the period before the pandemic.

According to Alexandrino (2020), the "size of the company is commonly used in academic works as a determining variable in ESG studies". According to Hillman and Keim (2001 apud Alexandrino, 2020) and Surroca, Tribó and Waddock (2010 apud Alexandrino, 2020), the larger the size of the company, the more inclined they are to sustainable practice behaviors. To represent this, the Size variable was used, calculated by the natural logarithm of the total assets.

In line with Fischer and Sawczyn (2013) and Velte (2017), the beta coefficient (Beta) was used as a proxy for systematic risk and the ratio between total debts and total assets (Debt) as a proxy for risk. Companies with a higher level of ESG are perceived as less risky with respect to "insurance effects" and will be connected with lower third-party capital costs (Godfrey et al., 2009; Velte, 2017).

3.4 Data Analysis Technique

Ordinary *Least Squares* (OLS) regressions were applied, with time and sector control. *Dummies* variables were used to explain the behavior of a given qualitative explanatory variable and the phenomenon in question, assuming values equal to 0 or 1, being represented by the variables year and sector (Fávero & Belfiore, 2017).

For each research hypothesis, a specific econometric model was elaborated. In all models, the variable tested for financial performance was ROA. The first regression model was used to test Hypothesis 1, represented in Equation 1, which aims to relate financial performance to companies' ESG score.

$$ROA_{it} = \propto_i + \beta_1 \text{ ESGmetrics}_{it} + \beta_2 Size_{it} + \beta_3 Debt_{it} + \beta_4 Beta_{it} + \gamma_2 Year + \gamma_2 Sector + \varepsilon_{it} \quad (1)$$

Next, the results of Equation 2 will be presented, which adds to equation 1 the information of the COVID period and its interaction with covid metrics, as follows:

$$ROA_{it} = \propto_i + \beta_1 \text{ ESGmetrics}_{it} + \beta_2 Covid_t + \beta_3 Covid_t * ESGmetrics_{it} + \beta_4 Size_{it} + \beta_5 Debt_{it} + \beta_6 Beta_{it} + \gamma_2 Year + \gamma_2 Sector + \varepsilon_{it} \quad (2)$$

In regressions, the variable refers to the 6 types of ESG metrics available, they are: ESG Score, ESG Controversies, Combined ESG, and the Environmental, Social, and Governance ESG Pillars.$MedidasESG_{it}$

4 Results and Analysis

4.1 Descriptive analysis

Regarding the descriptive statistical analysis of the research data, sample mean, sample standard deviation, minimum and maximum value and coefficient of variation (CV) were used. These measures are shown in Tables 5, 6 and 7, for the period before Covid-19, during and overall, respectively.

Table 5
Descriptive Statistics-Period Before the Covid-19 Pandemic (2018-2019)

Variable	N	Average	Standard deviation	Minimum Value	Maximum Value	CV
ROA	154	4,135	7,552	-31,080	27,390	1,826
ESG Score	154	49,086	21,679	4,050	89,340	0,442
ESG Combined	154	45,802	20,093	4,050	89,340	0,439
ESG Controversies	154	86,143	28,146	0,850	100,000	0,327
ESG Social	154	51,130	23,848	0,660	96,310	0,466
ESG Governance	154	50,965	22,152	3,330	91,310	0,435
ESG Environmental	154	45,000	27,692	0,000	95,240	0,615
Size	154	23,370	1,267	21,096	27,447	0,054
Debt	154	0,372	0,199	0,012	0,977	0,535

Beta	154	0,990	0,657	0,008	2,805	0,663

Source: *survey data.*

Table 6
Descriptive Statistics- Pandemic Period (2020-2021)

Variable	N	Average	Standard deviation	Minimum Value	Maximum Value	CV
ROA	155	5,605	8,449	-31,080	27,390	1,507
ESG Score	155	52,721	19,697	6,210	91,820	0,374
ESG Combined	155	50,369	18,543	6,210	91,820	0,368
ESG Controversies	155	90,720	24,137	1,320	100,000	0,266
ESG Social	155	55,494	21,525	4,410	96,320	0,388
ESG Governance	155	51,518	23,130	4,590	93,070	0,449
ESG Environmental	155	50,191	24,867	0,000	93,980	0,495
Size	155	23,501	1,256	21,096	27,447	0,053
Debt	155	0,385	0,211	0,009	0,977	0,547
Beta	155	1,008	0,472	0,008	2,368	0,468

Source: *survey data.*

Table 7
Descriptive Statistics - Full-time (2018-2021)

Variable	N	Average	Standard deviation	Minimum Value	Maximum Value	CV
ROA	309	4,872	8,035	-31,080	27,390	1,649
ESG Score	309	50,909	20,754	4,050	91,820	0,408
ESG Combined	309	48,093	19,435	4,050	91,820	0,404
ESG Controversies	309	88,438	26,269	0,850	100,000	0,297
ESG Social	309	53,319	22,781	0,660	96,320	0,427
ESG Governance	309	51,242	22,613	3,330	93,070	0,441
ESG Environmental	309	47,604	26,398	0,000	95,240	0,555
Size	309	23,436	1,261	21,096	27,447	0,054
Debt	309	0,378	0,205	0,009	0,977	0,541
Beta	309	0,999	0,571	0,008	2,805	0,571

Source: *survey data.*

Regarding the overall ESG score (*ESG Score*), an average score of 49.086, 52.721 and 50.909 was observed in the periods before the pandemic (2018-2019), pandemic (2020-2021) and full time (2018-2021), respectively. Regarding the score in the social pillar (*ESG Social*), an average score of 51.130, 55.494 and 53.319 was observed, respectively. In the corporate governance pillar (*ESG Governance*), an average score of 50.965, 51.518 and 51.242 was observed, in the periods, respectively. And in the environmental pillar (*ESG Environmental)* an average score of 45,000, 50,191 and 47,604 was observed in these periods, respectively. From this, it can be observed that the average score of the ESG Score and its three pillars, in relation to the study sample, increased compared to the period before the pandemic (2018-2019) and pandemic (2020-2021).

The ESG *Controversies* score averaged 86,143, 90,720, and 88,438 in the pre-pandemic (2018-2019), pandemic (2020-2021), and full-time (2018-2021) periods, respectively. The ESG *Combined score*, which reflects the ESG score on the effect of controversies, averaged 45.802,

50.369, and 48.093 for the respective periods. Therefore, there was an increase in ESG controversies between the period before the pandemic (2018-2019) and the pandemic period (2020-2021).

The average ROA of the sample studied, in turn, presented an average of 4.135%, 5.605% and 4.872% in the periods before the pandemic (2018-2019), pandemic (2020-2021) and integral (2018-2021), reciprocally. This represented an increase in the average sample ROA from the period before the pandemic to the pandemic period.

Regarding the control variables, in relation to what is shown in Tables 5, 6 and 7, the mean values of the size, debt, and beta variables showed a small increase in the comparison between the period before the pandemic and the pandemic period.

The standard deviation, as it is a measure of absolute dispersion, is not appropriate for making comparisons between time and variables. For this purpose, the coefficient of variation (CV) was calculated, shown in Tables 5, 6 and 7. The coefficient of variation is more suitable for comparisons between observations with different means or different quantities, as it is a relative measure. Based on this measure, it is possible to interpret that all ESG scores presented had a lower variation in the pandemic period (2020-2021), with the exception of the score in the corporate governance pillar. The ROA, Size and Beta variables also had a smaller variation between the period before the pandemic (2018-2019) and pandemic (2020-2021), unlike the Debt variable, in which there was an increase. In addition, according to Martins (2010, p. 58), because they have a coefficient of variation above 30%, all variables have a high dispersion, with the exception of the variable Size.

4.2 Correlation between variables

Table 8 shows the Pearson correlation matrix of the study variables.

Table 8

Panel A: Pearson's Correlation Matrix

	ROA	ESG	ESGC	ESGCT	SPS	GPS
ROA	1					
ESG	-0,0083	1				
ESGC	0,03770	0,8920***	1			
ESGCT	0,0610	-0,3332***	-0,0088	1		
SPS	0,0114	0,9252***	0,8330***	-0,2844***	1	
GPS	-0,0502	0,7328***	0,6311***	-0,2818***	0,5742***	1
EPS	0,0347	0,8472***	0,7647***	-0,2633***	0,7465***	0,3818***
Covid	0,0857	0,0772	0,1182**	0,0849	0,0899	0,0128
Size	-0,0940*	0,5821***	0,4423***	-0,4723***	0,5358***	0,4148***
Debt	-0,3851***	0,1101*	0,0946*	-0,1342**	0,1243**	0,1045*
Beta	-0,2198***	-0,0932	-0,0657	0,1018*	-0,0597	-0,0457

Panel B: Pearson's Correlation Matrix – continued

	EPS	COVID	TAM	DIV	Beta
ESG_A	1				
Covid	0,0891	1			
Size	0,5344***	0,0601	1		
Debt	0,0969*	0,0408	0,1613***	1	

Beta	-0,1317**	0,0752	-0,0368	0,0004	1

ROA (return on assets), ESG (ESG *Score*), EPS (*Environmental Pillar Score*), SPS (*Social Pillar Score*), GPS (*Governance Pillar Score*), ESGCT (ESG *Controversies Score*), ESGC (ESG *Combined Score*), Size (total assets), Debt (total debt) and Beta (beta coefficient of shares).
P-value in bold. , **, * = significant at the level of 1%, 5% and 10%.
Source: *Survey data*

According to Table 8, it is observed that the correlation between the ROA variable and the ESG score variables is low and not significant. It is also worth noting the negative sign between ROA and ESG Score and the Governance Pillar, indicating an inverse relationship between performance and these ESG scores. This association will be analyzed in more detail through the use of more robust econometric techniques as presented below.

4.4. Results of econometric models

Table 9 presents the results of multiple linear regression with time and sector *dummies*. In which the model of Equation 1 aims to verify the existence of a positive and significant relationship between financial performance, measured by ROA, and the ESG scores of companies. For this, ROA was used as the dependent variable, ESG scores as an independent variable, and the size, total debt, and beta coefficient of the companies' shares as control variables.

Table 9
Relationship between ROA and ESG scores

Variables	ROA	ROA	ROA	ROA	ROA	ROA
	0.043**					
ESG	(0.019)					
		0.046**				
ESGC		(0.018)				
			0.006			
ESGCT			(0.020)			
				0.037**		
SPS				(0.016)		
					0.003	
GPS					(0.020)	
						0.042***
EPS						(0.014)
	-0.901**	-0.717*	-0.383	-0.830*	-0.490	-0.954**
Size	(0.446)	(0.424)	(0.486)	(0.436)	(0.431)	(0.439)
	-18.174***	-18.253***	-17.822***	-18.184***	-17.876***	-18.105***
Debt	(2.634)	(2.609)	(2.606)	(2.644)	(2.624)	(2.587)
	-3.942***	-3.988***	-4.040***	-3.942***	-4.007***	-3.854***
Beta	(0.998)	(0.997)	(1.011)	(1.004)	(1.015)	(0.999)
	28.381**	23.839**	17.868	27.047**	20.755*	30.213***
Constant	(11.207)	(10.754)	(14.218)	(11.180)	(10.730)	(11.168)
Observations	309	309	309	309	309	309
R^2	0.397	0.399	0.390	0.396	0.390	0.402
Test F	6.654	6.695	6.428	6.604	6.367	6.943
Prob > F	0	0	0	0	0	0

ROA (return on assets), ESG (ESG Score), ESGC (ESG Combined Score), ESGCT (ESG Controversies Score), SPS (Social Pillar Score), GPS (Governance Pillar Score), EPS (Environmental Pillar Score).

, **, * = significant at the level of 1%, 5% and 10%.
Source: *survey data.*

Through the analysis of the regression data in Equation 1 shown in Table 9, it is observed that ROA has a positive and significant relationship with the scores in the general ESG (*ESG Score*) and in the social pillar (*Social Pillar Score*), at a significance level of 5%. The ROA also has a positive and significant relationship with the Environmental *Pillar Score*, at a significance level of 1%. And it has a positive, but not significant, relationship with the score in the Governance *Pillar Score*.

Regarding the ESG *Controversies Score*, ROA has a positive, but not significant, relationship. And in relation to the combined ESG score, the ROA has a positive and significant relationship, at a significance level of 5%.

Therefore, hypothesis 1, that there is a positive and significant relationship between financial performance (ROA) and companies' ESG scores, cannot be rejected, considering the relationship between ROA and ESG scores in general (ESG Score), in the social pillar (*Social Pillar Score*) and in ESG *combined (ESG Combined Score*), individually, at a significance level of 5%. As well as, considering the relationship between ROA and the score in the Governance *Pillar Score,* at a significance level of 10%. This confirms, in part, what was pointed out in the study by Alexandrino (2020) and Velte (2017).

Table 10 presents the results of the regression for the econometric model given by Equation 2. In which the model of Equation 2 aims to verify whether the Covid-19 Pandemic had a positive and significant impact in the relationship between ROA and companies' ESG scores.

Table 10
Relationship of ROA to ESG and COVID Score

Variables	ROA	ROA	ROA	ROA	ROA	ROA
	0.049**					
ESG	(0.023)					
		0.064***				
ESGC		(0.023)				
			0.021			
ESGCT			(0.023)			
				0.030		
SPS				(0.021)		
					0.027	
GPS					(0.026)	
						0.043**
EPS						(0.017)
	4.788**	5.971***	7.181**	3.234	6.687***	3.974**
Covid	(2.153)	(2.110)	(3.053)	(2.061)	(1.980)	(1.861)
	-0.014					
COVID*ESGS	(0.034)					
		-0.040				
COVID*ESGC		(0.034)				
			-0.035			
COVID*ESGCT			(0.031)			
				0.015		
COVID*SPS				(0.030)		
					-0.049	
COVID*GPS					(0.032)	

						-0.001
COVID*EPS						(0.028)
	-0.895**	-0.719*	-0.408	-0.834*	-0.476	-0.954**
Size	(0.451)	(0.426)	(0.490)	(0.438)	(0.433)	(0.440)
	-18.134***	-18.135***	-17.830***	-18.240***	-17.740***	-18.104***
Debt	(2.624)	(2.594)	(2.591)	(2.639)	(2.589)	(2.586)
	-3.951***	-4.018***	-4.055***	-3.932***	-4.009***	-3.856***
Beta	(1.004)	(0.996)	(1.011)	(1.010)	(1.000)	(1.013)
	27.989**	23.176**	17.503	27.454**	19.243*	30.194***
Constant	(11.393)	(10.902)	(14.252)	(11.321)	(10.722)	(11.284)
Observations	309	309	309	309	309	309
R^2	0.397	0.401	0.393	0.397	0.394	0.402
Test F	6.310	6.352	6.154	6.244	6.145	6.595
Prob > F	0	0	0	0	0	0

ROA (return on assets), ESG (ESG Score), ESGC (ESG Combined Score), ESGCT (ESG Controversies Score), SPS (Social Pillar Score), GPS (Governance Pillar Score), EPS (Environmental Pillar Score), Covid (pandemic period).
, **, * = significant at the level of 1%, 5% and 10%.
Source: *survey data.*

Through the analysis of the regression data from Equation 2 shown in Table 10, it can be seen that the ROA has insignificant relationships in the interaction of all ESG scores with the Covid-19 Period. Therefore, hypothesis 2, that the period of the Covid-19 Pandemic had a negative and significant impact on the relationship between the ROA and the ESG scores of companies, was rejected. Therefore, it is not possible to say that Brazilian firms with better ESG scores have a lower impact on financial performance during the period of the COVID-19 pandemic. Contrary to the study by Hwang, Kim and Jung (2021), which showed that companies with better ESG scores had a lower drop in their performance during the Pandemic.

5 Final Considerations

The purpose of this study was to investigate the impact of the Covid-19 Pandemic on the relationship between financial performance and ESG scores of Brazilian companies listed on B3. To do so, the relationship between ROA and overall ESG scores was first verified, in its pillars (environmental, social, and corporate governance), controversial, and combined, individually. And then, the effect of Covid-19 on these relationships was verified.

The study showed that financial performance (ROA) has a positive and significant relationship, at the level of 1%, with the score on the environmental pillar of ESG (Environmental Pillar Score). And, in addition, at a significance level of 5%, financial performance has a positive and significant relationship with the scores in the overall ESG (ESG *Score*), the social pillar of ESG (*Social Pillar Score*) and the combined ESG (ESG *Combined Score*). The current study also showed that the Covid-19 Pandemic had a negligible impact on the relationship between financial performance, as measured by ROA, and the various ESG scores presented in the study.

In this research, it is possible to identify some limitations. The non-consideration of a measure of economic performance can be criticized, however, this was not possible, because the most used variable, the Approximate Tobin's Q collected, was insufficient to establish any relationship, based on an invalid F test. Another point that can be criticized is the time section used of four years, however, due to the insufficiency of data and the objective of measuring the impact of the pandemic, it may justify the use of this section.

The control variables can also be criticized, as two of the three variables used come from financial reports as well as the dependent variable, which can affect the result, although this use was based on other studies. In addition, it can be highlighted that the methodology for measuring ESG scores and its pillars is not uniform, data about them collected from other sources can lead to other results. As well as causality arising from endogeneity, resulting in part from the approach of the social sciences.

It is possible to suggest for future research the use of measures other than financial performance, such as economic performance and total return, the use of a longer period and a better temporal delineation of the Covid-19 Pandemic, and the inclusion of other significant control variables in the model.

Finally, it is clear that the study of the impact of COVID-19 on the relationship between ESG and financial performance is essential to understand not only how companies have been affected by the crisis, but also to identify opportunities to improve and strengthen sustainable business practices in a globally interconnected and ever-changing environment.

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