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Do Sustainability and Covid-19 affect Firms Performance, Value, and Risk in Brazil?

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Abstract

Objective: This study investigated the impacts of the B3 sustainability index and the Covid-19 pandemic on the value, performance, and risk of 494 Brazilian listed firms from 2010 to 2020.

Method: The difference-in-difference regression method was adopted to observe the difference in performance, value, and risk variation between listed and non-listed companies on the ISE. The following dependent variables were selected: Return on Assets, Return on Equity, Price-To-Book Value, Market-to-book, Volatility and Beta. To measure sustainability, the B3 ISE (Corporate Sustainability Index) was adopted and the effect of the Covid-19 pandemic in 2020 was considered.

Results: The main results show that adherence to the B3 corporate sustainability index significantly reduces Return on Assets, Return on Equity, Price-To-Book Value, Market-to-Book, Beta and Corporate Volatility of Brazilian companies. No significant differences were found in the variation of performance, value, and risk between the ISE listed firms and their counterparts. Evidence shows that in 2020 there was a reduction in the value, performance, and the volatility of Brazilian companies, influenced by the emergence and expansion of Covid-19.

Contributions: The study provided evidence that the sustainable practices of the ISE listed companies positively influence market value and reduce investor risk perception. In addition, the study innovates by presenting empirical evidence on the implications of Covid-19 on the value, performance and risk of Brazilian companies.

Keywords: Sustainability, Covid-19, Performance, Value, Risk.

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Introduction

Brazil has been experiencing a period of uncertainty in the political, legal and economic sphere, which affects corporate performance (Viana et al., 2019). The development of sustainable portfolios on the stock exchange, such as the ISE (Corporate Sustainability Index) in Brazil and other indices abroad, such as DJSI in the United States and FTSE4Good in London, clearly demonstrates the financial market's commitment to the ESG criteria (Acronym for "Environmental, Social and Governance", that is, environmental, social and governance criteria) and its impact on investment decisions. Companies that recognize they are efficient in different spheres — economic, environmental and social, and transparent - have been more valued by the market (Friede et al., 2015; Cecon et al., 2018).

The current turbulent scenario motivates changes in associations, and firms find themselves under pressure to meet the expectations of different types of stakeholders or partners. Cecon et al. (2018) emphasize that the market is increasingly demanding regarding the disclosure of information by companies, especially those involving the environment. Insofar as they wish to respond to the market's aspirations, with regard to the environmental sphere, a dimension of great importance has gained ground: Corporate Sustainability (Buallay, 2019; Shalihin et al., 2020).

The development of corporate sustainability is associated with changes observed in the capital market, due to greater democratization and transparency in the circulation of information (Ahmed et al., 2021; Yoo et al., 2021). The concepts of social responsibility and sustainability are based on the premise that entities, public or private, as well, have commitments to a society. These principles are being progressively consolidated in the Brazilian capital market (Bose et al., 2021).

The Corporate Sustainability Index (ISE) is a tool that makes it possible to analyze and compare the performance of companies classified in B3 under the aspect of sustainability, based on environmental balance, social responsibility, economic-financial dimension and corporate governance (B3, 2021).

Compared to previous pandemics such as Eastern Respiratory Syndrome (MERS), the COVID-19 pandemic is more lethal, involving a wide global spread, aided by the current service-oriented economy (World Bank, 2020; Bose et al., 2021). According to data from the World Bank (2020), the global economy shrank 5.2% in 2020

and experienced the deepest recession since World War II. In this turbulent environment, a Covid-19 pandemic has immensely affected the stock market and most stock indices worldwide (Baker et al., 2020).

In the international literature, some works have already explored the relationship between sustainability versus performance / value / risk within the Covid-19 pandemic scenario, but there is still much to be researched. For example, Yoo et al. (2021) investigated the impact of ESG criteria on stock returns and volatility during a cited pandemic. They realized that, during a pandemic, a rise without an ESG score, particularly in the environmental part of the index, generated higher returns and lower stock volatility.

In turn, Huang and Liu (2021) found that Chinese firms that engaged in more angry CSR (Corporate Social Responsibility) activities were less exposed to risks of stock price declines in the post-Covid 19 period than those firms who were less involved in CSR activities. From a different perspective, Bose et al. (2021) studied the influence of the Covid-19 sustainability pandemic on changes in company value and its possible moderating effect on that of 47 countries. In Brazil, Avelar et al. (2021) found a decrease in the profitability of companies and an increase in the level of indebtedness during the period of evolution of Covid-19.

Based on the discussed literature, the following research problem was defined: What is the relationship between corporate sustainability practices, performance, value and risk of Brazilian companies, considering the effect of the Covid-19 pandemic?

This study is justified because professional investors and researchers have realized that performance, treated in isolation, is not enough for firms to achieve long-term growth. When the firm chooses to work from a perspective that considers social and environmental issues, how sustainability practices will help them improve their improvement, strengthen risk management, encourage stakeholder involvement and improve communication with their partners (Loh et al., 2017). Furthermore, studies carried out in the market by investment brokers state that companies that adopt an ESG criteria agenda have profitability above the Ibovespa.

Since the creation of the ISE in 2005, the ESG portfolio rose 296%, against 223% of the total scholarship (Estadão, 2020). According to the same report, the Coronavirus pandemic that hit the world in 2020 made this discussion

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even more pertinent, by revealing how actions and omissions by individuals or groups can have a huge collective impact (Estadão, 2020). In addition, several empirical studies carried out have already shown that the emergence and expansion of COVID-19 has significantly impacted the performance and value of companies worldwide (Bartik et al., 2020; Shen et al., 2020; Khatib et al., 2020; al., 2021).

In short, this study contributes to the literature in several ways. Initially, it is one of the first studies to examine the impact of Covid-19 on the sustainability versus value/performance/risk relationship in Brazil. No other study with the same proposal was found in the country. Second, the diff-in-diff methodology adopted in this study is possibly the "flagship" of natural experiment techniques (Atanasov & Black, 2016) and has been widely used in a number of articles in various management areas, including finance, accounting, international business, among others. Thirdly, studies on sustainability and ESG criteria have been gaining more and more space in the academy and in the market, and still need to be deepened.

2 Theoretical Reference

2.1 Sustainable investments and sustainability indices in the world

Before talking about sustainable investments and corporate sustainability, it is important to address an issue that has become the basis or "background" of sustainable practices: ESG investments (which follow the Environmental, Social and Governance criteria). The term ESG is very broad and incorporates environmental, social and governance considerations into the investment portfolio decisions of individuals and companies. Over the past five years, this term has gained substance in academic and professional literature. Data show that ESG investments are more present in Europe, but have grown rapidly in the US in recent years. From 2016 to 2018, the US invested more than $12 trillion in ESG strategies (Matos, 2020). In addition, in Brazil, the term has also grown and incorporated into the agenda of national companies.

Corporate sustainability corresponds to a set of practices performed by companies that are related to the environment, society, and the economy, based on the tripod of Elkington (2020), which consists of the so-called Three Ps of Sustainability (People, Planet, Profit).

Through the concern to assess the performance of companies based on the concept of Elkington (2020), several indexes were created. Sustainability indices can be understood as performance indicators of investment funds, which aim to clarify to investors which companies are committed to

the responsibilities foreseen in the sustainable principles (Peixoto et al., 2016).

In the 1990s, the first sustainability indices emerged, such as the Domini 400 Social Index and the Dow Jones Sustainability Index (DJSI) (Garcia & Orsato, 2013). The wave of sustainability indices began to spread to emerging countries and, in 2004, the Johannesburg stock exchange launched the JSE SRI (Johannesburg Stock Exchange Socially Responsible Investment) index (Cristófalo et al., 2016; Guimarães et al., 2017).

In 2005, the ISE (Corporate Sustainability Index) was created, the first index in Latin America. It arose with the objective of developing an investment environment that was satisfactory to the needs of sustainable development and instigating ethical responsibility and transparency in organizations in contemporary society (B3, 2021). The ISE is an index for analyzing the performance of organizations listed in B3 from the perspective of corporate sustainability based on concepts of environmental balance, economic efficiency, social justice and corporate governance (Guimarães & Peixoto, 2015).

2.2 Empirical studies on sustainability, value, performance and risk

Several Brazilian and international studies have sought to analyze the relationship between sustainability measures and performance/value. However, the results of the studies are still inconclusive. Silva and Lucena (2019) analyzed the relationship between the participation of companies in the ISE and their profitability, for a sample of 590 B3 companies from 2010 to 2016. They found a positive relationship between the participation of companies in the ISE and their ROA.

In turn, Vital et al. (2009) compared the performance of sustainable companies listed in the Guia 500, biggest and best companies in Exame Magazine, and related companies that were not part of the Guide in the period. They found that companies that participated in the ISE have greater sales and export potential. However, companies that were not part of the ISE showed better financial performance in the period.

From a similar perspective, Gabriel and Feil (2019) found that the generation of profit or loss by companies that were part of the ISE in 2016 did not influence the amount of investment made in environmental and social aspects. Felix et al. (2019) investigated industrial companies that were part of the ISE in the period between 2005 and 2015 and pointed out that spending on sustainability was inversely related to financial performance.

Similarly, Castro (2017) did not identify significant

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differences between two groups of companies that are or are not members of the ISE, with one caveat: when carrying out the analyses by economic sector, significance was revealed in the Basic Materials and Public Utility sectors, in which ISE participating companies outperformed non-participating companies.

Pletsch et al. (2015), from 2008 to 2012, also analyzed the relationship between social responsibility and the economic and financial performance of companies listed on the ISE. Using the ROA, ROE and Earnings per share variables to measure performance, they concluded that the greater the performance of companies, the greater will be the investments destined to the organizations' internal public and in external social benefits.

In turn, Oliveira and Cardoso (2015) analyzed the relationship between value and performance and sustainability practices of organizations in a specific sector: the electricity sector. The results suggest that companies that participate in the ISE have greater performance and corporate value. Under the same line of studies, Silva et al. (2015) sought to compare fundamental profitability indicators between a group of companies participating in the ISE and a control group, verifying whether sustainable management provides profitability and shareholder value. It was found that despite the ISE having a differentiated theoretical portfolio, the profitability of the companies that comprise it is similar or lower than that of the companies in the group taken as control. Despite this, it was found that the ISE group created shareholder value in different ways, for example, through lower volatility and less exposure to risk.

Buallay (2019) investigated the relationship between the ESG (Environmental, Social and Governance) index and performance for a sample of 342 financial institutions from 20 countries that achieved sustainable development goals in the years 2007 to 2016 by the SDG Index. The independent variable used was the ESG index and the dependent variables were ROA, ROE and Tobin's Q. The author found that, on the one hand, ESG positively affects market performance, which supports the theory of value creation. On the other hand, the index negatively affects the financial and operational performance, which is in line with the cost of capital reduction theory.

Laskar and Maji (2018) investigated the influence of sustainability reporting on the performance of companies in four Asian countries — Japan, South Korea, Indonesia and India. Drawing on a sample of 111 companies and using GRI global reports to calculate the score used to examine performance impact, the study found that data disclosure quality is highest for Japanese companies, followed by India, South Korea and Indonesia. They concluded that both the level and quality of disclosure of corporate sustainability performance impact the company's value in all countries surveyed.

Based on the studies mentioned, the first hypothesis of this study was elaborated:

H1- There is a positive relationship between the ISE and the performance of Brazilian companies.

With regard to studies on value and sustainability, research by Carvalhal and Tavares (2013) and Mazzioni et al. (2013) are similar. Both identified that companies belonging to the ISE have a higher market value than companies that do not belong to the index. The study by Milani et al. (2012) also allows us to infer that investments in companies with better sustainability practices constitute a less risky and more profitable alternative for investors.

According to Garcia and Orsato (2013), the firm's involvement in sustainability activities provides improvements in its image and reputation, as well as an advantageous capture of financial resources and greater competitive advantages.

Lameira et al. (2013) used a sample of 205 Brazilian publicly-held companies, from 2005 to 2009, to investigate the relationship between sustainability, performance, value, and risk. Their results indicated the influence of adherence to the ISE on companies' performance, value, and risk reduction.

Cavalcanti and Boente (2012) observed that companies that adopt the Responsible Sustainability Index (ISR) practices have an average return and systemic risk similar to companies that do not adopt this posture. Internationally, Shalihin et al. (2020) examined the relationship between sustainability and firm value in Indonesian companies. Using Tobin's Q as the dependent variable, from a sample of companies listed in the LQ45 Index, the results showed that sustainability has a positive effect on value, corroborating the signaling theory, according to which sustainability reports can be used as a long-term strategy to improve the performance and value of firms.

Using a sample of 812 European companies, Qureshi et al. (2019) investigated whether the disclosure of sustainability and female representation on boards would affect the company's value. They observed that companies with greater female representation on their boards have significantly better environmental, social and governance performance than their counterparts.

Using the Global Reporting Initiative (GRI), Loh et al. (2017) investigated how the adoption and quality of sustainability reports are related to market value. From a sample composed of all companies listed on the Singapore Exchange, they found that sustainability reports are positively related to the firm's value and this relationship is independent of its sector.

Based on studies on value and sustainability, the second

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hypothesis of this study was elaborated:

H2 — There is a positive relationship between the ISE and the value of Brazilian companies.

With regard to studies on risk, Martins et al. (2019) studied 2,365 Brazilian firms/year from 1995 to 2016 and found that although the adoption of environmental signaling practices does not reduce the systemic risk of firms, there is a change in the capital structure of ISO14001 certified companies, from reduction in the cost of third-party capital and an increase in the proportion of long-term debt.

Teixeira et al. (2011) investigated how the form of financing companies is affected by the participation of companies in the Corporate Sustainability Index and its relationship with risk based on a sample of 378 companies, divided into two groups. The results showed that companies that signaled Corporate Social Responsibility (CSR) had a negative relationship with indebtedness and risk, when compared to their counterparts. In turn, Silva and Quelhas (2006) chose to identify the impact of the cost of equity for Brazilian companies, by adopting the sustainability principles analyzed from the perspective of value and risk. They confirmed the expectation that by adhering to sustainability standards, the company reduces systematic risk, leading to a reduction in the cost of capital and an increase in value.

Based on the literature on risk and sustainability, the third hypothesis of this study was reached:

H3 — There is a negative relationship between the ISE and the risk of Brazilian companies.

It is also interesting to note recent studies dealing, in the scenario of the Covid-19 pandemic, with performance/value/risk versus sustainability. The study by Avelar et al. (2021) analyzed the effects of Covid-19 on the economic and financial sustainability of Brazilian companies, and found that the period of evolution of Covid-19 exerted a strong influence on the economic and financial sustainability of companies and generated significant losses in the stock market.

Bose et al. (2021) analyzed the impact of Covid-19 on changes in firm value and its moderating effect on sustainability in 47 countries of the Refinitiv Worldscope database. They found that for companies domiciled in countries where the impact of Covid-19 was strongest, there was a greater decline in firm value. Covid-19's negative impact on value was less strong for firms with better sustainability performance.

Yoo et al. (2021) examine the effect of ESG performance on stock returns and volatility during the financial crisis resulting from the Covid-19 pandemic. They found that during the pandemic, an increase in the ESG score,

especially in the E (Environmental) component, was related to higher returns and lower volatility.

Based on the aforementioned studies, the fourth hypothesis of this investigation was elaborated:

H4 — It is expected that in the year 2020, with the economic consequences of the Covid-19 pandemic, there will be a reduction in the performance and value of firms; and there will be an increase in your risk.

In short, it can be said that there is a vast amount of work that seeks to relate the financial, economic gains and reputation of companies to sustainability practices, both in Brazil and abroad. However, the results are still not inconclusive. Studies also vary in how they measure sustainability. In Brazil, studies that use the ISE to measure it are more common, while in Europe, the United States and Asia, the use of ESG indices to measure sustainability in conjunction with governance and social aspects is more common.

3 Methodology

3.1 Sample and data

This study addresses the impacts of sustainability and Covid-19 on the value, performance and risk of Brazilian firms listed on B3. We used a sample composed of all companies that had their shares listed on the stock exchange during the period 2010 to 2020. Financial and insurance companies were excluded, as well as all those that did not have data available in the period, which generated a sample of 494 firms. The presence of extreme values in the study variables was observed, these outliers were winsorized at the level of 1.5%. The final sample was divided into two sub-samples: the first composed of companies that were part of the ISE (treated group) and the second (control group) of companies that were not listed in the index during the study period.

Financial data were extracted from the Economática® database, while those related to sustainability were manually collected through the portfolios of companies participating in the ISE. The period was chosen considering that the decade 2010-2020 was marked by the adoption of several international agreements and conventions that encouraged governments and companies to adopt measures aimed at sustainable development. In addition, there is a growing adherence of Brazilian firms to the sustainability index created by B3 in this period. The year 2020 is considered in this study as the reference for observing the unfolding of the economic effects of Coronavirus on the performance, value, and risk of Brazilian companies.

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3.2 Study variables

Based on the studies by Lameira et al. (2013), Buchanan et al. (2018), Carvalhal and Tavares (2013) chose the following dependent variables: return on assets (ROA) and return on equity (ROE); share price on book value (PVPA) and Market-to-book (MTB); volatility (VOLAT) and Beta (BETA). To measure B3's corporate sustainability index, a dummy variable was created that takes the value of 1 if the company is listed on the ISE and zero otherwise.

To observe the effects of Covid-19, a dummy variable was created that assumes the value 1 for the year 2020 and zero for the years 2010 to 2019. Studies already carried out on the effects of Covid-19 on firms consider the year of 2019 (Huang & Liu, 2021; Liu et al., 2021), however, in this study 2020 was adopted as the reference year considering that sanitary restrictions began to be imposed in Brazil after the registration of the first case of infection on the 26th February 2020. Table 1 presents the study variables with their metrics and base authors.

Table 1. Description of study variables

Variable	Symbol	Metric	Base studies
Dependents			
Value	MTB	*Share market value/Share accounting value*	Lameira et al. (2013); Carvalhal and Tavares (2013)
	PVPA	*Share price/Share equity value*	Lameira et al. (2013);
Performance	ROA	*Net profit)/Total assets*	Carvalhal and Tavares (2013); Oliveira and Cardoso (2015); Silva and Lucena (2019)
	ROE	*Net profit/Net worth*	Silva et al. (2015); Pletsch et al. (2015)
Risk	BETA	Regression of the monthly return of the security against the monthly return of the market index (Ibovespa).	Lameira et al. (2013)
	VOLAT	The volatility of the company's stock returns.	Lameira et al. (2013)
Independents			
Corporate Sustainability Index	ISE	Dummy variable that takes the value 1 if the company is part of the ISE portfolio of B3 and 0 otherwise.	Lameira et al. (2013); Oliveira and Cardoso (2015); Silva and Lucena (2019); Pletsch et al. (2015)
Covid-19	COVID19	Dummy variable that takes the value 1 for the year 2020 and 0 otherwise.	Bartik et al. (2020), Shen et al. (2020); Khatib et al. (2021)
Control			
Financial Leverage	ALAFIN	*(LL+PART)*AT/PL+PART/ LL+PART-RF*	Lameira et al. (2013)
Operational Leverage	ALAOPE	*(RLO-CPV)/RLO-CPV-DV-DA*	Lameira et al. (2013)
Investment	INV	*Investment/Depreciation*	Lameira et al. (2013)
Debt to Equity	DPL	*Gross debt/Net worth*	Lameira et al. (2013)
Share Liquidity	LIQ	*100*(P/p)* √n/N*v/V*	Lameira et al. (2013); Silva and Quelhas (2006)
Paid Dividends	DIV	*(Paid dividends)/(Share value)*	Lameira et al. (2013)
Size	TAM	Natural Logarithm of Total Assets	Oliveira and Cardoso (2015); Silva and Lucena (2019)

Source: elaborated by the authors

3.2 Econometric Models

PTo investigate the effects of the ISE and Covid-19 on the performance, value, and risk of companies, following Huang and Liu (2021), the difference-in-difference method (diff-in-diff) was used. Schiozer et al. (2021) highlight that the models estimated by the Ordinary Least Squares are not able to deal with the problems of endogeneity, in addition to not dealing with the omission bias of important variables, simultaneity, and measurement errors. diff-in-diff unifies cross-section and time series models into a single model. According to Xie and Mo (2014), diff-in-diff models allow us to observe the causal effects of a specific intervention through changes or not in the differences between two distinct groups.

In order to observe the effects of Covid-19, the year 2020 was used as the exogenous source of an unexpected event to help mitigate the endogeneity problem, linked to the recursive relationship between the ISE, performance, value, and risk of companies. Therefore, it was possible to observe this relationship before and during the pandemic. It is noteworthy that stability between the two groups is one of the assumptions of the diff-in-diff model (Buchanan et al., 2018; Xie & Mo, 2014). In this context, it was observed that over the study period, firms entered and exited the ISE index. To control this movement, the firm and time fixed individual effect was included, considering only those firms that were part of the ISE in the period.

Initially, the diff-in-diff model was estimated in order to observe the effect of adopting sustainability practices and the effect of Covid-19 on company performance, as shown in equation (1):

$$\text{Desempenho}_{i,t}=\beta_0+\beta_1 \text{ISE}_i+\beta_2 \text{Covid19}_t+\beta_3(\text{ISE}*\text{Covid19})_{i,t}+\beta_4 \text{CONT}_{i,t}+\delta_i+a_t+\mu_{i,t} \quad (1)$$

Where Desempenho represents the return on assets and return on equity of firm i in the time t. ISE_i is a dummy variable of value 1 if the company is listed on ISE and 0 if otherwise. Covid19_t is a dummy variable which is assigned the value 0 for the period 2010 to 2019 and 1 if the year is 2020, to observe the performance of firms during the pandemic. β_3 is the diff-in-diff coefficient that captures the difference in the average variation in performance in the period before and during the pandemic for companies that adhered to sustainability practices compared to those that did not adopt sustainable practices. $\text{CONT}_{i,t}$ represents the set of control variables already highlighted in Table 1 for firm i at time t. δ_i and a_t are the fixed effects of the firm and time t respectively, and e $\mu_{i,t}$ is the error term.

The same logic was followed to estimate the model in equation 2 to observe the effects of the ISE and Covid-19 on the $\text{Valor}_{i,t}$ measured by Market-to-Book and the Price

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on the Equity Value of the Share of firm i in time t, including the diff-in-diff parameter and the control variables.

$$Valor_{i,t}=\beta_0+\beta_1 ISE_i+\beta_2 Covid19_t+\beta_3 (ISE*Covid19)_{i,t}+\beta_4 CONT_{i,t}+\delta_i+a_t+\mu_{i,t} \quad (2)$$

the same time, with the same independent and control variables as the previous model, the diff-in-diff regression in equation 3 was estimated, to observe the effects of the ISE, Covid-19 and the control variables on company risk, where $Risk_{i,t}$ is represented by the Beta and Volatility of firm i at time t.

$$Risk_{i,t}=\beta_0+\beta_1 ISE_i+\beta_2 Covid19_t+\beta_3 (ISE*Covid19)_{i,t}+\beta_4 CONT_{i,t}+\delta_i+a_t+\mu_{i,t} \quad (3)$$

4 Results Analysis

4.1 Descriptive data analysis

Descriptive statistics are presented in Table 2, comparing companies listed and not listed on the ISE, in the pre-Covid 19 period (2010 to 2019) and during the pandemic (2020). It can be observed in the pre-Covid 19 period, that companies that adopted B3's sustainability practices had, on average, lower levels of risk and higher returns on assets, return on equity and price on equity value of the share, unlike the firms not listed on the ISE that recorded negative returns and higher levels of risk and volatility.

During the Covid-19 period, in addition to the increase in risk levels, companies that adopted the ISE practices had a reduction in return on assets (from 4.32% to 4.29%), return on equity (from 11.30% to 6.69%) and an increase in Market-to-Book (2.238 to 3.67). Companies not listed on the ISE recorded a positive ROE (from – 2.2% to 2.08%), but the increase in ROA (from -8.10% to -4.18%) was not enough to recover from the negative feedback recorded before the pandemic.

The results of the Wilcoxon test showed that there is a significant difference, at the level of 5%, between the averages of performance, value, and risk of the two samples in the pre-Covid 19 period. For the performance variables (price over equity value of the share and volatility), this behavior continued even during the pandemic. However, the test showed that there was no significant difference between the mean Beta of the two groups during the pandemic period.

Regarding the control variables, it can be seen that, between the periods before and during Covid-19, there was an increase in leverage and in debt in relation to equity for both samples. A significant difference is observed in the increase in investments by companies listed on the ISE (from 8.39 to 11.72), while those that are not part of the

index reduced their investments from 6.94 to 5.38 during the pandemic. When comparing the standard deviations of the two sample groups, it was noted that the standard deviation of unsustainable companies indicates greater dispersion of data for most variables. At the same time, in sustainable firms, there is greater data dispersion in the variables, Volatility and Size, both before and during the pandemic.

Table 2. Descriptive Analysis of Listed and Unlisted Companies on the ISE

Before Covid-19	Not listed on ISE			Listed on ISE			Wilcoxon Test
	Mean	Standard dev.	Obs.	Mean	Standard dev.	Obs.	
ROA	-0.081	0.370	3512	0.0432	0.041	251	-4.45***
ROE	-0.022	0.436	3030	0.1130	0.181	251	-3.45***
MTB	1.706	2.480	2322	2.238	2.423	236	-4.03***
PVPA	1.851	2.419	2330	2.608	2.573	231	-4.65***
BETA	1.027	1.214	2192	0.717	0.891	225	3.63***
VOLAT	46.12	24.43	2192	31.24	16.87	251	8.23***
ALAFIN	0.289	0.268	3534	0.325	0.149	251	-4.21***
ALAOPE	1.879	3.047	3527	2.086	1.809	234	-2.37***
INV	6.945	18.23	3216	8.393	17.81	251	-6.06***
DPL	1.166	1.777	3043	1.306	1.561	251	-5.25***
LIQ	0.075	0.206	4689	0.526	0.331	251	-18.38***
DIV	0.302	0.576	3277	0.592	0.688	251	-7.69***
TAM	13.89	2.768	3535	17.12	0.829	251	-19.32***
During Covid-19	Not listed onISE			Listed on ISE			
ROA	-0.0418	0.281	707	0.0429	0.0397	41	-2.11**
ROE	0.0208	0.4176	604	0.0669	0.3291	40	-2.29***
MTB	2.501	2.906	473	3.673	3.2799	41	-2.51***
PVPA	2.4335	2.813	505	3.725	3.222	41	-2.80***
BETA	1.2491	1.567	466	1.214	1.12	39	0.26
VOLAT	41.475	37.71	466	30.68	12.78	39	2.79***
ALAFIN	0.306	0.272	707	0.365	0.3053	41	-1.06
ALAOPE	1.995	2.930	706	2.615	2.451	41	-1.82**
INV	5.381	15.43	649	11.72	19.98	36	-4.07***
DPL	1.276	1.956	604	1.618	2.127	40	-2.15**
LIQ	0.095	0.228	946	0.604	0.303	41	-9.47***
DIV	0.275	0.519	659	0.496	0.547	41	-3.45***
TAM	14.21	2.510	707	17.19	0.792	41	-8.89***

Note: Market-to-Book (MTB), Price to Equity Value (PVPA), Return on Assets (ROA), Return on Equity (ROE), Volatility (VOLAT), Financial Leverage (ALAFIN), Operating Leverage (ALAOPE), Investment (INV); Debt to Equity (DPL), Liquidity (LIQ), Dividend Paid (DIV), Firm Size (TAM). Pre-Covid 19 (2010-2019); During Covid-19 (2020). Source: Search results.

The results presented above indicate a great difference in the level of risk, value and performance obtained by companies belonging to the ISE in relation to others that are not included in the index. Despite being low, the increase in the profitability of both groups can be explained by the significant reduction in the firms' investment levels, when considering that the established restrictions led to the suspension of activities for a relatively long period. These

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results corroborate the study by Huang and Liu (2021), who also observed a drop in the market value of Chinese companies as one of the consequences of Covid-19, however, firms that adopt corporate social responsibility practices maintained a higher level of performance. Liu et al. (2021) also reported an increase in companies' risk levels caused by the pandemic.

Table 5 (Appendix 1) presents the results of the correlation matrix between the variables. The correlation coefficients between the dependent and control variables registered relatively low values, highlighting that there are possibly no multicollinearity problems. To verify this aspect, the Variance Inflation Factors — VIF test was performed. The test results, for all models, showed mean values below 10, confirming the absence of multicollinearity problems.

4.2 Impacts of ISE and Covid-19 on Performance, Value, and Risk

The result of the diff-in-diff estimators presented in Table 3 shows that there was a negative and significant difference at the 1% level in performance, in Market-to-Book and in risk between companies listed and not listed on the ISE before Covid-19. It is also observed that during the pandemic the difference between the two groups remained significant for ROA, ROE and firm volatility. However, the diff-in-diff coefficients signal that there was no significant difference in performance, value, and risk between companies listed and not listed on the ISE in the periods before and during Covid-19. These findings reflect the study by Khatib et al. (2021) who also did not observe a significant difference in the variation in the performance of Malaysian companies in the periods before and during Covid-19.

Table 3. Effect of ISE and Covid-19 on Performance, Value, and Risk — Diff-in-Diff Estimators

	ROA	ROE	MTB	PVPA	BETA	VOLAT
Before Covid-19						
Not listed on ISE	-1.081	-1.220	6.276	8.215	0.257	48.277
Listed ono ISE	-1.164	-1.297	5.737	7.993	-0.323	38.240
Difference	**-0.083***** **(0.018)**	**-0.077***** **(0.028)**	**-0.539***** **(0.316)**	-0.222 (0.291)	**-0.580***** **(0.131)**	**-10.036***** **(2.959)**
During Covid-19						
Not listed on ISE	-1.079	-1.272	-7.181	8.950	0.390	40.523
Listed on ISE	-1.162	-1.356	-7.209	9.156	0.035	33.521
Difference	**-0.084***** **(0.040)**	**-0.183**** **(0.085)**	-0.029 (0.652)	0.205 (0.602)	-0.355 (0.353)	**-7.002**** **(03.311)**
Diff-in-Diff	-0.0001 (0.020)	-0.107 (0.185)	0.568 (0.518)	0.587 (0.509)	0.224 (0.348)	3.034 (3.547)
Observations	3118	3118	1902	1961	1888	1757
R2	0.43	0.34	0.03	0.33	0.04	0.09

Source: research results.

In Table 4, it can be seen in columns 2 and 3 that, contrary to what was found by Lameira et al. (2013), the results

show that joining the ISE significantly reduces both the return on assets and the return on equity, from 7.91% and 08.91% respectively, to the 1% level. Covid-19 had a significant effect of 2.94% on ROA and 3.70% and ROE at the 1% and 10% levels respectively.

These findings reject the hypothesis (1) of the study, however, they corroborate the study by Buallay (2019) which found that the ESG (Environmental, Social and Governance) index negatively affected the return on assets and the return on equity of 342 companies located in 20 countries. These results suggest that the cost of adapting to standards, that is, to the requirements of sustainable practices, would have a negative effect on the profitability of companies in the short term.

In columns 4 and 5 of Table 4, it is observed that adherence to the ISE and Covid-19 negatively affected the value of firms, at the 1% level of significance. It can be said that Brazilian companies were significantly affected by the effects of COVID-19. These results corroborate the most recent studies that have shown that Covid-19 has negatively affected the value of companies (Bartik et al., 2020; Shen et al., 2020; Khatib et al., 2021).

These findings reject hypothesis (2) and do not corroborate the study by Lameira et al. (2013) who presented evidence of the positive effect of the ISE on the value of Brazilian companies. However, they reflect the same behavior observed by Huang and Liu (2021) among Chinese companies that adopted or not corporate social responsibility mechanisms during Covid-19. It is remarkable that the market perceives adherence to good sustainability practices as a positive aspect, considering it an effective sign of the companies' strategic engagement with efforts aimed at sustainable development during the pandemic.

The results presented in columns 6 and 7 show that adherence to the ISE reduces the beta and volatility of firms (at the 1%) level, by 0.42 and 6.36, respectively. These results confirm hypothesis (3) and corroborate the studies by Lameira et al. (2013) and Haryono et al. (2016) who also found that the adoption of sustainable practices reduces the risk and volatility levels of companies. Based on this evidence, the result of this article contrasts with the study by Martins et al. (2019), as it signals that the engagement of companies that adopt practices that favor the environment can reduce risk levels.

On the other hand, Covid-19 increased systematic risk (Beta) by 0.25 and decreased volatility by 16.69, which explains investors' lack of interest in investing their resources on the stock exchange during the pandemic. Huang and Liu (2021) highlight that a stock's high volatility offers possibilities to generate potential gains, however, it can cause an increase in risk levels. In this context, it is inferred that the accumulated losses, due to the disastrous

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falls in the Brazilian stock market indices caused by Covid-19, reflect a scenario of uncertainty that resulted in the cautious behavior of investors.

The coefficients of interest (COVID19*ISE) confirm the results previously reported, with no statistically significant differences in the behavior of firms listed and not listed on the ISE in the periods before and during Covid-19. In this regard, it can be inferred that, as both are under the same effects of the pandemic, as observed by Khatib et al. (2021) in Malaysia, there is no significant difference in the variation of performance, value, and risk of Brazilian companies.

Table 4. The Impact of ISE and Covid-19 on Performance, Value, and Risk of Brazilian Companies

Variables	PERFORMANCE		VALUE		RISK	
	ROA	ROE	MTB	PVPA	BETA	VOLAT
Covid19	-0.0294*** (0.0115)	-0.0370* (0.0255)	-0.5862*** (0.2047)	-0.6193*** (0.1586)	0.2536** (0.1294)	-16.6916*** (2.2125)
ISE	-0.0791*** (0.0189)	-0.0891*** (0.0280)	-0.5274*** (0.1726)	-0.2986** (0.2402)	-0.4249*** (0.1156)	-6.3638** (2.9414)
COVID19 *ISE	-0.0034 (0.0186)	-0.1216 (0.0889)	0.1193 (0.5257)	0.2573 (0.4740)	0.1453 (0.3394)	0.3101 (3.7248)
ALAFIN	-0.1789*** (0.0469)	0.0819 (0.0893)	-2.5409*** (0.3647)	3.3461** (0.8107)	0.0162 (0.3377)	11.4718* (6.5865)
ALAOPE	0.0045*** (0.0014)	0.0101*** (0.0029)	-0.0286* (0.0160)	-0.0399** (0.0185)	0.0108 (0.0116)	-0.0115 (0.2212)
INV	0.0010** (0.0005)	-0.0003 (0.0006)	-0.0120*** (0.0026)	-0.0185*** (0.0041)	-0.0040** (0.0020)	-0.0156 (0.0451)
DPL	-0.0049 (0.0035)	-0.0776*** (0.0117)	-0.6857*** (0.0715)	0.7162*** (0.00075)	0.0001 (0.0299)	1.1069** (0.5449)
LIQ	0.1703*** (0.0338)	-0.1102*** (0.0459)	-3.0830*** (0.2058)	3.3886*** (0.4518)	0.0317 (0.1794)	0.1193 (3.6250)
DIV	-0.0398*** (0.0105)	0.1048*** (0.00114)	-0.4415*** (0.0778)	-0.4486*** (0.1160)	-0.0896 (0.0545)	-5.2099*** (0.9111)
TAM	0.0769*** (0.0105)	0.0823*** (0.0116)	-0.3702*** (0.0417)	-0.4496*** (0.1025)	0.1084*** (0.0415)	-0.4513 (0.6126)
CONS	-1.0432*** (0.1526)	-1.2193*** (0.1636)	6.5250*** (0.7420)	7.7530*** (1.4110)	-1.5075*** (0.5723)	47.1791*** (8.8562)
Observations	3117	3117	2170	2169	1887	1887
No. of clusters	433	433	332	331	270	270
R²	0.4559	0.3596	0.2671	0.3982	0.1312	0.2392
F-test	4.29***	9.30***	32.48***	11.65***	6.51***	10.90***
Sector	Sim	Sim	Sim	Sim	Sim	Sim
Year	Sim	Sim	Sim	Sim	Sim	Sim

Note: Market-to-Book (MTB), Price to Equity Value (PVPA), Return on Assets (ROA), Return on Equity (ROE), Volatility (VOLAT), Financial Leverage (ALAFIN), Operating Leverage (ALAOPE), Investment (INV); Debt to Equity (DPL), Liquidity (LIQ), Dividend Paid (DIV), Firm Size (TAM). Source: Search results.

Regarding the control variables, the debt/equity ratio and share liquidity negatively affected ROE, while ROA was negatively affected by dividends paid. Operating leverage (ALOPE), investment (INV) and size (TAM) positively impacted both performance variables. As well as Lameira et al. (2013) and Shalihin et al. (2020) highlight, companies are more profitable when they use leverage to invest in their projects, however, an increase in the level of debt in relation to equity can be considered negative for performance.

With regard to firm value, all control variables had a negative impact on Market-to-Book, while evidence indicates that a one-unit increase in financial leverage, debt/equity and liquidity of the share, increases by 2.34, 0.62 and 3.39 respectively the price over the equity value of the share. However, the more companies invest in capital goods and pay more dividends, the lower the PVPA. These results partially corroborate Cavalcanti and Boente (2012) and Lameira et al. (2013) indicating that the more they invest in capital goods and the greater their liquidity, the less they will be valued by the market.

For each investment unit and dividend paid, Beta and Volatility are reduced by 0.004 and 5.21 respectively. If firm size increases firms' systematic risk, the debt/equity ratio positively affects stock price volatility. Such behaviors were also observed by Yoo et al. (2021) and by Lameira et al. (2013).

The results show that investors are becoming more and more attentive and demanding regarding the efforts mobilized by Brazilian companies to meet environmental requirements, which is a determining factor in reducing global warming. With the considerable advance of burning in the main forest reserves in the country and the expansion of the Covid-19 pandemic in 2020, the adoption of B3's sustainable practices may be an important factor to help companies reduce risk levels. Considering the limited number of firms listed on the ISE, it can be said that the costs to meet these requirements exert a reducing effect both on the performance of companies and on the price of shares.

5 Final considerations

This study investigated the impacts of sustainability practices and the Covid-19 pandemic on the value, performance and risk of 495 Brazilian firms listed on B3 in the period 2010-2020. The difference-in-difference methodology allowed us to observe the difference in the variation of dependent variables between firms that adopted the sustainability practices of B3 and those that are not listed in the index (control group) before and during the pandemic.

The results indicated that companies belonging to the B3 Corporate Sustainability Index showed a reduction in return on assets and return on equity. Therefore, hypothesis H1 was rejected, which sought to verify whether companies belonging to the ISE performed better, contrary to the findings of Plesch et al. (2015), Silva et al. (2015), however, corroborating Oliveira and Cardoso (2015) and Haryono et al. (2016).

With regard to the influence of sustainable practices on the value of companies, the results also showed a negative

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relationship, rejecting hypothesis H2 for the period. Studies carried out in the market by investment brokers claim that companies that adopt an agenda of ESG (Environmental, Social and Governance) criteria have profitability above the Ibovespa (Estadão, 2020). Laskar and Maji (2018) concluded that both the level and quality of corporate sustainability disclosure impact company value.

Regarding risk, hypothesis H3 was confirmed, since the adoption of the best sustainability practices had a negative and significant effect on Beta and Volatility. These findings are in agreement with Silva et al. (2015) and Lameira et al. (2013). However, these findings were contrary to the study by Cavalcanti and Boente (2012).

Finally, regarding the Covid-19 pandemic, the study partially confirmed the H4 hypothesis, as it found that in the year 2020, there was an increase in systematic risk and a reduction in performance (ROA and ROE) and value (MBA and PVPA), as well as a reduction in the volatility of the investigated firms, as expected and pointed out in the cited literature (Bose et al., 2021; Yoo et al., 2021). As well as Khatib et al. (2021), it was found that there was no significant difference in behavior between companies listed and not listed on the ISE in the periods before and during the pandemic.

This study contributes to the literature in several aspects. No other study was found in Brazil that associated sustainability versus performance/value/risk in the pandemic scenario, and still using the diff-in-diff method. Studies on the ESG agenda have gained momentum in academia and in the market, but they still remain inconclusive. Professional investors and researchers have realized that performance, treated in isolation, is not enough for firms to achieve long-term growth. When the firm chooses to work from a perspective that considers sustainability practices, it will help to increase its transparency, strengthen risk management, encourage stakeholder involvement and improve communication with its partners (Loh et al., 2017). For future research, it is suggested to adopt other measures for sustainability, such as the ESG index and other proxies for value, performance, and risk. In addition, the work can be extended to other countries and could use another data analysis methodology, noting whether the same behavior continues in the post-Covid-19 period.

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Table 5. Correlation matrix between variables.

	MTB	PVPA	ROA	ROE	BETA	VOLAT	ISE	ALAFIN	ALAOPE	INV	DE	LIQ	DIV	TAM
MTB	1.00													
PVPA	-0.92*	1.00												
ROA	0.24*	0.26*	1.00											
ROE	0.03	0.04*	0.80*	1.00										
BETA	-0.02	-0.01	-0.02	-0.05*	1.00									
VOLAT	-0.13*	-0.12*	-0.21*	-0.19*	0.49*	1.00								
ISE	0.06*	0.08*	0.10*	-0.08	-0.06*	-0.17*	1.00							
ALAFIN	0.07*	0.097*	0.072*	0.041*	0.01	0.10*	0.03*	1.00						
ALAOPE	0.04*	0.033	0.21*	0.16*	0.05*	-0.01	0.02	0.03	1.00					
INV	-0.02*	-0.03*	0.07*	-0.06*	-0.06*	-0.01*	-0.03	-0.017*	-0.11*	1.00				
DPL	-0.34*	0.32*	-0.01	-0.22*	0.02	0.13*	0.02	0.66*	0.04*	-0.05*	1.00			
LIQ	0.26*	0.25*	0.15*	0.13*	0.09*	-0.01*	0.42*	0.04*	0.04*	0.02	0.04*	1.00		
DIV	-0.12*	-0.13*	-0.22*	0.25*	-0.07*	-0.22*	0.13*	-0.03*	-0.07*	-0.01	-0.05*	0.10*	1.00	
TAM	0.16*	0.043*	0.61*	0.41*	0.09*	-0.22*	0.29*	0.27*	0.12*	0.02*	0.19*	0.46*	0.19*	1.00

Source: research results

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