REVISTA AMBIENTE CONTÁBIL
Universidade Federal do Rio Grande do Norte
ISSN 2176-9036
Vol. 17, n. 1, Jan./Jun, 2025
Sítios: https://periodicos.ufrn.br/index.php/ambiente
http://www.atena.org.br/revista/ojs-2.2.3-06/index.php/Ambiente
Article received on: December, 11th, .2023. Peer reviewed on: May, 01th, 2024. New submission on: May, 08th, 2024. New peer review on: June, 09th, 2024. Reformulated on: June, 14th, 2024. Evaluated by the double-blind review system.

DOI: 10.21680/2176-9036.2025v17n1ID38667

The stock market's reaction to the mandatory disclosure of ESG information

La reacción del mercado de acciones a la obligatoriedad de divulgación de información ESG

A reação do mercado de ações à obrigatoriedade da divulgação de informações ESG

Authors

Mateus Del Col Lopes
Master's student in Business Administration, research area in Strategic Finance at Universidade Presbiteriana Mackenzie (UPM). Address: Rua da Consolação, 930, São Paulo, São Paulo, Brasil, CEP: 01302-907. Identifiers (ID):
ORCID: https://orcid.org/0009-0007-6639-3598
Research Gate: https://www.researchgate.net/profile/Mateus-Del-Col-Lopes
Lattes: http://lattes.cnpq.br/2798532186267363
E-mail: mateusdelcol@gmail.com

Michele Nascimento Jucá
Post-doctorate in Finance from Columbia University, PhD in Business Administration from the University of São Paulo - with a sandwich at Columbia University (NY / USA). Professor of the Postgraduate Program in Administration at Mackenzie Presbyterian University (UPM). Address: Rua da Consolação, 930, São Paulo, São Paulo, Brasil, CEP: 01302-907. Identifiers (ID):
ORCID: https://orcid.org/0000-0002-8610-6193
Research Gate: https://www.researchgate.net/profile/Michele-Juca
Academia: https://mackenzie.academia.edu/MicheleNJuca
Google Citations: https://scholar.google.com.br/citations?hl=pt-BR&user=nasmv-8AAAAJ
Lattes: http://lattes.cnpq.br/6770985264140454
E-mail: michele.juca@mackenzie.br

Abstract

Purpose: Analyze the impact of mandatory disclosure of ESG information in Brazil on the price of shares in the local market.

Methodology: This analysis is carried out through an event study, which refers to the publication of the Reference Form (FRE) of companies in the metal and mining sector - that

are environmentally sensitive. The date of the event is the date of disclosure of each company's FRE, for the fiscal year ending on December 31, 2022.

Results: The results confirm the main hypothesis of this study: The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares. It is possible that the market understands that the short-term costs - related to the implementation of sustainability practices - still exceed the benefits that will lead to the appreciation of companies in the long term. However, the progressive integration of global markets foresees an alignment of sustainable practices that should reach the Brazilian market in the medium term.

Contributions of the Study: This research differs from others by finding that the mandatory disclosure of sustainability practices - by Brazilian companies - negatively impacts the return on their shares, after the implementation of Resolution no. 59/2021. It contributes to academia with the empirical analysis of the market efficiency hypothesis. Furthermore, its results can help companies, investors and the capital market to better understand the initial effects of mandatory publication of sustainable practices. Finally, this study also contributes to the stimulation or adaptation of policies defined by regulatory bodies on sustainability issues.

Keywords: Sustainability practices; Mandatory disclosure; Stock market; Event study; Brazil.

Resumen

Objetivo: Analizar el impacto de la divulgación obligatoria de información ESG en Brasil sobre el precio de las acciones en el mercado local.

Metodología: Este análisis se realiza a través de un estudio de eventos, el cual hace referencia a la publicación del formulario de referencia (FRE) de las empresas del sector metalúrgico y minero - que son ambientalmente sensibles. La fecha del evento es la fecha de divulgación del FRE de cada empresa, para el ejercicio fiscal que finaliza el 31 de diciembre de 2022.

Resultados: Los resultados confirman la hipótesis principal de este estudio: la divulgación obligatoria de las prácticas de sostenibilidad por parte de las empresas brasileñas impacta el rendimiento de sus acciones. Es posible que el mercado entienda que los costos de corto plazo - relacionados con la implementación de prácticas de sustentabilidad - aún superan los beneficios que conducirán a la apreciación de las empresas en el largo plazo. Sin embargo, la progresiva integración de los mercados globales prevé una alineación de prácticas sostenibles que deberían llegar al mercado brasileño en el mediano plazo.

Contribuciones del Estudio: Esta investigación se diferencia de otras al constatar que la divulgación obligatoria de las prácticas de sostenibilidad - por parte de las empresas brasileñas - impacta negativamente el rendimiento de sus acciones, después de la implementación de la Resolución n. 59/2021. Contribuye a la academia con el análisis empírico de la hipótesis de la eficiencia del mercado. Además, sus resultados pueden ayudar a las empresas, los inversores y el mercado de capitales a comprender mejor los efectos iniciales de la publicación obligatoria de prácticas sostenibles. Finalmente, este estudio también contribuye a la estimulación o adaptación de políticas definidas por los organismos reguladores en temas de sostenibilidad.

Palabras clave: Prácticas de sostenibilidad; Divulgación obligatoria; Mercado de acciones; Estudio de evento; Brasil

Resumo

Objetivo: Analisar o impacto da obrigatoriedade da divulgação das informações de ESG no Brasil sobre o preço das ações do mercado local.

Metodologia: Referida análise é feita por meio de um estudo de evento, o qual refere-se à publicação do formulário de referência (FRE) das empresas do setor de metal e mineração – que são ambientalmente sensíveis. A data do evento é aquela da divulgação do FRE de cada companhia, relativo ao exercício social que se encerra em 31 de dezembro de 2022.

Resultados: Os resultados confirmam a hipótese principal desse estudo: A divulgação obrigatória de práticas de sustentabilidade das companhias brasileiras impacta o retorno de suas ações. É possível que o mercado entenda que os custos de curto prazo - relacionados à implementação das práticas de sustentabilidade - ainda excedam os benefícios que levarão à valorização das companhias no longo prazo. Porém, a integração progressiva dos mercados globais prevê um alinhamento de práticas sustentáveis que devem alcançar o mercado brasileiro no médio prazo.

Contribuições do Estudo: Essa pesquisa se diferencia das demais por constatar que a divulgação obrigatória de práticas de sustentabilidade - das companhias brasileiras - impacta negativamente o retorno das suas ações, após a implementação da Resolução no. 59/2021. Ele contribui para a academia com a análise empírica da hipótese de eficiência de mercado. Além disso, seus resultados podem auxiliar as companhias, investidores e mercado de capitais a melhor compreender os efeitos iniciais da publicação obrigatória das práticas sustentáveis. Por fim, este estudo colabora ainda com o estímulo ou adequação das políticas definidas pelos órgãos reguladores sobre temas de sustentabilidade.

Palavras-chave: Práticas de sustentabilidade; Obrigatoriedade de divulgação; Mercado de ações; Estudo de evento; Brasil

1 Introduction

The growing demand for transparency in corporate sustainable practices is redefining the dynamics of financial markets on a global scale. The Brazilian Securities and Exchange Commission (BSEC) recently approved Resolution no. 59/2021, which imposes on companies the obligation to disclose information about sustainable practices in their Reference Forms (RF). However, the impact of this obligation on the market is a controversial issue, raising debates about the benefits and costs associated with expanding corporate transparency. Bond issuers, investors, asset managers and the general public are calling for greater transparency and corporate responsibility.

This has led many governments to consider adopting mandatory regulations for the disclosure of environmental, social and governance (ESG) information. Recently, policymakers in several countries have gradually recognized the economic impacts of disclosing ESG practices on sustainability growth and forced publicly traded companies to issue non-financial reports on such practices (Bolognesi & Burchi, 2023; Do & Vo, 2023).

Regulations related to ESG information may vary between countries and sectors. However, its purpose generally focuses on increasing companies' transparency regarding their environmental and social impacts, as well as standardizing and making disclosed ESG information comparable. In response to the demand for information about companies' sustainability practices, organizations offer voluntary ESG reporting standards that aim to improve or harmonize their policies. Among them are the Sustainability Accounting Standards Board (SASB) and the Global Reporting Initiative (GRI) (Christensen *et al.,* 2021; Chen *et al.,* 2023).

In other countries, the disclosure of sustainability practices is mandatory for publicly traded companies – e.g.: European Union, Hong Kong, Australia, and Japan (Grewal *et al.,* 2019; Chung *et al.,* 2023). More recently, the Securities and Exchange Commission has been providing guidance to listed companies.

However, on December 22, 2021, the BSEC approved Resolution no. 59, which includes in the RF the obligation to present or justify implementations in ESG and climate (BSEC, 2021). This resolution is a response to growing demands for greater transparency and corporate responsibility, considering the environmental and social impact of companies.

The new RF came into force on January 2, 2023, and is applicable to the disclosure of information relating to the fiscal year ending on December 31, 2022. Furthermore, as provided for in Article 25, §1, of BSEC Resolution no. 80, of March 29, 2022, the updated RF must be delivered within five months from the closing date of the fiscal year, that is, by May 31, 2023 (BSEC, 2022). The inclusion of ESG information in RF aims to standardize and facilitate comparisons between companies, allowing investors to make more informed and responsible decisions.

There are several corporate finance theories that support the disclosure of sustainable practices by companies, whether voluntarily or mandatory – e.g.: legitimacy, agency, information asymmetry, stakeholders, signaling, and regulatory. However, the empirical literature on this topic is not consensual (Christensen *et al.,* 2021). Chung *et al.* (2023), for example, suggest that agency problems are mitigated when disclosure of non-financial ESG reports is mandatory.

Grewal *et al.* (2019) identify a positive relationship between mandatory disclosure of sustainable practices and share prices for those companies that – voluntarily – already had a high level of ESG disclosure. In turn, Wang *et al.* (2023) analyze the impact of the ESG Disclosure Simplification Act of 2021 in the United States on stock prices. The authors find negative returns – around the approval of the law – possibly due to the perception that the costs of compliance are greater than the benefits of increasing transparency.

Given the lack of consensus in the empirical literature on this topic and the recent implementation of Resolution no. 59/2021 in Brazil, this study presents the following research problem: **The approval of BSEC Resolution no. 59/2021 impacts the price of shares in the Brazilian market?** Therefore, this study aims to analyze the impact of the mandatory disclosure of ESG information in Brazil on the price of shares in the local market. This analysis is carried out through an event study, which refers to the publication of the RF of companies in the metal and mining sector.

The event date is the one of each company's RF disclosure for the fiscal year ending on December 31, 2022. The final sample is made up of 10 companies, whose data is obtained through Standard & Poor's Capital IQ database (CIQ, 2023). This research differs from others because it is – to the best of our knowledge – one of the first to investigate the implementation effects of the Brazilian Resolution no. 59/2021 upon company shares' return.

The expected contribution of this article is the empirical confirmation of the efficient market hypothesis (EMH). Furthermore, it is also hoped that its results can help companies, investors, and the capital market to better understand the initial effects of the mandatory publication of sustainable practices. Finally, this study can also contribute to encouraging or adapting policies defined by regulatory bodies on sustainability issues.

2 Literature review

2.1 Efficient market hypothesis

EMH is based on the idea that the price of an asset should reflect all relevant information available (Fama, 1970, 1991, 1998). EMH further states that there are three levels of informational efficiency – weak, semi-strong, and strong. In the weak form, all past information about the company is reflected in its current share price. In the semi-strong form, both previous and current information – which is publicly available – impact the price of your assets in the present. Finally, in the strong form, there is the presence of privileged information, which does not characterize EMH.

Integrating efficient market theory into the analysis of sustainability practices requires considering how information about companies' ESG performance is absorbed and reflected in share prices. This aligns with the weak and semi-strong forms of the EMH. The weak form suggests that all historical information is reflected in current prices, while the semi-strong form also includes current public information such as ESG reports and other relevant disclosures.

2.2 Theories related to the dissemination of sustainable practices

According to the legitimacy theory, companies are not entitled to exist if their value system is contrary to the preponderant norms, beliefs, and precepts of society. Thus, the company acquires permission to operate, as long as it meets the expectations of the community regarding its activities. If this occurs, it gains the necessary legitimacy to explore available environmental and social resources, enabling its long-term continuity. Therefore, they are expected to disclose their sustainable practices to ratify compliance with their social contract (Suchman, 1995; García-Meca *et al.*, 2024).

Regarding corporate governance practices, agency theory states that companies are constituted by a set of contracts between one or more individuals. Among them, the owners, or principals, and the managers or agents stand out. A priori, the latter should act in favor of the interests of the former.

It turns out that the interests of both parties are sometimes conflicting (Jensen & Meckling, 1976). Therefore, it is necessary to use instruments that mitigate these conflicts. Among these tools, the disclosure of (non) financial reports on managers' corporate decisions about the company stands out. The transparency of managers' actions allows shareholders to verify whether agents are effectively acting in favor of their interests (Mio *et al.*, 2020; Tahir *et al.*, 2023).

The theory of information asymmetry states that, in a transaction, one of the parties involved generally has more information than the other, giving rise to power imbalances and inadequate decision-making (Akerlof, 1970; Bergh *et al.*, 2019). The disclosure of (non) financial information about companies is a positive signal to the market, as it enables the assessment and, above all, the management of market risks. As for sustainability information, it points to the company's long-term commitment to its various stakeholders. This fact

minimizes the irrational behavior of investors and reduces the agency conflict between the parties (Hu *et al.*, 2023).

Finally, according to regulatory theory, due to market imperfections, there is a demand from society for accounting rules – to mitigate informational asymmetry between managers and other stakeholders. In other words, financial statements and other accounting reports are a result of the market's inability to provide information about the operational efficiency of companies. Thus, the standardized disclosure of sustainable practices by companies conveys credibility to their actions, as well as allowing them to be compared with those of other companies in the same sector, for example. As a result, there is an increase in the legitimacy of companies and confidence in the market (Alberti-Alhtayba *et al.*, 2012; Chung *et al.*, 2023).

2.3 Rules and regulations on the disclosure of sustainable practices

Part of the content related to sustainability practices – at a global level – is inspired by the guidelines of the Sustainability Accounting Standards Board (SASB) and the Global Reporting Initiative (GRI). The SASB presents sector-specific standards that include disclosure topics, accounting metrics, technical protocols, and activity metrics, allowing communication with investors about the impact of sustainability on long-term value creation (SASB, 2023).

The GRI publishes a comprehensive set of standards to help organizations report their sustainability impacts. These standards include aspects such as climate change, work practices, human rights, and governance (GRI, 2023). Both organizations have complementary and fundamental roles in promoting transparency and corporate responsibility through non-financial disclosures related to ESG.

In the case of Brazil, BSEC Resolution no. 59/21 (BSEC, 2021), in force since January 2, 2023, brought important changes to BSEC Instructions no. 480/09 (BSEC, 2009a) and no. 481/09 (BSEC, 2009b), to improve and simplify the information disclosure system of companies issuing securities, via RF. These changes aim to ensure greater transparency and meet investor expectations regarding ESG aspects. Furthermore, it indicates the mandatory adoption of the "practice or explain" policy by companies, starting from the year ending December 31, 2022.

In turn, BSEC Resolution no. 80/22 (BSEC, 2022) deals with the registration and provision of periodic and occasional information from issuers of securities. It establishes that sustainability information for the year ending in 2022 must be made available, via RF, by May 31, 2023. Both resolutions have the purpose of promoting greater transparency and adequate disclosure of relevant information, contributing to solid governance and efficiency.

2.4 Relationship between mandatory disclosures and company performance

The impact of mandatory disclosure of sustainable practices on company performance is still controversial in the capital market. In countries where disclosure is mandatory – with norms standardized by the government itself and regulatory bodies – the effects on the capital market tend to be more positive (Veltri *et al.*, 2020; Pulino *et al.*, 2022; Chen & Xie, 2022).

Wen *et al.* (2022) corroborate this perception. They find a positive relationship between the quality of sustainability information and the growth of ESG investments. This occurs especially with companies located in countries where the disclosure of this information is mandatory. Furthermore, the authors find that above a certain level of quality – in this information – there is a significant increase in the value of your shares and long-term financial returns.

On the contrary, there are authors who find that the mandatory publication of ESG reports negatively affects companies' value. Grewal *et al.* (2019) verify that the mandatory disclosure of sustainable information implies an increase in compliance costs for investors. Wang *et al.* (2023) point out that companies need to incur new expenses to generate and disseminate information on their sustainability practices, in accordance with the country's standards.

Moreover, Chen *et al.* (2018) argue that these expenses can be high, generating more costs than benefits. Consequently, there is a negative effect on the financial results and value of companies that need to adapt to the new rules. Such arguments support the main hypothesis of this study.

H1 – The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares.

2.5 Results from other event studies on mandatory disclosures of sustainable practices

Table 1 presents a summary of the results of event studies on mandatory disclosures of sustainable practices. Lu's study (2016) analyzes the implementation of the "practice or explain" rule by the Hong Kong Stock Exchange between 2011 and 2015. As a result, the author finds that regulation in Hong Kong is driven by the government's strategy of identifying new sources of productivity, attract capital from environmentally friendly investors, and stimulate international competitiveness.

Furthermore, the article also verifies that the disclosure of ESG reports has a positive impact on shareholders. Such information should be considered as an opportunity for issuers to identify risks, reduce costs, develop innovative approaches aimed at productivity and growth, and expand access to capital. Besides, the study by Cosma *et al.* (2018) verifies whether shareholders consider good quality disclosure – of the mandatory Integrated Report (IR) – when evaluating their investments, rewarding companies that stand out.

This same study evaluates a sample of 76 announcements from South African companies that received awards – for the quality of their IR – being winners or finalists, between 2013 and 2016. The results indicate that shareholders appreciate the quality of (non) financial information published in IR. The stock market reacts positively to award announcements. This evidence should encourage managers to invest in improving the quality and dissemination of IR.

In turn, the study by Olsen *et al.* (2021) checks whether the US government's policy of requiring mining companies to disclose safety incidents has produced the desired results. This is done by examining how investors respond to mandatory disclosures about fatal coal mine accidents. 114 accident announcements were analyzed between 2012 and 2018. The results show that - for the majority of cases with a single fatality - the market does not react to safety incident disclosures. In summary, this study shows that without adequate research to establish the ideal threshold for disclosures of ESG practices, government attempts to obtain mandatory disclosures are unlikely to achieve the objectives of the implemented policies.

As for the study by Wang *et al.* (2023), it aims to examine the stock market reaction to the enactment of the Environmental, Social, and Governance (ESG) Disclosure Simplification Act of 2021 by the United States House of Representatives. The law requires the disclosure of standardized ESG metrics by North American companies.

Daily return data is collected from stocks listed on the American Stock Exchange (AMEX), the New York Stock Exchange (NYSE) and the National Association of Securities

Dealers Automated Quotations (NASDAQ), between January 1st. and August 31, 2021. The results point to a significantly negative reaction of -1.1%. Carbon-intensive companies and industries are the most vulnerable. However, the negative reaction attenuates among companies with higher ESG scores.

Table 1
Synthesis of event studies' results about mandatory disclosure of sustainable practices

Tests	Lu (2016)		Cosma *et al.* (2018)		Olsen *et al.* (2021)		Wang *et al.* (2023)	
	Sign	Sig.	Sign	Sig.	Sign	Sig.	Sign	Sig.
AR or CAR	+	5%	+	5%	-	n/s	-	1%

Notes: Sig: Level of statistical significance; AR: Abnormal return; CAR: Cumulative abnormal return; n/s: no statistical significance
Source: *Research data.*

Table 2
Windows of event studies about mandatory disclosure of sustainable practices

Windows in number of trading sessions	Lu (2016)	Cosma *et al.* (2018)	Olsen *et al.* (2021)	Wang *et al.* (2023)
Estimation	n/a	-270 a -21	-20 a -2	-273 a -22
Event	(a)	(b)	(c)	(d)

Notes: n/a: Not available
(a) -1 to +1, -2 to +2, -3 to +3
(b) -10 to +10, -5 to +5, -3 to +3, -10 to -1, -5 to -1, -3 to -1, 0 to +10, 0 to +5, 0 to +3, 0 to +1
(c) -1 to +1, -1 to 0, 0 to +1, 0 to +5, -1 to +5, -1, 0, +1
(d) -1 to +1, -3 to +3, -5 to +5, -10 to +10, 0 to +1, 0 to +2, 0 to +5, 0 to +10
Source: *Research data.*

3 Methodological Procedures

This work aims to analyze the reaction to the mandatory disclosure of ESG information in Brazil on the price of shares in the local market. The hypothesis arising from this objective is: *H1 – The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares***.** This hypothesis is verified through an event study. According to Campbell *et al.* (1997) and Mackinlay (1997), the steps of the event study are presented in Figure 1. Furthermore, it is noteworthy that the data on stock and market returns are obtained through the Capital IQ Pro database from Standard & Poor's (S&P).

Figure 1 *Event study steps*
Source: *Adapted from Campbell et al. (1997, p. 151).*

3.1 Event definition

The analyzed event refers to the disclosure of ESG practices, through the RF – on May 31, 2023 – of publicly traded companies. The BSEC makes the disclosure of sustainable practices mandatory, guiding companies to practice or explain their actions relating to the 2022 financial year, by Resolution no. 59/2021 (BSEC, 2021). The RF for this period must be

delivered within five months from the closing date of the fiscal year, that is, by May 31, 2023 (BSEC, 2022).

3.2 Selection criteria

The final sample is made up of 10 publicly held companies in the metal and mining sectors – which have a positive net equity on December 31, 2023, and a beta coefficient statistically different from zero. The sector classification and share price of these companies are obtained through Standard & Poor's Capital IQ database (CIQ, 2023). These sectors play a relevant role in the Brazilian economy, accounting for more than 5% of the country's Gross Domestic Product (GDP).

In addition to its contribution to the national economy, the exploration of metals and minerals is also fundamental to the success of the external sector, making the trade balance in surplus (Commerce Gazette, 2021). Furthermore, these sectors are among the most susceptible to changes in legislation related to environmental issues, being classified as environmentally sensitive (Garcia *et al.*, 2017; Chamber of Deputies, 2020).

3.3 Abnormal and normal returns

The existence of abnormal returns is observed as being the most significant point to conclude something about the impact of the event on the company's share price. The abnormal return of a stock is represented by Equation 1 (Campbell *et al.*, 1997):

$$AR_{it} = R_{it} - E(R_{it}) \quad (1)$$

In which:
AR_{it} = abnormal return of share "i" in period "t"
R_{it} = observed return of share "i" in period "t"
$E(R_{it})$ = expected return of share "i" in period "t"

The methodology for calculating normal returns presents two forms of measurement, traditional and logarithmic. The logarithmic measurement is the most appropriate because it provides a better composition in the normal distribution of returns compared to the parametric testing procedure. Furthermore, through it, it is possible to add the returns from different periods to obtain the total return. Finally, in logarithmic measurement, it is assumed that market information occurs all the time and that shares react continuously to this information (Fama, 1970; Campbell *et al.*, 1997). This return is obtained through Equation 2:

$$P_{it} = P_{it-1}\, e^{Rit} \quad (2)$$

In which:
P_{it} = price of share "i" in period "t"
P_{t-1} = price of share "i" in the previous period "t-1"
e = 2.718281
R_{it} = observed return of share "i" in period "t"

In turn, the calculation of the observed real return is given by Equation 3. It considers the following elements:

$$R_{it} = \ln (P_{it}/P_{it-1}) \quad (3)$$

In which:
R_{it} = observed return of share "i" in period "t", transformed by the Neperian logarithm (ln)
P_{it} = nominal closing price of share "i" after distribution of dividends in trading session "t"
P_{it-1} = nominal closing price of share "i" after distribution of dividends in trading session "t-1"

According to Campbell *et al.* (1997), the expected return is obtained through the market model, which relates the return on the share to the return on the market portfolio. This return can be understood through Equation 4:

$$E(R_{it}) = \alpha_i + \beta_i RM_t + \varepsilon_{it} \quad (4)$$

In which:
$E(R_{it})$ = expected return of share "i" in period "t"
RM_t = market return in period "t" of Ibovespa - main index of the Brazilian stock exchange
α_i and β_i = parameters of the market model for share "i"
ε_{it} = residue of the econometric equation of share "i" in period "t"

In turn, the cumulative abnormal return (CAR) model is calculated by the simple sum of all abnormal returns contained in an event window. Its calculation is done using Equation 5:

$$CAR_i\,(t_1 > t_2) = \sum_{t_1}^{t_2} AR_{it} \quad (5)$$

In which:
CAR_i = cumulative abnormal return of share "i"
t_1 = first day of the event window
t_2 = last day of the comparison window
AR_{it} = abnormal return of share "i" in period "t"

3.4 Estimation procedures

To estimate the mentioned returns, Figure 2 presents the analyzed windows. The deadlines are based on the empirical studies of Table 2. This research considers the trading day windows adopted in most of them, being: a) estimation -270 to -6, b) event -5 to +5 and c) post-event or comparison +6 to +20.

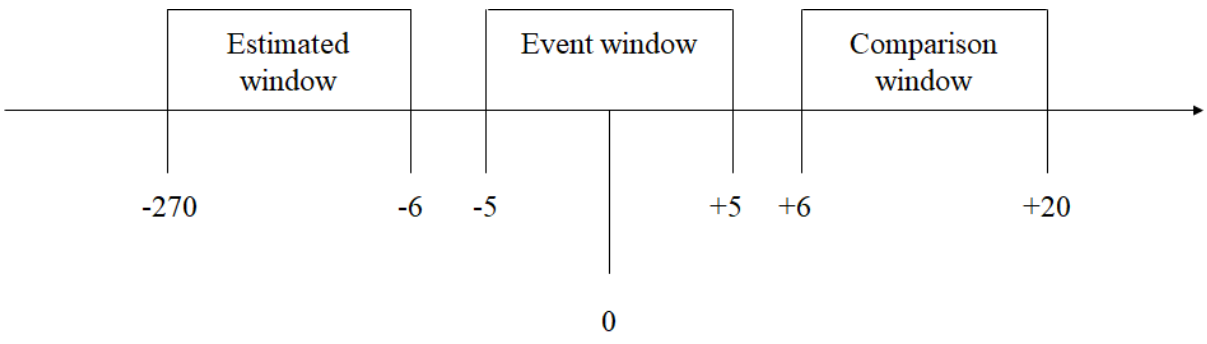

Figure 2 *Event study windows*
Source: *Research data.*

The estimation window comprises the period for calculating expected or normal share returns before the event window, comprising 265 trading sessions (-270 to -5). It is noteworthy that the estimation window must not overlap the event window so as not to influence the parameters and must be extensive enough so that possible discrepancies in returns can be diluted, without causing major changes in their frequency distribution (Campbell *et al.*, 1997).

In turn, the event window consists of 11 trading sessions before and after the announcement (-5 to +5). The RF disclosure event for the 2022 financial year takes place on date zero – on May 31, 2023. The study of the behavior of returns on the trading session prior to date zero aims to collect evidence of illegal use of privileged information, while the study of behavior in the trading session after date zero aims to observe the capital market's reaction to the occurrence of the event.

Finally, the comparison window consists of 15 trading sessions (+6 to +20), after the event window. Its objective is to verify whether or not returns continue to exhibit abnormal behavior after the event window.

3.5 Test procedures

The testing procedure for H1 – The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares - considers a set of tests. They are as follows:

i. First, the closing share prices of the sample companies are collected. This occurs during the period of the estimation, event, and comparison windows, to calculate their return;

ii. After obtaining this data, the expected returns are projected for the event and comparison windows, using Equation 4. The real observed returns of the assets in these same windows are obtained using Equation 3;

iii. Subsequently, the ARs and CARs are calculated via Stata software. This calculation is done for the event and comparison windows;

iv. After obtaining these returns, the normality of both distributions is verified, using the Shapiro-Wilk test (SW test), whose null and alternative hypotheses are: H0: The distribution is normal and Ha: The distribution is not normal;

v. If the distribution is normal, the "t test" of mean difference, between the observed and expected return on assets (AR and CAR), is used with a significance level of 5%. However, if the distribution is not normal, the non-parametric Wilcoxon test is used (Favero & Belfiore., 2019). These tests aim to verify the statistical significance of these differences or abnormal returns. The hypotheses tests are: H0: The means are equal and Ha: The means are not equal.

vi. Then the shares - whose CARs are statistically different from zero - are identified. The use of CAR becomes more appropriate for analyzing results, as there are difficulties in determining the exact date on which the market effectively absorbs information about the event under analysis. Finally, the arithmetic mean of the CARs is calculated for the event (-5 to +5) and comparison (+6 to +20) trading windows.

4 Results and Analysis

The initial sample is made up of 12 publicly-held companies in the metal and mining sectors traded on Brasil, Bolsa, Balcao (B3) – which have a positive net equity as of December 31, 2023. However, the companies Panatlantica S.A. (PATI4) and Tekno S.A. Industria e Comercio (TKNO4) are excluded because their beta coefficient is statistically equal to zero.

The sector classification and share price of these companies are obtained through Standard & Poor's Capital IQ database (CIQ, 2023). Therefore, the final sample is composed of 10 companies, whose betas in Equation 4 are statistically different from zero - see Table 3

Table 3
Companies o the final sample

#	Ticker	Company	#	Ticker	Company
1	VALE3	Vale S.A.	6	CMIN3	CSN Mineracao S.A.
2	GOAU4	Metalurgica Gerdau S.A.	7	BRAP3	Bradespar S.A.
3	GGBR4	Gerdau S.A.	8	CBAV3	Companhia Brasileira de Alumínio
4	USIM5	Usinas Siderurgicas de Minas Gerais S.A.	9	FESA4	Cia de Ferro Ligas da Bahia S.A.
5	CSNA3	Companhia Siderurgica Nacional	10	EALT4	Electro Aco Altona S.A.

Source: *Research data.*

Table 4 presents the arithmetic mean of the accumulated abnormal returns (CARs), for each of the 26 trading sessions of the 10 stocks analyzed, with 11 and 15 trading sessions for the event and comparison windows, respectively. In the case of ARs, they are all statistically equal to zero, which is why their analysis was not considered. In the case of CARs, all results are negative. This means that, a priori, the disclosure of ESG practices presents a decrease in the value of the companies in the final sample. However, definitive confirmation of this result should only occur for CARs that are statistically significant – see Table 6.

Table 4
Average share CAR in the event and comparison windows

Trading	Window	CAR	Trading	Window	CAR
-5	Event	-0.0131743	8	Comparison	-0.0603490
-4	Event	-0.0178648	9	Comparison	-0.0554162
-3	Event	-0.0083942	10	Comparison	-0.0592447
-2	Event	-0.0002107	11	Comparison	-0.0633963
-1	Event	-0.0158874	12	Comparison	-0.0624228
0	Event	-0.0237936	13	Comparison	-0.0774495
1	Event	-0.0322009	14	Comparison	-0.0952574
2	Event	-0.0140196	15	Comparison	-0.0914386
3	Event	-0.0143896	16	Comparison	-0.0893571
4	Event	-0.0278185	17	Comparison	-0.0783243
5	Event	-0.0390818	18	Comparison	-0.0714285
6	Comparison	-0.0494610	19	Comparison	-0.0818727
7	Comparison	-0.0597461	20	Comparison	-0.0893884

Source: *Research data.*

In turn, Table 5 presents the results of the normality test of the CARs of the final sample. The hypothesis test applied considers in its null hypothesis that the CAR distribution is normal. The statistical significance level of the test is 5%. It appears that there are 4 companies that have a normal distribution – p-value > 5%, while another 6 do not have a normal distribution – p-value < 5%.

Table 5
Shapiro-Wilk normality test of CARs in event and comparison windows

#	Ticker	Company	*P-value*
1	VALE3	Vale S.A.	0.01561
2	GOAU4	Metalurgica Gerdau S.A.	**0.40640**
3	GGBR4	Gerdau S.A.	**0.68004**
4	USIM5	Usinas Siderurgicas de Minas Gerais S.A.	0.01197
5	CSNA3	Companhia Siderurgica Nacional	**0.06993**
6	CMIN3	CSN Mineracao S.A.	0.00195
7	BRAP3	Bradespar S.A.	**0.51058**
8	CBAV3	Companhia Brasileira de Aluminio	0.00138
9	FESA4	Cia de Ferro Ligas da Bahia S.A.	0.01190
10	EALT4	Electro Aco Altona S.A.	0.00744

Notes: Values in bold refer to companies whose CAR distribution is normal (p-value > 5%)
Source: *Research data.*

Finally, Table 6 presents the results of the CAR mean difference tests. For shares with a normal distribution, the t test is applied. For non-normal distributions, the non-parametric Wilcoxon signed test is applied. The hypothesis test performed considers in its null hypothesis that the observed return is equal to the expected return of the share, that is, the averages are equal.

The level of statistical significance of the tests is 5%. All companies have a CAR that is statistically different from zero (p-value < 5%). It is worth highlighting that, as mentioned in item 3.5 vi – Test procedures, the CAR is more suitable for analyzing results than the AR, since there are difficulties in determining the date on which the market effectively absorbs the event information in the study.

Table 6
Test of difference in means of CARs in the event and comparison windows

#	Ticker	Company	Test	*P-value*
1	VALE3	Vale S.A.	Wilcoxon	**0.0001**
2	GOAU4	Metalurgica Gerdau S.A.	T-test	**0.0000**
3	GGBR4	Gerdau S.A.	T-test	**0.0000**
4	USIM5	Usinas Siderurgicas de Minas Gerais S.A.	Wilcoxon	**0.0000**
5	CSNA3	Companhia Siderurgica Nacional	T-test	**0.0000**
6	CMIN3	CSN Mineracao S.A.	Wilcoxon	**0.0000**
7	BRAP3	Bradespar S.A.	T-test	**0.0000**
8	CBAV3	Companhia Brasileira de Alumínio	Wilcoxon	**0.0030**
9	FESA4	Cia de Ferro Ligas da Bahia S.A.	Wilcoxon	**0.0000**
10	EALT4	Electro Aco Altona S.A.	Wilcoxon	**0.0000**

Notes: Values in bold refer to companies whose average CAR is different from zero (p-value < 5%)
Source: *Research data.*

This set of results indicates that all 26 trading sessions – see Table 4 – of the 10 companies in the metal and mining sector in the final sample have a negative CAR. Furthermore, all of them are statistically different from zero – see Table 6 – confirming H1 of this study: The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares.

The results also corroborate the finance theories presented in Item 2 – Literature Review. Companies operating in environmentally sensitive industries – such as metal and mining – are more vulnerable to legitimacy issues (Garcia *et al.*, 2017). This is due to the characteristics of its production chain and commercial transactions.

These companies always seek to obtain a positive image, in an attempt to minimize the likelihood of adverse reactions from their stakeholders (Naeem *et al.*, 2022; García-Meca *et al.*, 2024). However, this information may have signaled to the market the identification of risks that were possibly unknown to investors, reducing the price of shares in the final sample.

In any case, the first mandatory disclosure of sustainable practices in Brazil – via publication item 1.9 of the RF (BSEC, 2021) – contributed to reducing informational asymmetry and possible conflicts of interest between managers and other stakeholders. This result corroborates that obtained by Wang *et al.* (2023) – see Table 1. According to the authors, the drop in the share price of the North American companies investigated may be related to the anticipation of higher compliance expenses. For them, the results indicate that the costs of adapting to the rules for disclosing sustainable practices outweighed the benefits arising from a greater level of transparency by companies.

Obtaining negative returns, at first, does not diminish the relevance of the legislation in Resolution no. 59/2021 of the BSEC. On the contrary, it is a milestone in the history of the capital market in Brazil, equating its practices - increasingly - with those of developed markets. The disclosure of sustainable practices and monitoring of companies' operational risks is a growing demand from global markets. Therefore, the recurrence of disclosure of this information should establish a new standard of supervision of corporate decisions in favor of the sustainability of economic activities, especially for environmentally sensitive companies.

5 Final Considerations

The relevance of the topic of sustainability in society is growing, having led to changes even in the capital market legislation. In Brazil, this change occurs via the approval of Resolution no. 59/2021 of the BSEC, which requires companies to present or justify the implementation of ESG and climate practices in their RF – from the year ending December 31, 2022. Empirical studies present conflicting results. However, the majority point to a positive impact on share prices, following the mandatory disclosure of non-financial reports on ESG.

Therefore, this study aims to analyze the impact of the mandatory disclosure of ESG information in Brazil on the price of shares in the local market. To this end, a sample of 10 Brazilian companies from the metal and mining industries – which are environmentally sensitive – is considered. This analysis occurs through an event study, whose data is obtained from Standard & Poor's Capital IQ database. In turn, Resolution no. 80/2022 of the BSEC establishes that the updated RF must be delivered within five months from the closing date of the fiscal year. Therefore, the event date analyzed is May 31, 2023.

In conclusion, the results confirm H1 of this study: The mandatory disclosure of sustainability practices by Brazilian companies impacts the return on their shares. All trading sessions have a negative CAR – see Table 4 – and are statistically different from zero – see Table 6. This result is supported by finance theories. Companies that operate in environmentally sensitive industries have a greater need for legitimization in society. Therefore, the dissemination of their sustainable practices, theoretically, should make them more accepted and improve their image in the community.

However, the negative accumulated abnormal returns signal the perception of operational risks that were possibly unknown and that began to be priced by the market. In any case, the first mandatory communication of sustainable practices in Brazil contributes to mitigating information asymmetry and possible conflicts of interest between managers and other company stakeholders.

Furthermore, this result is in accordance with part of those mentioned in Table 1. It is possible that the market understands that the short-term costs – related to the implementation of sustainability practices – still exceed the benefits that will lead to the appreciation of companies in the long term. However, the progressive integration of global markets predicts a standardization in the register and the dissemination of sustainable practices – which should reach the Brazilian market in the medium term.

This research differs from others by finding that the mandatory disclosure of sustainability practices – by Brazilian companies – negatively impacts the return on their shares, after the implementation of Resolution no. 59/2021. It contributes to academia with the empirical analysis of the market efficiency hypothesis. Furthermore, its results can help companies, investors and the capital market to better understand the initial effects of mandatory publication of sustainable practices. Finally, this study also contributes to the stimulation or adaptation of policies defined by regulatory bodies on sustainability topics.

Among the limitations of this research is the small sample size of companies – notably from the metal and mining sector. Thus, future investigations can broaden the range of examined industries, as well as do a comparison between markets with different periods of mandatory disclosure implementation about sustainability information.

References

Akerlof, G.A. (1970). The market for “lemons”: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics*, *84*(3), 488-500. https://doi.org/10.2307/1879431

Alberti-Alhtaybat, L., Hutaibat, K., & Al-Htaybat, K. (2012). Mapping corporate disclosure theories. *Journal of Financial Reporting and Accounting, 10*(1), 73-94. https://doi.org/10.1108/19852511211237453

Alsayegh, M.F., Rahman, R.A, & Homayoun, S. (2020). Corporate economic, environmental, and social sustainability performance transformation through ESG disclosure. *Sustainability*, *12*(9), 3910. https://doi.org/10.3390/su12093910

Bergh, D.D., Ketchen Jr, D.J., Orlandi, I., Heugens, P.P., & Boyd, B.K. (2019). Information asymmetry in management research: Past accomplishments and future opportunities. *Journal of Management*, *45*(1), 122-158. https://doi.org/10.1177/0149206318798026

Bolognesi, E., & Burchi, A. (2023). The impact of the ESG disclosure on sell-side analysts' target prices: The new era post Paris agreements. *Research in International Business and Finance*, *64*, 101827. https://doi.org/10.1016/j.ribaf.2022.101827

Brazilian Securities and Exchange Commission (BSEC) (2009a). Instruction No. 480. Annex 24. *Contents of the reference form*. https://www.gov.br/SEC

Brazilian Securities and Exchange Commission (BSEC) (2009b). Instruction no. 481. *Provides for information and public requests for powers of attorney to exercise the right to vote at shareholder meetings*. https://www.gov.br/SEC

Brazilian Securities and Exchange Commission (BSEC) (2021). Resolution no. 59. Annex C. Item 1.9. *Reference form content*. https://www.gov.br/SEC

Brazilian Securities and Exchange Commission (BSEC) (2022). Resolution no. 80. *Subsection II – Reference form*. https://www.gov.br/SEC

Campbell, J.Y., Lo W.A., & Mackinlay C.A. (1997). *The econometrics of financial markets.* Princeton University Press, Princeton, New Jersey.

Capital IQ (CIQ) (2023). Database. *Company Screening Report.* Standard & Poor´s

Chamber of Deputies (2020). *Government project makes mineral exploration possible on indigenous lands*. https://www.camara.leg.br/noticias/634893-projeto-do-governo-viabiliza-exploracao-de-minerios-em-terras-indigenas/

Christensen, H.B., Hail, L., & Leuz, C. (2021). Mandatory CSR and sustainability reporting: Economic analysis and literature review. *Review of Accounting Studies*, *26*(3), 1176–1248. https://doi.org/10.1007/s11142-021-09609-5

Chen, L., Khurram, M.U., Gao, Y., Abedin, M.Z., & Lucey, B. (2023). ESG disclosure and technological innovation capability of the Chinese listed Companies. *Research in International Business and Finance, 65*, 101974. https://doi.org/10.1016/j.ribaf.2023.101974

Chen, Z., & Xie, G. (2022). ESG disclosure and financial performance: Moderating role of ESG investors. *International Review of Financial Analysis*, *83*, 102291. https://doi.org/10.1016/j.irfa.2022.102291

Chung, R., Bayne, L., & Birt, J.L. (2023). Determinants of ESG disclosure among listed firms under voluntary and mandatory ESG disclosure regimes in Hong Kong. *Journal of Applied Accounting Research*. Ahead-of-print. https://doi.org/10.1108/JAAR-07-2022-0179

Commerce Gazette (2021). *The importance of mining in the Brazilian economy*. https://diariodocomercio.com.br/opiniao/a-importancia-da-mineracao-na-economia-brasileira/#gref

Cosma, S., Soana, M. G., & Venturelli, A. (2018). Does the market reward integrated report quality? *African Journal of Business Management*, *12*(4), 78-91. https://doi.org/10.5897/AJBM2017.8469

Do, T.K., & Vo, X.V. (2023). Is mandatory sustainability disclosure associated with default risk? Evidence from emerging markets. *Finance Research Letters*. In press, 103818. https://doi.org/10.1016/j.frl.2023.103818

Fama, E.F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, *25*(2), 383-417. https://doi.org/10.1111/j.1540-6261.1970.tb00518.x

Fama, E.F. (1991) Efficient capital markets: II. *Journal of Finance, 46*(5), 1575-1617. https://doi.org/10.1111/j.1540-6261.1991.tb04636.x

Fama, E.F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics, 49*(3), 283-306. https://doi.org/10.1016/S0304-405X(98)00026-9

Favero, L.P., & Belfiori, P. (2019). *Data science for business and decision making*. Academic Press

Garcia, A. S., Mendes-Da-Silva, W., & Orsato, R. J. (2017). Sensitive industries produce better ESG performance: Evidence from emerging markets. *Journal of Cleaner Production, 150*, 135-147.

García-Meca, E., Ruiz-Barbadillo, E., & Martínez-Ferrero, J. (2024). High-quality assurance, ESG legitimacy threats and board effectiveness. *British Accounting Review, In Press*, 101385. https://doi.org/10.1016/j.bar.2024.101385

Global Reporting Initiative (GRI) (2023). *The global standards for sustainability impacts*. https://www.globalreporting.org/standards/

Grewal, J., Riedl, E.J., & Serafeim, G. (2019). Market reaction to mandatory nonfinancial disclosure. *Management Science, 65*(7), 3061-3084. https://doi.org/10.1287/mnsc.2018.3099

Hu, J., Zou, Q., & Yin, Q. (2023). Research on the effect of ESG performance on stock price synchronicity: Empirical evidence from China's capital markets. *Finance Research Letters*, 103847. https://doi.org/10.1016/j.frl.2023.103847

Jensen, M.C., & Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Lu, H (2016). The 'legalisation' of corporate social responsibility: Hong Kong experience on ESG reporting. *Asia Pacific Law Review, 24*(2), 123-148. http://dx.doi.org/10.1080/10192557.2016.1245385

MacKinlay, A.C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, *35*(1), 13-39. https://www.jstor.org/stable/2729691

Mio, C., Fasan, M., Marcon, C., & Panfilo, S. (2020). The predictive ability of legitimacy and agency theory after the implementation of the EU directive on non-financial information. *Corporate Social Responsibility and Environmental Management*, *27*(6), 2465-2476. https://doi.org/10.1002/csr.1968

Naeem, N., Cankaya, S., & Bildik, R. (2022). Does ESG performance affect the financial performance of environmentally sensitive industries? A comparison between emerging and developed markets. *Borsa Istanbul Review, 22*(2), S128-S140. https://doi.org/10.1016/j.bir.2022.11.014

Olsen, B. C., Awuah-Offei, K., & Bumblauskas, D. (2021). Setting materiality thresholds for ESG disclosures: A case study of US mine safety disclosures. *Resources Policy*, *70*, 101914. https://doi.org/10.1016/j.resourpol.2020.101914

Pulino, S.C., Ciaburri, M., Magnanelli, B. S., & Nasta, L. (2022). Does ESG disclosure influence firm performance? *Sustainability*, *14*(13), 7595. https://doi.org/10.3390/su14137595

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20*(3), 571-610. https://doi.org/10.5465/amr.1995.9508080331

Sustainability Accounting Standards Board (SASB) (2023). *SASB Standards*. https://sasb.org/standards/

Tahir, S., Ehsan, S., Hassan, M. K., & Zaman, Q. U. (2023). Does corporate governance compliance condition information asymmetries? Moderating role of voluntary disclosures. *Journal of Asian Business and Economic Studies*, *30*(1), 2-25. https://doi.org/10.1108/JABES-07-2021-0085

Veltri, S., De Luca, F., & Phan, H. T. P. (2020). Do investors value companies' mandatory nonfinancial risk disclosure? An empirical analysis of the Italian context after the EU Directive. *Business Strategy and the Environment*, *29*(6), 2226-2237. https://doi.org/10.1002/bse.2497

Wang, J., Hu, X., & Zhong, A. (2023). Stock market reaction to mandatory ESG disclosure. *Finance Research Letters*, *53*, 103402. https://doi.org/10.1016/j.frl.2022.103402

Wen, H., Ho, K. C., Gao, J., & Yu, L. (2022). The fundamental effects of ESG disclosure quality in boosting the growth of ESG investing. *Journal of International Financial Markets, Institutions and Money*, *81*, 101655. https://doi.org/10.1016/j.intfin.2022.101655