

THE COVID-19 PANDEMIC EFFECTS ON THE FINANCIAL PERFORMANCE OF BRAZILIAN LISTED COMPANIES

OS EFEITOS DA PANDEMIA DE COVID-19 NO DESEMPENHO ECONÔMICO-FINANCEIRO DAS COMPANHIAS ABERTAS BRASILEIRAS

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ABSTRACT

Purpose – The study aimed at analyzing the effects of the COVID-19 pandemic on the financial performance of Brazilian public companies listed on *Brasil, Bolsa, Balcão* (B3) in 2020.

Design/methodology/approach – It is a quantitative and descriptive research. A final sample of the study consisted of 158 companies that simultaneously provided the quarterly data of interest (economic-financial and operational) on both the B3 website and the Economática® Platform, from 2019 to 2020. In order to analyze data, we employ the following techniques: content analysis, descriptive statistics, Kolmogorov-Smirnov test, Kendall correlation coefficient, Kruskal-Wallis test, Wilcoxon test and multiple regression.

Findings – The results indicated the expected effects on the companies' financial performance in the first two quarters of 2020: (1) reduction in market value and profitability; and (2) increase in activity cycles and indebtedness. In the following quarters, there was a reversal of these effects, with different proportions for companies in different sectors.

Originality/value – It contributes to the literature on corporate finance in different aspects: (a) it presents a broad analysis of the effects of the COVID-19 pandemic on the different economic and financial dimensions of companies from different sectors; (b) discusses not only the effects of the pandemic, but also the reactions of companies and the economic and financial implications of these reactions; (c) analyzes external and internal information to companies to support conclusions; and (d) as it covers all quarters of 2020, it makes it possible to analyze the evolution of the impacts of the pandemic over the period.

Keywords - COVID-19 pandemic. Publicly Traded Companies. Economic-Financial Performance.

RESUMO

Objetivo – O objetivo da pesquisa apresentada neste artigo foi analisar os efeitos da pandemia de Covid-19 sobre o desempenho econômico-financeiro das companhias abertas brasileiras listadas na Brasil, Bolsa, Balcão (B3) em 2020.

Design / metodologia / abordagem – Trata-se de uma pesquisa quantitativa e descritiva. A amostra consistiu em companhias abertas brasileiras, sendo que seus dados trimestrais de 2019 e 2020 foram coletados da Plataforma Econômica® e da B3. Para a análise, foram usadas as seguintes técnicas: análise de conteúdo, estatística descritiva, teste de Kolmogorov-Smirnov, coeficiente de correlação de Kendall, teste de Kruskal-Wallis, teste de Wilcoxon e regressão múltipla.

Resultados – A análise dos dados indicou os efeitos esperados no desempenho econômico-financeiro das companhias nos dois primeiros trimestres de 2020: (1) redução do valor de mercado e da rentabilidade; e (2) aumento dos ciclos de atividades e do endividamento. Nos trimestres seguintes, verificou-se uma reversão desses efeitos, mas que foram sentidos de diferentes formas pelas empresas dos diversos setores.

Originalidade / valor – O estudo contribui para a literatura sobre finanças corporativas em diferentes aspectos: (a) apresenta uma ampla análise dos efeitos da pandemia de Covid-19 sobre as diferentes dimensões econômico-financeiras das companhias; (b) discute não apenas os efeitos da pandemia, mas também as reações das empresas e implicações econômico-financeiras dessas reações; (c) analisa informações externas e internas às empresas para subsidiar as conclusões; e (d) enfocam-se todos os trimestres do ano de 2020, analisando a evolução da pandemia ao longo do período.

Palavras-chave - Pandemia da COVID-19. Companhias abertas. Desempenho Econômico-Financeiro.

1 INTRODUCTION

COVID-19 spread rapidly both within and across national borders, reaching countries globally and synchronously (Baqaee & Farhi, 2020). Studies claim that the crisis caused by the COVID-19 pandemic is completely different from previous crises in terms of its cause, scope and severity (Didier, Huneus, Larrain, & Schmukler, 2020; Horn, Reinhart, & Trebesch, 2020). This is a rare and unprecedented event in recent history (Ashraf, 2020). Government measures of social isolation were adopted in order to avoid a collapse of the countries' health systems.

As a result, economies experienced a supply and demand shock that sparked a global financial crisis (Eichenbaum, Rebelo, & Trabandt, 2020; Heyden, & Heyden, 2020). As a result, economies experienced a supply and demand shock that sparked a global financial crisis, that priced in the potential effect of the pandemic, in which the main stock market indices fell sharply in March 2020, losing almost a third of its value in a few weeks (Baker, Bloom, Davis, & Terry, 2020). *Brasil, Bolsa, Balcão* (B3) followed this fall, and its main index, the Ibovespa, lost 31.5% in the same period (B3, 2020).

Given the expectations of contraction of the national gross domestic product (GDP) in 2020 (of up to 9.5%), the Brazilian government has introduced measures to minimize the negative effects of the pandemic on companies, emphasizing the maintenance of jobs and consumption, such as: the cost of payroll for small and medium-sized companies, opening of reduced interest financing lines, reduction of contributions to the S System, etc. According to the Ministry of Economy (2021), the S System is a definition for the set of organizations of corporate entities focused on professional training, social assistance, consulting, research and technical assistance, which in addition to having their name started with the letter S, they have common roots and similar organizational characteristics. Nine entities are part of the S system: Senai; Sesc; Sesi; Senac; Senar; SESCOOP; and Sest (Ministry of Economy, 2021).

It should be noted that the effects of the COVID-19 pandemic on the different economic and financial dimensions of companies, as well as the impacts of the coping measures adopted by them and by the governments, can be verified not only through market prices, but also on information contained in its financial statements. This information reflects internal and external factors and



its consideration in the economic-financial analyzes is necessary, especially in times of crisis (Andekina & Rakhmetova, 2013; Tron, 2021).

Given the above considerations, the study presented in this article aimed to answer the following research problem: How did the COVID-19 pandemic affect the economic and financial performance of Brazilian public companies listed on B3 throughout 2020? Thus, the general objective of the study was to analyze the effects of the COVID-19 pandemic on the economic-financial performance of Brazilian publicly-held companies listed on B3 throughout 2020. In particular, it aimed at: (a) measuring the effects of the COVID-19 pandemic on the different economic and financial dimensions of Brazilian publicly traded companies throughout 2020; (b) verifying the reactions of the aforementioned companies to face the conditions imposed by the COVID-19 pandemic; and (c) identifying the variables that explain the raising of funds by companies in this period.

The study developed is justified from different perspectives. First, a broad analysis of a health crisis with strong economic and financial effects was carried out, which can be considered unprecedented in recent history. In addition, the research focused on the entire year of 2020, considering different periods of evolution of the pandemic and its effects on the operations of different sectors. In addition, the different reactions of companies to such effects were verified. Finally, we analyzed information from outside the company (from the capital market) as internal information to these organizations, considering financial statements (of mandatory publication) as well as non-mandatory information reported to the market.

2 THEORETICAL FRAMEWORK

2.1 Effects of COVID-19 on the capital market

According to Eichenbaum *et al.* (2020), during the COVID-19 pandemic, economies experienced a supply and demand shock: on the one hand, there were lockdowns and employees who were banned from working, causing a reduction in production and an immediate impact on supply chains, paralyzing investments; on the other hand, families and companies that have reduced their demands for goods and services. Such measures directly affected economic activity, usually negatively influencing the operations of companies, and this fact was visible through the stock markets (Baker *et al.*, 2020). Specifically, from February 24 to March 23, 2020, several indices showed significant reductions, of which the following can be cited: Dow Jones Industrials (-33.5%), Standard & Poor's 500 Index (-30.6%), and the Nasdaq (-25.6%) (Huang, Yang, & Zhu, 2021).

The Brazilian capital market followed this drastic drop, and the main B3 index, the Ibovespa, lost 31.5% in the same month (B3, 2020). Pessimism was strong in March and, as the market moves based on future expectations, the real economy was consequently affected (Baig, Khaleeq, Ali, & Syeda, 2020; Zhang, Hu, & Ji, 2020). Brazilian GDP growth forecast of 2.3% in January, according to the perspective of market agents, they decreased to -6.5% in July (Focus, 2020). In December, markets reacted, given the expectation of vaccination campaigns and a counter-cyclical monetary policy, with interest rate cuts and intervention in foreign exchange markets (Hofmann, Shim, & Shin, 2020). The Ibovespa reached 119,017 points, a monthly increase of 9.30% and an accumulated annual increase of 2.92%. GDP grew 3.2% in the fourth quarter, but remained negative in 2020 (annual decline of 4.0%).

By analyzing these variations in the market from the perspective of the efficient markets hypothesis (EMH) highlighted by Fama (1970), we can explain the pricing of information in the capital market during the pandemic. According to this hypothesis, the price of an asset reflects the information available about the company, which would make it impossible for investors to obtain any return higher than the risk-adjusted return of a given asset (Malkiel, 2003). According to Fama (1970), the ideal is a market in which prices "fully reflect" the available information, thus being classified as "efficient".



In this context, it can be said that market efficiency in its semi-strong form is represented by the effect of information related to the pandemic on the stock price of companies (Ross, Westerfield, Jaffe, & Lamb, 2015). In view of this, the stock price would suffer a reflection of public information about the pandemic. Therefore, the expectation is that companies will have different effects on the value of their securities, presenting different effects, as they are not equitably affected by the pandemic and the restrictive measures arising from this (Baker *et al.*, 2020). Thus, the pricing of securities would have an individual effect on each company consistent with the EMH. That said, we developed Hypothesis 1a of the study:

H1a – There is a positive and significant relationship between the companies that lost the most market value in 2020 and those most exposed to the negative effects of the pandemic.

The scenario of uncertainties brought by the pandemic, raised the risk of operations due to the difficulty of forecasting by managers. In this case, according to Knight (2012), adequate management is necessary to mitigate the economic and financial impacts. Thus, considering that the impacts of the pandemic are different on companies due to their characteristics and the sector in which they operate (Abu Hatab, Lagerkvist, & Esmat, 2021; Han, & Qian, 2020; Shen, Fu, Pan, Yu, & Chen, 2020), we propose Hypothesis 1b:

H1b – There is a positive and significant relationship between the companies that most reported negative effects of the pandemic in 2020 and those that most reacted to such effects.

In addition, many companies tend to present a greater flow of information to the market, given the uncertainties generated by the pandemic, and this could reduce information asymmetry between companies and their stakeholders (Mejia, Orozco, Castaño, & Castro, 2020). We expect that companies with the highest level of corporate governance, in this case, the *Novo Mercado* on B3, seek to present a higher level of information more effectively and frequently, giving rise to Hypothesis 1c:

H1c – There is a positive and significant relationship between companies with the highest levels of corporate governance at B3 and those that disclosed the most information about the effects and reactions to the pandemic.

2.2 Effects of COVID-19 on economic and financial information

Although the effects of COVID-19 on the economic-financial performance of companies can be estimated through changes in their share prices, these effects can also be measured from the financial statements (Palepu, Healy, Wright, Bradbury, & Coulton, 2020; Seifzadeh, Salehi, & Abedini, 2020). According to Robinson, Henry and Broihahn (2020), the role of financial statements is to provide information about the performance of companies and their financial position that is useful to a wide variety of users in making economic decisions.

It is noteworthy that the economic and financial indicators, calculated from the aforementioned statements, form the basis for most of the economic-financial analysis techniques (Gae, 2020; Trejo Pech, Noguera, & White, 2015). It is observed that such indicators allow a synthesis of the information contained in the statements, providing a wide range of users with useful information about the company, which can assist in making economic decisions (Robinson *et al.*, 2020).

In times of crisis, such as the COVID-19 pandemic, this type of analysis by companies is especially relevant (Tron, 2021). Specific studies on COVID-19 have shown that bond pricing was influenced in different ways by different indicators (Heyden & Heyden, 2020). They also pointed out that the best performances in the market were obtained by companies with higher levels of liquidity and tangibility. Regarding profitability, the results were inconclusive (Heyden & Heyden, 2020).

The literature points out the main groups of economic-financial indicators traditionally used in business analysis: (i) liquidity – aim to provide information about the organization's ability to



pay its debts, contrasting their realizable rights and their liabilities (Burkhanov, 2020; Hu, Li, & Liu, 2020); (ii) cycles (activities) – intended to assess the efficiency with which the organization’s assets are being managed (Choudhry, Hassan, & Shabi, 2020; Ross *et al.*, 2015); (iii) indebtedness (or capital structure) – explain the percentage of assets financed with third-party and own capital, pointing out if the company has dependence on third-party resources (Padoveze & Benedicto, 2014; Forte, Barros, & Nakamura, 2013); and (iv) profitability/profitability - indicate the return achieved by the organization through its activities (Nguyen & Nguyen, 2020; Pohlmann & Iudícibus, 2010). We point out that the use of different groups of economic-financial indicators allows a broad analysis involving different dimensions of performance, as well as, a simultaneous analysis of endogenous and exogenous factors (Youssef, 2021; Andekina & Rakhmetova, 2013).

These indicators can be classified in different ways. In this study, we used the classification presented in Plataforma Económica®, since it was used as a basis for collecting part of the analyzed data. Table 1 shows a summary of the indicators and respective group classifications, consistent with the respective platform. All variables present in said table are treated as economic-financial indicators for the scope of this study.

Table 1
Economic-financial indicators and respective groups

Group	Indicators (Abbreviations)
Indebtedness (capital structure)	Net total debt (DebTtNet); Gross total debt (DebTtGross); Gross debt over assets (DebGrAsset); Gross debt over equity (DebGrEquit); Net debt over equity (NDOE); EBITFinB; EBITFinL; EBITNetDebt; Gross debt over EBITDA (DebtGrEbitda); Net debt over EBITDA (DebtNetEbitda); Short-term debt to total debt (DebSTDebTotal); Liabilities on Assets (LiabAs); Liabilities on shareholders’ equity (LiabEQ); Fixed assets over equity (FAXEQ); and Investment on equity (InvEQ).
Liquidity	General liquidity (GerLiq); Current liquidity (CurLiq); Dry liquidity (DryLiq); Working capital (WorkCap); and Capital employed (CapEmpl).
Cycles	Average storage period (ASper); Average payment term to suppliers (APsupp); Average Receipt Time for Customers (ARTcust); Financial cycle (FinCic); and Operating cycle (OpeCic).
Profitability	EBITDA; Asset turnover (AsTurn); Net worth turnover (EQTurn); Gross margin (GroMar); EBIT Margin (EBITMrg); Net margin (NetMargin); EBITDA Margin (EbitdaMrg); Asset profitability (AsProfit); Invested capital (InvestCap); Financial leverage (FinLev); Operating leverage (OpeLev); Capex; Free cash flow (FCF); and Revenues (Rev).

Note. Source: Económica® Platform (2021).

Ashraf (2020) showed that negative market reaction was strong during the early stages of the COVID-19 pandemic, impacting companies mainly through the drastic reduction of economic activity. Therefore, there is an expectation of several effects on their operational and financial cycles. Ressalta-se que o ASper, o APsupp e o ARTcust, are considered the main indicators of cycles (Kasahun, 2020; Sarwar, 2020). Considering the above, a drastic reduction in demand would lead to an increase in the level of inventories if production were not immediately stopped, that is, an increase in ASper. Therefore, the increase in this indicator would imply a decrease in inventory turns and operating cash flow, directly impacting APsupp. On the other hand, customers who would be experiencing a similar situation caused by the pandemic, could find it difficult to honor payments on the dates pre-agreed with the companies. Consequently, there would be an increase in ARTcust and the operational cycle. The financial cycle would result from the effect of the individual weight of the



aforementioned indicators. Based on these assumptions, we developed Hypothesis 2a:

H2a – The period of evolution of the COVID-19 pandemic is associated with a significant increase in indicators related to business cycles.

Since the beginning of social distance measures and their consequences, there was a decrease in the flow of people in circulation and many businesses were forced to temporarily close their doors. In view of this situation, a reduction in sales and, therefore, in the companies' revenues would be expected. However, some structural costs such as salaries and charges are not easily reduced, and tend to behave asymmetrically (sticky costs) (Golden, Mashruwalab, & Pevzner, 2020; Cannon, 2014; Shust & Weiss, 2014). Therefore, the fact that the significant reduction in revenues is not symmetrically accompanied by the reduction in costs would imply a reduction in the profitability of companies. Based on these assumptions, we develop Hypothesis 2b:

H2b – The period of evolution of the COVID-19 pandemic is associated with a significant reduction in the profitability of companies.

The reduction of business profitability may imply difficulties in honoring its commitments in general, such as payments of salaries, suppliers, taxes, among others. As a consequence of this situation, companies can resort to loans and financing (Putri & Rahyuda, 2020; D'amato, 2020; Padoveze & Benedicto, 2014). Thus, there is an expectation of an increase in corporate indebtedness during the period of evolution of the pandemic. Based on these assumptions, we developed Hypothesis 2c:

H2c – The period of evolution of the COVID-19 pandemic is associated with a significant increase in corporate indebtedness.

In this context, with the increase in indebtedness and the operating cycle, the company's ability to meet all its obligations is in doubt (Ellis, 2021; Mirza, Rahat, Naqvi, & Rizvi, 2020; Shoukry, 2020). Thus, a change in liquidity can be verified. Based on these assumptions, we developed the 2d Hypothesis:

H2d – The period of evolution of the COVID-19 pandemic is associated with a significant change in the liquidity of companies.

Finally, considering that the COVID-19 pandemic brought an expectation of an increase in corporate indebtedness (as proposed in H2c), it is important to address the variables that would justify a greater or lesser degree of fundraising from third parties in this period, factor that can be influenced by liquidity (H2d). In the literature traditionally used on capital structure determinants, the most eminent variables to explain this phenomenon are: company size (SIZ), growth (GROW), profitability (PROF), tangibility (TANG), singularity (SING), non-debt tax shield (NDTS) and risk (RISK) (Fama, 2021; Forte *et al.*, 2013; Pohlmann & Iudicibus, 2010; Frank & Goyal, 2009; Pereira, Venturini, Ceretta, & Dutra, 2009; Perobelli & Fama, 2002; Titman & Wessels, 1988; Rajan & Zingales, 1995;). Based on these variables, we propose seven hypotheses that can explain the variation in corporate indebtedness from the fourth quarter of 2019 to the fourth quarter of 2020:

H3a – the larger size of the company is significantly and positively related to its greater acquisition of resources in the period of evolution of the pandemic.

H3b – the company's growth potential is significantly related to its obtaining of resources in the period of evolution of the pandemic.

H3c – the company's profitability is significantly related to its obtaining of resources in the period of evolution of the pandemic.

H3d – the company's greater tangibility is significantly and positively related to its greater collection of resources in the period of evolution of the pandemic.

H3e – the company's greatest uniqueness is significantly and negatively related to its greater collection of resources in the period of evolution of the pandemic.



H3f – the company’s higher level of non-debt tax shield is significantly and negatively related to its increased fundraising in the first quarter of 2020. According to Titman and Wessels (1988), the fiscal shield is formed by accounts that result in a tax benefit from the indebtedness, such as tax deductions related to depreciation and amortization, and investment tax credits.

H3g – the higher level of company risk is significantly and negatively related to its greater acquisition of resources in the period of evolution of the pandemic.

It should be noted that, in the proposed hypotheses, an expected signal was not presented for the variables GROW and PROF, because its expected effects vary according to the theory used to address the phenomenon: trade-off theory or pecking order theory (Frank, & Goyal, 2008). The following section describes the methodological procedures adopted for the development of the research.

3 METHODOLOGY

The study population referred to Brazilian public companies active between 2019 and 2020. For the sample, those with positive income and net worth throughout the entire study period were selected, in order to avoid collecting data from companies that were not in operation or that already had economic and financial difficulties prior to the pandemic. Another restriction in the sample referred to the need for companies to submit their explanatory notes for the year 2020 on a quarterly basis.

Data were collected from two sources: Economática® Platform and B3. In the case of the latter source, data were collected from the explanatory notes of the companies disclosed quarterly. These documents were downloaded directly from the B3 website during the quarterly information disclosure period and analyzed through content analysis (Bardin, 2016). In each document the following terms were searched: “COVID”, “Coronavirus”, “Sars-Cov” and “Pandemic”. When we found the terms, we analyzed the contexts of their presentation and, if relevant to the research objectives, the information was categorized and classified into one of the two thematic axes of interest: “effects of the pandemic” or “company reactions”. Data were also collected on the level of corporate governance of the companies.

With regard to the data collected on the Economática® Platform, these referred to economic-financial indicators of the companies referring to the following quarters: third quarter 2019 (3Q19), fourth quarter 2019 (4Q19), first quarter 2020(1Q20), second quarter 2020 (2Q20), third quarter 2020 (3Q20) and fourth quarter 2020 (4Q20). These last four quarters refer to the period of evolution of the COVID-19 pandemic in the country. The two quarters of 2019 were selected to serve as benchmarks, considering immediately previous periods and that companies were not exposed to the effects of the pandemic. We collected data from the economic-financial indicators mentioned in Table 1, as well as data from the companies’ sector (following the classification of the platform itself). The final sample of the study consisted of 158 companies, which simultaneously presented the data of interest (economic-financial and operational) for the different quarters both on the B3 website and on the Economática® Platform. Table 2 presents this final sample by number of companies and by sector.



Table 2

Final research sample

Sector	Frequency	
	Absolute	Relative (%)
Agro and Fisheries	2	1.27
Food and Beverages	5	3.16
Trade	16	10.13
Construction	12	7.59
Electricity	26	16.46
Finance and Insurance	4	2.53
Industrial Machines	2	1.27
Mining	1	0.63
Non-Metallic Minerals	1	0.63
Others	43	27.22
Paper and Cellulose	3	1.90
Oil and Gas	6	3.80
Chemistry	2	1.27
Steel and Metallurgy	8	5.06
Software and Data	5	3.16
Telecommunications	2	1.27
Textile	6	3.80
Transport Service vehicles and parts	8	5.06
	6	3.80
Total	158	100.00

Both the data obtained through the explanatory notes and those from the Economática® Platform were treated using Microsoft Excel 365. After treatment, the data were analyzed using different statistical techniques, which are: descriptive statistics, Kolmogorov-Smirnov test, Kendall correlation coefficient (τ), Kruskal-Wallis test (H), Wilcoxon test and multiple regression (Maroco, 2010). We emphasize the option for several non-parametric tests, because the Kolmogorov-Smirnov test indicates that all variables did not present a normal distribution.

Descriptive statistics were used to summarize the main research data, especially in the form of tables. In turn, Kendall's correlation coefficient was used to analyze statistically significant associations between data referring to the capital market and those on the effects and reactions of the analyzed companies (hipótesis H1a and H1b). The Kruskal-Wallis test was used to analyze statistically significant differences between the company's level of corporate governance and the level of disclosure of the effects of the pandemic on its operations (hypothesis H1c). This technique was also used to verify statistically significant associations between some company reactions and economic-financial indicators during the pandemic.

The Wilcoxon test was used to compare whether there were significant variations in the different economic-financial indicators of the companies studied over the quarters (from 3Q19 to 4Q20) (hypotheses H2a, H2b, H2c and H2d). Finally, we used multiple regression to identify the determinant variables of third-party fundraising (onerous) during the pandemic period (quarters of 2020) (hypotheses H3a, H3b, H3c, H3d, H3e, H3f and H3g).

Regarding the latter technique, the natural logarithm of the variation in the companies' gross debt between 4Q19 and 4Q20 was defined as the dependent variable (VEND). The explanatory variables were those based on the literature highlighted in subsection 2.2 and presented in Table 3. It should be noted that all variables were calculated based on data from 4Q19, that is, situation prior to the pandemic. In turn, Equation 1 presents the estimated model, in which ϵ is equivalent to the error term.



Table 3

Traditional variables that determine indebtedness

Variable	Abbreviation	Calculation	Hip.
Profitability	PROF	EBIT ÷ Revenue	H3a
Growth	GROW	Market value ÷ Book value	H3b
Size	SIZ	$\ln(\text{Asset})$	H3c
Tangibility	TANG	(IVE + FIXA) ÷ Asset	H3d
Singularity	SING	INT ÷ Asset	H3e
Non-debt tax shield	NDTS	(DEP + AMORT) ÷ Asset	H3f
Risk	RISK	Share volatility (last 12 months)	H3g

Note. EBIT – Earnings before interest and taxes; IVE – Inventories; FIXA – Fixed assets; DEP – Depreciation; AMORT – Amortization.

$$VEND = \beta_0 + \beta_1 \times PROF + \beta_2 \times GROW + \beta_3 \times SIZ + \beta_4 \times TANG + \beta_5 \times SING + \beta_6 \times NDTS + \beta_7 \times RISK + \varepsilon \quad (1)$$

For an analysis of the model as a whole, in addition to the R2 and the F Test, we used the Durbin-Watson, Breusch-Pagan and Ramsey RESET tests to analyze possible problems of autocorrelation, heteroscedasticity and specification, respectively (Gujarati & Porter, 2011; Fávero, 2015). Also, potential multicollinearity problems were evaluated through the variance inflation factor (VIF). We operationalized all non-parametric tests and regression through R version 4.0.5. Figure 1 presents the study flowchart.



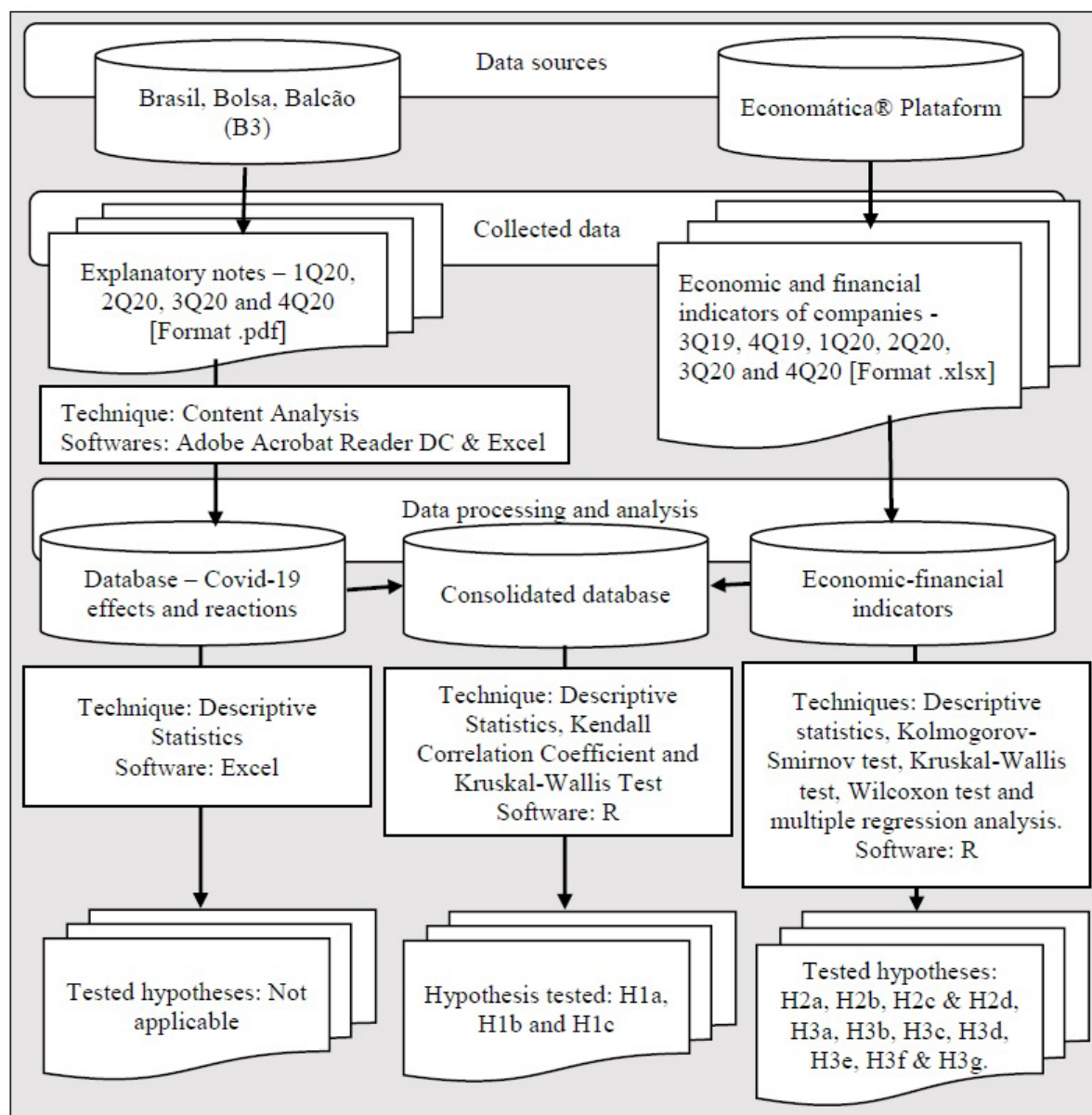


Figure 1. Methodological procedures
Note. Source: Authors' own elaboration.

4 RESULTS

4.1 The COVID-19 pandemic and market value of companies: effects and reactions

Table 4 presents the quarterly gains and losses of the market value of companies by sector. In general, it appears that there was a strong drop in 1Q20 (more than BRL 1 trillion), followed by a recovery in the three subsequent quarters (especially 2Q20 and 4Q20), totaling an increase of BRL 500 billion in the companies' market value between the end of 2019 and 2020. In this case, it is important to highlight two aspects. First, although the sharp drop in 1Q20 was widespread, affecting all sectors, in general, not all companies experienced a drop in their market value. We observed that 22 companies in the sample (from different sectors) had an increase in their market value in that quarter. Furthermore, despite the general recovery and an increase in the global market value of

companies between 4Q19 and 4Q20, only three sectors were responsible for generating more than 80% of this amount (BRL 418 million): Trade, Mining and Others. On the other hand, many sectors were unable to recover from losses in 1Q20 throughout the year (some still showed losses in market value in 3Q20), namely: Food and Beverages, Oil and Gas, Telecommunications, Textiles, Transport and Services, Vehicles and parts.

Table 4

Quarterly gains and losses on the market value of companies by sector*

Sector	1Q20	2Q20	3Q20	4Q20
Agro and Fisheries	-386,890.96	386,708.19	398,933.79	559,568.74
Food and Beverages	-139,946,120.57	45,857,377.72	-31,090,277.62	58,833,963.04
Trade	-88,262,775.35	159,588,230.17	45,269,943.10	18,282,363.53
Construction	-24,982,137.07	17,931,150.49	-2,982,353.26	8,048,911.06
Electricity	-90,483,092.46	51,391,167.01	-11,590,434.84	66,303,173.41
Finance and Insurance	-31,038,851.07	46,647,522.80	-5,103,777.25	14,667,089.55
Industrial Machines	-2,884,189.94	36,060,122.73	31,599,106.30	21,436,884.56
Mining	-51,622,730.60	65,149,869.85	16,364,416.13	145,381,678.08
Non-Metallic Minerals	-497,664.38	292,521.80	170,997.77	243,127.82
Others	-178,217,361.35	84,985,282.72	-84,844.68	201,801,540.85
Paper and Cellulose	-8,338,454.14	6,789,055.29	16,051,334.45	20,184,548.79
Oil and Gas	-260,963,269.07	131,729,292.37	-35,143,674.14	132,241,151.30
Chemistry	-2,265,911.71	380,803.37	283,708.87	2,800,520.89
Steel and Metallurgy	-36,907,456.08	21,019,817.42	20,524,707.81	35,690,934.38
Software and Data	-5,208,420.70	9,158,661.93	6,148,297.75	4,176,521.42
Telecommunications	-8,954,645.86	2,873,215.32	-10,430,072.54	4,232,221.61
Textile	-24,446,564.77	8,087,505.82	5,744,345.05	5,681,553.71
Transport Service	-43,040,238.31	26,878,497.38	4,329,953.38	8,019,248.79
vehicles and parts	-17,700,806.33	2,529,022.25	-1,072,160.90	5,546,770.16
Total	-1,016,147,580.73	717,735,824.62	49,388,149.17	754,131,771.67

Note. * Values in thousands of reais. Source: Research findings.

The aforementioned losses can be directly related to the effects of the COVID-19 pandemic and the measures to contain it, such as those mentioned by the companies in their explanatory notes, summarized in Table 5. Through this, we can see that the quarter with the highest number of reported effects was 1Q20. Subsequently, there were consecutive declines in 2Q20 and 3Q20, followed by an increase in reported effects in 4Q20. This pattern was observed in most of the effects presented, among them the two most frequent: Declining demand and uncertainty for forecasts. In order to verify the relationship between observed losses in the capital market and the reported effects (H1a), we estimated the Kendall correlation. The findings did not indicate a statistically significant association between such variables ($\tau = -0.08183$, p-value of 10.0%). Thus, at least based on the information on the effects disclosed by the companies, it was not possible to verify the expected effect based on Fama (1970) and Baker *et al.* (2020). It should be noted that, due to the fact that some sectors have few companies and not all of them report the effects of the pandemic, it was not possible to develop an analysis for each sector individually.



Table 5

Reported effects of the COVID-19 pandemic on companies

Effects of the pandemic	1Q20	2Q20	3Q20	4Q20	Total
Drop in demand	123	80	23	96	322
Prohibition of operation	35	15	10	15	75
Default	93	56	59	88	296
Currency devaluation	14	22	25	10	71
Uncertainty for forecasts	135	78	60	90	363
Total	400	251	177	299	1,127

Note. Source: Research findings.

It is important to note that companies were not passive in the face of the effects of the pandemic. Several reactions from companies have been reported since the beginning of the pandemic in Brazil, as shown in Table 6. The main reaction of the companies was related to “Employee safety” (526 citations). Such a reaction, whose frequency has remained relatively constant over time, focuses on an important stakeholder of companies, as well as the reaction “Support to Society and Government”. Other highly cited reactions were “Cash and revenue management” (489 citations) and “Periodical report to the market” (441 citations), that sought to reduce information asymmetry and present information about its management, especially in the short term.

We emphasize that, as explained in H1b, a greater number of reported reactions would be expected from companies that suffered greater effects of the COVID-19 pandemic. In using Kendall’s correlation, there was a positive and statistically significant association between such variables ($\tau = 0.2596$, significant at less than 1.0%), ratifying this hypothesis and corroborating what was expected based on authors such as Abu Hatab *et al.* (2021) and Han and Qian (2020). Furthermore, based on the H1c, it was expected that companies with a higher level of corporate governance (Novo Mercado) would present more information about the effects of COVID-19 on them. However, the Kruskal-Wallis test did not show a significant result ($H = 0.36$, p-value equal to 60.0%). Thus, using information about the effects disclosed by the companies, it was not possible to confirm the aforementioned hypothesis based on Mejia *et al.* (2020).

Finally, we analyze possible significant statistical associations between the reactions adopted by companies and their effects reflected by the financial statements. In this case, companies that consistently reacted throughout the year (i.e., the four quarters of 2020) were compared to those that did not react in any quarter, employing indicators that theoretically should be influenced by such reactions. We found that: (i) companies that consistently announced cost reductions did not show higher GroMar values ($H = 0.4$, p-value of 50.0%) or EBITMrg ($H = 1.8$, p-value of 20.0%) than those that did not; (ii) companies that consistently announced the search for loans and financing showed higher levels of DebTtGross ($H = 4.1$, p-value below 5.0%) than those that did not; and (iii) companies that consistently announced renegotiation with suppliers and customers did not show greater APsupp ($H = 2.4$, p-value of 10.0%) nor ARTcust ($H = 0.50$, p-value of 50.0%) than those that did not. We emphasize that, initially, we would also test the effects of the reactions “meeting new demands” (using Revenues as a proxy) and “review of projected investments” (using Capex as a proxy), however, very few companies (two and one, respectively) showed such reactions consistently. Again, it is important to point out that, due to the fact that some sectors have few companies and not all of them report the effects of the pandemic, it was not possible to develop an analysis for each sector individually.



Table 6

Reactions reported by companies to combat the effects of the COVID-19 pandemic

Reactions	1Q20	2Q20	3Q20	4Q20	Total
Support for Society and Government	29	36	35	40	140
Meeting new demands	13	10	21	12	56
Financing/Loans	60	52	77	8	197
Cash and revenue management	122	120	114	133	489
Postponement of Taxes	67	66	47	-	180
Receipt of Government Subsidy	11	20	31	21	83
Cost reduction	92	57	37	65	251
Renegotiation with Customers/Suppliers	94	83	107	105	389
Periodic report to the market	192	127	58	64	441
Review of projected investments	43	27	42	13	125
Employee safety	141	126	134	125	526
Total	864	724	703	586	2,877

Note. Source: Research findings.

4.2 COVID-19 pandemic and economic-financial indicators

As presented above, the effects of the COVID-19 pandemic and the companies' reactions are reflected in the financial statements of these organizations and, consequently, in the economic-financial indicators. For this purpose, the Wilcoxon test was used. Table 7 presents the test results by indicator (showing the coefficient and p-value). To summarize the results, figures 2a, 2b, 2c and 2d present the variations of the indicators between two analyzed periods, differentiating between those that presented statistically non-significant variations and those that presented statistically significant increases or decreases between the periods.

Based on Figure 2a, it is observed that, between 3Q19 and 4Q19, there was a drop in most of the economic-financial indicators related to activity cycles. At the beginning of the pandemic, however, in 1Q20, this trend was reversed and all indicators showed significant increases. This upward trend was also maintained in 2Q20, with no significant decline observed. In the following two quarters, however, there was a new trend reversal, with all indicators falling significantly in 3Q20 and four in 4Q20 (without any significant increase). Such findings partially confirm H2a.

With regard to the economic-financial indicators of profitability presented in Figure 2b, we verified a significant increase of six indicators between the 3Q19 and 4Q19 quarters against only one indicator with a significant decrease. In 1Q20, the beginning of the pandemic, however, ten profitability indicators showed a significant drop, with only two significant increases. This downward trend in profitability indicators continued in 2Q20. This situation can be associated, in part, to the phenomenon of asymmetric costs, as explained by Golden *et al.* (2020) and Shust and Weiss (2014). However, as in the case of indicators related to cycles, there was a new trend reversal, with the vast majority of indicators showing significant increases in 3Q20 and seven in 4Q20 (without any significant decrease). Thus, these results partially corroborate H2b.

When analyzing the economic-financial indebtedness indicators (Figure 2c), there were significant declines in five indicators between the 3Q19 and 4Q19 quarters and no significant increase. However, at the beginning of the pandemic (1Q20), thirteen debt indicators showed significant increases, with only one significant drop. This upward trend in indebtedness indicators continued in 2Q20. Such a tendency can be linked to that presented by Putri and Rahyuda (2020). However, as in the case of the aforementioned groups of economic-financial indicators, there was a new trend reversal, with the vast majority of indebtedness indicators showing significant drops in 3Q20 and 4Q20. It should be noted, however, that this reversal occurred less drastically with regard to indebtedness indicators in relation to what occurred in the indicators of the other groups. Based on the above, these results partially confirm H2c.



Table 7
Wilcoxon test results for the indicators analyzed over the quarters

Group	Quarter Indicator	3Q19-4Q19		4Q19-1Q20		1Q20-2Q20		2Q20-3Q20		3Q20-4Q20	
		Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Indebtedness	DebTrNet	-110,914	0.0003	31,053.00	0.0000	-119.00	0.9957	-66,854.00	0.0000	-31,562.00	0.1721
	DebTrGross	-19,754.00	0.1199	118,390.00	0.0000	201,305.00	0.0000	-8,667.00	0.4614	-104,148	0.0003
	DebGrAsset	-0.03	0.0003	1.43	0.0000	1.22	0.0000	-1.97	0.0000	-0.91	0.0000
	DebGrEquit	-1.80	0.0022	4.90	0.0000	6.50	0.0000	-8.10	0.0000	-2.18	0.0006
	NDOE	-3.41	0.0012	0.65	0.0000	-1.51	0.1358	-6.64	0.0000	-3.67	0.0070
	EBITFinB	0.03	0.2156	-0.73	0.0000	0.40	0.1895	0.97	0.0000	0.36	0.8467
	EBITFinL	-0.24	0.7879	0.70	0.0259	0.27	0.3222	-1.40	0.0025	0.84	0.0295
	EBITNetDebt	-0.89	0.1470	-1.48	0.2583	-0.49	0.7489	2.02	0.0000	1.00	0.3459
	DebtGrEbitda	-0.20	0.5322	2.73	0.0000	-2.27	0.3175	0.66	0.0007	-2.60	0.0014
	DebtNetEbitda	-0.33	0.2963	2.16	0.0002	-1.36	0.6994	-2.08	0.0000	-1.12	0.0056
	DebtSTDebtTotal	0.02	0.2863	5.31	0.0000	-0.39	0.0071	-1.73	0.0236	0.04	0.0261
	LiabAs	-0.92	0.2525	0.36	0.0000	1.73	0.0000	-1.33	0.0712	-0.24	0.0292
	LiabEQ	-5.32	0.3194	2.06	0.0005	10.38	0.0000	-8.03	0.1208	-1.40	0.0715
	LiabTRev	-31.38	0.0005	81.39	0.0000	104.87	0.0000	-125.21	0.0000	-48.28	0.0004
FAxEQ	-1.68	0.7201	-1.07	0.5991	0.31	0.2583	-2.51	0.0000	-0.82	0.2460	
InvEQ	0.03	0.4147	-0.04	0.5108	-0.03	0.4661	0.05	0.6305	-0.01	0.9966	
Liquidity	GerLiq	0.04	0.0862	0.01	0.2016	0.00	0.2616	0.00	0.0000	0.01	0.0401
	CurLiq	-0.07	0.4971	0.08	0.2115	0.00	0.7541	0.07	0.0450	-0.02	0.0088
	DryLiq	-0.00	0.1413	-0.02	0.0664	0.05	0.1944	0.06	0.0022	-0.04	0.0677
	WorkCap	33,626.00	0.8016	58,612.00	0.5492	74,455.00	0.0000	29,919.00	0.0001	14,955.00	0.0694
Cycles	CapEmpl	218,449.00	0.0003	39,491.00	0.0000	-20,786.00	0.0000	166,873.00	0.0000	13,740.00	0.2722
	ASper	-6.00	0.0006	7.52	0.0000	7.56	0.0051	-13.51	0.0000	-4.61	0.0000
	APsupp	-1.91	0.1249	5.33	0.0000	-2.23	0.2357	-1.19	0.0000	0.57	0.7190
	ARTcust	-3.64	0.0001	5.52	0.0000	6.78	0.0001	-9.20	0.0000	-5.40	0.0000
	FinCic	-6.15	0.0002	6.63	0.0000	13.67	0.0009	-12.27	0.0000	-3.02	0.0000
	OpeCic	-4.63	0.0000	11.82	0.0000	14.72	0.0002	-13.24	0.0000	-3.11	0.0000
	EBITDA	-7,095.00	0.2233	-28,364.00	0.0000	-7,002.00	0.5332	33,661.00	0.0000	23,707.00	0.0007
	AsTurn	0.00	0.0017	-0.03	0.0000	-0.02	0.0000	0.03	0.0000	0.02	0.0000
	EQTurn	0.00	0.0560	-0.05	0.0000	-0.04	0.0000	0.06	0.0000	0.06	0.0000
	GroMar	-0.60	0.2050	0.19	0.8286	-0.47	0.0009	2.51	0.0000	-0.31	0.8619
EBITMrg	0.07	0.7481	-4.29	0.0001	0.60	0.1774	5.38	0.0000	0.25	0.8932	
NetMargin	1.64	0.0058	-5.41	0.0000	0.61	0.5647	4.73	0.0000	2.15	0.0180	
EbitdaMrg	0.30	0.6494	4.08	0.0034	0.69	0.7149	4.79	0.0000	0.16	0.9880	
AsProfit	0.09	0.0256	-0.81	0.0000	0.15	0.7444	0.57	0.0000	0.55	0.0007	
InvestCap	-161,720.00	0.3930	4,401.00	0.0000	-38,624.00	0.0597	-24,557.00	0.0308	216,153.00	0.1924	
FinLev	0.10	0.2839	-0.24	0.0133	0.33	0.0070	-0.17	0.6184	0.28	0.0862	
OpelEv	0.28	0.0369	-0.30	0.6262	-0.30	0.0308	0.26	0.5263	-0.04	0.3448	
Capex	-655.00	0.0021	3,500.00	0.0024	-17,215.50	0.0155	6,628.50	0.0005	8,048.00	0.0000	
FCF	-3,493.50	0.6218	-29,131.00	0.0009	27,911.50	0.0000	3,279.50	0.0283	380.47	0.5471	
Revenue	18,369.00	0.0000	-54,269.00	0.0000	-34,588.00	0.0000	120,571.00	0.0000	31,679.00	0.0000	



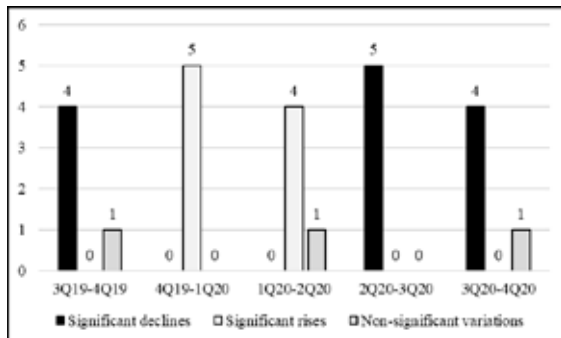


Figure 2a. Variations in cycle indicators over the quarters

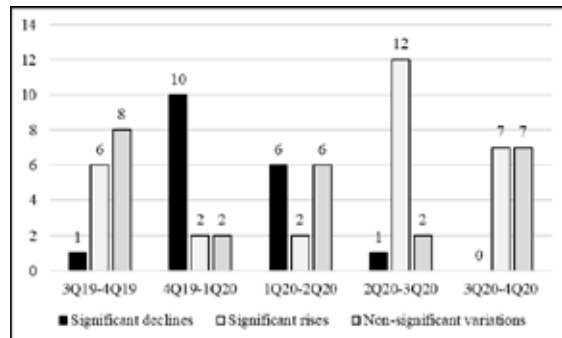


Figure 2b. Variations in profitability indicators over the quarters

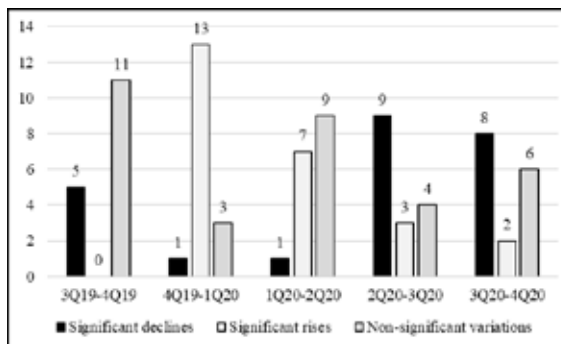


Figure 2c. Variations in indebtedness indicators over the quarters

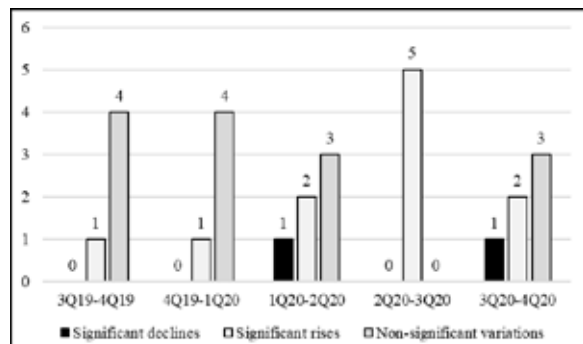


Figure 2d. Changes in liquidity indicators over the quarters

Finally, with regard to liquidity (Figure 2d), unlike the other groups, it was not possible to verify clear trends in variations. This may be related to contrary and interdependent effects already reported from the other groups of indicators (especially indebtedness and cycles). An exception refers to 3Q20, in which there was an increase in all the companies' liquidity indicators. It is noteworthy that this quarter coincides with the significant drop in all cycle indicators, significant declines in most indebtedness indicators and significant increases in most profitability indicators. Thus, these results partially confirm H2d.

4.3 COVID-19 pandemic and the level of indebtedness

As shown in the previous subsection, there were significant increases in several indebtedness indicators of the companies analyzed (especially in 1Q20 and 2Q20). Despite reversals in the following periods, many companies increased their level of indebtedness throughout the analysis period. Table 8 presents an analysis of the indebtedness determinants obtained over the period for such companies. The estimated model presented an R^2 of 68.2%, being significant at less than 1.0% (Test F). Ramsey's RESET test indicated that the functional form of the model is adequate, and the VIF value of only 1.22 showed that there are no multicollinearity problems. Furthermore, due to the heteroscedasticity determined by the Breusch-Pagan test, we opted for estimation using White's robust standard errors.

Table 8

Determinants of indebtedness obtained over the period for such companies

Variable	Coefficient	Robust standard error	t test
PROF	-0.0009	0.0003	-2.6600**
GROW	0.0450	0.0116	3.8800**
SIZ	0.9797	0.0585	16.7600**
TANG	0.5278	0.5631	0.9400
SING	0.0514	0.5376	0.1000
NDTS	0.7172	4.0246	0.1800
RISK	-0.0035	0.0053	-0.6600
Constant	-2.7052	0.9145	-2.9600**
R ²	0.6822		
Test F	156.4000**		
Breusch-Pagan	4.7200*		
VIF	1.2200		
Ramsey's RESET	0.1500		

Note. Source: Research findings.

Based on the results of Table 8, we found that three variables were significant: PROF, GROW and SIZ. In the case of the latter, we found that the larger the companies, the higher the level of fundraising from third parties obtained in the period, confirming H2a. In the case of the GROW variable, we found that companies that showed higher levels of growth potential in the previous year were able to obtain more resources during the pandemic, corroborating H3b. Finally, the negative sign of the coefficient of the variable PROF shows that less profitable companies raised a greater volume of resources from third parties, confirming H3c. The results obtained for each of the aforementioned hypotheses corroborate what was expected based on Frank and Goyal (2009), Fama and French (2005) and Forte *et al.* (2013), respectively. The other variables cited in the literature as determinants of the phenomenon, TANG, SING, NDTS and RISK, however, were not considered significant, thus not being possible to ratify H3d, H3e, H3f and H3g, respectively.

In order to summarize the results obtained in the analyzes carried out during the research, Table 9 presents the hypotheses and conclusions obtained. Through it, it is possible to verify that four hypotheses were fully corroborated (H1b, H3a, H3b and H3c), four were partially ratified (H2a, H2b, H2c and H2d) and six were rejected (H1a, H1c, H3d, H3e, H3f, H3g). Such results allow a better understanding of the impacts of the COVID-19 pandemic on national publicly traded companies, initiating discussions of possible solutions for mitigating business risk in unexpected negative situations.

Table 9

Analysis of the proposed hypotheses

Hypothesis	Conclusion	Hipótese	Conclusão
H1a	Hypothesis rejected.	H3a	The hypothesis is ratified.
H1b	The hypothesis is ratified.	H3b	The hypothesis is ratified.
H1c	Hypothesis rejected.	H3c	The hypothesis is ratified.
H2a	Hypothesis partially ratified.	H3d	Hypothesis rejected.
H2b	Hypothesis partially ratified.	H3e	Hypothesis rejected.
H2c	Hypothesis partially ratified.	H3f	Hypothesis rejected.
H2d	Hypothesis partially ratified.	H3g	Hypothesis rejected.

Note. Source: Research findings.

5 CONCLUSIONS

The present study aimed to analyze the effects of the COVID-19 pandemic on the economic and financial performance of Brazilian public companies listed on B3 throughout 2020. To this end, we use documents and economic-financial information provided by the companies. In general, we found that the pandemic is associated with significant effects on all dimensions of the economic-financial performance of the companies measured by the study. There is a concentration of the expected effects on the economic and financial performance of companies (significant reduction in market value and profitability and increase in business cycles and indebtedness) in the first two quarters of 2020. In the following quarters, there was a reversal of such effects in general.

It is important to highlight that three sectors (Trade, Mining and Others) had a market value increase of more than BRL 400 million in the second half of 2020 compared to the directly previous period. On the other hand, other sectors were unable to recover losses during the pandemic period. However, it was not possible to say that the companies that most reported negative effects of the pandemic on their operations were the ones that lost the most value in the period, just as it cannot be said that companies with the highest level of corporate governance were the ones that reported them the most.

We highlight that companies presented a series of reactions throughout 2020 in relation to the negative effects of the pandemic on their operations. It was found that the companies that reported such effects were the ones that most reported reactions in the period. One of these reactions referred to the search for loans and financing, and companies that disclosed such a reaction consistently showed a higher level of indebtedness in relation to those that did not. These showed an 8.6% increase in their gross debt compared to the 20.9% increase in their debt in the same period. When analyzing the organizations that raised funds in 2020, presenting an increase in their level of indebtedness, it was found that those with larger size, greater growth potential and less profitable tended to capture more resources than the others.

Given the above, the research presented in this article contributes to the literature on corporate finance in different aspects: (a) it presents a broad analysis of the effects of the COVID-19 pandemic on the different economic and financial dimensions of companies; (b) it discusses not only the effects of the pandemic, but also the reactions of companies and the economic-financial implications of these reactions; (c) it analyzes both external and internal information to the companies to support the conclusions; and (d) it focuses on all quarters of 2020, analyzing the evolution of the pandemic over the period. Even in the face of such contributions, it is important to highlight some limitations of the study. First, the information internal to the companies (explanatory notes) is prepared by the organization itself, who tend to avoid disclosing information against their interests. The categories developed to analyze the effects of the pandemic and the reactions were treated discreetly (their existence or not) and differences in the reporting by the companies were not considered.

Despite representative and highly relevant results, the present study carried out aggregate analyzes on the impacts of the COVID-19 pandemic on national companies. Future research, following similar proposals to the one used in this article, could prioritize the impacts on the different sectors and possible comparisons with other economic crises.



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1. Definition of research problem	√				√
2. Development of hypotheses or research questions (empirical studies)	√				
3. Development of theoretical propositions (theoretical work)	√	√			
4. Theoretical foundation / Literature review	√	√	√	√	
5. Definition of methodological procedures	√				
6. Data collection		√			√
7. Statistical analysis	√		√		
8. Analysis and interpretation of data	√	√	√	√	
9. Critical revision of the manuscript	√	√	√	√	√
10. Manuscript writing	√	√	√	√	
11. Other (please specify)					

Conflict of Interest

The authors have stated that there is no conflict of interest.

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