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The Impact of the Monetary Policy During the COVID-19 in the Brazilian Banking Sector

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The COVID-19 pandemic caused an outbreak on the global productive chains, transforming companies and society in general. Governments adopted anticyclical policies such as basic interest rates reduction as response. Brazil basic interest rate is denominated Selic. The application of these policies requires the protagonist of bank's financial intermediation. This study aims to verify two events—under the perspective of the efficient markets' theory. The first is the communication of the first death by COVID-19—and the subsequent, Selic rate reduction to 2% p.a.—and its effects on bank's shares prices. The hypotheses presented are: H1—The announcement of the first death by COVID-19 negatively impacts the banks' shares returns and H2—The announcement of the Selic interest rate—during the COVID-19—positively impacts the return of the banks' shares. We adopt event study methodology in a final sample of nine and 15 banks to Events 1 and 2 respectively. The results confirm H1 as well as the semi-strong informational efficiency market. H2 is not confirmed. Results confirm the non-effectiveness of the anticyclical policy of basic interest rate reduction. This contributes to the discussion about the impacts of COVID-19 and the efficacy of anticyclical policies.

Keywords: monetary policy, COVID-19, banks, Brazil, event study

Introduction

The COVID-19—caused by SARS-CoV-2 virus starts in Wuhan, China at the end of 2019. The World Health Organization (WHO) increases it to the pandemic status on March 11, 2020 (WHO, 2020). Since then, there has been a profound transformation in persons lives, companies, governments, and financial markets. In Brazil, the first death from COVID-19 happens on March 15, 2020 (SVS, 2020). In this occasion, the countries are forced to adopt social isolation measures, resulting in a decrease of demand and offer of products and services. As a result, there is a reduction in the expectation of future flows generation, profits, dividends distribution, and shares' prices (Eichenbaum, Rebelo, & Trabandt, 2021; Mazur, Dang, & Vega, 2020; Umar, Ji, Kirikkaleli, & Xu, 2020; Su, Dai, Ullah, & Andlib, 2021; Liu et al., 2022).

In response to these effects, governments adopted anticyclic monetary policies—through its central banks—as the basic interest rates reduction. In Brazil, this rate is denominated Selic—Special Liquidation and Custody System of federal public securities (Bacen, 2022). In August 4, 2020, the Monetary Policy Committee (Copom)

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reduces the Selic rate to 2% p.a. Empirical studies verify that expansionary shocks of monetary policy present a positive effect on shares prices in the short term (Copom, 2020; Gormsen & Koijen, 2020; Zhang, Hu, & Ji, 2020; Baykara, 2021; K. J. Heyden & T. Heyden, 2021).

One of the main functions of commercial banks is the financial intermediation between lenders and borrowers. Therefore, they are essential to the successful execution of the government's monetary policies as well as the maintenance of stability and robustness of the national financial system. With the pandemic evolution, the lenders reduce their capacity to provide resources to financial institutions. Furthermore, the borrowers increase their default risk due to cash restrictions. Therefore, there is a bank asset quality deterioration. With the reopening of the overall economy, the net effect of the anticyclical measures in the banking system shall be investigated (Acharya & Steffen, 2020; Berger & Kunt, 2021; Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021; Norden, Mesquita, & Wang, 2021).

Therefore, this study has as main purpose to comprehend the impact of two events related with Brazilian banks shares returns. The first refers to the occurrence of the first death by COVID-19 in Brazil—on March 15, 2020 (SVS, 2020)—while the second refers to the Selic interest rate reduction to 2% p.a.—on August 4, 2020 (Copom, 2020). These events originate the following hypotheses: H1—The announcement of the first death caused by COVID-19 in Brazil negatively impacts banks shares—this is related with Event 1—and H2—The announcement of the Selic interest rate reduction in Brazil—during COVID-19—impacts positively the banks shares returns—related with Event 2 in this study.

The verification of these hypotheses is made by an event study. The final sample is composed by 15 shares of public owned Brazilian banks, with shares negotiated in Brazil, Bolsa, Balcão (B3). Data are obtained during the window period presented in Figure 1, captured from Capital IQ Pro database (CIQ, 2023) and Bloomberg, between March 13, 2019 and September 1, 2020.

The contributions of this study are the better comprehension of the mechanisms of monetary policy mechanisms in Brazil. This analysis is relevant to the monetary authorities once these policies may define and apply efficient monetary policies. Furthermore, the results obtained can also offer the capital market agents a better understanding on alternative reactions to government incentives.

Theoretical Background and Literature Review

During December 21, 2019, WHO is informed about several pneumonia cases in Wuhan City, province of Hubei, at People's Republic of China. It is a new coronavirus variant that was not previously reported in human beings. During January 30, 2020, WHO reports the surge of a novel coronavirus and institutes a Public Health Emergency of International Concern, changing its status for pandemic on March 11, 2020 (WHO, 2020). In Brazil the first death caused by COVID-19 happens on March 15, 2020 (SVS, 2020).

COVID-19 not only is a sanitary and humanitarian crisis but also represents a simultaneous demand and offer shock. Amongst several imposed measures, countries restrict circulation of persons through partial or total lockdowns. These measures prevent companies from normally function, obliging them to adjust its labor costs, laying off its workers. Therefore, there is a reduction in consumption and production of goods, reducing the expectations of future cash flows generation, profits, dividends distribution, and share prices (Mazur et al., 2020; Polyzos, Samitas, & Kampouris, 2021; Sanguinet, Alvim, Atienza, & Fochezatto, 2021; Liu et al., 2022).

To mitigate the crisis effects, governments and central banks announce and implement anticyclical policies—e.g.: basic interest rates reduction, credit lines concessions, tax incentives, monetary basis expansions,

central banks swaps, amongst others. These measures present positive results, especially in emerging countries that have more volatile markets. In the case of Brazil, there are fiscal measures—state and municipal compensations for income losses—and monetary—basic interest rates reduction—the Selic (Beirne, Renzhi, Sugandi, & Volz, 2020; K. J. Heyden & T. Heyden, 2021; World Bank, 2020; Polyzos et al., 2021).

Selic name refers to the Special Liquidation and Custody System—created on November 14, 1979. It realizes the registry, custody, and liquidation of public securities, issued by the National Treasury. The Brazilian basic interest income is called Selic once it is the interest bearing responsible to pay the titles. There are two types of Selic interests: (i) target Selic—defined by the Monetary Policy Committee (Copom) each 45 days and (ii) Selic over—weighted average of all operations closed in Selic system, with being ballasted in federal public bonds with a maturity of one day.

Copom uses it as instrument for the execution of monetary policy and inflation control and the Brazilian Central Bank (Bacen) operates in this market, to assure that the Selic over rate closes to target Selic. Faced with the economic downturn caused by COVID-19, Copom, in its 232 ªmeeting of August 4, 2020, reduces Selic to its minimum historical value of 2% p.a. This value is maintained up to March 8, 2021, when it is increased to 2.75% p.a. (Bacen, 2022).

The monetary policy implementation—defined by Copom—also happens through commercial banks. Their function is the provision of financial resources needed to finance—in the short and long term—physical and juridic persons. Its role of finance intermediation between lenders and borrowers of resources is essential in the monetary policies transmissions. Brazil presents a strong and safe financial system, with capitalization rates above the regulatory minimum and adequate level of liquidity. These facts, associated with a fiscal situation consistent and monetary base expansion, allow COVID-19 shocks amortization (World Bank, 2020; Li, 2022).

Empirical studies show that expansionary shocks in monetary policy can bring a positive effect on the stock prices in the short term. This relationship is a relevant theme for several reasons. For monetary policymakers, to have reliable estimates—on the reactions of assets prices to the policy instruments—is a critical step in the formulation of effective monetary policy decisions. For market participants, the comprehension of this relationship is essential in the investment decision and risk management (Jarocinski & Karadi, 2020; Baykara, 2021; Juhro, Iyke, & Narayan, 2021).

Also, market efficient theory states that the asset pricing is composed of available information of the issuer company, preventing abnormal gains. The current asset price represents a random evolution of its previous price—the random walk (Fama, 1965a; 1965b; Samuelson, 1965). Fama (1970; 1991; 1998) states that when prices reflect this information, markets are efficient. Besides that, the author identifies the following informational efficiency levels of markets: weak, semi-strong, and strong. In the semi-strong form, prices reflect not only the historical prices but also all the public information available.

The velocity of the communication of the information can affect these assets prices with higher or lower responsiveness. If it is communicated simultaneously to all market agents, there is the occurrence of informational symmetry. In contrast, the information asymmetry occurs when two or more agents establish between them an economic transaction, with one of the involved parties having more information than the other. This is one of the main fails of the market, happening when it is difficult or expensive to gather relevant and precise information about the quality of the commercialized assets. This fact changes the market equilibrium and resources allocation (Akerlof, 1970; Dari-Mattiacci, Onderstal, & Parisi, 2021).

Therefore, it is expected that the first death by COVID-19 communication in Brazil—in simultaneous form to all the society—impacts negatively the future cash flows generation, profits, dividends distribution, and share prices (Mazur et al., 2020; Liu et al., 2022). It is assumed that the adoption of an expansionary monetary policy reduces the discount rates, increasing the enterprise's future cash flows, its stocks price, and returns. These patterns, if confirmed, validate the semi-strong form of the Brazilian market (Galloppo & Paimanova, 2017; Hammad, Awan, & Shah, 2019; Singh & Padmakumari, 2020). These statements support the two study hypotheses: H1—The announcement of the first COVID-19 death in Brazil negatively impacts the Banks stocks returns—that are related with the Event 1; and H2—The announcement of Selic interest rate reduction in Brazil—during COVID-19, impacts positively the Banks' stocks returns—that are related with Event 2 in this study.

Table 1 presents a summary of cumulative abnormal returns (CAR) results from studies that treat the impact of communication of the first case—or death caused by COVID-19—about the banking sector's stocks return. As mentioned, the expectation is a negative CAR, what happens in most studies that have statistical significance. Table 2 presents the quantity of trading sections considered in the event and estimation windows. Tables 1 and 2 are related to Event 1 of this study.

Table 1

Synthesis of the Event Studies Related with COVID-19—Event 1

Description	Goker et al. (2020)	Phuong (2021)	Sayed & Eledum (2021)	Tao et al. (2022)	Kakhkharov & Bianchi (2022)
Expected CAR signal	-	-	-	-	-
CAR results	(a)	-/5%	(b)	-/5%	(c)

Notes. CAR: Cumulative abnormal returns; SS: No statistical significance; (a) [(-20 to +20): -/5%], [(-10 to +10): +/SS], [(-5 to +5): +/SS], [(-2 to +2): +/SS], [(-1 to +1): +/SS], [(0 to 0): +/SS], [(0 to +10): +/SS], [(0 to +20), +/SS]; (b): [(-21 to -1): +/SS], [(0): -/SS], [(+1 to +9): -/1%], [(+10 to +17): -/SS], [(+18 to +38): -/1%], [(+39 to +58): -/SS], [(+59 to +68): -/SS]; (c) [(-1 to +3): -/SS], [(-1 to +1): -/1%], [(0 to 0): -/1%], [(0 to +1): -/1%].

Table 2

Event Studies Window Related with COVID-19—Event 1

Description	Goker et al. (2020)	Phuong (2021)	Sayed & Eledum (2021)	Tao et al. (2022)	Kakhkharov & Bianchi (2022)
Estimation	250	250	120	25	250
Event	(a)	-7 to +7	(b)	(c)	(d)
Comparison	ND	ND	ND	ND	ND

Notes. ND: Not available: (a): (-20 to +20), (-10 to +10), (-5 to +5), (-2 to +2), (-1 to +1), (0 to 0), (0 to +10), (0 to +20); (b): (-21 to -1), 0, (+1 to +9), (+10 to +17), (+18 to +38), (+39 to +58), (+59 to +68); (c): (-10 to +10), (-20 to +20); (d): (-1 to +3), (-1 to +1), (0 to 0), (0 to +1).

Goker, Eren, and Karaca (2020) analyze the impact of the announcement of the first case of contagious by COVID-19 at Turkey—and the pandemic status declared by WHO—in the stock's price of 26 sectors, including the banking sector. Both events happen on March 11, 2020. In the case of banks stocks, differently of what was expected, the authors observe a positive CAR and statistically significant. These findings suggest that commercial banks are fundamental to consumption and to match the basic needs of the population.

Phuong (2021) analyzes a series of evolutive events related with the restrictions imposed by Vietnam government—arise from COVID-19—on banking sector actions. These events happen between February 13,

2020, and July 28, 2020. The results, in general, show a negative CAR—and statistically negative—evidencing the efficient markets theory. Sayed and Eledum (2021) analyze the stock markets short term responses—including banks—to the announcement of the first contagion of COVID-19 in Saudi Arabia. The events happen between September 23, 2019, and June 11, 2020. The authors verify that the banking sector is one of the most negatively affected by the pandemic announcement.

Tao, Su, Yaqoob, and Hammal (2022) also observe a negative CAR and—statistically significant—in the banking sector shares, from the lockdown announcement in Pakistan—because of COVID-19. This result is due to uncertainties in the economy and lack of investors, confirming the semi-strong form of informational efficiency theory. Finally, Kakhkharov and Bianchi (2022) analyze the impact in stock prices of Australian banks and fintechs, after the announcement of successive restrictive measures—related to COVID-19. These announcements happen from January to June 2020. Most CARs are negative and statistically significant, especially in fintech and small banks. This fact indicates a major vulnerability of these companies to external chocks.

Table 3 indicates the event studies results that analyze the monetary policy effects of contraction and/or expansion on the banking sector share prices. The expected return of an increase or (reduction) of basic interest rates is a reduction (increase) in the stock returns. Summarizing, we verify inconclusive effects, with signs with (non) conformity with the expected and statistical significance. Regarding Table 4, it points out the auction quantity considering event and estimation windows. Tables 3 and 4 are related to Event 2 on this study.

Table 3

Synthesis of Results from Event Studies Related to Monetary Policy—Event 2

Description	Galloppo & Paimanova (2017)		Blomberg & Forell (2020)		Baykara (2021)		Demirgüç-Kunt et al. (2021)		Ferreira & Serra (2022)	
Changes in the basic interest rate	INCR	LOW	INCR	LOW	INCR	LOW	INCR	LOW	INCR	LOW
Expected CAR signal	-	+	-	+	-	+	-	+	-	+
CAR results	-/SS	+/SS	+/5%	+/5%	-/5%	NA	NA	+/5%	N/A	+/1%

Notes. INCR: Increase; LOW: Low; CAR: Cumulative abnormal returns; SS: No statistical significance; NA: Not applicable.

Table 4

Event Studies Windows Related to Monetary Policy—Event 2

Windows in number of auctions	Galloppo & Paimanova (2017)	Blomberg & Forell (2020)	Baykara (2021)	Demirgüç-Kunt et al. (2021)	Ferreira & Serra (2022)
Estimation	252	NA	250	NA	201
Event	(a)	-1 to +2	-5 to +5	-1 to +3	-1 to +1
Comparison	NA	NA	NA	NA	NA

Notes. NA: Not Available; (a): 0, (-1 to 0); (-1 to +3).

Galloppo and Paimanova (2017) investigate the monetary policy instruments influence on the emerging markets stock prices, between June 2007 and June 2012. They verify distinct reaction times, presenting positive (negative) CARs to expansionary (contractionary) policies. In the first case, the market reacts two or more times—a day—compared to the second, specifically to the financial sector.

As for the study by Blomberg and Forell (2020), it analyzes the impact of changes in the Swedish Central Bank's rediscount rates on the return on shares of companies in the real estate and banking sectors. 75 statements are verified between 2007 and 2019. The authors find that when the central bank reduces the discount rate, there is an increase in the return on shares in both sectors. However, when the rate increases, the result is only significant for the banking sector. Conclusively, the change in the repurchase rate affects—in three out of four cases—the stock market for the analyzed sectors.

Baykara (2021) examines the effect of the announcement by the Central Bank of Turkey—an increase in interest rates—on the CAR of bank and insurance company shares. The announcements are made between January 1, 2015 and December 31, 2020. The author finds the occurrence of negative and statistically significant CARs. In turn, Demirgüç-Kunt et al. (2021) verify the effect of a reduction in interest rates—in 52 countries—in the return on shares of commercial banks between May 2, 2019 and May 12, 2020. During this period, governments adopted countercyclical policies to mitigate the negative effects of the pandemic. Among these policies is the reduction of basic interest rates and quantitative easing—through assets acquisition. The authors identify a positive CAR—especially for banks with a low liquidity level.

Finally, Ferreira and Serra (2022) also analyze the impact of the reduction in interest rates on the return on shares in the European banking sector, which measures are adopted by the European Central Bank, Bank of England, and the Federal Reserve. The announcements take place between March 2008 and September 2018. The authors detect positive and statistically significant CARs, because bank loans are a relevant transmission channel for monetary policies.

It is noteworthy that in both Table 2 and Table 4, the studies do not consider the comparison window in their analyses. Despite this, according to MacKinlay (1997) and Campbell, Lo, and MacKinlay (1997), the inclusion of the post-event window increases the robustness of the market return measure, given the gradual changes in its parameters.

Methodology

This work aims to understand the impact of two events on the return on shares of Brazilian banks. The hypotheses that derive from this objective are: H1—The announcement of the first death due to COVID-19 in Brazil negatively impacts the return on bank shares and H2—The announcement of the Selic reduction in Brazil—during COVID-19—positively impacts the return on bank shares. Both hypotheses are verified through an event study. According to Campbell et al. (1997) and MacKinlay (1997), the stages of the event study are shown in Figure 1. It is also noteworthy that data on stock and market returns are obtained through the database Capital IQ from Standard & Poor's (S&P).

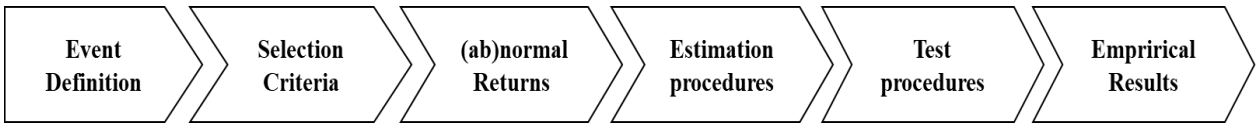

Figure 1. Event study stages. Source: Campbell et al., 1997, p. 151.

Events Definition

The analyzed event in this study refers to: (i) the communication of the first death caused by COVID-19, that happens on March 15, 2020—Event 1 (SVS, 2020) and (ii) reduction of Selic interest rate to 2% p.a. on

August 4, 2020—Event 2 (Copom, 2020), being this one of the anticyclical measurements to avoid the pandemic effects in the economy.

Selection Criteria

The initial sample considers 19 stocks listed in Brazil, Bolsa, Balcão stock exchange (B3)—on February 5, 2023—of all public traded Brazilian banks. The final sample is composed of nine and 15 stocks to Events 1 and 2, respectively, as presented in Table 5—whose exclusion criteria are mentioned in Item 4—Results Analysis.

Normal and Abnormal Returns

The existence of abnormal returns is observed as the most significant item to conclude about the impact of the event on the company stock prices. The abnormal return of a share is represented in the Equation 1 (Campbell et al., 1997):

$$ARit = Rit - E(Rit) \quad (1)$$

where:

ARit = assets abnormal return,

Rit = observed return to company "i",

E(Rit) = expected return and "t" event time.

The abnormal returns calculation methodology presents two measurement methods, the traditional and logarithmic. The logarithmic measurement is the most adequate because it shows a better composition in the normal distribution on the execution of the parametric tests' procedures. Besides that, it is possible to sum up the rentabilities of different periods to gather the total return. Also, the logarithmic measurement implies that the market information happens at every moment and that stocks react in a continuous fashion to theses information (Fama, 1970; Campbell et al., 1997). This return is shown through the Equation 2:

$$Pt = Pt\text{-}1\ er \quad (2)$$

where:

Pt = stock price at time "t",

Pt-1 = stock price at the time before,

e = 2,718281,

r = return.

The calculation of the real observed return is given by the Equation 3:

$$Rit = \ln (Pit/Pit\text{-}1) \quad (3)$$

where:

Rit = asset "i" return in date "t", transformed by the neperian logarithm (LN),

Pit = nominal closing price of the asset on the date "t",

Pit-1 = nominal closing price of asset "i" on the date "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 the Equation 4:

$$E(Rit) = \alpha i + \beta i\ RMt + \varepsilon it \quad (4)$$

where:

E(Rit) = expected return of an asset "i" in time "t",

RMt = market return in the time "t" of Ibovespa,

αi e βi = market model parameters of asset "i",

εit = econometric equation error of asset "i" in time "t".

In turn, the cumulative abnormal return (CAR) model is calculated by the simple sum of all abnormal returns contained in the event and comparison windows, according to Equation 5 (McWilliams & Siegel, 1997):

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

where:

CARi = cumulative abnormal return of asset "i",

t1 = first day of event and comparison window,

t2 = last day of the event and comparison window,

ARit = abnormal return of asset "i" in period "t".

Estimation Procedures

To estimate the returns mentioned, the windows presented in Figure 2 are considered. The deadlines presented are based on the empirical studies in Tables 2 and 4, as well as the seminal article by MacKinlay (1997). Thus, for the purposes of this study, the adopted trading day windows are: (a) estimation -251 to -6, (b) event -5 to +5, and (c) post-event +6 to +20.

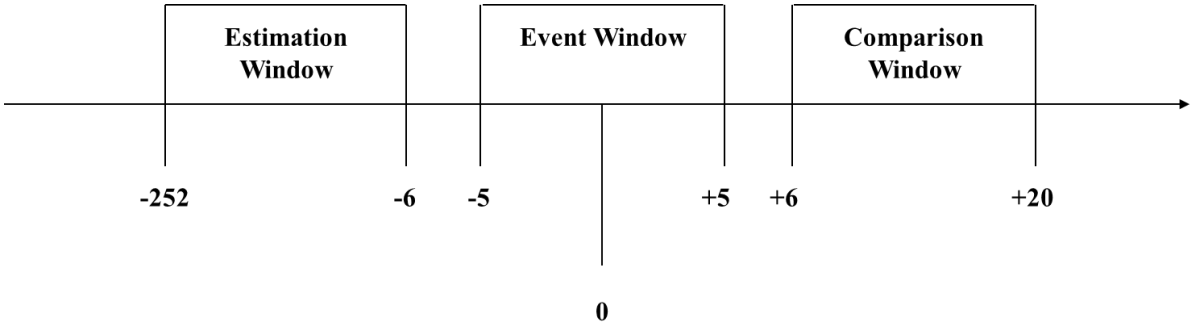

Figure 2. Event study window.

The estimation window comprises the period for calculating expected or normal stock returns before the event window, comprising 246 trading sections (-251 to -6). It is noteworthy that the estimation window so as not to influence the parameters 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).

The event window consists of 11 trading sessions before and after the announcement (-5 to +5). The dividend distribution announcement event occurs on date zero. The study of the behavior of the trading session return before the zero date aims to collect illegal evidence of the use of privileged information, while the study of the behavior in the trading session after the zero date aims to observe the reaction of the capital market to the occurrence of the event (McWilliams & Siegel, 1997).

Finally, the comparison window consists of 15 trading sessions (+6 to +20), after the event window. Its objective is to verify whether returns continue to exhibit abnormal behavior after the event window. Although the studies in Table 2 do not carry out analyses during this period, the seminal article by MacKinlay (1997) is considered as a reference. In it, the author adopts a maximum period of 20 trading sessions, after the event date in the comparison or post-event window.

In the case of Event 1—associated with H1 of this study, the window periods are: (a) estimation: from March 13, 2019 to March 6, 2020 (246 trading sessions), (b) event: from March 9 to 23, 2020 (11 trading sessions), (c) comparison: from March 24 to April 14, 2020 (15 trading sessions). In turn, for Event 2—associated with H2, the following window periods are considered: (a) estimation: from August 1, 2019 to July 27, 2020 (246 trading sessions), (b) event: from July 28 to August 11, 2020 (11 trading sessions), (c) comparison: from August 12 to September 1, 2020 (15 trading sessions).

Test Procedures

The testing procedure for both hypotheses H1 and H2 considers the following steps, whose calculations are carried out using Stata software (Ullah, Zaefarian, Ahmed, & Kimani, 2021).

1. First, the closing prices of shares are collected—from banks listed in B3—as well as the Ibovespa index, during the estimation window period (-251 to -6), to calculate their historical returns;

2. After obtaining this data, the expected returns are projected for the event and comparison windows—for companies with betas statistically different from zero—using the Equation 4. The real returns of shares in these same windows are obtained using Equation 3;

3. Subsequently, the abnormal returns (ARs) and CARs are calculated for the event (-5 to +5) and comparison (+6 to +20) windows;

4. After obtaining these returns, the normality of the distributions is verified—for both windows—using the Shapiro-Wilk test (Shapiro & Wilk, 1965), whose null and alternative hypotheses are: H0: The distribution is normal and Ha: A distribution is not normal;

5. If the distribution is normal, the t test for the difference in means (Fávero & Belfiore, 2022) between the real 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 (Wilcoxon, 1945). These tests aim to verify the statistical significance of these differences or abnormal returns, the hypotheses of which are: H0: The means are equal and Ha: The means are not equal;

6. Shares whose CARs are statistically different from zero are identified. The use of CAR becomes more appropriate for analyzing results, since there are difficulties in determining the date on which the market effectively absorbs information about the event under study. Next, the arithmetic average of the trading sessions in the event (-5 to +5) and comparison (+6 to +20) windows is calculated. The expectation is that most CARs will be negative and positive for hypotheses H1 and H2, respectively.

Results Analysis

The initial sample is composed of 19 shares listed on B3—on February 5, 2023—from all Brazilian banks. It turns out that Nu Bank only goes public on December 9, 2021. Therefore, its share is excluded from the sample, since the window periods of this study are prior to that date. In the case of Event 1, there is an exclusion of another four shares—Alfa Holdings (RPAD3), Banco do Estado de Sergipe (BGIP4), Banco do Estado do Espírito Santo (BEES3), and Banco de Brasília (BLSI4). This is because beta is statistically equal to zero, which makes it impossible to project its return—see Equation 4. As for Event 2, there is also the exclusion of Banco de Brasília share (BSLI4) for the same reason. Finally, there is also the exclusion of five actions from Event 1 and two from Event 2, since their CARs are statistically equal to zero, as opposed to subitem (vi) of

Item 3.5—Test Procedures. Therefore, the final sample of Event 1 and 2 is composed of nine and 15 actions, respectively—see Table 5.

Table 5

Companies in the Final Sample

Event 1			Event 2					
No.	Ticker	Bank	No.	Ticker	Bank	No.	Ticker	Bank
1	ABCB4	Banco ABC Brasil	1	RPAD3	Alfa Holdings	9	BRSR6	Banco do Estado do Rio Grande do Sul
2	BRIV4	Banco Alfa de Investimento	2	ABCB4	Banco ABC Brasil	10	PINE4	Banco Pine
3	BMGB4	Banco BMG	3	BRIV4	Banco Alfa de Investimento	11	SANB4	Banco Santander (Brasil)
4	BAZA3	Banco da Amazônia	4	BMGB4	Banco BMG	12	BEES3	Banestes S.A.—Banco do Estado do Espírito Santo
5	BMEB4	Banco Mercantil do Brasil	5	BBDC4	Banco Bradesco	13	BIDI4	Banco Inter
6	BPAN4	Banco Pan	6	BAZA3	Banco da Amazônia	14	ITUB4	Itaú Unibanco Holding
7	PINE4	Banco Pine	7	BBAS3	Banco do Brasil	15	ITSA4	Itaúsa
8	SANB4	Banco Santander (Brasil)	8	BGIP4	Banco do Estado de Sergipe			
9	BIDI4	Banco Inter						

Table 6 presents the arithmetic mean of the abnormal returns (ARs) and accumulated returns (CARs) of Event 1, for each of the 26 trading sessions of the nine stocks analyzed in the final sample, with 11 and 15 trading sessions for the event and comparison windows, respectively, In the case of ARs, 13 positive and negative results are identified each. In this case, all 26 CARs are negative, which corroborates H1 of the study—The announcement of the first death from COVID-19 in Brazil negatively impacts the return on bank shares.

Table 6

Average of ARs and CARs of Shares in Event and Comparison Windows of Event 1

Trading day	Window	AR	CAR	Trading day	Window	AR	CAR
-5	Event	-0.0502	-0.0502	8	Comparison	0.0136	-0.1155
-4	Event	0.0038	-0.0464	9	Comparison	-0.0104	-0.1259
-3	Event	-0.0069	-0.0533	10	Comparison	-0.0021	-0.1279
-2	Event	-0.0682	-0.1215	11	Comparison	-0.0143	-0.1422
-1	Event	0.0321	-0.0894	12	Comparison	-0.0294	-0.1716
0	Event	-0.0375	-0.1269	13	Comparison	0.0102	-0.1615
1	Event	-0.0208	-0.1476	14	Comparison	-0.0182	-0.1797
2	Event	-0.0545	-0.2022	15	Comparison	0.0333	-0.1464
3	Event	-0.0127	-0.2148	16	Comparison	0.092	-0.1372
4	Event	0.0415	-0.1734	17	Comparison	0.0280	-0.1092
5	Event	-0.0217	-0.1951	18	Comparison	0.0214	-0.0877
6	Comparison	0.0101	-0.1850	19	Comparison	0.0043	-0.0834
7	Comparison	0.0559	-0.1291	20	Comparison	0.0113	-0.0721

In turn, Table 7 presents the arithmetic mean of the abnormal returns (ARs) and accumulated returns (CARs) of Event 2, for each of the 26 trading sessions of the 15 stocks analyzed in the final sample, with 11 and 15 trading sessions for the event windows and comparison, respectively. In the case of ARs, 11 positive results and 15 negative results were identified. In the case of CARs, there are five positive results and 21 negative results, in opposition to H2 of the study—The announcement of the Selic reduction in Brazil—during COVID-19—positively impacts the return on bank shares.

Table 7

Average of ARs and CARs of Shares in Event and Comparison Windows of Event 2

Trading day	Window	AR	CAR	Trading day	Window	AR	CAR
-5	Event	-0.0008	0.0004	8	Comparison	-0.0091	-0.0097
-4	Event	0.0033	0.0056	9	Comparison	-0.0165	-0.0274
-3	Event	-0.0007	0.0061	10	Comparison	-0.0057	-0.0319
-2	Event	-0.0039	0.0023	11	Comparison	0.0076	-0.0242
-1	Event	-0.0017	-0.0002	12	Comparison	-0.0062	-0.0311
0	Event	-0.0097	-0.0107	13	Comparison	0.0092	-0.0210
1	Event	-0.0106	-0.0197	14	Comparison	0.0067	-0.0140
2	Event	0.0051	-0.0121	15	Comparison	0.0003	-0.0132
3	Event	0.0155	-0.0008	16	Comparison	-0.0026	-0.0177
4	Event	-0.0045	-0.0029	17	Comparison	0.0150	-0.0014
5	Event	0.0017	-0.0019	18	Comparison	-0.0052	-0.0043
6	Comparison	-0.0096	-0.0098	19	Comparison	0.0150	0.0048
7	Comparison	0.0064	-0.0017	20	Comparison	-0.0087	-0.0013

As for Table 8, it presents the result of the normality test of the ARs and CARs of the final sample for Events 1 and 2. The hypothesis test applied considers in its null hypothesis that the AR/CAR distribution is normal. The statistical significance level of the test is 5%. In the case of Event 1, there are 7 (2) ARs and 5 (4) CARs with (non) normal distribution. For Event 2, there are 11 (4) and 8 (7) ARs and CARs with (non) normal distribution, respectively.

Table 8

Shapiro-Wilk Normality Tests of ARs and CARs in the Event and Comparison Windows of Events 1 and 2

Event 1					Event 2				
No.	Ticker	Bank	P-value AR	P-value CAR	No.	Ticker	Bank	P-value AR	P-value CAR
1	ABCB4	Banco ABC Brasil	0.0759	0.4309	1	RPAD3	Alfa Holdings	0.0007	0.2401
2	BRIV4	Banco Alfa de Investimento	0.0625	0.8428	2	ABCB4	Banco ABC Brasil	0.9586	0.4975
3	BMGB4	Banco BMG	0.8210	0.0155	3	BRIV4	Banco Alfa de Investimento	0.5689	0.4843
4	BAZA3	Banco da Amazônia	0.8714	0.6410	4	BMGB4	Banco BMG	0.1647	0.2948
5	BMEB4	Banco Mercantil do Brasil	0.7817	0.0011	5	BBDC4	Banco Bradesco	0.6547	0.0149
6	BPAN4	Banco Pan	0.0118	0.1481	6	BAZA3	Banco da Amazônia	0.0109	0.0008
7	PINE4	Banco Pine	0.0126	0.0090	7	BBAS3	Banco do Brasil	0.9137	0.8696

Table 8 to be continued

8	SANB4	Banco Santander (Brasil)	0.2751	0.1162	8	BGIP4	Banco do Estado de Sergipe	0.0092	0.0001
9	BIDI4	Banco Inter	0.8458	0.0000	9	BRSR6	Banco do Estado do Rio Grande do Sul	0.0979	0.1518
					10	PINE4	Banco Pine	0.9927	0.2803
					11	SANB4	Banco Santander (Brasil)	0.4087	0.8993
					12	BEES3	Banestes S.A.—Banco do Estado do Esp ŕito Santo	0.0675	0.0105
					13	BIDI4	Banco Inter	0.2170	0.0000
					14	ITUB4	Ita ú Unibanco Holding	0.0287	0.0149
					15	ITSA4	Ita úsa	0.2108	0.0049

Notes. Values in bold refers to normal distribution ARs/CARs (p-value > 5%).

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 information about the event under study. Therefore, Table 9 presents the results of the CAR mean difference tests of Events 1 and 2. For shares with normal distribution, the t-test is applied. For those with non-normal distributions, the non-parametric Wilcoxon signed test is applied. The hypothesis test performed considers its null hypothesis that the observed return is equal to the expected return of the stock, that is, the averages are equal. The level of statistical significance of the tests is 5%.

Regarding Table 9, it highlights that all CARs have means that are statistically different from zero. In Event 1, Table 6 indicates that 100% of the auctions (26/26) have a negative CAR. This, it is possible to definitively confirm H1 of this study—The announcement of the first death form COVID-19 in Brazil negatively impacts the return on bank shares. However, in relation to Event 2, Table 7 shows that only 19.23% of trading sessions (5/26) have a positive CAR, which does not allow confirmation of H2—The announcement of the Selic reduction in Brazil—during COVID-19—positively impacts the return on bank shares.

The confirmation of H1 is in line with the results of the studies mentioned in Table 1—which deal with the impact of reporting the first case or death—resulting from COVID-19—on the return on shares in the banking sector. In fact, the pandemic caused abrupt drop in countries' economic activities. Furthermore, its speed of contagion, high risk of death, or permanent sequelae in the population causes even more uncertainty in the markets. Such effects negatively affect productive investment decisions by companies and—consequently—people's employment and income. This is reflected in the devaluation of shares and the fall in stock market indices. These results also confirm the efficiency markets theory. Stock prices are affected by the communication of events related to the pandemic, confirming the semi-strong level of market efficiency.

As for H2, the results of the studies presented in Table 3 are also inconclusive. This means that the adoption of countercyclical policies—such as the reduction of the basic interest rate—does not cause the expected expansionary effect of a uniform stimulus to the economic activity—and the consequent increase in the companies' profits and share prices. In the case of the Brazilian banking sector, specifically, the spread over the basic interest rate is traditionally high. Furthermore, part of the deposits is—necessarily—directed to certain lines of credit—e.g.: demand deposit/rural credit, savings deposit/real estate credit, etc. These characteristics lead to a certain stability in the relationship between supply and demand for credit and bank profitability. Thus, the price

of shares in the banking sector is more influenced by expectations of the performance of the Brazilian economy that by changes in the basic interest rate.

Table 9

Tests of Average Differences of CARs on Event and Comparison Windows of Events 1 and 2

Event 1					Event 2				
No.	Ticker	Bank	Test	P-value	No.	Ticker	Bank	Test	P-value
1	ABCB4	Banco ABC Brasil	T test	0.0000	1	RPAD3	Alfa Holdings	T test	0.0000
2	BRIV4	Banco Alfa de Investimento	T test	0.0000	2	ABCB4	Banco ABC Brasil	T test	0.0000
3	BMGB4	Banco BMG	Wilcoxon	0.0003	3	BRIV4	Banco Alfa de Investimento	T test	0.0007
4	BAZA3	Banco da Amazônia	T test	0.0005	4	BMGB4	Banco BMG	T test	0.0108
5	BMEB4	Banco Mercantil do Brasil	Wilcoxon	0.0000	5	BBDC4	Banco Bradesco	Wilcoxon	0.0000
6	BPAN4	Banco Pan	T test	0.0000	6	BAZA3	Banco da Amazônia	Wilcoxon	0.0002
7	PINE4	Banco Pine	Wilcoxon	0.0006	7	BBAS3	Banco do Brasil	T test	0.0007
8	SANB4	Banco Santander (Brasil)	T test	0.0000	8	BGIP4	Banco do Estado de Sergipe	Wilcoxon	0.0000
9	BIDI4	Banco Inter	T test	0.0000	9	BRSR6	Banco do Estado do Rio Grande do Sul	T test	0.0000
					10	PINE4	Banco Pine	T test	0.0000
					11	SANB4	Banco Santander (Brasil)	T test	0.0000
					12	BEES3	Banestes S.A.—Banco do Estado do Espírito Santo	Wilcoxon	0.0008
					13	BIDI4	Banco Inter	T test	0.0000
					14	ITUB4	Itaú Unibanco Holding	Wilcoxon	0.0000
					15	ITSA4	Itaúsa	Wilcoxon	0.0000

Notes. Values in bold are the ones that present CAR with an average statistically different from zero, to 5% significance level (p-value < 5%).

Conclusion

The COVID-19 pandemic has a profound impact on society in general. Economies face a period of recession that is normally overcome through the implementation of countercyclical government policies. The application of these policies relies on the fundamental role of financial intermediation developed by banks. Thus, this study aims to verify two events from the perspective of the theory of efficient markets. The purpose is to investigate whether the communication of the first death due to COVID-19 and the consequent reduction of the Selic rate to 2% p.a. affect the price of bank shares in Brazil. The hypotheses arising from these objectives are: H1—The announcement of the first death due to COVID-19 in Brazil negatively impacts the return on bank shares and H2—The announcement of the Selic reduction in Brazil—during COVID-19—positively impacts the return of bank shares.

To this purpose, the event study methodology is adopted in a final sample of nine shares for Event 1—whose data are obtained during the period from March 13, 2019 to April 14, 2020. For Event 2, the final sample is

composed of 15 shares—whose data are obtained during the 1st period, from August 2019 to September 1, 2020. Regarding Event 1, Table 6 indicates that 100% (26) of the auctions related to the event (11) and comparison (15) windows have negative average CARs. Furthermore, Table 9 shows that the CARs of the shares of the nine banks are statistically significant at the 5% level. Therefore, H1 is confirmed—The announcement of the first death from COVID-19 in Brazil negatively impacts the return on shares of the banks in this study and, consequently, the semi-strong level of informational efficiency in the market. Furthermore, this result is in line with those obtained by the studies mentioned in Table 1.

As for Event 2, Table 7 shows that of the 26 trading sessions in the event (11) and comparison (15) windows, only 19.23% (5/26) of them have positive average CAR, with another 80.77% (21/26) trading sessions with negative average CARs. In turn, Table 9 confirms the statistical significance—at the 5% level—of the CARs of the 15 banks shares. These results do not allow confirmation of H2—The announcement of the Selic reduction in Brazil—during COVID-19—positively impacts the return on bank shares. The alternation of results from the studies presented in Table 3 corroborates the fact that the effect of the countercyclical policy of reducing the basic interest rate does not fully meet governments' expectations.

Because they are agents directly linked to the performance of the real economy, bank share prices reflect market projections regarding the performance of economic activity. Between 2019 and 2020, there was a decrease in the Brazilian Gross Domestic Product (GDP) of 1.22% p.a. to -3.95% p.a. (IBGE, 2023). During this peak period of COVID-19, there is a slowdown in consumption and demand for credit, causing a devaluation in the price of shares in the banking sector—consequently. The severity of the impacts of the pandemic on the Brazilian market is not capable of being reversed—in the short term—even with the reduction of the Selic rate to 2% p.a. on August 1, 2020. Since banks are a relevant transmission channel for monetary policies, their share prices reflect the success of failure in the adoption of these government measures.

In view of the above, this study contributes to the discussion on the impacts of COVID-19, as well as the effectiveness of the speed of countercyclical policies, in the pricing of shares in the Brazilian banking sector. Among its limitations is the reduced number of publicly traded banks in Brazil. A sample with a greater number of observations would allow a more robust analysis of the objectives of this research. For future investigations and deeper understanding of the topic, we suggest comparing the results observed in Brazil with those in other developing countries. It is also recommended to analyze longer periods. This would make it possible to verify the effectiveness of contractionary policies adopted after COVID-19, with the aim of cooling inflation resulting from the heating of the economy. It is in the interest of governments and markets to understand the impact of choices between controlling inflation and stimulating the economy.

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