STUDY ON THE AREAS AFFECTED BY THE COVID-19 PANDEMIC IN ROMANIA

Oana PANAZAN, Catalin GHEORGHE ⓘ *

*Department of Engineering and Industrial Management, Transilvania University of Brașov,
b-dul Eroilor 29, 500036 Brașov, România*

Abstract. The crisis caused by the spread of the COVID-19 virus has affected companies listed on the stock exchange differently. While some actions have not been affected by the pandemic, others have declined sharply. Based on such a hypothesis, the objective of the research is to determine the extent to which the shares of companies listed on the Bucharest Stock Exchange were affected by the COVID-19 pandemic. The analysis period is between 01.01.2020 and 01.03.2021. For the shares that registered reductions of the market price, the period in which they reached the minimum value was established. Next, the average period was established in which their exchange rate returned to the value of January 2020. The research followed the dynamics of the listed shares from the point of view of the activity carried out and a ranking of them was made.

Keywords: COVID-19 pandemic, NACE Rev.2, ISIC Rev.4, Bucharest Stock Exchange, stock, company.

JEL Classification: G32, M10, O16.

Introduction

The global economy has been severely affected by the COVID-19 pandemic. The general context was dominated by uncertainty, generated by the rapid spread of the virus in waves and by the restrictive measures implemented by the authorities to combat medical problems. The crisis has seen significant declines in economic activity, with temporary reduction of production, the collapse of international trade and a significant investments reduction. Consumption of the population has also been affected, mainly due to the prospect of declining incomes and reluctance to engage in physical interaction. The effects of the pandemic have been passed on to stock markets around the world. The crisis has led to a decline in stock market activity, which shows the global size of the COVID-19 pandemic.

The emergence of the global COVID-19 crisis in the first quarter of 2020 progressively affected the Romanian economy through various channels, as can be seen in Figure 1. Combating the spread of the virus led to the establishment of a state of emergency, decreed by the President of Romania on March 14 a period of 60 days.

The economic impact of the COVID-19 crisis varies from one company to another, depending on a number of factors.

1 **December 8, 2019**
First cases of symptomatic disease.

2 **December 31, 2019**
First cases were reported.

3 **February 26, 2020**
First cases of illness were reported in Romania.

4 **March 11, 2020**
World Health Organization says the spread of COVID-19 virus has reached a pandemic.

5 **March 2020**
First lockdown in Romania, an aspect that led to a sharp decrease in the market price for listed companies.

6 **March 2020**
Starting with March 2020, there were: quarantine abroad, quarantine inside the country, there were decreases in external demand.
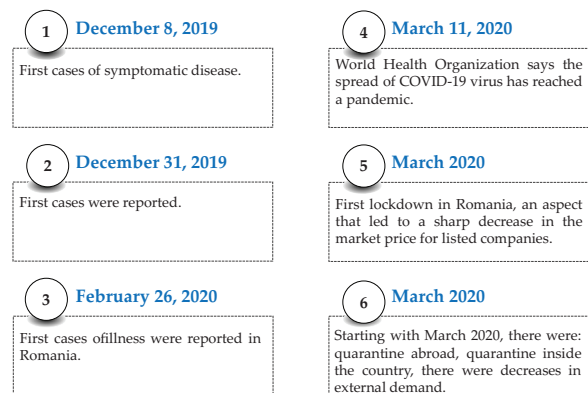
Figure 1. Coordinates of the COVID-19 pandemic in Romania (source: author's elaboration, based on Centrul Național de Supraveghere și Control al Bolilor Transmisibile [CNSCBT], n.d.)

The evolution of confirmed cases of COVID-19 virus in Romania is shown in Figure 2.

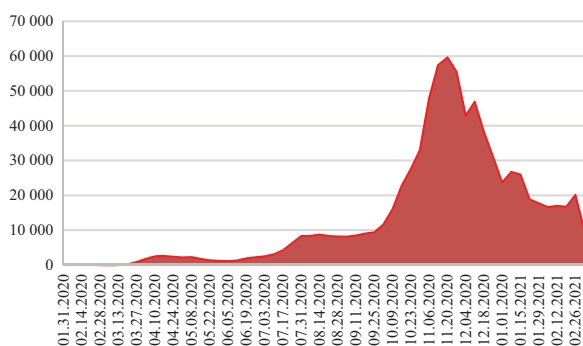* Corresponding author. E-mail: *gheorghe.c@unitbv.ro*

Figure 2. Number of cases of COVID-19 diseases confirmed in Romania during the analysis period (source: author's elaboration, based on CNSCBT, n.d.)

All shares listed on Bucharest Stock Exchange [BSE] were considered, regardless of the market or the segment on which they are traded. The number of days when the shares reached a minimum value was determined, compared to 01.01.2020.

Using the same benchmark, was determined the period in which the shares of the companies returned to their value on 01.01.2020. The results obtained were grouped according to the object of activity of the companies listed on BSE. The classification of the activities was done taking into account the specific legislation existing at national and international level. Such an organization allowed the ordering of activities according to the impact generated by the COVID-19 pandemic.

The paper is structured in sections. The following section contains a summary of the relevant literature on the impact of COVID-19 virus on stock markets. The second section describes the research methodology. The third section presents the results of the research and discussions related to the results obtained. The last section includes the conclusions of the research, limits, and future directions of the research.

1. Literature review

There have been studies on the impact of an infectious disease on stock markets on different continents before the onset of the COVID-19 virus. Such studies have referred to severe acute respiratory syndrome (SARS), and its impact on the capital markets, has been studied for a long time. Lee and McKibbin (2004) studied the impact of SARS on the world economy, Chen et al. (2007) followed the impact of this virus on the Taiwanese stock market in 2007, and Nippani and Washer (2004) stock markets in China and Vietnam. In a different paper, Chen et al. (2007) established the impact of SARS on Asian stock markets. The impact of the Ebola virus (EVD) on stock exchanges has been the subject of research led by Ichev and Marinc (2017). The influence of Zika virus on capital markets in South America has been studied by Macciocchi et al. (2016). Other researchers concerned about the link between a virus and the capital market were:

McKibbin and Sidorenko (2006), Smith et al. (2011), Karlsson et al. (2014).

For the past two years, researchers have been trying to respond to the economic challenges posed by the impact of the COVID-19 pandemic. The aspects pursued by the researchers were different. Some researchers have looked at the effects of virus transmission on the stock market nationwide (Al-Alawadhi et al., 2020; Carletti et al., 2020; Didier et al., 2020; Gajdzik & Wolniak, 2021; Herwany et al., 2021; Hung et al., 2021; Hoshikawa & Yoshimi, 2021; Lee et al., 2020; Lee, et al., 2021; Plastun et al., 2021; Tu & Hoang, 2021; Utomo & Hanggraeni, 2021; Wu et al., 2021; Xiong et al., 2020). Another orientation was the impact of the virus on the capital markets of different countries, located on the same continent (Aslam et al., 2021; Czech et al., 2020; Rabhi, 2020). Other researchers have conducted analysis of stock markets located on different continents, demonstrating the global influence of the pandemic (Bieszk-Stolorz & Dmytrow, 2021; Chahuán-Jiménez et al., 2021; David et al., 2021; O'Donnell et al., 2021; Okorie & Lin, 2021; Yu et al., 2021; Valls Martínez & Cervantes, 2021; Rai & Garg, 2021).

As a research results, the effects of the COVID-19 pandemic on financial markets, operators, traded values, specific mechanisms and other parties involved in financial mechanisms are known. The results obtained are different, depending on the direction chosen by the researchers. Thus, according to Rahim et al. (2020) and Utomo and Hanggraeni (2021), information played a decisive role during the COVID-19 pandemic. The Indonesian capital market reacted to information published by the government in March 2020. Chundakkadan and Nedumparambil (2021) tracked the impact of the light-lamp event in India during the COVID-19 pandemic. Fariska et al. (2021) found an increase in the phenomenon of microblogging in 2020. The authors found that investors who use microblogging have a significant impact on stock volatility and returns and vice versa. Lee et al. (2021) tracked the stock market reaction during the pandemic for listed Chinese companies and found that firms with a high volume of fixed assets and a high percentage of institutional investors were more affected.

According to Spelta et al. (2021), financial markets, they may react ineffectively to ads. Tissaouia et al. (2021) demonstrated that the pandemic does not affect the long-term liquidity of the market. Ryandono et al. (2021) have shown that there are shares that continue to perform well in the market even if there is negative information.

The spread of COVID-19 virus has disrupted global production and supply chains (Weiqing et al., 2021) and increased gregarious behavior in European capital markets (Espinosa-Mendez & Arias, 2021). Initial market reaction reflects concern over low-capitalized banks' crisis resilience (Bernardelli et al., 2021). Wieprow and Gawlik (2021) demonstrated the need to monitor the economic stability of the industry, as well as to invest and lend. If the concern of investors in any economy is to identify

the most profitable market (Samadi et al., 2021), then corporations should focus on intellectual capital, because it is the factor that reflects the awareness of investments among customers (Obeidat et al., 2021).

Carletti et al. (2020) established that the impact of the COVID-19 shock on Italian companies varies depending on the performance of the analyzed companies. The impact was greater for small and medium-sized enterprises. Wieprow and Gawlik (2021) analyzed the impact of the COVID-19 outbreak on Chinese tourism-listed tourism companies. The authors point out that government interventions will mitigate the negative impact of the virus on the economy. Rabhi (2020) studied the link between investor behavior and fear of COVID-19 deaths. Chahuán-Jiménez et al. (2021) showed that countries with a better health care system experienced lower declines in stock market indices during the pandemic. Herwany et al. (2021) investigated how the COVID-19 pandemic affected the Indonesian capital market and provides results on affected economic sectors. Didier et al. (2020) followed the causal relationship between corporate financing and US government decisions during the pandemic. O'Donnell et al. (2021) showed that investors reacted instinctively and decided to act early, before recording financial damage.

Several researchers have shown a different temporary connection between stock markets, determined by the state of economic uncertainty (Aslam et al., 2021; Chahuán-Jiménez et al., 2021; Lee et al., 2020; Okorie & Lin, 2021; Yu et al., 2021; Valls Martínez & Cervantes, 2021), such results demonstrate that stock market relations become more pronounced in times of crisis and confirm the relationship between the COVID-19 pandemic and the significantly negative returns on capital markets.

The models used by the authors allowed the fulfillment of the objectives and the demonstration of the formulated hypotheses. Commonly used models were: multiple regression analysis (Al-Alawadhi et al., 2020; Carletti et al., 2020; Didier et al., 2020; Chahuán-Jiménez et al., 2021; Plastun et al., 2021; Xiong et al., 2020); MES (Wu et al., 2021); OLS (Herwany et al., 2021); TGARCH (Czech et al., 2020); ARDL (Rabhi, 2020).

Certain limitations of the classical models of analysis of stock market phenomena during the COVID-19 pandemic have been demonstrated. Rahim et al. (2020) showed that ESG (Environmental, social, and governance scores) are not appropriate during the COVID-19 pandemic, as their content decreased in 2020. Plastun et al. (2021) presents some evidence that supports the evolving concept of financial markets, and the crisis may have a triggering role for evolutionary processes.

Research has been conducted that has identified the most affected economic areas in an economy, but these have been limited to a few areas and, in most research, there is no order of theirs. Xiong et al. (2020) argue that companies in the retail, transportation, tourism, postal services, real estate, construction, and entertainment sectors have been vulnerable to the COVID-19 pandemic.

Herwany et al. (2021) shows that Indonesia's most affected sector is the financial sector, followed by trade, services and investment, and the consumer goods and mining sectors have been less affected by the pandemic. Another limitation is that there is no research at the national level that ranks the economic activities of companies listed on the stock exchange, in terms of how they were affected during the COVID-19 pandemic. Having as a reference the limits resulting from the study of the literature, the objective of the research was established. The main objective was to follow the way in which the shares of the companies listed on the Bucharest Stock Exchange were affected depending on their object of activity. Such results are useful because they allow comparative analyzes between countries, activities, companies, and the orientation of the authorities in combating the effects generated by the pandemic.

2. Data and methods

The research methodology involved the following steps:

a) Identification of all shares, regardless of the market or segment, on which they are listed on the BSE;

b) Elimination of shares whose stock price has been affected by major problems of the company or for which no transactions have been recorded during the entire analysis period;

c) For each remaining share, the number of days it reached the minimum value and the number of days after which it returned to the value before the pandemic was calculated (the value corresponding to the date of 01.01.2020);

d) Grouping the results obtained according to the object of activity of the listed company, taking into account the specific legislation at national and international level.

The analysis period between 01.01.2020–01.3.2021 was set so that the first three waves of the COVID-19 pandemic in Romania. Prior to this, the market was operating normally, without major disruptions.

The data was collected from BSE's electronic platform. The Bucharest Stock Exchange offers a financing alternative both to mature companies, which can attract capital on the Main Market (RM), as well as to start-ups and SMEs for which the AeRO market was created. Both markets are divided into two sections: premium and regular. All shares regardless of the market or segment in which they are traded have been taken into account.

Initially, 368 shares of all companies listed on the BSE were initially included in the analysis at the beginning of the analysis period, January 1, 2020. These include 18 shares of foreign companies from the following countries (BSE, n.d.): Germany (13 companies), Poland (1), Netherlands (1), Austria (1) and Cyprus (2). The research did not take into account the shares of international companies. The arguments that led to such an organization are: the much higher market capitalization of foreign
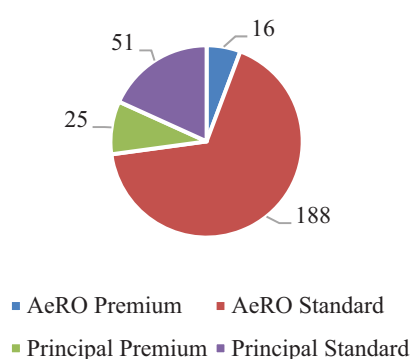
Figure 3. Distribution of shares by markets and segments (source: author's elaboration, based on BSE, n.d.)

companies compared to domestic ones, higher stock market performance, and influences from the countries of origin.

Next, 88 shares were eliminated due to events that affected the stock market during the analysed period, such as: insolvency proceedings, suspension from trading, merger, withdrawal request from trading, lack of transactions during the analysis period, and others. In this way, 280 shares remained. The shares included in the analysis were graphically represented in Figure 3. Collected data were statistically processed with SPSS, version 25. The programs were used to complete the steps previously specified in organizing the research.

3. Results and discussion

Shares listed on the BSE saw a decline in the stock market during the COVID-19 pandemic. The discount percentage is specific to each company depending on the object of activity. Initially, it was the number of days, when the share reached the minimum value, calculated compared to the beginning of the period (01.01.2020). The data processing allowed to determine the average number of days at which the shares reached the minimum value. The calculation was performed for all shares and followed their dynamics throughout the period. Statistical data are presented in Table 1.

Table 1. Statistical data

Number of companies	Valid	280
	Missing	0
Mean		132.29
Median		61.50
Minimum		0
Maximum		425
Skewness		1.034
Kurtosis		−.083

Table 1 shows that the data collected from the BSE platform were statistically validated. Of all the 280 shares, the average period at which the minimum value

was reached is 140.82 days compared to 01.01.2020. It means that, on average, the shares listed on BSE reached a minimum value on May 2, 2020, days after the first cases of illness with COVID-19 and 86 days after the first lockdown in Romania. The median formed was 89.50 days corresponding to March 30, 2020. Such a result shows that most shares reached the minimum value 33 days after the onset of the first cases of illness.

A share in which the market price has not returned to its initial value has a value of 425 days in Table 2. It means that during the analyzed period o f the course, it had decreases and increases, but it did not manage to return to the value it had before the pandemic. On the other hand, a share that was not affected by the COVID-19 pandemic is associated with the value 0. It means that the stock price of the share was higher, without falling to the value of the beginning of the period.

The distribution of the average number of days, at which the studied shares reached the minimum value, established on the markets and segments are: Main premium (155 days), Main standard (129 days), AeRO Premium (110 days), AeRO Standard (138 days).

It is noted that all categories and segments of BSE have been affected, and the period in which the shares listed on BSE have reached the minimum is between (110–155) days. Authors found that there are differences between the markets and the BSE segments in terms of how they were affected by the pandemic. The fastest affected was the AeRO Premium segment as the shares reached the minimum value after 110 days from the beginning of 2020. With the longest delay was affected the segment that includes the most important companies traded on the Romanian market (Main premium).

Table 2. Frequency, percent and cumulative percent

Number of days	Frequency	Percent	Cumulative percent
0	22	7.9	7.9
32	1	.4	8.2
33	19	6.8	15.0
58	1	.4	15.4
60	5	1.8	17.1
61	83	29.6	46.8
62	1	.4	47.1
79	1	.4	47.5
85	1	.4	47.9
89	1	.4	48.2
91	20	7.1	55.4
109	1	.4	55.7
116	1	.4	56.1
121	20	7.1	63.2
142	1	.4	63.6
145	1	.4	63.9
146	2	.7	64.6
152	7	2.5	67.1
162	1	.4	67.5

End of Table 2

Number of days	Frequency	Percent	Cumulative percent
166	1	.4	67.9
169	1	.4	68.2
170	1	.4	68.6
175	2	.7	69.3
180	1	.4	69.6
182	3	1.1	70.7
207	2	.7	71.4
209	1	.4	71.8
215	6	2.1	73.9
216	1	.4	74.3
225	1	.4	74.6
237	1	.4	75
243	1	.4	75.4
244	4	1.4	76.8
258	1	.4	77.1
268	1	.4	77.5
271	2	.7	78.2
272	2	.7	78.9
273	1	.4	79.3
274	3	1.1	80.4
275	1	.4	80.7
280	1	.4	81.1
282	1	.4	81.4
287	2	.7	82.1
288	1	.4	82.5
289	1	.4	82.9
293	1	.4	83.2
294	1	.4	83.6
299	2	.7	84.3
301	2	.7	85.0
302	4	1.4	86.4
306	6	2.1	88.6
314	1	.4	88.9
315	2	.7	89.6
317	1	.4	90.0
320	2	.7	90.7
321	1	.4	91.1
332	1	.4	91.4
333	1	.4	91.8
335	3	1.1	92.9
338	1	.4	93.2
362	2	.7	93.9
363	2	.7	94.6
366	1	.4	95.0
371	1	.4	95.4
379	1	.4	95.7
397	1	.4	96.1
406	1	.4	96.4
425	10	3.6	100.0
Total	280	100.0	

The frequency with which the shares reached the minimum value is set out below in Table 2. From the obtained results it is observed that the maximum frequency was reached at 61 days calculated compared to 01.01.2020, on March 2, 2020, when a number of 83 shares reached the minimum value. A number of 19 shares registered the minimum value on January 31, before the first case of infection appeared in Romania. Investors are found to have acted instinctively a few days after the first case of infection in China. The next high-value dates are 91 days (March 31) and 121 days (April 30). Figure 4 contains a histogram of frequencies, from which it can be seen that the capital market reacted with maximum intensity at the end of March 2020.
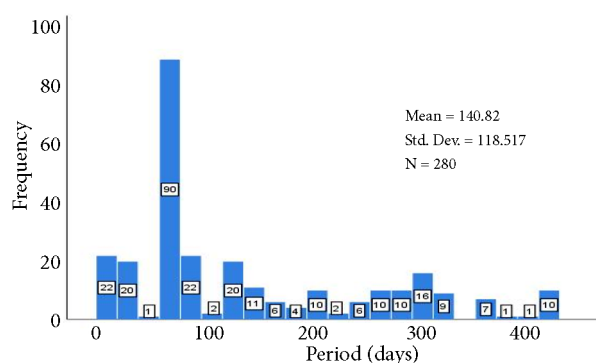

Figure 4. Frequency histogram

A number of 10 companies recorded the value of 425 days, which means that they registered an evolution below the value they had before the pandemic. The 10 companies belong to the following activities: extractive industry (2 companies), manufacturing industry (3 companies), wholesale and retail trade (1 company), transport and storage (1 company), hotels and restaurants (1 company), financial intermediation and insurance (1 company), administrative services (1 company). On the other hand, 22 companies (7.85% of the total) were not affected by the pandemic, as their market price did not decrease during the period. The result is of particular importance, which is why their object of activity has been identified: manufacturing (11 companies), financial intermediation and insurance (4 companies), construction (2 companies), wholesale and retail trade (2 companies), transport and storage (1 company), hotels and restaurants (1 company), professional, scientific, and technical activities (1 company).

The grouping of companies by activity codes, as they are organized in Romania, allowed the identification of the dynamics of each activity. The Classification of Activities in the National Economy [CANE] codes are used to designate the national statistical classification of economic activities in Romania. CANE Rev.2 corresponds to the Nomenclature of Activities of the European Community – NACE Rev.2 (EU standard) and the International Standard Classification of Economic Activities developed by the United Nations Statistical Commission – ISIC Rev.4 (UN standard). According to these

legislative elements, the organization of activities is done by activities (level 1), sections (level 2), groups (level 3) and classes (level 4).

In Table 3, companies were grouped by activities. The first section was considered in the research (the code consists of one letter), and for the manufacturing industry the second section (two-digit code). No greater degree of detail was required. Activity code: agriculture (A); extractive industry (B); manufacturing industry (C); production and supply of electricity and heat, gas, hot water and air conditioning (D); water distribution, sanitation, waste management (E); construction (F); wholesale and retail trade (G); transport and storage (H); hotels and restaurants (I); information and communications (J); financial intermediation and insurance (K); real estate transactions (L); professional, scientific and technical activities (M); administrative and support service activities (N) and health and social work (Q).

Table 3. Frequency of activities

Activity code	Frequency	Percent	Cumulative percent
A	5	1.8	1.8
B	9	3.2	5.0
C	130	46.4	51.4
D	2	.7	52.1
E	2	.7	52.9
F	24	8.6	61.4
G	25	8.9	70.4
H	13	4.6	75.0
I	21	7.5	82.5
J	2	.7	83.2
K	14	5.0	88.2
L	19	6.8	95.0
M	10	3.6	98.6
N	3	1.1	99.6
Q	1	.4	100.0
Total	280	100.0	

It is found that most companies have as object of activity C (manufacturing industry which groups 130 companies with a share of 46.4% in total), followed by G (wholesale and retail trade, 25 companies with a share of 8.9%) and H (transport and storage, 13 companies with a share of 4.6%). The number of days was grouped on each activity and resulted the values in Figure 5. The highest number was 335 days, recorded by the construction field (E), followed by agriculture 210 days and extractive industry 209.22 days. At the opposite pole, the lowest values were identified in health and social assistance 61 days, transport and storage 77.3 days and information and communications 106.5 days.

A total of 22 shares (7.9%) were not affected by the pandemic, as their market price was higher than the value recorded during the entire analysis period. Their object of activity has been identified.
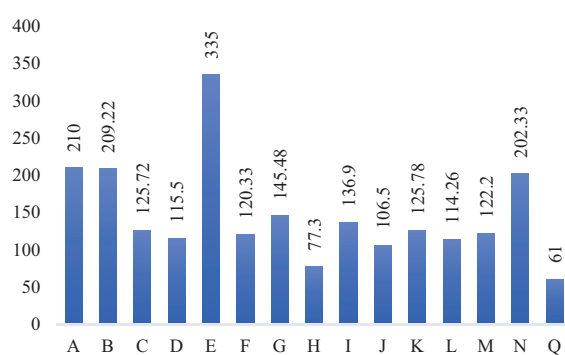

Figure 5. The period in which the shares reached the minimum value by types of activities

Table 4. Distribution of companies in the manufacturing industry by groups of activities

Group of activities	Description	Number of companies
10	Food industry	10
11	Manufacture of beverages	4
13	Manufacture of textiles	5
14	Manufacture of wearing apparel	4
15	Tanning and dressing of leather, manufacture of travel and leather goods	3
16	Woodworking, manufacture of wood and cork products, except furniture	1
17	Manufacture of paper and paper products	1
18	Printing and reproduction of recordings on media	1
19	Manufacture of coke oven products and petroleum products	1
20	Manufacture of substances and chemicals	2
21	Manufacture of basic pharmaceutical products	4
22	Manufacture of rubber and plastic products	7
23	Manufacture of other non - metallic mineral products	7
24	Metallurgical industry	6
25	Metal construction and metal products industry	19
26	Manufacture of computers, electronic and optical products	5
27	Manufacture of electrical equipment	13
28	Manufacture of machinery, machinery and equipment	16
29	Manufacture of road transport vehicles	5
30	Manufacture of other means of transport	11
31	Manufacture of furniture	5
Total		130

346

In the case of the manufacturing industry (field of activity C), the activity consists in the mechanical, physical or chemical transformation of materials, substances or components. The activity includes a number of groups, numbered from 10–33. Only groups with at least one company were retained. In order to have a clear picture of the manufacturing industry, the 130 companies were detailed according to the group they belong to. The data obtained were centralized in Table 4.

From Figure 6 it can be seen that the shortest durations correspond to activities D (103.5 days), G (195.4 days) and Q (196 days). Diametrically opposed are the activities with codes E (425 days), N (338.33 days) and K (321.28 days). The average duration in which the shares of the companies in the manufacturing industry reached the minimum value is in the range (103.5–425) days. The large range is noticeable, which means that the companies in the manufacturing industry have been affected differently, depending on their object of activity.
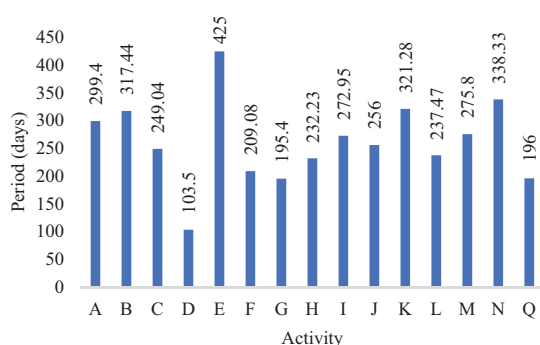

Figure 6. The average period depending on the company's activity

The last part of the research aimed to follow the way in which the shares return to the value from the first day of the analysis period (01.01.2020). The variable was the number of days the share reached the same initial value. Figure 6 groups the results obtained. Related to activity C, the results obtained in Figure 7 were detailed and represented graphically. It is found that the industry with the fastest is group 18 (60 days), the result being irrelevant as there is only one company in this group.
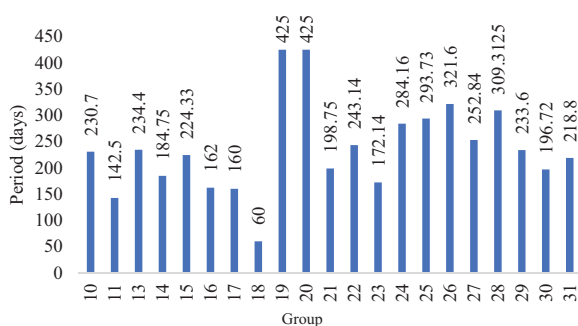

Figure 7. The average period in the manufacturing industry

On the other hand, there are companies from industries that have returned with difficulty (groups 26, 28, 25, 24). Some failed to recover for the entire analysis period (groups 19, 20).

Conclusions

The objective of the research was to establish the average period in which the shares reach the minimum value, the average period in which they return to the value before the pandemic and to rank the results according to the object of activity of the companies listed on BSE. It is found that a number of 22 shares (7.9%) were not affected by the pandemic as their market price was higher than the value recorded during the entire analysis period. At the opposite pole, a number of 10 shares (3.6%) did not recover during the analysis period, their price being below the value of 01.01.2020.

Taking into account the analyzed shares, it is found that the average period, calculated compared to 01.01.2020, at which the minimum value was reached is 140.82 days. It means that, on average, the shares listed on BSE reached a minimum value on May 2, 2020, days after the first cases of illness with COVID-19 and 86 days after the first lockdown in Romania. The median formed was 89.50 days corresponding to March 30, 2020.

It is noted that all categories and segments of BSE have been affected, and the period in which the shares listed on BSE have reached the minimum, is between (110–155) days. The fastest affected was the AeRO Premium segment, as the shares reached the minimum value after 110 days from the beginning of 2020. The segment that includes the most important companies traded on the Romanian market (Main premium) was affected with the longest delay. The companies were grouped according to the activity carried out, taking into account the national and international legislation.

Some activities are poorly represented at BSE such as: D (2 companies), E (2 companies), J (2 companies), N (3 companies), Q (1 company). In these circumstances, the results obtained are not fully relevant due to the small number of companies carrying out these activities. As most of the companies listed on the BSE have as object of activity the manufacturing industry (C), the analysis continued their deepening. And in this case some activity groups contain a small number of companies such as: groups 16, 17, 18, 19 (1 company), and group 20 (2 companies). Future research directions can be targeted to remove such limitations. Another direction for future research is to analyze the variables that affected the volatility of stocks on the Romanian stock market during the COVID-19 pandemic.

The results obtained allow better information to all participants on how the COVID-19 pandemic affects the capital market. Based on the results obtained, comparisons can be made between companies, markets or activities.

Although the global economic context is still unclear after the pandemic, the COVID-19 virus has prompted governments to take steps to mitigate the impact on economies. Governments, central banks, and international financial institutions need to implement effective economic strategies and policies to manage the post-pandemic period. The European Union's response has been more prompt and concerted than ever on both strategic axes: combating the COVID-19 pandemic and its economic effects. The most important support mechanism set up at EU level is the Next Generation Program (NEXTGEN), which consists of allocating large financial resources. From this perspective, the article can help guide capital.

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Contribution

The authors state that they contributed equally to the article.

Disclosure statement

The authors declare no conflict of interest.

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