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The impact of COVID-19 pandemic on Moroccan firms' performance: A pre- and post-crisis comparative analysis

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Abstract: The health crisis linked to the COVID-19 pandemic has profoundly disrupted the global economic fabric, having a lasting impact on corporate performance. This article aims to assess the impact of this crisis on the financial performance of Moroccan companies. The analysis is based on two key indicators, return on assets (ROA) and return on equity (ROE), measured on a sample of Moroccan companies from various sectors. The Wilcoxon signed-rank test was applied to compare financial performance before and after the COVID-19 pandemic. Additionally, linear regression was performed to assess the impact of the health crisis on the financial performance of companies. Both the Wilcoxon signed-rank test and linear regression show that firm performance declined after the COVID-19 pandemic. These results reflect the fragility of certain companies in the face of exogenous shocks and underline the importance of strengthening their resilience through more appropriate management mechanisms. This work paves the way for future research incorporating governance variables as explanatory factors of organizational resilience.

Keywords: *Covid-19 pandemic; Financial performance, Morocco, Return on asset, Return on equity.*

1. Introduction

December 2019 marked the beginning of Covid-19 crisis. The pandemic broke out for the first time in China, then spread to almost the entire world. On January 23, 2020, the Chinese authorities confined 11 million people to Wuhan. Italy is the first European country to shut down all non-essential activities. Its population was confined on March 10, followed by France on March 16, and Morocco and Tunisia on March 20. During the 3rd week of March, faced with the need to slow the spread of the virus, governments around the world implemented containment measures and social distancing strategies.

The COVID-19 pandemic has profoundly impacted all sectors of society around the world. All countries have been affected by this crisis, and almost everywhere in the world, barrier measures have been reinforced by the closure of companies, businesses, and administrations. Inactivity directly affects entire sectors and forcing others to work in confinement. As of May 26, 2020, 213 countries have been affected by the virus, with a total of 5,591,677 cases of infection and 347,944 deaths [1].

The Covid-19 pandemic has profoundly disrupted global economic activity, with potentially far-reaching consequences for business performance. With the health crisis, companies experienced an exceptional situation. In this sense, many companies saw their sales plummet even though containment measures did not force them to close.

Morocco, like many other countries, has suffered a significant economic slowdown due to the health crisis caused by the COVID-19 pandemic. This crisis has had profound and widespread impacts on the country's economic structure, affecting businesses of all sizes and sectors. Many companies have had to reduce their workforce through waves of layoffs to manage their expenses due to a sharp drop in

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demand. In addition, the disruption of global supply chains has caused frequent stockouts, jeopardizing the continuity of production and distribution operations. These difficulties were compounded by a significant drop in sales, linked to sanitary restrictions, the temporary closure of certain business activities and a persistent climate of uncertainty. These various factors have highlighted the fragility of Moroccan companies to large-scale exogenous shocks, underscoring the importance of analyzing their performance before and after the crisis, in order to determine the extent to which the latter has influenced company profitability and stability.

There are studies on the impact of the health crisis on companies' performance in Morocco. This observation can be supported by the surveys conducted by the High Commission for Planning. Added to this, is the work of Bennis and Oudda [2] who attempted to study the impact of COVID-19 on the activity of Moroccan companies. Then there is the work of Chourafi and Sbiti [3] who attempted to compare the situation of Moroccan companies in different sectors before and after Covid-19. In the present work, the aim is to analyze the effect of this health crisis on the performance of Moroccan companies, by comparing performance indicators for the four years preceding the pandemic with those for the four years following it.

With this in mind, our research aims to answer the following question: What is the impact of the health crisis on the performance of Moroccan companies?

To address the research question, this article is organized into 4 main sections. Section 1 presents the literature review and the development of research hypotheses. Section 2 describes the materials and methods used. Section 3 presents the results obtained, while Section 4 is devoted to their discussion and the interpretation of the main findings.

2. Literature Review and Development of Hypotheses

2.1. COVID Health Crisis

A crisis is "an event which is perceived by all stakeholders as unexpected, potentially disruptive and which may threaten the organizations' objectives and have profound implications for its smooth running." [4].

In the context of organizations, a crisis is an unlikely event with significant repercussions that jeopardizes the viability of an organization and is characterized by causes, effects and means of finding an immediate solution. Lemonakis and Zairis [5] It's an incident that risks compromising the safety of individuals, the environment, the reputation of an organization and its stakeholders. Weick [6] for his part, stresses that a crisis can be seen as a situation that threatens an organization's functioning, objectives and even values, and requires the implementation of new managerial practices. Health crises are events that actually or potentially affect a large number of people, affecting health and possibly increasing the significant mortality or excess mortality factor. A recent example of a health crisis is the COVID-19 pandemic, which began in 2019 and affected millions of people worldwide.

Here, we can speak of the notion of a pandemic as the spread of a new disease affecting a significant proportion of the world's population. Coronavirus 2020 is a pandemic caused by an emerging infectious disease caused by the SARS-CoV-2 virus. The underlying disease is called COVID-19. The Covid-19 pandemic has had a significant economic impact, profoundly affecting businesses, workers and consumers in every country without exception.

In response to the Covid 19 pandemic, Morocco declared a state of health emergency on March 20, when the country counted just 77 cases of the disease. All public events were suspended, as was international travel, while urban and inter-city travel was subjected to draconian control. With the pandemic evolving at such a rapid pace, the Kingdom had to be highly responsive, deploying a multi-level action plan. Decisions were taken very quickly, with a dual health and financial response aimed at better controlling the consequences.

It's clear that, when a crisis occurs, it's not easy to pinpoint its precise duration and consequences. The coronavirus pandemic is no exception, posing a challenge on four levels: health, economic, social, and security. As of May 26, 2020, 213 countries have been affected by the virus, with a total of 5,591,677

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cases of infection and 347,944 deaths [1]. Companies, too, have suffered from this crisis. Administrative closures and restrictions on mobility and industrial relations have had a major negative impact on our economy and on the performance of most companies.

Numerous studies have analyzed the impact of COVID-19 over the period 2019-2021 in order to assess the situation created by this global health crisis, rapidly followed by an unprecedented economic and social crisis. Morocco, like many other countries, was faced with a marked economic slowdown, major recessions and a significant rise in unemployment. This led to a number of visible consequences for companies, such as waves of redundancies, stock shortages and a significant drop in sales.

During the COVID-19 crisis, companies experienced profound internal imbalances that severely affected their performance. These imbalances have led many organizations to a significant drop in productivity and performance, sometimes rendering them unable to generate sustainable profits. In this context, crisis management has proven to be a key lever for maintaining performance and supporting productivity growth. Companies have thus been led to rethink their management methods, adapting their organizational processes, enhancing their operational agility, and implementing resilience mechanisms to address uncertainty and prolonged disruptions.

2.2. Performance

Etymologically, according to Bourguignon [7] the concept of performance comes from the Old French "parformer", which, in the 13th century, meant "to accomplish, to execute" (Petit Robert). In the 15th century, it appeared in English with the verb "to perform", from which the word "performance" derives. It means both the accomplishment of a process or task, with the results that flow from it, and the success that can be attributed to it.

Performance is a central concept in management science research, which aims in every way to improve the performance of the company or organization [8]. Moreover, the quest for performance has long been a crucial preoccupation within companies. Mastering performance enables companies to position themselves in the marketplace and thus ensure their survival.

However, there are many definitions of performance, and the literature review shows that there are many definitions, depending on the context in which they are used. According to Bourguignon [9] performance is defined as "the achievement of organizational objectives, whatever the nature and variety of these objectives. This realization can be understood in the strict sense (result, outcome) or in the broad sense of the process that leads to the result (action)...". According to Lorino [10]. "...A company's performance is therefore whatever, and only whatever, contributes to improving the value-cost ratio, i.e. to improving net value creation". Other authors, on the other hand, emphasize that performance means achieving a minimum or acceptable result, or reducing what is undesirable [11].

As for Giraud, et al. [12] Performance corresponds to what managers seek to achieve in terms of their organizations' goals [12].

Pesqueux [13] gives a strict meaning to performance, which "is a quantified result with a view to ranking (in relation to oneself - improving one's performance and/or in relation to others). The evaluation of performance is therefore based on a frame of reference, a scale of measurement" [13].

The use of financial aspects has long been employed by companies to measure their performance, yet currently financial indicators are far from sufficient to assess performance. As such, the latter must be complemented by the integration of other non-financial dimensions [14].

Financial indicators are frequently used by companies to assess their performance. The financial approach to performance is based on all the results presented by the accounting system, mainly intermediate management balances and the various ratios used to measure corporate profitability.

The measurement of organizational performance has long been reduced to exclusively financial management criteria, yet performance assessment can never be limited to the financial aspect [14].

However, they have a number of limitations, as they do not take human capital into account. For this reason, financial indicators need to be complemented by other, non-financial indicators that include social, political and environmental dimensions.

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Performance management is a key element in ensuring the success and survival of organizations, but it takes on even greater importance in times of crisis, such as the global financial crisis of 2008 or the recent health crisis caused by the COVID 19 pandemic, which can have far-reaching consequences for companies' activities, testing their resilience and ability to maintain performance.

The COVID-19 crisis has had a major impact on the performance of companies worldwide. Containment measures, economic restrictions and changes in consumer behavior have created unprecedented challenges for organizations. Hence our research hypothesis that the COVID-19 crisis has had an impact on the financial performance of Moroccan companies.

To verify our hypothesis, we will focus on two sub-hypotheses:

H_1: The COVID-19 pandemic has a significant and negative effect on financial performance, as measured by ROE.

H_2: The COVID-19 pandemic has a significant and negative effect on financial performance, as measured by ROA.

The following figure presents a graphic illustration of the conceptual research model for the study:

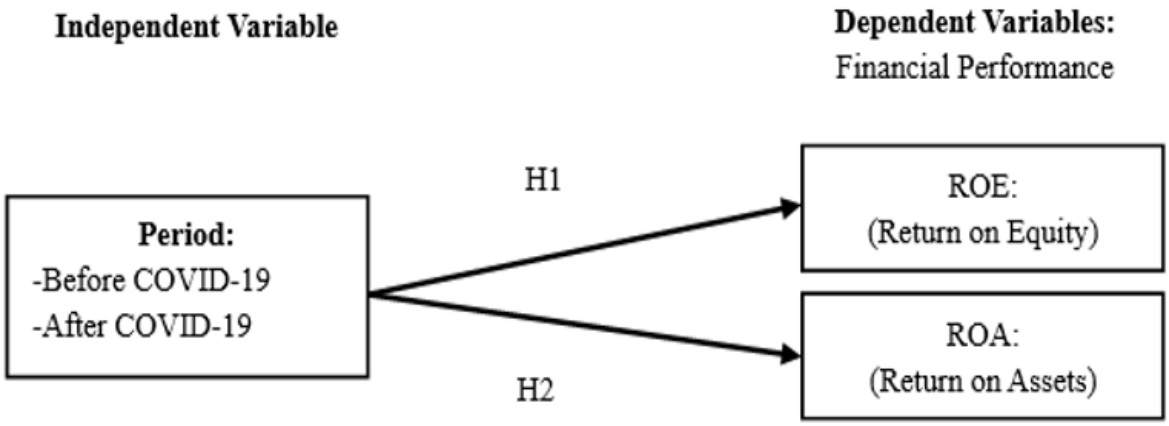

Figure 1.
Conceptual Model.

3. Data and Methodology

3.1. Sample and data Sources

The aim of this study is to analyze the impact of the COVID-19 crisis on the financial performance of companies, using key financial indicators: Return on Equity (ROE) and Return on Assets (ROA). The study compares company performance before and after the pandemic, using statistical tests adapted to data.

The data used in this study come from a sample of 50 companies listed on the Casablanca Stock Exchange. The two financial ratios were calculated using available financial information for the period 2016–2023. The analysis covers eight years of data for each company, divided into two distinct phases. The first phase covers the period from 2016 to 2019, representing the time before the health crisis. The second phase spans from 2020 to 2023, representing the period After the COVID-19 pandemic.

Each company has two variables (ROE and ROA) for each period, enabling a comparative analysis of financial performance before and after the pandemic.

The table below indicates the sectoral breakdown of our sample. It shows that a large majority of the companies in the sample belong to the banking sector, with a rate of 24% of the total, followed by firms operating in the building and construction materials sector with a rate of 12%.

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Table 1.
Sample by Company Sector.

	Percentage
Banking	24%
Building and Construction Materials	12%
Agri-food and Production	8%
Insurance	8%
Distributors	6%
Information Technology (Hardware, Software & Services)	6%
Real estate Development and Investment Activities	6%
Financing companies and other financial Activities	6%
Chemical Industry	4%
Oil & Gas	4%
Real estate investment trusts	4%
Beverage Industry	2%
Electricity	2%
Leisure and Hotels	2%
Mining	2%
Telecommunications	2%
Transportation	2%
Total	100%

3.2. Measurement of Variables

3.2.1. Dependent Variables

These are variables influenced by changes in independent variables. The dependent variables examined in this study were as follows:

- ROE measures the profitability of companies based on shareholders' equity. It is calculated as follows:

$$\frac{Net\ Profit}{Total\ Equity}$$

- ROA, on the other hand, measures how efficiently a company uses its assets to generate profits. It is calculated as follows:

$$\frac{Net\ Profit}{Total\ Assets}$$

These two indicators are essential for analyzing the financial performance of companies.

3.2.2. Independent Variable

The independent variable examined in this study is the Period. This variable distinguishes two observation periods:

Before COVID-19 (2016-2019)

After COVID-19 (2020-2023)

3.3. Statistical Analysis

The research was conducted using four main steps as follows:

–Step 1: Descriptive Statistics: In this study, descriptive statistics were used to describe the variables.

–Step 2: Normality Assumption: To select the most appropriate statistical tests for our study, it is essential to check the normality assessment of quantitative variables. This can be done using various normality tests, including the Kolmogorov-Smirnov, Shapiro-Wilk, Anderson-Darling, Lilliefors, Ryan-Joiner and Jarque-Bera tests. For our part, Shapiro-Wilk test and Kolmogorov-Smirnov were performed on SPSS V.25 software.

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–Step 3: Wilcoxon signed-rank test: the Wilcoxon signed-rank test was performed to compare quantitative data before and after the pandemic. The advantage of these tests is that the assumption of normal distribution is not required. This is a non-parametric test, it is the alternative to paired t-test [15]. A P-value < 0.05 was considered statistically significant. The effect size was measured by Wilcoxon's r. For performing this statistical analysis, the study sample was divided into two periods: After covid-19 and before covid-19

- Step 4: Test of the hypothesis by analysis of regression: This research used linear regression to assess the impact of the health crisis on the financial performance of companies.

Microsoft Excel was used to manage the data, and SPSS V.25 (Statistical Package for Social Science) for Windows was used to perform the data analysis. The statistical significance level was set at $p < 0.05$.

4. Results and Discussion

4.1. Descriptive Statistics

Brief descriptive statistics, summarized in Table 2 below, provide an overview of financial performance of the Moroccan firms covered by the current study. Based on this table, we can make the flowing observations:

The results show that, before the COVID period, the ROE ratio of the companies studied amounted to -0.19 and 0.65 respectively, with an average of 0.13015 and a median of 0.11. After COVID, ROE values ranged from -0.35 to 0.43, with an average of 0.0997 and a median of 0.09.

The ROA ratio ranged from -0.03 to 0.19 before the pandemic, with a mean of 0.0474 and a median of 0.03. After COVID, it ranged from -0.14 to 0.22, with a mean of 0.0355 and a median of 0.02.

Descriptive statistics already allow us to observe a difference between the data before and after the COVID-19 period. However, this observation can only be confirmed or refuted by appropriate statistical tests.

Table 2.
Summary Statistics.

	ROE		ROA	
	Before COVID	**After COVID**	**Before COVID**	**After COVID**
Mean	0.13015	0.0997	0.0474	0.0355
Median	0.11	0.09	0.03	0.02
Max	0.65	0.43	0.19	0.22
Min	-0.19	-0.35	-0.03	-0.14
Standard Deviation	0.1091	0.1017	0.0474	0.0465
Observations	200	200	200	200

4.2. Normality Assumption

Shapiro–Wilk and Kolmogorov–Smirnov test showed that data were not normally distributed. To examine the influence of outliers, various methods can be employed, the most common of which is the whisker Box Plot [16]. With this in mind, we used the Box Plot to visually identify outliers. After their detection (Refer Appendix A1), we eliminated only the most extreme outliers to assess their impact on the data distribution.

After identifying the outliers, we excluded the most extreme ones (Refer Appendix A2). However, when we repeated the normality tests, the results show that the variables still did not follow the normality assumption.

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Table 3.
Results of Shapiro-Wilk and Kolmogorov–Smirnov normality test.

Period		Shapiro-Wilk		Kolmogorov-Smirnov	
		N	Sig.	N	Sig.
ROE_Value	After COVID	197	0.000	197	0.000
	Before COVID	195	0.000	195	0.000
ROA_Value	After COVID	197	0.000	197	0.000
	Before COVID	195	0.000	195	0.000

Thus, for the condition of normality of the distribution to be met, the P-Value must be greater than the significance level at 0.05. If the distribution normality condition is met, parametric tests can be used. If the distribution normality condition is violated, non-parametric tests are applicable.

The results in Table 3 demonstrate that data were not normally distributed (P-Value < 0.05), then, t-test would not be appropriate to perform. We used the Wilcoxon signed-rank test to compare financial performance before and after the covid pandemic. The r value is used to measure the effect size.

4.3. Wilcoxon Signed-Rank Test

In this step, we apply statistical test for difference to compare financial performance indicators, namely ROE and ROA, between the period before COVID-19 and the period after it. Given that the data was not normally distributed and that they are paired observations (the same companies analyzed over two distinct periods), the use of Wilcoxon signed-rank test is relevant. This non-parametric test makes it possible to check whether there is a statistically significant difference between the measurements of the two periods without requiring a normality condition. The significance of the test statistics is determined by computing the P-value. If this P-value is less than a specified level (usually 0.05), the null hypothesis is rejected in favor of the alternative hypothesis. Otherwise, no conclusion can be reached [17]. The Wilcoxon signed-rank test results are presented below:

Table 4.
Difference between performance before and after the COVID-19 pandemic.

		N	Mean rank	Sum of ranks	Sig.	Z-value	Effect Size: Wilcoxon's r
ROE	Negative ranks	124	87.375	10.834.500	0.000	4.506[b]	-0.324
	Positive ranks	52	91.183	4.741.500			
	Ties	17					
	Total	193					
ROA	Negative ranks	102	74.627	7.612.000	0.000	4.814[b]	-0.342
	Positive ranks	42	67.333	2.828.000			
	Ties	54					
	Total	198					

Note: [b] Based on negative ranks
Wilcoxon's r value 0.10 measured small, 0.30 represents moderate, and 0.50 value considered large.

It is clear from Table 4 that the difference between performance is significant at 0.05 level of significance, which means that values after COVID are lower than those before COVID. Moreover, Both Z-values are negative, this indicates that the Covid-19 pandemic had a significant negative impact on financial performance.

In the Wilcoxon signed-rank test, several measures can be used to estimate the effect size. One of the most common is the coefficient r. The effect size makes it possible to estimate the real importance of the difference observed, regardless of the size of the sample, by relating it to the random variability of the data.

Wilcoxon's r shows a moderate effect for both performance indicators ROA and ROE (r = 0.33, r= 0.34 respectively). These values remind us that the variations observed in the performance of companies before and after the crisis are statistically significant.

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4.4. Regression Analysis

To evaluate the impact of the health crisis on the financial performance of companies, a linear regression was constructed. The linear regression equations used:

$y = \beta 0 + \beta 1x + \varepsilon$

Where,

y: is the value of the dependent variable: ROE and ROA.

$\beta 0$: is the intercept.

$\beta 1$: is the regression coefficient for the independent variable.

x:is the independent variable: Period time.

ε: is the random error term

Table 5.
Regression Analysis Result.

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Standard Error.	Beta		
ROE	(Constant)	0.161	0.017		9.632	0
	Period	-0.03	0.011	-0.143	-2.887	0.004
ROA	(Constant)	0.059	0.007		7.99	0
	Period	-0.012	0.005	-0.126	-2.535	0.012

The linear regression results indicate that the independent variable has a significant negative effect on the dependent variables with a p-value less than 0.005 for both performance indicators ROA and ROE. Thus, the covid pandemic affected financial performance negatively. Therefore, we support our hypotheses. It can be argued that Moroccan companies experienced a decline in activities after the Covid-19 period. Therefore, the Covid-19 pandemic had a significant negative impact on financial performance as measured by ROE and ROA.

5. Discussion of Findings

According to Atayah, et al. [18] Covid-19 on financial performance varies from country to country. The aim of this research was to examine this impact on the performance of Moroccan companies. Using the Wilcoxon signed-rank test, we sought to assess whether company performance had varied significantly after the crisis. The results of the Wilcoxon signed-rank test show that the p-value for both variables, ROE and ROA, is less than 0.05, indicating a statistically significant difference in company performance before and after the crisis. On the other hand, the negative value of the Z statistics indicates a decline in companies' financial performance after the pandemic. This decline is consistent with the general economic impact observed in several industries following the health crisis, notably due to demand disruptions, health restrictions and financing difficulties.

To complete this analysis, we calculated the effect size (Wilcoxon's r) to measure the significance of the observed change. The r coefficients obtained in the analysis indicate a moderate effect of the health crisis on financial performance indicators. Indeed, for ROE, the value of r is -0.3243294, indicating a significant impact on return on equity. Similarly, ROA has a coefficient of -0.3420997, which also confirms a significant influence of the pandemic on return on assets.

The regression analysis validated the proposed hypothesis. The results of this simple linear regression confirm the impact of the COVID-19 pandemic on the financial performance of the sampled companies. Coefficient B is negative for both models, indicating that company performance declined during the post-COVID period. This decline is statistically significant ($p < 0.05$), confirming the results obtained using the non-parametric Wilcoxon test.

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Although these results do not reflect a complete collapse in financial performance, they highlight a deterioration sufficiently marked to justify particular attention in interpreting the effects of the crisis on corporate performance.

In conclusion, our results highlight a significant deterioration in companies' financial performance after the COVID-19 pandemic, with notable declines in both ROE and ROA. These results suggest that the health crisis has had a negative impact on companies' profitability, highlighting the need to develop financial resilience strategies to overcome such crises.

6. Conclusions, Limitations and Future Recommendations

The objective of this research was to examine the impact of the COVID-19 pandemic on the performance of Moroccan companies by comparing ROE and ROA ratios before and after the crisis. Descriptive statistics of data gave us a more accurate picture. Furthermore, the results of the Wilcoxon signed-rank test indicate that the p-value for both variables, ROE and ROA, is less than 0.05, indicating a statistically significant difference between company performance before and after the crisis. Conversely, the negative value of the Z-statistics indicates a decline in company financial performance after the pandemic. This decline is consistent with the general economic impact observed in several countries following the health crisis, particularly due to demand disruptions, health restrictions, and financing difficulties. To complete this analysis, we calculated the effect size (Wilcoxon r) to measure the significance of the observed change.

The r coefficients obtained in the analysis show a moderate effect of the health crisis on financial performance indicators. Indeed, for ROE, the r value is -0.3243294, indicating a significant impact on return on equity. Similarly, for ROA, the coefficient is -0.3420997, which also confirms a significant influence of the pandemic on return on assets. The results of the simple linear regression confirm that the period variable has a significant and negative impact on the financial performance of companies, thus illustrating a weakening of ROE and ROA after the health crisis. While these results do not reflect a complete collapse in financial performance, they highlight a deterioration sufficiently marked to warrant careful interpretation of the effects of the crisis on company performance.

Despite all, several limitations have been identified that open the paths and gave a new perspective for future research. First, in this study, we tested our research hypotheses on the population of Moroccan companies listed on the Casablanca Stock Exchange. This choice makes it difficult to generalize the results obtained to all Moroccan companies. Our research could be tested on other types of companies or even other countries.

Another shortcoming concerns the choice of variables in our research, which could be improved. However, it would also be interesting to integrate other variables.

Another possible extension of this study, given these results, appears essential to better understand the internal factors that enable some companies to be more resilient than others. In particular, the concepts of organizational resilience and corporate governance deserve special attention. Thus, a relevant avenue of research would be to analyze how the quality of governance can mitigate the effect of external shocks on performance and strengthen corporate resilience in times of crisis.

In conclusion, we can say that this research has allowed us to address our question, namely the impact of the health crisis on the performance of Moroccan companies. Thus, the proposed research perspectives should be exploited in our future research activities.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Appendix A: Treatment of outliers in a moustache box.

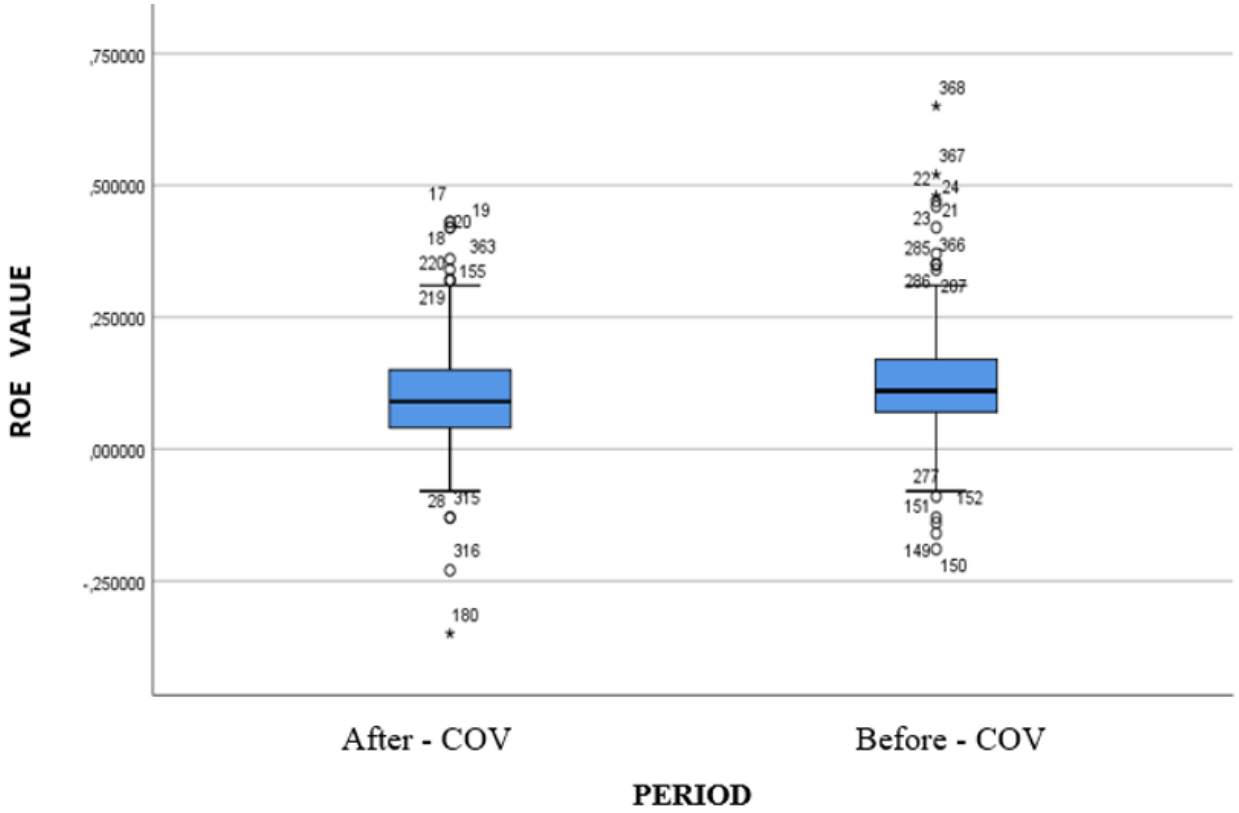

Figure A1.
Treatment of outliers in a moustache box: ROE.

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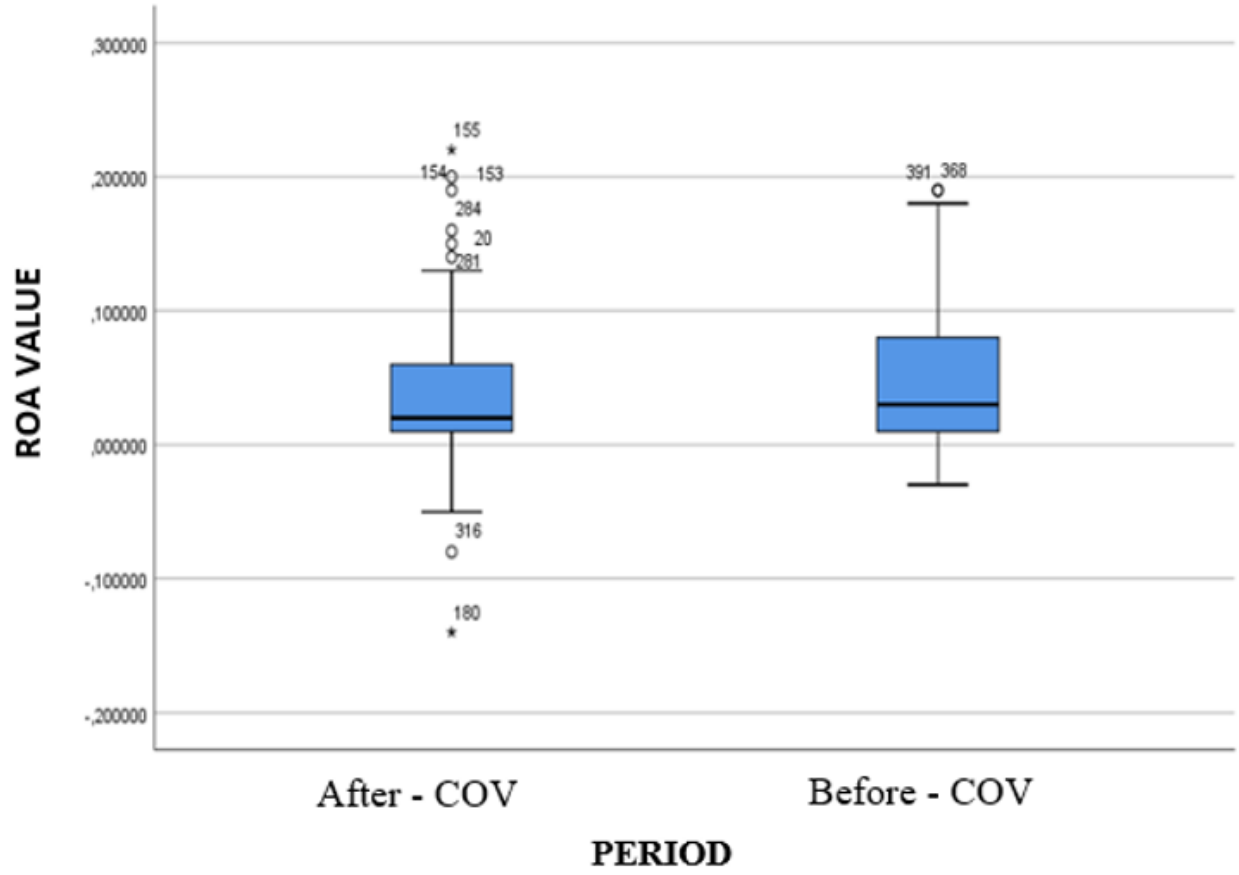

Figure A2.
Treatment of outliers in a moustache box: ROA.

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