

## **CORONAVIRUS 2019 AND FINANCIAL HEALTH INDICATORS OF NIGERIAN FOODS AND BEVERAGES MANUFACTURING COMPANIES**

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**Adebawojo Oladipupo Akindehinde<sup>1</sup>**

Bursary Division

Babcock University, Ilishan Remo, Ogun State, Nigeria

**Adebawo Oluseye Olasubomi<sup>2</sup>**

Accounting Department

Babcock University, Ilishan Remo, Ogun State, Nigeria

**Adebawo Owolabi Olutokunbo<sup>3</sup>**

Busary Department

Adeleke University, Ede, Osun State, Nigeria

**Dada Samuel Olajide<sup>4</sup>**

Accounting Department

Babcock University, Ilishan Remo, Ogun State, Nigeria

**CORRESPONDING AUTHOR:**

**Adebawojo Oladipupo Akindehinde**

[adebawojoo@babcock.edu.ng](mailto:adebawojoo@babcock.edu.ng)

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### **Abstract**

Coronavirus (COVID-19) broke out in 2019. It infected the whole world including Nigeria. This study, evaluated the effect of Coronavirus Pandemic on the stability of listed Nigerian Foods and Beverages Manufacturing Companies. Expost-Facto design was employed. Using Purposive Sampling Technique 17 Companies that made financial reports to 31<sup>st</sup> December 2022 were selected from 20. Data was analyzed with T-test. The results showed an insignificant difference in ROCE mean values between the Pre-COVID-19 and COVID-19 periods ( $p > 0.05$ ), as well as between the Post-COVID-19 and COVID-19 periods ( $p > 0.05$ ). However, significant differences were observed in the mean current and acid test ratios between both the Pre-COVID-19 and COVID-19 periods ( $p < 0.05$ ) and the Post-COVID-19 and COVID-19 periods ( $p < 0.05$ ). Additionally, long-term solvency analysis revealed significant mean differences for both the Pre-COVID-19 vs. COVID-19 periods and the Post-COVID-19 vs. COVID-19 periods ( $p < 0.05$ ). From the results of the tested hypotheses and the discussion of findings, we concluded that Coronavirus significantly affected the performance of the Nigerian foods and beverages manufacturing companies. Hence, we recommended that management of food and beverages companies must carry out continuous monitoring of their companies' financial metrics during pandemic periods.

## Introduction

SARS-CoV-2, the virus responsible for Coronavirus Disease- 2019 (COVID-19), is a highly contagious illness (WHO 2024). This disease broke out in Wuhan, China in 2019 and spread like wide fire across nations by the year 2020 (Zhu et.al 2020; Süt and Öznaçar 2021). According to the World Health Organization (WHO) in May, 2021 Coronavirus Disease- 2019 became a Public Health Emergency of International Concern (PHEIC) in January 2020 after 171 confirmed deaths. Hence, WHO in conjunction with global experts and governments of various countries, made concerted efforts to engage in research that would result in developing effective vaccines in order to combat the diseases. By the end of December 2020, according to WHO records, the death toll had risen from 171 to 1,813,188. This really confirmed the situation as an emergency. In addition to efforts towards developing effective vaccines, series of guidelines and protocols were issued by governments of different nations based on technical advice and pronouncement of WHO in order to control the spread of the virus. Restriction of public meetings, limitation of social interactions by maintaining social distancing, wearing of masks, closure of schools, shops, and restaurants, travel restrictions within and across international borders and restrictions on public transportation system were among various COVID 19 protocols that were put in place (Arriola, et al., 2022; Guljaš et al., 2021; Nicola et al. (2020).

Some countries in Europe, Asia, America and Africa including Nigeria experienced several months of lockdowns. This situation halted economic, political, social as well as educational activities across the globe, reducing economic growth to an annualized rate of roughly -3.2% in 2020. According to the Congressional Researcher Service (CRS) report on the global Economic Effect of COVID 19, this was the worst effect on global economic growth in almost a century (Jackson et al.,). Nigeria as a country, was not left out in this situation. Economic, political social and education activities were paralyzed during this period due to several months of lockdown. However, few organizations with formidable technology backups leveraged on this to make their workers work from home. Hence, the problem is that the general lockdown rule of COVID 19 affected all sectors of Nigeria economy including the manufacturing sector which is considered to be a driver of economic development.

There have been several studies on the effect of coronavirus since 2019. These include its effect on teaching and learning both in primary and tertiary institutions, effect on health and well-being, work and employment and environmental effects. However, these articles rarely discussed its effect on financial performance of Nigeria manufacturing industry. Hence; this study is to bridge this gap in literature by assessing how Corovirus-2019 Pandemic affected the financial performance of the Nigerian companies in foods and beverages industry between 2018 and 2022 with the following specific objectives:

1. To assess the difference in the return on capital employed (ROCE) of Nigerian foods and beverages companies in pre and post Coronavirus-2019 periods.
2. To examine the difference in the liquidity of Nigerian foods and beverages companies in Pre and post Coronavirus -2019 periods.
3. To determine the difference in the long-term stability of Nigeria foods and beverages companies in pre and post Coronavirus-2019 periods.

The following research questions were posed in an effort to meet these objectives;

1. What difference exists in the return on capital employed (ROCE) of Nigerian foods and beverages companies in Pre and post Coronavirus -2019 periods?
2. What difference exists in the liquidity of Nigerian foods and beverages companies in pre and post Coronavirus-2019 periods?
3. What difference exists in the long-term stability of Nigeria foods and beverages companies in pre and post Coronavirusd-2019 period?

We attempted to provide answer to this research question by testing the following research hypotheses:

1.  $H_0$  : The Return on Capital Employed (ROCE) of Nigeria foods and beverages companies did not presents significant difference in pre and post Coronavirus-2019 periods.
2.  $H_0$  : The liquidity of Nigeria foods and beverages companies did not presents significant difference in pre and post Coronavirus -2019 periods.
3.  $H_0$  : The long-term stability of Nigeria foods and beverages companies did not present significant difference in pre and post Coronavirus -2019 periods.

## Literature Review

### Conceptual Framework

#### *Financial Performance*

An organization's financial health measured over time is financial performance. It involves the evaluation of an organization revenue, expenditures or costs, profit or surplus, losses or deficits, debt structure, liquidity, assets and investments returns over a given period. Financial performance is further defined by Devi et al. (2020), citing Subramanyan (2014), as a state that indicates or represents a company's financial status in accordance with predefined objectives, standards, and criteria. An effective tool for assessing an organization's or business's financial performance or financial health is a financial statement or financial report, which includes the cash flow, profit and loss, comprehensive income, and statement of financial position.

#### *Liquidity*

This refers to the volume of fund that is available to meet the immediate expenditures of day to day activities of an organization or a bussiness venture. To avoid a challenge of inability to meet commitments and obligations, organization must have sufficient funds and be able to do immediate conversion of its assets into cash whenever the need arises. It is the ability of a debtor to meet his or her current debt commitments without raising external funds (Priya and Nimalathasa, 2013; Hayes, 2024; Elsharif, 2016). A company's ability to pay its debts that are coming due in less than a year is determined by looking at its liquidity ratio. The most popular out-of-liquidity ratio is the current ratio, which is the ratio of current assets to current liabilities. (Olowe 2017; Devi et al.,

2020).

#### *Return on Capital Employed (ROCE)*

Return could be described as the profit derived from a particular investment. Hence, Return on Capital Employed shows the relationship between the level of profits derived from a particular business and the volume of capital that has been invested in that business (Pradip 2017). This ratio which is sometimes referred to as a Primary Ratio, measures the efficiency with which a firm utilizes its resources or capital in generating profits. It highlights the earnings potentials of a firm's assets in response to the long-term sources of capital utilized in the acquisition of such assets. Return on Capital Employed is similar to Return on Assets which also measures how efficiently a firm is able to generate profits in relation to its total assets (Gazi et al. 2022). A high ROCE is an indication that the management of the firm efficiently utilized the funds in generating profits for the firm (Olowe 2017 and Pradip 2017). In a depressed economic situation such as Covid 19 period, it could be difficult for a business to generate profits. Usually people would experience decline in purchasing ability or power and this would likely translate into reduction in demands for companies' products or services. Such decrease in sale is not usually backed up by corresponding decrease in expenses in a short run. Hence, it would result in reduction of business profit (Devi et al. 2020). ROCE is computed as follows:

$$\text{ROCE} = \frac{\text{Profit before Interest and Taxes} \times 100}{\text{Capital Employed}}$$

The Capital Employed is however defined by Olowe (2017) as the Total Assets of firm less its Current Liabilities.

#### *Solvency Ratio for Long –Term Stability*

The term "solvency" describes an organization's capability to fulfill its long-term financial obligations. It is crucial for businesses to assess their capacity to meet long term financial commitments, especially in times of economic crisis. Hence, a solvency ratio becomes an important measure of a company's financial stability (Hayes 2024). Financial literatures identified certain solvency ratio that could be computed for proper assessment of a firm solvency. These consist of the following: gearing or financial leverage ratio, debt ratio, equity multiplier, total debt to shareholder funds, fixed interest cover, fixed charge cover, and proprietary ratio. A company with a high solvency ratio is more likely to have sufficient financial resources to continue operating into the foreseeable future without facing financial instability (Olowe, 2017; Akinsulire, 2019).

### **Theoretical Framework**

The theoretical base of this study was the Baney's Resource Based Theory of 1991. It postulated that organization that have strategic resources will have strong competitive advantages over those that do not have. According to the theory, a resource becomes strategic to an organization if it is valuable, rare, difficult to imitate and non-substitutable. Hence, some resources such as cash or motor vehicles are valuable assets but may not be considered strategic because an organization's competitors can easily acquire them. In their investigation into how Coronavirus-2019 Pandemic affected the financial health of listed companies on the Indonesia stock exchange, Devi et al. (2020) also used this theory. Citing Sun et al. (2020), they pointed out the need to develop new competitive advantages for long-term development, which could support Chinese mining companies' financial performance as they navigate a variety of risky economic situations.

This was accomplished through the use, management and control of owned resources, such as corporate strategies and organizational procedures, in the face of a variety of challenges, including the financial crisis. Additionally, they clarified that among the resources that need to be managed effectively are assets, technological know-how, and human resource capacity to manage the organization in a variety of contexts. COVID 19 was a period of economic recess for many countries including Nigeria as a result of an extended period of lockdown. During this period, operations of many companies or firms were negatively affected. The pandemic period was a period when firms had to review their processes and strategies of operations in order to sustain services. It was also a period to evaluate their resources so as to determine the strategic ones with comparative advantages that should be engaged alone to survive the economic recession period. Hence, the relevance of this theory.

### **Empirical Review**

The results of earlier studies on the Coronavirus and business financial performance were examined in this section of the study. According to Devi et al. (2020), the degree to which Coronavirus has affected the financial health of companies listed on the Indonesia Stock Exchange varies depending on the industry and sector of the companies. They observed that the consumer goods sector experienced an increase in liquidity, profitability, and activity along with a decrease in leverage, whereas the property, real estate, building construction, finance, trade, services, and investment sectors saw a decline in these same metrics. The implication of this finding is that the financial performance of firms dealing with essential items like foods and beverages, pharmaceuticals cosmetics and household items may not be significantly affected during Coronavirus 2019 Pandemic.

In their study on the financial performance of the Lithuankwu transport sector, Paulina and Nomedra (2021) noted that during the first Coronavirus' initial wave of outbreak, transport companies saw a decline in profitability indicators. Based on their subsequent investigations, they concluded that the most affected companies were those that provided road transport services. They further stated that the impact of Covid-19 on a company's financial performance would either be positive or negative, depending on the activities of such company. Contrary to the findings of Paulina and Nomedra (2021), Osama et al. (2021) studied the impact of Covid 19 on financial performance of logistics firms from G-20 countries and concluded that generally, the logistics firms recorded higher financial performance during the period of the pandemic. It was however noted that 6 out of the 20 countries had their logistics firms negatively impacted by Covid-19. This finding corroborated the study by Devi et.al (2020), which noted that the extent of impact of Coronavirus on performance of companies depends on the industry or the sector. Further to the findings of Osama et al. (2021), Nguge (2022) who studied the effect of Covid19 on the listed logistics firm on Vietnam Stock Exchange, established that there was no improvement in the financial performance of 114 listed logistics firms considered in the study. Specifically, they found that leverages ratio, profitability and efficiency ratio of these companies deteriorated or worsened during Covid -19 period while their liquidity ratio also did not show any significant difference. In a similar vein, Hayati et al. (2021) found no significant differences in return on investment between the periods before and after the pandemic. However, they observed that the difference in return on assets between the period before the infectious disease and the period after the infectious disease is significant for consumer goods industry companies listed on the Jakarta Islamic index (JII).

Nevertheless, Shoukat and Matrian (2022) observed that Coronavirus Disease did not significantly affect the financial health of telecommunication companies. They associated this positive result to the fact that while physical activities were cut down as a result of lock down regulations, there was an upsurge in virtual digital activities. Most offices, schools, business depended on online platform riding on telecommunication networks for their operations. Quadri et.al (2023) also confirmed that banks in Southern Asia were able to maintain their position in the economy because they did not stop working during the pandemic. According to the study, with the use of technology, the banks were able to render services throughout the pandemic period. Furthermore, it was observed that the overall financial performance of South Asian banking sector in terms of liquidity, solvency, profitability and activity ratios was better before the pandemic than the performance recorded during the pandemic. Furthermore, Kawaljeet et al. (2021) noted financial burdens as one of the numerous challenges posed by Covid'19 to manufacturing companies. These findings implied that Covid-19 impacted on the financial performance of manufacturing companies although their study did not establish the extent of such impact. In addition, Abdullah (2023), in his own study of covid-19 pandemic and financial performance, concluded that while the pandemic negatively impacted profitability, its impact on debts was positive with no significant impact recorded on liquidity of industrial companies in Jordan.

Also the study of Demmou et.al (2022) on liquidity, considering large firms' balance sheet for 14 countries, confirms that 38% of firm had liquidity challenges during Covid 19. Amnim (2021) studied the effects of the Coronavirus 2019 pandemic on the liquidity and profitability of Nigerian businesses. They particularly looked into how Covid 19 affected the return on equity and liquidity ratio by contrasting these ratios between the pre-Coronavirus-2019 and Coronavirus-2019 eras. The pandemic had a major impact on firms' liquidity and profitability, according to their study's conclusion. Anastasia et.al (2022) also observed in their study of the effect of Coronavirus 2019 on the firms in financial sector in Nigeria. They concluded that Coronavirus-2019 positively and highly impacted the banks' capital adequacy and return on assets. This finding is intandem with that of Musah et.al (2022) who concluded that the pandemic did not have negative effect on the financial performance of commercial banks in Ghana. According to them, it provided opportunity for banks to improve their performance. Comparing this conclusion to that of Quadri et al. it suggested that the level of impact of the pandemic on the financial performance of organization also differs from country to country. However, the findings of the Lalani et.al (2023) from their study on the impact of Covid 19 on the financial performance of the largest teaching hospitals in the United State suggested that the hospitals might have recorded decline in financial performance in 2020 due to the pandemic. They observed that the financial position of academic hospitals, proxied by return on asset, became improved in 2021 as a result of and an increase in non-operating income.

### **Research Methodology**

Ex-post Facto design was used for this empirical study. The 20 companies listed on the Nigeria Exchange as of December 2022 as manufacturers of consumer goods made up the study's population. Out of the 20 listed consumer goods manufacturing companies, the 17 listed companies that manufacture foods and beverages were chosen as the sample size using the purposive sampling method. Food and Beverages companies were selected because food items were considered to be essential for populace particularly during a crises period. The validity and reliability of the data used for this study was based on the annual statutory audit of financial reports of these companies

by qualified external auditors. Using Students’ T-test in Stata statistical analysis software, the researcher compared the financial strength of the listed Food and beverages companies for the two years pre- COVID19 periods (2018 and 2019) with the financial strength of these companies during COVID period in 2020. We also compared the financial strength of the companies post-COVID 19 periods (2021 and 2022) with financial strength of companies during Covid-19 period. The model for students’ T-Test is stated as follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

• Sample means of groups 1 and 2 were represented by  $\bar{x}_1, \bar{x}_2$

- Standard deviations of groups 1 and 2 were represented by  $S_1^2, S_2^2$
- Sample sizes of groups 1 and 2 were represented by  $n_1, n_2$

**Results and Discussions**

**Test of Hypothesis one:**

**Objective One:** To evaluate the difference in the ROCE of Nigerian foods and beverages companies in Pre and post Covid-19 periods.

**Research Question One:** What difference exists in the Return on ROCE of Nigerian foods and beverages companies in Pre and post Covid-19 periods?

**Research Hypothesis One: H<sub>0</sub> :** The Return on Capital Employed (ROCE) of Nigerian foods and beverages companies did not presents significant difference in Pre and post Covid-19 periods.

We were able to accomplish our first research objective by answering our first research question. The solution was obtained by applying the T-test to test the first research hypothesis for which results were presented in Tables 1 and 2.

**Table 1: T-test Result Table for Assessment of Pre- Coronavirus 2019 and Coronavirus 2019 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of ROCE**

Variables	Observed	Mean	Standard Error	Standard Deviation	95 % Conf. Interval Lower Limit	95% Conf. Interval Upper Limit
Covid ROCE	65	0.0247692	0.137073	0.1105117	-0.0026142	0.521527
Pre-Covid ROCE	65	0.66	0.0225499	0.1818035	0.0209513,	0.11104897
Diff		-0.0412308	0.0263892		-0.0934463;	0.109848

**Source: Researcher’s Result (2024)**

Diff = Mean (Covid Roce) – Mean (Pre-Covid Roce)

t= -1.5624

Degree of freedom = 128

H<sub>0</sub> ; diff = 0

H<sub>a</sub>: diff <0 ;      H<sub>a</sub>! Diff ! = 0;    H<sub>a</sub>; diff>0

Pr(T<t) = 0.0603;    Pr(1 T| > | t |) = 0.1207;    Pr (T >)0.9397

The T-test results as presented in Table1, confirmed that the mean difference in ROCE between pre-Covid 19 period and Covid19 period was -0.0412308, with t-value of -1.5624, degree of freedom of 128 and P-value of 0.1207 for two tailed test. This result suggests that, there exists an insignificant difference in the average performance of Nigerian foods and beverages manufacturing firms between the periods before Coronavirus-2019 and during the period of Coronavirus-2019 in terms of profitability as measure by ROCE.

### Decision

At the significance level of 0.05, the mean difference in ROCE was -0.0412308 with t-statistics of -1.5624 while the P-value =0.1207. Since P-value is higher than the adopted level of significance of 0.05, we reject the alternative hypothesis to accept the null hypothesis. Hence we conclude that there was no significant difference in the financial performance of Foods and Beverages Manufacturing firms in Nigeria between Pre-Coronavirus-2019 period and Coronavirus-2019 Period.

**Table2: T-test Result Table for Assessment of Post- Coronavirus 2019 and Coronavirus 2019 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of ROCE.**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval Lower Limit	95% Conf. Interval Upper Limit
Covid ROCE	65	0.0247692	0.0137073	0.1105117	0.0026142	0.0521527
Post covid ROCE	65	0.052	0.01444520	0.1164608	0.0231424	0.0808876
Combined	130	0.038346	0.0099903	0.1139074	0.0186185	0..581507
Diff		-0.0272308	0.0199136	-	-0.0666333	-0.0121718

### Source: Researcher's Result (2024)

Diff = Mean (Covid ROCE) – Mean (post Covid ROCE)

t= -1.3674

Ho: diif =0; Dgree of freedom = 128

Ha: diff <0 Ha;diff !=0 Ha; diff>0 Ha;diff>0

Pr<t) = -0.0869 ; Pr|Tl>|tl = 0.1739; Pr (T>t)=0.9131

The T-test results as presented in Table 2 confirmed that the mean difference in ROCE between post-Covid 19 period and Covid19 period was -0.0272308, with t-value of -1.3674, degree of freedom of 128 and P-value of 0.1739 for two tailed test. This result suggests that, there is no sufficient evidence to conclude that there exists significant difference in the average performance of Nigerian manufacturing firms between the periods After Coronavirus-2019 and during the period of Coronavirus-2019 in terms of profitability as measure by ROCE.

### Decision

At the level of significance of 0.05, the mean difference in ROCE was -0.0272308 with t-statistics of -1.3674 while the P-value =0.1739. Since P-value is higher than the adopted level of significance of 0.05, we rejected the alternative hypothesis to accept the null hypothesis. Hence we concluded that there is no significant difference in the financial performance of foods and beverages manufacturing firms in Nigeria between post-Covid period and Covid period.

The overall result of T-test in Tables 1 and 2 revealed that there is no significant difference between Precovid 19 and Covid 19 period return on capital employed on one hand; on the other hand



between Covid 19 and post covid 19 period return on capital employed of foods and beverages manufacturing companies in Nigeria. These results were consistent with the findings of Devi et.al (2020) who reported that the extent of impact of covid 19 on firms is dependent on the industry or the sector to which the firms belong. The insignificant difference in ROCE of pre or post Covid 19 when compared to Covid 19 ROCE could be associated with the fact that the food and beverages are one of the essential industries that must keep running in times of crises for sustainability of lives. Hence profitability of such companies may not be impaired during crises period such as the period of covid 19. However, the finding was contrary to that of Paulina and Nomedá (2021) who observed a decline in profitability indicators of companies in the transport sector. This was because transport sector was badly affected as a result of social distancing rule at the period. Shoukat and Matrína (2022) who observed an insignificant impact of Coronavirus-2019 on financial performance of telecommunication companies, further supported the findings by confirming that the level of impact on a company was dependent on the sector to which a company belongs. The result is also in tandem with that of Musah et.al (2022) who concluded in their own study of the effect of Covid 19 pandemic on the financial performance of commercial banks in Ghana, that the pandemic did not have negative effect on the financial performance of commercial banks in Ghana. According to them, it provided opportunity for banks to improve their performance. Comparing their conclusion to that of Quadri et al. (2023) it suggested that the level of impact of the pandemic on the financial performance of organization also differs from country to country.

### Test of Hypothesis Two:

**Objective Two:** To determine the difference in the liquidity of Nigerian foods and beverages companies in pre and post Covid-19 periods.

**Research Question Two:** What difference exists in the liquidity of Nigerian foods and beverages companies in pre and post Covid-19 periods?

**Research Hypothesis Two:**  $H_0$ : The Liquidity of Nigerian foods and beverages companies did not presents significant difference in pre and post Covid-19 periods.

We were able to accomplish our second research objective by answering our second research question. The solution was obtained by applying the T-test to test the second research hypothesis. Tables 3,4,5 and 6 show the results of this test.

**Table3: T-test Result's Table for Assessment of Pre- Coronavirus 2019 and Coronavirus Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Current Ratio**

Test Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval Lower Limit	95% Conf. Interval Upper Limit
Covid-19 Current Ratio	65	0.2427692	0.0762301	0.614587	0.090482	0.3950564
Pre-Covid 19 Current Ratio	65	0.5203077	0.0993297	0.8008218	0.3218738	0.7187416
Combined	130	0.3 815385	0 .0635472	0 .7245531	0.2558087	0.5072682
Diff		-0.2775385	0.1252095		-0.5252869	-0.02979

Source: Researcher's Result (2024)

Diff = Mean (Covid Current Ratio) – Mean (Precovid Current Ratio)

$t = -2.2166$

Ho; diff = 0

Degree of freedom = 128

Ha; diff < 0;

Ha; diff != 0;

Ha diff > 0

Pr(T<t)= 0.0142

Pr (|T|> |t|)=0.0284

Pr(T>t)=0.9858

**Table4: T-test Results' Table for Assessment of Pre- Coronavirus 2019 and Coronavirus 2019 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Acid Test Ratio**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval. Lower Limit	95% Conf. Interval Upper Limit
Covid-19 Acid Test	65	0.1623077	0.0512116	0.4128815	0.060007	0.2646147
Pre-Covid 19 Acid Test	65	0.3701538	0.0798805	0.6440169	0.2108743	0.5297334
Combined	130	0.2662308	0.481368	0.5488441	0.1709909	0.3614706
Diff		-0.2078462	0.0948869		-0.3955961	-0.0200962

**Source: Researcher's Result (2024)**

Diff = Mean (Covid Acid Test Ratio) = Mean (Pre Acid Test Ratio)

$t = -2.1905$  Ho: Diff = 0

Degree of Freedom = 128

Ha: diff < 0 ; Ha ; diff != 0

Ha; diff > 0

Pr(T<t) = 0.152

Pr (|T|>|t|) = 0.0303

Pr (T>t) = 0.9848

The T-test results as presented in Tables 3 and 4 confirmed that the mean differences in current ratio and acid-test ratio as measures of liquidity were -0.2775385 and -0.2078462 respectively between Pre-Covid 19 period and Covid 19 period with t-value of -2.2166 for Current ratio and t-value of -2.1905 for Acid test ratio. While the Current Ratio and Acid Test Ratio recorded the same degree of freedom of 128, the P- values for Current, Acid -Test were reported as 0.0284, 0.0303 respectively for two tailed tests for firms' liquidity measured by the current and acid-test ratios. This result implies that there is enough evidence to draw the conclusion that there is a significant difference in the financial performance of Nigerian manufacturing firms between the pre-Coronavirus 2019 and during the Coronavirus 2019 period.

### Decision

At the significance level of 0.05, the mean differences in current and acid test were -0.2775385, -0.2078462 respectively with t-statistics of -2.2166 for current ratio and t-statistics of -2.1905 for acid-test ratio. Also, the P- values for current and acid -Test were 0.0284, 0.0303 and 0.0168 respectively. Since the P-values were all greater than the adopted level of significance of 0.05, we rejected the null hypothesis to accept alternative hypothesis. Hence, we concluded that there is significant difference in the financial performance of foods and beverages manufacturing firms in

Nigeria between pre-Coronavirus-2019 period and Coronavirus-2019 period in terms of their liquidity.

**Table 5: T-test Results' Table for Assessment of Post- Coronavirus 2019 and Coronavirus 2019 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Current Ratio**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval Lower Limit	95% Conf. Interval Upper Limit
Covid 19 Current Ratio	65	0.02427692	0.0762301	0.614587	0.090482	0.3950564
Post Covid19 Current Ratio	65	0.51	0.0951964	0.767498	0.3198233	0.7001767
Combined	130	0.3763846	0.0618702	0.7054286	0.253973	0.4987963
Diff		-0.2672308	0.1219565	-	-0.5085426	-0.025919

**Source: Researcher's Result (2024)**

Diff = Mean (Covid Current Ratio) – Mean (post covid current ratio)

t= -2.1912

Ho: diff =0; Degree of freedom = 128

Ha: diff <0 Ha;diff !=0 Ha;diff>0

Pr(T<t) = -0.0151 Pr(T>t) = 0.9849

**Table 6: T-test Results' Table for Assessment of Post- Coronavirus 2019 and Coronavirus 2019 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Acid Test.**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval	95% Conf. Interval
					Lower Limit	Upper Limit
Covid Acid Test	65	0.1623077	0.0512116	0.4128815	0.0600007	0.2646147
Post Covid 19 Acid Test	65	0.3573846	0.0715311	0.576702	0.2144848	0.5002844
Combined	130	0.2898462	0.0446496	0.5690834	0.1715059	0.3481864
Diff		-0.1950769	0.0879735		-0.3691474	-0.0210064

**Source: Researcher's Result (2024)**

Diff = Mean (Covid acid test) – Mean (post covid acid test)

t= -2.2175

Ho: diff =0; Degree of freedom = 128

Ha: diff <0 Ha;diff !=0 Ha;diff>0

Pr(T<t) = -0.0142 Pr(T>t) = 0.9858

The T-test results as presented in Tables 5 and 6 confirmed that the mean differences in current ratio and acid-test ratio as measures of liquidity and were -0.2672308, and -0.1950769 respectively between the post-Covid 19 period and Covid period with t-value of -2.1912 for current ratio and t-value of -2.2175 for acid test ratio. While the current ratio and the acid test ratio

have the same degree of freedom of 128, their P-values were reported as 0.0302 and 0.0284 for current and acid –test ratios respectively, for two tailed tests. This result suggests that, there is sufficient evidence to conclude that, there exists a significant difference in the financial performance of Nigerian manufacturing firms between the post Covid 19 and Covid 19 periods in terms of liquidity of the firms measured by current and acid–test ratios.

### **Decision**

At the level of significance of 0.05, the mean differences in current and acid test ratios were -0.2672308, -0.1950769 respectively with t-statistics of -2.1912 for current ratio and t-statistics of -2.2175 for acid-test ratio while the P-values for current and acid -test were 0.0302 and 0.0284 respectively. Since the P-values were all less than the adopted level of significance of 0.05, we rejected the null hypothesis to accept alternative hypothesis. We therefore came to the conclusion that, in terms of liquidity, there is a significant difference in the financial performance of Nigerian companies that manufacture foods and beverages between the post-Coronavirus 2019 period and the Coronavirus 2019 period.

The comparability test of liquidity in terms of current ratio and acid test ratio of foods and beverages companies for the pre, During and post Covid 19 periods as presented in tables 3, 4, 5 and 6 revealed a significant difference in liquidity of these companies during the periods. This finding was corroborated by Devi et.al (2020) who confirmed from their study that, firms in consumer goods industry saw a rise in liquidity and profitability during Covid 19. It was also consistent with the findings of Shoukat and Matrian (2022) who found that firms in telecommunication sector were not negatively affected in terms of financial performances, this was because every business activity shifted to virtual platform during Covid. However, the result was inconsistent with the findings of Demmou et.al (2022). Nguyen (2022) and Amnim et.al (2021). They all supported the findings of this study. Furthermore, the findings of Quadri et.al (2023) also supported this study. They observed that the overall financial performance of South Asian banking sector in terms of liquidity, solvency, profitability and activity ratios was better before the pandemic than the performance recorded during the pandemic. Hence, they noted a decline in the metrics of financial performance during Covid19 period which implied that there was a significant difference between the financial performance of the banks in South Asian before the Covid19 period and their financial performance during and after Covid19 periods.

### **Test of Hypothesis Three:**

**Objective Three:** To determine the difference in the long-term stability of Nigerian foods and beverages companies in pre and post Covid-19 period.

**Research Question Three:** What difference exists in the long-term stability of Nigeria foods and beverages companies in pre and post Covid-19 periods?

**Research Hypothesis Three:**  $H_0$ : The long-term stability of Nigeria foods and beverages companies did not present significant difference in pre and post Covid-19 periods.

We were able to accomplish our third research objective by answering our third research question. The solution was obtained by applying the T-test to test the third research hypothesis. Tables 7 shows the result of this test.

**Table 7: T-test Results' Table for Assessment of Pre- Covid and Covid Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Solvency Ratio**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval Lower Limit	95% Conf. Interval Upper lower
Covid Solvency	65	0.1107692	0.0288225	0.2323743	0.0531897	0.1683488
Pre-Covid Solvency	65	0.2283077	0.390448	0.3147895	0.1503067	0.3063087
Combined	130	0.1695385	0.247188	0.2818374	0.1206318	0.2184452
Diff		0.1175395	0.0485308		0.2135649	-0.0215121

**Source: Researcher's Result (2024)**

Diff = Mean (Covid solvency) – Mean (PreCovid Solvency )

t= -2.24219

Ho: diff =0; Dgree of freedom = 128

Ha: diff <0                      Ha;diff !=0                      Ha; diff>0

Pr<t) = -0.0084                      Pr|T|>|t| = 0.0168                      Pr (T>t)=0.9916

The T-test results as presented in Table 7 confirmed that the mean differences in solvency ratios as measures of long term stability was -0. 0.1175395 between Pre-Covid 19 period and Covid19 period with t-value of -2.24219. While the degree of freedom was 128, the P- values was 0.0168 for two tailed tests. This results suggests that, there was sufficient evidence to conclude that there exists significant difference in the average performance of Nigerian foods and beverages manufacturing firms between the periods pre- Covid 19 and during the period of Covid 19 in terms of solvency ratio as a measure of long term stability.

### Decision

At the level of significance of 0.05, the mean differences in solvency ratio was 0.1175395 with t-statistics of -2.24219 for solvency ratio. The P- values solvency ratios was 0.0168 respectively. Since P-value was less than the adopted level of significance of 0.05, we reject the null hypothesis to accept alternative hypothesis. Hence we concluded that there was significant difference in the financial performance of foods and beverages manufacturing firms in Nigeria between pre-Covid 19 period and Covid 19 period in terms of solvency as a measure of long-term stability.

**Table 8: T-test Results' Table for Assessment of Post- Covid 19 and Covid 19 Periods Financial Performance of Nigeria Foods and Beverages Manufacturing firms in Terms of Solvency**

Variables	Observed	Mean	Standard Error	Standard Deviation	95% Conf. Interval Lower Limit	95% Conf. Interval Upper
Covid 19 Solvency	65	0.1107692	0.0288225	0.2323743	0.0531897	0.1683458
Post covid 19 Solvency	65	0.2486154	0.0403243	0.3251052	0.1680583	0.3291725
Combined	130	0.1796923	0.0254217	0.2898514	0.1293949	0.2299897
Diff		-0.1378462	0.049566		-0.2359209	-0.0397714

**Source: Researcher's Result (2024)**

Diff = Mean (Covid Solvency) – Mean (Post Covid Solvency)

t= -2.7811

Ho: diff =0; Dgree of freedom = 128

Ha: diff <0

Ha;diff !=0

Ha;diff>0

Pr(T<t) = -0.0031

Pr(|T|>|t|) =0.0062

Pr (T>t)=0.9969b

The T-test results as presented in Table 8 confirmed that the mean differences in Solvency ratios as measures of long term stability was -0.1378462 between post-Covid 19 period and Covid 19 period with t-value of -2.7811. While the degree of freedom is 128, the P- value was reported as 0.0062 for two tailed tests. This result suggests that, there is sufficient evidence to conclude that there exists a highly significant difference in the financial performance of Nigerian foods and beverages manufacturing firms between the post- Covid 19 period and Covid 19 period in terms of solvency of the firms as a measure of long term stability.

### Decision

At the significance level of 0.05, the mean difference in solvency ratios was -0.1378462 with t-statistics of -2.7811 while the P-value was 0.0062. Since the P-value was less than the adopted level of significance of 0.05, we rejected the null hypothesis to accept alternative hypothesis. Hence, we came to the conclusion that there was a highly significant difference in the financial performance of Nigerian companies that manufacture foods and beverages in terms of solvency ratios as a measure of long-term stability between the post-Covid-19 period and Covid-19period.

From the test results for solvency both the periods of Covid-19 and Post Covid presented in Tables 7and 8, there were sufficient evidences of highly significant difference between the two periods under consideration. The findings were in agreement with that of Kawaljeet et.al (2022) who affirmed that financial burden is one of during Covid 19 for 35% of firms across 14 countries. Also in support of the study, Abdullah (2023) investigated the effect of covid-19 pandemic on financial performance and the numerous challenges of manufacturing firms induced by Covid 19. This was further supported by Nguyen (2022) who also observed that leverages, profitability and efficiency deteriorated concluded that while the pandemic negatively impacted profitability, its impact on debts was positive with no significant impact recorded on liquidity of industrial companies in Jordan. Hence, the study suggested a significant difference existed between debts before the Covid-19 and debts of the periods during and after Covid19. This finding suggested that although profitability of foods and beverages companies was consistent during pre-Covid, Covid and post Covid periods, the long term stability was however, impaired. For foods and beverages firms, their long-term solvency could be impaired as a result of cash flow challenges that characterized the Covid 19 period. During this periods, firms found it difficult to meet their debt obligations, they experienced increase in borrowing cost as a result of localized financial market's restrictions to accessibility of credits, thus making the period challenging for manufacturing.

### Conclusion and recommendation

This study was carried out for the purpose of investigating the effect of Coronavirus pandemic on the financial performance of foods and beverages manufacturing companies listed on Nigeria Exchange Group. From the results of the three tested research hypothesis and the subsequent discussion of findings, we came to the conclusion that Coronavirus significantly affected the performance of the Nigerian foods and beverages manufacturing companies in terms of liquidity and long term stability. However, their return on capital employed (ROCE) being a short-term

performance measure was not significantly impaired. Hence, we recommend that the management of food and beverages companies must carry out continuous monitoring of their companies' financial metric during pandemic periods. This will allow for close monitoring of negative fluctuations in companies' financial indicators and be able to develop strategies that could hedge against such. Foods and beverages sector is considered by this study to be essential for sustainability of populace during pandemic periods. Hence, the policy implication of this study is for the policy makers and the industry regulators including government to design policies that could enhance stability of companies during pandemic. Such policies should be able to help in hedging against negative fluctuations in the financial metrics.

However, this study was limited by dearth of relevant empirical studies. Although there were empirical studies on effect of Covid 19 in various facets of the economy around the globe, very few of the of the available ones discussed the effect on the financial performance of foods and beverages companies in particular. Future researchers may further investigate the impact of the pandemic on the financial performance of companies in order sectors of the Nigeria economy while the periods not covered by the study may also be included in order to cover more years of study.

Finally, this study has expanded academic discourse and also bridged the gaps in literature in the area of the evaluation of the effect of COVID 19 on financial performance of the Nigerian foods and beverages companies. It shows how the financial performance of foods and beverages companies was affected during pre-Covid19, Covid19, and post-Covid19 periods.

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The authors have disclosed no conflicts of interest.

### Author's Affiliation

#### **Adebawojo Oladipupo Akindehinde<sup>1</sup>**

Bursary Division  
Babcock University, Ilishan Remo, Ogun State, Nigeria

#### **Adebawo Oluseye Olasubomi<sup>2</sup>**

Accounting Department  
School of management Sciences  
Babcock University, Ilishan Remo, Ogun State, Nigeria

#### **Adebawo Owolabi Olutokunbo<sup>3</sup>**

Busary Department  
Adeleke University, Ede, Osun State, Nigeria

#### **Dada Samuel Olajide<sup>4</sup>**

Accounting Department  
School of Management Sciences  
Babcock University, Ilishan Remo, Ogun State, Nigeria

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**REFERENCES**

- AI-zoubi, A.M. (2023) Covid-19 Pandemic and financial performance. *International Journal of professional Business review* 8(4) 01-20.  
<https://doi.org/10.26668/businessreview/2023.v8i4.825>
- Akinsulire, O. (2019). *Financial management*. Lagos: El-toda Ventures Limited.
- Ammi, O. E. L., Aipina, O. P. C., & C., O. F. (2021). Impact of Covid-19 Pandemic on Liquidity and Profitability of Firms in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 11(3), 1331-1344.  
<http://dx.doi.org/10.6007/IJARBS/v11-i3/9229>
- Anastasia, C., Blessing, A. G., & Oyhenetega, O. E. (2022). COVID-19 pandemic and the performance of financial firms in Nigeria. *Linguistics and Culture Review*, 81, 242-251.  
<https://doi.org/10.21744/lingcure.v6nS1.1996>
- Arriola, C., Kowalski, P., & van Tongeren, F. (2022). Understanding structural effects of COVID-19 on the global economy. *OECD Trade Policy Paper*. Retrieved from: [Congressional Research Service Report (CRS)].
- Demmou, L., Franco, G., Calligaris, S., & Dlugosch, D. (2022). Liquidity shortfalls during the Covid-19 outbreak: Assessment and policy responses. *Economie et Statistique / Economics and Statistics*, 532-33, 47-61. doi: 10.24187/ecostat.2022.532.2070.
- Devi, S., Warasniasih, N. M. S., Masdiantini, P. R., & Musmini, L. S. (2020). The impact of Covid-19 pandemic on the financial performance of firms on the Indonesia Stock Exchange. *Journal of Economics, Business, & Accountancy Ventura*, 23(2), 226-242. doi: <http://dx.doi.org/10.14414/jebav.v23i2.2313>
- Elsharif, T. A. (2016). The impact of liquidity management on profitability. *Graduate School of Social Sciences*, 1-11.  
[https://www.researchgate.net/publication/309176083\\_The\\_Impact\\_of\\_Liquidity\\_Management\\_on\\_Profitability](https://www.researchgate.net/publication/309176083_The_Impact_of_Liquidity_Management_on_Profitability)
- Gazi, M. A. I., Nahiduzzaman, M., Harymawan, I., Masud, A. A., & Dhar, B. K. (2022). Impact of COVID-19 on financial performance and profitability of banking sector in special reference to private commercial banks: Empirical evidence from Bangladesh. *Sustainability*, 14(10), 6260. <https://doi.org/10.3390/su14106260>
- Guljaš, S., Bosnić, C. Z., Salla, T., Berecki, M., Krivić Dupan, Z., Rudan, S., & Majnarić Trtica, L. (2021). Lack of informations about COVID-19 Vaccine: From implications to intervention for supporting public health communications in COVID-19 Pandemic. *International Journal of Environmental Research and Public Health* 2021, 18, 6141. <https://doi.org/10.3390/ijerph18116141>
- Hayati., H., Rofizar.,H., Savitri, A, Syahputra, A., (2021). Financial performance analysis of consumer goods industry companies listed on the jakarta islamic index (jii) before and during covid-19. *Jurnal Manajemen dan Bisnis* Vol. 10, No. 2, December 2021, pp. 22-29. <https://doi.org/10.34006/jmbi.v10i2.296>

- [Hayes, A.. \(2024, June 11\) What is solvency? Definition, how it works with solvency ratios. https://www.investopedia.com/terms/s/solvency.asp](https://www.investopedia.com/terms/s/solvency.asp)
- Hayes, A. (2024, June 13). Understanding liquidity ratios: Types and their importance. *Investopedia*. <https://www.investopedia.com/terms/l/liquidityratios.asp>
- Jackson J.,K., Weiss M., A., Schwarzenbergm, A., B., Nelson, R., M., Sutter, K., M., & Sutherland, M.,D., (2021). Global economic effects of COVID-19. *Congressional Research Service (CRS)*. Retrived from <https://sgp.fas.org/crs/row/R46270.pdf>
- Kawaljeet, K., Yogesh, K.,D., Ramakrishnn, R., & Ali, Z.,B. (2023, January 6). How is COVID-19 altering the manufacturing landscape? A literature review of imminent challenges and management interventions. *Annuals of Operation Research*, 335, 1567-1599. <https://doi.org/10.1007/s10479-021-04397-2>
- Lalani, K., Helton, J., Vega F.R., Cardenas-Turanzas, M., Champagne-Langabeer, M., & Langabeer, J.R (2023). The impact of covid-19 on the financial performance of largest Teaching Hospitals. *Healthcare*, 11, 1996. <https://doi.org/10.3390/healthcare11141996>
- Musah, A., Padi, A., & Ahme, I.A. (2022) the effect of the covid19 pandemic on the financial performance of commercial banks in Ghana. *International Journal of Accounting & Finance Review* 12(1) 20-29. <https://doi.org/10.46281/ijafr.v12i1.1804>
- Nguyen, H. T. X. (2022). The effect of Covid-19 pandemic on financial performance of firms: Empirical evidence from Vietnamese logistics enterprises. *Journal of Asian Financial, Economic, and Business*, 9(2), 177-183. <http://dx.doi.org/10.2139/ssrn.3934934>
- Nicola., M., Alsafi., Z., Sohrabi, C., Kerwan., A., Al-Jabir., A., Iosifidis, C., Agha.,M., Agha, R., (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery* 78, 185-193. <https://doi.org/10.1016/j.ijssu.2020.04.018>
- Olowe, A. (2017). *Financial management concepts, finance system and business finance* (4th ed.). Lagos: Brierly Jones Nigeria Limited.
- Osama, F.A., Mohammed, M.D., Khakha, N. & Guilherme F.F. (2021). Impact of Covid 19 on Financial performance of logistics firms: Evidence from G-20 countries. *Journal of Global Operations and Strategic Sourcing* 2398-5364. <https://www.emerald.com/insight/content/doi/10.1108/JGOSS-03-2021-0028/full/html>
- Paulina, P., & Nomeda, D., (2021). The impact of COVID-19 on the financial performance: a case study of the Lithuanian transport sector. *Insights into Regional Development*, 3(4), 34-50. [http://doi.org/10.9770/IRD.2021.3.4\(3\)](http://doi.org/10.9770/IRD.2021.3.4(3))
- Pradip K. D. (2017) Impact of Return on Capital Employed On Company Performance – An Introspection in India. *Saudi Journal of Business and Management Studies*, Volume 2, Issue 9. Retrieved from: <https://saudijournals.com/media/articles/SJBMS-29848-853-r.pdf>

- Priya, K., & Nimalathasan, B. (2013). Liquidity management and profitability; A case study of listed manufacturing companies in Sri Lanka. *International Journal of Technological Exploitation and Learning*, 2(4), 161-165. [https://www.researchgate.net/publication/255910992\\_Liquidity\\_Management\\_and\\_Profitability\\_A\\_Case\\_Study\\_of\\_Listed\\_Manufacturing\\_Companies\\_in\\_Sri\\_Lanka](https://www.researchgate.net/publication/255910992_Liquidity_Management_and_Profitability_A_Case_Study_of_Listed_Manufacturing_Companies_in_Sri_Lanka)
- Quadri, S., U., Ma, Z., Raza, M., LI, M., Quadri, S., Ye, C. & Xie, H. (2023). Covid -19 and financial performance: Pre and post effect of covid -19 on organization performance: A study based on South Asian economy. *Front. Public Health*. 10; 1055406. <https://www.frontiersin.org/journals/publichealth/articles/10.3389/fpubh.2022.1055406/full>
- Shoukat, I., & Matrian, M. T. (2022). An evaluation on the impact of COVID-19 in the financial performance of telecommunication companies in Oman (Omantel and Ooredoo). *Global Scientific Journal (GSJ)*, 10(2), 367-882. Retrieved from: [https://www.globalscientificjournal.com/researchpaper/AN\\_EVALUATION\\_ON\\_THE\\_IMPACT\\_OF\\_COVID\\_19\\_IN\\_THE\\_FINANCIAL\\_PERFORMANCE\\_OF\\_TELECOM\\_MUNICATION\\_COMPANIES\\_IN\\_OMAN\\_OMANTEL\\_AND\\_OOREDIOO\\_.pdf](https://www.globalscientificjournal.com/researchpaper/AN_EVALUATION_ON_THE_IMPACT_OF_COVID_19_IN_THE_FINANCIAL_PERFORMANCE_OF_TELECOM_MUNICATION_COMPANIES_IN_OMAN_OMANTEL_AND_OOREDIOO_.pdf)
- Süt, H. M., & Öznaçar, B. (2021). Effects of COVID-19 period on educational systems and institutions. *International Journal of Curriculum and Instruction*, 13(1), 537–551. <https://files.eric.ed.gov/fulltext/EJ1285554.pdf>
- World Health Organization (2021) The true Death Roll of Covid 19 retrived from: <https://www.who.int/data/stories/the-true-death-toll-of-covid-19-estimating-global-excess-mortality>
- World Health Organization. (2024, June). Coronavirus disease. Retrieved from [https://www.who.int/health-topics/coronavirus#tab=tab\\_1](https://www.who.int/health-topics/coronavirus#tab=tab_1)
- Zhu, H., Wei, L. & Niu, P. (2020). The novel coronavirus outbreak in Wuhan, China. *Global Health Research and Policy* 5:6. <https://doi.org/10.1186/s41256-020-00135-6>