Global crises and inflation dynamics in Nigeria

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Abstract

This study provided evidence that global crises affected the inflation in Nigeria. Analysing data over the 1999Q1-2022Q4 period within the Test of Means and Variances model, this study finds that the magnitude and volatility of inflation in Nigeria changed with crises. While inflation declined after the global financial crisis (GFC), its volatility rose after the crisis. In contrast, inflation rose after the COVID-19 pandemic while the volatility increased. The decline in inflation after the GFC was associated with increase in real GDP, suggesting its inflation-reducing output effects post-GFC. The absence of any significant increase in real GDP after the COVID-19 shows that the pandemic was trailed by stagflation. These results also show that COVID-19 impacted on inflation dynamics in Nigeria differently from how GFC had.

1. Introduction

Inflation is a main macroeconomic variable of significant interest and importance to virtually all economic agents [1] households, firms, government, and even inter-governmental institutions. Its importance stems from its direct and/or indirect permeation into the utility functions of the agents, hence, their need to adjust their decisions as a means of maximizing their utilities in the light of inflation trajectories. Inflation not only affects households negatively through decline in real disposable income, and weakens businesses through (demanded) higher wages and loss of export competitiveness [2]. It is also a source of concerns to government and policy makers due to its spillover effects on other macroeconomic variables such as exchange rate [3], interest rates, economic growth, external balance [4,5], cost of production and consumer expenditures [6].

Major shifts in macroeconomic variables such as inflation are often ignited by global developments such as the global financial crisis (GFC) and COVID-19 pandemic. Inflation in any country, have been affected by external shocks [7,8] that are often associated with global crises. While previous crises have apparently been associated with recession as well as low and declining inflation, the COVID-19 pandemic have been noted to have led to high and rising inflation, in association with recession [9].

A number of studies may have identified the association between change in inflationary pattern and global events, none, to the best of our knowledge, has empirically evaluated magnitude and volatility of inflation around these crises in Nigeria as a means of establishing the possible effects of these developments on inflation. Most studies on the effects of crisis on the economy focus on the impact of crises on other macroeconomic variables such as manufacturing activities [10], stock market returns [11], stock market capitalization [12], output [13], exchange rate and employment [13] and non- performing loans [12]. Furthermore, no known study has made a comparison with the pandemic-associated shift in inflation dynamics with that of the global financial crisis (GFC).

This study thus attempted to bridge this gap in the literature by estimating, within the test of means and variances model, magnitude and volatility of inflation in Nigeria before and after these crises, determining if there are shifts in these parameters after the crises, and comparing the shifts to determine the similarity and difference between COVID-19 pandemic and the GFC with regards to their impacts on inflation and output. The findings from the analysis are insightful.

This study finds that the inflation significantly rose after the COVID-19 pandemic but declined after the GFC. While the decline in inflation post-GFC was associated with significant increase in real output, inflation surge in the wake of COVID-19 was not accompanied by any significant increase in real GDP. These results suggest that, while the GFC had in its wake deflation-induced output growth, COVID-19 was associated with stagflation (inflation-stunted growth). In addition, the COVID-19 pandemic was, unlike the GFC, not associated with inflation and output volatility. These results show that both crises are dissimilar in terms of their associated pattern of shift in inflation and output. While the aftermath of GFC was associated with significant recovery and moderated inflation, the wake of COVID-19 handed out softened recovery with stubborn inflation. With these findings, policy makers may note that crises are different in terms of their macroeconomic interaction or effects on the economy. Therefore, a one-cap-fit-all approach to crisis management would be inappropriate; hence, policy intervention to manage any crisis must be contextually fit.

This paper is organized into five sections. Following the introduction, Section 2 reviews the literature review while section 3 highlights the methodology. Section 4 discusses the findings and Section 5 rounds off with conclusion and recommendation.

2. Literature Review

This section provides a review of the literature with a view of highlighting the both the theoretical and empirical advances in the study of inflation.

The literature documents a number of the theories on inflation and these differ on their views on the causes of inflation the 'Demand-Pull' or 'Keynesian' Theory of Inflation holds that that inflation rises when aggregate demand for goods and services exceeds aggregate supply for goods and services, resulting in an excess demand that cannot be satisfied by running down the existing stocks [14]. The aggregate demand may be fueled by increased government spending, rise in household and firms' consumption and prices in the international market [15].

In contrast, the 'Cost-Push' Theory of Inflation posits that inflation rises when the cost of production consistently increased, leading to rise in prices of produced goods and services. As the major component of the production inputs is labor, cost-push inflation exists when wages or production costs start rising, leading to higher prices of good as producers pass these rising costs upon the consumers [16]. The prices of other production inputs also contribute to production cost; hence any factor increasing these prices would lead to inflation. Therefore, exchange rate depreciation will lead to inflation the bulk of raw materials required for their production is imported.

According to the Monetary Theory of Inflation, increase in money supply is believed to translate to inflation under full employment. Based on Irving Fisher's quantity theory of money, prices rises proportionally to the rise in money supply there may not be any output effects on prices when all resources in the economy are full engaged.

According to this theory, the value of money is determined by the amount of money available in an economy. An increase in the money supply results in a decrease in the value of money because an increase in the money supply also causes the rate of inflation to increase.

The Classical theorists disagree with the monetary theory in that it posits that monetary expansion causes inflation even when there is no full employment. It establishes that inflation is always and everywhere a monetary phenomenon; hence, prices are likely to increase when the rate of increase in money supply is greater than the rate of increase in real output of goods and services.

According to the Structuralist Theory of Inflation, however, the long–run inflationary results from structural rigidities, market imperfection and social tension, relative inelasticity of food supply, foreign exchange constraints, protective measures, and rise in demand for food, fall in export earnings and political instabilities. The structuralists argue that by the very nature of their economies, the less developed countries are prone to inflation. The reason assigned for this argument is that there exist structural rigidities or bottlenecks namely; economic, institutional and socio-political factors in these countries.

Several studies have examined inflations during normal periods and during crises. This review looks at recent studies on inflation, especially in a period that is associated with the COVID-19 pandemic, which has had a significant impact on global inflation dynamics and volatility, causing significant changes in inflation trends after the pandemic. The impact of COVID on inflation, globally and in many countries, has been reviewed and analysed by many studies.

Ehsan, Deniz and Soledad (2020) [17] examined conceptually and wherever possible, empirically, the potential drivers and dynamics of the global inflation during the COVID-19 pandemic distinguishing between the lockdown phase, characterized by restrictions in mobility and potentially significant supply and demand disruptions, and the reopening phase, when restrictions to mobility were lifted and economic activity started to rebound. Early evidence from advanced and emerging market economies pointed to an increase in food prices; however, there was no evidence of inflation when considering broader indexes. Although it was still too early to analyze the behavior of inflation following the reopening, measures of inflation expectations showed no obvious pattern of an upward move in inflation. There had been, however, a rise in the variance of expected inflation indicating significant uncertainty and a potential risk of de-anchoring.

Apergis and Apergis (2021) [18] explore the role of

the COVID-19 pandemic event in the course of inflation expectations and their volatility through US inflation swap rates. The findings document that inflation expectations and their volatility are positively affected by the COVID-19 pandemic. These results have real activity implications, while close monitoring of inflation expectations could signal inflation expectations un-anchoring risks.

Weber et al., (2023) [20] examines the expected, perceived, and realized inflation rates on households in United States before and during the COVID-19 pandemic. Using matched micro data on spending of households and their macroeconomic expectations, the authors studied the link between the inflation experienced by households in their daily shopping and their perceived and expected levels of inflation both before and during the pandemic. The study found that household expectations of inflation were relatively stable in the years leading up to the pandemic, but there was a significant increase in perceived inflation during the pandemic. However, actual inflation rates did not increase significantly during this period.

Tingfeng et al. (2022) [21] used online prices and inflation using 107 Websites to measure the effect of COVID19 on China's inflation during COVID19 quarantine period. The findings showed how the pandemic led to 0.4% surge in the overall inflation rate, a 20% decrease in the price change probability, and a 1% decline in the size of an absolute price changes. Moreover, the pandemic had heterogeneous impacts on different structural sectors, leading to significant structural inflation. Specifically, the pandemic hindered the price correction behavior after spring festival, and whether products could be consumed while customers stayed at homes was an important factor affecting price adjustment and inflation dynamics.

Another similar research was conducted by Asha and Ashok (2020) on the effects of COVID19 on various sectors in India from April to October, 2020. They found out that transportation and communication inflation rose continuously and had 8.6% weight age in the overall CPI. They explained that the reason behind this was that the public started using private transport rather than public transport during the pandemic. Personal care had also affected inflation with a rise of 3.9% due to increase in gold prices. Healthcar e inflation had 5.9% weight age in the CPI and had increased from 2.8% in April to 5.2% in October 2020. The CPI inflation increased due to food inflation while the pandemic resulted in higher retail inflation. Inflation remained high for the two commodity groups- health, and transport and communication. In October the food inflation had increased to 11% from 10.68% in September and had been high over the preceding months due to seasonal and flood induced shortages. This had also increased the retail inflation to over 7% in the last two months. Food and beverages count for more than 45% in the overall retail inflation index.

Asha and Ashok found out that the high inflation in India during COVID-19 pandemic was not only because of high food inflation. The core inflation, which leaves out food items and fuel and light items, the inflation, was at 5.64%, the highest in two years. An increase in the cost of transportation was the major reason for higher inflation, which went up by 11.16% in October. Fares of buses, taxies, auto rickshaws and rickshaws had gone up and the primarily reason for this was the petrol and diesel were now more expensive, because the government had increased excise duty on them. The government's dependence on fuel taxes had gone up and that reflects higher inflation. Petrol and diesel used for vehicles come under the transport communication category of the CPI, and not the fuel category.

A study conducted by Yadav et al. (2022) [22] claimed that the inflation in India during the pandemic in the personal segment was 12.07% in October 2022. The prices of gold, silver and other ornaments rose significantly by 33.77%, 36.66% and 20.52%. Inflation in the personal segment was 12.07% in October 2020. There was also a significant rise in the prices of gold, silver and other ornaments, which went up by 33.77%, 36.66% and 20.52%, respectively. Inflation in the health category went up by 5.22% which was the highest in the year 2019. In October again, the price of domestic cooking gas went up by 10.16%, while non-PDS kerosene raised by 8.28%.

Ozili (2021) [12] analyses the COVID-19 situation in Nigeria, its effect on the economy and the structural causes that worsened the coronavirus (COVID-19) crisis. This paper uses simple descriptive analysis to examine the COVID-19 situation in Nigeria. The results show that the economic slowdown in Nigeria was brought on by a combination of falling oil prices and COVID-19 outbreak spillovers, which not only decreased demand for oil goods but also prevented economic activity when social distancing regulations were put in place. The government responded to the problem by giving businesses and a few households that were impacted by the coronavirus (COVID-19) epidemic financial support. The monetary authority implemented accommodating monetary policies and provided specific sectors with 3.5 trillion in lending support. These initiatives were supposed to stop the economic crisis in its tracks, but they did not. The COVID-19 disease prevented economic agents from freely engaging in economic operations.

Jacob et al. (2020) [23] showed that the COVID-19 pandemic affected higher institutions in Nigeria through the lockdown of schools, reduction of international education, disruption of academic calendar of higher institutions, cancellation of local and international conferences, creating teaching and learning gap, loss of man power in the educational institutions, and cut in budget of higher education.

World Bank (2020) [24] reported that the Nigeria's economy experienced its deepest recession in 2020 since the 1980s due to the COVID-19-related disruptions, inflation, notably lower oil prices and remittances, enhanced risk aversion in global capital markets, and

mobility restrictions.

Akintunde et al. (2021) [25] studied stochastic modelling of Nigeria inflation rate. The study examined the Nigeria monthly inflation rate data between January, 2011 and March 2021. This work is important as it examines the inflation situation in Nigeria and make possible predictions of the nature of the system in the future for adequate awareness and planning for effective control by all stakeholders in the country. The dynamics of the inflation rate is stochastic. Markov chain model was used to model inflation rate in Nigeria. A three- state Markov model with a Random Walk was used to determine the rate. The Chapman relation was used to generate the absolute probability distribution. According to the findings, an increasing inflation rate in Nigeria is unavoidable if required control measures are not implemented by the governments. The paper suggests that the Markov technique be used to model the behavior of dynamic systems and that reversion mechanisms be used, particularly by the governments to reduce Nigeria's inflation rate.

Musa (2021) [26] examines the relationship between exchange rate volatility and inflation in Nigeria. The study uses annual time-series data from 1986-2019 and finds that exchange rate volatility and an increase in money supply have a positive and significant effect on inflation. The study recommends that the central bank should control the growth of money supply to reduce inflation. This highlights the need for targeted and coordinated macroeconomic policies to address inflation challenges in Nigeria during pandemic times. It also emphasizes the importance of developing policies tailored to the specific needs of each country to effectively address the challenges posed by inflation and unemployment during pandemic times.

Orji and Opualla-Charles (2022) [27] discussed Unemployment – Inflation Dynamics: as it impacts Entrepreneurship Development in Nigeria spanning the period of 1990 -2021. The Private Sector Productive Capacity Index (PSPC), a proxy for entrepreneurship development, was studied using the Auto Regressive Distributed Lag technique. The explanatory variables were the inflation rate commercial bank credit to small scale enterprises as a percentage of total credit to the private sector, unemployment rate, and real interest rate. The results showed, among other things, that unemployment rate and commercial bank credit to small scale enterprises as a percentage of total credit to the private sector in Nigeria have a statistically significant positive association. Therefore, institutional-based restrictions such as property rights and the legal system together with non-inclusive and segregated attitudes of institutions to government entrepreneurship development programs, particularly on young employment, could be a cog in the wheel. Due to structural and financial rigidity toward enterprise development in Nigeria, real interest rate produced a positively insignificant relationship with commercial bank credit to small scale enterprises that yielded non-conformity to theoretical expectations.

IMMAP (2021) [28] revealed that although Nigeria's economy was gradually recovering from the negative effects of the COVID-19 pandemic, unemployment and inflation have remained high with the receding number of confirmed cases and the lifting of COVID-19 restrictions. Nigeria's total unemployment rate rose to 33.30% in Q1 2021 from 27.10% in Q2 2020, and of the population, unemployed youth accounted for 53.4% in Q1 2021 from 40.8% in Q1 2020.

Adenomon and Maijamaa (2020) [11] examined the impact of COVID-19 on the Nigerian stock exchange from the 2nd January 2020 to 16th April 2020. The results revealed a loss in stock returns and high volatility in stock returns during the COVID-19 period in Nigeria.

Adeosun et al., (2022) [29] investigates the dynamic relationship between economic policy uncertainty (EPU), geopolitical risks (GPR), the interaction of EPU and GPR (EPGR), and inflation in the USA, Canada, the UK, Japan, and China. The authors use the wavelet coherence (WC) to look at the co-movement and lead-lag status of the series over a range of frequencies and time, as well as the continuous wavelet transform (CWT) to monitor the evolution of model variables. The authors use multiple wavelet coherence (MWC) to assess how well the linear combination of independent variables co-moves with inflation across several time-frequency domains in order to enhance the WC. The CWT reveals heterogeneous characteristics in the evolution of each variable across frequencies. Inflation across samples exhibits significant short- and medium-term variation, while long-term volatility declines.

With the exception of Japan and China, where coherence is visible in the near term, a similar trend for the explanatory factors applies for EPU. Strong short- and medium-term coherence is revealed by GPR data from the United States and Canada. Additionally, the UK and China exhibit great short-term coherence but weak medium-term importance, whereas Japan's GPR only shows strong short-term coherence. With the exception of China, the EPGR exhibits significant short- and medium-term variance between samples. The MWC reveals the combined intensity, strength, and significance of both EPU and GPR in predicting inflation across frequency bands among the countries, whereas the WC's phase-difference reflects bidirectional causalities and switches in signs among series across different scales and periods in the samples. Important worldwide events including the Asian financial crisis, the global financial crisis, and the COVID-19 pandemic are corroborated by the findings, which also demonstrate strong co-movement among series within date-stamped periods.

Adenomon et al., (2022) [30] examines the effect of COVID-19 outbreak on the performance of the Nigeria stock exchange using secondary data for

the period of 2nd March 2015 to 16th April, 2020 and also considered the COVID-19 period of 2nd January 2020 to 16th April 2020. The study used EGARCH and QGARCH models with the addition of a dummy variable to accommodate periods before and after COVID-19. According to the GARCH model results, Nigeria's stock returns under the COVID-19 period were lower and more volatile than those under the non-COVID-19 period. The report consequently suggested that economic policy be enacted, including incentives for indigenous businesses to generate new jobs, diversification of the economy to draw in new investors, and a flexible currency rate system to facilitate commerce between Nigerian investors and foreign markets.

3. Methodology

This section presents the analytical method used in evaluating inflation dynamics under the global crises, data used, its description, sources and scope.

3.1 Methods

This study employs the test of two means and variances that compares the means and variances of inflation, and also the GDP before and after the global financial crisis and the COVID-19 pandemic, as employed by Alley et al. (2023), [31] Alley (2022) [3], Adegbaju and Olokoyo (2008) [32] and Sobodu and Akiode (1998) [33] in analyzing banking sector performance in Nigeria before and after banking sector reforms [34].

The test provides two statistics by which the means and variances of inflation and real gross domestic product (RGDP) before and after the two crises: the z statistics and F statistics. The z statistics is a measure by which the statistical significance of the difference between the means of the macroeconomic indicators before and after the crises, and hence help in suggesting the possible effects of the crises on the on the inflation and RGDP. The F statistics allows for the comparison of the volatility of the indicators before and after the crisis.

Given the data scope (1999-2022), the z statistics, whose p-values indicate whether the mean values of the macroeconomic indicators after global financial crisis (GFC) in 2007 (2008Q1-2015Q2) and COVID-19 pandemic in 2019 (2019Q3-2022Q4) are statistically different from those before the GFC (1999Q1 – 2007Q4) and the pandemic (2015Q2- 2019Q2), are given in equations 1 and 2. Equations 3 and 4 present F test for equality of standard deviation for the data before and after the crises.

$$z = \frac{Y^{Mean}_{99Q1-07Q4} - Y^{Mean}_{08Q1-15Q2}}{\sqrt{(\sigma_Y^{99Q1-07Q4})^2 + (\sigma_Y^{08Q1-15Q2})^2}} \qquad 1$$

$$z = \frac{Y^{Mean}_{15Q3-19Q2} - Y^{Mean}_{19Q3-22Q4}}{\sqrt{(\sigma_Y^{15Q3-19Q2})^2 + (\sigma_Y^{19Q3-22Q4})^2}} \qquad 2$$

$$F = \frac{\sigma_Y^{99Q1-07Q4}}{\sigma_Y^{08Q1-15Q2}} \qquad \dots\dots\dots 3;$$

$$F = \frac{\sigma_Y^{19Q3-22Q4}}{\sigma_Y^{15Q3-19Q2}} \qquad \dots\dots 4;$$

3.2 Data: Description, Measurement and Sources

Inflation, defined as the indicator that tracks the movement in price level, is measured as percentage change of monthly consumer price index in Nigeria on quarter-on-quarter basis. Real gross domestic product (RGDP) is the monetary value of final goods and services produced within Nigeria in a year, measured in constant prices. Both data are obtained from the statistical database of the Central Bank of Nigeria.

4. Findings and Discussion

This section reports research findings on inflation dynamics in Nigeria around the global crises, both the global financial crisis and the COVID-19 pandemic.

As shown in Table 4, there are statistically significant differences in inflation and real GDP before the crises and their values after the crises. The analytical results show that the crises are different in term of their effects on inflation and real GDP dynamics in Nigeria.

While inflation, on average, significantly declined after the global financial crises, from the mean value of 12.63 per cent in the period 1999Q1-2007Q4 to 10.36 in the period 2008Q1-2015Q2, it rose significantly, on the average, after the COVID-19 pandemic to 16.59 per cent in the period 2019Q3-2022Q4, from 13.00 per cent in the pre-COVID- period 2015Q3-2019Q2. Though inflation volatility decreased in both crises, it was large and significant after the global financial crises. These results suggest that inflation was rising and unabating after the COVID-19 pandemic, in contrast to the global financial crises.

The real GDP significantly rose, on the average, from the natural logarithm of 25.54 in the pre-GFC period 1999Q1-2007Q4 to 29.07 in the post-GFC period 2008Q1-2015Q2, albeit with significantly increased volatility. The real GDP did not significantly change around COVID-19 pandemic: the mean of the natural logarithm of real GDP slightly increase, albeit insignificantly from 30.49 in the pre-COVID-19 period to 30.536 after the pandemic. The volatility also increased but with no statistical significance.

The foregoing results also suggest that there was output-induced disinflation in Nigeria in the aftermath of global financial crises as output rose while inflation

declined. In contrast, COVID-19 pandemic appears to be associated with stagflation in Nigeria, as deductible from sharp rise in inflation after the health crisis without any significant compensating increase in output.

5. Conclusion

This study analyses inflation dynamics in Nigeria, and how global crises affect them. It sought to analyses the magnitude and volatility of inflation in Nigeria before and after the global financial crisis (GFC) and the COVID-19 pandemic with a view to determining if they differ across the crisis periods, and if so, infer whether the crisis play a role in the variations. It also seeks to know if the pattern of change in inflation, its dynamics are the same or different across the two crises.

It employed the tests of means and variances to analyse data on Nigeria from the first quarter of 1999 to the last quarter of 2022. The scope of the data is influenced by the country of interest, data availability, and location of the analysis within democratic regime to ensure that data generating process is not subject to inconsistency that may arise from difference in political regimes, and thus avoid problems such as presence of outliers.

Findings from the test of means show that inflation declined significantly in the period after the GFC while the real GDP rose. In contrast, inflation rose, significantly, after the COVID-19 pandemic while there was no significant change in output. These results suggest that inflation dynamics are different across the two crises, and COVID-19 pandemic affected inflation dynamics in a way different from how GFC did. While there was inflation reducing output effects after the GFC, it can be inferred that stagflation trailed the COVID-19 pandemic in Nigeria.This study has shown that inflation dynamics changes over time, and may be impacted by crises. It has also demonstrated that the effects of crises on the dynamics are not the same.

It is thus very important for all economic agents – households, businesses, governments – to internalize these properties of inflation in their utility function for dynamic optimisation of their welfare. Households and firms should recognize that inflation

Table 4: Inflation and Real GDP Means and Volatility around the Crises

Series	Moment	Pre-Global Financial Crisis	Post-Global Financial Crisis	Difference	Pre-COVID-19 Pandemic	Pre-COVID-19 Pandemic	Difference
Inflation	Mean	12.630	10.361	-2.269*** (0.000)	12.998	16.591	3.593*** (0.000)
	Volatility	6.354	3.142	0.494*** (0.000)	3.142	2.912	0.928
							(0.819)
	Mean	25.537	29.074	3.537*** (0.000)	30.491	30.536	0.045 (0.904)
Real GDP				(0.000)			
	Volatility	0.177	2.066	11.672*** (0.000)	0.06900	0.089	1.289 (0.296)

is likely to change after a crisis.

In order to be prepared, they may take decisions that presume rise in inflation when a crisis looms as a way of being protected from impending rise in inflation. For instance, labour unions may prepare to negotiate for higher wages in anticipation of inflation increase when a crisis looms.

Policy makers may note that crises are different in terms of their macroeconomic interaction or effects on the economy; hence, one-cap-fit-all approach to crisis management would be inappropriate, and policy intervention to manage any crisis must be therefore be contextually fit.

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