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Testing for Explosive Behaviour in Relative Inflation Measures: Implications for Monetary Policy under Uncertainty

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Abstract

This study sets out to examine the explosive behaviour of relative inflation measures and its effects on consumers' inflation expectation as well as on the efficacy of monetary policy under uncertainty. To achieve these objectives, we applied the Generalised Sup Augmented Dickey-Fuller (GSADF) test to Nigeria's data on aggregate consumer price index (CPI) and its energy, food & "core" components over the period 1995-2020. In the case of energy price, food price and aggregate price, four (4), two (2) and two (2) episodes of explosive behaviours were identified relative to core items. Two of these episodes correspond to the 2016 recession and COVID-19 economic lockdown. It was found that under explosive regimes, inflation expectations were significantly affected, and consumers had become increasingly uncertain about the impact of monetary policy on inflation. One implication of these findings is that because the explosive nature of relative inflation is found to be a determinant of inflation expectation, considering the explosiveness of relative inflation may be an important input to monetary policy decisions. Therefore, we recommend that Central Bank of Nigeria should consider explosiveness in relative inflation measures to determine the best instrument for managing inflation.

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1.0 Introduction

One of the major economic consequences of the COVID-19 containment measures in Nigeria was its adverse effect on domestic inflation. Following the massive demand and supply shocks associated with the restrictions and lockdown. These restrictions have resulted in a sustained increase in the headline inflation in Nigeria. The rise in headline inflation was prompted by the concerted increase in both the food and core components, albeit at different paces, hence leading to spikes in relative prices of energy and foodstuffs. Spike in the prices of food and energy relative to the prices of the core items in the consumer basket imply that the prices of these components behave differently from those of the core items. These spikes may have caused a significant deviation of the aggregate inflation and relative prices from their long-term trends (See Figure 1). Continuous divergence of relative prices, especially when explosive, can significantly raise inflation uncertainty, thereby rousing revisions of inflation forecasts; difficulty in anchoring inflation expectations; and increasing uncertainty in the conduct of monetary policy. Arora et al. (2013) show that an increase in relative prices may present a substantial risk to inflation and de-anchoring of consumers' inflation expectations. Also, Humpage (2008) shows that when movements in relative prices are caused by non-monetary factors, monetary policy may have little influence. The empirical knowledge of the nature and causes of the movement in relative prices is, therefore, important for the effectiveness of monetary policy.

Furthermore, a review of the empirical literature shows that inflation expectations behave differently under episodes of normal deviations compared to explosive episodes (see Arora et al., 2011 and Ganioğlu, 2017). These differences are used to infer the occurrence of de-anchoring of inflation expectations. De-anchoring of expectations may amplify the level of uncertainty of central banks' medium and long-term inflation forecast. Thus, explosive deviations may have a significant impact on the efficacy of monetary policy in containing inflation since its success depends on well-anchored inflation expectation. Therefore, the estimates can be a very important consideration for policymakers as an early warning/signal of sustained inflationary pressures, de-anchoring of consumers' inflation expectation, and a probable amplification of uncertainty of the central bank's inflation forecast.

Early empirical works on the explosive deviation of headline inflation relative to core prices could be linked to the work of Arora et al. (2011), who observed that explosive deviations have a significant implication on consumers' inflation expectation in the United States. Similar findings were also observed in the later studies of Arora et al. (2013); Liu et al. (2017); Ganioğlu (2017); Ganioğlu (2020); and Butt and Mumtaz, (2019). Motivated by these studies, coupled with the recent surge in both food and energy prices, we consider Nigeria to be a good case study for two reasons. First, to the best of our knowledge, this study will be the first to test for explosive deviation of food, energy, and overall prices from core items of the CPI. Second, food and energy items accounted for at least 61.66% of consumption expenditure in 2019, thus, an important influence on households' inflation expectation and welfare as well as the efficacy of monetary policy[1]. The outcome of this study significantly contributes to the empirical literature given the scanty extant works in inflation dynamics and uncertainty, especially for Nigeria.

[1] When food or energy prices rise fast and significantly, consumers expectation of inflation is more likely to be influenced upward even if the prices or the core items are not increasing. The deviation of the prices of these components from the prices of the core items can therefore affect the efficacy of monetary policy by raising inflation expectation, which is an important determinant of inflation.

Therefore, this study seeks to assess the nature and pattern of deviations of the prices of food, energy, and headline items from the prices of the core items of inflation in Nigeria over the periods 1995-2020. It, therefore, seeks to identify periods within the sample when movements in the prices of food, energy, and aggregate inflation behave so differently from the core items, hence, deriving the inflation and its expectation formation. Further, it seeks to examine the empirical effects of explosive deviations on inflation forecasts and monetary policy uncertainty in Nigeria. Thereafter, CBN's survey data is used to analyse consumers' attitudes during the episode of explosive deviations of the headline from core inflation measures.

2.0 Review of Related Empirical Literature

The empirical literature on the explosive deviation of food, energy, and aggregate prices relative to the core items' prices is scanty and emerging. However, several studies are concerned with the impact of explosive deviation on consumers' inflation expectation and anchoring of expectation by Central Banks. For instance, Arora et al. (2011) examine the implication of explosive deviation of headline inflation relative from core inflation on inflation expectations in the United States and using the GSADF test, the study identified three (3) occurrences of explosive deviations. Notably, the study finds that inflation expectations behave differently under normal and explosive deviation and consumers rely heavily on past inflation when forming their inflation expectations. In another similar study in U.S, Arora et al. (2013) found that consumers are more likely to rely on past inflation when forming their inflation expectation under an explosive deviation regime. Thus, these differences in inflation expectation between the regimes maybe interpreted as evidence of de-anchoring of expectation while suggesting that explosive deviations can significantly influence how consumer inflation expectation develops in the economy.

Similarly, Ganioğlu (2020) applied the GSADF test to 27 European countries and found explosive episodes in 17 countries. Precisely, Ganioğlu (2017) finds that consumers revise their inflation expectations during periods when headline consumer prices deviate explosively from core prices. However, the study discovers that consumers in Germany, France, Luxembourg, Austria, Finland, Sweden, and the United Kingdom translate higher interest rates to be a signal for future rise in inflation under the explosive regimes. In another GSADF test on Turkey, Ganioğlu (2017) finds three (3) episodes of explosive deviation of processed food and energy prices from core prices. Specifically, the study shows that consumers revise their inflation expectations when processed food and energy prices deviate explosively from the prices of core items of the CPI in Turkey.

On the other hand, studies such as Liu et al. (2017) and Butt and Mumtaz (2019) were concerned only with identifying the occurrence of explosive deviations in relative measures of inflation. For example, Butt and Mumtaz (2019) test for the occurrence of multiple bubbles in all inflation indices in Pakistan and finds at least one episode in each measure of inflation. Also, Liu et al. (2017) investigate the origination and termination explosive episodes in the Chinese consumer price index (CPI). In the study, the GSADF test identified and date-stamp four (4) occurrences of explosive episodes over the period 2006-2014.

In summary, the literature reviewed above suggests that explosive deviation of aggregate inflation from its medium and long-term trend (measured by core inflation) has strong implication for consumers' inflation expectation and can make anchoring of inflation expectation difficult for central banks, leading to an increase in the level of uncertainty of inflation and its forecast by central banks. In most cases, consumers are shown to rely heavily on past inflation when forming

expectation under explosive deviation, while in a handful of countries such as Germany, France, Luxembourg, Austria, Finland, Sweden and the United Kingdom consumers rely on interest rates as a signal for future rise in inflation. Also, the literature has identified a persistent increase in food and energy prices as major push factors for the occurrence of explosive deviations. Under this condition, consumers' inflation expectation is most likely to be driven by food and energy prices relegating the core inflation as the major determinant expectation. Overall, these findings imply that selecting the right policy instrument to maintain a well-anchored inflation expectation requires empirical knowledge and understanding of the state of the divergence among measures of inflation. However, based on the empirical review we could not find any study that tests for explosive deviation of components such as food, energy, and overall prices from core prices as well as its impact on inflation expectations. This is core to the study on the deviations of inflation which informs us implicitly on the key drivers of the divergence rather than relying on the aggregated or explicit component(s). Therefore, this study examines the nature of the deviations of food, energy, and headline measures of price level relative to the core inflation and its implication on inflation expectation and uncertainty in Nigeria.

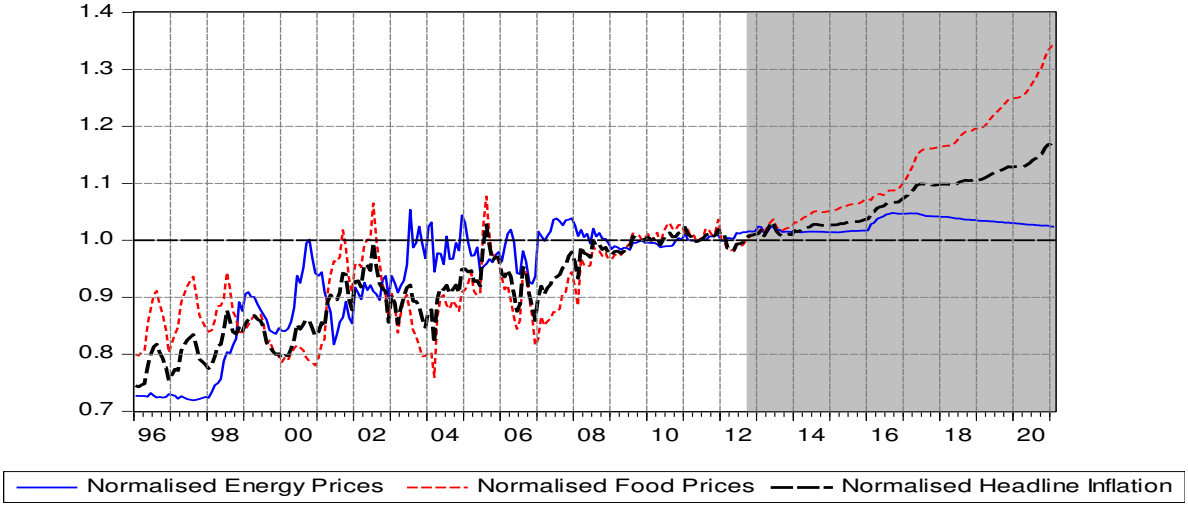
3.0 Data and Methods

To construct the relative measures of inflation for this study, the food, energy, and headline inflations were normalised by core inflation to obtain relative measures of inflation. This was achieved by dividing each measure of inflation by the core inflation. Consumers' attitudes data towards inflation was obtained from the CBN expectation survey of 2019.

3.1 Evolution of the Relative Inflation Measures in Nigeria from 1995 to 2021

Figure 1 shows the evolution of relative inflation measures in Nigeria from 1995 to 2020. A cursory look at the figure reveals that food and energy prices have risen significantly above the prices of core items since October 2012, highlighting their increasing importance in the inflationary process in Nigeria.

Figure 1: Evolution of Relative Inflation Measures in Nigeria from 1995 to 2021



While energy prices are gradually converging to the prices of core items since January 2017, food prices continually diverge since October 2012, leading to persistent deviation of the headline measure of inflation from core prices. These rising relative prices are indication of domestic supply shortages which are often complemented with imports. These imports have appeared to mount an excessive demand pressure on Naira since 2016, leading to its enduring depreciation and increased fragility of the Nigerian economy to foreign supply-side shocks such as oil, rice, and other commodities price shock. In addition, a persistent increase in the relative prices of food and energy from those of the core items could be indicative of the deterioration in the short-run trade-off between output and inflation. However, the key question is whether these swings in both food and energy prices are substantial to overwhelm the headline inflation away from a measure of a medium and long-term trend.

3.2 Identifying the Periods of Explosive Divergence of Relative Inflation Measures

To identify and date-stamp the occurrence of an explosive episode in relative prices, this study follows Arora et al. (2011) and Ganioğlu (2017) to employ the Generalised Sup Augmented Dickey-Fuller (GSADF) test of Phillips et al. (2015), to date-stamp origination and termination of explosive behaviour in the relative inflation measures. These would allow inference on the dynamics of how consumers form inflation expectations under a high level of uncertainty as well as its effects on CBN's inflation forecasts. The GSADF test was originally designed to detect and date-stamp asset price bubbles characterised with explosive behaviour[2]. However, there are other comparable tests such as Sup Augmented Dickey-Fuller (SADF) test, Regime-Switching and Log-Periodic Power Law (LPPL) models exist, but the GSADF test outperforms these tests, especially when there are multiple episodes of explosive behaviour (Phillips et al., 2015; Greenaway-McGrevy and Phillips, 2016). Following Ganioğlu (2017), the empirical model is specified as follows;

$$\Delta y_t = \alpha_{r_1,r_2} + \beta_{r_1,r_2} y_{t-1} + \sum_{i=1}^{k} \psi^{i}_{r_1,r_2} \Delta y_{t-1} + \varepsilon_t \quad (1)$$

Where: y_t is the relative inflation measure of food, energy, and headline, k is the lag order, r_1 is the (fractional) starting point of the estimation sample, r_2 is the (fractional) point of the estimation sample. The GSADF statistic is used to conduct inference of the existence of explosive behaviour within the sample period. On the other hand, Backward Sup ADF (BSADF) test was used to date-stamp the occurrence period(s) of the explosive episode(s). The BSADF test implements a right-tailed unit root test against an explosive alternative repeatedly on a backward expanding sample sequence (Phillips et al., 2015). This study estimated equation (1) utilising monthly data on food, energy, core, and headline inflation obtained from the National Bureau of Statistics from January 1995 to February 2021.

[2] The choice of the GSADF test to identify and date-stamp the occurrence date(s) of explosive divergence of relative inflation measures was motivated by the work of Arora et al. (2011), Liu et al. (2017), and Ganioğlu (2017). Arora et al. (2011) test for large deviations in headline measures of the price level relative to core in the United States; and Liu et al. (2017) test for explosive behavior in Chinese consumer CPI, while Ganioğlu (2017) used the GSADF test to identify and date-stamp periods when processed food and energy prices deviate explosively from core inflation in Turkey.

4.0 Empirical Results

This section presents the empirical results on the explosive deviation of food, energy, and aggregate prices core items.

4.1 Explosive Episodes in Relative Inflation Measures in Nigeria

Table 1 reports the GSADF statistics, along with respective finite sample critical values estimated from equation 1. From Table 1, the estimates showed evidence of explosive behaviour in all three (3) inflation measures relative core, namely, food, energy, and headline inflation. Specifically, for the relative measure food, energy, and headline inflation, GSADF statistic is 5.98, 5.41, and 5.08, which are greater than the 99% critical value 2.67. This implies the existence of explosive deviation of food, energy, and headline inflations from core inflation within the sample period (1995-2020). The core inflation was also explosive. However, the exact dates of occurrence of the explosive deviation of the three (3) measures of inflation from the core inflation are presented in Figure 2 and Table 2 estimated based on the BSADF test.

Table 1: GSADF Test Results for Normalised Food, Energy, and Headline Inflation

Measure of Inflation	T-Stat Critical Value (95%)	GSADF Statistics	P-value
Core Inflation	2.12	10.44	0.00
Relative Energy Prices	2.12	5.41	0.00
Relative Food Prices	2.12	5.98	0.00
Headline Inflation	2.12	5.08	0.00

4.1.2 Date-Stamping the Explosive Episodes in Relative Inflation Measures

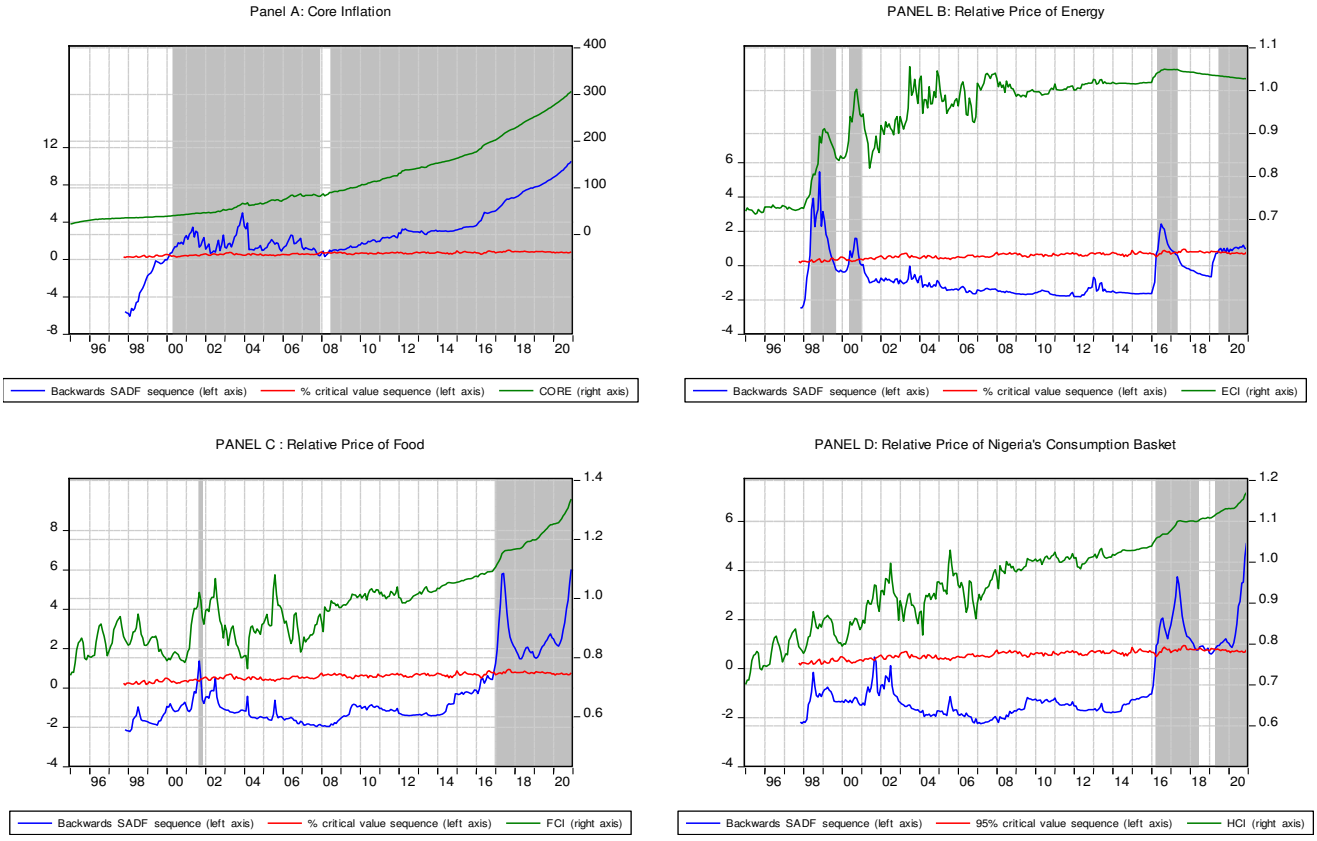
The estimates in Table 2 revealed that relative price of energy, food, and headline explosively deviated from core prices on four (4), two (2), and two (2) on occasions from 1995 to 2020 respectively. From the Panel in Figure 2, explosive deviation of relative energy prices lasted for 15, 7, 12, and 18 months from May 1998 to August 1999, May 2000 to December 2000, April 2016 to April 2017, and June 2019 to December 2020 respectively.

Table 2: Date-Stamping Occurrence of Explosive Episodes in Relative Inflation Measures

	First Episode		Second Episode		Third Episode		Fourth Episode	
Inflation	**Date**	**Duration**	**Date**	**Duration**	**Date**	**Duration**	**Date**	**Duration**
Core	2000M04-2007M11	91 months	2008M06-2020M12	150 months				
Energy	1998M05-1999M08	15 months	2000M05-2000M12	7 months	2016M04-2017M04	12 months	2019M06-2020M12	18 months
Food	2001M08-2001M10	2 months	2016M12-2020M12	48months				
Headline	2016M03-2018M05	33 Months	2019M04-2020M12	20 months				

Two of these episodes (2016M04-2017M04 & 2019M06-2020M12) coincide with the 2016 recession induced by the oil price shocks and supply chain destruction caused by the imposed economic lockdown as part of COVID-19 containment measures respectively. This implies that structural factors such as supply-side shocks pushed energy prices explosively above the prices of core items in Nigeria.

Figure 2: Date-Stamping Occurrence of Explosive Episodes in Relative Inflation Measures in Nigeria



Note: *Areas shaded show the periods of explosive inflation regimes*

From Table 2, the relative price of food items explosively deviated for 2 months and 48 months. These episodes are 2001M08-2001M10 and 2016M12-2020M12 (Panel C in Figure 2), showing that food prices remain explosively above the long-term trend since the 2016 recession and was pushed further by the COVID-19 containment strategies. Similarly, the headline explosively deviated from core price from 2016M03-2018M05 and 2019M04-2020M12. These episodes lasted for 33 months and 20 months respectively. These episodes coincide with (i) the 2016 recession and supply chain destruction following economic lockdown to control the spread of the COVID-19 pandemic around the second quarter of 2020, (ii) the occurrence of explosive behaviour in the relative price of food and energy. Overall, the findings of this study suggest that the explosive behaviour relative price of energy and food prices are key determinants of explosive deviation of headline inflation from its trend.

On the one hand, from Figure 2, the explosive behaviour in the relative price of energy in 1998M05-1999M08 and 2000M05-2000M12 does not transform into comparable movements in headline inflation but pulled the headline back to core prices from 2017M05 to 2019M05. On the other hand, except for the 2 months (2001M08-2001M10), explosive behaviour in the relative measure of food prices translates into a similar behaviour in the headline prices. This suggests that explosive food price behaviour is more significant than similar behaviour in energy prices in producing explosive behaviour for the aggregate measure of inflation in Nigeria[3].

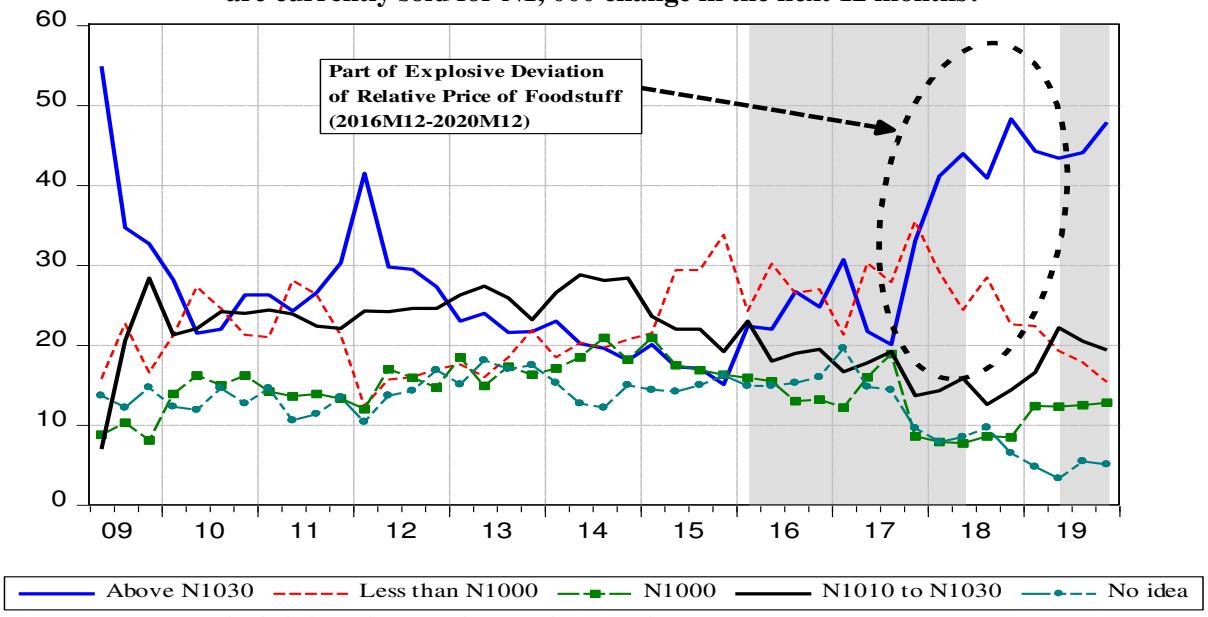
4.2 Explosiveness in Relative Inflation Measures and Consumers' Attitude towards Inflation

In this subsection, the study presents the analysis of consumers' attitude towards inflation in Nigeria under the identified explosive and normal regimes[4]. Thereafter, monetary policy decisions under the explosive episodes are analysed.

4.2.1 Explosiveness in Relative Inflation Measures and Consumers' Inflation Expectations

Figure 3 presents the responses of consumers to the question sourced from the "CBN Expectation Survey Report" on *how much will you expect prices of items that are currently sold for ₦1,000 to change in the next 12 months?*

Figure 3: Responses of Consumers to the Question: How much will you expect prices of items that are currently sold for N1, 000 change in the next 12 months?



Note: *Areas shaded show the periods of explosive inflation regimes*

In Figure 3, the responses show that consumers' inflation expectations behave differently under episodes of normal deviations compared to explosive episodes. It may also be inferred from the

[3] This finding is consistent with Iliyasu and Sanusi (forthcoming) who find that food prices dominate Nigeria's inflation process during the 2016M01-2018M06 and 2020M05–2021M12 periods.

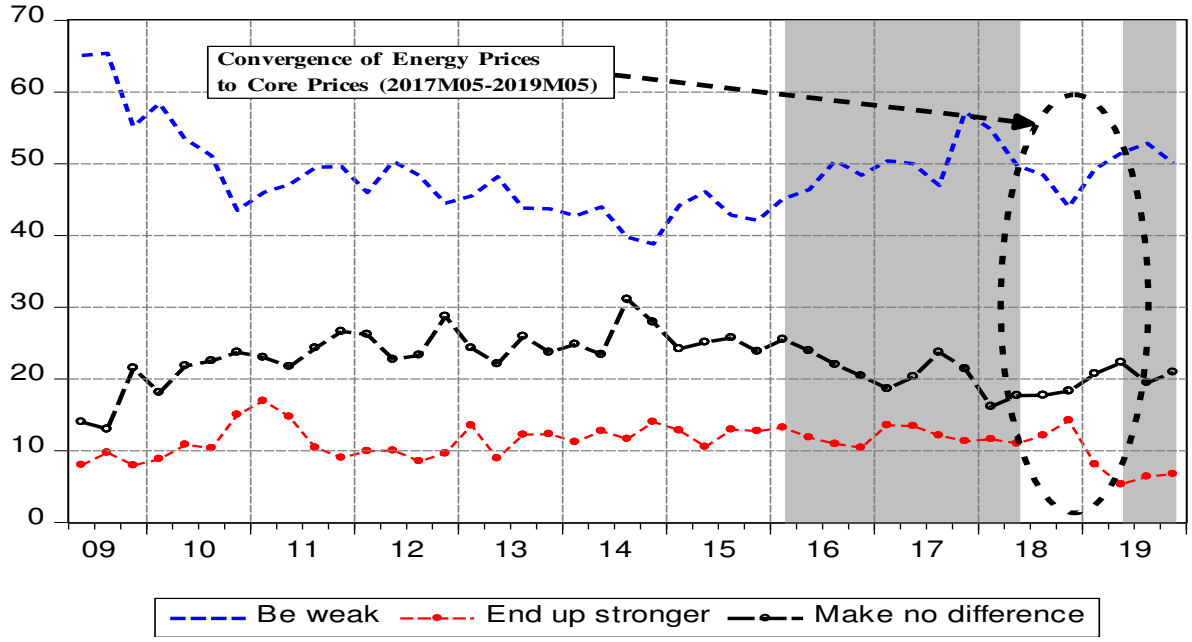
[4] This study uses the CBN's consumer inflation expectation survey data for the analysis in this section. The CBN through the National Bureau of Statistics (NBS), collects data on consumers' inflation by asking "*how much will you expect prices of items that are currently sold for ₦1,000 to change in the next 12 months?"* and which is then collated into overall percentages.

illustrative evidence that most consumers expect prices to rise in the next 12 months within the range of ₦1010-1030 and above ₦1030. Relative to normal periods, the number of consumers that expect higher inflation has significantly increased, while the proportion of consumers that expect a fall in prices significantly dropped under the explosive deviation regimes.
This may also suggest that under explosive episodes[5], consumers tend to anticipate higher inflation that they do under normal periods. To be consistent with the literature, we interpret this as evidence of de-anchoring of consumers' inflation expectation.

4.2.2 Explosiveness, Inflation and Nigeria's Economy

Figure 4 presents the responses of consumers to the question *if prices started to rise faster than they do now, do you think Nigeria's economy would "be weak", "no difference" or "be end up stronger"?* The responses of consumers to this question differ significantly between the normal and explosive regimes. Under the explosive deviation, most of the consumers expect the economy to "be weak" and a handful expects "no difference", while the proportion of consumers that expect the economy to "end up stronger" declined steadily. This implies that most of the consumers expect inflation to have negative impact on the economy under explosive regimes.

Figure 4: Responses of Consumers to the Question: If prices started to rise faster than they do now, do you think Nigeria's economy would…?



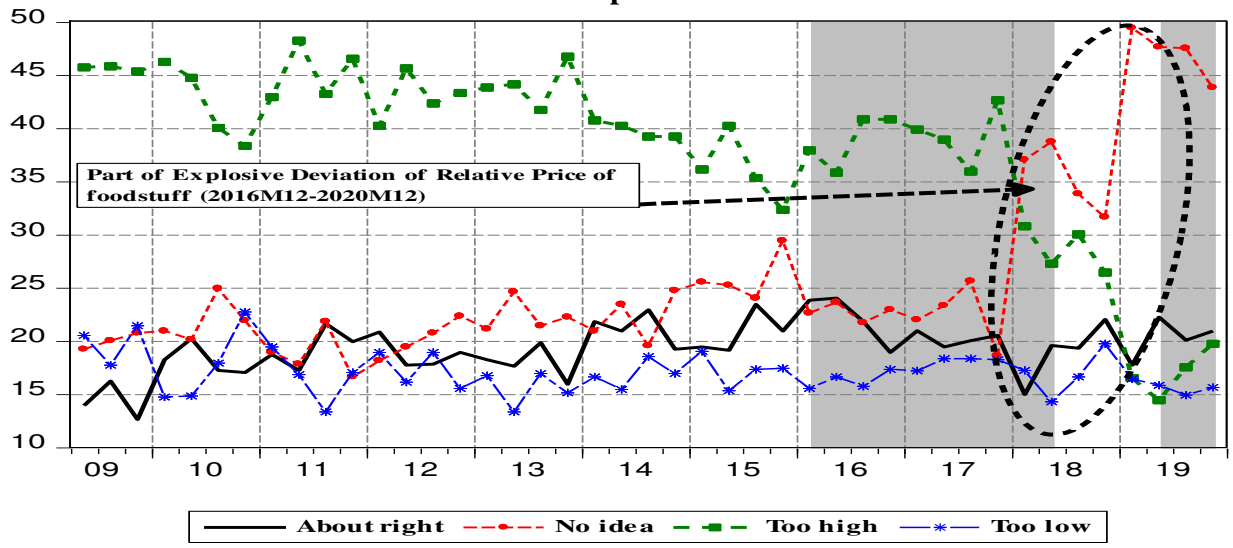
Note: *Areas shaded show the periods of explosive inflation regimes*

[5] Given the findings in section 4.1.2 that explosive behavior in the aggregate inflation is predominantly driven by explosive behavior in the food inflation, food price inflation is, therefore, important in anchoring inflation expectation in Nigerian. This finding is consistent with that in Patnai (2020), who found that food inflation feeds into households'' inflation expectations for India, and Iliyasu and Sanusi (forthcoming) who found that food and energy prices have effects on inflation expectation.

4.2.3 Explosiveness and Consumers' Perception of Government Anticipated Inflation

Figure 5 presents the responses of consumers to the question "*what do you think of this year's Government anticipated inflation rate?"* From Figure 5, under explosive deviation, most of the consumers do not have an "idea" of the government's anticipated inflation.

Figure 5: Responses of Consumers to the Question: What do you think of this year's Government anticipated inflation rate?

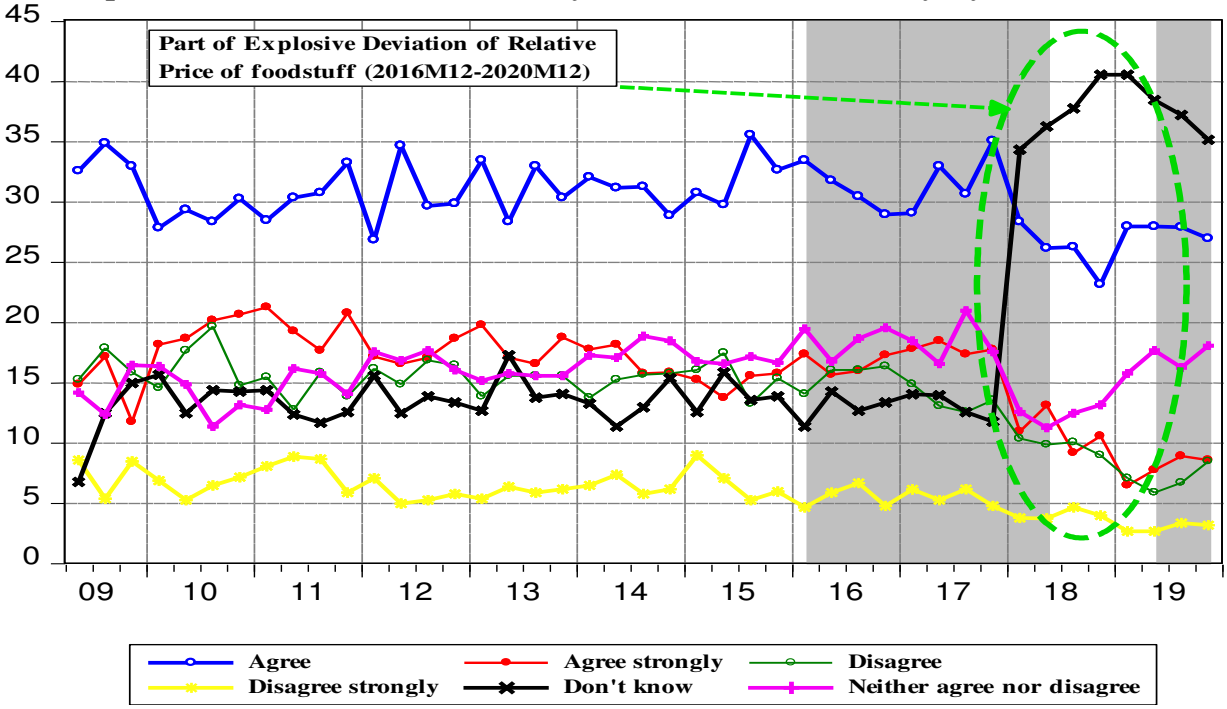


Note: *Areas shaded show the periods of explosive inflation regimes*

4.2.4 Explosiveness and Impact of Interest Rate on Inflation

Figure 6 presents the responses of consumers to the question "*a rise in interest rates would make prices in the street rise more slowly in the medium term - say a year or two."* From Figure 5, under explosive deviation, the number of consumers who believed interest rate could have an impact on inflation has declined, while the number of consumers who do not know about the impact of the interest rate on inflation has risen significantly to represent the dominant response. This may imply that most of the consumers are uncertain about the effect of interest on inflation in Nigeria under the explosive deviation.

Figure 6: Responses of Consumers to the Question: A rise in interest rates would make prices in the street rise more slowly in the medium term - say a year or two



Note: *Areas shaded show the periods of explosive inflation regimes*

4.2.5 Monetary Policy under Explosive Episodes

Table 3 presents number of Monetary Policy Committee (MPC) meetings and decisions during the explosive episodes. In the first episode, which lasted for 33 months, Table 3 shows that the committee met 14 times and Monetary Policy Rate (MPR) was retained 85.7% of the times and raised 14.3% of the times, while there was no downward review of the MPR[6].

Table 3: Monetary Policy Committee Meetings and Decision under Explosive Regimes

	First Episode		Second Episode		All Episodes	
Decision	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Retain	12	85.7%	8	72.7%	20	80.0%
Increase	2	14.3%	0	0.0%	2	8.0%
Decrease	0	0.0%	3	27.3%	3	12.0%
Number of Meetings	14	100.0%	11	100.0%	25	100.0%

In the second episode which lasted for 20 months, the Committee met 11 times and the MPR was retained 72.3% of the times, decrease 27.3% of the times, and there was no upward review. Collectively, the table shows that MPC met 25 times, retained MPR 80% of the times, increased 8.0% of the times, and decreased 27.3% of the times under the explosive episodes. The

[6] Note, however, that monetary policy response in Nigeria is not strictly limited to changing the MPR. Other tools including CRR, LR and "administrative measures" are sometimes used to control liquidity (Central Bank of Nigeria's Communique No 142, of the MPC Meeting of May 2022).

overwhelming retention of the MPR 80.0% of the times during explosive regimes implies that the MPC maybe uncertain about the foreseeable direction of the economy under the explosive deviation. For example, in the first episode, the MPC believed that the sources of the anticipated inflationary pressure were structural (supply-side) while during the second episode, it believed that the expected inflation may come from a combination of monetary and structural factors[7]. While structural factors dominate the two regimes, monetary policy has limited impact on them. Hence, the observed wait-and-see stance on the MPR[8].

4.3 Discussion and Implication of Findings

The results from the GSADF test show four (4), two (2), and two (2) episodes of explosive behaviour in prices of energy, food, and overall items relative to the prices of core items over the period 1995-2020. Further analysis shows that explosive behaviour in the relative price of food items maybe the major cause of explosive deviation of prices of the consumption basket relative to the prices of the core. Under these explosive regimes, our findings indicate that; (i) the proportion of consumers that expect inflation rose significantly, while the fraction of consumers that expect prices to fall dropped, leading to de-anchoring of inflation expectation; (ii) the percentage of consumers that expect the economy to "be weak" increased relative to normal times; (iii) the fraction of consumers that have no idea on government anticipated inflation increased significantly relative to 2014 and 2015 periods; (iv) the number of consumers who do not know the impact of interest rate on inflation increased significantly. On the other hand, the retention of the MPR 80.0% of the times implies that the MPC maybe increasingly uncertain about the future direction of the economy under the explosive regimes.

In general, these may suggest the occurrence of de-anchoring of the inflation expectation during the explosive episodes. Indeed, these results appear to lend empirical support to the findings of Arora et al. (2011), Arora et al. (2013), Ganioğlu (2017), and Ganioğlu (2020) who inferred that inflation expectations behave differently under normal and explosive deviation. More importantly, our findings suggest that explosive behaviour in relative inflation measures is perhaps an important influence on consumers' inflation expectation (de-anchoring) and may present a sizeable risk of inflationary pressure. This may not only impact the efficacy of CBN's monetary policy in managing inflation but may also result in uncertainty in its inflation forecasts. Hence, under normal condition, the CBN's monetary policy action should be focused on determining which instruments is best to manage inflation. However, this would require building an early warning system that can ex-ante' predict a probable explosive deviation given the behaviour of the early warning indicators.

5.0 Conclusion

In this study, we investigated the impact of explosive behaviour in relative inflation measures on consumers' inflation expectation in Nigeria over the period 1995-2020. To achieve this objective, we employed the Generalised Sup Augmented Dickey-Fuller (GSADF) to test for explosive behaviour in relative inflation measures and the main findings are divided into three (3). First, the GSADFT test has identified four (4), two (2), and two (2) episodes of explosive behaviour in prices of energy, food, and overall items relative to the prices of core items. Again, two of these episodes

[7] See Central Bank of Nigeria Communiqués of the Monetary Policy Committee No. 128 (January 2020) & 129 (March 2020)

[8] This study also acknowledges that the CBN may have deployed other policy instruments such as CRR, LR and administrative measures to rein in the inflation pressures during the explosive episodes.

coincided with the 2016 recession and the 2020 COVID-19 economic lockdown. Secondly, the results have indicated that consumers' inflation expectations behave differently under episodes of normal deviations compared to explosive episodes. Also, consumers expect more inflation and had become overly uncertain about the impact of interest rates in dousing inflationary pressures. Thirdly, the MPC maybe uncertain about future inflation and the direction of the economy as it retained the MPR 80% of the times. This was viewed as evidence of de-anchoring of consumers' inflation expectation, leading to more difficulty in conducting monetary policy by the CBN. Given the evidence, we conclude that de-anchoring occurred in the periods 2016M03-2018M05 and 2019M04-2020M12.

Therefore, we recommend that CBN should consider explosiveness in relative inflation measures to determine the best instrument for managing inflation. We further recommend that future research should be directed at (i) determining the impact of the explosiveness on monetary policy and inflation uncertainty, and (ii) developing an ex-ante' early warning system of explosive behaviour in relative inflation measures.

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