INFLATIONARY THRESHOLD AND ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

This paper estimates inflationary threshold in Nigeria using all the components of the aggregate demand model. The study used annual time series from 1981 to 2019 and the variables were confirmed to be free from unit root problems using Augmented Dickey Fuller and Ng-Perron Tests. The bounds test results suggested that there was long run relationship among the variables while the short run error correction model showed that the variables were capable of adjusting back to equilibrium in an event of any temporary shock within a year. The study found that the inflationary threshold for Nigeria is 8%. This is because the residual sum of squares was at maximum at 8% while the sum of the coefficients of inflation and the constructed dummy variable remained highest at 8%. It was therefore recommended among other things that central bank of Nigeria should gear its inflation target towards 8%.

Keywords: Inflation, Threshold, Economic Growth

JEL Classification: E31, C24, O47

1. Introduction

From the Keynesian point of view, inflation is "a necessary evil" in managing an economy since some form of inflation is necessary to spur up investment for economic growth. On the other hand, a very high level of inflation scales away investment and hampers economic growth. Interestingly, inflation futures prominently in most economies of the world including Nigeria. This may have been the reason why Solow (1979) posited that the value of our money is ever decreasing because inflation exists and because it exists, it is expected; and it is expected because it has always existed. However, in an attempt to cushion the effect of inflation on income and in order to enhance the living standards of people, economic management policies the world over are tailored towards achieving price stability and to raise the level of economic growth that guarantees adequate employment opportunities (Vaish, 2005). Price stability therefore is the primary goal of monetary policy with associated objectives of achieving stable economic growth and higher levels of employment (Fisher, 1926; Skousen, 1997; Central Bank of Nigeria, (CBN), 2011).

It is universally accepted that a sustained high level of inflation distorts prices, erodes savings, discourages investment, stimulates capital movement into precious metals or other unproductive channels and is a hazard to economic planning. In its extreme form, it breeds economic inequality and creates social unrest in the system (Vaish, 2005). A high level of

inflation is therefore innately undesirable and costly; creating money illusion, uncertainties, relative price distortions and market inefficiency (Heinz & Ndikumana, 2011).

Nigeria's economic growth have kept an upward trend though with some episodes of recession during the period under study. For instance, upon return to democracy in Nigeria, her GDP rose steadily over the years until the economy slid into recession in 2009 when her GDP declined from $337.04 billion in 2008 to $291.88 in 2009. However, with a rebased GDP in 2010, Nigeria's GDP rose to 363.36 billion in 2010 making her the largest economy in Africa. This was however to be short lived as the economy slipped back into recession in 2015 where the GDP figures fell from $568.50 billion in 2014 to $494.58 billion. The downward turn continued till the economy began to recover where her GPD in 2018 and 2019 are recorded to be $398.16 billion and $448.12 billion respectively (The World Bank, 2020).

On the other hand, Nigeria's inflation rates have remained relatively high necessitating the CBN's decision to embark on inflation targeting given that a very high inflation rate dampens economic growth (Inyiama, 2013). Nigeria recorded the lowest inflation rate of 3.45% in 1972 and the highest in 1995 (72.83%). Since then, her inflation rates have not gone below 5%. In 2010, Nigeria's inflation rate was 13.72% but declined to 10.84% in 2011. Inflation rate in Nigeria stood at 18.60% in 2017
. Though the rate of inflation reduced in 2018 and 2019, it maintained double digits to close at 12.80% and 11.40% respectively (NBS 2016 & the Federal Reserve Bank of St. Louis, 2020). The persistent high inflation rates suggest that, inflation control measures such as Open Market Operations (OMO) and inflation targeting have yielded little or no desirable results.

Consequently, the relationship between inflation and economic growth has generated quite an array empirical investigations. While inflation has been found to have negative and significant influence on economic growth in South Africa (Munyeka, 2014), Sri Lanka (Thayaparan, 2014) and Iran (Mosheni & Jouzaryan, 2016); there is no general consensus regarding the relationship between inflation and economic growth in Nigeria among scholars. Whereas Ademola and Badiru (2016), Umaru, Donga and Musa (2013) as well as Umaru and Zubairu (2012) found that inflation has a positive and significant effect on economic growth; Mohammed, Okoroafor and Awe (2015), Anocha and Maduka (2015), Olu and Idih (2015), Shuaib, Okeria and Ogedengbe (2015) and Bula (2014) found that the relationship between inflation and economic growth in Nigeria is in fact a negative and significant one. Anochiwa and Maduka (2015) however concluded that although there is an inverse relationship between inflation and economic growth; the relationship is not universal; it appears only when inflation exceeds some turning points. It then means that if inflation is kept at appropriate rate, it will boost economic growth which in turn will reduce unemployment. Accordingly, there is a consensus in economic literature that inflation is not entirely inimical to economic growth except when it exceeds a certain threshold level beyond which it becomes toxic to economic growth (Fischer & Modigliani, 1978; Friedman, 1977; Khan & Senhadji, 2001 and Sattarov, 2011).

But like the goldilocks economics, inflation is expected neither to be "too low" nor "too high". However, the main concern is how "not too low" or "not too high" should inflation in Nigeria be? Scholars like Doguwa (2012), Gahse (2017), Thanh (2015), Sattarov (2011) as well as Khan and Senhadji (2001) have made attempts to estimate the desired inflationary threshold in Nigeria (and elsewhere) by simply picking up some random variables as control variables once they set economic growth as a dependent variable and inflation as an explanatory variable. Such studies have painted a picture that there is no single link between economic growth and three main economic spending units (households, firms and government) and of course the external sector (net exports). They have also failed to take into account the import of the four components of the aggregate demand model on price level and of course economic growth. On the basis of the foregoing reasons this study clearly stands out by employing an innovative approach of incorporating all the economic units (households, government, business firms and the external sector) which are the main components of a typical Keynesian aggregate demand model. In addition, inflation and unemployment are incorporated in the model in order to estimate the desired inflationary threshold for Nigeria.

The rest of the paper is structured into; section 2 which is dwells on the review of related literature, section 3 deals with the methodology of the study while section 4 is the presentation and discussion of results. Finally, section 5 of the paper focuses on conclusion and recommendations for policy options.

2. Literature Review

Theoretical Review

Since the ground breaking postulations by Keynes (1936), it has become almost customary to make references to his submissions in any meaningful discourse on economic growth. Keynes contended that so long as aggregate demand remains below the equilibrium point the recessions of the 1930's was going to persist until the government intervenes by injecting liquidity into the economy to employ people to earn money and make consumption purchases. The Keynesian postulation discarded the laissez-faire model and made room for serious government intervention in stimulation of economic growth. It was Keynes who came up with the main components of the aggregate demand model. To him, for an economy to grow, households needed to have income to warrant effective demand. The business firms must invest to employ labour while government spends to lay the necessary infrastructure and intervenes where necessary. Again, the external trade balance (exports-imports) needs to be positive. However, many critics of Keynes have referred to him as an inflationist who wanted unemployment eradicated at all cost. But Humphrey (1981) argues that Keynes was not an inflationist but did deplore inflation and cautioned repeatedly of its ills and advocated for restrictive demand management policies to prevent it.

However, a more explicit explanation concerning the relationship between inflation and economic growth is explained by two independent but closely related studies carried out by Mundell (1973) and Tobin (1965). The duo used the neoclassical growth theory to explain

the impact of inflation on economic growth. They submitted that, an increase in nominal interest rate caused by inflation will make people to invest more and consume less. This ultimately leads to more capital accumulation for higher output and economic growth and this is what has come to be known as "the Mundell- Tobin Effect". It then means that except inflation rates become too high, some form of inflation is needed to trigger economic growth.

Although, Friedman (1963) insisted that inflation everywhere is a monetary phenomenon; it must be noted that such monetary influences are transmitted into the price system by consumption purchases of households, firms, government and through trade balance. The monetarists believe that factors causing inflation are primarily a matter of excessive aggregate demand due to excess liquidity chasing few goods and services. But in developing nations such as Nigeria, the Structuralists' school of thought believes that the roots of inflation can be found in the bottlenecks of "inelastic supply" and "inflexibilities in the productive structure" (Wachter, 1979). This may be the reason why the Keynesian School of thought believes that inflation is necessitated in an economy either by 'demand pull' or 'cost push' factors or both.

However, Okun (1962) linked economic growth with employment. This implies that, total output is dependent on labour and as such there is a direct relationship between output and employment and an inverse relationship between output and unemployment (Wen & Chen, 2012). Despite its popularity, the stability and usefulness of Okun's law have been disputed by Tatom (1978) and Davies (1979). While Tatom (1978) insisted that the law does not provide an accurate view of the link between changes in the nation's output and employment; Davies (1979) deduced that the simple inverse relationship between output and unemployment has entirely disappeared as can be verified in the UK and the USA. This implies that Okun's law may not hold true in many countries of the world.

Empirical Literature

The empirical review in this study is organised in three parts; the first set of reviews deal with studies that are panel studies (dealing with a group of countries). The second set of reviews deals with country specific cases that are not about Nigeria while the third set are about Nigeria. In each set, the most current study is reviewed first.

Ndoricimpa (2017) examined nonlinearities in the inflation-growth nexus in Africa. A dynamic panel threshold regression was applied to account for the potential endogeneity bias in the model. The findings of the study confirmed the existence of nonlinearities in the inflation-growth nexus. An inflation threshold of 6.7% was estimated for the whole sample, 9% for the sub-sample of low-income countries and 6.5% for middle-income countries. The findings suggested that low inflation was growth-enhancing for the sub-sample of middle-income countries but neither affected economic growth for the whole sample nor for the sub-sample of low-income countries. On the other hand, Yabu and Kessy (2015) estimated the appropriate inflationary threshold for three founding members of the East African Countries (AEC)—Kenya, Tanzania and Uganda using panel data series from 1970 to 2013. The study

used the random effect model and found that for the three countries, an inflationary rate beyond 8.46% was inimical to economic growth. However, the Seemingly Unrelated Regression (SUR), which treated each country separately indicated that, an inflationary threshold of 6.77%, 8.80% and 8.41% were healthy for economic growth in Kenya, Tanzania and Uganda respectively. Both studies recommended that any inflationary rate beyond single digit would exert cost to economic growth. Similarly, Thanh (2015) estimated the threshold of inflation and its effects on economic growth in five Asian economies of Indonesia, Malaysia, Philippines, Thailand and Vietnam (ASEAN-5) from 1980 to 2011. The study, employed Panel Smooth Transition Regression (PSTR) model and checked the robustness by using GMM-IV specification and found that there existed a statistically negative relationship between inflation and economic growth for rates above the threshold level of 7.84% inhibit economic growth of the ASEAN-5 countries. The study recommended that this threshold value should be a guide to the ASEAN-5 central banks in inflation targeting while carrying out their monetary policy. Again, Danladi (2013) examined the threshold effect of inflation on economic growth of Burkina Faso, Ghana, Nigeria and Senegal using annual data from 1980 to 2009. Adopting a non-linear approach, the study found that beyond an inflationary threshold of 9% beyond which inflation exerts negative effect on economic growth in the study area. Also, Khan and Senhadji (2001) used a panel data of 140 countries which was made up of both industrial and developing countries to examine inflation-growth nexus among them with a focus on inflationary thresholds. The data spanned from 1960 to 1998 and the study used non-linear least squares to estimate the threshold model and found that for industrial countries, inflation rates between 1%-3% were growth enhancing. But for the developing countries, inflation rates between 11%-12% were growth stimulating. However, inflation rates above the established thresholds in either cases were detrimental to economic growth. It is clear from the panel studies that, while very low levels of inflation are necessary for economic growth in the developed countries, developing countries thrive better under higher inflation rates ranging between 6.5% and 12%.

Mosikari and Eita (2018) adopted Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) methods to estimate an optimal inflationary threshold in Swaziland using annual data series for the period 1980 to 2015.While the result of OLS method found an inflationary threshold of 12%; 2SLS method found the threshold point to be 18.5%. In the same vein, Gashe (2017) investigated the interplay between savings, inflation and economic growth and estimated the threshold level of inflation that is consistent with the economic growth of Ethiopia using time series data from 1981 to 2015. An Ordinary Least Square (OLS) model was also used to estimate the inflationary threshold and found that 12% threshold level of inflation was consistent with economic growth of Ethiopia. It can also be observed here that double digit inflation rates do not hurt economic growth in the two low income countries.

Obi and Uzodigwe (2016) conducted a threshold analysis of inflation in Nigeria using annual data from 1970 to 2015. The study was divided into four different periods of pre-SAP era (1970-1986), post-SAP era (1986-1998), the civil rule era (1999-2015) and the whole sample period 1970-2015. The study equally found four different inflationary thresholds; one each

for a period. The thresholds were; 12% (pre-SAP era), 11% (Post SAP era), 7% (Civil rule era) and 8% for the entire study period. While their efforts are commendable, there is no policy implication for estimating an inflationary threshold for a period that is far away from the present. A study by Salami and Kelikume (2010) estimated two optimal inflation thresholds for Nigeria using annual times series from 1970 to 2008 and from 1980 to 2008. In the former period, the study found a statistically significant inflationary threshold of 8% while for the latter period it found an inflationary threshold of 7% which was not statistically significant. Again, Doguwa (2012) re-examined the issue of inflation threshold and growth in Nigeria, using quarterly data from 2005 to 2012. He adopted three different approaches that provided appropriate procedures for estimating the threshold level and inference. While Sarel's approach provided a threshold point estimate of 9.9%, the technique of Khan and Senhadji identified a 10.5% inflation threshold as statistically significant in to explaining the inflation-growth nexus in Nigeria. Finally, the approach of Drukker, Gomis-Porsqueras and Hernandez-Verme suggested a two-threshold point model with 11.2 and 12.0 % as the appropriate inflation threshold points. These results suggest that the threshold level of inflation above which inflation is inimical to growth is estimated at 10.5% to 12% for Nigeria. He concluded that on the basis of these findings that there was a threshold level of inflation above which money was not super-neutral.

This study clearly stands out among the rest of other similar studies in content, focus and time frame especially when viewed at the backdrop of the fact that prices of major commodities in Nigeria have substantially increased Nigeria since 2015. Also, the present study has adopted a modest but very innovative approach to estimating inflationary threshold in Nigeria by doing so using the Keynesian aggregate demand model. The model takes into account the fact that economic growth is dependent on "aggregate spendings" of households, firms, the government (which are domestic economic units) and the external sector (net exports). The aggregate spending of these economic units is the chief determinant of economic growth and it gives rise to the general price level in an economy.

3. Methodology

Theoretical Model

The variables of the model for this study are situated within the theoretical and empirical framework of "the Mundell- Tobin Effect", the Keynesian aggregate demand model and Okun's law. Ultimately, "the Mundell- Tobin Effect" suggests that:

$$GDP = f(INF) \quad (1)$$

Where GDP gross domestic product taken as a measure of economic growth and INF is the rate of inflation in the economy.

Relatedly, following the great depressions of the 1930's, Keynes (1936) postulated that stimulation of aggregate effective demand was the key to economic recovery and growth. Thus his aggregate demand model was set up as:

$$Y = f(C + I + G + (X - M)) \quad (2)$$

Where Y is Gross Domestic Product (GDP) or national income, C is the level of private consumption, G is government expenditure and $(X - M)$ is the net exports.

Finally, Okun (1962) also linked economic growth to the level of unemployment in an economy by postulating that an economy's output declines as the level of unemployment increases. Invariably, he also suggested that:

$$GDP = f(UNE) \quad (3)$$

Where UNE is unemployment rate.

Now by harmonizing all the explanatory variables about economic growth, the study obtains:

$$GDP = f(INF, HCX, PIX, GEX, NEX, UNE) \quad (4)$$

However, the generic form of a standard linear threshold model is specified as:

$$y_t = \chi_t^{'}\beta + Z_t^{'}\delta_j + \xi_t \quad (5)$$

The variables are divided into the χ and Z variables wherein, the former are variables whose parameters do no vary with regimes while the later are a group of variables with regime specific variables. Assume that there is an observable threshold variable q_t and strictly increasing threshold values ($\gamma_1 \angle \gamma_2 \angle ... \angle \gamma_m$) in a manner that we are in regime j if and only if: $\gamma_j \le q_t \angle \gamma_{j+1}$

Where we set $\gamma_0 = -\infty$ and $\gamma_0 = -\infty$. Therefore, in regime j if the value of the threshold variable is at least as large as the j-th threshold value but not as large as (j+1)-th threshold. That is to say in the single threshold, two regime model, we have:

$$y_t = \chi_t^{'}\beta + Z_t^{'}\delta_1 + \xi_t \quad \text{if } -\infty \angle q_t \angle \gamma_1 \quad (6)$$

$$y_t = \chi_t^{'}\beta + Z_t^{'}\delta_2 + \xi_t \quad \text{if } \gamma_1 \le q_t \angle \infty \quad (7)$$

Now by applying an indicator function 1(.) which takes the value 1 if the expression is true and 0 otherwise and defining $1_j(q_{t,}\gamma) = 1\left(\gamma_j \le q_t \angle \gamma_{j+1}\right)$ we may combine the $m+1$ individual regime specification into a single equation:

$$y_t = \chi_t^{'}\beta + \sum_{j=0}^{m} 1_j\left(q_t, \gamma\right).Z_t^{'}\delta_j + \xi_t \quad (8)$$

Model Specification

Following from equation (4), the stochastic form of the equation can be expressed as:

$$GDP_t = \beta_0 + \beta_1 INF_t + \beta_2 HCX_t + \beta_3 PIX_t + \beta_4 GEX_t + \beta_5 NEX_t + \beta_6 UNE_t + \xi_t \quad (9)$$

Consequently, the study introduced a dummy variable D_t and inflationary threshold level $\boldsymbol{\pi}$ and added inf_t to the equation in line with Khan and Senhadji (2001) and Satarrov (2011).

Note that D_t is a dummy variable constructed from: D_t=1, if $\Delta inf_t > \pi$ and $D_t = 0$, if $\Delta inf_t \le \pi$

The parameter π is threshold level of inflation and has a property that the relationship between inflation and economic growth is given by β_1 when there is low rate of inflation; and $\beta_1+\beta_2$ when there is a high rate of inflation. By estimating the regressions for different values of π which were chosen in ascending order, the optimal value of π is obtained by finding the value that maximizes R^2 from the respective regressions. In other words, the optimal threshold level(π^*) is that which minimizes the Residual Sum of Squares (Ahmed & Mortaza, 2005 and Sattarov, 2011).

$$GDP_t = \beta_0 + \beta_1 INF_t + \beta_2 D_t INF_t - \pi + \beta_3 HCX_t + \beta_4 PIX_t + \beta_5 GEX_t + \beta_6 NEX_t + \beta_7 UNE_t + \xi_t \quad (10)$$

By taking the semi-logs and differencing both the regressand and the regressors as appropriate equation (10) becomes:

$$\Delta\ell GDP_t = \beta_0 + \beta_1(\Delta INF_t) + \beta_2 * D_t(\Delta INF_t - \pi) + \beta_3\Delta\ell HCX_t + \beta_4\Delta\ell PIX_t + \beta_5\Delta\ell GEX_t + \beta_6\Delta\ell NEX_t + \beta_7\Delta UNE_t + \xi_t \quad (11)$$

4. Results and Discussion of Findings

Table1: Descriptive Statistics (variables are measured in US Dollars and Per cent ages)

Statistic	GDP (Billions)	INF (%)	HCX (Billions)	PIX (Billions)	GEX (Billions)	NEX (Billions)	UNE (%)
Mean	191	19.1467	123	48.4	11.3	3.96	11.3564
Median	97.1	12.5500	35.3	37.0	1.54	2.34	11.9000
Maximum	568	72.8400	415	147	37.8	24.4	27.4000
Minimum	27.8	5.3900	13	12.3	0.465	-30.9	1.9000
Std. Dev.	170	17.0627	133	30.9	13.9	11.4	7.6528
Skewness	0.7988	1.7837	0.9285	1.1287	0.8489	-0.4670	0.5036
Kurtosis	2.1242	4.9982	2.3083	4.1990	2.0057	4.4911	1.9226
Jarque-Bera	5.3935	27.1697	6.3812	10.6173	6.2908	5.0307	3.5348
Prob.	0.0674	0.0000	0.04115	0.0049	0.0431	0.0808	0.1708
Observations	39	39	39	39	39	39	39

Source: Extract from E-Views 10

Table 1 displays the descriptive statistics of the seven variables used in this study and their individual characteristics are explained as follows.

Gross Domestic Product (GDP): Nigeria's GDP averaged around $191 billion with a standard deviation of over $170 billion. The variable is positively skewed and platykurtic. This implies that the variable has a tendency for higher values and its slope is not steep since its kurtosis of 2.1242 is less than the threshold of 3. The highest GDP in Nigeria was $568.50 billion in 2014 while the least GDP was recorded in 1993 to be $27.80 billion. The

distribution of GDP is not normal given its high Jarque-Bera statistic and probability value of 0.0674.

Inflation (INF): Nigeria's inflation for the past 39 years averaged above 19% with a standard deviation of 17.06%. It is clear that inflation has not gone below 5.39% in Nigeria while the worst inflation was recorded in 1995 to be 72.84%. The variable is positively skewed and leptokurtic. Its Kurtosis of about 5 is greater than 3. The variable does not possess a normal distribution given its high Jarque-Bera statistic (27.17%) and low probability value of 0.000.

Household Consumption Expenditure (HCX): HCX averaged around $123 billion with a standard deviation of $133 billion. The least household consumption expenditure was $13 billion in 1993 and the maximum HCX was $415 billion in 2014. The variable has a tendency for higher values since it is positively skewed. It has a high Jarque Bera statistic value of 6.38 and a low probability value of 0.04 and as such its distribution is not normal. The variable is platykurtic since its kurtosis is 2.31 which is less than the threshold of 3.

Private Investment Expenditure (PIX): Nigeria's private investment expenditure averaged around $48.4 billion with a high standard deviation of $30.9 billion. The highest PIX was recorded in 1981 to be $147 billion and a minimum of $12.3 billion in 1993. The variable has a tendency for high values hence it is positively skewed and leptokurtic given that its kurtosis is 4.12. With a high Jarque Bera statistic (10.62) and low probability value of 0.005, it shows that the variable is not normally distributed.

Government Expenditure (GEX): The mean value of government expenditure in Nigeria for past 39 years stands at $11 billion with a high standard deviation of $13.9 billion. The least government expenditure was recorded in 1996 to be $465 million and the highest was recorded as $37.8 billion in 2012. GEX in Nigeria is positively skewed with a platykurtic kurtosis of 2.01. The variable is not normally distributed given its high Jarque Bera statistic (6.29) and low probability value of 0.04.

Net Exports (NEX): Despite Nigeria's huge foreign exchange earnings from the oil sector, her net exports over the years has not performed well. The variable has a mean value of $3.96 billion with a high standard deviation of $11.4 billion. Nigeria's highest net exports was $24.4billion in 2005 and the worst was $-30.9 billion in 2019. This is shocking especially that the federal government has embark on some foreign trade protection strategies by banning importation of some commodities like rice. Net exports in Nigeria is skewed in favour of the negative values and it is leptokurtic (Kurtosis of 4.50>3). NEX in Nigeria is not normally distributed given that its jarque Bera statistic is 5.03 and a probability value of 0.08.

Unemployment (UNE): The average unemployment rate in Nigeria during the period under review stands at 11.36% with a standard deviation of 7.65%. The worst level of unemployment in Nigeria was recorded in 2013 as 27.4% while the least level of

unemployment was 1.9% in 1996. Unemployment in Nigeria is positively skewed and the distribution is not peaked hence its kurtosis (1.92 < 3) is platykurtic. The Jaque Bera value of 3.53 and the probability value of 0.17 show that the variable is not normally distributed.

Summary of unit Root Tests Results

To ensure that the variables used in this study had no unit root problems and were stationary in tandem with the stochastic process, both the Ng-Perron and the Augmented Dickey Fuller (ADF) unit root tests were applied. It must however be noted that for both ADF and Ng-Perron unit root tests, the asterisks (**) indicate that the variable is stationary otherwise, it is not at 5% level of significance.

Table 2: Ng-Perron Unit Root Test

Variable	MZa -8.1000	MZt -1.9800	MSB 0.2330	MPT 3.1700	Stationarity	Remark
LGDP	-0.1387	-0.1098	0.7918	36.3563	I(0)	Not Stationary
D(LGDP)	-15.5792	-2.7675	0.1776	1.6603	I(1) **	Stationary
INF	-11.8048	-2.4186	0.2549	3.2178	I(0)	Not Stationary
D(INF)	-17.9996	-2.9970	-0.1665	1.3719	I(1)**	Stationary
LHCX	0.7095	0.5780	0.8147	45.7638	I(0)	Not Stationary
D(LHCX)	-18.3929	-3.03173	0.1648	1.33507	I(1)**	Stationary
LPIX	-1.1428	-0.7476	0.6542	21.1200	I(0)	Not Stationary
D(LPIX)	-14.0088	-2.6349	0.1881	1.7937	I(1)**	Stationary
LGEX	-0.3330	-0.2118	0.6361	24.8073	I(0)	Not Stationary
D(LGEX)	-18.3579	-2.9991	0.1634	1.4447	I(1)**	Stationary
NEX	-1.72334	-0.55953	0.32468	9.50772	I(0)	Not Stationary
D(NEX)	-66.6023	-5.5847	0.0839	0.7768	I(1)**	Stationary
UNE	-2.40528	-0.86311	0.35884	8.9052	I(0)	Not Stationary
D(UNE)	-18.2720	-3.0175	0.1652	1.3591	I(1)**	Stationary

Source: Extracts from the Unit Root Test Results Using E-views 10

From Table 2, it should be noted that for Ng-Perron Test, stationarity is attained when all or at least majority of the values of MZa, MZt, MSB and MPT are less than their corresponding critical values at 5% level of significance.

Table 3: ADF Unit Root Test

Variable	ADF Statistics	Prob. Value	Stationarity	Remark
LGDP	0.0789	0.9599	I(0)	Not Stationary
D(LGDP)	-4.2218	0.0020	I(1)**	Stationary
INF	-0.2194	0.9260	I(0)	Not Stationary
D(INF)	-5.3448	0.0001	I(1)**	Stationary
LHCX	-1.1567	0.6801	I(0)	Not Stationary
D(LHCX)	-6.3860	0.0000	I(1)**	Stationary
LPIX	-1.8194	0.3658	I(0)	Not Stationary
D(LPIX)	-3.7085	0.0080	I(1)**	Stationary
LGEX	-0.1383	0.9377	I(0)	Not Stationary
D(LGEX)	-5.3764	0.0001	I(1)**	Stationary
NEX	-2.7542	0.0770	I(0)	Not Stationary
D(NEX)	-5.8082	0.0000	I(1)**	Stationary
UNE	-1.0142	0.3173	I(0)	Not Stationary
D(UNE)	-5.5105	0.0001	I(1)**	Stationary

Source: Extracts from the Unit Root Test Results from E-views 10

The ADF Test on Table 3, just as the Ng-Perron test was carried out at 5% level of significance. Thus for ADF test; any statistic with a probability value of less than 0.05 shows that the variable is stationary otherwise it has unit root. Table 3 presents the results of the ADF Test. It can be observed that in both the ADF and Ng-Perron tests all variables became stationary after they were differenced once (at first defference).

Test of Long Run Relationship

In order to ascertain that there is a long run relationship among the variables of the model, Johansen cointegration test was carried out. This was based on the fact that all the variables became stationary at first and uniform difference. The results of the Johansen cointegration tests are presented in tables 4 and 5.

Table 4: Results of Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.8622	222.7970	125.6154	0.0000
At most 1 *	0.7606	151.4565	95.7537	0.0000
At most 2 *	0.6995	99.9962	69.8189	0.0000
At most 3 *	0.5502	56.7126	47.8561	0.0059
At most 4	0.4997	27.9473	29.7971	0.0805
At most 5	0.0797	3.0137	15.4947	0.9663
At most 6	0.0006	0.0227	3.8415	0.8801

Source: Extracts of Johansen Cointegration Rank Trace Test from E-views 10

It is evident from Table 4 that the Trace test indicates four (4) cointegrating equations at the 0.05 level of significance. It then implies that the null hypothesis of no cointegration has been rejected in four instances starting from None* to at most 3*.

Table 5: Results of Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.8622	71.3405	46.2314	0.0000
At most 1 *	0.7606	51.4603	40.0776	0.0018
At most 2 *	0.6995	43.2836	33.8769	0.0028
At most 3 *	0.5502	28.7653	27.5843	0.0352
At most 4 *	0.4997	24.9336	21.1316	0.0139
At most 5	0.0797	2.9910	14.2646	0.9473
At most 6	0.0006	0.0227	3.8415	0.8801

Source: Extracts of Johansen Cointegration Max-Eigen Value Test from E-views 10

It is clear from Table 5 that the maximum Eigenvalue test indicates five (5) cointegrating equations at the 0.05 level of significance. This means that the null hypothesis of no cointegration has been rejected in five instances starting from None* to at most 4*. The study hereby concludes that there is a long run relationship among the variables of the model.

Table 6: Results of Threshold Model

Π	**Variable**	**Coefficient**	$\beta_1 + \beta_2$	**Std. Error**	**t-statistic**	**Prob.Value**	R^2
	C	0.0073		0.0141	0.5190	0.6087	
	ΔINF_t	0.0003		0.0009	0.3718	0.7135	
	$D_t\left(\Delta INF_t - \pi\right)$	-0.0010		0.0011	-0.9573	0.3484	
	$\Delta lHCX_t$	0.3376		0.0665	5.0730	0.0000	
6%	$\Delta lPIX_t$	0.5719	**-0.0007**	0.1047	5.4639	0.0000	**87.68%**
	$\Delta lGEX_t$	0.0607		0.0366	1.6591	0.1107	
	$\Delta lNEX_t$	0.0400		0.0388	1.0306	0.3134	
	ΔUNE_t	0.0033		0.0037	0.8909	0.3822	
	C	0.0077		0.0146	0.5250	0.6048	

	ΔINF_t	0.0004		0.0011	0.3943	0.6971	
	$D_t\left(\Delta INF_t - \pi\right)$	-0.0010		0.0011	-0.9471	0.3539	
	$\Delta \ell HCX_t$	0.3393		0.0689	4.9220	0.0001	
7%	$\Delta \ell PIX_t$	0.5709	**-0.006**	0.1071	5.3301	0.0000	**87.47%**
	$\Delta \ell GEX_t$	0.0601		0.0377	1.5932	0.1254	
	$\Delta \ell NEX_t$	0.0401		0.0396	1.0122	0.3225	
	ΔUNE_t	0.0034		0.0039	0.8833	0.3866	
	C	0.0054		0.0133	0.4082	0.6877	
	ΔINF_t	0.0339		0.0107	3.1669	0.0051	
	$D_t\left(\Delta INF_t - \pi\right)$	-0.0150		0.0135	-1.1135	0.2794	
	$\Delta \ell HCX_t$	0.3568		0.0712	5.0071	0.0001	
8%**	$\Delta \ell PIX_t$	0.6462	**0.0189****	0.0929	6.9584	0.0000	**92.31%****
	$\Delta \ell GEX_t$	0.0460		0.0317	1.4499	0.1634	
	$\Delta \ell NEX_t$	0.0305		0.0333	0.9162	0.3711	
	ΔUNE_t	0.0045		0.0035	1.2919	0.2119	
	C	0.0046		0.0163	0.2830	0.7801	
	ΔINF_t	0.0000		0.0013	0.0202	0.9841	
	$D_t\left(\Delta INF_t - \pi\right)$	-0.0005		0.0013	-0.4008	0.6928	
	$\Delta \ell HCX_t$	0.3823		0.0902	4.2350	0.0004	
	$\Delta \ell PIX_t$	0.5538		0.1122	4.9368	0.0001	
9%	$\Delta \ell GEX_t$	0.0559	**-0.0005**	0.0392	1.4250	0.1696	**87.20%**

	$\Delta\ell NEX_t$	0.0452		0.0412	1.0975	0.2854	
	ΔUNE_t	0.0037		0.0040	0.9154	0.3709	
	C	0.0031		0.0013	0.0315	0.9752	
	ΔINF_t	0.0000		0.0014	0.0315	0.9752	
	$D_t\left(\Delta INF_t - \pi\right)$	-0.0008		0.0015	-0.5566	0.5843	
	$\Delta\ell HCX_t$	0.3772		0.0929	4.0598	0.0007	
10%	$\Delta\ell PIX_t$	0.5586	**-0.0008**	0.1150	4.8552	0.0001	**86.90%**
	$\Delta\ell GEX_t$	0.0586		0.0405	1.4463	0.1644	
	$\Delta\ell NEX_t$	0.0448		0.0421	1.0638	0.3007	
	ΔUNE_t	0.0038		0.0041	0.9228	0.3677	

Source: Extract of Results of the Threshold Model from E-Views 10

It is evident from the table 4 that inflation has maintained a positive coefficients at each level of inflation while the dummy variable $D_t\left(\Delta INF_t - \pi\right)$ maintained negative values all through. However, the positive values of inflation were not statistically significant except at inflation level of 8%. The sums of coefficients $\beta_1 + \beta_2$ also remained negative in all other four inflation rates except at inflationary rate of 8%. Furthermore, the Residual Sum of Squares were highest at 92.31% at an inflationary rate of 8%. This implies that the inflationary threshold in Nigeria is 8%. Once the level of inflation exceeds 8%, it will hamper economic growth seriously.

In addition, all the other control variables remained positively related with economic growth in Nigeria with household consumption and private investment clearly standing out as they maintained positive and significant values all through the five inflationary rates of 6%, 7%, 8%, 9 % and 10%. This shows that the control variables are the true determinants of economic growth in Nigeria.

It is however, evident that although government expenditure, net exports and unemployment were positively related with economic growth, their influence were not statistically significant all through the inflationary episodes. This implies that both government expenditure and net exports are not performing maximally in spurring up economic growth. Government expenditure in Nigeria in most cases is in favour of recurrent expenditure (against capital expenditure) which does not necessarily add to capital stock for economic

growth. High level of importation is also weakening the net exports and as such driving away domestic demand and creating jobs abroad.

Post Estimation Tests

Tests of Homoscedasticity and Non- serial correlation

The results to confirm that variables of the model and the errors respectively did not suffer from serial correlation and heteroscedasticity are presented in Tables 7 and 8.

Table 7: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.8782	Prob. F(2,21)	0.4302
Obs*R-squared	2.3927	Prob. Chi-Square(2)	0.3023

Source: Extract from E-views 10

From Table 7, it is clear that all the probability values are greater than the critical value of 0.05 and as such the study fails to reject the null hypothesis of no serial correlation. This implies that the variables of the model are not serial correlated.

Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.4749	Prob. F(7,23)	0.8427
Obs*R-squared	3.9149	Prob. Chi-Square(7)	0.7895
Scaled explained SS	2.1861	Prob. Chi-Square(7)	0.9488

Source: Extract from E-views 10

It is evident from Table 8 that all the probability values are far higher than the 0.05 critical values, it then implies that the study cannot reject the null hypothesis of homoscedasticity. Implying that the residuals have been found to have exhibited constant variance.

Test of stability of the residuals

The residuals of the model and the model generally were stable as depicted in Figures 1 and 2.

As can be observed the cumulative sum and the cumulative sum of square lines do not go outside the 5% level of significance lines on either sides.

Figure 1: Graph of Cumulative Sum (CUSUM)

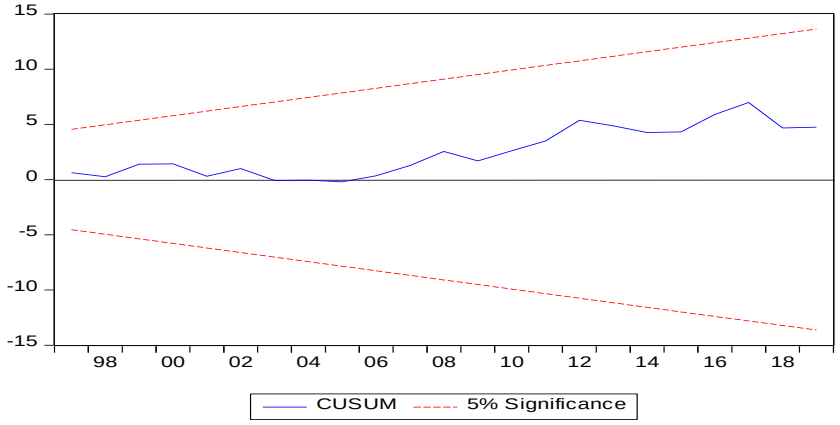
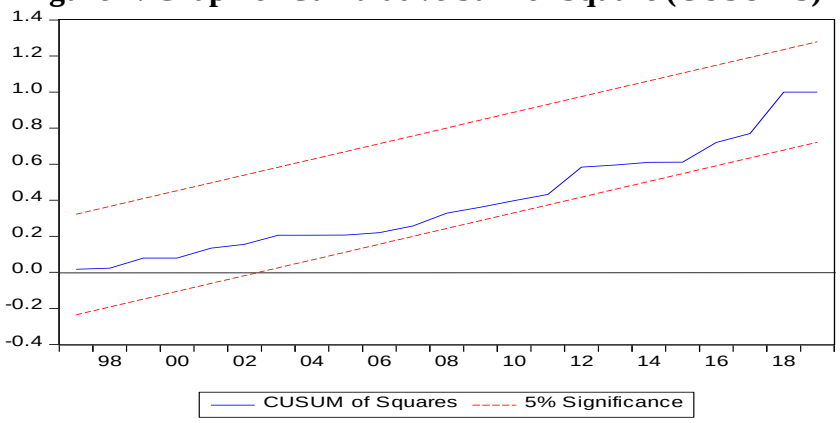


Figure 2: Graph of Cumulative Sum of Square (CUSUMS)



5. Conclusion and Policy Recommendations

This study concludes that the best way to estimate inflationary thresholds is not by randomly plugging variables but by use of aggregate consumption demand approach since inflation manifests through consumption spending by different economic units. It is therefore clear that inflation rates beyond 8% will inhibit the level of economic growth in the economy. It is therefore necessary that:

i. Inflation targets by the Central Bank of Nigeria (CBN) be set at 8%.
ii. Government encourages local manufacturing as an import substitution measure so as to improve the level of net exports' contribution to economic growth.
iii. The structure of government expenditure should be tailored in favour of capital expenditure more than recurrent expenditure in order to boost the level of capital projects that would trigger investment and economic growth.
iv. Tax cuts and other disposable income enhancing measures should be extended to households and private investments to enhance their contribution to GDP.

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