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**Inflation-Economic Growth Nexus in Nigeria: New Evidence on
Threshold Effects**



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Inflation-Economic Growth Nexus in Nigeria: New Evidence on Threshold Effects

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Abstract

Purpose: The aim of this study is to analyze the influence of inflation on the economic growth of Nigeria from 1990 to 2021. Specifically, it aims to identify a threshold, if it exists, at which the impact of inflation on economic growth begins to shift.

Methodology: To assess the inflation threshold and its impact on economic growth, this study employed a novel method, the endogenous sample-splitting and threshold model developed by Hansen (2000).

Findings: The study reveals a non-linear relationship between inflation and economic growth in Nigeria, with a single inflation threshold of 12.88%. When inflation is below this threshold, it positively impacts economic growth, while exceeding it negatively impacts economic growth. Furthermore, higher trade openness negatively affects economic growth, and population growth positively impacts growth across all inflation regimes. Investments contribute to economic growth in the linear model, but their influence is statistically insignificant across the threshold regimes. Financial deepening impedes growth above the inflation threshold.

Unique Contribution to Theory, Practice and Policy: The study expands upon the current body of research on estimating the inflation threshold for Nigeria using the Hansen (2000) sample splitting technique. To our knowledge, this is the first study that has adopted this technique to estimate inflation threshold for Nigeria. The Hansen (2000) threshold technique offers more flexibility in model specification. It allows for the estimation of parameters separately for different regimes, typically above and below the threshold. This flexibility can help in identifying distinct regimes, such as low and high inflation regimes, and capturing their unique characteristics. The research findings are crucial for shaping monetary policy in Nigeria, providing policymakers with valuable insights for establishing an inflation target that is in line with Nigeria's overarching goal of attaining sustained economic growth.

Keywords: *Inflation, Economic Growth, Threshold Regression Model*

1. INTRODUCTION

The question of whether inflation has a positive or negative impact on economic growth has been extensively studied, mainly due to its policy relevance. The primary goal of macroeconomic policy is to promote growth in the economy while sustaining moderate levels of inflation (Khan & Senhadji, 2001; Seleteng, Bittencourt, & van Eyden, 2013; Vinayagathan, 2013). High and unstable inflation is widely acknowledged to have detrimental effects on economic development and result in welfare losses. The conflict between Russia and Ukraine has led to a surge in global food prices, triggering a new wave of inflationary pressures in the global economy. This has had a particularly strong impact on economies in sub-Saharan Africa (SSA), where food constitutes a significant proportion of the consumer basket. Consequently, there has been renewed interest in research focused on exploring the relationship between inflation and economic growth.

Although the relationship between inflation and growth has been extensively examined, there is a lack of definitive conclusions, both theoretically and empirically. The initial theory that elucidated this relationship is known as the Phillips curve. Within the framework of the aggregate demand-aggregate supply model (AD-AS model), the Philips curve has successfully depicted the intricate association between inflation and output growth. The AD-AS model reveals the positive or negative correlation between inflation and unemployment (output growth). Specifically, a positive correlation exists when the unemployment rate increases, leading to a corresponding increase in inflation, or vice versa. Conversely, there is an inverse relationship, referred to as a trade-off, where a slight increase in unemployment results in a slight decrease in inflation, or vice versa. However, the Phillips curve fails to adequately account for the phenomenon of stagflation, in which inflation and unemployment are alarmingly high (Phillips, 1958).

Due to the failure of the Phillips curve to provide a comprehensive explanation for the occurrence of stagflation, there has been an ongoing debate and disagreement among economists and researchers regarding the nature of the relationship. While different country-specific studies have identified varying threshold levels, there is a growing consensus that moderate inflation has a beneficial impact on economic growth and high levels of inflation negatively impact economic growth. In the same vein, some academics (Khan and Senhadji 2001; Azam and Khan 2020) have proposed that elevated and persistent inflation can be detrimental to economic growth. This is because inflation raises uncertainty within the economy, subsequently reducing capital investment and impeding economic growth. Azam and Khan (2020) conducted research on the threshold effect of inflation on economic growth in a panel of 27 countries during the period 1975–2018. They concluded that when inflation exceeds 12.23% in underdeveloped nations and 5.36% in developed economies. According to a study by Khan and Senhadji (2001), advanced countries had threshold levels between 1% and 3%, whereas developing countries had threshold levels between 11% and 12%.

The Nigerian government has had a long-standing goal of achieving strong economic growth while simultaneously maintaining a stable and low inflation rate. In 1990, Nigeria was recognised for its low inflation rate of 7.4% and robust economic growth of 11.8%. However, from 1991 to 1996,

the economy experienced a sustained period of inflationary pressures, consistently maintaining a level of inflation in the double digits and hitting its peak at 72.8% in 1995. This period also coincided with sluggish economic growth, with the economy mostly in recession. Inflation then returned to a single digit between 1997 and 2000, but economic growth was mixed. The period 2001–2021 was characterised mostly by double-digit inflation, while growth was mostly modest, with a few exceptional periods where robust economic growth rates were recorded. However, since the Russia-Ukraine conflict, the Nigerian economy has experienced inflationary pressures and modest growth. From the foregoing analysis, it emerged that there is broadly no discernible relationship between inflation and economic growth in the case of Nigeria.

Consequently, there have been some research efforts focused on estimating the threshold level of inflation for the Nigerian economy. For example, Ajide et al. (2011) and Adeleke (2012) estimate a single-digit inflation threshold; Bawa et al. (2012) find an inflation threshold of double digits; and Doguwa (2012) and Obi et al. (2016), on the other hand, estimate an inflation threshold ranging between single and double digits. From these empirical studies, there seems to be a consensus that there is a nonlinear relationship between inflation and economic growth, though they adopted different estimation techniques covering varying periods. However, the existing empirical literature gives mixed evidence on the inflation threshold for Nigeria. Given the present inflationary pressures in Nigeria and the lack of consensus on the threshold level of inflation in the empirical literature on Nigeria, further research into the optimal inflation threshold level is required. In addition, understanding the relationship between inflation and economic growth is critical for setting the inflation target. It is our view that the findings of this study would have significant implications for policymakers, academics, and professionals concerned with monetary policy conduct in Nigeria.

Prior research estimating the inflation threshold in Nigeria adopted estimation methods first introduced by Sarel (1996) and the conditional least squares technique developed by Khan and Senhadji (2001), along with an ARDL methodology. However, these specific models externally establish the threshold value and test it for significance. To address these issues, this study tries to bridge the existing gap through the utilisation of the threshold sample splitting approach which endogenously determine the threshold value of inflation (Hansen, 2000). In addition, this approach will help determine the effect of inflation on economic growth, either below or above the inflation threshold. Our primary objective is to identify potential threshold effects of inflation stemming from changes in the structure of the economy and further examine the implications of these thresholds on the inflation-growth relationship.

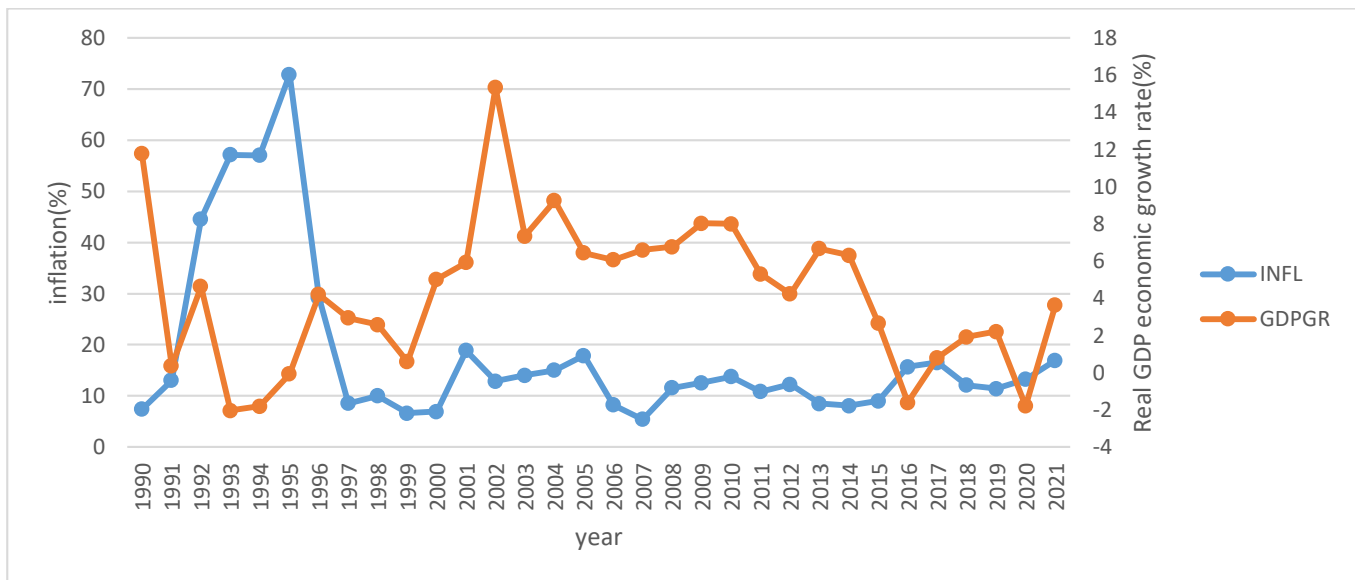
Following the introduction, Section 2 provides stylized facts on the relationship between inflation and economic growth in the Nigerian context. Section 3 reviews past literature on the inflation-economic growth nexus. Section 4 then presents our data, model, and technique. Section 5 deliberates on the empirical findings of the study. Finally, Section 6 concludes our findings with policy implications.

2. INFLATION-ECONOMIC GROWTH NEXUS IN NIGERIA: SOME STYLIZED FACTS

The Nigerian economy experienced significant fluctuations in both inflation and economic growth during the study period of 1990–2021, with the combined effects of domestic and external shocks accounting for the observed trends in inflation and economic growth. The domestic shocks included several issues, such as supply shocks caused by reoccurring swings in the weather patterns, disruptions to Nigeria's production and distribution system, and demand shocks caused by changes in monetary and fiscal policy. Multiple commodity price shocks served to further reinforce these domestic factors. During the entire sample period, the average real economic growth rate was 4.32%, while the average inflation rate stood at 18.06%. Figure 1 presents the trends of the past patterns observed in these two macroeconomic indicators. It can be deduced from Figure 1 that there were episodes of inflationary pressures in the early stages of the 1990s, with inflation increasing continuously from a single-digit level of 7.36% to a peak of 72.84% in 1995. Subsequently, it began to decline, reaching a rate of 6.62% in 1999. Significant reforms under the Structural Adjustment Programme (SAP) had preceded this time, including the deregulation of key pricing like interest rates and currency rates, which combined had a major effect on domestic prices (Olubusoye and Oyaromade, 2008). During the period of the SAP, several factors contributed to inflationary pressures, including the notable depreciation of the naira currency rate, which raised the cost of imported commodities, coupled with an increase in the money supply. Following the inauguration of a new civilian government in 1999, several changes were promptly implemented to engender macroeconomic stability. These measures included the lowering of government funding for deficits via the central bank's ways and means approach and concurrently creating a benchmark oil price rule and an excess crude account. These changes helped usher in a new age of financial restraint.

The foreign currency market was further liberalised, and the banking industry was recapitalized with the implementation of the wholesale Dutch auction system (wDAS) as an extra reform step. The combination of these policies had a positive effect on the macroeconomic environment, resulting in lower inflationary pressures and a stabilised naira exchange rate. Inflation rates decreased as a result of the changes, from an average of 30.64% in the 1990s to an average of 12.46% from 2000 to 2010. Correspondingly, economic growth increased from an average of 2.31% in the 1990s to an average of 7.71% between 2000 and 2010. However, between 2011 and 2021, the inflation rate was relatively stable, with an average rate of 12.23%. However, average real economic growth was modest at 2.70% over the same period, reflecting the effect of the global financial crisis. It is challenging to discern the impact of inflation on economic growth solely from Figure 1. It can be deduced from the Figure 1 that the variables move in either the same or opposite directions, contingent on the sub-periods within the sample. Consequently, there is a need for empirical investigation utilizing a more contemporary econometric approach that enables measurement by distinguishing positive changes from negative changes when analyzing the correlation between inflation and economic growth.

Figure 1: Trends in Inflation and Economic growth 1990-2021



Source: construction by authors using data from WDI 2022

We used an approach similar to that of Ghosh and Phillips (1998) and Mubarik (2005) to investigate the relationship between inflation and economic growth in Nigeria. This method has resulted in the inflation rates being computed and arranged into ascending sub-ranges; Table 1 displays the frequency of inflation falling within a certain range, expressed in years. Additionally calculated were the average rates of inflation and economic growth corresponding to each distinct range of inflation. It can be deduced from Table 1 that the modal inflation rate ranged between 5 and 15 percent. It can also be observed that for the first two inflation ranges, a higher average inflation rate corresponds to a lower average economic growth rate. However, in the third and fourth inflation ranges, higher average inflation corresponds to higher economic growth. Finally, we saw a notable decline in economic growth in the last two inflation categories, which are significantly high. There is some evidence to imply that greater inflation causes slower economic development, except for two of the six inflation ranges. Thus, we may conclude that inflation and economic growth in Nigeria may have a non-linear relationship. This prompts an inquiry into the direction of the link between these variables and estimating the specific inflation threshold.

Table 1: Inflation ranges and economic growth (1990-2021)

Inflation range	Frequency	Average inflation	Average growth rate	GDP
$5 \leq \text{infl} < 15$	22	10.51	5.37	
$15 \leq \text{infl} < 25$	5	17.18	3.04	
$25 \leq \text{infl} < 35$	1	29.27	4.20	
$35 \leq \text{infl} < 45$	1	44.59	4.63	
$45 \leq \text{infl} < 55$	-	-	-	
$55 \leq \text{infl} < 65$	2	57.10	-1.93	
$65 \leq \text{infl} < 75$	1	72.84	-0.07	

Source: authors' computation

3. LITERATURE REVIEW

The number of scholarly articles that have reflected on the relationship between inflation and economic growth in both developed and emerging and developing economies has significantly increased in recent years. Figuring out the threshold level at which inflation tends to hinder economic growth has been the focus of these investigations. However, the empirical evidence about threshold values seems mixed. Numerous variables, such as the unique features of a given country, the degree of economic growth, the kind of data collected, and the methodological and estimating techniques adopted, may be attributed to the varying inflation threshold levels.

For instance, Mosikari et al. (2018) estimated the optimal threshold effect of inflation on Swaziland's economy for the period from 1980 to 2015. This was accomplished by using both the regular least squares method and the two-stage least squares methodology. Their research yielded data indicating that economic growth is negatively impacted when inflation exceeds the threshold of 12%. Nevertheless, the use of the two-stage least-squares technique led to a higher inflation threshold of 18.5%. Tenaw et al. (2020) conducted a thorough investigation on the influence of inflation on the economic development of Ethiopia between 1975 and 2018. The study used the Two-Regime Threshold Auto-regressive (TAR) model, which is a distinctive method for estimating. The results indicated that a threshold inflation rate ranging from 9% to 10% was suitable for both regimes. Asaduzzaman (2021) did a study examining the correlation between inflation and economic development in Bangladesh. The study used yearly time series data from 1980 to 2017. The threshold level was determined using a quadratic regression analysis, resulting in an inflation threshold of 7%. According to Tarawallie et al. (2022), in Sierra Leone, inflation

has a positive impact on economic growth as long as it stays below the threshold of 10.3%. At a level higher than this, inflation presents a substantial risk to the expansion of the economy. The research identified investment, openness, and conflict as key determinants of economic development. Esako (2023) used the conditional least squares approach to analyse the time series data of Burundi from 1990 to 2020. The study found evidence of nonlinear relationships between inflation and economic development and identified a specific inflation threshold of 13%.

From a cross-sectional perspective, Azam et al. (2020) used fixed effects and feasible generalised least squares methods to reevaluate the threshold effect of inflation on economic development in a dataset consisting of 27 nations. This dataset includes 16 emerging economies and 11 developed economies, covering the time period from 1975 to 2018. Empirical findings indicate that economic development is impeded when inflation exceeds the threshold of 12.23% for emerging nations and 5.36% for established economies. In addition, they determined that economic growth is favourably impacted by gross fixed capital creation, government spending, household consumption, and real exports. Nevertheless, the pace of population expansion has a detrimental effect on economic growth. In their recent study, Khan et al. (2020), the authors carefully examined data from 113 countries from 1981 to 2015 using the dynamic system GMM approach. The research results suggest that there is a crucial threshold for the quality of institutions. Below this threshold, there is no link between the price level and the pace of economic development. However, beyond this threshold, the relationship becomes harmful. Sanga et al. (2020) investigate the relationship between inflation and economic growth in the Franc zone currency union from 1970 to 2018 using the cointegration approach. The findings indicate a specific threshold level of 5.6 percent. Özyilmaz (2022) investigates the correlation between inflation and economic growth in 27 EU nations from 1996 to 2019, using Dumitrescu and Hurlin's (2012) causality methodology. The investigation used two inflation indices, namely the Consumer Price Index (CPI) and the GDP deflator. The results indicate a reciprocal causal link between inflation and economic growth, with inflation influencing economic growth and economic growth influencing inflation, as shown in both inflation indices.

The evidence on the inflation threshold in Nigeria is inconclusive. For example, Ajide et al. (2012) utilised a least squares multivariate technique to determine the inflation threshold level in Nigeria and explored the long-term correlation between other essential factors influencing economic development. The findings of the study suggest a non-linear relationship between inflation and economic growth in Nigeria, with the research establishing an ideal inflation threshold level of 9% for sustaining economic development. In a comparable analysis, Adeleke (2012) investigates the relationship between inflation and economic growth in Nigeria from 1970 to 2009. The study confirms an inflation threshold of 8%. Bawa et al. (2012) estimated an inflation threshold of 13% for Nigeria, which differs from the findings of Ajide et al. (2012) and Adeleke (2012). Doguwa (2012) used a modified version of estimation methods to examine the inflation threshold specific to Nigeria. The result demonstrates that the various methodologies yielded distinct estimations of inflation threshold values. The Sarel (1996) method indicated an inflation threshold of 9.9%, the Khan and Senhadji (2001) technique suggested a threshold of 10.5%, and the Drukker et al. (2005)

approach identified two threshold values of 11.2% and 12.0%. Obi et al. (2016) used the general-to-specific modelling technique to determine the inflation threshold for Nigeria between 1970 and 2015. They used three inflation threshold models by dividing the data into three periods: 1970–1986 (before the implementation of the Structural Adjustment Programme); 1986–1998 (after the implementation of the Structural Adjustment Programme); and 1999–2015 (during the period of civilian governance). They discovered that the inflation threshold varied depending on the time period. During the whole sample from 1970 to 2015, the threshold was 12%. However, during the period from 1970 to 1985, it was 11%. However, from 1986 to 1998, the threshold decreased to 7%, and from 1999 to 2015, it was 8%.

3.1. Synthesis and Gap in the Empirical Literature

From the reviewed literature, several valuable observations may be obtained. First, there is consensus on the presence of a nonlinear relationship between inflation and economic growth. This suggests that there is an obvious threshold for inflation. In addition, when inflation is below this threshold, it promotes economic growth, and when it exceeds this threshold, it negatively affects economic growth. Second, several techniques, including quadratic and panel threshold regression, as well as ARDL methods, were utilised to estimate the inflation threshold. Third, the existing empirical literature offers numerous findings about the influence of inflation thresholds on economic development. This might be attributed to the different methodologies used to estimate the thresholds, as well as the range of countries included in the studies. The predicted inflation threshold is much lower in industrialised nations compared to developing economies. The discrepancy might be ascribed to differences in institutional and macroeconomic progress. Finally, for empirical investigations conducted in the Nigerian context, it has been observed that there is still a lack of agreement over the specific inflation threshold. While several studies estimated an inflation threshold of single digits, others indicated double digits. Furthermore, as far as the authors are aware, no empirical study has estimated an inflation threshold in Nigeria using the sample-splitting threshold approach that Hansen (2000) proposed.

4.0 METHODOLOGY AND DATA

4.1 Model specification

To investigate the inflation threshold in Nigeria, this study adopted and modified the modeling style in previous studies by Ajide et al. (2012), Rutayisire (2015), and Yabu et al. (2015). The econometric model assumed the following structure:

$$Rdpgr_t = \alpha_0 + \theta_1 Infl_t + \theta_2 X_t + \varepsilon_t \text{-----} (1)$$

Where, $rdpgr$ represents the growth rate of real gross domestic product, $Infl$ is the annual growth rate of consumer price index, X_t is a vector of control variables that affect economic growth, θ_1 and θ_2 are the parameters to be estimated, and ε_t is the error term

The recurrent issue in economic growth theory lies in identifying the primary factors that drive economic growth and selecting the correct explanatory variables for equation 1. The neoclassical

economic growth theory places capital stock, labour force, and technical advancement as the main factors that drive economic growth (Solow, 1956; Swan, 1956). However, the endogenous growth model emphasises the importance of human capital, knowledge, and new technologies (Romer, 1990a; Grossman and Helpman, 1991).

In this study, we used the neoclassical growth model to provide a rationale for selecting the explanatory variables in the model. The Solow model's capacity to elucidate the phenomenon of economic growth in both developed and developing countries has been well demonstrated in the existing empirical literature on economic growth (Mankiw, Romer, & Weil, 1992). However, because of limitations in the available data, we used investment as a proxy for capital stock and population as a proxy for the labour force in the empirical model.

Levine and Renelt (1992) and Sala-i-Martin (1997) have discovered several explanatory factors that may be included in economic growth models. Nevertheless, only a few of them are likely to have substantial influence. Consequently, they suggested doing an econometric analysis to evaluate the reliability of the variables. Sala-i-Martin's robustness test has identified some explanatory variables that are statistically significant in influencing economic growth. The factors include investment, population growth, inflation rate, government spending, trade openness, and the growth rate of terms of trade. These factors have a consistent correlation with economic growth. Empirical research has also emphasised the importance of financial development for economic growth (King and Levine, 1993).

Consequently, this study has also taken into account some of these variables. Hence, in addition to considering inflation, the fundamental model is specified below:

$$gdpgr_t = \alpha_0 + \alpha_1 infl_t + \alpha_2 inv_t + \alpha_3 findep_t + \alpha_4 pop_t + \alpha_5 open_t + \varepsilon_t \text{-----} (2)$$

Equation 1 specifically defines the variables $gdpgr$ and $infl$. inv , however, denotes investment, specifically gross fixed capital formation as a percentage of nominal GDP. $findep$ is a statistic used to measure the financial development indicator. It is calculated by dividing broad money (M2) by the nominal GDP. pop refers to the yearly population growth rate, while $open$ denotes trade openness, which is determined by dividing the total value of exports and imports by the nominal GDP. Ultimately, the variable t serves as an index for the progression of time.

The regression model specified in equation (2) is a conventional linear economic growth model. However, we modify this linear model by incorporating the threshold term. The model can be represented in the following form:

$$gdpgr_t = (\alpha_1 + \alpha_1 infl_t + \alpha_2 X_t)I[infl_t \leq \gamma] + (\alpha_3 + \alpha_4 infl_t + \alpha_5 X_t)I[infl_t > \gamma] + \varepsilon_t \text{---} (3)$$

4.2 Estimation strategy

We utilised the Hansen (2000) sample-splitting approach to investigate the threshold level for inflation in Nigeria. This estimation approach uses least squares estimation for determining the regression parameters, which is regarded as more effective than the traditional method of

externally imposing quadratic terms, which tend to have a potential multicollinearity problem (Narayan et al., 2010). Our method is different from others because it doesn't force a certain kind of non-linearity and lets us find out for ourselves what the statistical significance of all thresholds and their confidence intervals are. Our research not only measures the precise threshold effect but also demonstrates the impact of inflation on economic growth when inflation is either below or above the estimated threshold.

To start the estimation process, a hypothesis test is used to look at the null hypothesis of linearity, which is written as $H_0: \alpha_1 = \alpha_4$. This is done for the threshold model shown in Equation 3. There is statistical evidence that there is a threshold-level regression with two regimes if the null hypothesis is rejected. This suggests that the model is non-linear. Once a certain threshold is reached, the sample is deemed to belong to the first regime if the inflation value is less than or equal to γ , and to the second regime if the inflation value exceeds γ . From a statistical perspective, it is evident that both regimes yield distinct outcomes during the estimation process. This study will utilise the heteroscedasticity-consistent Lagrange Multiplier (LM) bootstrap procedure proposed by Hansen (2000). The purpose of this procedure is to test the null hypothesis of a linear formulation in comparison to an alternative threshold regression hypothesis.

Since the threshold parameter γ cannot be determined while examining the null hypothesis of no threshold effect, the p-values are computed using a fixed bootstrap technique. Hansen (2000) has shown that this specific approach yields asymptotically precise p-values. If the null hypothesis that $\alpha_1 = \alpha_4$ is rejected and a threshold level is established, it is essential to evaluate the threshold regression model against a linear specification. The task should be accomplished by partitioning the initial sample according to the given threshold. The aforementioned technique is iterated until the null hypothesis of $\alpha_1 = \alpha_4$ can no longer be rejected.

4.3 Data and sources

To estimate the relationship between inflation and economic growth, an annual dataset covering the years 1990–2021 was used. The data was extracted from the World Development Indicators of the World Bank. Table 2 provides specifics about the variables used.

Table 2: Variables and Description

Dependent variable	$gdpgr_t$	The growth rate of real gross domestic product (%)
Threshold variable	$infl_t$	Annual change in the consumer price index
Control variables X_t		
	inv_t	Total gross fixed capital formation as % of GDP
	$findep_t$	Broad money supply as % of GDP
	$open_t$	Sum of exports and imports as % of GDP
	pop_t	Growth rate of population

5.0 PRESENTATION AND ANALYSIS OF RESULTS

5.1 Descriptive Statistics

The variables utilised in the investigation are described in Table 3, which presents intriguing descriptive statistics. It is worth noting that the Nigerian economy experienced an average inflation rate of approximately 18.06% from 1990 to 2021. During the same period, the maximum inflation rate was a staggering 72.84%, while the minimum was 5.39%. Additionally, the average GDP growth rate of Nigeria was 4.32%, with the highest recorded growth rate standing at an impressive 15.33%, while the lowest was -2.04%.

Table 3: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gdpgr	32	4.32	4.017	-2.035	15.329
infl	32	18.061	16.365	5.388	72.836
findep	32	17.935	6.072	9.063	27.379
inv	32	28.224	11.382	14.169	53.122
pop	32	2.604	0.101	2.406	2.764
open	32	36.16	9.394	16.352	53.278

Source: authors' computation using stata17

5.2 Correlation Coefficient

We then assess if the multicollinearity problem is present. The correlation coefficients are shown in Table 4. The correlation coefficients show that trade openness and population growth are positively correlated with the growth rate of the real gross domestic product. Conversely, there is a negative association between the growth rate of the real gross domestic product and inflation, financial deepening, and investment, respectively. Furthermore, the correlation coefficient between the independent variables shows a majority of low values, except for the correlations between population growth rate and trade openness (0.520) and between investment and financial deepening (-0.719). Regression analysis encounters the problem of multicollinearity when the correlation coefficient between two independent variables is greater than 0.8 (Gujarati et al., 2003). The independent variables presented in Table 4 exhibit correlation coefficients, with the highest observed correlation coefficient being -0.719. Given that the value is less than 0.8, it is unlikely that multicollinearity will pose a significant issue in our regression analysis.

Table 4: Correlation coefficient

Variables	gdpgr	infl	findep	inv	pop	open
gdpgr	1.000					
infl	-0.420	1.000				
findep	-0.165	-0.283	1.000			
inv	-0.152	0.417	-0.719	1.000		
pop	0.645	-0.220	-0.037	-0.366	1.000	
open	0.382	-0.109	-0.399	0.072	0.520	1.000

Source: authors' computation using stata17

The variance inflation factor (VIF) was used to check if there was evidence of multicollinearity among the explanatory variables. Kennedy (1992) asserts that the presence of multicollinearity is not a concern when the variance inflation factors (VIFs) of variables are below 10. According to Table 4, the variance inflation factor (VIF) values are all below 10, indicating that there is no multicollinearity among the variables.

Table 5: Variance Inflation Factor

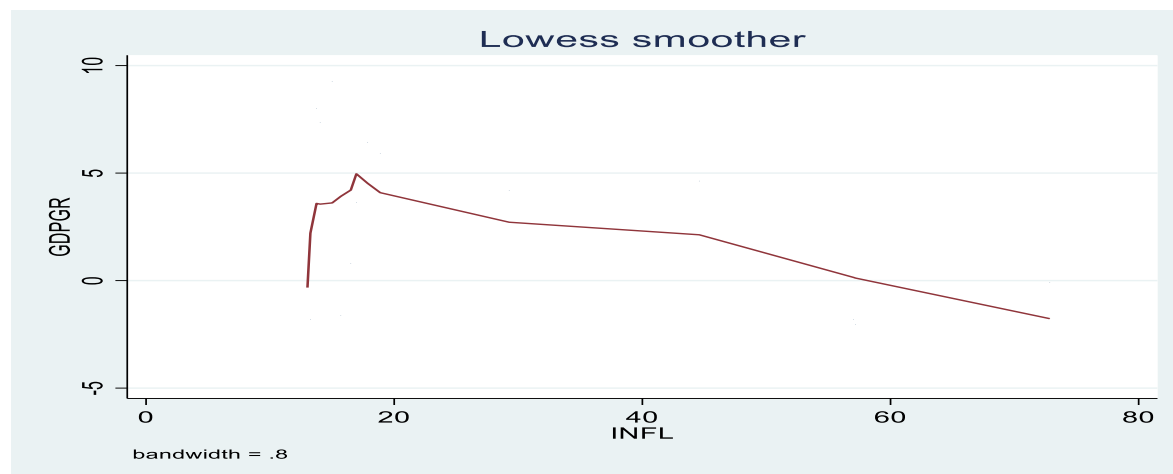
	VIF	1/VIF
gfcf	3.211	.311
findep	2.942	.34
pop	1.879	.532
open	1.749	.572
infl	1.244	.804
Mean VIF	2.205	.

Source: authors' computation using stata17

5.3 Test for the Existence of Threshold Effects

Initially, we used the graphical method to examine the presence of a nonlinear relationship between inflation and economic growth. The graph illustrates a positive correlation between economic growth and inflation, up to a certain threshold when it peaks and thereafter decreases at greater levels of inflation. Hence, the lowess graph shown in Figure 2 indicates the presence of nonlinearity between inflation and economic growth.

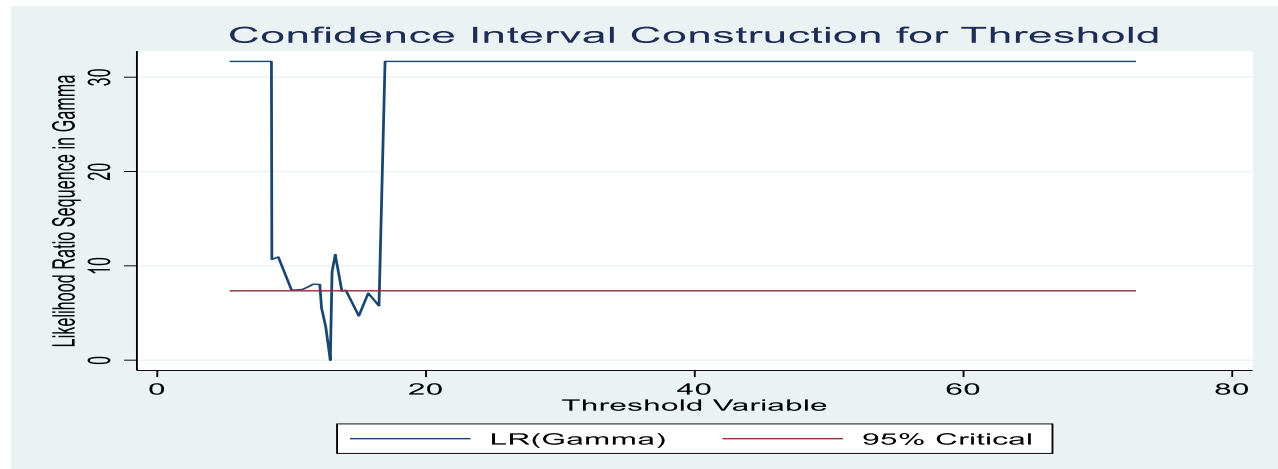
Figure 2: Relationship between inflation and economic growth



Although the graphical analysis shows a non-linear relationship between inflation and economic growth, we continued with a formal test of linearity by using the Hansen (2000) sample splitting algorithm. The initial step entails the development of the F-test and the likelihood ratio statistic to examine the presence of a threshold within the entire sample. In this study, the bootstrap method, specifically employing 5000 bootstrap replications, as suggested by Hansen (2000), was utilised.

The resulting p-value for the threshold model was found to be 0.0348, as presented in Table 5. This suggests the presence of a notable threshold level, leading to the rejection of the null hypothesis that posits the absence of a threshold. Consequently, this study proceeds to estimate the threshold value by employing the likelihood ratio sequence. Figure 3 illustrates the sequence of normalised likelihood ratios as a function of the inflation threshold. The graph exhibits a minimum value, which represents the estimated inflation threshold. Specifically, this minimum value is observed at a point of 12.88% in Figure 3.

Figure 3: Confidence interval for Inflation threshold



Note: Threshold estimates is the point where $LR(\gamma)$ is equal to zero. We obtain a value of 12.88 for the threshold. Source: authors' estimation.

We then divided the sample based on the previously estimated inflation threshold level of 12.88. The subset of observations used to establish the second inflation threshold level consists of all instances where the inflation level exceeds the estimated threshold point (12.88). The sub-sample is subjected to further testing to determine the presence of a statistically significant threshold point. The bootstrap p-value of 0.7288, which results from the execution of 5000 bootstrap iterations, supports the findings that a second inflation threshold does not exist (see Table 6). As a result, we fail to reject the null hypothesis, which posits the absence of a second threshold, leading to the conclusion that there does not exist a second threshold inflation level in this study. Hence, findings suggest that there is substantial evidence supporting the existence of a single inflation threshold for Nigeria.

Table 6: Threshold estimates of inflation

Null Hypothesis	Alternative Hypothesis	LM Test	Bootstrap p-value	Estimated Threshold (%)	95% Confidence Interval
No Threshold	One Threshold	13.0169**	0.0348	12.8765	[12.2242,16.5023]
One Threshold	Two threshold	7.0133	0.7288	-	-

Source: authors' computation using Stata 17

Note: The thresholds are determined by the minimum sum of squares residual. '****', '**', '*' represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

5.4 Threshold Regression Model

After establishing the presence of a threshold effect, our analysis proceeds to investigate the relationship between inflation and economic growth in Nigeria under different inflation regimes. Furthermore, we attempted to determine the direction of this effect. Table 7 presents a comprehensive summary of the estimation results. To facilitate comparison, the initial column provides estimates for a linear specification that does not take into account the presence of a threshold effect. The subsequent columns present estimations of the threshold models. The findings from the linear model indicate that inflation hurts economic growth in Nigeria. Based on regime 1, which corresponds to cases where inflation remains below the threshold value of 12.88%, there is a statistically insignificant positive correlation between inflation and economic growth. The lack of significance in the relationship below the threshold value suggests that a lower inflation rate does not exert a constraining influence on economic growth. This empirical observation is consistent with the conclusions drawn from the empirical studies proposed by Huybens and Smith (1999), as well as Bose (2002). Conversely, in regime 2, when the inflation rate exceeds the established threshold of 12.88%, there is a statistically significant and negative impact on economic growth. It can be inferred from the results that fostering economic growth is contingent upon maintaining a low level of inflation. With regard to the control variables in this study, their effects align with the expected outcomes, although not all of them are statistically significant. The results further suggest that trade openness negatively and significantly impacts economic growth in Nigeria, irrespective of the inflation regime.

Additionally, population growth is shown to positively and significantly influence economic growth in Nigeria, in both the linear model and when inflation is below the threshold. However, above the inflation threshold, population growth is found to be statistically insignificant. Investment is only significant in the linear model, while financial deepening is significant above the threshold.

Table 7: Results of the Inflation and Economic growth nexus for Nigeria

Explanatory variable: rgdpgr	Linear model without threshold	Regime1 Inflation≤12.88	Regime2 Inflation>12.88
Intercept	-55.5081(-3.5411)	-75.7783(-5.7042)	-9.2079(-0.4915)
Infl	-0.0957(-6.8849)	0.6103(1.5193)	-0.0877(-2.4160)
Findep	-0.1491(-1.1531)	-0.2594(-0.9935)	-0.2576(-2.1611)
Inv	0.2993(3.3330)	0.0931(1.0616)	-0.0918(-0.9829)
Pop	24.8303(4.3002)	32.7189(6.1158)	6.8706(0.9192)
open	-0.0348(-0.6667)	-0.2068(-2.8213)	-0.1198(2.0000)
R-square	0.5601	0.6257	0.6981
Heteroscedasticity test (p-value)	0.6259	-	-
No. of observation	32	17	15

Source: Authors' estimation using Stata 17, Note: The t-values are in parentheses

6.0 CONCLUSION AND POLICY RECOMMENDATIONS

This study aims to investigate the potential presence of threshold effects of inflation on the economic growth of Nigeria from 1990 to 2021. By utilising the non-linear sample splitting threshold modelling technique that Hansen (2000) proposed, it contributes to the body of literature on the relationship between inflation and economic growth. The results demonstrate a non-linear correlation between inflation and economic growth in Nigeria, suggesting an inflation threshold of 12.88%. This suggests that inflation above this level hurts economic growth. The study also reveals that some of the control variables were not statistically significant in explaining variations in economic growth in Nigeria across all inflation thresholds. Trade openness was found to hurt economic growth in Nigeria, irrespective of whether it was below or above the inflation threshold. However, population growth has a positive impact on economic growth when inflation is below the threshold, while it has no effect when inflation exceeds the threshold level. In the linear model, investments are found to be beneficial for economic growth, but their impact is statistically insignificant both below and above the inflation threshold. Lastly, the study observes that financial deepening has a negative influence on economic growth beyond the inflation threshold, but it has no effect on economic growth below the threshold. This study has significant implications for

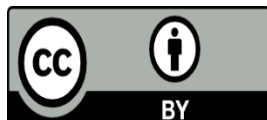
monetary policy in Nigeria, as it assists policymakers in identifying the threshold level of inflation and establishing inflation targets that are consistent with economic growth.

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