



## **Inflation and Economic Growth in Nigeria: A Threshold Determination**

by

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### **Abstract**

*This study examined the effects of inflation on economic growth in Nigeria using annual data covering the period of 1985 to 2022. Specifically, the study: investigates the existence of long and short run relationship between inflation and economic growth in Nigeria; and establishes the inflation threshold for economic growth in Nigeria. The ARDL long-run bounds test served as a crucial analytical tool, revealing a sustained association between inflation and economic growth over the years. Notably, the regression coefficient analysis uncovers a compelling negative and statistically significant relationship between inflation and output growth in Nigeria. The study further identified a critical threshold inflation level of 13 percent for Nigeria. Below this pivotal threshold, inflation demonstrates a positive impact on economic activities, acting as a stimulant for production. However, above the 13% threshold, inflation was found to exert a detrimental and statistically insignificant effect on economic growth in Nigeria. This nuanced finding highlights the delicate balance between inflation and economic prosperity. In the light of these findings, the study emphasizes the imperative for relevant authorities to craft and implement effective fiscal, monetary, and exchange rate policies aimed at managing and curbing inflation, ensuring it remains below the identified 13% threshold. This strategic approach is crucial for maintaining price stability, fostering investment, optimizing supply chain efficiency, promoting trade by enhancing productivity, and ultimately catalyzing sustained economic growth in Nigeria. These measures, if implemented judiciously, hold the potential to reshape the economic landscape of Nigeria, ensuring a trajectory of stability and prosperity.*

**Key words:** *Inflation, Economic growth, Threshold, ARDL model, Co-integration, Error correction,*

### **1. Introduction**

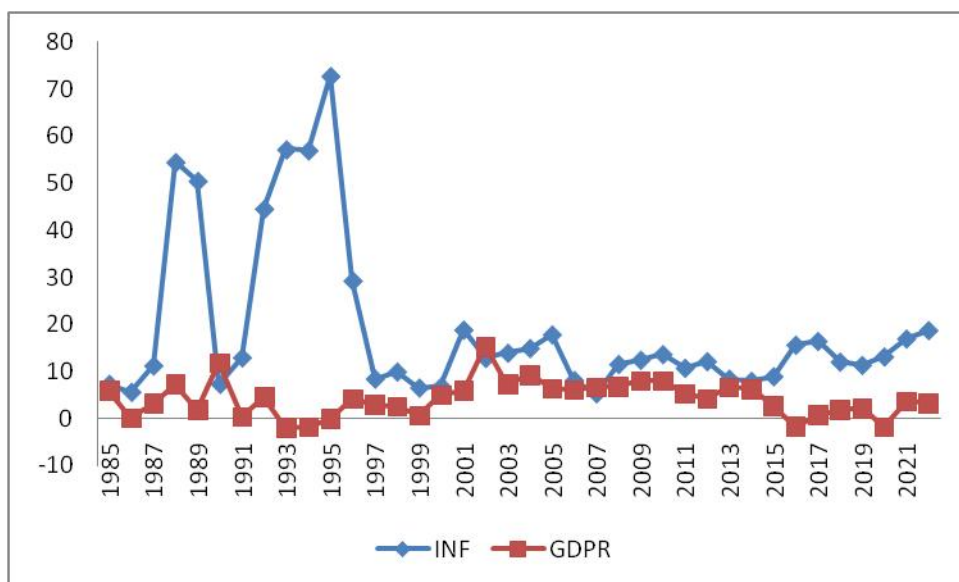
The intricate relationship between inflation and economic growth has been a central focus in the field of economics for some decades. Inflation, characterized by a persistent increase in the overall price level of goods and services, stands as a macroeconomic phenomenon with far-reaching implications for a nation's economic trajectory. The consequential impact of inflation on economic growth has ignited fervent

deliberation and scholarly discussion. This enduring discourse underscores the recognition of inflation's pivotal role in shaping the economic landscape, emphasizing the perpetual quest within the academic community for a nuanced understanding of its multifaceted implications on economic growth and stability.

Theoretical frameworks offer valuable perspectives on the potential impact of inflation on economic growth. At its core, inflation diminishes the purchasing power of money, introducing uncertainty into the economy. According to classical economic theory, specifically the Quantity Theory of Money, an excess of money supply results in inflation, subsequently impedes economic growth. The presence of inflation can discourage investment by heightening uncertainty and diminishing the real returns on investments, as evidenced by a decrease in output sales levels (Niyama, 2013).

On the flip side, certain economic theories posit that a moderate level of inflation may play a crucial role in fostering economic growth. From a Keynesian standpoint, mild inflation is seen as a potential catalyst for increased consumer spending and a deterrent against hoarding money, thereby fostering investment and overall economic activity. Furthermore, the financial repression hypothesis proposes that a controlled level of inflation can effectively reduce the real interest rate, thereby incentivizing borrowing and investment—key components in propelling economic growth (Bayo, 2011).

Furthermore, other empirical researchers had come out with mixed reactions in their findings as regards to the effects of inflation on economic growth in Nigeria. Researchers like, Andiroba (2018) and Ogwu (2010) posit a positive relationship between inflation and economic growth of Nigeria, and while Idris and Suleiman (2019) findings show that there exists negative relationship between inflation and economic growth of Nigeria.



**Figure 1: Trends of Inflation rate and Real Gross Domestic Product in Nigeria**

Source: *World Bank, (2022)*

Available data on the Nigerian economy spanning from 1980 to 2022 unveils dynamic fluctuations in both the inflation rate and real gross domestic product (GDP).

Figure 1.1 illustrates a vivid portrayal of this volatility, showcasing the inflation rate's oscillations. Notably, the inflation rate reached an unprecedented peak of 73% in 1995. In tandem, the growth rate of real GDP exhibited active fluctuations, hitting a zenith of 42% in the same pivotal year of 1995. These fluctuations underscore the economic dynamics and challenges experienced by Nigeria during this extensive time frame.

The observed scenario, where inflation exhibited volatility while the real gross domestic product (GDP) growth remained consistently low throughout the review period, complicates the interpretation of their relationship. Determining whether inflation is beneficial or detrimental to the Nigerian economy becomes a nuanced challenge. The intricate interplay between inflation and economic output prompts an exploration of the optimal inflation level that could potentially stimulate productivity and foster economic growth in Nigeria. This underscores the need for a comprehensive analysis to discern the intricate dynamics between inflation and overall economic performance.

It is on this premise that this study is aimed at examining inflation as an economic phenomenon and its effects on the overall economic performance of Nigeria economy. Therefore, the major objective of this study is to examine the effect of inflation on economic growth in Nigeria using annual data covering the period of 1985 to 2022. Specifically, the study seeks to: investigate the existence of long and short run relationship between inflation and economic growth in Nigeria; and establish the inflation threshold for economic growth in Nigeria.

This research holds significant importance for several reasons. Firstly, it addresses the diverse perspectives on the inflation-growth relationship in Nigeria, offering insights into the optimal inflation level for fostering economic growth. Secondly, given recent episodes of hyperinflation in the Nigerian economy, the study becomes crucial in informing authorities about the implications of inflation on growth. This knowledge is vital for formulating effective fiscal and monetary policies to manage inflation dynamics and ensure price stability. Lastly, the research contributes substantially to the existing literature, advancing the frontier of knowledge on the interplay between inflation and economic growth, thereby enriching the academic discourse and understanding in this field.

This study is organized into different sections, starting with the introduction, Section two presents the literature review which includes conceptual, theoretical, empirical reviews and the evaluation of literature reviewed. Section three presents the methodology and model specification. While section four deals with data presentation and discussion of findings. Section five presents the summary of the findings, conclusions and recommendations of the study.

### **3. Materials and Methods**

#### **Research Design**

The research design adopted for this study is the ex-post facto design. This design is suitable for investigations or evaluations conducted retrospectively, utilizing existing information from past events. It is particularly apt for after-the-fact research scenarios where data analysis is based on historical information.

#### ***Nature and Sources of Data***

Data used for this study are annual time series data covering the period 1985 to 2022. All data were obtained from sources such as the Central Bank of Nigeria (CBN)

Statistical Bulletin (various issues), World Bank and World Development Indicators (WDI) and World Bank national accounts data.

### Model specification

The underlying theory of this study is the endogenous growth theory because it maintains that economic growth is primarily the result of internal forces, rather than external factors. In an attempt to determine the threshold effects of inflation on economic growth in Nigeria, the study modifies the model of Idris and Suleiman (2019), which measure inflation using inflation rate, and it is use as a proxy for the independent variable, while real gross domestic product was used as a proxy for the dependent variable. This model is presented in equation 1.

$$RGDP=f(INF).....(1)$$

In line with our objectives, equation 1 is modified to capture other variables such as lending rate, exchange rate, labour force, gross fixed capital formation, trade openness, foreign direct investment and total government expenditure, which are used to represent the independent variables, while real gross domestic products is used to measure economic growth, which represents the dependent variable. Thus, the model for this study is formulated below as follows:

$$RGDP = f(INF, LINT, EXCH, LABFRC, GRFCF, TOP, FDI, TGEX).....(2)$$

(-)    (-)    (-)    (+)    (+)    (+)    (+)    (+)

Equation 2 can be restated in the econometric form as in equation 3:

$$RGDP_t = \alpha + \beta_1 INF_t + \beta_2 LINT_t + \beta_3 EXCH_t + \beta_4 LABFRC_t + \beta_5 GRFCF_t + \beta_6 TOP_t + \beta_7 FDI_t + \beta_8 TGEX_t + \mu_t.....(3)$$

Where:

RGDP = Real Gross Domestic Product

INF = Inflation rate

INT = Lending rate

EXCH = Nominal Exchange rate

LABFRC = Labour participation rate

GRFCF = Gross fixed capital formation (% of GDP)

TOP = Trade openness (Net Export to GDP)

FDI = Foreign direct investment (% of GDP)

TGEX = Total government expenditure (% of GDP)

$\alpha$  = Constant Parameter

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ , and  $\beta_8$  = Represents the coefficients of the explanatory variables.

**A priori expectations:** The figures in parenthesis in equation 2 represents a priori expectation about the signs of the coefficients.

### Analytical Techniques

The techniques of data analysis adopted for the study are based on the specific objectives of the study.

### The ARDL Model

This test for co-integration was developed by Pesaran *et al.* (2001). ARDL co-integration Technique is preferable when dealing with variables that are integrated of mixed order between I(0) and I(1) and, robust when there is a single long run relationship between the underlying variables in a small sample. The ARDL method does not require the unit root test of stationarity, but to avoid ARDL model crash in the presence of variables that are stationary at second difference, the unit root test will be carried out to determine the number of unit root in series of co-integration. The long run relationship of the underlying variables is detected through the F-statistic (Wald test). In this approach, long run relationship of the series is said to be established when the F-statistic exceeds the critical value bond (Nkoro and Uko, 2016). To ascertain the cointegration between the variables, equation 3.4 will therefore be expressed in the general ARDL model developed by Peasran et al, (2001). The generalized ARDL (p,q) model is specified as in equation 4.

$$Y_t = \alpha_{0j} + \sum_{i=1}^p \delta Y_{t-i} + \sum_{j=1}^q \beta X_{t-j} + \varepsilon_j \quad \dots\dots\dots(4)$$

Where  $Y_t$  is a vector and the variable in  $X_t$  are allowed to be purely I(0) or I(1) or cointegrated;  $\beta$  and  $\delta$  are coefficients;  $\alpha_0$  is the constant;  $j=1,\dots,k;p,q$  are optimal lag order;  $\varepsilon_j$  is the vector of the error terms.

The Autoregressive distributed lag (ARDL) model is written as in equation 5:

$$\begin{aligned} \Delta \text{RGDP}_t = & \alpha_0 + \alpha_1 \text{RGDP}_{t-1} + \alpha_2 \text{INF}_{t-1} + \alpha_3 \text{LINT}_{t-1} + \alpha_4 \text{EXCH}_{t-1} + \alpha_5 \text{LABFRC}_{t-1} \\ & + \alpha_6 \text{GRFCF}_{t-1} + \alpha_7 \text{TOP}_{t-1} + \alpha_8 \text{FDI}_{t-1} + \alpha_9 \text{TGEX}_{t-1} + \sum_{i=1}^n \beta_1 \Delta \text{RGDP}_{t-i} \\ & + \sum_{i=1}^n \beta_2 \Delta \text{INF}_{t-i} + \sum_{i=1}^n \beta_3 \Delta \text{LINT}_{t-i} + \sum_{i=1}^n \beta_4 \Delta \text{EXCH}_{t-i} + \sum_{i=1}^n \beta_5 \Delta \text{LABFRC}_{t-i} \\ & + \sum_{i=1}^n \beta_6 \Delta \text{GRFCF}_{t-i} + \sum_{i=1}^n \beta_7 \Delta \text{TOP}_{t-i} + \sum_{i=1}^n \beta_8 \Delta \text{FDI}_{t-i} + \sum_{i=1}^n \beta_9 \Delta \text{TGEX}_{t-i} + \mu_t \quad \dots\dots(5) \end{aligned}$$

Where  $\beta_0 - \beta_9$  are short-run elasticities,  $\alpha_0 - \alpha_9$  are long-run elasticities,  $\text{ECM}_{t-1}$  is one lag of error correction term,  $\lambda$  is the speed of adjustment parameter with a negative sign,  $\Delta$  is first difference,  $\mu_t$  is white noise,  $\beta_0$  is constant term.

If the computed F-test exceeds the upper critical bounds value, then  $H_0$  is rejected signalling co-integration amongst the different variables. If the computed F-value is below the critical bound, we fail to reject  $H_0$ . But if the computed F-value falls within the critical value bound, the result is inconclusive. If these series are found to be co-integrated, an unrestricted error correction version of the corresponding ARDL model can be estimated to trace the short-term dynamics of the model. The reparametrized result gives the short-run dynamics and long run relationship of the underlying variables.

### Error Correction Model

The error correction model (ECM) is used to detect the short-term and long-term dynamics of a variable around its stationary equilibrium value. For an adjustment in the shortrun distortions, error correction requires that the sign of the coefficient of the

residual is negative and statistically significant. The greater the absolute value of the ECM coefficient, the more quickly the model fine-tunes to achieve long-run equilibrium. Based on Equation (5), the short-run connections may be stated as an ARDL ECM as follows:

$$\begin{aligned} \Delta \text{RGDP}_t = & \alpha_0 + \alpha_1 \text{RGDP}_{t-1} + \alpha_2 \text{INF}_{t-1} + \alpha_3 \text{LINT}_{t-1} + \alpha_4 \text{EXCH}_{t-1} + \alpha_5 \text{LABFRC}_{t-1} \\ & + \alpha_6 \text{GRFCF}_{t-1} + \alpha_7 \text{TOP}_{t-1} + \alpha_8 \text{FDI}_{t-1} + \alpha_9 \text{TGEX}_{t-1} + \sum_{i=1}^n \beta_1 \Delta \text{RGDP}_{t-i} \\ & + \sum_{i=1}^n \beta_2 \Delta \text{INF}_{t-i} + \sum_{i=1}^n \beta_3 \Delta \text{LINT}_{t-i} + \sum_{i=1}^n \beta_4 \Delta \text{EXCH}_{t-i} + \sum_{i=1}^n \beta_5 \Delta \text{LABFRC}_{t-i} \\ & + \sum_{i=1}^n \beta_6 \Delta \text{GRFCF}_{t-i} + \sum_{i=1}^n \beta_7 \Delta \text{TOP}_{t-i} + \sum_{i=1}^n \beta_8 \Delta \text{FDI}_{t-i} + \sum_{i=1}^n \beta_9 \Delta \text{TGEX}_{t-i} \\ & + \lambda \text{ECM}_{t-1} + \mu_t \end{aligned} \quad \text{.....(6)}$$

Where  $\beta_0 - \beta_5$  are short-run elasticities,  $\alpha_0 - \alpha_5$  are long-run elasticities,  $\text{ECM}_{t-1}$  is one lag of error correction term,  $\lambda$  is the speed of adjustment parameter with a negative sign,  $\Delta$  is first difference,  $\mu_t$  is white noise,  $\beta_0$  is constant term.

### Threshold Regression Analysis

Threshold regression model is a statistical model that is used to analyze the relationship between a dependent variable and one or more independent variables when the relationship is not linear, but instead exhibits a threshold effect. A threshold effect occurs when there is a particular value of an independent variable that, once exceeded, leads to a significant change in the relationship between the dependent and independent variables. In threshold regression, the data is divided into two or more groups based on the threshold value of the independent variable. The model then estimates separate regression equations for each group. This approach allows for the identification of different relationships between the dependent and independent variables in different regions of the independent variable.

The threshold regression model is also known as a regime-switching model or a switching regression model, as it switches between different regression equations or regimes depending on the value of the threshold variable (Hansen 1999). Threshold regression equations can be specified in equations 7:

$$\text{RGDP}_{it} = \alpha_{\text{inf}} + \beta_1 d_{it}^{\text{inf}} (\text{inf} - \text{inf}^*) + \beta_2 (1 - d_{it}) (\text{inf}_{it} - \text{inf}^*) + \delta_{\text{inf}} p_{t-1} + \epsilon_{it} \quad \text{.....(7)}$$

Where, RGDP and INF are as earlier defined;  $p_{t-1}$  is the autoregressive component used to clear the effects of other control variables with  $\delta$  as the respective coefficients. The variable  $\text{inf}^*$  is the value used for the iteration process in our search for the optimal threshold point. The effect of inflation on real GDP growth is captured by  $\beta_1$  for periods in which the inflation is greater than the threshold (high inflation period) while  $\beta_2$  represent the effect of inflation on RGDP when the inflation level is lower than the threshold value (low inflation period).

### Diagnostic Tests

#### Pre-estimation tests

#### Unit Root Test

The unit root test is involved with the testing for the order of integration of each variable. A series is said to be integrated of order I(1) if it needs to be differenced once to become stationary. The same holds for an I(2) series which will need to be differenced twice to become stationary. Thus a stationary series is integrated of order zero I(0) (i.e, no differencing is necessary). The study will employ the Augmented Dickey-Fuller (ADF) and the Philips-Perron (PP) unit root tests to determine the order of integration of each series.

#### **Post-estimation tests**

- a) Breusch-Godfrey test is a statistical test that checks for the presence of serial correlation or autocorrelation in the residuals of a regression model. In other words, it determines if there is a pattern in the residuals that can be explained by previous residuals or errors.
- b) The Breusch-Pagan-Godfrey test is a statistical test used to determine whether there is heteroscedasticity in a regression model. The test involves regressing the squared residuals from a linear regression model on the independent variables in the original model. The resulting regression model is then used to calculate a test statistic, which is compared to a chi-square distribution to determine the p-value. In summary, if the p-value is less than 0.05, it indicates that there is evidence of heteroscedasticity in the data, and the regression results should be interpreted with caution. If the p-value is greater than 0.05, there is no evidence of heteroscedasticity, and the regression results are considered reliable.
- c) The Jarque-Bera test is a statistical test used to determine whether a given dataset has a normal distribution. The test calculates a test statistic, which is compared to a critical value from a chi-squared distribution with two degrees of freedom. If the test statistic is larger than the critical value, then the null hypothesis of normality is rejected. If the null hypothesis is rejected, it means that the data does not have a normal distribution. However, if the null hypothesis is not rejected, it does not necessarily mean that the data is normally distributed, as the test is not very sensitive to departures from normality when the sample size is small.

#### **4. Results and Discussion**

The study conducted descriptive statistics to provide a comprehensive summary of the data used and it helps in understanding its characteristics. Descriptive statistics is important because it provides a concise summary of the main features of a dataset; allows for a preliminary exploration of the data; helps identify data errors, inconsistencies, or missing values and creates a visual representation of data making it easier to understand patterns, and distributions. This is shown in Table 1.

**Table 1: Descriptive Statistics of all Variables**

	<b>RGDP</b>	<b>INF</b>	<b>LINT</b>	<b>EXCH</b>	<b>LABFRC</b>	<b>GRFCF</b>	<b>TOP</b>	<b>FDI</b>	<b>TGEX</b>
<b>Mean</b>	0.17	0.19	18.27	119.70	2.99	0.15	4.73	-0.18	1.16
<b>Median</b>	0.13	0.14	17.59	120.58	2.97	0.13	1.40	0.07	1.09
<b>Maximum</b>	0.43	0.73	31.65	401.15	6.44	0.37	94.15	0.80	3.93
<b>Minimum</b>	0.05	0.05	9.43	0.89	0.20	-0.14	-33.99	-4.77	-1.57
<b>Std. Dev.</b>	0.09	0.17	4.27	109.62	1.61	0.12	21.73	1.03	1.11

<b>Skewness</b>	0.93	0.78	0.59	0.88	0.04	0.28	2.60	2.8	0.02
<b>Kurtosis</b>	2.50	2.85	4.54	4.05	2.13	4.02	11.02	12.08	4.22
<b>Jarque-Bera</b>	5.69	4.69	5.80	4.80	1.19	0.49	141.14	175.40	2.29
<b>Probability</b>	0.10	0.24	0.10	0.10	0.55	0.78	0.00	0.00	0.32
<b>Sum</b>	6.16	7.07	676.61	4428.78	110.99	5.58	174.89	-6.78	43.08
<b>Sum Sq. Dev.</b>	0.28	1.09	656.57	432617.4	93.73	0.49	17003.28	38.26	44.56
<b>Observations</b>	37	37	37	37	37	37	37	37	37

Source: Author's Computation (Eviews 10)

The descriptive statistics for each of the variables used in this study is presented in Table 1. We have a total of 37 observations for each of our variables. The mean tells us the average value for each of the variables. For RGDP, the mean and median values are 0.17 and 0.13, for INF the mean and median values are 0.19 and 0.14. While EXCH has the highest mean and median values of 119.70 and 120.58 respectively, while FDI has the lowest mean and median values of -0.18 and 0.07 respectively. The Median tells us the middle value for each of our variables. RGDP mirrors a normal skewness (0.93) and is platykurtic because the kurtosis value (2.8) is less than 3. INF has a long-right tail (positive skewness of 0.78) and platykurtic because the kurtosis value (2.13) is less than 3. Also, LABFRC has a long-right tail (positive skewness of 0.04) and platykurtic because the kurtosis value (2.85) is less than 3.

While LINT, EXCH, GRFCF, TOP, FDI and TGEX have positive skewness (of 0.59, 0.88, 0.28, 2.60, 2.80 and 0.02) but are leptokurtic because the kurtosis values (4.54, 4.05, 4.02, 11.02, 12.08 and 4.22) are greater than 3. Further, the Jarque-Bera statistics measures the difference between the skewness and kurtosis of the series with those from normal distribution. From the result in Table 1, it can be seen that RGDP, INF, LINT, EXCH, LABFRC, GRFCF and TGEX are normally distributed because their probability values of (0.10, 0.24, 0.10, 0.10, 0.55, 0.78 and 0.32 respectively) are greater than 0.05, while TOP and FDI are not normally distributed because their probability values of 0.00 is less than 0.05.

### Correlation Matrix

The study also conducted a correlation matrix which is a useful statistical analysis technique that provides insights into the relationships between multiple variables in a dataset. Some of the reasons for running a correlation matrix are that it helps to identify the strength and direction of relationships between variables; assists in variable selection by identifying highly correlated variables and provides valuable insights for decision-making and policy formulation. This is presented in Table 2.

**Table 2: Correlation Matrix of all Variables**

	<b>RGDP</b>	<b>INF</b>	<b>LINT</b>	<b>EXCH</b>	<b>LABFR C</b>	<b>GRFC F</b>	<b>TOP</b>	<b>FDI</b>	<b>TGEX</b>
<b>RGDP</b>	1	0.74	0.55	-0.44	0.07	0.47	0.15	0.20	-0.36
<b>INF</b>	-0.74	1	0.43	-0.35	-0.29	0.52	-0.1	-0.27	-0.15
<b>LINT</b>	-0.55	0.43	1	-0.33	-0.09	0.3	-0.07	-0.04	-0.16
<b>EXCH</b>	-0.44	-0.35	-0.33	1	0.39	0.04	0.15	0.08	-0.1
<b>LABFRC</b>	0.07	-0.29	-0.09	0.39	1	-0.24	-0.06	0.06	-0.27
<b>GRFCF</b>	0.47	0.52	0.3	0.04	-0.24	1	0.1	-0.25	-0.12



<b>TOP</b>	0.15	-0.1	-0.07	0.15	-0.06	0.1	1	0.043	0.08
<b>FDI</b>	0.20	-0.27	-0.04	0.08	0.05	-0.25	0.04	1	-0.06
<b>TGEX</b>	-0.36	-0.15	-0.16	-0.1	-0.27	-0.12	0.08	-0.06	1

Source: *Author's Computation (Eviews 10)*

From Table 2, RGDP and INF have a correlation of -0.74, and since it is close to 1, we say that RGDP and INF have a strong positive correlation. It means that when INF increases, RGDP decreases. Also RGDP and INT has a strong negative correlation with a coefficient, -0.55. It means that when INT increases, RGDP decreases, this conforms to our stated apriori expectation. Again, EXCH and TGEX have a weak negative correlation to RGDP with their coefficients as -0.43 and -0.43 respectively. While LABFRC, GRFCF, TOP and FDI has a weak positive correlation to RGDP given their coefficients as 0.07, 0.47, 0.15 and 0.20 respectively. Implying that when LABFRC, GRFCF, TOP and FDI increases, RGDP increases, again this agrees to both theoretical and our stated a priori expectations.

### Unit Root Test Results

The variables in the models were subjected to unit root tests to determine the stationarity of the variables. The test was carried out at levels and first differences of the chosen variables and was performed assuming intercept and trend in ADF and PP specifications. The null hypothesis states that each of the variables has unit root, that is, each is non-stationary whereas the alternative hypothesis states that each variable does not have unit root, that is, each variable is stationary. The unit root test result is contained in Table 3.

**Table 3: ADF and PP Unit Root Results**

Variable	ADF t-Statistic	Order of Integration	Variable	PP t-Statistics	Order of Integration
<b>RGDP</b>	-3.3355	I(1)	<b>RGDP</b>	-3.3355	I(1)
<b>INF</b>	-2.8125	I(1)	<b>INF</b>	-2.8125	I(1)
<b>LINT</b>	-2.7718	I(1)	<b>LINT</b>	-2.7718	I(1)
<b>EXCH</b>	2.7698	I(1)	<b>EXCH</b>	2.7698	I(1)
<b>LABFRC</b>	-4.0887	I(1)	<b>LABFRC</b>	-4.0887	I(1)
<b>GRFCF</b>	-5.3234	I(0)	<b>GRFCF</b>	-5.3234	I(0)
<b>TOP</b>	-6.5512	I(0)	<b>TOP</b>	-6.5512	I(0)
<b>FDI</b>	-3.0951	I(0)	<b>FDI</b>	-3.0951	I(0)
<b>TGEX</b>	-7.176	I(0)	<b>TGEX</b>	-7.176	I(0)

Source: *Author's Computation (Eviews 10)*

The decision rule states that for variable to be stationary at any level, the absolute value of the t-statistic must be higher than the absolute critical value at 5% level of significance. From the result in Table 3, unit root for both (ADF) and (PP) test shows that all the variables used for this study were stationary at level and first difference. RGDP, INF, INT, and LABFRC are all stationary at first difference, while GFCF, TOP, FDI and TGEX are stationary at level. Based on the mixed order of integration between I(0) and I(1) among our variables, this justifies adoption of ARDL techniques to investigate the effect of inflation on economic growth in Nigeria.

### Cointegration Test Results

Cointegration among time series variables suggests that series may behave in different way in the short run but that they will converge towards common equilibrium behaviour in the long run. The ARDL Bounds Test will be used to test for cointegration in the model. The cointegration test result is contained in Table 4.

**Table 4: ARDL Bounds Test Result for Cointegration**

Test Statistic	value	Significant Level	Bound Lower I(0)	Bound Upper I(1)
F-Statistic	15.40			
k	8	10%	1.95	3.06
		5%	2.22	3.39
		1%	2.79	4.1

Source: Author's Computation (Eviews 10)

The co-integration test was conducted to ascertain the long run relationship among the variables after the data have been ascertained to be free from unit root. Table 4 shows the results of the cointegration analysis. It can be seen that the calculated F-statistics value of 15.40 exceeds the lower bound critical value of 2.22 and upper bound critical value of 3.39 at the 5% level of significance. This means the null hypothesis of no co-integration among the variables is rejected at the 5% level, hence there exist cointegration (a long run relationship) between the variables, and this shows that inflation and economic growth (as well as other independent variables in the model) are bound by a long run relationship. Thus, the result is a sufficient condition for fitting ECM. The presence of a long run relationship between inflation and economic growth in Nigeria implies that if inflation is optimally managed, it can serve as policy tool for boosting growth in the long run.

### ARDL Long Run Estimates

The first objective was to investigate the existence of long run relationship between and economic growth in Nigeria using ARDL model. The result is presented in the Table 5.

The result of the long run coefficient in Table 5 shows a constant value of 16.42. This indicates a negative and significant relationship between the constant and economic growth (RGDP). The constant reflects the value of economic growth rate (RGDP) when all explanatory variables are held constant. From the ARDL result presented in appendix III, the coefficient of multiple determination R<sup>2</sup> is 0.95, meaning that 95% of the changes in economic growth is accounted for by the independent variables. The Prob (F-stat) value of (0.000002) shows that the overall relationship in the model is significant.

**Table 5: ARDL Long run Result**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-0.229151	0.121472	-1.886456	0.0001
LINT	-0.411825	0.001895	6.241743	0.0004
EXCH	-0.500429	0.000105	-4.078598	0.0011
LABFRC	0.214283	0.004249	3.361535	0.0047
GRFCF	0.322059	0.095292	3.306797	0.0045
TOP	0.300794	0.00056	1.417548	0.1782

FDI	0.207025	0.022969	-3.058431	0.0085
TGEX	-0.402894	0.011564	2.502594	0.0253
<b>EC = RGDP - (-0.2292*INF -0.4118*LINT -0.5004*EXCH + 0.2143*LABFRC +</b>				
<b>0.3221*GRFCF + 0.3008*TOP + 0.2070*FDI -0.4028*TGEX )</b>				

Source: *Author's Computation (Eviews 10)*

The ARDL regression result in Table 5 shows that inflation has a negative and significant effect on economic growth in Nigeria, given its coefficient s -0.23. This result conforms to the a priori expectation. The value of interest rate (-0.41) shows a negative and significant effect on economic growth in Nigeria and it agrees with our a priori expectation. The value of EXR shows a negative and significant effect on economic growth in Nigeria. This result conforms to the a priori expectation. LABFRC, GRFCF, TOP and FDI were found to have a positive and significant effect on economic growth in Nigeria. This conforms to both theoretical and our stated a priori expectations. TGEX was found to have a negative and insignificant effect on economic growth in Nigeria and it does not conform to our a priori expectation.#

### **Short Run ARDL Estimates**

The second objective was to investigate the existence of short run relationship between inflation and economic growth in Nigeria using ARDL model. The result is presented in the Table 6.

**Table 6: Short run Result**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.092735	0.007446	-12.45503	0.0000
INF	-0. 100033	0.121472	-1.886456	0.6238
LINT	-0. 211696	0.001895	6.241743	0.0000
EXCH	-0. 302351	0.000105	-4.078598	0.0000
LABFRC	0.214283	0.004249	3.361535	0.6247
GRFCF	0. 090022	0.095292	3.3797	0.0199
TOP	0. 201087	0.00056	1.417548	0.0000
FDI	0. 022143	0.022969	-3.058431	0.0001
TGEX	-0. 019169	0.011564	2.502594	0.0000
CointEq(-1)*	-0.902176	0.081106	-14.76058	0.0000

Source: *Author's Computation (Eviews 10)*

The error correction term CointEq(-1) in the model has the expected sign (i.e. negative) and significant at 5% probability level. The existence of long-run equilibrium among the time series in the inflation and economic growth equation is validated by this result. The slope coefficient of the error correction term in absolute terms (-0.90) represents the speed of adjustment and is consistent with the hypothesis of convergence towards the long-run equilibrium. The value indicates that it will take the speed of about one year and 1 month in the case of disequilibrium in the short-run to be corrected in the long-run if the right policy measures are put in place.

### **Threshold Regression**

The third objective was to establish inflation and output growth threshold for Nigeria using the Threshold Regression Analysis. The result is presented in the Table 7.

The optimal inflation threshold established for this study is set at 13% of inflation, this finding is in conformity with the work done by Sani & Abdullahi (2011). Above this level, inflation pressure could be detrimental to the economy. Inflation below 13% has a positive and significant effect on economic growth in Nigeria while inflation above 13% also has a negative but insignificant effect on economic growth in Nigeria.

**Table 7: Threshold Regression Result of Inflation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-2) < 0.1321052 -- 16 obs				
INF	0.111642	0.047477	1.14532	0.0003
0.1321052 <= INF(-2) -- 20 obs				
INF	-0.384061	0.053559	7.170816	0.3052
Non-Threshold Variables				
C	0.111675	0.014716	7.588772	0.0000

Source: Author's Computation (Eviews 10)

## Diagnostic Test Results

### Test for autocorrelation

The hypothesis to be tested includes:

H0: there is no autocorrelation

H1: there is autocorrelation

### Decision Rule:

Do not reject H0 if the p-value is greater than 0.05, otherwise reject H0 and conclude that

**Table 8: Breusch-Godfrey Serial Correlation Test Result**

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.094914	Prob. F(2,12)	0.2149
Obs*R-squared	0.963733	Prob. Chi-Square(2)	0.2201

there is autocorrelation. Table 8 contains the correlation test result.

Source: Author's Computation (Eviews 10)

From Table 8,  $0.2201 > 0.05$ , therefore, we accept the null hypothesis of no autocorrelation and conclude that there is no serial correlation amongst the variables. Also, the Durbin-Watson statistics also confirms the presence of no serial correlation, given its value as 1.81.

### Test for Normality

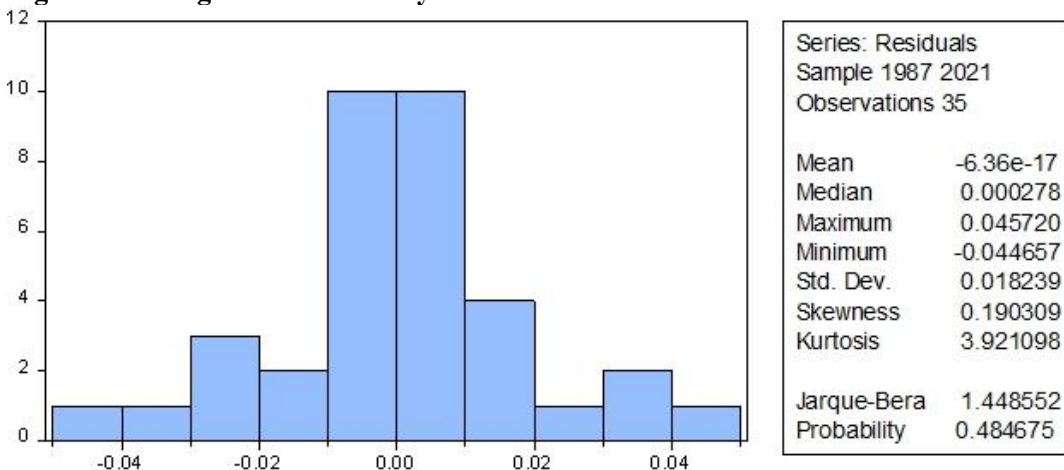
The classical normal linear regression model assumes that each error term is distributed normally. This study will make use of the Jarque-Bera normality test to find out if the estimated errors are normally distributed. The following hypothesis will be tested:

H<sub>0</sub>: The data follows a normal distribution

**Decision rule:**

Reject  $H_0$  if the histogram is not bell shaped and the p-value of the Jarque-Bera statistics is significant at 5% level of significance; otherwise we fail to reject  $H_0$ . Figure 2 represents the normality test result.

**Figure 2: Histogram of Normality Test Result**



From Figure 2, the histogram is bell shaped with a Jarque-Bera value of 1.45 and p-value of 0.49 which is greater than 0.05. Therefore, we accept the null hypothesis and conclude that the model follows a normal distribution.

**Test for Heteroskedasticity**

This test is basically focused on the variance of the error term. The test helps to ascertain whether the variance of the error is constant. The hypothesis to be tested include:  
 **$H_0$ :** There is no heteroskedasticity

**Decision Rule:**

Reject  $H_0$  if the p-value of the F-statistic is insignificant (meaning that the p-value is greater than 0.05), otherwise we fail to reject  $H_0$  and conclude that there is no heteroskedasticity in the model. Table 9 shows the heteroskedasticity test result.

From Table 9, the prob. Chi-square (0.2629) is greater than 0.05, therefore we accept the null hypothesis and conclude that our model is homoscedastic, meaning that the variance of the errors is constant across different values of the independent variables.

**Table 9: Breusch-Pagan-Godfrey heteroskedasticity test result**

Heteroskedasticity Test: ARCH			
F-statistic	1.225025	Prob. F(1,32)	0.2766
Obs*R-squared	0.953599	Prob. Chi-Square(1)	0.2629

Source: *Author's Computation (Eviews 10)*

From the ARDL results, this study shows that inflation has a negative and significant effect on economic growth in Nigeria in the long run, given the long run regression coefficients as -0.22. This means that the effect of inflation is significantly felt

by the Nigerian economy in the long run, as one-unit increase in inflation will bring about 22% decrease on economic growth in Nigeria. This is due to the fact that, high inflation rate reduces consumer purchasing power and lowers overall consumption, leading to decreased in demand, production, and higher unemployment, resulting from decrease in investments rate occasioned by increase in borrowing costs, thereby deterring the growth process in Nigeria. Furthermore, high inflation discourages foreign investment due to uncertainty and diminished returns, reducing foreign direct investment vital for growth.

More so, interest rate has a negative and statistically significant effect on economic growth in Nigeria both time period, based on its regression coefficients as 0.41, and 0.21 respectively. This implies that a unit increase in interest rate will bring about 41%, and 21% fall in output growth decrease in Nigeria both in the long and short run respectively. This is traceable to the fact that, higher interest rates increase borrowing costs for businesses and individuals, discouraging investment and reducing consumer spending. This can lead to a slowdown in economic activity, hindering growth. Higher lending rates can also strengthen the local currency, making exports more expensive for foreign buyers and potentially reducing export demand, which is vital for economic growth in Nigeria. Again, exchange rate has a negative and significant effect on economic growth in Nigeria both in the long and the short run, based on its regression coefficients as 50%, and 30% respectively. This shows that exchange rate is one of the most crucial macroeconomics variables that could significantly affect output growth in Nigeria.

Evidence from the regression coefficient shows that gross capital formation and foreign direct investment has positive and significant influence on economic growth in Nigeria, both in the long and in the short run, giving their coefficients as 0.32 and 0.10 and 0.21 and 0.02. This shows that both gross fixed capital formation and foreign direct investment are crucial variables that will enhance the output in the growth process of the Nigerian economy. Labor force shows a positive and significant effect of 21% on economic growth in Nigeria in the long run, while in the short run, it has a positive and insignificant effect on economic growth in Nigeria. Trade openness indicates a direct and insignificant effect on economic growth in Nigeria in the long run, while in the short run, it has a positive and significant effect of 20% on economic growth in Nigeria. Total government expenditure exacerbates a negative influence on economic growth in Nigeria, both in the long and in the short run, giving their coefficients as 40% and 2%. This portrays the true nature of the Nigerian government total spending which I've not been able to stimulate economic growth in Nigeria.

The optimal inflation rate threshold established for this study is set at 13% of total. Above this level, inflation could be detrimental to the economy. Inflation rate below 13% has a positive and significant effect on economic growth in Nigeria while inflation rate above 13% has a negative and insignificant effect on economic growth in Nigeria.

Findings from the ARDL result showed that inflation had a negative and significant effect on economic growth in Nigeria. This means that the effect of inflation is significantly felt by the Nigerian economy in the long run, as one-unit increase in inflation will bring about 22% decrease on economic growth in Nigeria. This is due to the fact that, high inflation rate reduces consumer purchasing power and lowers overall consumption, leading to decrease in demand, production, and higher unemployment, resulting from decrease in investments rate occasioned by increase in borrowing costs thereby deterring the growth process in Nigeria. Furthermore, high inflation discourages foreign investment due to uncertainty and diminished returns, reducing foreign direct investment vital for growth.

The optimal total inflation threshold established for this study was set at 13%. This implies that above this level, inflation could be detrimental to the economy. From the result, inflation rate below 13% showed to have a positive and significant effect on economic growth in Nigeria while inflation rate above 13% could showcase a negative and significant effect on economic growth in Nigeria. Our findings equally revealed that interest rate has a negative and significant effect on economic growth in Nigeria both in the long and the short run the long run alone. This is traceable to the fact that, higher interest rates increase borrowing costs for businesses and individuals, discouraging investment and reducing consumer spending. This can lead to a slowdown in economic activity, hindering growth. Higher lending rates can also strengthen the local currency, making exports more expensive for foreign buyers and potentially reducing export demand, which is vital for economic growth in Nigeria.

The ARDL result also showed that gross fixed capital formation has a positive and significant effect on economic growth in Nigeria. Gross fixed capital formation which represents the net increase in physical assets such as machinery, buildings, and infrastructure within an economy, can positively influences economic growth in Nigeria. This portends that, relevant authorities should prioritize efficient resource allocation, enhance access to financing, address infrastructure gaps, and maintain a stable business environment conducive to investment. This strategic approach can optimize the positive impact of GFCF on Nigeria's economic growth trajectory.

Based on the threshold regression analysis conducted, the optimal inflation threshold established for this study was set at 13%. What it implies is that above this level, inflation could be detrimental to the economy, while inflation rate below 13% could be growth enhancing. Hence, it is pertinent for the relevant authorities to formulate and implement viable fiscal, monetary and exchange rate policies aimed at curbing and managing inflation to a level below 13%, thus ensuring price stability, since such measures have the potentials to encourage investment, enhance the efficiency of supply chains, Foster trade through increase in productivity and ultimately stimulate economic growth in Nigeria.

Given the negative sign of inflation and economic growth coefficient, the implication is that, high inflation rate reduces consumer purchasing power and lowers overall consumption, leading to decreased in demand, production, and higher unemployment, resulting from decrease in investments rate occasioned by increase in borrowing costs, thereby deterring the growth process in Nigeria. Furthermore, high inflation discourages foreign investment due to uncertainty and diminished returns, reducing foreign direct investment vital for growth.

Given the negative sign of interest rate and economic growth coefficient, the implication is that, higher interest rates increase borrowing costs for businesses and individuals, discouraging investment and reducing consumer spending. This can lead to a slowdown in economic activity, hindering growth. Higher lending rates can also strengthen the local currency, making exports more expensive for foreign buyers and potentially reducing export demand, which is vital for economic growth in Nigeria. Furthermore, Exchange rate fluctuations can have negative implications on various fronts, including increased uncertainty for businesses in international trade, potential profit and loss volatility, and challenges for economic planning due to unpredictable currency values. Additionally, it can lead to higher costs for importing goods, contributing to inflationary pressures in a country.

Gross fixed capital formation, representing investments in physical assets like infrastructure and machinery, positively influences economic growth by enhancing productivity, fostering innovation, and improving overall economic efficiency. This increased capital formation contributes to long-term growth, job creation, and a more robust economic foundation. Foreign direct investment (FDI) has positive implications for economic growth as it brings in capital, technology, and managerial expertise. This can stimulate job creation, enhance productivity, and facilitate the transfer of skills and knowledge. FDI also often leads to the development of infrastructure and contributes to the overall economic development of the host country.

## **5. Conclusion and Recommendations**

This study has revealed the existence of a long run association between inflation and economic growth in Nigeria. It has also revealed the existence of a negative and significant relationship between inflation and output growth in Nigeria with an estimated threshold inflation level of 13 per cent for Nigeria. Below the threshold level, inflation has a positive effect on economic activities and could act as an incentive for production, while inflation rate above 13% has a negative and insignificant effect on economic growth in Nigeria. Furthermore, this work has contributed significantly to the existing body of knowledge through its findings as it helps to advance the frontiers of knowledge. However, the major limitation to the smooth conduct of this study was the issue of lack of sufficient data for some macroeconomic variables that would have had obvious effects on economic growth in Nigeria.

Based on the findings of this study, this policy recommended actions are necessary.

**Inflation Management:** Both monetary and fiscal authorities such as central bank and federal ministry of finance should formulate and implement fiscal, monetary, and exchange rate policies to keep inflation below the 13% threshold.

The central bank should utilize tools such as interest rate adjustments, open market operations, cash reserve ratio, credit control, moral suasion, liquidity management and coordination with government policies to manage inflation effectively. Maintaining inflation below the threshold can act as an incentive for production and economic activities, thereby stimulating growth. Stable inflation can foster a conducive environment for both domestic and foreign investments.

**Exchange Rate Management:** The central bank should adopt a balanced exchange rate policy to ensure currency stability and competitiveness. Manage currency levels actively to prevent excessive appreciation. Also implement selective capital controls if necessary to stabilize the economy.

**Taxation Policies:** The implementation of a progressive tax system can play a crucial role in managing inflation and increasing productivity. By taxing higher incomes at higher rates, the government can reduce income inequality and manage consumer demand, thereby curbing demand-pull inflation. Additionally, offering tax incentives and breaks for businesses, particularly in critical sectors such as manufacturing and agriculture, can stimulate investment and production. These incentives can encourage businesses to expand operations, innovate, and increase output, contributing to overall economic productivity.

**Government Spending:** Strategic allocation of government funds is vital for controlling inflation and enhancing productivity. Investing in critical infrastructure projects, such as the construction and maintenance of roads, bridges, ports, and energy facilities, can



significantly improve the efficiency of transportation and logistics, reducing production costs for businesses, promoting productivity and increasing output growth in Nigeria.

**Subsidies and Support Programs:** Targeted subsidies and support programs can help stabilize prices and boost productivity in key sectors. Providing agricultural subsidies, for instance, can enhance food production and ensure a stable supply of essential commodities, helping to control food prices and reduce inflation. Similarly, financial assistance in the form of grants, low-interest loans, and other support for small and medium-sized enterprises (SMEs) can strengthen these businesses, enabling them to increase their output and contribute more significantly to the economy. These measures help create a more robust and resilient economic foundation.

## References

- Ahmed, S. and Mortaza, G. (2005). Inflation and Economic Growth in Bangladesh: 1981-2005. Bangladesh Bank Working Paper Series – WP 0604.
- Barro, R. J. (1996). Inflation and Growth. Federal Reserve Bank of St. Louis Review, May/June.
- Billi, R. M. and Khan, G. A. (2008). What Is The Optimal Inflation Rate. *Federal Reserve Bank of Kansas City Economic Review*, Second Quarter.
- Bruno, M. and Easterly, W. (1998). Inflation Crises and Long-run Growth. *Journal of Monetary Economics*, 41: 3 – 26.
- Chimobi, O. P. (2010). Inflation and Economic Growth in Nigeria. *Journal of Sustainable Development*, 3(2): 34-37.
- Dornbusch, R., Fischer, S. and Kearney, C. (1996). Macroeconomics. The McGraw-Hill Companies, Inc., Sydney.
- Easterly, W. (1996). When is Stabilization Expansionary. *Economic Policy*, 65- 108.
- Fabayo, J. A. and Ajilore, O. T. (2006). Inflation – How Much is Too Much for Economic Growth in Nigeria”, *Indian Economic Review*, 41:129-148.
- Fischer, S. (1993). The Role of Macroeconomic Factors in Growth. *Journal of Monetary Economics*, 32: 485 – 512.
- Frimpong, J. M. and Oteng-Abayie, E. F. (2010). When is Inflation Harmful? Estimating the Threshold Effect for Ghana. *American Journal of Economics and Business Administration*, 2 (3): 232-239.
- Ghosh, A. and Phillips, S. (1998). Warning: Inflation May be Harmful to Your Growth. *IMF Staff Papers*, 45(4): 24-27.
- Hussain, M. (2005). Inflation and Growth: Estimation of Threshold Point for Pakistan. Economic Policy Department, State Bank of Pakistan.
- Khan, M. S. and Senhadji, A. S. (2001). Threshold Effects in the Relationship between Inflation and Growth. *IMF Staff Papers*, 48(1), 2001.
- Kremer S., Bick A. and Nautz D. (2009). Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis. SFB 649 Discussion Paper.
- Mallik, G. and Chowdhury A. (2001). Inflation and Economic Growth: Evidence from Four Asian Countries. *Asia-Pacific Development Journal*, 8 (1), June 2001.
- Masha, I. (2000). New Perspectives on Inflation in Nigeria. *CBN Economic and Financial Review*, 38(2), June.
- Mordi, C. N. O., Essien, E. A., Adenuga, A. O., Omanukwue, P. N., Ononugbo, M. C., Oguntade, A. A., Abeng, M. O. and Ajao, O. M. (2007). The Dynamics of Inflation in Nigeria, *CBN Occasional Paper* 32, August.
- Mubarik, Y. A. (2005). Inflation and Growth: An Estimate of the Threshold Level of Inflation in Pakistan, *State Bank of Pakistan Research Bulletin*, 1 (1).

- odge, D. (2005). Inflation and Growth in South Africa. *Cambridge Journal of Economics*, 30:163-168.
- Sala-i-Martin, X. (1997). I Just Ran Two Million Regressions. *The American Economic Review*, 87 (2):178-183.
- Sarel, M. (1996). Non-Linear Effects of Inflation on Economic Growth. *IMF Staff Papers, International Monetary Fund*, 43:199-215.
- Sidrauski, M. (1967). Inflation and Economic Growth. *Journal of Political Economy*.
- Singh, K. Kaliappa, K. (2003). The Inflation-Growth Nexus in India: An Empirical Analysis. *Journal of Policy Modelling*, 377-396.
- Tobin, J. (1965). Money and Economic Growth. *Econometrica*, 33: 671-684.