The Appropriate Threshold Level of Inflation for Economic Growth in Nigeria: Evidence from Error Correction Model (ECM)

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Abstract

The study investigated the appropriate threshold level of inflation for economic growth in Nigeria: Evidence from error correction model (ECM) using annual time series data from 1980 to 2016. The result of the ECM revealed that out of the five explanatory variables used in the model, only three are statistically significant which are inflation rate, squared inflation rate and growth rate of gross capital formation but squared inflation rate has a negative significant effect on growth rate of gross domestic product while both inflation rate and gross capital formation has a positive significant effect on growth rate of gross domestic product and they can only explained about 51.8% of the total variations in the behaviour of growth rate of gross domestic product in Nigeria and there is no autocorrelation or serial correlation in the model. Also, the threshold result established that the maximum level of inflation which supports economic growth in Nigeria was 13.13% that is, the maximum tolerable cost of inflation to growth and below this level, inflation is likely to have mild effect on economic growth while above it inflation would significantly hurt economic growth in Nigeria. Furthermore, it was recommended that Nigeria should maintain a relatively low and stable inflation rate if the goal of attaining steady and rapid economic growth is to be achieved.

Keywords: *inflation rate, GDP & ECM.*

JEL Classification: *E31; E59; P44*

Introduction

The word inflation rings bell in the market economics of the world. It is a problem that threatens all economics because of its undesirable effects. Inflation is a household word in many market oriented economics (Chude and Chude, 2015). Inflation is defined as a generalised increase in the level of price sustained over a long period in an economy, that is, a persistent rise in the price levels of commodities and services, leading to a fall in the currency's purchasing power (Osuala *et al*, 2013). According to Hossain *et al.,* (2012) while high inflation is bad for an economy because of its adverse effect on economic performance, zero inflation is equally harmful because it will lead to eventual stagnation of the economy since its presence at a mild level is needed for economic growth. The problem of inflation is not confined to national boundaries neither is it restricted to emerging market economies of the world; it is also an over-

arching challenge in the developed market economies, and since it is by no means a new challenge or phenomenon, over the years, its control has become the unquestioned mantra of economic policymakers worldwide.

Nigeria as a nation is by no means immune to the menace of inflation. Increase in price level has always been compelling problem to both policy makers and the entire Nigerian citizenry. There is perhaps more debate on the question of prices than any other issue these days. This is not surprising since depending on which side of transaction an individual is on he finds his welfare adversely or beneficially affected by a movement in one or more prices. The fact that price level leads to a fall in the standard of living, unpredictability of government policy actions and of macroeconomic relationships is no more an issue of dispute. The consequence of inflation can easily be inferred. Given constant set of prices today, a situation of relatively much more chasing the same bundle of goods and services tomorrow with constant real wage income simply implies adjustment in consumption patterns. The same bundle of goods and services consumed today cannot therefore be consumed tomorrow. Hence a decrease in consumption capacity and standard of living is imminent (Babalola *et al.,* 2015).

However, there has been substantial debate on whether inflation promotes or harms economic growth and exploring this question will enable policy maker to formulate policy that will help the economic. It has been observed from the literature that studies regarding threshold effect are mostly conducted outside the countries (Kasidi and Mwakanemela, 2015; Lee and Wong, 2005; Ndoricimpa, 2017; Tung and Thanh, 2015 & Yabu and Kessy, 2015) and few studies are conducted in Nigeria (Doguwa, 2015 & Bawa and Abdullahi, 2012). Although these studies have been playing a vital role in the threshold effect of inflation on economic growth but the findings of the studies are not applicable to other countries of the world due to the difference in cultures, customs and legal atmosphere. The studies related to threshold effect of inflation on economic growth are very few in Nigeria. Based on the past studies in this area, this study identified some gaps in the literatures in terms of theory, methodology and empirical finding. On the theoretical, they past studies utilized classical growth theory and neoclassical growth theory while this study will employ monetarist theory to make it different from the previous study in this area. Also, the common method used in the past works are correlation analysis, dynamic panel data analysis, ordinary least square (OLS), two-stages least squares (2-SLS), generalized method of moments (GMM), Granger causality and autoregressive distributed lag (ARDL). Therefore, this paper will be different by using error correction model (ECM) which has not been used before.

Literature Review

The effect of inflation rate on economic growth is quite extensive outside the country and within the country with mixed in terms of the direction of influence. For example, Ndoricimpa, (2017) examined nonlinearities in the inflation-growth nexus in Africa. A dynamic panel threshold regression is applied to account for the potential endogeneity bias in the model. The findings of the study confirmed the existence of nonlinearities in the inflation-growth nexus. An inflation threshold of 6.7% is estimated for the whole sample, 9% for the sub-sample of low-income countries and 6.5% for middle-income countries. The findings suggested that low inflation is growth-enhancing for the sub-sample of middle-income countries but neither affects economic growth for the whole sample nor for the sub-sample of low-income countries. However, inflation above the threshold is detrimental to economic growth for all the cases considered.

Furthermore, Yabu and Kessy, (2015) empirically estimated threshold level of inflation, which is conducive for economic growth in the three founding EAC countries, Kenya, Tanzania and Uganda using panel data set for the period1970 to 2013. The non-linear quadratic model was used to estimate the threshold level or the turning point beyond which inflation exerts a negative

impact on economic growth. To examine the inflation-growth relationship other moderating variables were included in the model. It was found that credit to GDP ratio, degree of openness of the economy and foreign direct investment flows to EAC member states have significant and positive impact on growth. In determining threshold level of inflation for the three EAC member states, regression results of the random effect model establish that the *average* rate of inflation beyond 8.46% has negative and significant impact on economic growth. For individual countries, findings from the Seemingly Unrelated Regression (SUR), which treats each country separately, indicate that the optimal levels of inflation for Kenya, Tanzania and Uganda are 6.77%, 8.80% and 8.41%, respectively, beyond which inflation starts exerting cost on economic growth. Likewise, Aydın *et al.*, (2016) investigated the influence of inflation on economic growth for five Turkish Republics (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan) that are in the transition period through dynamic panel data analysis based on threshold. Study results indicated that there was a nonlinear relationship between inflation and growth rate; the threshold for the influence of inflation on economic growth is 7.97%, and an inflation rate above this threshold has a negative influence on economic growth while an inflation rate below this threshold has a positive influence on economic growth.

Moreover, Lee and Wong, (2005) employed a threshold regression model to investigate the existence of inflation threshold effects in the relationship between financial development and economic growth for Taiwan and Japan. Results indicated that there was one inflation threshold value in Taiwan, whereas there are two in Japan. In addition, the threshold level of inflation below which financial development significantly promotes growth was estimated at 7.25% for Taiwan and 9.66% for Japan. Also, Hasanov, (2011) examined possibility of threshold effect of inflation on economic growth over the period of 2000 - 2009. Estimated threshold model indicated that there was a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth is 13%. Below threshold level inflation has statistically significant positive effect on GDP growth, but this positive relationship becomes negative one when inflation exceeds 13%.

Furthermore, Tung and Thanh, (2015) determined a threshold level in the relationship between inflation and economic growth in Vietnam. The study was considered as one of the first empirical studies on inflation threshold in Vietnam – a country in transition from a communist centrally-planned to a market economy. The research applied three regression methods including Ordinary Least Squares (OLS), Two-Stages Least Squares (2-SLS) and Generalized Method of Moments (GMM) with annual data for the period of 1986 - 2013. The results consistently concluded that the inflation threshold is about 7%, which means inflation will be detrimental to economic growth if inflation rate exceeds 7%. Also, Danladi, (2013) explored the issue of the existence of threshold effect in the present relationship between inflation and economic growth in the context of West African economies. The study covers four countries in the West African region: Burkina Faso, Ghana, Nigeria and Senegal for the period 1980 – 2009. Findings from the empirical results strongly suggested the existence of a threshold level of 9% beyond which inflation exerts a negative effect on growth. In the same manner, Frimpong and Oteng-Abayie (2010) attempted to find out whether inflation is harmful or not; and if it is at what level does it become harmful to economic growth in Ghana. They adopted a threshold regression model designed to estimate the inflation thresholds instead of imposing them, using annual data on CPI and GDP covering 1960 - 2008. They found evidence of threshold effect of inflation on economic growth, which was estimated at 11%. Below this level, inflation is likely to have mild effect on economic growth, while above it inflation would significantly hurt economic growth.

Based on the evidence in Nigeria, Doguwa, (2015) examined the issue of the existence and the level of inflation threshold in the relationship between inflation and growth in Nigeria, using three different approaches that provide appropriate procedures for estimating the threshold level and inference. While Sarel's (1996) approach provides a threshold point estimate of 9.9% that

was not well identified by the data, the technique of Khan and Senhadji (2001) identifies a 10.5% inflation threshold as statistically significant to explain the inflation-growth nexus in Nigeria. Also, the approach of Drukker et al (2005) suggests a two threshold point model with 11.2% and 12.0% as the appropriate inflation threshold points. These results suggested that the threshold level of inflation above which inflation is inimical to growth is estimated at 10.5 to 12% for Nigeria.

Bawa and Abdullahi, (2012) utilized a quarterly time series data for the period 1981 – 2009 to estimate a threshold level of inflation for Nigeria. Using a threshold regression model developed by Khan and Senhadji (2001), the study estimated a threshold inflation level of 13 per cent for Nigeria. Below the threshold level, inflation has a mild effect on economic activities, while above it, the magnitude of the negative effect of inflation on growth was high. The negative and significant relationship between inflation and economic growth for inflation rates both below and above the threshold level is robust with respect to changes in econometric methodology, additional explanatory variables and changes in data frequency. These finding are essential for monetary policy formulation as it provide a guide for the policy makers to choose an optimal target for inflation, which is consistent with long-term sustainable economic growth goals of the country.

Lastly, Sani *et al*., (2013) utilized a quarterly time series data for the period 1981 – 2009 to estimate a threshold level of inflation for Nigeria. Using a threshold regression model developed by Khan and Senhadji (2001), the study estimated a threshold inflation level of 13% for Nigeria. Below the threshold level, inflation has a mild effect on economic activities, while above it, the magnitude of the negative effect of inflation on growth was high. The negative and significant relationship between inflation and economic growth for inflation rates both below and above the threshold level is robust with respect to changes in econometric methodology, additional explanatory variables and changes in data frequency. These finding are essential for monetary policy formulation as it provide a guide for the policy makers to choose an optimal target for inflation, which is consistent with long-term sustainable economic growth goals of the country.

Theoretical Framework and Methodology

Theoretical Framework

The theoretical framework for this study was based on monetarist theory of inflation which argued that if the money supply rises faster than the rate of growth of national income then there will be inflation. If money supply increases in line with inflation then there will be no inflation. Quantity theory of Money are given by

$$MV = PY \tag{1}$$

where M is money supply, V is velocity of circulation, P is price level and Y is total transactions or national income. However unwarranted increases in the money supply which cause inflation. Monetarists believe that in the short term velocity (V) is fixed. This is because the rate at which money circulates is determined by institutional factors e.g. how often workers are paid does not change very much. Also, they believe output Y is fixed. They state that may vary in the short-run but not in the long-run (because LRAS is inelastic). Therefore an increase in the money supply will lead to an increase in inflation.

Methodology

Model Specification and Estimation Techniques and Data Requirement and Source

The study adopts the monetarist theory of inflation to build a sample model.

$$MV = PY \tag{2}$$

Since velocity (V) is fixed, it is like a constant which will be equal to one (1).

$$M = PY \qquad (3)$$

Making Y the subject of formula from equation (4.3)

$$Y = M/P \qquad (4)$$

If equation (4) is express in logarithm form this yields.

$$gy = gm - \Psi \qquad (5)$$

g_y is growth rate of output, g_m is the growth rate of money and Ψ is the inflation rate. It has been established in the literature by numerous threshold model authors such as Sarel (1996), Khan and Senhadji (2001), Li (2005), Drukker *et al.* (2005) and Mohanty *et al.* (2011) that inflation exhibits a non-linear relationship with economic growth. It is generally accepted that inflation has a negative effect on growth once it crosses the threshold level, while below the threshold level it is generally expected to have a positive impact on growth. Also, this study will include growth rate of investment and degree of openness. Hence, the linear regression model was specified as follows:

$$GRGDP = \beta_0 + \sum_{K=1}^{n} \beta_1 GRM2_{K-1} + \sum_{K=1}^{n} \beta_2 INF_{K-1} + \sum_{K=1}^{n} \beta_3 INF_{k-1}^2 + \sum_{K=1}^{n} \beta_4 GRGCF_{K-1}$$
$$+ \sum_{K=1}^{n} \beta_5 TOPEN + e \qquad (6)$$

Therefore, the coefficients in the models $\beta_1 - \beta_5$ define elasticity's of the variables. Where *GRGDP = Growth Rate of Gross Domestic Product, GRM_2 = Growth Rate of Broad Money Supply, INF = Inflation Rate using Consumer Price Index, INF^2 = Squared Inflation Rate for the threshold effect, GRGCF = Growth of Investment using Growth Rate of Gross Capital Formation and TOPEN = Trade Openness (Export plus Import/GDP).*

Therefore, the error correction model (ECM) regression model was specified as:

$$GRGDP = \beta_0 + \sum_{K=1}^{n} \beta_1 GRM2_{K-1} + \sum_{K=1}^{n} \beta_2 INF_{K-1} + \sum_{K=1}^{n} \beta_3 INF_{k-1}^2 + \sum_{K=1}^{n} \beta_4 GRGCF_{K-1}$$
$$+ \sum_{K=1}^{n} \beta_5 TOPEN_{K-1} + \lambda ECM_{K-1} + e \qquad (7)$$

The error correction model tells us the degree to which the equilibrium behavior drives short-run dynamics. Equilibrium relationship in turn have implications for a short- run behavior, one or more series move to restore equilibrium. Theoretically, ECM should range between -1 and 0 with which you can interpret it as a percentage return to equilibrium of your variables or how much percentage is disequilibrium corrected.

The a priori expectation for this study was based on the monetarist theory of inflation and the work of Yabu and Kessy, (2015) & Doguwa, (2015).

$$\frac{dGRGDP}{dGRM2} > 0 \quad \frac{dGRGDP}{dINF} < 0 \quad \frac{dGRGDP}{dINF2} > 0 \quad \frac{dGRGDP}{dGRGCF} > 0 \quad \frac{dGRGDP}{dTOPEN} > 0$$

From equation (7), the squared term of inflation, INF^2, will be generated to find out the turning point, from which the threshold level of inflation can be obtained. Therefore, combination of linear and squared term, propose that the impact of inflation on economic growth can be

described as an inverted U-shaped curve, and supports the view that the positive effects of inflation switches to negative when inflation exceeds some threshold level. The peak of the quadratic function identifies the inflation threshold level or the turning point above which the marginal effect of inflation becomes negative. The non-linearity effect of inflation on growth is assessed basing on the significance of the coefficients of linear and non-linear estimated terms of inflation in equation (7). If both coefficients are significantly different from zero, we can find out the peak of the quadratic function that identifies the critical point of inflation above which the marginal impact of inflation on growth is negative. To calculate the critical point corresponding to the inflation threshold level, the partial derivative of equation (7) is computed with respect to inflation, *INF*. The derivative yields the following equation that is set equal to zero:

$$\frac{dGRGDP}{dINF} = \beta_2 + 2\beta_3 INF \qquad (8)$$

Solving equation (8) for the critical point of inflation *INF* * beyond which the marginal impact of inflation on economic growth becomes negative gives the following equation:

$$INF^* = -\frac{\beta_2}{2\beta_3} = 0 \qquad (9)$$

Also, the study makes use of annual time series data ranging from 1980 to 2016. The data was sourced from Central Bank of Nigeria Statistical Bulletin (CBN, 2016) and World Development Indicator (WDI, 2017).

Empirical Analysis and Discussions

Descriptive Statistics

Table 1 below gives a summary of descriptive statistics of series for the model. The reported statistics include the mean with their corresponding maximum, minimum and standard deviation. The distributional properties are also examined through their skewness and kurtosis, while the Jarque-Bera test statistic is used to test for normality in the distribution.

Table 1. Descriptive Analysis

	GRGDP	INF	INF^2	GRM_2	GRGCF	TOPEN
Mean	3.814	19.235	669.560	7.599	22.820	50.651
Median	4.411	11.578	134.049	7.599	22.213	52.794
Maximum	33.736	72.836	5305.010	7.608	25.221	81.813
Minimum	-13.128	5.382	28.968	7.591	21.427	21.447
Std. Dev.	7.466	17.548	1224.420	0.005	1.264	16.310
Skewness	1.150	1.715	2.312	-0.039	0.765	-0.159
Kurtosis	8.938	4.689	7.596	1.767	2.158	2.088
Jarque-Bera	62.524	22.535	65.548	2.354	4.705	1.441
Probability	0.000*	0.000*	0.000*	0.308	0.095***	0.486
Sum	141.107	711.678	24773.73	281.194	844.356	1874.080
Sum Sq. Dev.	2006.593	11084.95	53971372	0.001	57.556	9576.629
Observations	37	37	37	37	37	37

Source: Author's Computation from E-view 9
*Note: *, ** and *** imply 1%, 5% and 10% rejection of null hypothesis for normality using JB statistics*

As shown in the tables all the series exhibit positive average values. Consequently, squared of inflation has the highest yearly mean value of 669.560 while the growth rate of gross domestic product has the lowest yearly mean value of 3.814. Given the standard deviation values of the six series under consideration, the squared of inflation seems to be more volatile while the

money supply appears to be least volatile. This finding is however, in agreement with the statistical properties of the series. With respect to the statistical distribution of the variables, all the series are positively skewed except the money supply and the trade openness which exhibit negative skewness. Three of the series are leptokurtic (> 3) while others are playkurtic (< 3).

Correlation Analysis Result

The degree and direction of association among the variables are shown in Table 2.

Table 2. Correlation Analysis

	GRGDP	INF	INF^2	GRM_2	GRGCF	TOPEN
GRGDP	1.000					
INF	-0.097	1.000				
INF^2	-0.093	0.976	1.000			
GRM_2	0.451	-0.275	-0.242	1.000		
GRGCF	0.133	-0.447	-0.436	0.638	1.000	
TOPEN	0.174	0.064	0.062	0.144	-0.334	1.000

Source: Author's Computation from E-view 9

From Table 2 above, some of the variables signs tend to conform with a priori expectation while others do not conform. Also, growth of money supply, growth of gross capital formation and trade openness have positive correlation with growth of GDP while inflation rate and squared inflation are inversely associated with growth of GDP. No serious problem of multicollinearity exists, as the Pairwise correlation coefficient for any of the variables does not exceed 0.80 (Gujarati, 2003).

Unit Root Test

The study tests for unit roots on growth rate of gross domestic product, inflation, squared inflation, money supply, gross capital formation, gross capital formation and trade openness. In other to test for unit root of the variables, Philip-Peron test was employed. The study makes use of unit root in order of guarantee that our inference regarding the important issue of stationarity is unlikely driven by the choice of testing procedures used. However, the results of the stationarity tests of variables at level and first difference are presented in Table 3 below.

Table 3. Unit Root Test Using Phillips-Perron (PP) in Nigeria: 1980 - 2016

Variables	Order	T-statistics	Probability Value	Remark
D(GRGDP)	Level	-2.948	0.001	I(1)
	First difference	-2.951	0.000***	
D(INF)	Level	-2.948	0.070	I(1)
	First difference	-2.951	0.000***	
D(INF^2)	Level	-2.948	0.046	I(1)
	First difference	-2.951	0.000***	
D(GRM_2)	Level	-2.948	0.379	I(1)
	First difference	-2.951	0.999***	
D(GRGCF)	Level	-2.948	0.941	I(1)
	First difference	-2.951	0.000***	
D(TOPEN)	Level	-2.948	0.202	I(1)
	First difference	-2.951	0.000***	

Source: Authors computation from E-View 9
Note: *, ** and *** imply 1%, 5% and 10% level of significant

The unit root tests applied to the variables at levels reject the null hypothesis of stationarity of all the variables used. The variables are therefore differenced once in order to perform stationarity tests on difference variables. After differencing the variables once, all the variables were confirmed to be stationary. The PP test applied to the first difference of the data series accept the null hypothesis of stationarity for all the variables used. It is, therefore, worth

concluding that the variables are integrated of order one. Therefore, the variables will be co-integrated in order to ascertain the existence of long-run relationship of the variables.

Co-integration Tests

The null hypothesis of no co-integrating vector can be rejected for all the variables used in the study and the empirical findings reinforce the conclusions about the presence of long-run relationship between growth rate of gross domestic product, inflation rate, squared inflation rate, growth rate of money supply, growth rate of gross capital formation and trade openness. However, the results of the co-integration test of variables are presented in Table 4.

Table 4. Unrestricted Co-integration Rank Test (Trace)

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.794	149.549	95.754	0.000
At most 1 *	0.636	94.312	69.819	0.000
At most 2 *	0.563	58.966	47.856	0.003
At most 3 *	0.351	30.003	29.797	0.047
At most 4	0.225	14.879	15.495	0.062
At most 5 *	0.157	5.972	3.841	0.015
Trace test indicates 4 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors computation from E-View 9

Empirical results from Table 4 show that both the trace tests on statistics has values greater than the critical values at 5% level of significance. Therefore, the null hypotheses of no co-integrating vectors ($r = 0$; $r \leq 1$) against the specific alternatives are clearly rejected. Trace test at most four co-integrating equation. According to trace value the study can state that there were long-run relations among the six variables.

Effect of Inflation Rate on Economic Growth in Nigeria

In order to know the effect of inflation rate on economic growth in Nigeria, error correction model (ECM) estimation was carried out and it is presented in Table 5.

Table 5. Effect of Inflation Rate on Economic Growth in Nigeria

Dependent variable is growth rate of gross domestic product D(GRGDP)	
Variable	Coefficient
D(INF)	0.105 (0.005)*
D(INF^2)	-0.004 (0.007)*
D(GRM$_2$)	-0.0003 (0.484)
D(TOPEN)	-0.024 (0.716)
D(GRGCF)	2.069 (0.052)**
C	-20.029 (0.672)
ECM	-0.1666 (0.000)*
R-squared	0.609
Adjusted R-squared	0.518
Durbin-Watson stat	1.852
F-statistic	22.603 (0.007)*

Source: Authors computation from E-View 9
Note: *, ** and *** imply 1%, 5% and 10% level of significant

The result affirmed that five explanatory variables, only three are statistically significant which are inflation rate, squared inflation rate and growth rate of gross capital formation but squared

inflation rate has a negative significant effect on growth rate of gross domestic product while both inflation rate and gross capital formation has a positive significant effect on growth rate of gross domestic product. Therefore, a percentage increase in inflation rate will lead to an increase of about 0.105% in growth rate of gross domestic product in Nigeria. This is an indication that lower inflation rate encourage growth in Nigeria. Therefore, for a better grow of gross domestic product, inflation rate must be lower. In the same vein, squared inflation rate also, worsen the growth of gross domestic product by 0.004% indicating that inflation rate start increasing, this will deteriorate growth rate of gross domestic product in Nigeria. In the same manner, gross capital formation exert a positive significant effect on growth of gross domestic product in Nigeria. A percentage increase in gross capital formation will bring about 2.069% increase in gross domestic product in Nigeria. The more private investment, the more will be the economic growth in Nigeria.

The R-square shows that about 60.9% of the variations in the behaviour of growth rate of gross domestic product are explained by the explanatory variables. The Adjusted R-square shows that about 51.8% of the total variations in the behaviour of growth rate of gross domestic product are explained by the explanatory variables. Furthermore, the Durbin-Watson statistics of 1.852 shows that there exist no autocorrelation or serial correlation in the data for the model while the F-statistics implies of 22.603 with a probability value of 0.007 implies that the overall model is statistically significant at 1% level of significant.

The result shows an ECM value of -0.1666 which is otherwise referred to as the speed of adjustment. The speed of adjustment is significant at 1% percent level considering its standard error. Approximately 16.66% of disequilibrium from the previous year's shock converges back to the long-run equilibrium in the current year. Also, the ECM is correctly signed and statistically significant with the speed of convergence to equilibrium at 16.66% percent. That is 16.66% of the short-run inconsistencies are being corrected and incorporated into the long-run relationship.

Threshold Effect of Inflation Rate on Economic Growth in Nigeria

To calculate the critical point corresponding to the inflation threshold level, the partial derivative of growth rate of gross domestic product with respect to inflation will give.

$$\frac{dGRGDP}{dINF} = 0.105 + 2(-0.004)INF \tag{10}$$

The threshold level of inflation rate will be

$$INF^* = -\frac{0.105}{2(0.004)} = 13.13 \tag{11}$$

The result above establish that the maximum level of inflation which supports economic growth in Nigeria is 13.13% that is, the rate of inflation beyond the threshold of 13.13% percent in Nigeria has negative and significant impact on economic growth. This is the maximum tolerable cost of inflation to growth. Below this level, inflation is likely to have mild effect on economic growth, while above it inflation would significantly hurt economic growth. The finding of this research work is in line with the finding of Sani *et al* (2013) who used a quarterly time series data for the period 1981 – 2009 to estimate a threshold level of inflation for Nigeria by using a threshold regression model developed by Khan and Senhadji (2001) and found out that the threshold inflation level of 13 per cent for Nigeria

Conclusion

The study investigated the appropriate threshold level of inflation for economic growth in Nigeria: Evidence from error correction model (ECM) using annual time series data from 1980 to 2016. The result of the ECM revealed that out of the five explanatory variables used in the model, only three are statistically significant which are inflation rate, squared inflation rate and growth rate of gross capital formation but squared inflation rate has a negative significant effect on growth rate of gross domestic product while both inflation rate and gross capital formation has a positive significant effect on growth rate of gross domestic product and they can only explained about 51.8% of the total variations in the behaviour of growth rate of gross domestic product in Nigeria and there is no autocorrelation or serial correlation in the model.

Also, the threshold result established that the maximum level of inflation which supports economic growth in Nigeria was 13.13% that is, the maximum tolerable cost of inflation to growth and below this level, inflation is likely to have mild effect on economic growth while above it inflation would significantly hurt economic growth in Nigeria. Furthermore, it was recommended that Nigeria should maintain a relatively low and stable inflation rate if the goal of attaining steady and rapid economic growth is to be achieved. Also, the monetary author should also control inflation so that it will not rise beyond one digit level for a better economic growth in Nigeria. Finally, economists and policy makers should focus on the level of money supply and see that it does not lead to inflation because the monetarist economists believed that inflation is always and everyway monetary phenomenon.

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