ADFJ ISSN 2522 – 3186.

African Development Finance Journal

VOLUME 4 (I)

Effect of Inflation Rate and Investment on Economic Growth in Nigeria

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Abstract

Using the Neo-Classical Growth Model, this research experimentally investigates the relationship between Nigerian economic growth, investment, and inflation. First, using annual data from 1980 to 2021, it was evaluated how the inflation rate affected economic growth in Nigeria, with the potential of two threshold levels. Next, it was determined whether the relationship between inflation and investment was nonlinear. Particularly, the findings indicate that there is a non-linear link between inflation and economic growth, with two thresholds (6 percent and 12 percent). Below the first barrier, inflation has a small but positive and important impact on economic growth. The effect of inflation is found to be negative and significant at moderate rates of inflation, between the two threshold levels. At high rates of inflation, above the second threshold, the marginal impact of extra inflation on economic growth lessens but remains notably negative. The results also show that there is just one threshold at 7% and that there is a non-linear relationship between these two variables. Investment is significantly impacted negatively by inflation rates beyond the threshold, but positively by inflation rates below it. Therefore, it is preferred to maintain inflation below 6% (the first criterion) by smart macroeconomic policies in order to promote sustained economic development and investment (both monetary and fiscal).

Keywords: *Inflation, Investment, Macroeconomic Stability, Thresholds Effect, Non-linear relationship*

Introduction

Generally, inflation symbolizes a situation of rapid persistent and unacceptable high rise in the general price level in an economy resulting in the loss of purchasing power of the country's currency. The high rate of inflation, which Nigeria has been experiencing since the 1970s has its origin in the economic measure and control that were enacted during the Nigeria civil war of 1967-1970. Prior to the war, Nigeria practiced the open market economic policy with very little government control. Investment on the other hand is known to constitute the main engine of growth in any economy. Infact, Odoko (2003) describes it as the major catalyst for economic development. Investment is financed from savings (domestic or foreign), but as a result of insufficient domestic savings in the developing economy like Nigeria due to

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low income and inefficient financial system, foreign saving is required to supplement domestic savings in financing of investment. Osakwe (1982) points out that inflation reduces the volume of savings and the more persistent and stronger the inflation, the lower is the level of saving and investment. There are basically three major approaches used when calculating inflation, the gross domestic product is deflated (GNP), which implicitly measures inflation, the consumers' price index (CPI) and the wholesale price index (WPI). In Nigeria the most widely used measure of inflation is the consumer price index because it is readily available on monthly, quarterly and annual basis.

In the classicalist theory of monetary transmission mechanism, increased money stock only leads to an inflationary pressure on the economy thereby leaving the real sector where investment belongs unaffected. According to Rostow (1934) inflation has been important for several industrial take off. But then, there is a level of inflation that can be considered conducive for economic growth i.e that will promote growth through increase in investment. The problem therefore lies in determining the inflation rate consistent with development and identifying the price that reflect a conducive inflationary pressure on the economy. It is therefore imperative that there have been some arguments surrounding the relationship between inflationary rate and economic development. While the classical economist believe that inflationary rate doesn't affect the real sector where investment belong, economist like Rostow is of the opinion that inflation plays a major role in industrial take off i.e it has the tendency of promoting capital accumulation.

Literature Review and Theoretical Framework

There have been several studies on inflation related issues in different journal and publications both local and international. For instance, Bhatia (1960) and Eckstein (1958) attempted to review that Rostow's thesis did not completely show that the take-off stages of economic development has typically been associated with inflation. Looking at the historical relation between inflation and economic growth in five countries, Bhatia find no evidence that take off in Sweden, Japan and Canada was associated with inflation He concluded that relation between inflation and growth has been on the increase in the United Kingdom, Germany and Japan and significantly positive only in Sweden. Eckstein (1958), carrying out a test on the effect of inflation on economic growth for eight industrialized countries concluded that period of rapid economic growth occurred without inflation showing that there is no historical relationship between inflation and economic growth, but this he said occurred up to a critical rate, after that, the inflation rate will drop.

Thirallich (1974) in a cross-section study of forty-three countries over the period of (1956-1965) finds inflation to be negatively related with growth. His study concludes that depressing effect of inflation on economic growth works through the worsening of the economic distribution and the cost of investment. Also, in a study conducted by Durance (1975) in the relationship between inflation, growth and the level of per capita income was examined. He suggested that in a situation where growth rise with the rate of inflation up to a point and then begins to decline and in a situation where growth rise with level of per capita income and then, we should expect the evidence to conform to a mild inflation as growth rises. However, the relationship between investment and inflation has been seen by various economists using different economies in diverse perspectives. While some see it to be positive, some see it to be negative. This study therefore attempts to study the relationship by focusing on the impact of inflationary rate on investment using Nigeria Economy as a study.

Theoretical Framework

Demand and pure Cost Push Theories

The demand-pull theory ascribe rising prices to excess demand. In the goods market, prices rise because the claiming on a society's resources from investors and consumers in money when terms exceed the economy's real productive potential. Thus, this type of inflation occurs when aggregate demand rises faster than aggregate supply. In the early 1960s, Nigeria experienced a mild inflation or single digit inflation, which is said to be consistent with the process of economic growth. It would therefore be unrealistic to ascribe the inflation during the early stages of development in Nigeria to demand pull forces. The pure cost model of inflationary process indicated that inflation arise from increases in the cost of production, especially rising wage emanating from trade union actions. According to Iyoha (1975), Inflation in Nigeria can be attributed to both demand and supply phenomena as well as the openness of the Nigerian economy and just one related factor.

The cost push school suggests that inflation arises from increase in the cost of production, rise in wages from trade union activities and embodies a socio-political view (Agwu and Charles 2015). The cost push views attribute inflation to a host of non-monetary supply oriented influences of shocks that raise costs and consequently price.

The Structaralists Theory

The structuralists, according to Mubarik (2012) explains the long run inflationary trend in developing countries in terms of structural rigidities, market imperfection and social tension, relative inelasticity of food supply, foreign exchange, contracts protective measures, rise in demand for food, fall in export earnings, hording import substations, industrialization, political instabilities.

The Monetarist Theory of Inflation

From the monetarist perspective, inflation is always and everywhere a monetary phenomenon and maintaining a policy of monetary and physical stability is a basic prerequisite for rapid economic development. The monetarist theory of inflation is linked with Friedman (1968) and Schwartz (1973). Accordingly, they believe that inflation is a monetary phenomenon and as such can only be viewed in terms of increase in the stock of money in the economy. Monetarist see the arrow of causation in the equation of exchange (MV=PY) as going from left of prices. This direct causation was supported by the empirical work of Micron Friedman (1968) and Schwartz (1973). Schwartz like Friedman carried out his empirical study by means of data from countries covering the period (1959-1969). The result showed a high positive correlation between money supply and prices which is consistent with Friedman (1968) statement that the level of the rate of growth of money supplies whether domestic or global determines the price levels. The monetarist therefore view money supply as exogenously determined and such can be controlled only by the monetary authorities.

The Classical Theory of Investment

The classical theory state that planned investment will equal planned savings and the equilibrating factor is the interest rate. They argued that S=f(r),F1 (r) <0.

Thus, in the classical theory, interest rate as a very powerful factor, which influence investment. Thus, investment is interest.

The Keynesian Theory of Investment

Keynesian attacked the classical theory for the exclusion of income as a fundamental determinant of savings. The classicalists said that interest can adjust intermittently towards equilibrium but the Keynesians said this is not realistic that there will be monetary and fiscal policies to decide what the rate of interest will be. In the Keynesian model. I=i(r), However, since at equilibrium, saving equals investment, we have S=I,(y) =I (y, r), (y) > 0, (r)<0.

Empirical Review

Sackey, (2007) discovered empirical evidence about a positive relationship between money supply capital formation and economic growth but a negative relationship between inflation and economic growth in Nigeria. Babalola et al, (2015) also identified positive relationship between money supply and inflation rate in Nigeria. Gbadebo Mohammed (2015), found evidence between money supply and inflation and stress the role of government and monetary policy maker in mitigating the money supply inflation dynamics in Nigeria. Emerenini and Eke (2014) highlighted the need for relevant policy options in curbing the effect of money supply on inflation. The authors showed that expected inflation, money supply and exchange rate had influence on inflation within the period under consideration. Olayungbo and Ajuwon (2015) also find a positive relation-ship between money supply and inflation in Nigeria. From the study too, interest rates have an important impact on monetary expansion in the economy." Olayungbo and Ajuwon (2015), Hussain, (2005) highlighted key monetary policy variables that engender inflation in the Nigerian economy. The research identified net domestic credit and currency outside banks as the most important variable in determining inflation in the short run in Nigeria. Olusegun, (2010) highlighted the effect of some monetary policy variables and monetary aggregates on consumer price index in Nigeria. These are increase in prime lending rate, minimum rediscount rate, consumer price index, and money supply. However money supply was found to be most significant. Ayeni, (2014) study revealed that there are many determinants of inflation in Nigeria. According to the author, the determinants of inflation in the Nigerian economy are multidimensional and dynamic. Therefore, the government should pursue with vigor.

The Accelerator Principle

The accelerator principles take two different forms. The simple accelerator principle and the flexible accelerator otherwise called the capital stock adjustment principles.

Clarke (1963) in business accelerator and the law of demand developed simple accelerator. The theory states that the rate of investment expenditure depends on upon changes in the levels of output. That is increase in output puts pressure on existing production capacity, which necessitates an expansion of the capital stock and in turn necessitates a higher rate of investment expenditure.

Symbolically, Let K = Capital Stock, = Level of output, = K/Y − Capacity output ratios, = accelerator, f W =K/Y, =WY, K=WΔY this is the accelerator principle. As output change (Δk) changes the same direction, et Kt = capital stock of period t. t = output level at period t.

Kt= capital stock at the previous period, t − I = output level at previous period. W = Δ K/ Δ Y …………………. Accelerator

Clark (1963) made use of potential output in his analysis. The flexible accelerator theory removes one of the major. Weakness of the simple accelerator principle that the capital stock is optimally adjusted any time lag?? In the flexible accelerator principle, there are lags in the adjustment process between the level of output and the level of capital stock. This is also known as the capital adjustment model.

Trends in Public Debt and Inflation in Nigeria

Figure 1 illustrates trends in total public debt and inflation rate using annual data for the period from 1980 to 2018 in Nigeria. Nigeria's total public debt stock had evolved in the last three decades. As a percentage of gross domestic product (GDP), this represent a decrease from 19.83% in 1980 to 16.07% in 2018, with a minimum of 7.26% in 2008 and a maximum of 79.38% in 1992 (Central Bank of Nigeria, 2004, 2019; Debt Management Office Nigeria, 2006). The ratio between 1980 and 2004, before external public debt relief in 2005, averaged 44.34%, compared to 11.15% between 2007 and 2018, after the implementation of the third phase of the Paris Club debt deal and the exit from London Club debt obligations in 2006 (Central Bank of Nigeria, 2004, 2019; Debt Management Office Nigeria, 2006).
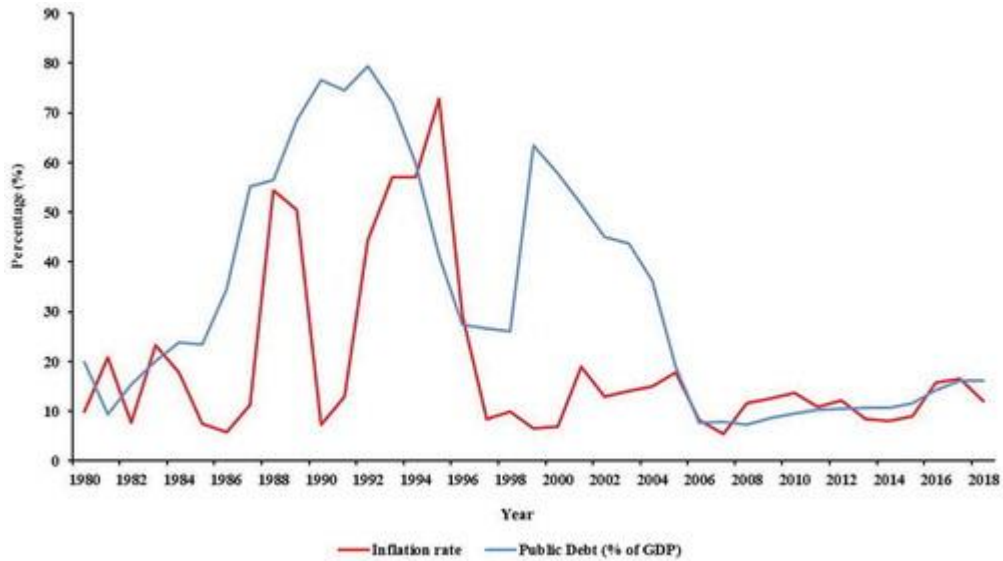
Figure 1. Trends in Public Debt and Inflation

Sources: Central Bank of Nigeria (2004)**; World** Bank (2019); Central Bank of Nigeria (2019)—
Authors' compilation using Excel

The composition of Nigeria's total public debt stock can be broadly categorised into external and domestic public debt. The proportional share of these two sources had alternated since 1980. From 1980 to 1985, it was largely dominated by domestic public debt stock and from 1986 to 2005 by external public debt stock. Starting 2006, it reverted to domestic public debt stock having dominant share up until 2018. The changes in domestic public debt stock in the 1980s and 1990s resulted mainly from the fiscal operations of the central government's large deficits (Central Bank of Nigeria, 2001; Essien et al., 2016; Titus, 2013).

Domestic public debt stock since 2001 had gradually increased its contribution to total public debt stock. The changes between 2004 and 2005 were as a result of three main factors, which were in line with Nigeria's domestic debt management strategy. First was the development of the domestic debt market for financing budget deficits; second was developing and deepening of the financial market; and third was sourcing investment funds (Debt Management Office Nigeria, 2005) Trends from 2006 to 2016 showed a drastic increase in domestic public debt stock. The increased changes recorded between 2006 and 2007 were largely as a result of deficit finance, securitizations of local contractors' debt and the settlement of Nigeria Airways ex-staff entitlements (Debt Management Office Nigeria, 2006). In

addition, increased changes between 2008 and 2018 were as a result of government financed appropriated budget deficits, refinanced matured securities and special projects expected to stimulate economic growth and poverty reduction, and the settlement of part of the arrears to local contractors and other central government obligations (Debt Management Office Nigeria, 2016, 2018).

Prior to external public debt relief in 2005, total public debt was characterized by huge external borrowing by the government in meeting its financing needs, which resulted in public debt stock that was largely dominated by external public debt stock (Central Bank of Nigeria, 2001; Debt Management Office Nigeria, 2006). For instance, between 1986 and 2006, a decrease was recorded in 1996 as a result of external public debt reconciliation exercise with creditors to confirm the authenticity of some external claims. Thereafter, external public debt stock continued to grow as a result of the capitalization of defaulted interest payments and accumulation of payment arrears even when no new loans was contracted up until 2005 (Titus, 2013). There was a significant drop in external public debt stock in 2005 by 44.9% and further in 2006 by 83.3% (Debt Management Office Nigeria, 2006). The reduction in 2005 was as a result of the implementation of the first and second phases of the Paris Club debt relief deal, which paid off all the arrears on Paris Club debt and reduced the stock by 33.0%. The significant reduction in 2006 was as a result of the implementation of the third phase of the Paris Club debt deal and the exit from London Club debt obligations (Debt Management Office,Nigeria, 2006). As shown in Figure 1, these changes reduced total public debt to GDP ratio from 36.14% in 2004 to 18.95% in 2005 and 7.69% in 2006.

A closer look at the trend for total public debt to GDP ratio from 2006 reveals an upward trend in this ratio. The change in this ratio from 2005 was largely driven by domestic public debt stock accumulation, which can be attributed to government deepening of the financial market through the development of financial instruments and domestic debt finance of budget deficits (Debt Management Office Nigeria, 2005, 2006, 2009, 2018; Titus, 2013). The composition of Nigeria's public debt stock stood at 37.78% for external public debt stock and 62.21% for domestic public debt stock while total public debt to GDP ratio stood at 16.07% as at end 2018 (Central Bank of Nigeria, 2019). The composition ratios compare favorably to the optimal target of 60:40 for domestic and external debt, respectively, by end 2019 as contained in the 2016–2019 Nigeria's Debt Management Strategy (Debt Management Office

Nigeria, 2016) Overall, for the study period, increased changes in the public debt stock were largely through the implementation of domestic debt management strategies and fiscal excesses.

With respect to inflation rate in Nigeria, Figure 1 reveals mixed inflation movements during the study as inflation hovered across single- and double-digit rates. As indicated in Figure 1, between 1980 and 2018, Nigeria recorded several experiences of high inflation rate in excess of 25%. According to Masson et al. (1997), once a country experiences annual inflation rates in the range of 15%-25% for a number of consecutive years, it will be unable to rely on monetary policy alone to target a stable and reduced inflation rate. At high rates of inflation, fiscal and monetary policies become virtually inseparable. As revealed in Figure 1, Nigeria recorded its highest inflation rates in the 1980s and 1990s. For instance, the country recorded rates as high as 57.17% in 1993 and 72.84% in 1995.

In the 1980s inflation was largely influenced by government's expansionary fiscal operations that were financed by the Central Bank of Nigeria's credit and monetization of oil revenue, and the repurchase of external debt with new local currency obligation (Bawa et al., 2016; Moser, 1994). This episode, which persisted into the 1990s, coincides with a period of expansionary fiscal deficit and high money supply growth that exacted higher inflationary pressures through growth in money supply (Bawa et al., 2016; Moser, 1994). For the period from 2000 to 2018, double-digit rates were largely recorded for inflation rate even though single digit rates were also recorded occasionally during this period. Inflation rate was at its minimum for this period at 5.39% in 2007 and maximum at 18.87% in 2001. The change to double digit in 2008 was attributed to global food shortages and financial crisis, while, in other periods, double-digit inflation largely due to expansionary fiscal and monetary policy operations (Central Bank of Nigeria, 2010). Overall, even though there are other factors, such as depreciation in exchange rate, inadequate power supply, and weak infrastructure facilities that have contributed to changes in inflation rate for the period under review, major changes in inflation rate were largely due to excess domestic demand generated by expansionary fiscal and monetary policy in Nigeria. Annual inflation rate stood at 12.09% in 2018 compared to 9.97% in 1980.

Although the descriptive analysis above provides us with some insight into the reality of public debt and inflation in Nigeria, it is important to note that such analysis only gives or shows a general picture. To complement this analysis, it is paramount to undertake an econometric investigation of the individual

effect associated with public debt given its significant role in fiscal policy determination for the study period in Nigeria.

Methodology

Model Specification

The relationship between inflation and investment can be derived using the approach by Barro (1991) and Martin (1997) and subsequently adopted by Iqbal and Nawazi (2012) as:

$$\text{dlogGRINV} + X\beta + \varepsilon \dots\dots\dots\dots\dots\dots(1)$$

Where: Y is a measure of a real investment, X is a vector of explanatory variables that affects investment, β, is the slope coefficients and ε, is the error term.

This basic growth model is extended to capture the link between inflation and investment in the following linear regression model specified as:

$$\text{dlogGRINV} = \alpha_0 + \alpha_1 INF + X\beta + \varepsilon \dots\dots\dots\dots\dots\dots (2)$$

Where: dlogGRINV is the growth rate of real investment, INF is inflation rate, measured as growth rate of consumer price index, and X is matrix of other explanatory variables, β, is matrix of slope coefficients and is ε, the error term.

Neoclassical growth model uses investment and population growth in the regression equation as increase in investment together with a decrease in population growth rate promotes economic growth. International trade theory proposes to include openness of the economy in the growth regression which is positively related to growth. Money supply is an important indicator for financial development. Thus, our empirical analysis uses the following explanatory variables: investment, population growth, M2 to GDP 19 and openness of the economy. This choice of variables is consistent with the pattern previously used by other researchers (Khan and Senhadji, 2001; Sergii, 2009; Iqbal, 2012).

Incorporating these variables, the following model is specified:

$$\text{dlogGRINV} = \alpha_0 + \alpha_1 (INF) + \beta_1 (POPG) + \beta_2 (INVY) + \beta_3 (FD) + \beta_4 (OPN) + \varepsilon \dots\dots\dots\dots\dots\dots(3)$$

Where: dlog dlogGRINV is growth rate of real investment, INF is growth rate of consumer price index (CPI) , POPG is population growth rate, INVY is investment to GDP ratio, FD is financial development

measured as M2 to GDP ratio , OPN is openness of the domestic economy measured as [(Export + Import)/GDP)] and ε is the error term.

As discussed earlier, theoretical and empirical studies predict that threshold effects are associated with a rate of inflation exceeding some "critical value" or below some "critical value". Threshold Model was developed by Khan and Senhadji (2001) for the analysis of threshold level of inflation for industrialized and developing countries. Mubarik (2005) and Iqbal and Nawiz (2012) use the same model for the estimation of threshold level of inflation in Nigeria.

By introducing the possibility of two threshold level of inflation; the final regression equation is captured as:

dlogGRINV=$\alpha1$+ $\alpha2$ (INF) *I(INF$\pi2$) + $\beta1$ (POPG)+ $\beta2$ (INVY) + $\beta3$(FD)+ $\beta4$ (OPN)+ ε...(4)

Where: dependent variable and the control variable are defined as the same as in equation (3) while (1) and (2) are two thresholds level of inflation. I (INF<$\pi2$) are indicators functions which take the value of one if the term between parentheses is true and zero otherwise.

This model specifies the effects of inflation with three coefficients: $\alpha2$, $\alpha3$ and $\alpha4$. $\alpha2$ denoting the effect of inflation below the first threshold level $\pi1$, $\alpha3$ denotes the effect of inflation on economic growth between $\pi1$ and $\pi2$, and $\alpha4$ denotes the effect of inflation on investment exceeding the second threshold level $\pi2$. Identification of threshold is based on the methodology defined by Khan and Senhadji (2001). Regression equation is estimated for different values of threshold which is chosen in an ascending order (i.e., 1, 2 and so on), the optimal value threshold is obtained by finding the value that maximizes the R 2 from the respective regressions. This also implies that the optimal threshold level is that which minimizes the residual sum of squares (RSS). This procedure has become widely accepted in the literature on inflation-growth nexus (Iqbal and Nawazi 2012). Search of optimal threshold for wider range of threshold is very tedious. Moreover, Hansen (2000) proposed to search optimal value only in the region where we do expect the threshold should be. Graphical analysis is also used to narrow the range of values for inflation threshold. Theoretical literature has suggested that investment might be the channel from

inflation to economic growth. Following this, a linear model specification is used to measure the linear relationship between investment and inflation:

$$INV = \delta 0 + \delta 1 INF + \delta 2 INVt\text{-}1 + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

Where: INV is the gross fixed capital accumulation as share of GDP and first lag of I is included to control the economic conditions in the last period (Li, 2006).

For non-linear the following regression equation is used:

$$INV = \delta 1 + \delta 2\,(INF) * I\,(INF < \pi 1) + \delta 3\,(INF) * I\,(\pi 1 \le INF \le \pi 2) + \delta 4\,(INF) * (INF > \pi 2) + \delta 5\,(INVt\text{-}1) +$$
$$\varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Selection of threshold level is based on the similar procedure explained as above.

Data Sources and Variables Description

The data for this study are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin (various editions), and National Bureau of Statistics (NBS). Data covers the period 1980 to 2020 and consists of the following variables. Inflation is measured as annual percent change of average consumer price index; Population growth rate is measured as annual population growth rate, Investment is measured as gross fixed capital formation as percent of GDP and Openness is measured as share of export plus import in GDP.

Empirical Results and Analysis

The empirical analysis that is performed in this chapter involves the estimation and succinct analysis of the model that was specified in the previous section. However, in order to examine the characterization as well as correlation among the variables used in the regression analysis, we carry out the descriptive and correlation analysis, before conducting the unit root test and subsequent econometric estimations.

Descriptive Statistics

Table 2 presents the descriptive statistics of the sample data on the variables used for the analysis. The descriptive statistics show that the mean value of growth rate of investment is 9.16 percent while its median value is 6.15 percent. The mean value of investment to GDP ratio is 11.02 percent. Inflation has a mean value of 10.52 percent and population growth has a mean value of 4.25 percent. M2 as share of GDP has a mean value of 13.7 and openness has a mean value of 18.21. The relative high values of investment to GDP, M2 to GDP and openness underscore their pronounced critical role in driving

economic growth. Further buttressing this fact is their relative high maximum values. Apparently, these variables have high multiplier effect on growth. In terms of the standard deviation, inflation is seen to have the highest value of 5.5 over the sample period-an indication of inflation variability in Nigeria. The kurtosis values also indicate normality in distribution over the period for all the variables, except inflation with a value of -1.62, a further attestation to inflation instability during the reference period.

Table 2. Descriptive Statistics

	Mean	Median	Max.	Min.	Std. Dev.	Skew	Kurt.	J-B
GRINV	9.16	6.15	25.18	4.61	2.16	2.21	4.05	4.25
INV	11.02	2.22	24.02	3.41	1.29	1.30	3.60	2.30
INF	10.52	3.04	15.21	-0.98	5.50	-1.25	-1.62	3.12
POPG	4.25	5.26	16.12	2.25	2.25	1.95	3.20	3.10
FD	13.70	6.50	22.27	3.19	4.45	1.75	3.19	2.52
OPEN	18.21	9.20	28.15	5.32	4.50	2.33	5.50	3.21

Correlation Analysis

In order to examine the correlation between the variables used in the analysis, we conduct the correlation analysis. The result of the correlation tests are reported in table 3 below. In the correlation matrix, a positive relationship is observed between GDP growth rate and all the variables (except inflation), an indication that these variables invariably stimulate higher economic growth, with that of inflation having a destabilizing effect on growth. The correlations between the explanatory variables indicate that inflation is negatively correlated with investment, while all other variables are positively correlated with each other. From the correlation result analysis, there is a relationship between the variables; inflation encourages investment and the investors, whose aim is to make profit. The population growth increases the level of investment and financial development, as well as the openness of the country's investment policies, which will attract foreign direct and indirect investment that will result to significant economic growth; therefore, the variables are inter-related.

Table 3: Correlation Results

	GRINV	INVY	INF	POPG	M2/GDP	OPENNES
GRINV						
INVY	0.17					
INF	-0.27	-0.55				
POPG	0.15	0.38	0.33			
FD	0.58	0.57	0.36	0.038		
OPEN	0.42	0.12	0.17	0.09	0.30	

Unit Root Analysis

A time series is stated as non-stationary if its mean and variance is dependent overtime. On the other hand, a time series is regarded as stationary if the mean and variance is time-invariant and constant over time. Using the Augmented Dickey Fuller (ADF) test, the results of the unit root is presented in levels and first difference in table 4 below: The result indicates that the variables were initially non-stationary at levels. In line with the argument of Box and Jenkins (1978) that non-stationary time series in levels may be made stationary by taking their first differences, we took the first differences of the respective variables and performed the unit root test on each of the resultant time series. Since the variables were not stationary except after first differencing, we used their first differences.

Table 4. Unit Root Test for Variables in First Difference

Variables	Levels	Remarks	First Difference	Order	Remarks
GRINV	-1.2572	Non-Stationary	-5.3196**	1(1)	Stationary
INVY	-1.6342	Non-Stationary	-4.4492*	1(1)	Stationary
INF	-1.7905	Non-Stationary	-3.2544*	1(1)	Stationary
POPG	-1.0613	Non-Stationary	-5.2115**	1(1)	Stationary
FD	-2.2370	Non-Stationary	-4.2142*	1(1)	Stationary
OPN	-2.9945	Non-Stationary	-3.1729*	1(1)	Stationary

* Significant at the 5%
** Significant at the 1%

Table 5. Linear Estimation: Dependent Variable is Growth Rate of Real Investment (GRINV.)

Variable	Coefficient	t-Statistic
Constant	-1.0652	1.7231
INF	-0.1546	2.9744
INV	0.5205	3.2192
FD	0.1159	1.7698
OPN	0.2527	2.3814
POPG	0.292	2.5314

R-Squared = 0.65; DW Statistic = 1.97

Jaque-Bera RESET Test = 0.62

Ramsey test = 1.45 [0.46]

Inflation and Economic Growth Nexus

The simple linear model of inflation-growth nexus as defined in equation (3) has been estimated. The cardinal aim of the simple linear regression is to reveal the shape of the growth function linking inflation with economic growth. The estimation is done using data for Inflation and GDP growth and other control variables from 1980 to 2014 as shown in Table 5 below. Given the coefficient of determination of 0.65, it is invariably clear that about 65 percent of the systematic variations in economic growth is explained by the explanatory variables. The DW Statistic indicates the absence of serial correlation in the model, making the model reliably fit for policy perspective. Inflation has significant negative impact on economic growth. This supports the findings of Mubarak (2005), Hussain (2005), Iqbal and Nawaz (2012) for Pakistan and, Bawa and Abdullahi (2012) and Aisien and Iyoha (2013) for Nigeria. Investment has positive and significant impact on economic growth. Openness has a positive and significant influence on economic growth and population growth also has positive and significant impact on economic growth. The impact of M2 to GDP ratio is positive (though insignificant), an indication of low level of financial development, except for the sweeping financial sector reforms in recent time. The coefficient of investment to… GDP ratio is 0.52, indicating that a 1 percent increase in investment will cause a 0.52 percent increase in growth. That of inflation shows that a 1 percent increase in inflation will reduce growth by 0.15 percent, while that of openness, M2 to GDP ratio and population growth will stimulate economic growth by 0.25 percent, 0.12

percent and 0.29 percent respectively. Nonlinear model has been estimated using equation 4. For estimation of (1), we apply the methodology used previously.

The Following steps are involved in estimation of nonlinear model. In the first step, we estimate the equation 3 with one threshold level. The estimation process of $\pi 1$ is the same as given in section 5.

dlogGRINV= $\alpha 1$ +$\alpha 2$ (INF)* I(INF≤ $\pi 1$) +$\alpha 3$(INF)* I(INF> $\pi 1$) + $\beta 1$ (POPG) + $\beta 2$ (INVY) + ε………………………………………………..(7)

We apply a range of threshold level ranging from 1 to 8 and select the value that minimizes the error sum of square in line with the position by Hansen (2000) and subsequently followed by other threshold studies e.g. Iqbal and Nawazi (2012). The result indicates that the value of 1 is 6 and inflation below 6 has positive impact on economic growth. These findings of first threshold level are also consistent with Singh (2003) for India, Hussain (2005) and Iqbal and Nawazi (2012) for Pakistan Aisien and Iyoha (2013) and Bawa and Abdullahi (2012) for Nigeria. Thereafter, we carry out a significant test of no threshold against one threshold. The null hypothesis is H0= $\alpha 2$ = $\alpha 3$ against the alternative of H= $\alpha 2 \neq \alpha 3$. The result indicates that null hypothesis is rejected at 5 percent level of significance which confirms the existence of one threshold level in inflation data.

Table 6. Estimation with Threshold Effect: Dependent Variable is Growth Rate of Real Investment.

Variable	Coefficient	t-Statistic
Constant	-0.9864	-1.4570
Inflation < 6	0.1025	0.7869
Inflation ≥ and Inflation ≤ 12	-0.3395	-2.7712
Inflation > 12	-0.2908	-2.9551
Investment	0.1590	2.6229
FD	0.1025	1.9263
OPN	0.2171	2.2430
POPG	0.0862	2.5028

R-Squared = 0.51; DW Statistic = 2.11
Jaque-Bera RESET Test = 0.48
Ramsey test = 1.19 [0.3]

The existence of second threshold in the relationship between growth and inflation is tested by using equation 4. By using same process, we find the second threshold level which is 12 in this case (Table 6). Then, we carry out a significant test of one threshold against two thresholds. The null hypothesis is existence of only one threshold against the alternative of existence of two thresholds. The result supports the existence of two thresholds against one at 5 percent level of significance.

The final estimation results of equation 4 are presented in table 6. An interesting finding is that for the low inflation, the coefficient of inflation (0.1025) is positive. This result shows that 1 percentage increase in inflation will cause a 0.10 percentage point increase in economic growth. However, this positive impact is not significant.

This implies that in Nigeria, low inflation up to 6 is not harmful for the country. In the middle inflation category (inflation between 6 and 12), the coefficient of inflation (- 0.3395) is negative and significant at one percent level. This finding corroborates the results of Aisien and Iyoha (2013) of a single inflation threshold of 8 percent for Nigeria, since the mean inflation threshold between the two thresholds (6 percent and 12 percent) is 9 percent -a level immediately above the 8 percent in which further rise beyond the 8 percent inflation threshold has significant deteriorating effect on growth. Accordingly, an increase in one percentage point inflation per year is associated with a deteriorating growth rate of real GDP by 0.34 percentage point. When inflation rate is exceeding the 12 percentage point, the coefficient of inflation is more negatively significant at the 1 percent level. This, negative effect is however lower than that when inflation is in the range of 6 percent to 12 percent. A 1 percent increase in inflation, when inflation rate is more than 12 percent, leads to a reduction of 0.29 percent in real GDP growth rate. The existence of two threshold level implies that inflation can be divided into three parts. As inflation rises from zero to 6 percent, the effect on economic growth is negligible or even positive. As inflation crosses the low threshold level, it has a significant and negative (deteriorating) impact on the GDP up to a certain level. When inflation exceeds the second threshold level, the marginal adverse impact of inflation on growth diminishes.

Thus, accelerating rate of inflation has diminishing marginal destabilizing effects on growth in Nigeria, as the adverse effect would already have slowed economic activities. This findings is corroborated by findings of Hussein (2005), Li (2006) for a group of developed and developing countries, and Nasir and Iqbal (2012) for Pakistan and Singh (2003) for India.

The smaller negative coefficient illustrates that the inflation growth relationship flattens when the economy has high inflation. Intuitively, we can conclude that once inflation exceeds a threshold level, all of the damage to the financial system has already been done; consequently, perfect foresight dynamics comes into being. When these occur, further increases in inflation have no additional detrimental effects on economic growth, but the impact is still negative and significant.

Inflation and Investment Nexus

Theoretical literature has posited that investment serves as the channel that through which inflation affects economic growth. The linear model is estimated by using equation (5) to examine the relationship between inflation and investment.

An examination of the result shown in table 7 below indicates that inflation has significant and negative impact on investment/GDP ratio. The coefficient of inflation (- 0.0548) shows that a 1 percentage point increase in inflation will cause a 0.05 percent reduction in investment. The first lag of investment is used to account for the effect of economic conditions in the last period which has significant and positive impact on current investment. This linear analysis confirms the inflation-investment nexus like that of inflation and GDP growth. Further relationships between inflation and investment with threshold effects by using the same techniques described for inflation and economic growth is estimated.

Table 7. Dependent Variable is Investment to GDP Ratio

Variable	Coefficient	t-Statistic
Constant	-2.5932	-2.3691
Inflation	-0.0548	-2.3160
Lag of Investment	0.6109	-2.8542

R-Squared = 0.53, DW Statistic = 1.87
Jaque-Bera RESET Test = 0.11
Ramsey test = 1.18 [0.3]

Nonlinear model estimation began by estimating the equation 6. By applying the same approach as given for inflation and growth, a single threshold at 7 percent is estimated since we cannot reject the null hypothesis of one threshold against two thresholds. This finding is in line with the findings for Nigeria by Aisien and Iyoha (2013) for a single threshold.

This result is economically plausible given that the inflation-growth threshold effect as a matter of theory and evidence should be lower than that of inflation-investment threshold, since investment constitutes the channel through which inflation affects economic growth. As a result, investment serves as direct channel through which inflation affects growth (pass-through variable). Inflation will thus affect investment first before affecting growth, which makes the value of the effect of inflation threshold on investment of a higher magnitude.

Table 8 presents the estimation results of the inflation-investment relationship with threshold effects. The coefficient of inflation (0.1068) is insignificantly positive when inflation is below the threshold level. However, as inflation rates exceed the threshold level, the effect of inflation on the level of investment is negative and significant. The evidence suggests that during a period of high inflation, the level of investment is adversely affected by inflation.

Thus, high level of inflation has a destabilizing effect on investment. Investment thus serves as a potential transmission channel through which inflation affects economic growth.

Table 8. Estimation with Thresholds Effects: Dependent

Variable	Coefficient	t-Statistic
Constant	3.0692	2.4745
Inflation <7	0.1068	0.8769
Inflation > = 7	-0.0574	-2.7625
Lag of Investment	0.7295	3.1726

R-Squared = 0.56, DW Statistic = 1.77
Jaque-Bera RESET Test = 0.07
Ramsey test = 0.15 [0.76]

Conclusions and Recommendations

Economic stability and the necessary infrastructure are among the condition precedents for sustained growth. Investment constitutes an important channel through which inflation affects economic growth. Low or moderate inflation is an indicator of macroeconomic stability and creates an environment conducive for investment, as accelerating rates of inflation undermines growth. A review of the existing cross-country international evidence, as well as evidence from developing countries, indicates a negative relationship

between inflation and long-term growth. Countries with low or moderate rates of inflation have higher growth rates over the long-term compared with countries with high inflation rates. However, low inflation does not constitute a sufficient condition for growth, as it must be complemented with increasing investment, sound macroeconomic policies and institutional structures.

Taxation as a control mechanism of inflation is seen as permanently remover of purchasing power and so reduces the accumulation of savings in the form of government debt, thus reducing the threat of future inflation. It may cause pressure for higher wages but gives loss actual reason for acceding to such demands than do most other taxes. High marginal rates may discourage overtime work and the work of woman. The income tax avoids reduction in the ability to produce. The existence of the personal exemptions and credits for dependents furnishes a margin of untaxed income to take care of the basic necessities for maintaining health and strength and security which are the foundation for high productivity in industry. For these reasons, it can be safely concluded that the individual income tax is an appropriate and effective instrument of inflation control.

The objective of the present study has been twofold. Firstly, the impact of the inflation rate on economic growth with the possibility of two threshold level for Nigeria using annual data from 1980 to 2021 has been examined and secondly, nonlinear relationship between inflation and investment is also investigated. Inflation and growth model supports the existence of a nonlinear relationship with two thresholds (6% and 12%). Existence of double threshold, divide the inflation range into three categories i.e. low inflation, moderate inflation and high inflation. Inflation below the first threshold (6%) affects economic growth positively, at moderate rates of inflation, between the two threshold levels (6% to 12%), the effect of inflation is significant and strongly negative and at high rates of inflation, above the second threshold (above 12%), the marginal impact of additional inflation on economic growth diminishes but is still significantly negative. The existing literature emphasizes only one threshold level beyond which inflation impedes growth, but below which inflation has no significant or even positive effects on growth. This study however finds evidence of a second threshold level for Nigeria. The finding of first threshold level is also consistent with those of developing countries such as Singh (2003) for India, Hussain (2005), and Iqbal and Nawiz (2012) for Pakistan.

The second objective of the study is to investigate the mechanism through which inflation affects long-run economic growth in a non-linear fashion. Investment is one of the possible channels through which inflation affect economic growth and the analysis indicates the nonlinear relationship between these two variables with only one threshold at 6%. Rate of inflation below the threshold level has positive but insignificant impact, while above the threshold has strong negative and significant impact on the investment. These findings provide some important policy implications. On the basis of this study, it is desirable to keep the inflation rate below 6 percent. Therefore, central bank should implement sound non-inflationary macroeconomic policies as well as inflation targeting mechanisms that will keep the inflation rate below the first threshold, since such will be helpful for the achievement of sustained economic growth and overall macroeconomic stabilization. Low inflation is also helpful for minimizing the uncertainties in the financial market which in turn enhances investment and overall economic growth. Sound investment-enhancing policies coupled with stable and coherent complementary macroeconomic policies and institutional structures should be put in place in order to propel rapid economic growth in Nigeria.

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