Asian Economic and Financial Review

journal homepage:http://aessweb.com/journal-detail.php?id=5002

INFLATION THRESHOLDS AND ECONOMIC GROWTH: EVIDENCE FROM NIGERIA

Kazeem Bello Ajide[1]
Olukemi Lawanson[2]

ABSTRACT

Inflation is one of the most challenging macroeconomic objectives capable of frustrating every pragmatic effort at achieving other macroeconomics goals if not curtailed. To this end, the paper empirically examines the threshold inflation rate that is considered optimally reasonable for maintaining a sustainable economic growth. The study in specific terms employs a least square multivariate approach to estimate a threshold level of inflation. Further, error correction modeling (ECM) approach was explored to identify the long run relationship among other major determinants of real GDP growth using a simple augmented production function. In addition, a pairwise granger causality test was conducted to explore the causal link between the inflation and growth of real GDP. Interestingly, it was observed from the causality test that there was neither bidirectional nor unidirectional causality between the two but rather an independent relationship. The findings from least square estimation also established 9% threshold inflation level. The results from ECM confirmed the values of lagged of real GDP growth rates, investment, current inflation, population growth and terms of trade as important factors affecting growth rates of real GDP in Nigeria. Based on the outcome of the results it was therefore suggested that an identification of country-specific inflation thresholds in the inflation-growth relationship might provide useful information about the appropriate location and width of an inflation targeting band.

Key Words: Inflation thresholds, Economic growth, Error correction models
JEL Classification: E31, O40, C51

[1] Department of Economics University of Lagos, Lagos, Nigeria

E-mail: kazeemajide@gmail.com

[2] Department of Economics University of Lagos, Lagos, Nigeria

E-mail: Kemilaw2000@yahoo.co.uk

INTRODUCTION

The two major macroeconomic issues that have continuously bothered policy makers' world over, but most especially, with a particular reference to the developing countries, is on how to achieve high and sustainable economic growth as well as low inflation rates at the same time. Anecdotal evidences have shown that the two always move in an opposite direction most of the time. For this reason, and for quite sometimes, price stability and real output growth have been considered to be mutually exclusive policy objectives. As a result, the relationship between the two has been subjected to intense empirical investigations both by developed and developing countries alike. In spite of the copious documented empirics on the relationship, the issue still largely remains contentious and unresolved in the literature. On the theoretical fronts, conventional macroeconomics theorists are divided in their explanation of the mechanics through which inflation-growth affects each other. To some schools of thought, a better platform for attaining the much desired sustainable economic growth is predicated mainly on the achievement of low and stable inflation rates. As a consequence, they posit a negative relationship between the two. Empirical evidences abound confirming an inverse relationship between inflation rates and economic growth (see Fischer and Modigliani, 1978; Gregoria, 1991; Andres and Hernanrdo, 1997; Ahmed and Mortaza, 2005; Kremer, Bick and Nautz 2009). To other schools, they contend that since money and capital are substitutes, an increase in inflation rate increases capital accumulation by shifting portfolio from money to capital thereby stimulating a higher level of economic growth (see Mundell 1965; Tobin, 1965; Gregorio, 1996 for detailed narratives). In a nutshell, they strongly supported a direct positive relationship between inflation and growth. In the light of the foregoing, it is quite apparent why inflation-growth relationship has continued to generate intense discussions and endless empirical assessments to date.

On the whole, inflation has been seen as a major culprit which can either inhibits or promotes sustainable economic growth Therefore, it is generally believed that the attainment of every other macroeconomics goals depend on the maintenance of a stable and low inflation environment. The reasons for this are not far-fetched as deleterious effects of inflation on the economy have been well documented in the literature. These include: imposition of welfare costs on society, distortion of market system efficiency, worsening of terms of trade conditions, discourages long-term investments and distorts a tax system, reducing country's international competitiveness and disrupting borrowing and lending decisions. Even, in its extreme, it breeds greater inequality, provokes social and political unrest as well as being hazardous to effective planning. In view of these identifiable costs of inflation, it is apparent why attaining single digit as well as targeting for moderate and low inflation rates have become the most popular policy objectives that are being pursued by many developing countries.

However, most developing economies particularly countries from sub-Saharan Africa region have been eluded by low and stable inflation rates for a very long time. In Nigeria, for instance, inflation has continued and still posing a challenging threat to the realization of other crucial economic

policy objectives given its oscillating behaviour for over three decades. Further, it has been considered as a drag on the country's progress in the attainment of primary convergence criteria set by West Africa Monetary Zone (WAMZ) for inflation rates as well as Millennium Development Goals (MDGs) targets. Thus, if inflation is a major obstacle in promoting economic growth, then it readily follows that policymakers should aim at a low rate of inflation. At this juncture, the pertinent issues are: If inflation constitutes an unavoidable evil in the economy, how then can it be minimized? What constitutes the optimal level of inflation? What level of inflation thresholds commensurate with sustainable level of economic growth? Attempts at solving the above raised issues largely depend on each country's initial conditions, policy environment as well as a host of other intervening factors which vary from one economy to another.

Though, a large number of formal empirical studies have been conducted on inflation-growth relationships and other inflation related issues in Nigeria. For instance, Omoke (2010) specifically examined the inflation and economic growth. Fielding (2008), looked at Inflation Volatility and Economic Development: Evidence from Nigeria to mention but a few. However, studies on inflation thresholds in Nigeria are scanty at least to the best of our knowledge. We are only aware of Fabayo and Ajilore (2006) who examined the existence of threshold effects in inflation-growth relationship using Nigeria data for the period 1970-2003. Salami and Kelikume (2010) also determined the inflation thresholds for Nigeria using annual time series data spread over two periods 1970-2008 and 1980-2008.

While this study is similar in spirit to this latter strand of evidences, our study however charts a distinct path on a number of fronts. First, none of the studies on inflation thresholds conducted for Nigeria test for time series properties of the variables used since most macroeconomic time series data are known to be plagued by unit root problems. Thus, this paper expresses skepticism about the validity of the empirical results of most of these earlier studies. This skepticism is based upon the fact that it is now an agreed consensus that it is inappropriate to apply conventional econometric techniques to nonstationary time series[3]. To estimate a regression with this type of data at best ignores important information about the underlying (statistical and economic) processes generating the data and at worst leads to spurious results (Harris 1995). Second, the study analyzes empirically the impact of inflation on GDP growth of the Nigerian economy augmented with some growth determining variables like investment, financial development indicators, degree of openness and population which earlier studies conducted for Nigeria took for granted.. Further, the paper employs *Engle-Granger* (1987) two stage co-integration procedure analysis of the relationship between inflation and economic growth as well as explores an interesting policy issue of what is the threshold level of inflation for the economy.

[3] The empirical evidence provided by Nelson and Plosser (1982) and Meese and Singleton (1983) have shown that in reality, aggregate time-series are not stationary in their levels and therefore contain variances that explode with time (Delong and Whiteman 1991).

Following the introduction, the rest of the paper is structured as follows. Section 2 discusses the structure, trends of inflation and economic growth in Nigeria. Section 3 reviews both the theoretical underpinnings and empirical studies on inflation thresholds and economic growth. Section 4 presents the methodology while section 5 presents the empirical results. The conclusion and policy implication emanating from the study is addressed in section 6.

INFLATION AND ECONOMIC GROWTH IN NIGERIA

This section houses a snapshot of some selected macroeconomics indicators in the Nigerian macroeconomic environment. This is to provide a context for the inflation-growth space which is pursued in our subsequent analysis.

Nigeria has witnessed series of rising and double digits inflation episodes right from post independence period to date. The five years average annual inflation rates in table 1 shows that the country's inflation rates for the most part of the periods have been in double digits. Inflation rate increased from 10.4 percent between 1970 and 1974 to a staggering height of19.8 percent during 1975-1979. About the same periods, both the narrow and broad money growth also witnessed dramatic rise from their initial levels of 10.4% and 26.1% between 1970 and 1974 to 19.8% and 39.9% respectively from 1975 to 1979. Given these situations, one might be tempted to conclusion that inflation was occasioned mainly by monetary phenomenon as espoused by the monetarist schools as forming the basis for inflationary episodes experienced then. Though, it may be part of the reasons but not absolute since a lot of other events unfolded within the period. For instance, the world oil price shocks of 1973/74 stood out prominently as a major driven cause of inflation jump experienced by most economies whose crude oil constitutes the bulk of their exportables. From 1980 to 1989, the inflation remains relatively stable with a marginal decline from 20.3 to 20.1 percent. This may be explained in part by austerity measured introduced by the then administration and this consequently engendered reduction in the expenditure patterns of the Nigerians. The situation could not be sustained as inflation peaked at 35.8 percent between 1990 and 1994 and later declined between 1995 and 1999. A policy shift regarding a change in the base years might be part of contributory factor responsible for this. A great deal of success is however recorded in inflation movement as the rates hover around 13.5 and 11.1 percent between 2000 and 2009 from 25.4 percent during 1995 to 1999. The policy focus of single digits inflation by government had contributed to the achievement of this feat.

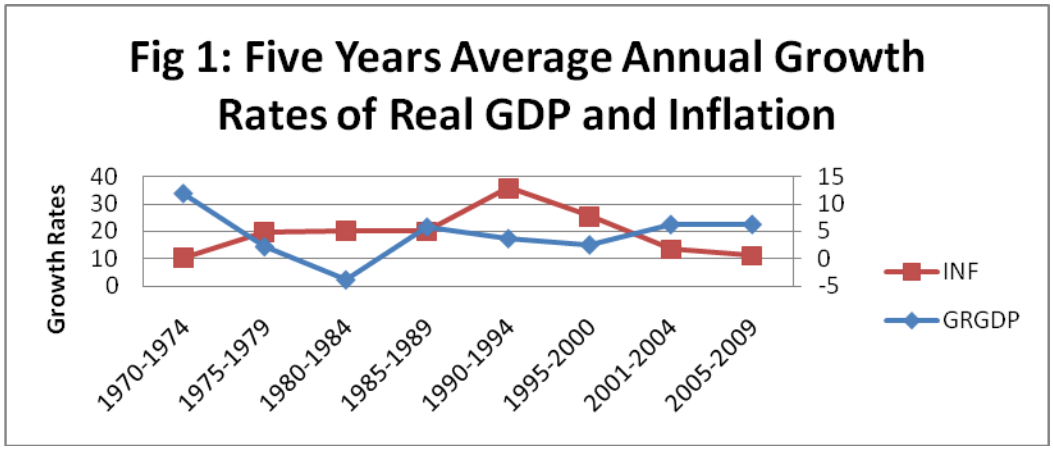
Table-1: Selected Macroeconomics Indicators (Averages)

INDICATORS	*1970-74*	*1975-79*	*1980-84*	*1985-89*	*1990-94*	*1995-99*	*2000-04*	*2005-09*
Real GDP Growth	11.8	2.17	-3.86	5.72	3.64	2.50	6.19	6.21
Inflation rate	10.4	19.8	20.3	20.1	35.8	25.4	13.5	11.1
M1 Growth	26.1	39.9	15.8	17.1	45.5	18.4	28.9	31.6
M2 Growth	30.2	36.5	18.8	15.6	41.8	21.4	27.0	33.7

Budget Deficit (% of GDP)	0.92	-2.65	-7.08	-7.55	-8.90	-2.56	-3.04	-1.14

Source: Authors Calculation from CBN Statistical Bulletin, 2010.

Growth of Real GDP on the other hand, which stood at 11.8 percent between 1970 and 1974 plummeted drastically to 2.17 percent during 1975 to 1979. A negative average annual growth rate of 3.86 was recorded between 1980 and 1984 while inflation rate rose to 20.3 percent from an average of 19.8 percent from the preceding period thus lending credence to an inverse relationship posits between the two from the theoretical standpoint. A slow growth rate of 3.64 percent was also observed during 1990 to 1994 and fell further to 2.50 between 1995 and 1999. But the country achieved a greater feat between 2000 and 2004 with a growth rate of 6.19 percent from 2.50 during 1995 to 1999 and this later spilled over to the next period averaging 6.21. In addition, the government 's fiscal operations, especially inflationary financing of large budgetary deficits by the Central Bank of Nigeria (CBN) have continued to pose serious challenge to monetary management. With the exception of surplus of 0.92 recorded between 1970 and 1974, all other periods witnessed negative budget deficits. For instance, between 1980 and 2000, the fiscal operations of the federal government resulted in deficits every year except in 1995 and 1996. The fiscal deficits were occasioned by credits through ways and means advances from the CBN. The consequences of deficit financing have reflected in rapid growth if liquidity in the economy. For instance, both the growth of M1 and M2 became heightened between 1990 and 1994 with 45.5 and 41.8 respectively while budget deficit averaged -8.90 being the highest of all periods of negative percents.



A visual inspection of the figure supports an inverse relationship between real GDP growth rate and inflation for virtually all the periods.

Theoretical Expositions on Inflation -Economic Growth Relationship

Just like earlier mentioned that conventional macroeconomics theories[4] could not also reached a consensus agreement about the nature and existence of the relationship between inflation and growth thus suggesting that variety of conclusions is possible. This section will review some of the various theoretical underpinnings which underscore the inflation-growth nexus in order to be able to put the discussion in context in what follows.

Classical Growth theory which was championed by Adam Smith laid the foundation for growth model using supply side driven model and production function argument. In the production function which includes land, labour and capital inputs. He argued that growth was self-reinforcing as it exhibited increasing returns to scale. He was able to link economy growth to investment that was created through savings. He also posited that profits decline – not because of
Decreasing marginal productivity, but rather because the competition of capitalists for workers will bid wages up. Though it was not specifically stated the linkage between inflation and economic growth but it was implicit since negative relationship was suggested as indicated by the reduction in firms' profits levels through increases in labour wage costs[5].

Keynesian Theory also provides an explanation on a possible link between inflation and economic growth through aggregate demand and supply framework. According to this model, in the short run, the (*AS*) curve is characterized by upward sloping trend rather than vertical. But If the *AS* curve were to assume a vertical line, it then means that any changes on the demand side will only resulting into price changes. However, if it is upward sloping, changes in *AD* affect both prices and output, (Dornbusch, et al, 1996). This is made possible because many factors drive the inflation rate and the level of output in the short-run. These include changes in: expectations; labour force; prices of other factors of production, fiscal and/or monetary policy.

Monetary Theory position on inflation –growth nexus was explicitly explained using The Quantity Theory of Money which provides a link between inflation and economic growth by simply equating the total amount of spending in the economy to the total amount of money in existence. Thus, inflation was the product of an increase in the supply or velocity of money at a rate greater than the rate of growth in the economy. This explanation was provided by Milton Friedman to challenge neutrality of money which holds if the equilibrium values of real variables -including the level of GDP – are independent of the level of the money supply in the long-run. Superneutrality holds when real variables - including the rate of growth of GDP - are independent of the rate of growth in the money supply in the long-run. In summary, Monetarism suggests that in the long-run, prices are mainly affected by the growth rate in money, while having no real effect on growth. If the growth in the money supply is higher than the economic growth rate, inflation will result.

[4] Like Classical, Keynesian, Neo-Keynesian, Monetarist, Neo-classical and Endogenous growth theories, each with their respective contribution to the inflation-growth relationship.-

[5] To the extent that inflation is seen as a tax on profit.

Neo-classical Theory –The earliest neo-classical models was championed by Solow (1956) and Swan (1956). The variants of these models produce different conclusions on the nature of relationship between inflation-growth nexus. One such variants was articulated by Mundell (1963) who stated that an increase in inflation or inflation expectations immediately reduces people's wealth arising from a fall in the rate of return on individual's real money balances. Greater savings means greater capital accumulation and thus faster output growth. Tobin (1965) is another neoclassical economist, whose framework shows that a higher inflation rate permanently raises output level but the effect on output growth is temporary. Tobin effect suggests that inflation causes individuals to substitute out of money and into interest earning assets, which leads to greater capital intensity and promotes economic growth. In effect, inflation exhibits a positive relationship to economic growth. Quite apparently he suggests a positive relationship between inflation and economic growth. Another variant of the model is Stockman (1981) who posits a negative relationship between inflation and economic growth. In Stockman's model an increase in the inflation rate results in a lower steady state level of output and people's
welfare declines.

In Endogenous Growth Theory, the rate of economic growth depends on the rate of return on capital, which has an inverse relationship with inflation. Variables, like inflation decreases the rate of return and this in turn reduces capital accumulation and hence decreases the growth rate. Some versions of the endogenous growth set within a monetary exchange framework also reported that inflation rate (tax) lowers both the return on all capital and the growth rate.

Given the brief theoretical reviews on the inflation -growth relationship, it is clear that each of the theory falls under one of these four major predictions as highlighted in the literature by Drukker *et al*. (2005). First, some theories find that there are no effects of inflation on economic growth. Related to this category, are those who perceives money as being super neutral. (see Sidrauski 1967). Second, are those who subscribes to the fact that money is a substitute for capital, so sees inflation as having positive effects on growth. (see Tobin 1965). Third, Stockman (1981) proposes a model in which money is seen as a complement to capital, thus inflation generates negative effects on economic growth and lastly, is a new class of theory that supports that though inflation impacts negatively on economic growth but only when it is above a certain threshold. In these models, high inflation rates exacerbate the frictions on financial markets, thus hampering efficiency and causing reduction on economic growth.

Review of Empirical Studies on Inflation Thresholds and Economic Growth

Existing empirical studies, just like theoretical models, reflect different views on the relationship between inflation and output growth. The emanated findings from these studies differ depending on data periods and countries, thus suggesting that the association between inflation and growth is not stable. Though, a vast amount of literature has attempted to offer explanations to what is considered to be an optimal inflation rate (thresholds) in different regions and countries but what is clear is that the outcome of their findings are largely mixed and somewhat inconclusive. To date,

the issue has remained the most highly researched policy issue among academic researchers and policy makers alike. The studies on inflation thresholds can be perceived as falling into two major lineages of research. The first being those who conducted studies on inflation thresholds-growth using cross countries datasets (Fischer, 1993 ; de Gregorio 1992, 1994 ;Sarrel,1996; Phillips,1998; Bruno and Easterly, 1998; Khan and Senhadji,2001; Kremer etal, 2009) and those who focused mainly on country specific experiences (like e.g Nell, 2000; Faria and Carneiro,2001; Sweidan,2004; Hussain,2005; Mubarik,2005; Ayyoub,2011).

Fischer (1993) and de Gregorio (1992, 1994) have investigated the link between inflation and growth in time-series, cross section and panel data sets for a large numbers of countries. The main result of these works is that there is a negative impact of inflation on growth. Fisher (1993) argued that inflation hampers the efficient allocation of resources due to harmful changes of relative prices. Barro (1997) used a panel data for 100 countries over the period 1960-1990 and estimated growth regression using Instrumental Variables (IV) technique. He obtained clear evidence that a negative relationship exists only when high inflation data was included in the sample. He further submitted through his estimation that 10% of inflation reduces real GDP per capita by 0.2% per year. Sarrel (1996) found the evidence of structural break in interaction between inflation and growth. He used fixed effect technique to deal with panel data sample covering 87 countries over 21 years (1970-1990). The main result is that the estimated threshold level equals to 8 percent, exceeding which leads to negative, powerful and robust impact of inflation on growth. Bruno and Easterly (1998), for example, showed in a cross-sectional setting that inflation has only a detrimental impact on long-term economic growth if inflation exceeds a critical level of 40% — a rather large value which may be of only of limited relevance for monetary policy of many countries. Christoffersen and Doyle (1998) investigated the nonlinear relationship between inflation and growth for 22 transitional countries over the time period from 1990 to 1997. They used Sarrel's (1995) approach to modeling the kinked interaction between inflation level and economic growth. As a result, the authors found that threshold level is 13%. They did not find any evidences that output will be rapidly increased by high inflation for countries that keep inflation below this threshold level. This result showed that policy makers should keep inflation at some specific threshold level where the favorable impact of inflation on growth performance is the highest. Khan and Senhadji (2001) investigated the inflation-growth interaction for both developing and developed countries applying the technique of conditional least squares. They used the panel data set on 140 countries (both industrial and developing) over the period 1960-1998. The authors employed the method of non-linear least squares to deal with non-linearity and non-differentiability of the inflation threshold level in growth regression. As a result, they obtained estimates of the threshold levels of 1-3% for developed and 11-12% for developing countries, which turned out to be very precise. The authors mentioned that the total negative effect of inflation may be underestimated due to the fact that they controlled investment and employment, so the main channel of impact is productivity. Nevertheless, this study asserted the idea that low inflation is a good thing for the economy because it has favorable influence on growth performance. Kremer *et al.* (2009) provides new evidence on the effect of inflation on long-term economic growth for a panel of 63 industrial and non-industrial

countries. The empirical results show that inflation impedes growth if it exceeds thresholds of 2% for industrial and 12% for non-industrial countries, respectively. The study, however, indicates that below these thresholds, the effects of inflation on growth are significantly positive.

Aside the cross country studies that had been conducted on inflation-growth nexus, a large handful of country-specific studies were also documented on the same issues. Nell (2000) examines the issue whether inflation is always harmful to growth or not? Considering the South African Economy's data for the period 1960-1999 and dividing it into four episodes, using Vector Auto Regressive (VAR) technique, his empirical results suggest that inflation within the single-digit zone may beneficial to growth, while inflation in the double digit zone appears to impose costs in terms of slower growth. Faria and Carneiro (2001) investigate the relationship between inflation and output for the economy of Brazil where permanent inflationary shock has been observed for the last many years. They use a bivariate vector auto-regression composed of output growth and the change in inflation in order to test the hypothesis that inflation has long run impact on output. They also use the data for the same period 1980-95 to estimate the short run relationship between inflation and real output. Their findings verify Sidrauski's superneutrality of money which can be defined as inflation has no real effect on output and productivity in the long-run. Their results suggest that inflation has real effects on output in the short run. Faria and Carneiro (2001) using time series annual data between 19760 and 2008, documented a threshold inflation rate of 11% for Ghana economy and that beyond which inflation will have adverse effects on the rate of economic growth and below which the impacts the impacts will remain mild. Sweidan (2004) examines the relationship between inflation and economic growth for economy of Jordan and finds a structural break point at 2 percent level of inflation. Another issue which is covered by the study is to check the effect of inflation uncertainty on the growth and developments in the economy. The result implies that the effects of inflation on growth are stronger as compared to the effects of inflation uncertainty and variability. Mubarik (2005) estimates the threshold level of inflation in Pakistan using annual data for the period 1973 to 2000.The empirical results from his study suggest 9 percent threshold level of inflation for the economy of Pakistan, above which inflation is very unfavorable for economic growth. The study follows the work of Khan and Senhadji (2001) in which they calculate threshold level for both the developing, including Pakistan, and developed economies. They use panel data for 140 developing and developed economies for the period 1960 to 1998 and suggest threshold levels,1-3 percent and 7-11 percent, for both group of countries respectively. Hussain (2005) finds no definite threshold level of inflation for Pakistan and just suggests that 4-6 percent range of inflation is tolerable for economy of Pakistan. This study shows similar results with Singh (2003) which recommends 4-7 percent range of inflation for India. The researcher contradicts with Mubarik (2005) as 9 percent threshold level for Pakistan appears to be on the very high side. He also follows the methodology used by Khan and Senhadji (2001) and Singh (2003) and advises the central bank authorities to keep the inflation low and stable, irrespective of any threshold level. Ayyoub. et al (2011), also re-examine the existence of inflation growth relationship in the economy of Pakistan and to analyze empirically the impact of inflation on GDP growth of the economy. Annual time-series data for the period 1972-73 to 2009-10 were

used and they employ the method of Ordinary Least Squares (OLS). A negative and significant inflation growth relationship has been found to be existed in the economy of Pakistan. The results of the study show that prevailing inflation is harmful to the GDP growth of the economy after a certain threshold level of 7% was established. Suggestions was offer to State Bank of Pakistan to restrict the inflation below the 7 percent level and to keep it stable. So that it may exert its positive effects on economic growth of the economy.

In Nigeria, we are only aware of two documented studies in this regard. First, Fabayo and Ajilore (2006) who examined the existence of threshold effects in inflation-growth relationship using Nigeria data for the period 1970-2003. The results suggest the existence of inflation threshold level of 6%. Below this level, there exists significantly positive relationship between inflation and economic growth, while above this threshold level, inflation retards growth performance. Sensitivity analyses conducted confirmed the robustness of these results. This finding suggests that bringing inflation down to single digits should be the goal of macroeconomic management in Nigeria. Recently was a study conducted by Salami and Kelikume (2010) to determined the inflation thresholds for Nigeria using annual time series data spread over two periods 1970-2008 and 1980-2008. Using a non linear inflation-growth model, control variables such as growth in the ratio of broad money supply to GDP (GLM2/GDP) and growth in term of trade (GLTOT), they established an inflation threshold of 8 percent for Nigeria over the sample period 1970-2008.

In light of the above theoretical and empirical literature reviews, it can therefore be seen that the issue concerning inflation and economic growth is still ongoing as there are divergences in the level of inflation thresholds either from cross country and/or country specific studies' experiences. However, there seems to be convergence of opinions as to the fact that low rates of inflation do not impact negatively on the long run rates of real economic growth. The reverse of the argument holds for a country that has been witnessing episodes of high rates of inflation.

THE MODEL AND METHODOLOGY

This section contains the specification of the relationship between inflation and growth in a production function growth framework. Also, the description and measurement of the variables used in the empirical analysis is presented. Finally, we expound on the adopted Autoregressive Distributed Lag Model (ARDL) of Bound Testing Approach. This is pursue in what follows:

The paper employs two econometric models to achieve the empirical results: the first one examines the short-run and long-run relationships between real GDP and inflation as well as control for other variables[6] like investment, population, degree of openness and financial development index, by

[6] Any empirical analysis of inflation's impact on economic growth has to control for the influence of other economic variables that are correlated with the rate of inflation.

applying the *Engle-Granger* (1987) two stage co-integration procedure and the associated Error Correction Model (ECM). As a prelude to the main estimation, the unit roots of concerned time series variables are tested for since economic data are known to have unit root problems. The paper adopts a simple production function of the form specified below as follows:

$$Q = AKL \text{----------(1)}$$

Where **Q** stands for output , **A** measures the level of technological advance, **K** and **L** represent quantities of capital and labour used in the production of Q. The long run growth equation function for Nigeria is specified as follows:

$$RGDP = \theta_0 + \theta_1 INF + \theta_2 INV + \theta_3 POP + \theta_4 FI + \theta_5 TOT + \theta_6 OPN + \mu \text{ ---(2)}$$

Where RGDP= real GDP, INF=inflation, FI=financial development index, OPEN=openness, POP=population and μ is random error term or residual. In the second stage, the Error Correction Model (ECM) is employed to see whether the economy is approaching equilibrium in the long-run or not and the short-run dynamics of the co-integrated time series variables. The ECM is internally consistent if the two time series variables are co-integrated of the same order or if they are stationary (Greene, 2003: 654). Engle and Granger (1987) show that if two variables are co-integrated, i.e., there is a valid long-run relationship, and then there exists a corresponding short-run relationship. This is popularly known as the *Granger's Representation Theorem.* Hendry's (1979, 1995) *general-to-specific* approach has been applied in this case where the model (i.e., ECM) is used in the following form:

$$\Delta LNGDP_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta LNGDP_{t-i} + \sum_{i=1}^{n} \theta_{2i} \Delta INF_{t-i} +$$
$$\sum_{i=0}^{n} \theta_{3i} \Delta LNINV_{t-i} + \sum_{i=0}^{n} \theta_{4i} \Delta LNPOP_{t-i} + \sum_{i=0}^{n} \theta_{5i} \Delta FI_{t-i} +$$
$$\sum_{i=0}^{n} \theta_{6i} \Delta LNTOT_{t-i} + \sum_{i=0}^{n} \theta_{7i} \Delta LNOPN_{t-1} - \theta_8 ECM_{t-i} + \varepsilon_i \text{----------(3)}$$

Where, Δstands for the difference operator, ECM_{t-i} is error correction term lagged one period, ε_i is the random disturbance term, n shows the number of lag lengths determined by the Akaike's information criterion (AIC).

The second model estimated in the paper utilizes threshold regression model developed by Khan and Senhadji (2001) to estimate the threshold level of inflation for Bangladesh above which inflation affects economic growth negatively. The equation to estimate threshold level of inflation has been considered in the following conditional form:

$$GDP_t = \phi_0 + \phi_1 INF_t + \phi_2 D(INF - K) + X\eta + \varepsilon_t \text{ ----------(4)}$$

Where, K is the threshold level of inflation. The dummy variable D is defined in the following way:

$$D = \begin{cases} 1 \ if^{INF>K} \\ 0 \ if^{INF\leq K} \end{cases} \text{----------(5)}$$

The variable X is a vector of control variables which include the gross domestic investment , population and degree of openness and financial development index.

As per the definition in Mubarik (2005) the parameter K (that is the threshold inflation level) has a property that the relationship between economic growth and inflation is given by: (i) (ϕ_1) represents low inflation; (ii) $(\phi_1 + \phi_2)$ represents high inflation. The high inflation means that when the long-run inflation estimate is significant then both coefficients $(\phi_1 + \phi_2)$ would be added to see their impact on growth and that would be the threshold level of inflation. By estimating regressions for different values of k which is chosen in an ascending order (that is 1, 2, 3 so on), the optimal value of k is obtained by finding the value that maximizes the R2 from the respective regressions. In other words, the optimal threshold level (k*) is that which minimizes the Residual Sum of Squares (RSS). The lack of knowledge of the optimal number of threshold points and their values complicates estimation and inference. Though the procedure is widely accepted in the empirical literature, it is tedious since several regressions have to be estimated. Khan and Senhadji (2001) discuss the details of the estimation procedure and the computation methods.

DATA AND EMPIRICAL RESULTS

We use annual time series data set for the period of 1970- 2010. This period of coverage was chosen based on availability of the data. Data were sourced from the World Development Bank (WDI) 2011 and Central Bank of Nigeria Statistical Bulletin, 2010. All the variables were log transformed so that the problem of heteroskedasticity can be reduced since it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold (Gujarati,1995). In addition all the nominal variables are also converted to real values.

PRESENTATION OF RESULTS

This section begins with correlation matrix so as to ascertain that the variables are not highly correlated and after which the unit root tests are conducted in order to test for the time series properties of the variables.

Correlation matrix results depict the level of association among the variables concerned. It is clear from table 1 that there seems to be weak positive correlation between the real GDP and inflation as indicated by the value of 0.1636. This outcome further lends credence to the results of pairwise granger causality test in table 2 below that presents an independent relationship between the two.

Apart from the real GDP and term of trade which bear positive relationships with inflation, other variables carry negative signs. This in effect implies that any increase in any of the variables (like INV, POP and FI) will have declining impacts on the growth rate of real GDP. Thus, with the nature of relationship which subsists among these variables, it becomes apparent that the problems of multicollinearity that may likely stem from estimated results have been avoided.

Table-1: Correlation Matrix

	INF	LNGDP	LNINV	LNPOP	LNFI	LNTOT	LNOPN
INF	1						
LNGDP	-0.1636	1					
LNINV	0.1259	0.4436	1				
LNPOP	-0.0055	-0.3203	0.5504	1			
LNFI	-0.0335	0.6094	0.0834	0.2141	1		
LNTOT	-0.2099	0.3319	-0.4307	0.3799	0.5505	1	
LNOPN	-0.3754	0.5432	0.3241	0.2132	-0.2321	-0.2872	1

Source: Estimated with E-views

GRANGER CAUSALITY TEST RESULTS

This test is normally performed in order to measure the linear causation between inflation and economic growth. It is basically concerned with the use of past information in a variable to be able to predict the value of the other. The study applies causality test developed by Granger (1969). The study therefore specifies pairwise causality test of the form:

$$INF_t = \delta_0 + \sum_{i=1}^{\tau_1} \delta_{1i} INF_{t-1} + \sum_{i=1}^{\tau_2} \delta_{2i} RGDP_{t-1} + \varepsilon_{1t} \text{ ----------(6)}$$

$$RGDP_t = \varsigma_0 + \sum_{i=1}^{m_1} \varsigma_{1i} RGDP_{t-1} + \sum_{i=1}^{m_2} \varsigma_{2i} INF_{t-1} + \varepsilon_{2t} \text{ ----------(7)}$$

Where τ_1, τ_2, m_1 and m_2 are the optimal lag length, ε_{1t} and ε_{2t} are white noise error terms which are identically and independently normally distributed with mean zeros and constant variance. The results in table 2 shows that the null hypothesis that inflation does not granger cause real GDP cannot be rejected thus suggesting that inflation does not lead to growth of real GDP. Similar argument holds from real GDP to inflation. Hence, they are both independent as they do not causes each other. This by implication suggests that information on past values on either of the variable cannot be used to predict their future values. This outcome is consistent as well as further confirms the earlier findings by Salami and Kelikume (2010) and Omoke (2010) for Nigeri

Table-2. Pairwise Granger Causality Test Results

Sample: 1970-2010 **Null Hypothesis**	**F-Statistics**	**Probability Value**
INF does not granger cause RGDP	1.34131	0.27499
RGDP does not granger cause INF	0.61780	0.54507

Source: Estimated with E-views

UNIT ROOT TEST RESULTS

In order to test for the stationarity of the data used in this study, the Augmented Dickey-Fuller (ADF) and Phillip Perron tests are used. These tests examined the null hypothesis that each of the variables has a unit root (non-stationary) versus the alternative hypothesis that the variable is stationary. The ADF and Phillip perron test results presented in Table 3 clearly reveal that all the variables under investigation are integrated of order 1, they become stationary after first differencing. Both tests did not produce any significant different results. The results depict that all the variables are first difference stationary.

Table-3. Unit Root Test Results

Series	Augmented Dickey Fuller		Phillip Perron	
	Intercept with no trend	Intercept with time trend	Intercept with no trend	Intercept with time trend
Level				
INF	-2.8097	-2.7589	-2.5802	-2.5210
LNRGDP	-2.6653	-2.1267	-2.8334	-2.5242
LNINV	-2.6013	-2.3549	-2.6013	-2.3907
LNGRPOP	-2.3496	-2.3496	-1.9742	-2.2687
LNFI	-2.0587	-2.0654	-1.8346	-1.8956
LNTOT	-2.6971	-1.5065	-2.7344	-1.4842
LNOPN	-1.9817	-1.8538	-2.2122	-1.7623
First Difference				
ΔINF	-7.1088***	-7.0683***	-15.6803***	-15.2851***
ΔLNGDP	-5.5986***	-5.9954***	-5.5649***	-6.4301***
ΔLNINV	-7.0732***	-6.9801***	-7.8607***	-7.6980***
ΔLNPOP	-4.1766***	-7.8293***	-6.2374***	-5.4641***
ΔLNFI	-3.2092**	-4.6488***	-4.7147***	-3.2549**
ΔLNTOT	-6.4317***	-7.2226***	-6.4298***	-7.2020***
ΔLNOPN	-5.0119***	-6.6117***	-6.0515***	-6.0515***

Note: *** and ** denote the rejection of the null hypothesis of unit root at the 1% and 5% level of significance, respectively. The lag order for the series was determined by the Akaike Information Criterion. The symbol of Δ is the first difference.

Applying ordinary least square (OLS) to equation (2) yields the long run regression results reported in Table (4).

Table-4. Estimates of Long-run Real GDP model

Dependent variable: **LN** $RGDP$		
Regressors	Parameter estimates	T-ratio
Intercept	2.008673	24.89385***
INF	-0.002383	-0.216229
LNINV	-0.017249	-1.284843
LNPOP	0.002456	1.653904
LNTOT	0.041168	2.145172**
LNFI	0.058519	2.205577**
LNOPN	0.036593	2.432123**
R^2	0.887170	
$AdjR^2$	0.874633	
F-Statistics	7.923218	
D.W	1.3101693	

Table 4 reveals that inflation carries a negative sign but statistically insignificant, thus implying that an increase of one percentage point in inflation rate is associated with 0.002 percentage point reduction in the level of economic activity, albeit negligible when compared to the percentage change in the prices of goods and services. Many empirical studies on inflation-growth relationship have documented negative relationship the two. Such studies include Fisher (1993) De Gregorio (1993) Barro (1995,1996); Brunno and Easterly (1995); Malla (1997); Faria and Carneiro (2001) Dewan & Hussein (2001) and Mubarik,(2005). The negative sign on coefficient of investment variable contradicts earlier studies as it reduces the level of economic activities though not statistically significant. This may be explained, in part, by the deteriorating nature of public infrastructural investment. Examples include bad and poor feeder roads, epileptic power supply, incessant communication network failure by the service providers etc. countless number of studies in Nigeria have documented the crowding out effects of Nigeria's government investment on businesses and consequent retardation on economic growth. The population variable though bears the expected sign of positive relationship with economic growth but it is insignificant in the long-run. It is not implausibly to attribute this to the fact that the advantage inherent in population growth does not seem to be translated into any meaningful progress in the context of the Nigerian economy. Unemployment and underemployment are two major phenomena that have characterized the Nigeria economy's experience. In effect, majority of people are without jobs even those that are fortunate enough were seriously underutilized.

In addition, term of trade, financial index and degree of openness variables have the expected hypothesized signs and statistically significant at the conventional levels of 5%, implying that an increase in any of these variables will lead to an increase in the overall economic growth. For instance, the financial reforms that were adopted and implemented by the country have had positive impact on growth. This has been validated by some many empirical studies like Osikoya,1992; Fowowe, 2011 etc. The same is applicable to the degree of openness which engendered technological diffusions and ease capital mobility between and /or among the trading partners. All of these serve to facilitating effective human and material developments and consequently

promotes economic growth. In addition, for robustness, the high R^2 is suggestive of the fact that the total variations in the growth of economy can be attributed majorly to the explanatory variables to the tune of 89%. A dynamic modeling using the variable at their levels would results in spurious regression as it is confirmed by the test in the static regression shown in Table (4). The table indicates low values of D-W statistics (1.3102).

Cointegration Test

Having established unit root problems in the variables; the next step is to test whether a long run relationship exists among the variables of equation (2). The Engle-Granger Two-Step procedure and the Johansen Maximum Likelihood procedure were applied. The below shows that there is co-integration between real GDP and its regressors of the model as the residual is found to be stationary at all levels of significance. The stationarity is observed from both the Augmented Dickey Fuller and Phillip Perron tests.

Table-5. Residual of the co-integration test Using Engle-Granger Two Step Procedure

Variable	**Test Statistics**			
Residuals from the static long run of growth model	**Augumented Dicken Fuller**		**Phillip-Perron**	
	With intercept	With intercept and Time Trend	With intercept	With intercept and Time Trend
	-5.7493	-5.6822	-5.7529	-5.6808
Critical values				
1%	-3.615588	-4.219126	-3.615588	-4.219126
5%	-2.941145	-3.533083	-2.941145	-3.533083
10%	-2.609066	-3.198312	-2.609066	-3.198312

Before undertaking the Johansen-Juselius Maximum Likelihood cointegration test, we first of all specify the relevant order of lags (*p)* of the VAR model. We select 2 for the order of the VAR since the sample size is relatively small (See Pesaran and Pesaran, 1997). On the basis of the foregoing, the Johansen and Juselius (1990) is applied to determine whether any combinations of the variables are cointegrated.

Table-6. Johansen-Juselius Maximum Likelihood Cointegration Tests

Maximal eigenvalue test				Trace test			
Null	Alternative	Statistics	95% critical value	Null	Alternative	Statistics	95% critical value
$r=0$	$r=1$	68.94	39.37	$r=0$	$r=1$	157.03	94.15
$r\leq 1$	$r=2$	34.24	33.46	$r\leq 1$	$r=2$	88.09	68.52
$r\leq 2$	$r=3$	21.52	27.07	$r\leq 2$	$r=3$	53.85	67.21
$r\leq 3$	$r=4$	15.05	20.97	$r\leq 3$	$r=4$	32.33	39.68
$r\leq 4$	$r=5$	12.32	14.07	$r\leq 4$	$r=5$	17.28	25.41
$r\leq 5$	$r=6$	4.96	3.76	$r\leq 5$	$r=6$	4.96	5.76

Note: r stands for the number of cointegrating vectors

Starting with the null hypothesis of no cointegration $(r=0)$ among the variables, the maximal eigenvalue statistic is 68.94, which is above the 95% critical value of 39.37. Hence it rejects the null hypothesis $r=0$ in favour of the alternative hypothesis $r=1$. As can be observed from the table also, the null hypotheses of, $r\leq 2$, $r\leq 3, r\leq 4$ and $r\leq 5$ cannot be rejected at a 5% level of significance. Consequently, we conclude that there are only two cointegrating equations at the 5% level.

Turning to the trace test, the null hypothesis of no cointegration $(r=0)$ is rejected at 5% level of significance in favour of the alternative hypothesis $r=1$. However, the test fails to accept the null hypothesis of $r\leq 1, r\leq 2$, $r\leq 3, r\leq 4$ and $r\leq 5$. Like maximal eigenvalue, we conclude that there are two cointegrating equations at the 5% level.

Estimation of an Error-Correction Model

Once a cointegrating relationship is established, then an ECM can be estimated to determine the short-run dynamic behaviour of the real GDP growth equation. This is further supported by Engle and of Granger representation theorem which states that the existence of the cointegrating relationship among a set of variables that are not stationary in levels, implies there will be a short-run error correction relationship associated with them. Following Hendry's (1995) general-to-specific modeling approach, we include 3 lags of the explanatory variables and of the error correction term and then gradually eliminate the insignificant variables until parsimonious error correction model is obtained. The results of which is presented in what follows:

The table below shows that the lag values of growth of real GDP have declining impacts on the current real GDP and this increase progressively from first to third lags. The can be attributed mainly to the high level of corruption and rent-seeking behaviour which had pervaded those vested with political powers in Nigeria. Most times, the political office holders see national resources as resources to be shared but not to be used for any developmental projects. Also, the current and previous values of inflation do not have any negative impact on the growth of real GDP as they both co-moved together at least in the short run. By implication, they both bear positive relationship with each other in the short term. Albeit, the relationship between the two is negative in the long run as can be observed in table.4 because the impact of long run negativity far outweighs that of short run positivity. The two -year lag value of investment has a negative and statistically significant impact on real GDP growth. This can partly be attributed to poor and lack of maintenance culture on the part of Nigeria citizenry in maintaining public investments which aid in the further production of goods and services. In addition, obsolete and dilapidated infrastructural facilities can possibly be held accountable as a factor responsible for the observed result. Interestingly however is the effect of population growth on real GDP growth rate. The impacts of lag values are found to be mixed while at the same time, are statistically significant at a conventional level of 1% . The likely explanation for this may be likened to frequency with which capital is being substituted for labour services due to emergence of information technology in spite

of a growing population. Further, the current term of trade variable and its third year lag value is found to have increasing effects on the growth of real GDP. This can largely be attributed to favourable trade policies which have been instituted as well as positive government disposition towards both bilateral and multilateral trade agreements with other trading partners within and outside the sub-Saharan continent. The financial index (FI) measured by financing deepening indicator is insignificant at the current period but its lag value seems to impact negatively on real GDP growth as indicated by both t-statistics and probability values. A plausible explanation is that of shallowness and undeveloped nature of Nigerian financial system in the pre-reformed era which was largely repressive in nature. In addition, a measure of degree of openness is also insignificant on the growth of real GDP in the short run. This can, in part, be explained by repatriation of profits by foreigners doing businesses in Nigeria to their home country. The table also shows the disequilibrium errors accumulated in the previous period that are corrected in the current period. The speed of adjustment of the real GDP growth to the long run equilibrium path is low. Specifically, only about 12% of the disequilibrium errors that occurred in the previous year are corrected in the current year.

Table-7. Estimated error-correction model

Dependent variable: Δ(LNRGDP)		
Regressors	**Parameter estimates**	**T-ratio**
Intercept	0.015[0.035]	3.288***
Δ(LNRGDP(-1))	-0.216[0.117]	-1.637
Δ(LNRGDP(-2))	-0.361[0.007]	-3.017***
Δ(LNRGDP(-3))	-0.495[0.002]	-3.518***
Δ(LNINF)	0.011[0.039]	2.201**
Δ(LNINF(-1))	0.009[0.187]	1.363
Δ(LNINV(-2))	-0.016[0.050]	-2.072
Δ(LNPOP(-1))	4.891[0.000]	5.699***
Δ(LNPOP(-2))	-8.884[0.000]	-6.019***
Δ(LNPOP(-3))	5.214[0.000]	6.180***
Δ(LNTOT)	0.060[0.003]	4.375***
Δ(LNTOT(-3))	0.039[0.012]	2.756**
Δ(LNFI)	0.047[0.127]	1.588
Δ(LNFI(-1))	-0.055[0.063]	-1.961*
Δ(LNOPN)	0.002[0.973]	1.637
Δ(LNOPN(-1))	0.005[0.732]	1.343
ECM(-1)	-0.117[0.022]	-2.187**
R^2	0.76	
$AdjR^2$	0.59	
D.W	2.163	
S.E	0.022	
Diagnostic Statistics		

Normality	0.381
Serial Correlation	1.082
ARCH LM test	1.731
Heteroscedasticity	2.411
Ramsey reset test	8.897

Note: The figures in parentheses are t-statistics and all variables are defined earlier.

The diagnostic tests of the estimated ECM model suggest that the model passes the tests of serial correlation, functional form misspecification, normality and heteroscedasticity.

Estimation of Threshold Level of Inflation

The table 8 presents the optimal level of Inflation that is necessary for propelling sustainable economic growth in Nigeria. From the estimated results, it can be observed that at low threshold inflation levels below nine percent, there is a statistically insignificant relationship between the dummy of threshold level of inflation and economic growth. As threshold begins to increase starting from 9-percent upward, a statistically significant relationship is observed between economic growth and the dummy of threshold level of inflation which continues up to 12-percent inflation rate. However, in the estimation process, the threshold level of inflation is observed at 9-percent level where the value of R^2 is maximized i.e. RSS is minimized. While inflation below this threshold level has no significant effect on economic growth (i.e. statistically insignificant), inflation rates above it, has a significant negative effect on economic growth. Therefore, the empirical analysis suggests that if inflation rate is above 9-percent, then the economic growth performance of Nigeria might experience a declining situation.

Table-8. Parameter Estimates of Threshold Model

Threshold Levels	Variables	Coefficients	Standard Error	T- Statistics	R-Squared	Residual Sum of Square(RSS)
1%	C	2.533183	0.236998	10.68864	0.848	0.027
	INF	-0.026542	0.014482	-1.332747		
	D(INF-K)	-0.001163	0.000776	-1.497682		
	INV	0.010979	0.010883	1.008844		
	GRPOP	0.237512	0.217182	1.093609		
	FI	0.022757	0.032533	0.699494		
	TOT	0.029785	0.019150	1.555337		
	OPN	0.137701	0.098871	1.310237		
	AR(1)	0.856436	0.063834	13.41671		
2%	C	2.532020	0.237052	10.68128	0.848	0.027
	INF	-0.026542	0.014482	-1.332747		
	D(INF-K)	-0.001163	0.000776	-1.497682		
	INV	0.010979	0.010883	1.008844		
	GRPOP	0.237512	0.217182	1.093609		
	FI	0.022757	0.032533	0.699494		

	TOT	0.029785	0.019150	1.555337		
	OPN	0.137701	0.098871	1.310237		
	AR(1)	0.856436	0.063834	13.41671		
3%	C	2.530858	0.237109	10.67381	0.848	0.027
	INF	-0.026542	0.014482	-1.332747		
	D(INF-K)	-0.001163	0.000776	-1.497682		
	INV	0.010979	0.010883	1.008844		
	GRPOP	0.237512	0.217182	1.093609		
	FI	0.022757	0.032533	0.699494		
	TOT	0.029785	0.019150	1.555337		
	OPN	0.137701	0.098871	1.310237		
	AR(1)	0.856436	0.063834	13.41671		
4%	C	2.531290	0.237209	10.67113	0.848	0.027
	INF	-0.026138	0.014337	-1.323086		
	D(INF-K)	-0.001145	0.000771	-1.485690		
	INV	0.011145	0.010918	1.020759		
	GRPOP	0.237484	0.217281	1.092979		
	FI	0.022622	0.032554	0.694903		
	TOT	0.029774	0.019164	1.553625		
	OPN	0.137701	0.098871	1.310237		
	AR(1)	0.856176	0.063968	13.38449		
5%	C	2.532129	0.237328	10.66932	0.844	0.028
	INF	-0.025625	0.014153	-1.810528		
	D(INF-K)	-0.001123	0.000764	1.470064		
	INV	0.011340	0.010964	1.034299		
	GRPOP	0.237400	0.217413	1.091932		
	FI	0.022458	0.032581	0.689300		
	TOT	0.029752	0.019181	1.551109		
	OPN	0.113321	0.098871	1.213037		
	AR(1)	0.855888	0.064122	13.34771		
6%	C	2.534828	0.237362	10.67916	0.849	0.028
	INF	-0.024934	0.013837	-2.801978		
	D(INF-K)	-0.001091	0.000749	-1.457065		
	INV	0.011269	0.010965	1.027756		
	GRPOP	0.238253	0.217694	1.094436		
	FI	0.022673	0.032590	0.695704		
	TOT	0.029289	0.019142	1.530120		
	OPN	0.113321	0.098871	1.213037		
	AR(1)	0.856219	0.063793	13.42190		
7%	C	2.538324	0.237383	10.69297	0.848	0.028
	INF	-0.024091	0.013420	-1.795199		
	D(INF-K)	-0.001053	0.000729	-1.444846		
	INV	0.011045	0.010940	1.009595		
	GRPOP	0.239591	0.218044	1.098821		
	FI	0.023120	0.032595	0.709330		
	TOT	0.028641	0.019085	1.500700		
	OPN	0.113321	0.098871	1.213037		

	AR(1)	0.856837	0.063255	13.54566		
8%	C	2.541014	0.237683	10.69075	0.848	0.028
	INF	-0.022856	0.012910	-1.770322		
	D(INF-K)	-0.001996	0.000706	-1.411182		
	INV	0.010650	0.010907	0.976465		
	GRPOP	0.240093	0.218548	1.098582		
	FI	0.023404	0.032633	0.717191		
	TOT	0.028226	0.019077	1.479555		
	OPN	0.113321	0.098871	1.213037		
	AR(1)	0.857540	0.062880	13.63768		
9%	C	2.543308	0.238148	10.67951	0.852	0.025
	INF	-0.031385	-0.012344	-2.732443		
	D(INF-K)	-0.020932	0.000685	-2.361857		
	INV	0.003902	0.010893	0.945765		
	GRPOP	0.059883	0.219135	2.894680		
	FI	0.023394	0.032695	0.715515		
	TOT	0.028106	0.019116	1.470322		
	OPN	0.065432	0.098871	1.212113		
	AR(1)	0.858090	0.062753	13.67408		
10%	C	2.545282	0.238506	10.67179	0.850	0.026
	INF	-0.041076	0.011788	-2.703131		
	D(INF-K)	-0.039878	0.000664	-2.322504		
	INV	0.004017	0.010881	0.920589		
	GRPOP	0.049640	0.219591	2.791301		
	FI	0.023304	0.032743	0.711729		
	TOT	0.028073	0.019153	1.465752		
	OPN	0.003421	0.098871	1.432167		
	AR(1)	0.858512	0.062683	13.69599		
11%	C	2.546769	0.237798	10.70980	0.850	0.026
	INF	-0.042812	0.011275	-2.757080		
	D(INF-K)	-0.038897	0.000647	-2.386180		
	INV	0.002968	0.010831	0.920321		
	GRPOP	0.041926	0.219064	2.604360		
	FI	0.023212	0.032659	1.710740		
	TOT	0.028271	0.019112	1.479233		
	OPN	0.003421	0.098871	1.432167		
	AR(1)	0.857966	0.062718	13.67971		
12%	C	2.547495	0.236991	10.74936	0.837	0.029
	INF	-0.069595	0.010804	-2.813690		
	D(INF-K)	-0.051922	0.000632	-3.858507		
	INV	0.009965	0.010782	0.924265		
	GRPOP	0.044010	0.218340	2.717569		
	FI	0.023024	0.032564	0.707053		
	TOT	0.028640	0.019078	2.501180		
	OPN	0.083421	0.098871	1.510037		
	AR(1)	0.857195	0.062880	13.63213		

Source: Estimated with E-views

The results which emanate from the above are consistent with the findings of Tarawalle (2011) for Sierra Leone, Mubarik (2005) for Pakistan and Selenteng (2005) for Lesotho. The empirical results further lend credence to Khan and Senhadji (2001) findings that put developing countries threshold levels within the range of 7 and 11 percent. The result shows that if inflation increases beyond 9%, economic growth is estimated to reduce by 0.03 percent. The percentage reduction in the growth rate of an economy increases progressively as the level of threshold increases. However, the negative effect of inflation on growth trajectory though statistically significant but not as much as expected. What this implies in effect is that inflation does not wield pervasive and damaging impact on growth as far as Nigeria case is concerned. This result further corroborates our earlier assertion that neither inflation nor economic growth granger causes each other. The probable reasons for this development may be likened to the structure of the Nigerian economy which is largely monocultural in nature. Thus, Nigerian economic growth could be said to bode well on account of oil industry which remains the main driven engine for the country.

It is also discernable from the results some key important determinants of economic growth in Nigeria. Factors like investment, growth rate of population, financial development index, term of trade and degree of openness bear the expected signs but with varying levels of statistically significance. Investment is found to be statistically insignificant. This result is not unexpected given the prevalence of infrastructural decay which has characterized every facet of the country's economic lives. To the extent that most blue-chip companies have left the shores of the country for more infrastructurally- stable countries. The growth rate of population has significant impact on the country's economic growth as indicated by t-value of 3.895. What this portends for country's development is that Nigeria has been able to tap on its labour potentials. The result shows that a unit increase in population will raise the rate of economic growth by 0.06 when 9% threshold level is maintained. The index of financial development does not seem to be statistically significant in explaining Nigerian economic growth. The measure of financial deepening variable used shows that it could not translate into growth. This explains why financial sector reforms (which are still ongoing) have been instituted to be able to put sanity into the operational modalities of banking system in Nigeria. In addition, both terms of trade and openness were also not significant. The likely excuse for these might be likened to continually trade deficits posture of the country (for former) and public-private investment crowd-out by foreign investment whose profits are usually remitted back to their home country.

Finally, the structural stability of the long-run and short-run relationships for the entire period is examined by the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of the recursive residual test which proposed by (Brown et al, 1975). The null hypothesis of these tests is that the regression equation is correctly specified. These two tests are presented in figure 1 and 2. The pair of straight lines is each figure indicates the 5 per cent significant level and if the plotted CUSUM and SUSUMSQ graphs remain inside the straight lines the null hypothesis of correct specification of the model can be accepted. Otherwise, the null hypothesis is rejected and it can be concluded that the regression equation is miss-specified. The two figures reveal that the plots of

CUSUM and SUSUMSQ stay within the lines, and, therefore, this confirm the equation 1 is correctly specified and stable. The selected models adopted in the study seem to be good and robust in estimating the short and long-run relationships between economic growth and the determinants considered.

Figure-1. Plotting of CUSUM Statistics for Stability Test

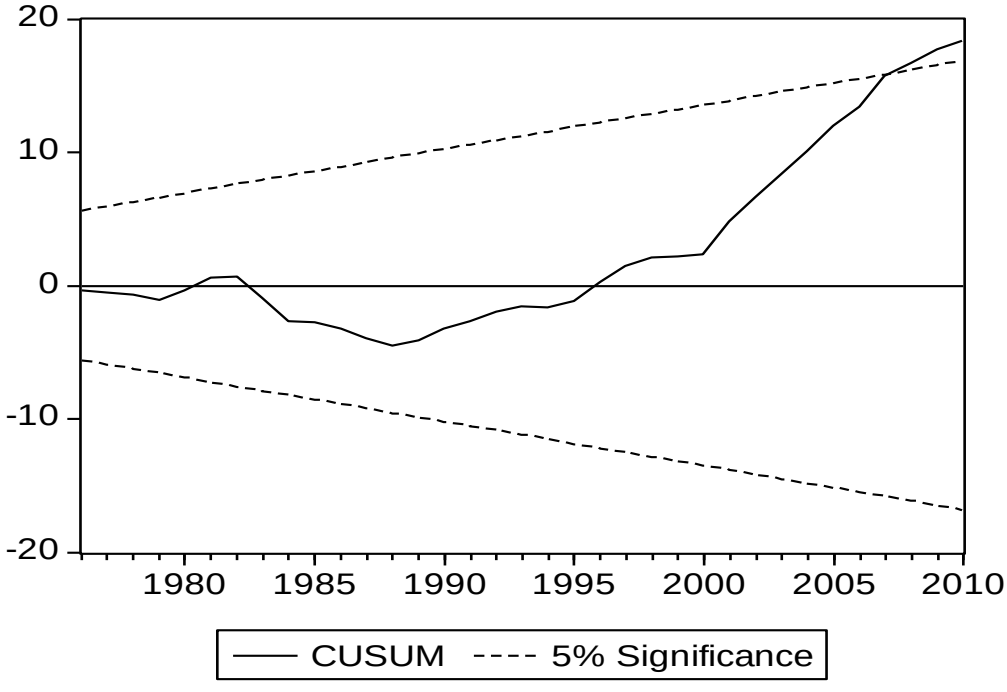
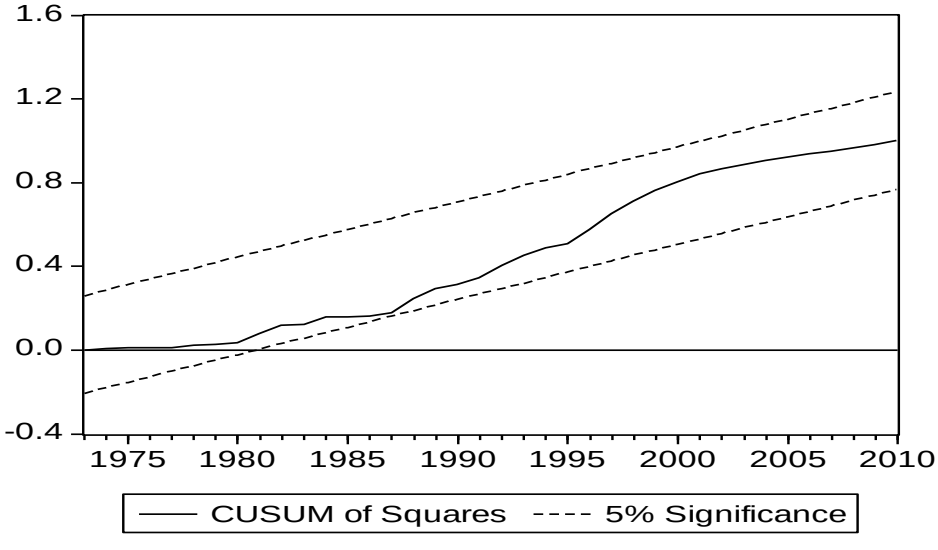


Figure-2. Plotting of CUSUMSQ Statistics for Stability Test



CONCLUSIONS AND POLICY RECOMMENDATIONS

The paper examines the inflation thresholds and economic growth in Nigeria as well as explores the determinants of such growth using a simple augmented production function. Inflation threshold of 9% is considered as an optimal because beyond which it exerts a negative effect on growth but below which there exists an insignificant relationship between inflation and output growth. The result is consistent with khan and Senhadji (2001) who put the threshold inflation level between 7 and 11% for developing countries. The study also explores error correction model to empirically establish the determinants of real growth rates in Nigeria. Factors like financial index, terms of trade and degree of openness are found to have significant impacts on growth of real GDP in the long run. In addition, the pairwise granger causality test result depicts an independent relationship between inflation and economic growth. The emanated outcomes of estimated models have important policy implications. First, like other developing nations, since inflation is inimical to growth, hence should be targeted not to exceed the threshold level of 9% at every point in time. This is because the identification of country-specific inflation thresholds in the inflation-growth relationship might provide useful information about the appropriate location and width of an inflation targeting band. More importantly is that, attention needs be focused on other important indicators of growth. First, government should not rest on its oars in sustaining reforms programmmes which is currently ongoing in financial sector since it has positive impact on growth in the long run. Policies that might continue to improve favourable terms of trade should be instituted and lastly, unfettered access of foreigners and their products into the country all in the name of liberalization should be completely discouraged.

REFERENCES

Ahmed, S., and Mortaza, G. (2005). Inflation and Economic Growth in Bangladesh:1981- 2005. Policy Analysis Unit (PAU) Working Paper 0604.

Andres J. and I. Hernando (1997). Does inflation harm Economic Growth? Evidence for the OECD, Banco de Espana Working Paper 9706.

Ayyoub,.M; I.S. Chaudhry and F. Farooq (2011) Does Inflation Affect Economic Growth? The case of Pakistan , Pakistan Journal of Social Sciences (PJSS) Vol. 31, No. 1 (June 2011), pp. 51-64

Bruno, M. and W. Easterly. (1998). Inflation Crises and Long-Run Growth, World Bank Policy Research Working Paper No.1517.

Bruno, M., and W Easterly. (1998), "Inflation cries and long-run growth," Journal of Monetary Economics, Vol.41, pp.3-26.

Christoffersen, P. and P. Doyle (1998) From Inflation to Growth, Eight Years of Transition, IMF Working Paper No. WP/98/100.

De Gregorio, J. (1991). The Effects of Inflation on Economic Growth: Lessons from Latin America, IMF Working Paper WP/91.

De Gregorio, J. (1996). Inflation, Growth and Central Banks: Theory and Evidence, Ministry of Finance Paper, Santiago Chile.

Dornbusch, R., S. Fischer and C. Kearney. (1996) Macroeconomics. The Mc-Graw-Hill Companies, Inc., Sydney.

Drukker, D., Gromis, P. and Hernandez, V. P. (2005), "Threshold Effects in the Relationship between Inflation and Growth: A New Panel-Data approach", Working Paper, Presented at the 11th International Conference on Panel-Data, Texas A&M University, College Station, Texas, June 2004.

Engle, R. F. and Granger, C.W.J. (1987) Co-integration and Error Correction: Representation, Estimation and Testing. Econometrica, Vol. 55, pp. 1-87.

Fabayo, J. A. and O.T. Ajilore (2006) Inflation: How Much is too much for Economic growth in Nigeria", vol. 41, Issue 2, pp. 129-147.

Faria, J. R. and F. G. Carneiro (2001). "Does High Inflation Affect Growth in the Long and Short-run?," Journal of Applied Economics, Vol. IV, No. 1 (2001), pp. 89-105.

Fowowe,B (2011). Financial Sector Reforms And Private Investment In Sub-Saharan African Countries, Journal of Economic Development 79 Volume 36, Number 3, pp.79-97, September 2011.

Fischer, S. and F. Modigliani (1978) "Towards and Understanding of the Real Effects and Costs of Inflation," Weltwirtschaftliches Archiv, Vol.114, No.1978, pp. 810-833.

Greene, W. H (2003). Econometric Analysis. 5th ed. New Jersey: Prentice-Hall (2003).

Gujarati, D. N., (1995): "Basic Econometrics," 3rd ed., New York: McGraw-Hill.

Harris, R. I. D (1995) Using Co-integration Analysis in Econometric Modeling, London: Prentice Hall, Harvester Wheatsheaf (1995).

Hendry, D. F. (1979) "Productive Failure Econometric Modelling in Macroeconomics: The Transmission Demand for Money," in Economic Modeling: Current Issues and Problems in Macroeconomic Modeling in the UK and the USA, (ed.), London: P. Ormerod (1979). _____ . Dynamic Econometrics, London: Oxford University Press (1995), pp. 577-629.

Hussain, M., (2005), "Inflation and Growth: Estimation of Threshold Point for Pakistan".Pakistan Bank Review, vol.17, No 3, pp. 1-15.October,2005.

Khan, M. S. and Senhadji, A. (2001). Threshold Effects in the Relationship between Inflation and Growth, IMF Staff Papers, 48:1

Kremer, S., Bick, A. and Nautz, D. (2009), "Inflation and Growth: New Evidence from a Dynamic Panel Threshold Analysis", SFB 649, Discussion Paper No. 036, Economic Risk, Berlin.

Mubarik, Y. A (2005). "Inflation and Growth: An Estimate of the Threshold Level of Inflation in Pakistan," State Bank of Pakistan – Research Bulletin, Vol.1, No. 1-2 (2005), pp. 35-44.

Mundell, R. "Growth, Stability and Inflationary Finance," Journal of Political Economy, vol. 73 (1965), pp. 97-109.

Nell, K.S. (2000). Is Low Inflation a Precondition for Faster Growth? The Case of South Africa. Working Paper No. 7.

Omoke P.C.(2010), Inflation and Economic Growth in Nigeria. Journal of Sustainable Development, Vol. 3, No. 2; pp 159-166, June 2010.

Oshikoya, T.W. (1992), "Interest Rate Liberalization, Savings, Investment and Growth: The Case of Kenya," Savings and Development, Vol.16, No.3, pp.305-320.

Fielding,D (2008), Inflation Volatility and Economic Development: Evidence from Nigeria, University of Otago, Economics Discussion Papers,No. 0807.

Salami.D and I. Kelikume (2010) An Estimation of Inflation Threshold for Nigeria 1970-2008. International Review of Business Research Papers Volume 6. Number 5. November 2010. pp. 375 – 385

Sarel, Michael. (1996). Nonlinear E¤ects of In.ation on Economic. IMF Staff Papers Vol.43, No.1, pp.199-215.

Sidrauski, M (1967) "Rational Choice and Patterns of Growth in a Monetary Economy", American Economic Review Vol.57,(1967), pp. 534-544.

Solow, R. (1956). A contribution to the theory of economic growth. Quarterly, Journal of Economics, Vol.70, pp.65-94.

Stockman, Alan, (1981), "Anticipated Inflation and Capital Stock in A Cash-in-Advance Economy." Journal of Monetary Economics Vol.8, pp.387–93.

Swan,T.(1956). Economic growth and capital accumulation. Economic Record, Vol.32, pp.344-361.

Sweidan, O. D. (2004) "Does Inflation Harm Economic Growth in Jordan? An Econometric Analysis for the Period 1970-2000," International Journal of Applied Econometrics and Quantitative Studies, Vol.1-2 (2004), pp. 41-66.

Tobin, J.(1965). "Money and Economic Growth," Econometrica, Vol.33 (1965), pp. 671-684.