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Full Length Research Paper

Inflation Targeting and Economic Growth in Nigeria

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Abstract

Inflation management is one of the most challenging macroeconomic objectives capable of frustrating every pragmatic effort aimed at achieving sustainable economic growth. This study examines inflation and inflation targeting vis-a-vis economic growth in Nigeria. Methodologically, the study employed the two-stage least squares (2SLS) techniques in examining the impact of inflation targeting for growth, where for, consumer price index (CPI) is said to be functional to money supply, exchange rate, gross domestic product and monetary policy rate on the one hand, and GDP a proxy of growth is functional to inflation targeting on the other hand over a period of 1980-2011. The model ascertained the extent to which policy target influence growth. The results show that inflation targeting is marginally potent to cause growth. The study, therefore, recommends that more policy attention should be given to inflation targeting in-order to achieve sustainable economic growth in Nigeria.

Keywords: Economy, Nigeria, economy, target.

INTRODUCTION

Background to the study

The application of monetary policy strategies toward achieving macroeconomic objectives has been a dominant feature of economic management over the years. In this regard, the two main strategies of monetary policy- monetary aggregate target and inflation targeting has been adopted at different point in time across different countries. However, the adoption of inflation targeting has grown in acceptance ever since it was adopted by New Zealand in 1989, as quite a number of industrial countries has followed suit in the early 1990s, in addition to a growing number of emerging market and developing countries. As of late 2006, 24 countries are classified as inflation targets, including 8 industrial countries and 16 emerging markets and developing countries. Prominent among the IT developed economies are United Kingdom, New Zealand, Canada, Sweden, Norway, Switzerland, Iceland and Austria; while early adopters of IT in emerging market economies include South Korea, Brazil, Mexico, Poland, Czech Republic, Thailand, South Africa, Colombia, Hungary, Chile, Israel, and Peru (Mishkin and schmidt-Hebbel, 2000).

Erratic government spending, which often led to large budget deficits, as witnessed in emerging market economies also may lead to significant changes in inflation. Thus, small movements in government spending may trigger inappropriately large movements in inflation expectations and, ultimately, inflation (Mishkin and schmidt-Hebbel ,2000).

Poor government finances may also lead to increases in regulating prices in order to limit public deficits. Such prices are quite important in Emerging Market Economies (EMEs), where many governments determine prices for transportation, electricity, fuel, etc. Changes in government-controlled prices and subsidies can therefore

have a large and immediate impact on inflation. Since monetary policy affects inflation with a long lag, this may raise the volatility of inflation and render it more difficult for the central bank to establish credibility (Ernest, 2012).

Also, large government debts are also problematic since they provide incentives to reduce the real value of the debt through inflation or by forcibly converting the maturity structure of the debt. This raises inflation and risk premier, and therefore nominal interest rates. If the Central Bank in fact maintains low inflation, ex-post real interest rates will be high, reducing growth and leading to unstable debt dynamics(Ernest, 2012). Inflation-targeting regimes put great stress on the need to make monetary policy transparent and to maintain regular channels of communication with the public; in fact, these features have been central to the strategy's success in industrialized countries (Ernest, 2012). As observed by (Mishkin and Posen 1997; and Bernanke et al. 1999), inflation-targeting Central Banks have frequent communications with the government, and their officials take every opportunity to make public speeches on their monetary policy strategy. The most important issues on inflation targeting centered on the notion of preconditions for adopting inflation targeting across countries in the literature. It is implicit in the argument that, unless the prerequisites are satisfied, the Central Bank should refrain from targeting inflation. Yet a closer look suggests that the preconditions typically specified are necessary for any monetary policy strategy to be successful - be it inflation, exchange rate or monetary targeting (Jelilov, 2015).

Arestis and Sawyer (2003) refer to inflation targeting to be the ‘New Monetary Policy’, which is characterized by: a numerical and official inflation target; monetary policy exercised through interest rates; an independent central bank; and no other objectives of monetary policy. However, inflation targeting is considered to entails much more than a public announcement of numerical targets for inflation for the year ahead, particularly as regards developing countries and emerging market economies, who routinely reported numerical inflation targets or objectives as part of the government's economic plan for the coming year, and yet their monetary policy strategy should not be characterized as inflation targeting, which requires the other four elements for it to be sustainable over the medium term (Jelilov, Gylych; Waziri, Fadimatu; Isik, Abdurahman;, 2016).

Price stability is globally acclaimed to be the overriding objective of monetary policy of central banks (CBN, 2012). This is against the backdrop of the several benefits of ensuring that prices are stable, which may include an incentive for investments by preserving margins, preserving the value of external value of the currency and enhancing competitiveness (Jelilov, Gylych; Kalyoncu, Huseyin; Isik, Abdurahman, 2015). Without doubt central banks are committed to achieving stable and low inflation consistent with other macroeconomic objectives. This explains why defining an explicit inflation target has become a key feature of inflation targeting monetary policy framework to anchor inflation expectations (Jelilov, Gylych; Abdulrahman, Samira; Isik, Abdurahman;, 2015).

Price stability is obviously subject to some uncertainty and macroeconomic volatility, which are at the centre of economic decisions by economic agents. The lack of predictability of the inflation process weakens and alters investment decisions and hence, economic growth. In addition, as noted by Khan and Sendhaji (2001), high and volatile inflation process can undermine a country's competitiveness in the world market and put pressure on margins. As the terms of trade worsen, the balance of payments is negatively affected due to an appreciation of the real effective exchange rate forcing a reduction in exports with plausibility for higher fiscal deficits (Jelilov, Gylych; Musa, Muhammad;, 2016).

Various evaluations have attested to the success of inflation targeting (IT) as a potent framework for monetary policy in both developing and developed economies (Bernanke *et al.,* 1999; Mishkin, 2004). It is popular because of its ability to test clear standards to evaluate whether or not central banks achieve their inflationary goals, keeps them accountable and guarantees their independence (Petruson, 2005; Kiruhara, 2005). Under inflation targeting, central banks commit to a target level of inflation, usually over a one-year horizon, which can either be core inflation (i.e., excluding items such as food and energy which exhibit high short-run price volatility resulting from external shocks) or headline inflation based on total consumer price index (CPI).

Inflation targeting countries need dynamic inflation forecasting models that are capable of stimulating the impact of shocks to monetary policy on macroeconomic variables. Also, the relevance of inflation forecasting models is seen from its ability to capture inflation expectations, which is one of the channels through which monetary policy transmits to the real sector (CBN, 2010). Moreover, because monetary policy usually affects the economy with lags, the understanding of inflation forecasting models is crucial for the success of the conduct of monetary policy (Jelilov, 2016). In recent years, dramatic changes in the inflationary environment have stimulated significant amount of interest devoted in evaluating the relative accuracy of alternative models of inflation forecasts. In addition, there has been a lot of work on methodologies of forecasting inflation. In Nigeria, efforts were made by Central Bank of Nigeria in 2007 to develop a suite of models for inflation forecasting. (CBN, 2010). These models, which ranged from trend, autoregressive integrated moving average (ARIMA), money gap, open economy to the Phillips curve models, were developed to inform monetary authorities the possible inflation models suitable for forecasting.

However, it was emphasized in that study "the need for a robust inflation forecasting model..." (Mordi, *et al.,* 2007,p.97).

Statement of the problem

Since the attainment of independence in 1960, economic policies have been concerned basically with anti-inflationary measures aimed at achieving price stability (CBN, 2010). Indeed, the monetary policy framework adopted by Nigeria since 1993 has an overriding objective and that is the achievement of single digit inflation (Essien and Eziocha 2002). Monetary and fiscal policy as well as wage freeze, price control, exchange rate and other measures have been employed from time to time to stem the tide of sustained increase in the general price level. In retrospect, it appears that in spite of these efforts; the achievement of price stability objective has been limited.

Against this background, this study is poised to investigate and identify the impact of inflation targeting on economic growth of Nigeria with a view to proffering suggestion on ways to target it.

Research questions

a). What are the impacts of inflation targeting on Nigeria's economic growth?
b). Why have all the policies used by CBN are unable to target the rate of inflation on Nigeria's economic growth?

Objectives of the study

The broad objective of this study is to analyze the impact of inflation targeting on Nigeria's economic growth, while the study would specifically:

1). Identify how money supply affects Nigeria's economic growth.
2). Recommend monetary policy to the government on how to target inflation.

Statement of the hypotheses

H_0: Money supply has no significant impact on the economic growth in Nigeria.

H_0: Inflation targeting has no significant impact on the economic growth in Nigeria.

Scope of the study

This project covers a period of 21 years, that is from 1980 to 2011. It intends to examine the impact of inflation targeting on economic growth in Nigeria, within the period stated.

More so, it will take an extensive review of the history of economic growth and review empirical works on inflation targeting, monetary policy and economic growth using obtained data from Nigeria.

Limitation of the study

The undergoing of this project will be limited because of the following reasons:

1). Collection of data and other related materials.
2). Time needed for the completion of this project.
3). Cost of materials.

Organization of the study

The project is divided into five chapters. Chapter one deals with the introduction which include: the background to the study, statement of the problem, the research questions, objectives of the study, the scope of the study, the limitation of the study, and the organization of the study . Chapter two is the literature review which include: conceptual review, theoretical review, empirical review and theoretical framework . Chapter three deals with methodology which include: research design, sources of data collection, method of analysis and model specification. Chapter four is concerned with data presentation and analysis of results. Lastly, chapter five deals with the summary of major findings, conclusion and recommendations.

LITERATURE REVIEW

Conceptual review

CBN (2010) defined inflation as an increase in the general price level in the economy. It can also be described as a persistent fall in the purchasing power of the national currency, as inflation and the value of money move in opposite direction, inflation depicts a situation in which the prices of goods and services rise generally and continuously over a period of time. In the simplest language, inflation has been defined as "too much money chasing too few goods".

Measurement of inflation

In measuring inflation, we are usually very interested in knowing how the overall cost of living changes as prices rise or fall, and therefore, instead of looking at the change in price of one good, we want to know what happens to the price of a representative large 'basket' of goods and services in the economy of Nigeria. This is the purpose of constructing price indices, which are the weighted average of many prices (CBN, 2010).

Price Indices

There are different price indices, designed to measure different sets of prices that affect different people. The widely known indices for which inflation rates are commonly reported are:

1). Consumer Price Index (CPI)

The CPI is a measure of the average price level over time of a basket of consumer goods and services. The CPI measures how the price levels of consumer goods and services purchased by households have changed between two time periods. To measure the changes in price, the statistical authority verifies how each of the prices of these items has changed over the months. An average is then calculated from the changes in these prices: the prices of goods on which consumers spend more of their incomes are given higher weights in the calculation while the goods on which they spend less of their income are assigned lower weights.

Wholesale Price Index (WPI)

The WPI is the price of a representative basket of wholesale goods. It is an indicator designed to measure changes in the prices of commodities that flow into wholesale trade intermediaries.

Producer Price Index (PPI)

The PPI measures the average change over time in the selling prices received by domestic producers for their output. This measures the cost of a given basket of goods.

Retail Price Index (RPI)

The RPI shows the cost of goods and services purchased by a typical household in one period relative to a base period.

GDP Deflator

The GDP deflator is an economic metric that accounts for inflation by converting output measured at current prices into constant (domestic currency, Naira) GDP. The deflator shows how much a change in the base year's GDP is accounted for by changes in the price level. Alternatively, it is the ratio of nominal GDP in a given year to real GDP and provides a measure of inflation from period to period in which the base year prices for calculating GDP are taken to the current period.

Application of Consumer Price Index

Out of the different indices used to measure inflation, the applicable measure that Nigeria uses to measure inflation is the CPI. Since measuring price changes for every item of goods and services will be very tedious, a basket of goods is normally selected to represent those that are frequently consumed by the majority of the people in the economy. Items such as housing, food, transportation, communication etc, are represented by specific goods whose price changes can be accurately recorded over time. The individual goods and services are then weighted based on their relative importance, after which the prices of individual items and their respective weights are used in calculating the CPI.

The weights in CPI represent the proportion of spending that an average consumer spends on each type of good or service (using data collected by surveying households). The measure of inflation rate using the CPI is the percentage change in the price index. The CPI uses a base year quantities as weights; hence, some price changes have greater impact on the measured inflation than others. For example, if the CPI in May 2008 was 177.60 and the price index was equal to 100 in year 2003, the appropriate interpretation of the index is that prices in the market basket of goods and services purchased by the typical consumer increased by 77.6 percent from 2003 to May 2008. The working is shown in the table below. From the table above, a typical consumer good that cost one Naira in March 2010 costs 1.0123 Naira in April 2010. Inflation is reported as percentage change in the CPI on a monthly basis. For example, if the CPI in April 2010 increased by 1.2%, the approximate annual rate of increase can be calculated by multiplying the 1.2% by 12 months. Thus, the annual rate of inflation in April 2010 was 14.4%.

Causes of Inflation

In every market economy, including Nigeria, prices are determined by the interaction of demand and supply in the market place. Consequently, economists tend to generally ascribe the causes of inflation to either demand or supply factors.

Demand-Pull or Excess Demand Factors

This occurs when the total demand for goods and services in an economy exceeds the available supply and their prices rise in response. This can be attributed to an increase in the ability to buy. A major demand-pull theory centers on the supply of money. The theory asserts that inflation may be caused by an increase in the quantity of money in circulation relative to the ability of the economy to supply goods and services. Historically, this has been the most common type and the most serious.

Table 1. Movement of the CPI

Monthly/Year	CPI	Monthly Inflation Rate
April 2010	222.1	222.1 - 219.4 = 0.0123 or 1.23%
March 2010	219.4	219.4

Source: Central Bank of Nigeria

Wars particularly produce this type of inflation because the demand for war materials and manpower grows rapidly without commensurate production in goods and services. Other causes of demand-pull inflation include rising incomes, which raise the earning capacity of the population, as is currently in China, India and many other emerging economies. Demand-pull inflation was recorded in Nigeria during the civil war, 1966 to 1970 and after the Udoji salary awards in 1974. Other factors such as droughts and floods can also affect prices in the short-run.

Cost-Push Factors

Costs of production rise, for one reason or another, and force up the prices of finished goods and services. For example, a rise in wages in excess of any gains in labor productivity increases the unit cost of production and, thus, raises prices. Also, an upward movement in the price strategic commodity, such as petroleum, it can raise the cost of production and induce cost-push inflation. There is also imported inflation, when prices in other countries go up and the prices we pay for imports also go up.

Pricing Power Inflation or Administered Price Inflation

This occurs whenever businesses decide to raise their price in order to increase their profit margins. It occurs when the economy is booming and sales are strong. It could be called oligopolistic inflation, because it is oligopolies that have the power to raise their prices independent of the force of demand and supply. An oligopolistic firm often realizes that if it raises its prices, the other major firms in the industry will likely see that as a good time to widen their profit margins too without suffering much from price competition from the other firms in the industry.

Sectoral Inflation

The term applies whenever any of the other three types of inflation hits a specific industry, causing price increases there. If the affected industry is a major supplier of inputs to other industries, for example, steel, that would raise the cost of the industries using steel and jerk up prices in those industries, so that inflation becomes more widespread throughout the economy, even though it originated in just one basic sector.

Inflation targeting

Conceptually, inflation targeting has been defined in different ways by different authors. However, those suggested by Mishikin (2000) and Savastano (2000) are considered a representative of those found elsewhere in literature. According to them, inflation targeting is a monetary policy strategy that encompasses five main elements: First, the public announcement of medium-term numerical targets for inflation; Second, an institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated; Third, an information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate are used for deciding the setting of policy instruments; Fourth, increased transparency of the monetary policy strategy through communication with the public and the markets about the plans, objectives, and decisions of the monetary authorities; And fifth, increased accountability of the central bank for attaining its inflation objectives.

According to Mishkin (1999), the adoption of inflation targeting is considered to offer some benefits to the adopting countries, some shortcomings were also observed to be linked to its implementation. In this vein, critics of inflation targeting have identified seven disadvantages of this monetary policy. The first four of those disadvantages explained that inflation targeting is too rigid, that it allows too much discretion, that it has the potential to increase output instability, and that it will lower economic growth. The fifth disadvantages, that inflation targeting can only produce weak central bank accountability because inflation is hard to control and because there are long lags from the monetary policy instruments to the inflation outcome, is an especially serious one for emerging market countries. The sixth and seventh disadvantages, that inflation targeting cannot prevent fiscal dominance, and that the exchange rate flexibility required by inflation targeting might cause financial instability, are also very relevant in the emerging market country context(Bernanke *et al.,*1999).

In line with the recommendation of Masson et al. (1997), inflation targeting is likely to be a more effective strategy if it is phased in only after there has been some successful disinflation. According to them, one factor

affecting inflation targeting (controllability) that is especially relevant in the emerging market context is the (at times large) incidence of government-controlled prices on the index used to compute headline inflation. And this shortcoming it may not be sufficient to ensure fiscal policy with an inflation targeting regime to break down: the fiscal deficits will eventually have to be monetized or the public debt eroded by a large devaluation, and high inflation will follow (Jelilov, Gylych; Onder, Evren, a 2016).

In the same vein, Arminio *et al.,* (2003) and Alberto et al (2002) assesses inflation targeting in EMEs, and develop applied prescriptions for the conduct of monetary policy and inflation targeting design in EMEs. They verified that EMEs have faced more acute trade-offs-higher output and inflation volatility- and worse performance than developed economies. They argued that these results thus stem from more pronounced external shocks, lower credibility , and lower level of development of institutions are required in order to improve their performance. In addition , at an operational level, they propose a procedure that a central bank under inflation targeting can apply and communicate when facing strong supply shocks, and suggest monitoring structure for an inflation-targeting regime under an IMF program (Jelilov, Gylych; Muhammad Yakubu, Maimuna;, 2015).

However, FitzGerald (2004) examined inflation targeting with reference to stabilization policy in emerging market economies from two critique perspectives: First, from the Keynesian and The structuralist. He thus, developed two frameworks: First, from the Keynesian perspective, the International Monetary Fund (IMF) "basic monetary programming framework's for developing countries which uses government borrowing and the exchange rate as policy instruments in other to achieve specific inflation and balance of payments targets was adapted. This standard model was adapted in other to include short-term capital flows and the floating exchange rate arising from financial liberalization. In this way, the macroeconomic consequences of the current fund focus on inflation targeting and the use of a single monetary policy instrument (the interest rate, combined with rigid fiscal and reserve 'rules') in emerging market economies was demonstrated (Jelilov, Gylych; Chidigo, Mary; Onder, Evren, 2016).

Rogers (2006) examined the macroeconomic performance of emerging market economies under inflation targeting and alternative monetary policy regimes. Statistical analysis of the benefits of adopting inflation targeting are based on a "difference in differences" approach, comparing how performance for key macroeconomic variables has changed in countries adopting inflation targeting with performance in other countries under alternative monetary regimes over the same period. The result obtained suggest that inflation targeting has been associated with better macroeconomic performance that under alternative other monetary policy frameworks.

Theoretical review

Just like earlier mentioned that conventional macroeconomics theories 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, labor 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 labor wage costs.

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; labor 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. Super neutrality 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.

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. (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. (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 (Jelilov, Gylych; Onder, Evren, b 2016).

According to Dwivedi (2005), the rate of economic growth depends primarily on the rate of capital formation which depends on the rate of savings and investment. He says further that, whether inflation affects economic growth positively or negatively depends on whether it affects savings and investment positively or negatively. Some Economist hold the view that inflation is conductive to economic growth and that there is positive relationship between inflation and economic growth. Some arguments are put forward in favor of this preposition. During the period of inflation, there is a time-lag between the rise in output prices and rise in input prices, particularly, the wage rate (Alchian and Kessel, 1960). This time-lag between the rise in output prices and the wage rate is called wage-lag. When the wage-lag persists over a long period of time, it enhances the profit margin. The enhanced profits provide incentive and investible funds to the firms. This result is an increase in investment production capacity and a higher level of output (Hamilton, 1956).

Ogbokor (2004), also argued that inflation is usually accompanied by prosperity and boom; when total demand exceeds total supply, the inflationary gap so created will induce more in investment as a result of increase in prices. This would in turn lead to the creation of more employment activities and hence growth. Gylfson and Herbertson (2001) posit that an increase in the autonomous parts of savings and real GDP stimulates growth and shows inflation down, ceteris paribus where as an increase in the autonomous part of velocity of money increases both inflation and growth.

Empirical Review

Inflation targeting and economic growth has been examined by different authors. There exist a lot of literature on the relationship between inflation and growth. These studies can be classified into two groups:

-The studies that presuppose that the relationship between

inflation and growth is the same at all rates of inflation.
-And those that believe that the relationship between inflation and growth is different at different inflation rates.

In the latter studies, the researchers usually aim to estimate the rate of inflation at different level of output growth. This school of thought believes that inflation would be detrimental to growth above certain threshold rate of inflation (Vikesh and Subrina, 2004). To confirm the changing views of the 1990s and 80s, that inflation has a negative effect on growth, Sarel (1995), examined the possibility of non-linear effects of inflation on economic growth using a panel dataset spanning from 1970 to 1990 from 87 countries.

The result showed evidence of a structural break when inflation is per cent, implying that inflation rate below the rate tends to have slightly positive or no effect on growth, while that above 8% had significant effect on growth. The result was supported by the works of Fang et al (1997), who used a cross-sectional data from 152 countries to examine the relationship between inflation and its variability. They found evidence of threshold for inflation rates below 3%, while higher inflation was not associated with higher inflation variability (Jelilov, Gylych; Kachallah Ibrahim, Fatima; Onder, Evren, 2016).

Ghosh and Phillip (1998) argued that if a relationship exists between inflation and growth, it's not likely to be linear. This they investigated using a panel dataset from 145 countries. They confirmed the non-linear relationship between inflation and growth and a threshold rate between 2% to 3%. To re-examine the existence of inflation threshold in inflation-growth relationship. Khan and Sendhaji (2001) used a panel data from 140 industrialized and developing countries. Their result suggest the existence of a threshold level of inflation at 1% to 3% for industrialized countries and 11% to 12% for developing countries. Kremer and Naurtz (2009) confirmed the existence of inflation threshold using a dynamic panel threshold for both industrialized and non-industrialized countries. Their result confirmed the inflation targets of 2% by many Central banks in the industrialized countries; but estimated threshold level of inflation of 17% for developing countries.

Many studies in Nigeria has provided different views on the inflation threshold. Fabayo and Ajilore (2006) who examined existence of threshold effects in inflation-growth relationship using Nigeria data for the period of 1970 to 2003. The result 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 result. 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 to 2008 and 1980 to 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% for Nigeria over the sample period 1970 to 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 threshold 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.

Theoretical Framework.

The pioneer work of Phillips (1958) on the relationship between unemployment and the rate of change of money wage rate provided the foundation on which theories on inflation has been developed over the last four decades. The basic tenet of the original version of the Phillips curve, postulated an inverse and stable curve linear relationship between money wage rate as a proxy for inflation rate and the rate of unemployment. This tenet thus throws up the famous inflation-unemployment trade-off in macroeconomic management, as it assumed that the achievement of low inflation rate is conditioned on the tolerance of high unemployment rate and vice versa.

However, the subsequent challenge of this philosophy by the Milton Friedman-led Monetarist sequel to the empirical finding that reveals a contradiction of the trade-off postulate underlying the curve, using the 1900-1958 U.S. data; as the trade-off relationship was hardly as stable as that postulated originally by Phillips using data on Britain. Beside the observed absence of a systematic inverse relationship between both variables, there was also an observed simultaneous increase in both variables overtime (Ernest, 2012) . Hence, due to the absence of a long run tradeoff between inflation and unemployment, this school of thought asserts that any observed trade off was at best a short run phenomenon. In addition, the Monetarist asserts that there must be some level of unemployment that is consistent with a cleared labor market (full employment situation), a level which was subsequently termed as “the natural rate of unemployment” as well as “non-accelerating inflation rate of unemployment (NAIRU).

Regarding the measurement of inflation, quite a number of measures has been suggested and widely employed as measures of inflation in theory and practice.

Prominent among these measures are consumer price indices (CPIs) which measure the price of a selection of goods purchased by a "typical consumer"; Cost-of-living indices (COLI) which often adjust fixed incomes and contractual incomes based on measures of goods and services price changes; producer price indices (PPIs) which measure the price received by a producer. This differs from the CPI in that price subsidization, profits, and taxes may cause the amount received by the producer to differ from what the consumer paid. There is also typically a delay between an increase in the PPI and any resulting increase in the CPI. Producer price inflation measures the pressure being put on producers by the costs of their raw materials.

Also, Wholesale price indices (WPI), which measure the change in price of a selection of goods at wholesale, prior to retail mark ups and sales taxes; commodity price indices (CPI), which measure the change in price of a selection of commodities that are weighted by the relative importance of the components to the "all in" cost of an employee; and GDP Deflators, which measures price increases in all assets rather than some particular subset. The term "deflator" in this case means the percentage to reduce current prices to get the equivalent price in a previous period. Aron and Muellbauer (2000) note that a large body of economic theory suggests that high uncertainty impedes investment, and there is a negative link between inflation volatility and growth. Therefore, if monetary policy can lower volatility and uncertainty, this could support long-run growth, productivity and welfare. There is, however, a short-run trade-off between inflation and output (or deviations from potential output).

METHODOLOGY

The focus of this chapter is on the methodology employed in this study. The description of the research method justifies the findings of the study. Specifically, the chapter discusses the nature, sources of data collected, the techniques of data analysis and the model specification.

Nature and Sources of Data Collected

This study would use time series data (Secondary data). The data used in this research were obtained from secondary sources namely: Publications of the Central Bank of Nigeria such as Annual Reports of statement of accounts, statistical bulletin, Nigeria major economic banking and financial indicators. Nigeria source to ensure accuracy and The data obtained from the above sources would cover the periods between 1980 to 2011.

Technique of data analysis

The method of analysis used in this study is the ordinary least square (OLS) techniques. The OLS is a statistical technique used for fitting regression line (that is choosing the parameters) to sample some observations in such a way as to minimize the sum of squares of the deviations of the actual observation from the line. It has been chosen for our analysis because, according to Koutoyiannis (1977), its computational procedures are fairly simple, as compared to other econometric techniques.

One of the OLS methods is the multiple regression analysis. Regression analysis is multiple when the value of dependent variables s estimated on the basis of two or more independent (explanatory variables).

Model Specification

In the literature, as shown in chapter two, causes of inflation are explained by different school of thoughts ranging from money gap, mark-up, and structural to Phillip curve models. In the specification of the model, this project intend to use Phillip curve model.

The model is expressed as:

$$\pi_t = \pi^e_t - \theta (y_t - y^*_t) \quad \text{.....(3.1)}$$

Where π_t and π^e_t are actual and expected inflation, y_t and y^*_t are actual and desired output, respectively; θ captures the impact of output on inflation. The spread between y_t and y^*_t is termed the "output gap", and is a measure of the deviation of log of actual real output from capacity or potential output. Potential output is the level of output consistent with a stable rate of inflation given the capital stock. Specifically, in order to plan monetary policy and to measure its success an objective function is used that accounts for the rate of inflation and economic output:

$$F(\mu^*, Y^*) = [(\mu_{t+1}-\backslash\mu^*)^2 + \lambda(Y_{t-1}-Y^*)^2] \quad \text{.....(3.2)}$$

μ* describes the targeted rate of inflation, μ_{t-1} the achieved rate of inflation in one year. Monetary policy's effects are time-shifted, the real effects are perceived later, that is why the rate of inflation in one year is of importance. The same way Y_{t+1} is the economic output in one year whereas Y* is the targeted economic output. The difference of both is squared to get a positive result. That assures that there is no interpretative difference between a deviation downwards or a deviation upwards, both are not desired. λ has a special meaning: If it is equal to 0 then economic output does not matter to monetary policy, but if it is larger than 0, then economic output matters. The value of λ describes in how far the economic output matters relative to the rate of inflation.

The two cases can be distinguished as follows: λ =

0:strict inflation targeting , > 0:flexible inflation targeting. Hence, transforming equation 3.2 into:

$f(\mu^*,Y^*,MS^*,EXRT^*,MPR^*) = [(\mu_{t+1}-\mu^*)^2 + \lambda (Y_{t-1}-Y^*)^2 + (MS_{t-1}-MS^*)^2 + (EXRT_{t-1}-EXRT^*)^2 + (MPR_{t-1}-MPR^*)^2]$ .....(3.3)

Removing the influence of expectation from equation (3.3), we derive:

$\mu=f(Y, MS, EXRT, MPR) = [(\mu_{t+1})^2 - +\lambda(Y_{t-1})^2 + (MS_{t-1})^2 + (EXRT_{t-1})^2 + (MPR_{t-1})^2]$ ...(3.4)

Removing the lags and squares in equation (3.4), and making μ the subject of the equation, equation (3.3) is transformed in natural log form as follows:

$\ln\mu = \beta 0 + \beta_1 \ln Y + \beta_2 \ln MS + \beta_3 \ln EXRT + \beta_4 \ln MPR + u$ .....(3.5)

The symbol μ and Y is represented as: Inflation target and GDP but μ will be replaced with θ which is the impact of inflation targeting measured thus: ($CPI_{Actual} - CPI_{Target}$ divided by $GDP_{Actual} - GDP_{Target}$) in the model as follows:

$\theta = f(GDP_T, MS, EXRT, MPR, CPI)$ .....(3.6)

$\theta = \beta 0 + \beta_1 \log GDP_T + \beta_2 \log MS_T + \beta_3 EXRT_T + \beta_4 MPR_T + \beta_5 CPI_T + u_T$ .....(3.7)

$GDP = f(\theta)$ .....(3.8)

$\log GDP = \alpha_0 + \alpha_1 \theta_T + u_T$ .....(3.9)

Hence, models 3.7 and 3.9 become relevant for the study analysis accordingly. This implies that they are simultaneous model or system of equations; as such 2SLS analytical method would be adopted because of suspected simultaneity or endogeneity econometric problem.

Where;

CPI= Consumer Price Index. Proxy of target inflation, described according to Phillips (2010) as: CPI = Inflation $_{Target}$ - (Output $_{Actual}$ - Output $_{Target}$)
GDP = Gross Domestic Product. $GDP_{Actual} - GDP_{Target}$ that is GDP actual minus GDP target.
MS = Money Supply.
EXRT = Exchange Rate.
MPR = Monetary Policy Rate.
θ (INFLTARG) = Impact of output on Inflation Targeted. $CPI_{Actual} - CPI_{Target}$ divided by GD
$P_{Actual} - GDP_{Target}$
u = Mean which fulfills the usual classical assumptions to enable Ordinary Least Square (OLS) estimation of parameters.

Theoretical (a priori) expectations

The evaluation procedure consists of deciding whether the estimates are theoretically meaningful, statistically reliable and econometrically satisfactory. We follow the procedure recommended by Koutsoyiannis (1977), we examine the statistical significance of our estimate using T-Statistics, whose condition are satisfied by the observed data can be used to test for the statistical significance of the estimated co-efficient.

Some important statistics embodied in any multiple regression equation are the multiple correlation (R), the coefficient of multiple determination (R2), and the standard deviation (error) of the estimates. R measured the degree of relationship between dependent and independent variable. R2 is used to assess the explanatory power of the regression equation.

In other words, it measures the extent to which the explanatory variables included in an equation are responsible for the changes in the dependent variable. It values lie between 0 and 1. The higher the value, the better the "goodness fit" of the regression estimates to the observation and vice versa.

The standard error of estimates measures the dispersion of the estimates around the true parameters. In other words, it indicates the standard deviation of the actual values of dependent variables from their predicted value. The larger the standard error of a parameter, the less reliable it is and vice versa.

F- Test

The F- statistic could be used in testing the overall significance of R2. The test involves comparing the computed F value (Fc) with the table or theoretical F-value (Ff) at a stated level of significance and degree of freedom. If the computed F-value (Fc) is greater than the table or theoretical F-value (Ft), we reject the null hypothesis and accept the alternative version. This implies that there is a greater significant relationship between the regressed and the regressors'.

In other words, the value of R2 adequately reflect the variations in the dependent variable, thereby confirming the predictive power of the model. If however, Fc < Ft, then the null hypothesis will be accepted and the alternative version rejected the regressed and the regressor, thereby confirming the weakness of the model.

DATA PRESENTATION AND ANALYSIS OF RESULTS

Data Presentation

YEAR	CPI	LOGGDP	LOGMS	EXRT	MPR	θ
1980	0.66	2.87	28.63	0.55	11.77	0.23
1981	0.80	20.84	30.03	0.62	13.42	0.04
1982	0.86	-1.05	32.13	0.67	11.01	-0.82
1983	1.06	-5.05	32.31	0.72	8.50	-0.21
1984	1.25	-2.02	33.40	0.77	8.80	-0.62
1985	19.67	10.33	32.00	0.89	7.69	0.22
1986	1.42	-8.75	32.31	1.75	6.32	-1.90
1987	1.58	-10.75	26.54	4.02	5.66	-1.05
1988	2.43	7.54	26.44	4.54	6.20	0.40
1989	3.66	6.47	19.29	7.36	6.93	0.88
1990	3.93	12.77	22.08	8.04	6.98	0.29
1991	21.29	-8.27	24.10	9.91	5.45	-0.28
1992	6.87	-1.87	20.82	17.30	3.25	-38.67
1993	26.94	-1.94	20.52	22.07	3.00	0.27
1994	15.86	0.91	21.58	22.00	3.60	28.43
1995	16.85	-1.85	16.12	21.90	5.21	-9.78
1996	30.87	-0.87	13.11	21.88	5.02	7.13
1997	17.61	-2.61	14.62	21.89	5.00	8.74
1998	10.18	-1.18	18.58	21.89	4.92	14.65
1999	10.81	-1.81	21.79	92.34	4.62	-1.26
2000	7.11	1.89	22.16	101.70	5.73	4.78
2001	7.28	-0.28	24.52	111.23	3.40	-73.79
2002	9.67	-0.37	21.83	120.58	1.17	62.46
2003	4.43	4.57	20.2O	129.22	2.12	-1.20
2004	8.42	1.58	18.26	132.89	2.34	2.92
2005	8.49	1.51	17.73	131.27	4.19	5.84
2006	9.97	-0.97	19.04	128.65	5.96	-2.12
2007	12.55	-3.55	28.03	125.81	5.86	-17.36
2008	10.52	-1.52	36.35	118.55	2.39	-3.15
2009	7.04	1.96	40.68	148.90	0.50	-9.62
2010	9.32	1.88	32.48	150.30	0.72	-18.80
2011	11.95	0.05	33.58	154.74	1.45	418.8

Source: Central Bank of Nigeria, National Bureau of Statistics, International Monetary Funds, International Financial Statistics and World Bank Organization

Note 1: CPI= Consumer Price Index. Proxy of target inflation, described according to Phillips (2010) as: CPI = Inflation $_{Target}$ - (Output $_{Actual}$ - Output $_{Target}$)

Note 2: GDP = Gross Domestic Product. GDP $_{Actual}$ - GDP $_{Target}$ that is GDP actual minus GDP target.

Note 3: MS = Money Supply.

Note 4: EXRT = Exchange Rate.

Note 5: MPR = Monetary Policy Rate.

Note 6: θ = Impact of output on Inflation Targeted. CPI_{Actual} –CPI_{Target} divided by GDP_{Actual} - GDP $_{Target}$

Pre-diagnostic (Stationarity) test Result

Variable		At Level	At 1st Difference	I(d)	Significance Level/Remark
LogGDP	ADF	-5.3467***	-	I(0)	logGDP was stationary @ level in all the Mackinon Critical Percentage Values.
CPI	ADF	-	-9.7393***	I(1)	LogCPI was stationary at first difference
LogMS	ADF	-	-4.1359***	I(1)	LogMS was stationary at first difference
EXRT	ADF	-	-3.4769***	I(1)	Exrt was stationary at first difference
MPR	ADF	-5.2173***	-	I(0)	MPR was stationary @ level in all the Mackinon Critical Percentage Values.
INFLTARG	ADF	-	-4.9518***	I(1)	INFLTARG was stationary at first difference

Source: E-view output, 2014

Key: *** Stationary @ 1% 1% Mackinon Critical level= -3.6702
** Stationary @ 5% 5% Mackinon Critical level= -2.9639
* Stationary @ 10% 10% Mackinon Critical level=-2.6210

PRESENTATION OF RESULT

INFLTARG= 77.5222 + 1.4827logGDP + 1.1196CPI + 1.2697logMS - 0.7324EXRT - 11.1667MPR
S.E = (39.261) (0.8810) (1.9576) (4.4023) (0.2452) (0.4599)
R^2 = 0.73
Adjusted R^2 = 0.60
S.E of Regression = 90.29 F statistics = 4.67
Mean dependent variable = 16.49 F-prob = 0.000506
Akaike info criterion = 6.74
Durbin Watson stat = 1.91

DISCUSSION OF RESULT

From the result, the adjusted R^2 and F-Statistics are 0.60 and 4.67 (p-value=0.000506) respectively. This suggests that at least one of the variables in the model explains the variation on the explained variable, growth otherwise proxy by INFLTARG. The result further shows that, given their respective probability values, Money Supply (logMS), and Consumer Price Index (CPI) were statistically non-significant while only Gross Domestic Product (logGDP), Exchange Rate (EXRT), and Monetary Policy Rate (MPR) were significant at 5% level of significance within the period in review. It is pertinent to note that the two of regressors (GDP and MS) in the model are in log form. This is consistent with the principle of econometrics standardization of variables used in analysis. More so, all with an exception of Monetary Policy Rate (MPR) and Gross Domestic Product (logGDP) were stationary at first difference.

Therefore, the above result means that 1% increase in the value of Gross Domestic Product (logGDP), would lead to a significant change in inflation-induced growth by 0.02% on the average, holding other variables constant. On the other hand, a unit change in Monetary Policy Rate (MPR) and Exchange Rate (EXRT) would lead to 0.005 and 0.007 average change on inflation-induced growth respectively. Although, the effects of Money Supply (logMS), and Consumer Price Index (CPI) are not statistically significant, however, their increase by 1% and a unit respectively would have the potential effect of raising growth by 0.013% and 1.12 average change on inflation-induced growth.

The implication of the result was firstly that even though inflation targeting may have been affecting growth significantly, the effects were seen to be marginal though. The results further showed that all the variables exhibited or rather consistent with 'a priori' economic expectation. The instantaneous implication of the result above is that inflation targeting in Nigerian is yet to attain a desirable height of tight monetary policy measures capable of adequately inducing economic growth in Nigeria.

FINDINGS FROM THE RESULT

From the above result, it was found that inflation targeting was significantly but marginally inducing growth in Nigeria. This is justified by the result from Gross

Domestic Product, Exchange Rate and Monetary Policy Rate. The result also found that inflation targeting policy is at averse with the level of Money Supply and Consumer Price Index, a tight monetary measure is needed to induce due and adequately spur economic growth in Nigeria. Finally though, Inflation targeting was found as a potent tool in monetary policy management in Nigeria.

SUMMARY OF MAJOR FINDINGS

In summary, it was found that inflation targeting policy in Nigeria has marginally been inducing growth in Nigeria. The result is also relevant as it would help redirect the focus of the policy makers towards management of productive level of money supply in Nigeria. The resurgent rising inflation rate in Nigeria in the past few years is a pointer of the effect of this.

Lastly, policy measures that are capable of reducing degree of fluctuations in these variables should be welcomed by the Central Bank of Nigeria. Finally, inflation targeting as a new monetary policy tool should be encouraged in Nigeria financial sector by the authority in order to induce desired economic growth.

CONCLUSION

This study examines the impact of inflation targeting on economic growth in Nigeria from 1980 to 2011. It pointed out that targeting inflation is a key factor for the policy makers in Nigeria in order to achieve her macroeconomic objectives. This study came out with empirical evidence that will help in understanding the relationships among variables used in the model drawing from the Nigerian experience. Having considered the present state of the impact of inflation targeting on economic growth in Nigeria from the period of 1980 to 2011, a tight monetary and fiscal measures are vital to Nigeria's growth process.

RECOMMENDATIONS

Based on the findings made in the course of this study, the following recommendations are hereby:

1). The government should identify how money supply affects Nigeria's economic growth. The analysis of result is relevant to the Nigerian policy makers who desire to understand how inflation hinders economic growth. Thus, more policy attention should be given to regulation of inflation rate and a steady boost in money supply in Nigeria.

2). The monetary authorities should recommend monetary policy to the government on how to target inflation.

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APPENDIX

First difference stationary

Null Hypothesis: D(EXRT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.217246	0.0002
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXRT,2)
Method: Least Squares
Date: 12/05/14 Time: 15:26
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXRT(-1))	-0.983694	0.188547	-5.217246	0.0000
C	5.055938	2.755190	1.835060	0.0771

R-squared	0.492934	Mean dependent var	0.145667
Adjusted R-squared	0.474825	S.D. dependent var	19.57118
S.E. of regression	14.18304	Akaike info criterion	8.206311
Sum squared resid	5632.439	Schwarz criterion	8.299724
Log likelihood	-121.0947	Hannan-Quinn criter.	8.236194
F-statistic	27.21965	Durbin-Watson stat	2.005363
Prob(F-statistic)	0.000015		

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.739271	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPI,2)
Method: Least Squares
Date: 12/05/14 Time: 15:28
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPI(-1))	-1.545349	0.158672	-9.739271	0.0000
C	0.529091	1.368549	0.386607	0.7020

R-squared	0.772086	Mean dependent var	0.083000
Adjusted R-squared	0.763946	S.D. dependent var	15.41957
S.E. of regression	7.491653	Akaike info criterion	6.929797
Sum squared resid	1571.496	Schwarz criterion	7.023210
Log likelihood	-101.9469	Hannan-Quinn criter.	6.959680
F-statistic	94.85339	Durbin-Watson stat	2.276068
Prob(F-statistic)	0.000000		

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.135982	0.0035
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MS,2)
Method: Least Squares
Date: 12/05/14 Time: 15:36
Sample (adjusted): 1982 2011
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MS(-1))	-0.821633	0.198655	-4.135982	0.0003
C	0.216545	0.791653	0.273535	0.7867

R-squared	0.406265	Mean dependent var	-0.091111
Adjusted R-squared	0.382516	S.D. dependent var	5.211685
S.E. of regression	4.095351	Akaike info criterion	5.728769
Sum squared resid	419.2974	Schwarz criterion	5.824757
Log likelihood	-75.33838	Hannan-Quinn criter.	5.757311
F-statistic	17.10635	Durbin-Watson stat	2.010204
Prob(F-statistic)	0.000349		

Null Hypothesis: D(INFLTARG) has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.951763	0.0006
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLTARG,2)
Method: Least Squares
Date: 12/05/14 Time: 15:39
Sample (adjusted): 1989 2011
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLTARG(-1))	-33.17423	6.699478	-4.951763	0.0002
D(INFLTARG(-1),2)	29.89428	6.386830	4.680614	0.0004
D(INFLTARG(-2),2)	26.93634	5.757631	4.678372	0.0004
D(INFLTARG(-3),2)	22.86784	4.836413	4.728265	0.0003
D(INFLTARG(-4),2)	17.89629	3.762389	4.756631	0.0003
D(INFLTARG(-5),2)	12.50396	2.618297	4.775608	0.0003
D(INFLTARG(-6),2)	7.465894	1.519713	4.912702	0.0002
D(INFLTARG(-7),2)	3.082825	0.614881	5.013697	0.0002
C	12.59261	13.82095	0.911125	0.3777

R-squared	0.801938	Mean dependent var	18.96304
Adjusted R-squared	0.688760	S.D. dependent var	118.1031
S.E. of regression	65.88838	Akaike info criterion	11.49997
Sum squared resid	60777.90	Schwarz criterion	11.94430
Log likelihood	-123.2497	Hannan-Quinn criter.	11.61172
F-statistic	7.085635	Durbin-Watson stat	0.529376
Prob(F-statistic)	0.000812		

Stationary at level

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.346698	0.0001
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 12/05/14 Time: 15:31
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-1.718029	0.321325	-5.346698	0.0000
D(GDP(-1))	0.554890	0.207269	2.677150	0.0129
D(GDP(-2))	0.249177	0.151012	1.650047	0.1114
C	0.213034	0.890959	0.239106	0.8130

R-squared	0.624997	Mean dependent var	0.037931
Adjusted R-squared	0.579997	S.D. dependent var	7.346118
S.E. of regression	4.760845	Akaike info criterion	6.086170
Sum squared resid	566.6411	Schwarz criterion	6.274762
Log likelihood	-84.24946	Hannan-Quinn criter.	6.145234
F-statistic	13.88873	Durbin-Watson stat	1.887241
Prob(F-statistic)	0.000016		

Null Hypothesis: MPR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.476864	0.0159
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPR)
Method: Least Squares
Date: 12/05/14 Time: 15:38
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR(-1)	-0.267599	0.076966	-3.476864	0.0017
D(MPR(-1))	0.323126	0.153875	2.099925	0.0452
C	1.111178	0.466171	2.383627	0.0244

R-squared	0.348165	Mean dependent var	-0.399000
Adjusted R-squared	0.299881	S.D. dependent var	1.407696
S.E. of regression	1.177863	Akaike info criterion	3.259921
Sum squared resid	37.45877	Schwarz criterion	3.400040
Log likelihood	-45.89881	Hannan-Quinn criter.	3.304746
F-statistic	7.210773	Durbin-Watson stat	1.647252
Prob(F-statistic)	0.003096		

Granger Causality Test Result

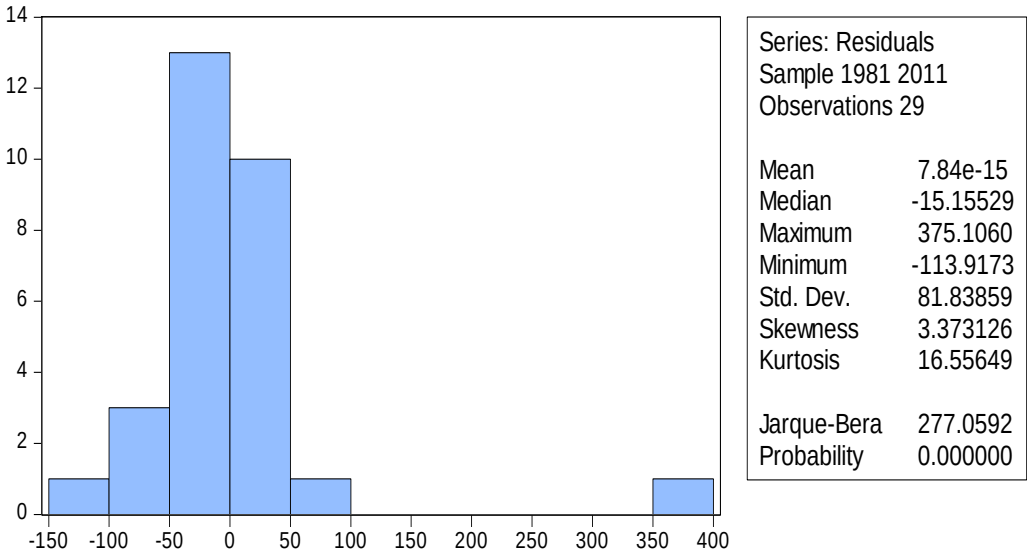
Pairwise Granger Causality Tests
Date: 12/05/14 Time: 15:40
Sample: 1980 2011
Lags: 2

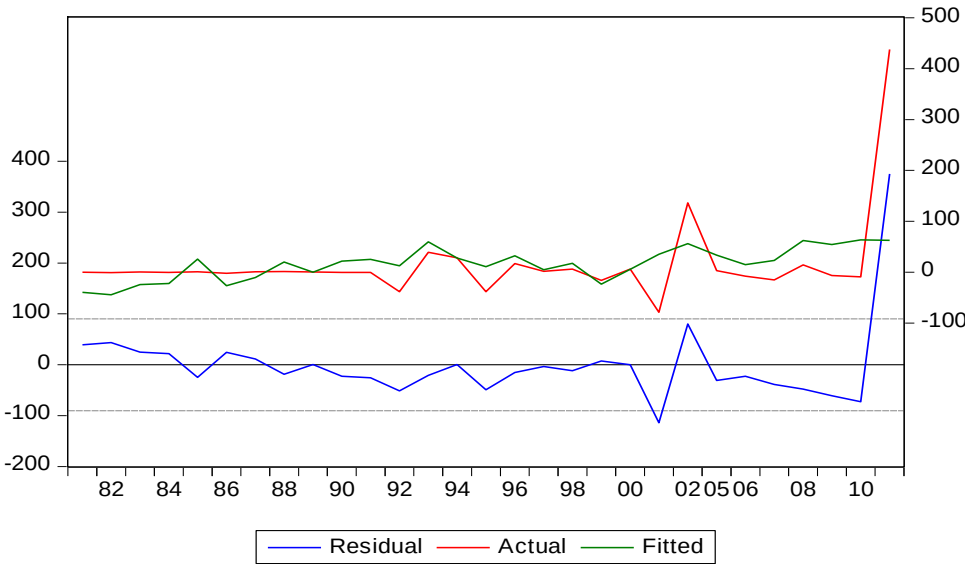
Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause CPI	30	0.53491	0.5923
CPI does not Granger Cause GDP		3.00540	0.0677
MS does not Granger Cause CPI	27	1.06378	0.3622
CPI does not Granger Cause MS		0.84564	0.4428
EXRT does not Granger Cause CPI	30	0.07448	0.9284
CPI does not Granger Cause EXRT		0.62279	0.5446
MPR does not Granger Cause CPI	30	1.18551	0.3222
CPI does not Granger Cause MPR		0.22646	0.7990
INFLTARG does not Granger Cause CPI	30	1.23385	0.3083
CPI does not Granger Cause INFLTARG		0.00378	0.9962
MS does not Granger Cause GDP	27	0.84050	0.4449
GDP does not Granger Cause MS		0.09962	0.9056
EXRT does not Granger Cause GDP	30	0.20155	0.8188
GDP does not Granger Cause EXRT		0.31358	0.7337
MPR does not Granger Cause GDP	30	0.22829	0.7975
GDP does not Granger Cause MPR		0.44316	0.6470
INFLTARG does not Granger Cause GDP	30	0.22014	0.8039
GDP does not Granger Cause INFLTARG		0.09908	0.9060
EXRT does not Granger Cause MS	27	2.31957	0.1219
MS does not Granger Cause EXRT		1.18286	0.3251
MPR does not Granger Cause MS	27	0.61476	0.5498
MS does not Granger Cause MPR		2.52555	0.1029
INFLTARG does not Granger Cause MS	27	0.39915	0.6757
MS does not Granger Cause INFLTARG		3.97052	0.0337
MPR does not Granger Cause EXRT	30	0.90895	0.4159
EXRT does not Granger Cause MPR		2.97789	0.0692
INFLTARG does not Granger Cause EXRT	30	0.14736	0.8637
EXRT does not Granger Cause INFLTARG		1.00643	0.3799
INFLTARG does not Granger Cause MPR	30	2.41465	0.1100
MPR does not Granger Cause INFLTARG		1.99577	0.1570

Dependent Variable: D(INFLTARG)
Method: Two-Stage Least Squares
Date: 12/05/14 Time: 15:46
Sample (adjusted): 1981 2011
Included observations: 29 after adjustments
Instrument specification: GDP MPR D(CPI) D(MS) D(EXRT)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	77.52227	39.26081	1.974546	0.0604
GDP	1.482737	0.881062	1.682897	0.0017
D(CPI)	1.119598	1.957549	0.571939	0.5729
D(MS)	1.269705	4.402326	0.288417	0.7756
D(EXRT)	-0.732423	0.245157	-2.987615	0.0051
MPR	-11.16666	0.459899	-24.28072	0.0073

R-squared	0.727140	Mean dependent var	16.48655
Adjusted R-squared	0.602612	S.D. dependent var	87.59634
S.E. of regression	90.29698	Sum squared resid	187531.5
F-statistic	4.670034	Durbin-Watson stat	1.463192
Prob(F-statistic)	0.000506	Second-Stage SSR	187531.5
J-statistic	2.11E-45	Instrument rank	6

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