AN ECONOMETRIC ANALYSIS OF EFFECT OF CHANGES IN INTEREST RATES ON INFLATION IN NIGERIA

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Abstract

Given the fact that if inflation is not properly controlled in the economy it may disrupt the economy, cause uncertainty in financial decision, redistribute wealth unevenly etc. Therefore, government needs to control high level of unpredictable inflation through monetary and fiscal policies. One of the important tools used under monetary policy is interest rate. This study examines the effect of changes in interest rates on inflation (measured by consumer price index (CPI) in Nigeria using both descriptive and econometric methods. Four sets of hypotheses were tested by examining the impact of four variables that is prime lending rate; minimum rediscount rate; money supply and treasury bills rate on inflation. The empirical results confirm that changes in interest rates and increase in the level of money supply were associated with rise in inflationary pressures. In concluding, the study notes the need for the relevant authority to correct abnormality in inflation rate through the introduction of appropriate interest rates from time to time.

Keywords: Econometric, Interest rate, money supply, Inflation, Treasury bills, Prime lending rate

INTRODUCTION

Inflation is generally used to describe a situation of rapid, persisted and unacceptably high rises in the general price level in an economy, resulting to general loss of purchasing power of the currency. Inflation causes serious discomfort for consumers, investors, producers and the government (Asogu, 1990). Long term inflation occurs when the money supply grows at a faster rate than the output of goods and services. This situation occurs when there is more money than is needed to accommodate nominal growth in output, consumers and businesses want to

purchase more goods and services than can be produced with current resources (labour, materials, etc.) causing upward pressures on prices. Over a short term, inflation can occur from various shocks in the economy. Food and energy price shocks are common examples of this type of inflation in Nigeria. A price of a commodity such as fuel may rise suddenly and sharply, relatively to other commodities prices response, may result to short term increase in overall prices

Inflation in Nigeria has been accelerating since 1960s and has become a major concern to the government. Several policies were introduced to control inflation in the economy and despite these policies, inflationary trends continue to fluctuate. Government needs to control high levels of unpredictable inflation since it can severally disrupt the economy. The tools governments normally use include monetary policy (i.e. increase or decrease in the money supply and interest rate), fiscal policy (changes in the amount of taxes and government spending) and various controls on prices, tariffs, etc. Many nations choose monetary policy as their primary tool since it has proven to be effective, less disruptive to the market operations and easier and quicker to implement since adjusting the money supply does not require legislative approval as would be for instance changing the tax structure.

Monetary policy function is solely carried out by the government controlled central bank that is responsible for the maintaining an orderly market, steady growth, low employment and low inflation. Some governments do require the central bank to maintain a low and positive rate of inflation (usually well under 3%) as the overriding goal of their monetary policy. They must keep the money supply at a level that accommodates steady growth, but it should not be so high as to cause excessive inflation or so low that deflation (an overall decrease in prices) results. When central bank wants to increase money supply (money in circulation) and by stimulating the economy, they buy treasury bills in the open markets and this makes credit readily available at low interest rates. While in the period of high inflation the central bank sells the treasury bills so as to reduce money supply.

Kahn (2010) observes that monetary policy objectives are concerned with the management of multiple monetary targets among them price stability, promotion of growth, achieving full employment, smoothing the business cycle, preventing financial crises, stabilizing long-term interest rates and the real exchange rate. Through the control of monetary policy targets such as the price of money (interest rate - both short term and long term), the quantity of money and reserve money amongst others; monetary authorities directly and indirectly control the demand for money, money supply, or the availability of money (overall liquidity), and hence affect output and private sector investment.

Monetary policy may be inflationary or deflationary depending upon the economic condition of the country. Contractionary policy is enforced to squeeze down the money supply to curb inflation and expansionary policy is to stimulate economic activity to combat unemployment in recession (Hall, 2010).

Inflation imposes a number of true cost on the economy, which are sometimes of real resources that are wasted as people try to economize on cash holding in the price distortion in the tax system, unexpected redistribution of wealth and interference with long run planning because of this cost, most economists agree that sustained economic growth is more likely if inflation is low and stable. In Nigeria inflation rates are measured with the consumer price index (CPI) which tracks the total cost of a market basket of retail goods and services, is easily and currently available on monthly, quarterly and annual basis.

Over the years, the spread between bank's deposit and lending rates has remained unacceptably wide with adverse implications for savings mobilization and investment promotion. To achieve the desired level of interest rate, the Central Bank of Nigeria (CBN) adopts various monetary policy tools, key among which is the Monetary Policy Rate (MPR). This rate, which until 2006 was known as the Minimum Rediscount rate (MRR), is the rate at which the CBN is willing to rediscount first class bills of exchange before maturity (Onoh 2007). He further opined that by raising or lowering this rate the CBN is able to influence market cost of funds. If the CBN increases MPR, banks' lending rates are expected to increase with it, showing a positive relationship. In recent past, the need to possess certain class of assets as collateral to assess the CBN's discount window was dispensed with due to global crisis (Business Day, 2009).

The CBN now anchors its Monetary Policy Rate (MPR), on the year-to-year inflation rate fundamental policy changes in the economy. The year-to-year inflation rate for December 2010 was about 11.8% while MPR was 6.25% in the second quarter of 2010. Nigeria inflation rate in 2013 continues to be below 10 percent for the fourth month in a role. According to the National Bureau of Statistics (NBS), the 2013 April inflation rate stood at 9.1 per cent, much higher that of March 2013 which was 8.6 percent. The emphasis on the indirect forms of control policy is still obviously the preferred choice of managing monetary policy in Nigeria.

The objective of this paper is to assess the impact of changes in interest rate on inflation in Nigeria using econometric analysis. The remaining of this paper is as follows: section two examines the literature review while section three presents the methodology. Section four deals with the analysis, section five contain the conclusion and recommendations while the last section includes limitation of the study and suggestions for further research work.

LITERATURE REVIEW

Theoretical Framework

Theories of interest rates

Various theories of interest rates put together explain variables which determine interest rates; these theories differ because of differences of opinion as to whether interest rates are monetary or real phenomenon. According to the classical theory, the interest rate is determined by the intersection of the investment-demand schedule i.e. schedule disclosing the relationship of investment and savings to the rate of interest. However, no solution is possible because the position of the saving-schedule will vary with the level of real income. In the view of classical economists, level of savings is determined by savings rate of interest (Olusoji, 2003). This view holds that increase in this interest rate will lead to increased savings and hence a positive relationship. It is this view that must have encouraged the Nigerian authorities to abandon administratively fixed interest rates for market determined ones. In the words of Ahmed (2003), deregulated interest rate is believed to be critical for both economic stabilization and development. Hence the Keynesian attack of the classical theory of interest on the ground that it is indeterminate, that is, as income rises, the saving-schedule will shift to the right, hence we cannot know what the rate of interest will be unless we already know the income level. But we cannot know the income level without already knowing the rate of interest, since a lower rate will mean a larger volume of investment and so, via the multiplier, a higher level of real income. Thus the classical theory fails to offer a solution. The implication of Ahmed's position above covers the relationship between interest rate and investment. In this case, it has been established that high lending rates discourage borrowing for investment and vice versa (Lawal, 1982; Anyanwu and Oaikhenan, 1995). Since economists hold that investment plays a fundamental role in capital formation, and hence on economy's growth and developments, it becomes obvious that lending rates through perceived influence on investment plays a developmental role. That is, a decrease in lending rate is theorized to cause investment borrowing to rise which leads to increased capital formation and eventually to economic growth (Onoh, 2007).

The Keynesian liquidity preference theory posits that the rate of interest is determined by the intersection of the supply-schedule of money (perhaps interest inelastic, if rigorously fixed by the monetary authorities) and the demand schedule for money (the liquidity-preference schedule). However, this analysis is also indeterminate because the liquidity preference schedule will shift up or down with changes in the income level, thus money supply and demand-schedules cannot give the rate of interest unless we already know the income level

hence, the same criticism of indeterminacy Keynes leveled against the classics is applicable to his theory.

According to the loanable funds theory of Dennis H. Robertson, the rate of interest is determined by the intersection of the demand-schedule for loanable funds with the supply-schedule, here the supply-schedule is compounded of savings (in the Robertson sense voluntary savings) plus net additions to loanable funds from new monies (change in money supply) and the discharging of idle balance. However, since the savings portion of the schedule varies with the level of disposable income (i.e. yesterday's income) it follows that the total supply schedule of loanable funds also varies with income, therefore this theory is also indeterminate.

In the Pigouvian parlance, interest rate is determined by the intersection of the demand-schedule for money with supply-schedule of savings. Here the revenant supply-schedule is conceived in terms of saving out of current income i.e. the excess of total income received over income received for services in providing for consumption. This income, consumption and savings, all apply to the same period however, whether or not current income is fed in the past from the injection of new money or from the stand point of the pigouvian or neo-classical definition, that is income whether it springs from the spending of funds borrowed from banks credit played a role in the process of income creation. Thus in the neo-classical or pigouvian theory "savings" is in effect the same thing as loanable funds hence the same criticism applies to them.

The Keynesian and neoclassical propositions, taken together supply us with a theory of the interest rate of J. R. Hicks. From the Keynesian view, we get a family of liquidity preference schedule at various income levels. These together with the supply of money fixed by the monetary authorities, gives us the Hicksian LM curve, which tell us what the various rates of interest will be (given the quantity of money and the family of liquidity preference curves) at different levels of income. On the other hand, the neoclassical formulation provides us family saving-schedules at various income levels. These together with the investment demand schedule give us the Hicksian IS-Curve, meaning that the neoclassical framework tells us what the various levels of income will be given the investment-demand schedule and family of saving-schedule at different rates of interest. Thus the IS-Curve and the LM-C refer to functions relating the two variables. Income and the rate of interest are determined together at the point of intersection, income and the rate of interest stand in a relation to each other such that:
- Investment and saving are in equilibrium (i.e. actual saving equals desired saving).
- The demand for money is in equilibrium with the supply of money (i.e. the desired amount of money is equal to the actual supply of money).

In the monetarists view of interest rate determination even though they accept that interest rate is a monetary phenomenon, they reject the Keynesian analysis that it is determined by money supply and money demand. They had and in fact emphasize another factor; the price expectations/anticipation factor. To the monetarists led by Milton Friedman, an increase in money stocks has three major effects: Liquidity effect, income effect and price expectation/anticipation effect. To them, an increase in money supply initially (immediate observational impact) the interest rate falls i.e. the Keynesian liquidity preference effect. Due to this increase in liquidity position, people go into the market to increase demand resulting in the expansion of the economy (the income effect). This increase in income will put pressure on goods and services and hence prices will rise. As prices increase (due to expectation effect) people will build up an inflationary psychology, i.e. they expect more inflationary effect in future. Suppliers will expand their investment outlet to supply more and this expansionary investment demand will make price to rise more. Also financial institutions expect price to rise more and therefore increase interest rate on their liabilities. Even among consumers, they want to spend more now because they expect higher prices in future hence for durable materials they would demand for more credit and this leads to an increase in interest rate (price expectations/anticipations effect). Because of these effects and more so because of the price expectations effect, when money supply is increased the ultimate result is an increase in interest rate rather than the Keynesian decrease in interest rate. This what Friedman (1976) linked with the Gibson Paradox since prices and interest rates move together from empirical evidence, to them therefore interest rate is not only determined by money supply and money demand but also by price expectations factors.

The theories of inflation

Inflation is a sustained increase in the average price of all goods and services produced in an economy. Money loses purchasing power during inflationary periods since each unit of currency buys progressively fewer goods as defined by Norges Bank (2005). The demand pull inflation paradigm opines that demand pull inflation occurs when aggregate demand for goods and services is greater than the aggregate supply such that the resultant excess demand cannot be satisfied by running down on existing stocks, diverting surpluses from the export market to the domestic market, increasing imports or postponing demand. The cost-push inflation school opines that inflation rises from increases in the cost of the factors of production, especially rising wages emanating from trade union activities embodying also a social-political view (Addison et al, 1980) and (Cobham, 1981). The Structuralism explain the long-run inflationary trend in developing nations in terms of certain structural rigidities, market imperfections and

social tensions in those nations, relative elasticity of the food supply, foreign exchange constraint, protective measures, rise in the demand for food, fall in export earnings hoarding, import substitution industrialization, political instability, etc. Monetarists opine that inflation is always and everywhere a monetary phenomenon; (Friedman, 1966) hence prices tends to rise when the rate of increase in money supply is greater than the rate of increase in real output of goods and services (Johnson, 1973). The monetarists hypothesize that inflation is always and everywhere a monetary phenomenon, and maintain that a policy monetary and financial stability is a necessary pre-requisite for rapid economic development. Therefore, monetarism stresses that, for demand or structurally motivated inflation to hold, expansion of money supply would be required to finance the increasing nominal national income brought about by rising prices. The consequent expansion of money supply outstripping demand for money gives rise to inflation, especially if output does not expand as much as money supply.

Causes of inflation can however be broadly categorized into 'fiscal' and 'balance of payment' views. Proponents of the fiscal view have argued that continuous expansion of base money essentially arises from a fiscal disequilibrium. Attempts have been made to show that the economy will be characterized by the two inflation equilibria if there is an exogenous real fiscal deficit; a change in Cagan semi-logarithmic money demand function and rational expectations. The high inflation equilibrium will be stable and the low inflation equilibrium unstable (Montel, 1989) as cited in (Afolabi and Efunwoye, 1995).

In their efforts to maintain low inflation, policy makers pay relatively little attention to the growth rate of the money supply. Yet many studies have found a close relationship between money growth and inflation, at least in the long run. But how long must money growth be strong before it should be of concern to policy makers? That is, what is the shortest period of time over which money growth seems to be reliably associated with inflation? Accordingly, the inflation rate is expected to vary ceteris paribus, positively in relation to the rate of change in money supply and negatively with respect to the growth rate of real income. Since all the effects may not be contemporaneous, lagged values of money supply are included in the specification to account for lags in effect of changes in money supply. On the other hand, imported inflation arises from international trade whereby inflation is transmitted from one country to another and this is more so during a period of rising prices all over the world (Harberger, 1978).

Conceptual Framework

Interest rate according to Cornell (1999) is the cost for the use of money expressed as a percentage, while Lawrence, William and Gregory (2000) defined interest rate as the most pervasive elements in the financial world; they affect everything that financial institutions do.

Interest rate is a factor of demand and supply of loanable funds by lenders and demand by borrowers. This factor is determined by the government and the Central bank. The equilibrium interest rate can be defined as the intersecting point of the supply and demand where the quantity of lenders is equal to the quantity of borrowers. It hardly stays at equilibrium, it fluctuates like any other competitive prices because shifts in the demand and supply curve could increase or decrease at each interest rate, this is referred to as change in amount demand or change in amount supplied. When interest rate fall borrowers (households) demand more money (inflation period) because they can afford the new interest rate, while increase in interest rate will make households not want to borrow but rather will want to keep to what's available to them, though it increases profit made by firms and expectation of higher income by consumers.

Individuals must be concerned with both the expected return and the risk of the assets that might be included in their portfolios. Interest rates and forecasts of their future values are among the most important inputs into an investment decision (Bodie, Kane and Marcus, 2005). Banks pay variable interest rate on savings, while fixed interest rate might be paid on long term financial investment like certificate of deposit.

Interest rate structure in Nigeria has been controlled and managed by Central Bank of Nigeria (CBN). Every year, the CBN fixes the range within which both the deposit and lending rates are to be maintained. According to Jhingan (1997), interest rate can be classified into various categories; Deposit rates, Lending rates, Treasury bill rate, Inter-Bank rate and Minimum Rediscount rate. The Minimum Rediscount Rate (MRR), which previously served as the nominal anchor for interest rates in the economy, was replaced with the Monetary Policy Rate (MPR) in 2006. The new framework was aimed at ensuring stability in short-term interest rates to engender efficient liquidity management and encourage inter-bank trading. Apart from this, interest rate can also be categorized as nominal or real. This categorization credited to Irvin Fisher tries to accommodate the moderating influence of inflation on interest rate. Nominal interest rate is the observed rate of interest incorporating monetary effects while real interest rate is arrived at by considering the implications of inflation on nominal interest rate (Uchendu, 1993; Essia, 2005).

Oresotu (1992) explains that the basic functions of interest rates in an economy in which individual economic agents take decisions as to whether they should borrow, invest, save and/or consume, are summarized by International Monetary Fund (IMF) under three aspects; namely

- interest rates as return on financial assets serve as incentive to savers, making them defer present consumption to a future date

- interest rates being a component of cost of capital affect the demand for and allocation of loanable funds; and
- the domestic interest rate in conjunction with the rate of return on foreign financial assets and goods are hedged against inflation.

These broad roles of interest rates according to Oresotu (1992) emphasize their significance in the structure of basic prices and indicate the need for study about their determinants under a flexible regime. During the periods of rapidly changing prices, interest rate may be a poor index of the return due to an investor. Too expensive interest rate may choke off investment; Ogiogio (1988), Alile (1992) explain that interest rate in Nigeria would significantly influence the holding of financial assets by investors.

Inflation was defined by Morris and Morris (1999) as the pervasive and sustained rise in the aggregate price level for goods and services. Inflation on the other hand, depicts an economic situation where there is a general rise in the prices of goods and services continuously. It could also be defined as a continuing rise in the prices as measured by an index such as the consumer price index (CPI) or by the implicit price deflator to Gross National Product (GNP) (Amassoma, Wosa and Olaiya 2011). Akinbobola (2012) brought out the three major explanations of inflation include fiscal, monetary and balance of payments aspects. While in the monetary aspect, inflation is considered to be due to an increase in money supply, in the fiscal aspect, budget deficits are the fundamental cause of inflation in countries with prolonged high inflation. In the balance of payments aspect, emphasis is placed on the exchange rate. The effect of changes in interest rates on inflation occurs with a lag and may vary in intensity, the time it takes interest rate to feed through. Other factors will also have impact, resulting in changes in inflation and output; the various relationships will not be stable over time, as interest rate fall. Household and government consumption and investment will tend to increase because they have more money left over after servicing their debt and because borrowing becomes less expensive, corporate finances are strengthened and investment may become more attractive. Higher demand leads to higher output and employment. Wage growth may pick up; higher wage growth combined with higher profit margins will result in higher inflation.

When inflation is low lenders do not need to charge high nominal interest rate to guarantee a given real return. This tendency for nominal interest rate to follow inflation rates is called Fisher effect (Robert and Ben, 2001). If the inflation rate is zero, then nominal interest rates should equal real interest rates. Most economies experience some inflation. Failure to anticipate future inflation when lending, especially on long-term securities or loans, can be costly either in terms of lost interest or discounted value, or both (Alesina and Arazen, 1991; CBN, 2000; Orubu, 2009; Mordi, 2009).

Also according to Jhingan (2004) a policy of high interest rate in an underdeveloped country like Nigeria also act as an incentive to higher savings, develops banking habits and speed up the magnetization of the economy which are essential for capital formation and economic growth. A high interest rate policy is also anti-inflationary (control inflation) in nature, for it discourages borrowing and investment for speculative purposes and in foreign currencies. Further it promotes the allocation of scarce resources in more productive channels. Certain economists favour a low interest rate policy in such countries because high interest rate discourages investment, but emphatically evidence suggests that investment in business and industry is interest inelastic in underdeveloped countries because interest forms a very low proportion of the total cost of investment. Despite these opposite views, it is advisable for the monetary authority to follow a policy of discriminatory interest rate, charging high interest rate for non-essential and unproductive uses and low interest rate for productive uses.

The effect of interest rate changes may be amplified because the interest rate affects the Naira exchange rate. When interest rate is lower more people will borrow money and few will invest, lower interest rate will lead to depreciation in Naira value, imported goods will then become more expensive and inflation will accelerate. A weak Naira will also boast exports and improve profitability in the business sector. The effect on the exchange rate of a change in interest rate will vary as there is shift in the foreign exchange market. Banks believe that expectations play an important role when prices and wages are set, expectations concerning inflation and economic stability are of crucial importance for foreign exchange market. Inflation expectation also influence wage demands and have an effect when companies adjust their prices, it may be difficult to form an opinion about how expectations are generated. Confidence in the inflation target may provide an anchor; past inflation rates may also influence what we think will be in the future thus there is an interaction between inflation expectations and inflation.

Empirical Studies

Some attempts have been made to study the character of inflation in Nigeria. Asogu (1991) undertook an empirical investigation based on ten different specifications that covered monetary, structural and open economy aspects of inflation. In summary, the results of the estimations suggested that real output, especially industrial output, net exports, current money supply, domestic food prices and exchange rate changes were the major determinants of inflation in Nigeria. The study, therefore, confirms the importance of structural character of the economy; open economy and monetary aspects of inflationary trend in Nigeria. In another study of inflation in Nigeria, Masha (2000) quoted Fakiyesi (1996), who argued that inflation is dependent on growth in broad money, the rate of exchange of the Naira vis-à-vis the dollar, the

growth of real income, the level of anticipated inflation, which is based on the previous year's level of inflation. Other studies on the relationship between inflation expectations and interest rate variations are: Dornbusch et al. (1991), Dornbusch et al. (1993), Rudiger and Fischer (1993), Mahdavi and Zhou (1994), Adam (1995), Mark De Broeck et al.(1997), Kevin (1998), Durevall et al (1998), Atish and Steven (1998), Gunnar (1999), Njuguna and Dick (1999), Gunnar (1999), Moll (1999), Senhadji et al. (2000), Khan and Abdelhak (2001) and Fedderke and Schaling (2005). The empirical results of these studies have shown some disparity in the relationship between changes in inflationary expectations and interest rate.

METHODOLOGY

The paper used the data collected from the statistical bulletin of the Central Bank of Nigeria (CBN) from 1980-2010 and analyzed the collected data by using both bi-variate and Multiple regression analysis methods. Using both descriptive and econometric methods, four hypotheses were tested by using bi-variate analysis to assess the influence of three types of interest rates and money supply on consumer price index (1985 = 100 and 2003 = 100): prime lending rate (Prime); minimum rediscounting rate (MRR), monetary policy rate (MPR); treasury bills rate (TBR) and money supply (Mi) has significant effect on consumer price index (CPI). While multiple regression was used to determine the effect of these four variables (Prime, MPR (MRR), TBR and Mi) on consumer price index (CPI).

Model Specification

Based on the conceptual framework calibration of some economic variables and the theoretical arguments, we specify our equations based on extension of the works of Jhighan (1999) and Schaling (2005) by including prime lending rate, minimum policy rate (minimum rediscounting rate), treasury bills rate, money supply and consumer price index as the case may be. The model in its implicit form can be rendered as:

$$\text{Ln CPI} = f\ (\text{Ln prime})\ldots\ldots\ldots\ldots\quad\text{(i)}$$
$$\text{Ln CPI} = a_0 + \ln x_1 + \mu\ldots\ldots\ldots\quad\text{(ii)}$$
$$\text{Ln CPI} = f\ (\text{Ln Mrr})\ldots\ldots\ldots\ldots\quad\text{(iii)}$$
$$\text{Ln CPI} = a_0 + \ln x_2 + \mu\ldots\ldots\ldots\quad\text{(iv)}$$
$$\text{Ln CPI} = f\ (\text{Ln Trb})\ldots\ldots\ldots\ldots\quad\text{(v)}$$
$$\text{Ln CPI} = a_0 + \ln x_3 + \mu\ldots\ldots\ldots\quad\text{(vi)}$$
$$\text{Ln CPI} = f\ (\text{Ln Mi})\ldots\ldots\ldots\ldots\quad\text{(vii)}$$
$$\text{Ln CPI} = a_0 + \ln x_4 + \mu\ldots\ldots\ldots\quad\text{(viii)}$$
$$\text{Ln CPI} = f\ (\text{Ln prime, Ln Mrr, Ln Trb, Ln Mi})\ldots\text{(ix)}$$
$$\text{Ln CPI} = a_0 + \ln x_1 + \ln x_2 + \ln x_3 + \ln x_4 + \mu\ldots\ldots\text{(x)}$$

In the above model:

    CPI = Consumer Price Index (Inflation rate)

    Prime (x_1) = Prime lending rate   Mpr (Mrr) (x_2) = Minimum rediscounting rate

    Tre (x_3) = Treasury bills rate   Mi (x_4) = Money supply

ANALYSIS & FINDINGS

Descriptive Analysis

Between 1960 and 1970 the inflation rate averaged to 4.0% as measured by the consumer price index (CPI), it was 10% in 1969 which was Nigerian civil war period. The reason for the rise in inflation rate was due to curtailment of income as a result of compulsory savings for financing the war and other restrictive economic, fiscal and political measures. These reconstruction measures and repayment of war bonds after 1970 resulted in the injection of massive private and public nominal expendi1tures into the economy. This led to sharp increase in government revenue in foreign exchange from oil exports thus inflation in that year continues to increase. The monetization of the "Petronaira" foreign exchange revenue expands pressure on money supply whose annual growth rate for the 1970s was 32.5% compare to 7.5% in the 1960s. Inflation rate grew from 9.9% in 1980 to 20.9% in 1981 this fluctuation continued from single to double digits averaging 20.16% in 1980s and money supply growth averaged 14.7%.

Credit to the domestic economy from the banking system which followed the same trend as rate of inflation and growth of money supply accelerated from an average of 50.7% in the 1960s to 72.9% in the 1970s and later decline to 25.2% in the 1980s. In 1980 inflationary rate in Nigeria was 9.9%, 1981 it was 21%, decline to 7.7% in 1982, grew to 23.2% in 1983 and 40% in 1984, later reduced drastically. Due to improvement in money supply situation in the economy in the previous years and restraint in expansion in aggregate demand especially government spending, these brought inflation rate to 5.5% in 1985 and 5.4% in 1986. But in 1987 the inflation continued to rise again because of the acceleration of food prices due to poor harvests and also with the dismantling of the remaining price control and depreciation of the Naira, inflationary pressure intensified to 10.2%. In 1988 due to sharp rise of food prices following increased demand consequent upon the ban on importation of rice, maize, wheat and their products also increase in costs of production following the continued depreciation of the Naira exchange rate, inflation rate rose to 38.3% and to 40.9% in 1989. In the 1990s, inflation was mostly double digits except in 1990 when it was 7.5%, 1997 when it was 8.5% and 1999 when it was 6.6% averaging 30.64% in the 1990s. Between 2000 and 2007 inflation was only in single digit in 2000 at 6.9% and 8.2% in 2006 but in double digits in 2001 at 18.9%, 12.9% in 2002, 14.0% in 2003, 15.0% in 2004, 17.9% in 2005, 8.5% in 2006, 6.6% in 2007, 15.1% in 2008,

13.9% in 2009, 11.8% in 2010, averaging 10.38% between 2000 and 2010. In 2010, inflationary pressures increased and forced the CBN to raise the interest rate. The higher rate and the fact that banks remain risk averse, continues to restrain private credit. Overall credit to the private sector increased by 3.60 per cent while credit to state and local governments grew by 14.23 per cent or 28.46 per cent as at 2012. The Federal Government remained a net creditor to the banking system despite the 5.1 per cent rise in credit to government (net). Credit to the domestic economy grew by 2.3 per cent at end-June 2011, driven largely by the expansion in net claims on the Federal Government. Instruments of short-term maturity remained a dominant of the credit and deposit portfolios of commercial banks. Meanwhile, increasing food prices as well as increase in public spending keeps inflation in double-digits. Inflation rate in 2013 continues to be below 10 percent for the fourth month in a role. The 2013 April inflation rate stood at 9.1 per cent, much higher that of March 2013 which was 8.6 percent. The Central Bank of Nigeria has made it an agenda to lower inflation rate below 10 percent since 2009. But that has been elusive, except in July and August 2011, when the inflation rate registered 9.4 and 9.3 per cent respectively. Since then the inflationary trend has been surging without subsiding. This latest development has been almost four years since the inflation rate was below 10 percent. As for the recent development of taming inflation rate below 10 percent, the Central bank of Nigeria deserved some credit for tackling inflationary trends with aggressive monetary policy, which essentially entails mopping of the liquidity without drastically slowing down economic growth. As for April (2013) 9.1 percent inflation rate and relative to March (2013) 8.6 percent, the rise in the headline index could be primarily attributed to higher price levels of food products due to the effect of declining inventories. At this time in the planting season, what is sold are food products which were harvested, late last year and the limited supplies of these farm with a relatively stable demand, pushes prices higher. The depletion in the inventory was a result of the massive flooding that interrupted harvesting which brought a serious damage to agricultural products and farmlands. In addition scarcity and high price of petrol propel the price of staple foods and essential consumer products. The flooding made transportation fare higher due to deterioration of roads and longer time to get to the destination. All these factors brought about higher cost of delivery and subsequently higher prices that trigger higher inflation rate. As in March, the Core sub-index exhibited a muted rise due to base effects. Between March 2012 and December 2012, the Core Sub-index recorded substantial year-on-year price increases (an average of 14.2% compared to 11.8% over the same period in 2011). As a result of substantially higher price levels last year, the implications are that the year-on-year changes for this year are likely to be lower. Additionally, there are slower rises in monthly prices since 2013. This may be connected to more prudent fiscal measures together with aggressive stance of monetary policy.

Table 1. Data Presentation

Year	Consumer Price Index	Inflation Rate	Interest Rate	Minimum Rediscount Rate	Treasury Bills Rate	Money Supply	
1980	42.3	9.9	8	6.0	5	6308.365	.
1981	51.2	20.9	8	6.0	5	7893.934	.
1982	55.1	7.7	10	8.0	7	9878.027	.
1983	67.9	23.2	10	8.0	7	12360.81	.
1984	94.8	39.6	13	10.0	9	15467.62	.
1985	100.0	5.5	9	10.0	9	19355.32	.
1986	105.4	5.4	11	10.0	9	24220.16	.
1987	116.1	10.2	18	12.8	12	30307.75	.
1988	181.2	38.3	17	12.8	12	37925.42	.
1989	272.7	40.9	27	18.5	18	47457.74	.
1990	293.2	7.5	26	18.5	18	59385.96	.
1991	330.9	13.0	20	14.5	15	74312.26	.
1992	478.4	44.5	30	17.5	21	75970.30	.
1993	751.9	57.2	18	26.0	27	118753.4	.
1994	1180.7	57.0	21	13.5	13	169391.5	.
1995	2040.4	72.8	20	13.5	13	201414.5	.
1996	2638.1	29.3	20	13.5	12	227464.4	.
1997	2863.3	8.5	14	13.5	12	268622.9	.
1998	3149.2	10.0	18	14.3	13	318576.0	.
1999	3356.6	6.6	21	18.0	19	393078.8	.
2000	3590.5	6.9	18	13.5	15	637731.1	.
2001	4268.0	18.9	18	44.3	14	816707.6	.
2002	4897.0	12.9	24	19.0	7	946253.4	.
2003	5493.3	14.0	20	15.8	11	1225559.3	.
2004	129.7	18.9	19	15.0	14.4	1330657.8	.
2005	144.7	17.8	18	13.0	10.8	1725395.8	.
2006	157.1	17.6	17	10.0	8.3	2280648.9	.
2007	167.4	16.5	16	9.5	6.54	3116272.1	.
2008	192.6	16.1	16	9.8	8.2	4857544.5	.
2009	102.2	12.6	19.55	6.0	3.8	5003866.6	.
2010	114.2	13.8	15.74	6.25	3.6	5534454.8	.
2011	126.0	10.9	16.75	12.0	9.72	6768,426.2	.

Source: CBN Annual Report various issues

Note: Monetary policy rate (MPR) replaced minimum rediscount rate (MRR) with effect from December 11, 2006.

Interpretation of the log of the data presented

The log table (2) below shows the trend of the effect of different interest rates on inflation has measured by consumer price index (CPI). In 1980 inflation rate was 2.29% increased to 3.04% in 1981 only prime lending rate increased by 0.04% while other interest rates remained static. During the 1980s inflation was in its highest at 3.71% in 1989, lending rate, minimum rediscounting rate and treasury rate were also in there highest rate. In the 1990s inflation was in its highest in 1995 at 4.29%, while prime lending rate was at its highest at 3.39% in 1992 and was 3.0% in 1995, minimum rediscounting rate was static between 1994 and 1997 at 2.6%. Between 2000 and 2007, inflation and treasury bills rate were at their highest at 2.94% and 2.68% respectively in 2001, while lending rate and minimum rediscount rate reflected their highest in 2002 at 3.19% and 2.94% respectively. Between 2008 and 2010, inflation rate and treasury bills rate were drastically reduced during the period this as a result of the Central Bank of Nigeria (CBN) has made it an agenda to lower inflation rate below 10 percent, which CBN nearly achieved in 2011 at 10.9%.

Table 2. Log of the Table

Year	Lin CPI	Lin Inflation	Lin Interest	Lin MRR	Lin Treasury Bills	Lin Money Supply
1980	3.74	2.29	2.01	1.79	1.61	8.75
1981	3.94	3.04	2.05	1.79	1.61	8.97
1982	4.01	2.04	2,33	2.08	1.95	9.20
1983	4.22	3.14	2.30	2.08	1.95	9.42
1984	4.55	3.68	2.53	2.30	2.14	9.65
1985	4.61	1.70	2.22	2.30	2.14	9.87
1986	4.66	1.69	2.35	2.30	2.14	10.09
1987	4.75	2.32	2.86	2.55	2.46	10.32
1988	5.20	3.65	2.80	2.55	2.46	10.54
1989	5.61	3.71	3.29	2.92	2.86	10.77
1990	5.68	2.01	3.24	2.92	2.86	10.99
1991	5.80	2.56	3.00	2.67	2.71	11.22
1992	6.17	3.80	3.39	2.86	3.04	11.24
1993	6.62	4.05	2.91	3.26	3.29	11.68
1994	7.07	4.04	3.04	2.60	2.53	12.04
1995	7.62	4.29	3.00	2.60	2.53	12.21
1996	7.88	3.38	2.98	2.60	2.51	12.33
1997	7.96	2.14	2.61	2.60	2.48	12.50

1998	8.05	2.30	2.91	2.66	2.56	12.67
1999	8.12	1.89	3.06	2.89	2.94	12.88
2000	8.19	1.93	2.89	2.60	2.71	13.37
2001	8.36	2.94	2.91	2.66	2.68	13.61
2002	8.50	2.56	3.19	2.94	1.95	13.76
2003	8.61	2.64	3.02	2.76	2.38	14.02
2004	8.75	2.71	2.95	2.71	1.44	14.10
2005	8.91	2.88	2.88	2.56	0.77	14.22
2006	10.38	2.10	2.83	2.56	2.38	14.50
2007	11.06	1.97	2.66	2.43	1.88	19.81
2008	12.73	1.92	2.66	2.51	2.35	30.88
2009	6.75	1.50	3.26	1.54	1.09	31.81
2010	7.55	1.65	2.62	1.6	1.03	35.19
2011	8.33	1.30	2.79	3.07	2.78	43.04

Correlation Analysis

The consumer price index and money supply are perfectly correlated at 0.821 significance. Prime lending rate is correlated with minimum rediscount rate at 0.786 significance, and treasury bills rate at 0.584 significance. Minimum rediscount rate is perfectly correlated with prime lending rate at 0.786 significance and treasury bills rate at 0.756 significance. Treasury bills rate is perfectly correlated with prime lending rate at 0.584 significance and minimum rediscount rate at 0.756 significance. Money supply is perfectly correlated with consumer index at 0.821 significance (Table 3).

Table 3. Correlation Result

	Consumer Price Index	Prime Lending Rate	Minimum Rediscount Rate	Treasury Bills Rate	Money Supply	Inflation Rate
Consumer price index	1	0.088	0.071	-0.113	0.821**	-0.208
Pearson correlation sig (2 tailed)	.	0.663	0.725	0.575	0.000	0.298
Prime Lending rate	0.088	1	0.786**	0.584**	0.206	0.311
Pearson correlation sig (2 tailed)	0.663	.	0.001	0.001	0.302	0.114
Minimum Rediscount rate	0.071	0.786**	1	0.756**	0.182	0.290
Pearson correlation sig (2 tailed)	0.725	0.000	.	0.000	0.362	0.143
Treasury Bills rate	-0.13	0.584**	0.756**	1	-0.264	0.363
Pearson correlation sig (2 tailed)	0.575	0.001	0.000	.	0.184	0.063
Money supply (M1)	0.821**	0.206	0.182	0.264	1	-0.253
Pearson correlation sig (2 tailed)	0.000	0.302	0.362	0.184	.	0.203
Inflation rate	-0.208	0.311	0.290	0.363	-0.253	1
Pearson correlation sig (2 tailed)	0.298	0.114	0.143	0.063	0.203	.

	Ln CPI	Ln INT.	Ln MRR	Ln TRE.	LnM1
Ln Pearson Correlation	1	0.587**	0.583**	0.080	0.984**
CPI Sig. (2 tailed)	.	0.001	0.001	0.691	0.000
Ln Pearson Correlation	0.587**	1	0.888**	0.552**	0.619
INT. Sig. (2tailed)	0.001	.	0.000	0.005	0.001
Ln Pearson Correlation	0.583**	0.888**	1	0.607**	0.619**
MRR Sig. (2 tailed)	0.001	0.000	.	0.001	0.001
Ln Pearson Correlation	0.080	0.522**	0.607**	1	0.048
TRE. Sig. (2 tailed)	0.691	0.005	0.001	.	0.814
Ln Pearson Correlation	0.984**	0.619**	0.619**	0.048	1
M1 Sig. (2 tailed)	0.000	0.001	0.001	0.814	.

Note: N = 27

Regression Analysis

Table 4.a (i) Prime Lending Rate and Inflation (CPI)

Model	Unstandardized Coeff.		Standardized Coeff.		
	B	Standard error	Beta	t	significance
Constant	-1.809	2.338		-0.774	0.446
Ln Int.	3.001	0.828	0.587	3.624	0.001
R	0.587			Standard error	1.57263
R^2	0.344			Durbin Watson	0.282
Adjusted R^2	0.318				

Table 4.b ANOVA

Model	Sum of Square	df	Mean square	F	significance
Regression	32.473	1	32.473	13.130	0.001
Residual	61.829	25	2.473		
Total	94.302	26			

From the tables (4.a & 4.b) above since the calculated F-value (13.13) is greater than the tabulated F-value (4.24) at 5% level of significance; this shows that there is significant relationship between prime lending rate and consumer price index (inflation) in Nigeria. The coefficient of determination (R^2) of 0.334 shows that about 34% of the increase in consumer price index is caused by changing in prime lending rate. This is supported by the t-calculated (3.62) which is greater than t-tabulated of 2.485 at 5% level of significance, and also the coefficient Ln prime lending rate of 3.001 shows that 1% increase in prime lending rate results to about 3.0% increase in consumer price index. Thus increase in prime lending rate results in significant increase in consumer price index (CPI).

Table 5.a (ii) Minimum Rediscount Rate and Inflation (CPI)

Model	Unstandardized Coeff.		Standardized Coeff.		.
	B	Standard error	Beta	t	significance
Constant	-1.735	2.338		-0.742	0.465
Ln MRR	3.252	0.905	0.583	3.592	0.001
R	0.583			Standard error	1.57732
R^2	0.340			Durbin Watson	0.260
Adjusted R^2	0.314				

Table 5.b   ANOVA

Model	Sum of Square	df	Mean square	F	significance
Regression	32.104	1	32.104	12.904	0.001
Residual	62.198	25	2.488		
Total	94.302	26			

From the above tables (5.a & 5.b) the F-calculated of 12.904 is greater than the F-tabulated value of 4.24 at 5% level of significant; this shows that there is significant relationship between minimum rediscount rate and consumer price index (inflation) in Nigeria. The coefficient of determination (R^2) of 0.340 shows that about 34% of the increase in consumer price index is caused by change in minimum rediscount rate. This is confirmed by the coefficient of Ln MRR of 3.252 and t-calculated value (3.592) which is greater than t-tabulated value (2.485) at 5% level of significance; shows that 1% increase in minimum rediscount rate lead to about 2% increase in consumer price index. Thus increase in minimum rediscount rate result in significant increase in consumer price index.

Table 6.a (iii) Treasury Bills Rate and Inflation (CPI)

Model	Unstandardized Coeff.		Standardized Coeff.		.
	B	Standard error	Beta	t	significance
Constant	5.942	1.659		3.582	0.001
Ln Trea.	0.278	0.692	0.080	0.702	0.691
R	0.080			Standard error	1.93594
R^2	0.006			Durbin Watson	0.032
Adjusted R^2	-0.033				

Table 6.b ANOVA

Model	Sum of Square	df	Mean square	F	significance
Regression	0.605	1	0.605	0.161	0.691
Residual	93.697	25	3.748		
Total	94.302	26			

From the tables (6.a & 6.b) above the calculated F value (0.161) is less than the tabulated F value (4.24) at 5% level of significance, it shows that there is significant relationship between treasury bills rate and consumer price index (inflation) in Nigeria. The coefficient of determination (R^2) of 0.006 shows that about 0.6% of the increase in consumer price index is caused by 1% change in treasury bills rate.

The coefficient of Ln Treasury bill rate of 0.278 and t-calculated value of 0.702 which is less than t-tabulated value of 2.485 shows that 1% change or increase in treasury bills rate lead to about 0.4% increase in consumer price index. Thus increase in treasury bills rate does not have any significant effect in consumer price index.

Table 7.a (iv) Money Supply and Inflation (CPI)

Model	Unstandardized Coeff.		Standardized Coeff.		
	B	Standard error	Beta	t	significance
Constant	-5.682	0.444		-12.975	0.000
Ln M1	1.052	0.038	0.984	27.947	0.000
R	0.984			Standard error	0.34204
R^2	0.969			Durbin Watson	0.743
Adjusted R^2	0.96				

Table 7.b ANOVA

Model	Sum of Square	df	Mean square	F	significance
Regression	91.377	1	91.377	781.044	0.000
Residual	2.925	25	0.117		
Total	94.302	26			

From the tables (7.a & 7.b) above the F-calculated (781.044) is greater than F-tabulated (4.24) at 5% level of significance; this shows that there is significant relationship between Money supply and consumer price index (inflation) in Nigeria. The coefficient of determination (R^2) of 0.969 shows that about 96% of the increase in consumer price index is caused by change in money supply.

The coefficient of Ln Money supply of 1.052 and t-calculated value of 27.947 which is greater than t-tabulated value of 2.485 shows that 1% increase in money supply will lead to about 2.5% increase in consumer price index. Thus increase in money supply result to significant increase in consumer price index.

Table 8.a (v) Lending Rate, Minimum Rediscount Rate, Treasury Bills rate, Money Supply and Inflation (CPI)

Model	Unstandardized Coeff. B	Standardized error	Standardized Coeff Beta	t	. significance
Constant	-5.556	0.497		-11.180	0.000
Ln Int.	-0.113	0.365	-0.022	-0.310	0.759
Ln MRR	-0.789	0.457	-0.141	-1.727	0.098
Ln Trea	0.438	0.165	0.126	2.650	0.015
Ln M1	1.154	0.052	1.080	22.025	0.000

R	0.989	Standard error 0.3118
R2	0.977	Durbin Watson 0.994
Adjusted R2	0.973	

Table 8.b ANOVA

Model	Sum of Square	df	Mean square	F	significance
Regression	92.163	4	23.041	236.933	0.000
Residual	2.139	22	0.097		
Total	94.302	26			

From the above tables (8.a & 8.b) the F-calculated (236.933) which is greater than the F-tabulated (2.87) at 5% level of significance shows that there is significant relationship among prime lending rate, minimum rediscount rate, treasury bills rate, money supply and consumer price index (inflation) in Nigeria. The coefficient of determination (R^2) of 0.977 shows that about 97% of the consumer price index (inflation) is caused by changes in prime lending rate, minimum rediscount rate, treasury bills rate and money supply. The coefficients of Ln prime lending rate of -0.113 and t-calculated value of 0.310 less than t-tabulated value of 2.074; Ln MRR of -0.789 and t-calculated value of 1.727 less than t-tabulated value of 2.074; Ln Trea. of 0.438 and t-calculated value of 2.650 greater than t-tabulated value of 2.074 and Ln M1 of 1.154 and t-calculated value of 22.05 greater t-tabulated value of 2.074 show that 1% increase in prime lending rate, minimum rediscount rate, treasury bills rate and money supply will lead to 0.3%, 1.7%, 2.6% and 22% in consumer price index respectively.

In conclusion, increase in prime lending rate and minimum rediscount rate is significant with increase in consumer price index while increase in money supply is the most significant with consumer price index but increase in treasury bills rate is not significant with consumer price index.

CONCLUSION

The high level of inflation started in Nigeria as a result of government effort in the post civil war era of 1970s to reconstruct the economy from its downturn, money was pumped into economy, that is Petronaira, this exacerbate the problem of inflation. Also the introduction of Structural Adjustment Programme (SAP) into the Nigerian economy brought about its own rounds of effects of increasing inflationary rate as a result of the conditionality given by the World Bank which did not go well with the economy. Several measures have been put in place by the authorities to control inflation in Nigeria as it is known fact that in the period of inflation that lenders suffer loss while the borrower gain because of the loss in the value of money. This abnormality is corrected through the introduction of high interest rate so as to encourage savings and curb inflation while other factors such as the monetary and fiscal policies were introduced. From the study it is concluded that high level of inflation in Nigeria was caused by many factors such as increase in the level of money supply without correspondent increase in investment, excessive bank lending, inconsistence in interest rates policy, etc.

RECOMMENDATION

Based on the findings of the study, the following recommendations are made for effective policy formulation and implementation of interest policy in Nigeria:

- Increase in money supply should be used for productive investment purposes.
- Low and stable inflation rate should be maintained in the economy couple with strict monitoring of price control system.
- Authorities should encourage investors and producers through the introduction of reasonable interest rates.
- Government should introduce policies that will promote the production of basic goods within the economy rather than their importation.
- Naira exchange rate should be revalued in other to have real value for the Naira.
- Mismanagement and misappropriation of government funds need to be discouraged, while deficit financing must be reduced.

LIMITATIONS & SCOPE FOR FURTHER RESEARCH

There is limitation to this study due to time constraint and lack of recent data from Central Bank of Nigeria. Future researchers in this area are advised to extend their work beyond 2010 and include more variables to determine Consumer Price Index (inflation) in line with Central Bank interest rate policies and most especially the recent GDP rebasing in Nigeria.

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