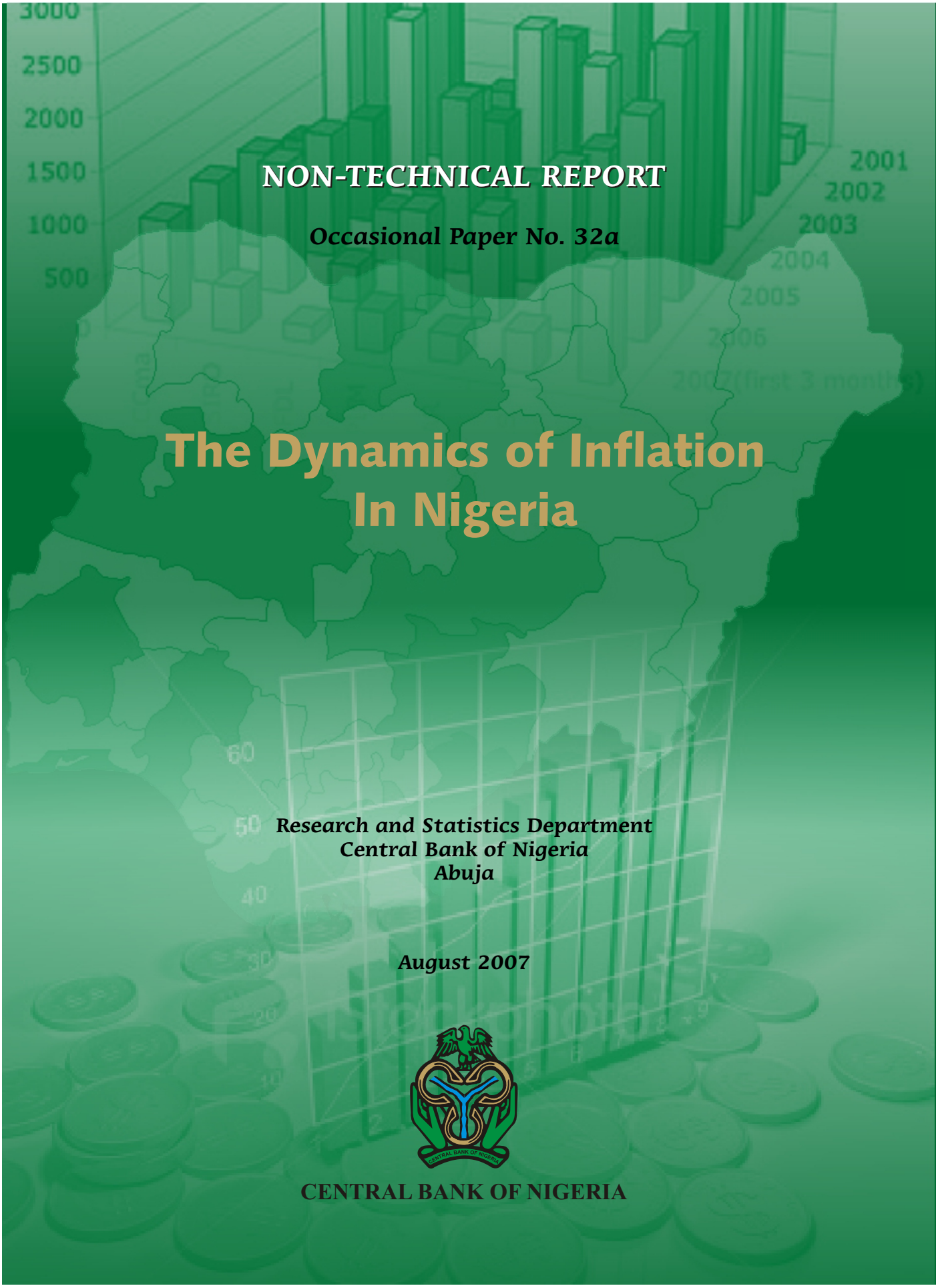

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The Dynamics of Inflation In Nigeria

Research and Statistics Department
Central Bank of Nigeria
Abuja

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CENTRAL BANK OF NIGERIA

NON-TECHNICAL REPORT

THE DYNAMICS OF INFLATION IN NIGERIA

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Preface

Inflationary forces had, over the years, greatly refocused the monetary policy of central banks from its primary function of providing finance for government and helping to stabilize the financial system to the maintenance of a stable domestic value of the currency. The question as to whether a central bank should be given the task of assuring price stability or low inflation was, as a result, put to rest in the affirmative that inflation should be tamed by the monetary institution.

The costs of inflation are well documented. Perhaps the most important of them is that it frustrates sustainable growth. However, it is important to note that the extent to which this happens depends on the institutional structure of an economy, the extent to which inflation has been anticipated and its behaviour understood. It is, therefore, not surprising that central banks devote considerable time and resources to study inflation in order to determine the optimal rate that would be consistent with economic activity, the type of monetary policies that can be designed to control it as well as the instruments to be used.

The Central Bank of Nigeria has long held the view that the behaviour of inflation in Nigeria has not been properly understood. Recognizing this challenge, the Research and Statistics Department of the CBN made it a high priority study with the aim of understanding the dynamics of inflation as well as developing a forecasting model that would give an indication of inflation in the future.

At the completion of the study report, the Bank then decided to extract a non-technical part of the report for the purpose of educating a wider audience. The study does not attempt to give answers to all the problems associated with inflation for that would be truly an onerous task. It is hoped that the report would, however, address many of the unasked questions about inflation and equally serve as a good guide to understanding the perceived path of inflation.

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Abstract

For most countries, the maintenance of price stability continues to be the overriding objective of monetary policy. The emphasis given to price stability in the conduct of monetary policy is with a view to promoting sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others. This non-technical report examines the dynamics of inflation with emphasis on the stylized facts on inflation in Nigeria, using quarterly data sets spanning 1981-2005. It is an excerpt from the main study report "The Dynamics of Inflation in Nigeria" intended to serve as a useful guide for policy makers, non-economists and experts in other allied fields in the understanding of the basic concepts of inflation, its measurements and its responses to macroeconomic policy developments. The empirical findings on inflationary developments in the industrialized, emerging market and developing countries, including Nigeria are discussed based on econometric evidences. It reviews institutional framework and the mandate of price stability, as well as explores the relationship between inflation and key macroeconomic variables.

Among other deductions from the analysis, time-trend is found to have a significant positive relationship with core and headline inflation, while food inflation shows significant seasonal variations. The significant seasonal component exhibited by food inflation confirms that it responds mostly to the predictable conditions of weather, which affects farm produce. Past effects of inflation are prevalent and persistent. Thus, there is a backward looking behaviour by economic agents in setting future prices.

Overall, policy issues recommended include the need to: take cognizance of the lag effect in the design of monetary policy in order to ensure that policy targets are effectively monitored; re-examine the type of monetary aggregates that provide important information about future inflation and continue the use of headline inflation, which is well understood by the general public and affects households almost immediately, as a measure of inflation.

THE DYNAMICS OF INFLATION IN NIGERIA

I. Introduction

For most countries, the maintenance of price stability continues to be the overriding objective of monetary policy. The emphasis given to price stability in the conduct of monetary policy is with a view to promoting sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others. In order to do this, they employ monetary policy frameworks/instruments considered best suited for achieving this mandate.

The Central Bank of Nigeria (CBN) employs the monetary targeting framework in the conduct of its monetary policy. This is based on the assumption of a stable and predictable relationship between money supply and inflation. Consequently, the need to understand the dynamics of inflation is central to the success of monetary policy to ensure the achievement of price stability.

This non-technical report examines the dynamics of inflation with emphasis on the stylized facts on inflation in Nigeria. It is an excerpt from the main study report "the Dynamics of Inflation in Nigeria". It is intended to serve as a useful guide for policy makers, non-economists and experts in other allied fields in the understanding of the basic concepts of inflation, its measurements and its responses to macroeconomic policy developments. It provides timely information to enable monetary policy actions that would mitigate inflationary pressures to be undertaken.

The rest of the report is structured into four sections. Following this introduction, section two covers the literature review, examining conceptual and theoretical issues as well as empirical literature for industrialized, emerging market and developing countries, including Nigeria. The empirical findings on inflationary developments in the various economies discussed are based on econometric evidences. Section three discusses stylized facts on inflation, using quarterly data sets spanning 1981-2005, in five ways. First, it examines the different components and structure of the consumer price index (CPI) basket. Second, it discusses institutional framework and the mandate of price stability. Third, it explores the relationship between inflation and key macroeconomic variables. Fourth, it x-rays the historical trends in inflation as well as policy responses. Lastly, a decomposition of the CPI is carried out in order to unveil its time series properties. Section four, concludes the report.

II. Literature Review

II.1 Conceptual Issues

In the economics literature, the concept of inflation has been intrinsically linked to

money, as captured by the often heard maxim "inflation is too much money chasing too few goods". Inflation has been widely described as an economic situation when the increase in money supply is “faster” than the new production of goods and services in the same economy (Hamilton, 2001). Usually, economists try to distinguish inflation from an economic phenomenon of a one time increase in prices or when there are price increases in a narrow group of economic goods or services (Piana, 2001). Thus, the term inflation describes a general and persistent increase in the prices of goods and services in an economy (Ojo, 2000; Melberg, 1992).

Inflation rate is measured as the percentage change in the price index (Consumer Price Index, Wholesale Price Index, Producer Price Index, etc). The consumer price index (CPI), for instance, measures the price of a representative basket of goods and services purchased by the average consumer and calculated on the basis of periodic survey of consumer prices (Essien, 2002). Owing to the different weights in the basket, changes in the price of some goods and services have impact on measured inflation with varying degrees. There are several disadvantages of the CPI as a measure of the price level. First, it does not reflect goods and services bought by firms or government, such as machinery. Second, it does not reflect the change in the quality of goods which might have occurred over time. Third, changes in the price of substitutable goods are not captured. Lastly, CPI basket usually does not change often. Despite these limitations, the CPI is still the most widely used measurement of the general price level. This is because it is used for indexation purposes for many wage and salary earners (including government employees).

Another measure of price movements is the GDP deflator. This is available on an annual basis. However, it is rarely used as a measure of inflation. This is because the CPI represents the cost of living and is, therefore, more appropriate for measuring the welfare of the people. Furthermore, because the CPI is available on a more frequent basis, it is most useful for monetary policy purposes.

In recent times, there have been three dominant schools of thought on the causes of inflation; the neo-classical/monetarist, neo-Keynesian, and structuralists. The neo-classical/monetarists opine that inflation is driven mainly by growth in the quantum of money supply. However, practical experiences of the Federal Reserve in the United States (US) have shown that this may not be entirely correct. For instance, the US money supply growth rates increase faster than prices itself (Hamilton, 2001, Colander, 1995). This has been traced to the increased demand for the US dollar as a global trade currency.

The neo-Keynesians attribute inflation to diminishing returns of production. This occurs when there is an increase in the velocity of money and an excess of current consumption over investment. The structuralists attribute the cause of inflation to structural factors and underlying characteristics of an economy (Adamson, 2000).

For instance, in developing countries particularly, those with a strong underground economy, prevalent hoarding or hedging, individuals expect future prices to increase above current prices and, hence, demand for goods and services are not only transactionary, but also precautionary. This creates artificial shortages of goods and reinforces inflationary pressures.

The literature is replete with those factors that could affect the level of inflation. These factors can be grouped into institutional, fiscal, monetary and balance of payments. Several studies (Melberg, 1992; Cukierman, Webb and Neyapti, 1992; Grilli et al, 1991; Alesina and Summers, 1993; Posen; 1993, Pollard (1993); and Debelle and Fisher, 1995) have shown that the level of independence (legal, administrative, instrument, etc.) of the monetary authority is an important institutional factor that determines inflation, especially, in industrialized countries, while the rate of turnover of central bank Governors in developing countries was seen as an important factor influencing inflation. However, caution should be exercised in the interpretation of these findings, given the difficulty in measuring the actual level of independence of a central bank.

The fiscal factors relate to the financing of budget deficits, largely through the money creation process. Under this view, inflation is said to be caused by large fiscal imbalances, arising from inefficient revenue collection procedures and limited development of the financial markets, which tends to increase the reliance on seigniorage as a source of deficit financing (Agenor and Hoffmaister, 1997 and Essien, 2005). The monetary factors or demand side determinants include increases in the level of money supply in excess of domestic demand, monetization of oil receipts, interest rates, real income and exchange rate (Moser, 1995). Prudent monetary management was also found to aid the reduction in the level and variability in inflation (Alesina and Summers, 1993).

The balance of payments or supply side factors, relate to the effects of exchange rate movements on the price level. For instance, exchange rate devaluation or depreciation induces higher import prices, external shocks and accentuates inflationary expectations (Melberg, 1992; Odusola and Akinlo, 2001; and Essien, 2005).

There are three major types of inflation according to the neo-Keynesians. The first is the demand-pull inflation, which occurs when aggregate demand is in excess of available supply (capacity). This phenomenon is also known as the Phillips curve inflation. The output gap can result from an increase in government purchases, increase in the foreign price level, or increase in money supply. The second is known as cost-push inflation, “commodity inflation” or “supply shock” inflation and occurs in the event of a sudden decrease in aggregate supply, owing to an increase in the price/cost of the commodity/production where there are no suitable alternatives

(Thomas, 2006). This type of inflation is becoming more common today than before, as evident in the rising price of housing, energy and food. It is often reflected in price/wage spirals in firms, whereby workers try to keep up their wages with the change in the price level and employers pass on the burden of higher costs to consumers through increase in prices. The third type, referred to, as structural inflation, is the built-in inflation, usually induced by changes in monetary policy.

Within these broad typologies of inflation, there are other types of inflation with varying determinants, effects, and remedies, which are classified based on the intensity, severity and persistence of the price increase. Thus, we have: hyperinflation (an extreme acceleration of yearly price increases of 3 percentage points), extremely high inflation (ranging between 50 per cent and 100 per cent); chronic inflation (15 30 per cent and lasting for at least 5 consecutive years); high inflation (with rates between 30 per cent and 50 per cent a year); moderate inflation (when the rate of increase in the general price level ranges from 5 per cent to 25/30 per cent); and low inflation (when the change in the consumer price index ranges from 1 per cent to 5 per cent). For any inflation below zero, a country is regarded as experiencing deflation (Vegh, 1992 and Piana, 2001). It is pertinent to note that there exists no binding restriction on the ranges of these classifications of inflation. The classification is usually determined by the inflation histories of the respective countries.

There are basically six identified costs of inflation in the literature. These include: shoe leather costs, menu costs, unintended changes in tax liabilities, arbitrary redistribution of wealth, uncertainty, and increased variability of relative prices. The shoe leather costs occur when economic agents have an incentive to minimize their cash holdings and prefer to hold cash in interest bearing accounts due to the loss in the value of currency. Menu costs of inflation itemizes all the inconvenience that individuals and firms face as price lists are updated frequently and price labels are changed. This diverts the attention of economic agents from other more productive ventures. Unintended changes in tax liabilities, say a reduction may be treated as real gains when incomes are unadjusted. This arises because, with a progressive taxation, rising nominal incomes are taxed more. Wealth is redistributed between debtors and creditors, which may otherwise be unacceptable, with unexpected or incorrectly anticipated inflation. Uncertainty becomes a cost, when in periods of volatile inflation, investors/firms may be reluctant to invest in new equipment; individuals will be unwilling to spend as they are unsure of what government would do next. Through increased variability in relative prices, rising inflation would reduce the competitiveness of a country in the international market for goods and services. The negative effect of this on the balance of payments cannot be overemphasized.

II.2 Theoretical Review

II.2.1 The Phillips Curve

Two major goals of interest to economic policy makers are low inflation and low employment, but quite often, these goals conflict. The adoption of monetary and/or fiscal policy moves the economy along the short-run aggregate supply curve to a point of higher output and a higher price level. As higher output is recorded, this is followed by lower unemployment, as firms need more workers when they produce more and vice-versa. This trade-off between inflation and unemployment is described as the Phillips curve. This was an empirical discovery by Phillips (1958), which showed an inverse relationship between wage and unemployment rates, using United Kingdom data plotted over the period 1862-1957. The discovery is strengthened by the fact that movement in the money wages could be explained by the level and changes of unemployment. An argument in favour of the Phillips curve is the extension that establishes a relationship between prices and unemployment. This rests on the assumption that wages and prices move in the same direction. The strength of the Phillips curve is that it captures an economically important and statistically reliable empirical relationship between inflation and unemployment. However, the Phillips curve is not without its critique.

A major criticism of the Phillips curve is that it does not take into account the interactions in the underlying or structural behaviour of consumers and firms in the economy, but rather captures empirical regularities between unemployment and inflation rates based purely on correlations in historical data. The Lucas Critique, for instance, opined that this may not be entirely exploited by the monetary authority if inflationary expectations shift in a particular direction, which does not align with historical data. Perhaps, the greatest weakness of the Phillips curve is its lack of theoretical underpinnings. No known study has derived a Phillips curve from first principles, beginning with the fundamental concerns and constraints of consumers and firms. This is not to say that the empirical relationship makes no sense. For instance, labor costs account for about two-thirds of the total cost of production, so that pressures in the labor markets should strongly influence changes in wages and prices. As Fuhrer (1995) stated, "*still, some feel that this lack of rigorous theoretical foundations is a fatal flaw; many find this deficiency less life-threatening*".

Second, in the trade-off that exists between trying to keep the rate of inflation down and achieving a lower unemployment rate, (two objectives which governments desire to pursue simultaneously), has raised concerns that some given level of unemployment rate, that would be consistent with some level of inflation has to be determined, if both objectives have to be pursued. Nevertheless, controversies rage on. This is primarily because the Phillips curve of the UK appears to be a special case, which remains to be validated unambiguously in other western industrialized

economies. This has rendered it an inconclusive guide to policy as to how inflation may be tackled, even in the highly industrialized economies. So far, issues pertaining to what rates of unemployment and inflation are to be regarded as tolerable, or what levels are to be regarded as consistent with the broad policy objective of full employment remain unresolved. Despite these shortcomings, the Phillips curve is still being used as a basis for forecasting inflation.

II.2.2 The Monetarist

The monetarists, following from the Quantity Theory of Money (QTM), have propounded that the quantity of money is the main determinant of the price level, or the value of money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM is traceable to Irving Fisher's famous equation of exchange:

$$MV = PQ \qquad \text{----------} \quad (1)$$

Where M stands for the stock of money; V for the velocity of circulation of money; Q is the volume of transactions which take place within the given period; while P stands for the general price level in the economy. Transforming the equation by substituting Y (total amount of goods and services exchanged for money) for Q, the equation of exchange becomes:

$$MV = PY \qquad \text{----------} \quad (2)$$

The introduction of Y provides the linkage between the monetary and the real side of the economy. In this framework, however, P, V and Y are endogenously determined within the system. The variable M is the policy variable, which is exogenously determined by the monetary authorities. The monetarists emphasize that any change in the quantity of money affects only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only. An essential feature of the monetarist model is its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics (Dornbusch, et al, 1996).

Nevertheless, the model's general weakness is found in its inadequacy to explain general price movement. The truism of direct proportion between change in the quantity of money and change in the price level can not be accepted in today's world (as there are other factors involved such as infrastructural and structural factors). Second, it is technically inconsistent to multiply two non-comparable factors as M relates to a point of time (static concept) and V to a period of time (dynamic concept). Furthermore, the velocity of circulation of money, V is highly unstable and would

change with variations in the stock of money or money income. Thus, it is unrealistic to assume V to be constant and independent of M.

In as much as the QTM analyses the relation between M and P in the long-run, it has been criticized for neglecting the short-run factors which influence this relationship. For instance, the Lucas "surprise price" shock posits that expectations are important in explaining relationships among variables and changes in policy could affect those expectations. Contrary to the monetarists' position that price levels vary in proportion to changes in monetary growth, Lucas opined that only unanticipated changes of money supply generate price variations that economic agents may misconstrue as relative price movements, which leads to price and output increase. In succinct terms, the Lucas "surprise price" shock assumes a positive correlation between output and inflation such that unexpected monetary expansion exerts a real effect on the economy in the short-run, while anticipated changes in money supply has no real economic effects. The QTM also gives undue importance to the price level, as if changes in prices were the most critical and important phenomenon of the economic system, overlooking factors such as the rate of interest as one of the causative factors between money and prices. Also, it places a misleading emphasis on the quantity of money as the principal cause of changes in the price level during the trade cycle. Thus, it has been argued that prices may not rise, despite an increase in the quantity of money during a depression; and they may not decline with reduction in the quantity of money during a boom. In addition, low prices during a depression are not caused by shortage of money, and high prices during a boom are not caused by abundance of money. Thus, the quantity theory is at best an imperfect guide to the cause of the trade cycle in the short period.

II.2.3 The Keynesians

The Keynesians opposed the monetarists' view of a direct and proportional relationship between the quantity of money and prices. According to this school, the relationship between changes in the quantity of money and prices is non-proportional and is indirect, through the rate of interest. The strength of the Keynesian theory is its integration of monetary theory and value theory on the one hand and the theory of output and employment through the rate of interest on the other hand. Thus, when the quantity of money increase, the rate of interest falls, leading to an increase in the volume of investment and aggregate demand, thereby raising output and employment. In other words, the Keynesians see a link between the real and monetary sectors of the economy an economic phenomenon that describes equilibrium in the goods and money market (IS-LM). Equally important about the Keynesian theory is that they examined the relationship between the quantity of money and prices both under unemployment and full employment situations. Accordingly, so long as there is unemployment, output and employment will change in the same proportion as the quantity of money, but there will be no change in prices.

At full employment, however, changes in the quantity of money will induce a proportional change in price. Thus, this approach has the virtue of emphasizing that the objectives of full employment and price stability may be inherently irreconcilable (Olofin, 2001).

Several weaknesses of the Keynesian postulation have been documented. For instance, Keynesians assume prices as fixed, so that the effect of money appears in terms of quantity of goods traded rather than their average prices. Keynesians also assume that monetary changes are largely absorbed by changes in the demand for money. They fail to appreciate the true nature of money and assume that money could be exchanged for bonds only. However, it is known that money can be exchanged for many different types of assets like, securities, physical assets, human wealth, etc.

II.2.4 Neo-Keynesian

The Neo-Keynesian theoretical exposition combines both aggregate demand and aggregate supply. It assumes a Keynesian view on the short-run and a classical view in the long-run. The simplistic approach is to consider changes in public expenditure or the nominal money supply and assume that expected inflation is zero. As a result, aggregate demand increases with real money balances and, therefore, decreases with the price level. Neo-Keynesian theory focuses on productivity, because, declining productivity signals diminishing returns to scale and, consequently, induces inflationary pressures, resulting mainly from over-heating of the economy and widening output gap. From the neo-Keynesian perspective, budget balancing and restraints on spending do not control inflation, and persistent budget deficits do not cause inflation. What causes inflation are increase in the velocity of money and the reduction in efficiency caused by excessive present consumption versus investment.

A major development under this theory is the concept of 'potential output', which at times is referred to as the natural output. This level of output also corresponds to the natural rate of unemployment, or what is also referred to as the non-accelerating inflation rate of unemployment (NAIRU). According to the neo-Keynesians, inflation depends on the level of potential output or the natural rate of unemployment. However, the exact level of potential output or natural rate of unemployment is generally unknown and tends to change over time.

The neo-Keynesians recognize the fact that most economic decisions are made under conditions of uncertainty. However, given their preoccupation with the dynamics of

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[1] *This is a level of output where the economy is at its optimal level of production, given the institutional and natural constraints.*

[2] *NAIRU is the unemployment rate at which the inflation rate is neither rising nor falling or the natural rate of unemployment described as the normal rate of unemployment around which the unemployment rate fluctuates. It is the rate of unemployment that is beyond the influence of monetary policy and determined by*

growth and long-run considerations, it is logical to expect that they cannot successfully, abstract from the reality of uncertainties surrounding dynamic analysis.

II.3 Empirical Literature

A review of the literature on inflation in industrialized, emerging market, and developing economies is the focus of this section. It seeks to reveal the dominant theoretical underpinning for assessing the dynamics of inflation and the methodology for forecasting its future trajectory.

De Brouwer and Ericsson (1995) investigated inflationary developments in Australia, between the 1980s and 1990s. Their results showed that the structure of the inflationary process in Australia did not appear to have changed. Rather, the recent fall in inflation was explained in terms of changes in those factors that determine inflation. Stock and Watson (1999) used the conventional Phillips curve (unemployment rate) to investigate forecasts of U.S. inflation at the 12-month horizon. They found that inflation forecasts produced by the Phillips curve generally had been more accurate than forecasts based on other macroeconomic variables, including interest rates, money and commodity prices but relying on it to the exclusion of other forecasts was a mistake. Forecasting relations based on other measures of aggregate activity could perform as well or better than those based on unemployment, and combining these forecasts would produce optimal forecasts.

In the case of India, Callen and Chang (1999) in their study of inflation adopted a multiple indicator approach. They used percentage changes in three different price indices: the wholesale price index (WPI); the consumer price index (CPI); and the GDP deflator as measures of inflation in order to determine which of them provided the most useful information about future inflationary trends. The WPI was used in the analysis because it had a broader coverage and was published on a more frequent and timely basis than the CPI. However, the CPI remained important because it was used for indexation purposes for many wage and salary earners (including government employees). The sample period used in the estimation work was 1982Q2 to 1998Q2. The findings indicated that exchange rate and import prices were relevant for inflation. It was concluded that while the broad money target has been de-emphasized, developments in the monetary aggregates remain an important indicator of future inflation.

Williams and Adedeji (2004) examined price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded-goods markets on inflation, holding other potential influences constant. The study captured the remarkable macroeconomic stability and growth for the period 1991 to 2002. They found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation, and the exchange rate. The authors observed that

inflation was influenced only by imbalances in the money market.

Examining the determining factors of inflation, from 1998 to June 2005, in Pakistan, Khan and Schimmelpfennig (2006) showed that monetary factors were the main drivers of inflation, while "wheat support price" affects inflation in the short-run. A monetary perspective that included monetary variables such as money supply, credit to private sector, the exchange rate, as well the "wheat support price" as a supply-side factor was adopted. The findings indicated that monetary factors played a dominant role in recent inflation, affecting inflation with a lag of about one year and increases in the wheat support price influence inflation in the short-run. The conclusion of the study was that wheat support price mattered for inflation over the medium term only if accommodated by monetary policy. The study confirmed that a long-run relationship existed between the CPI and private sector credit.

Aron and Muellbauer (2000) examined inflation and output for South Africa. They confirmed the importance of the output gap and the exchange rate for forecasting inflation; and the influence from recent changes in the current account surplus to GDP ratio, which was also sensitive to short-term interest rates. However, a rise in interest rates increased inflation in the short-run, via a rise in mortgage interest payments (a component of the consumer price index). On the demand side, there were important negative interest rate effects, though these had been altered by changes in the monetary policy regime. The trade surplus and government surplus to GDP ratios, which also responded to interest rate changes and improvements in the terms-of-trade, all had a positive effect on future output.

Lim and Papi (1997) attempted to shed some light on the determinants of inflation in Turkey by analyzing price determination within the framework of a multi-sector macroeconomic model during 1970-1995. The choice of the sample period was dictated by the desire to take a long-term view, while the rationale for quarterly data, as opposed to annual data, was to capture short-term inflation dynamics. The main findings were that monetary variables played a central role in the inflationary process. Public sector deficits contributed to inflationary pressures and inertia factors were important. The authors concluded that policy makers' commitment to active exchange rate depreciation on several occasions in the past 15 years had also contributed to the inflationary process. Their conclusions were broadly in line with the results from the other developing countries, albeit perhaps with the exchange rate having a stronger role in the inflationary process than was the case in several other countries.

In Africa, several studies have been conducted on the dynamics of inflation. Durevall and Ndung'u (1999), analyzed the dynamics of inflation in Kenya during 1974-1996, a period characterized by external shocks and internal imbalances. The study found exchange rate, foreign prices, and terms of trade as having long-run effects on

inflation, while money supply and interest rate only had short-run effects. Past inflation was also very important in the Kenyan economy up to 1993, when about 40 per cent of current inflation was transmitted to the next quarter. In the study by Ubide (1997) for Mozambique, results from the analyses of a decomposition of the components of CPI, showed that the rate of inflation was determined by seasonal behaviour and a collection of irregular events, corresponding mainly to agro-climatic conditions.

In Nigeria, although a number of studies on inflation exist, there is no consensus on which theory of inflation determination is the most adequate. These studies explored all the dominant theories under a variety of modeling techniques. While some favour the structuralists, others adopted the monetarists, and some, the fiscalists approach, still others examined a combination of these theories. Odusola and Akinlo, (2001) showed that inflation in Nigeria was largely determined by the absence of fiscal prudence on the part of government, parallel exchange rate shocks and output. Asogu (1991) noted this view and concluded that industrial output, net exports, current money supply, exchange rate changes and domestic food prices were key determinants. Other Nigerian scholars like Fakiyesi (1996), Adamson (2000), and Masha (2000), concluded that growth in broad money, rate of exchange of the naira vis-à-vis the dollar, growth of real income, and price volatility were some of the variables that influence inflation behaviour in Nigeria.

Overall, the empirical studies have not been conclusive as to the causative factors of inflation. However, there seem to be a consensus that entrenched fiscal imprudence may worsen inflation.

III. Stylized Facts on Inflation in Nigeria

III.1 Component and Structure of CPI

In Nigeria, inflation is derived from the Consumer Price Index (CPI). The National Bureau of Statistics (NBS), formerly known as the Federal Office of Statistics (FOS), is responsible for the computation of this index and reports it in its monthly publication, the "Statistical News". Officially, the CPI is called the "Composite Consumer Price Index" since it combines the rural and urban CPIs. The composite CPI measures the average level of retail prices of goods and services consumed by households living in all parts of the country. Information for the computation of the CPI, including the weights is obtained through surveys. The regular survey monitors and records price developments, while the survey to obtain the weights for the computation of the base period is conducted periodically. This is because of the huge resources required in reviewing the weights.

The NBS first revised the base period of the CPI from 1960 to 1975 following its

National Consumer Expenditure Survey (NCES) of 1974/1975 when it commenced the computation of the indices on rural and urban basis. The generated rural and urban CPIs were subsequently used to compute the composite CPI. Further consumer expenditure surveys were conducted in 1980/1981 and 1996/1997, consequent upon the desire to update and improve the basket of goods used for the compilation of the CPI to reflect the reality of the evolution of purchasing power and the consumption patterns of the average consumer in Nigeria. This led to further revisions of the base period of the composite CPI to 1985 and May 2003, respectively.

After each NCES, the mix of commodity groups in the basket, inclusion of new items/groups and re-computation of weights are based on newly provided data on expenditure. For instance, the 1985-based CPI basket was reviewed to indicate new commodity groups such as medical care and health expenses, recreation, entertainment, education and cultural services, which were not included when the 1975 base was used. The recently compiled May 2003 base-year CPI is essentially, based on the classification of individual consumption by purpose (COICOP). With the approach, the old indices were revised, new weights derived and the basket structured into 12 commodity groups and eighty-five subgroups. Prices of the components of these groups are obtained both for urban and rural areas. The components and weights of the composite CPI basket are given in Table 1. Expectedly, food and non-alcoholic beverage dominate the basket, representing 64.4 per cent of the consumption basket. Consequently, factors affecting food prices would be crucial in understanding the determinants of inflation in Nigeria.

In recent times, a number of countries, particularly those that have adopted price stability as the main objective of monetary policy and have an explicit inflation target, have developed measures of "underlying or core" inflation. This measure attempts to distinguish permanent trends in inflation by eliminating temporary or non-core fluctuations from the index. A distinguishing characteristic of these two types of inflation is that while non-core is generated by supply shocks, such as: drought, cyclone, oil price, etc, the core component is mainly influenced by demand shocks (Essien, 2002). Core inflation can be measured by merely removing (that is, excluding), in an ad hoc manner, the unwanted component or noise from the index used in computing the inflation rate. In Nigeria, until recently, core inflation was measured by excluding the farm produce component of CPI from the basket. However, a second measure of core inflation excludes both farm produce and energy. As shown in the table below, the two core components, (all items less farm produce and all items less farm produce and energy) are equally important in the basket at about 41 and 34 per cent, respectively. Generally, while the food component has declined in recent times, from about 70 per cent to 63.76 per cent, the core component has increased.

An important variable in the consumer basket is the housing, water, electricity, gas

and other fuel group. Transport and communication is equally important. The least item in terms of weight in the basket is education.

Table 1: Percentage Contribution of Items in the CPI Basket of Goods

Core (All Items less Farm Produce)	40.95
Core (All Items less Farm Produce and Energy)	33.59
Food	63.76
Food & Non -alcohol Beverage	64.41
Alcoholic Beverage, Tobacco and Kola	2.06
Clothing and Footwear	3.21
Housing Water, Electricit y, Gas and Other Fuel	18.10
Furnishings & Household Equipment Maintenance	3.82
Health	1.36
Transport and Communication	4.35
Recreation & Culture	0.89
Education	0.21
Restaurant & Hotels	1.29
Miscellaneous Goods & Services	0.30

Note: Transport and Communication are separate commodity groups in the NBS Statistical News
Source: NBS Statistical News

III.2 Institutional Framework and the Mandate of Price Stability

One of the statutory responsibilities of the CBN is the formulation and implementation of monetary policy, with the overriding objective of maintaining stable prices consistent with the achievement of sustainable economic growth. Monetary policy formulation entails setting intermediate and operating targets in tandem with the assumed targets for GDP growth, inflation rate and balance of payments. Monetary policy in Nigeria is based on the assumption that there is a stable relationship between monetary variables (such as money and domestic credit), which falls under the purview of the monetary authorities, and non-monetary variables (such as real output and prices).

Prior to the liberalization of the banking system, the CBN relied on administrative measures like credit ceilings, cash and liquidity ratios, credit guidelines, etc, in the conduct of its monetary policy. Following liberalization, the monetary policy

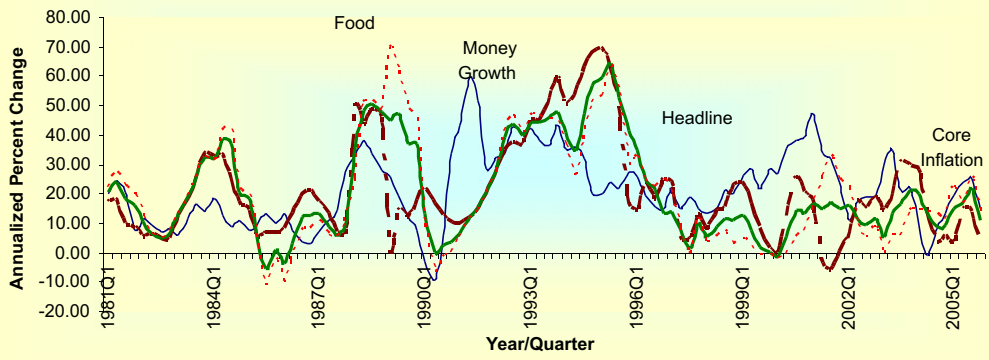
framework shifted in 1993 to the indirect approach. The open market operations thus became the primary instrument for the conduct of monetary policy supported by discount window operations and reserve requirements. The minimum rediscount rate (MRR) complemented with the repurchase (REPO) rate is the key policy rate that sets the monetary policy stance. In recognition of the lag effects of monetary policy, the CBN, since fiscal 2002 shifted to a medium-term framework. Under this framework, money growth targets that are consistent with inflation and real output growth targets are set over a two-year period. In December 2006, a new monetary policy framework, which relies on short-term interest rate as a major operating target was adopted. The monetary policy rate (MPR) replaced the MRR in the new framework and, thus, became the anchor rate for other interest rates.

The success of monetary policy depends largely on the autonomy of the central bank. However, the achievement of these overall macroeconomic objectives was greatly hindered owing to the limited operational autonomy of the CBN. The instrument autonomy granted to the CBN in 1998, which repealed the CBN (Amendment) Decree No 3 of 1997 enabled the Bank to deploy monetary instruments at its disposal for the conduct of monetary policy. In 2007, a new CBN Act, which gave the Bank broader independence, was enacted to include the provision of a transparent and credible framework to lock-in inflationary expectations through the adoption of inflation target as the nominal anchor for monetary policy.

III.3 Relationship between Inflation Rate and Key Macroeconomic Variables

The figures below show the quarterly movements in the rate of inflation (decomposed into headline, core and non-core) and key macroeconomic variables from 1981 to 2005. All variables except interest rates were measured on annualized basis as the percentage change in their logarithmic form. Core inflation is defined as headline inflation less farm produce, while non-core refers basically to food inflation.

Fig. 1
Money Growth vs Headline, Core and Food Inflation Rates, 1981 - 2005



Specifically, Figure 1 shows movement in broad money growth and the three variants of inflation rate. The chart indicates a co-movement between growth in money stock and the rate of inflation, as suggested by theory. This is particularly discernible in the first half of the 1980s and mid-1990s. From the chart, it is obvious that the different variants of inflation respond to growth in the broad money stock with a lag. Visual inspection of the chart suggests that in the early 1980s, headline inflation responded to changes in the money stock after about a quarter. Thereafter, the lag varies ranging usually between two to three quarters between the late 1980s and mid-1990s. Beginning from 1997, all four variables record high frequency changes making the co-movement less apparent. A careful study of the chart reveals that, during this period, all three variants of inflation responded to changes in the money stock at different paces.

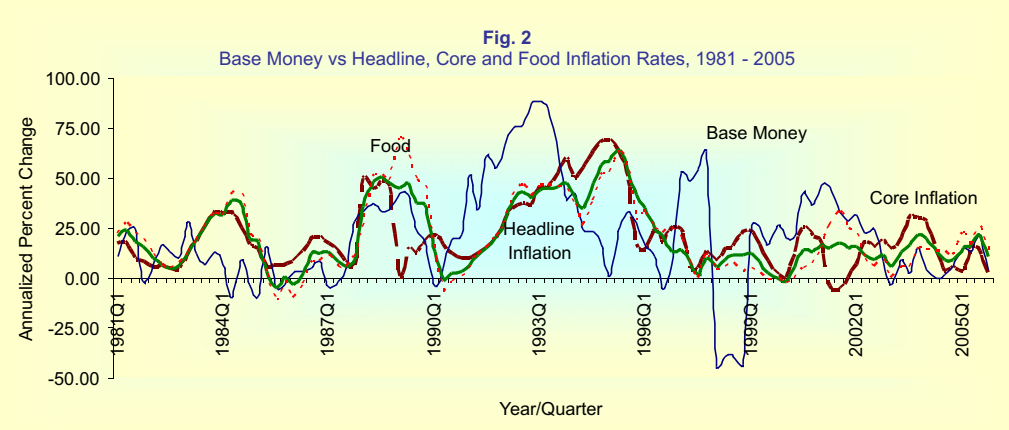
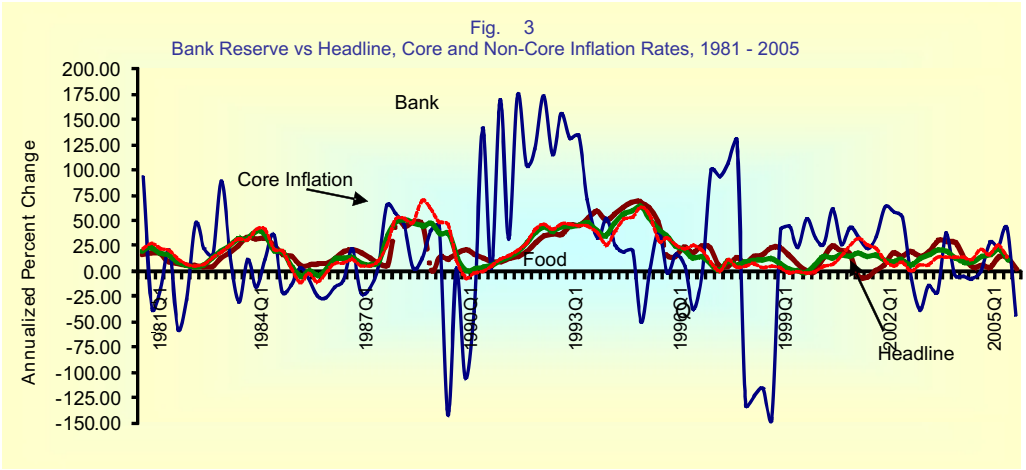
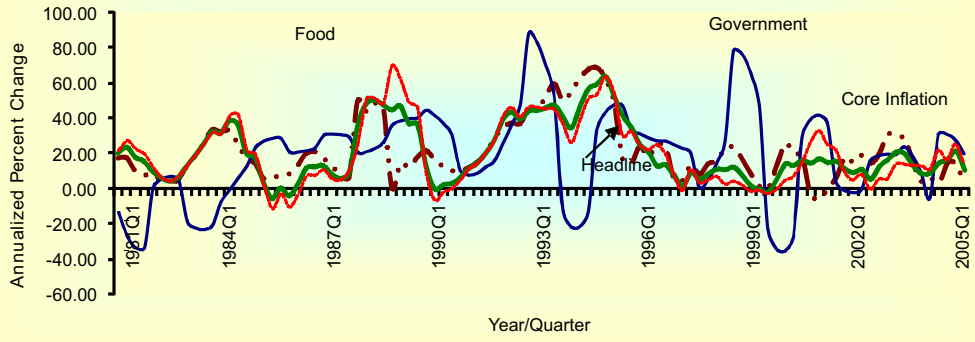


Figure 2 shows movement in base money vis-à-vis the three variants of inflation. The pattern as expected is similar to that of money supply. Base money exerts a considerable influence on inflation rate with a lag, except for the period 1996 and 1999 when movement in base money vis-a-vis inflation is obscure.



In Figure 3, the relationship between bank reserves and inflation rate is shown. A careful analysis of the chart indicates that, though bank reserves displays sharp oscillations, inflation rate responds less sharply. What is clearly seen is that in periods when bank reserves were high, the various measures of inflation generally maintained a rising trend. Though these variables move in sympathy, the lag at which inflation responds to changes in bank reserves varies for different periods.

Fig. 4
Government Expenditure vs Headline, Core and Food Inflation Rates, 1981 - 2005



The relationship between government expenditure and inflation rate is shown in Figure 4. From the chart, inflation tends to co-vary with government expenditure with a shorter lag. Beginning from 2002, however, inflation rate responds to increase in government expenditure with a lag of about one to two quarters. In Figure 5 below, the relationship between the exchange rate and various definitions of inflation is shown. From the chart, prior to the liberalization of the domestic currency, inflation rate led changes in the exchange rate.

Fig. 5
Exchange Rate vs Headline, Core and Non-Core Inflation Rates, 1981 - 2005

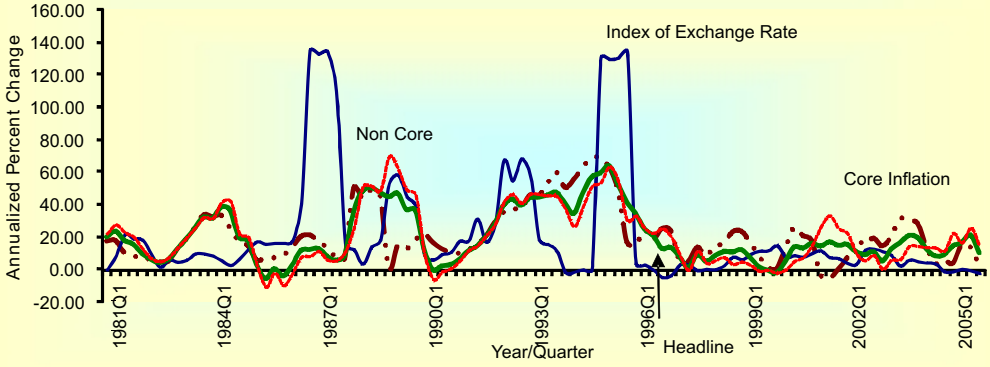


Fig. 6
Headline Inflation Rate vs Savings, Deposit and Prime Lending Rates, 1981 - 2005

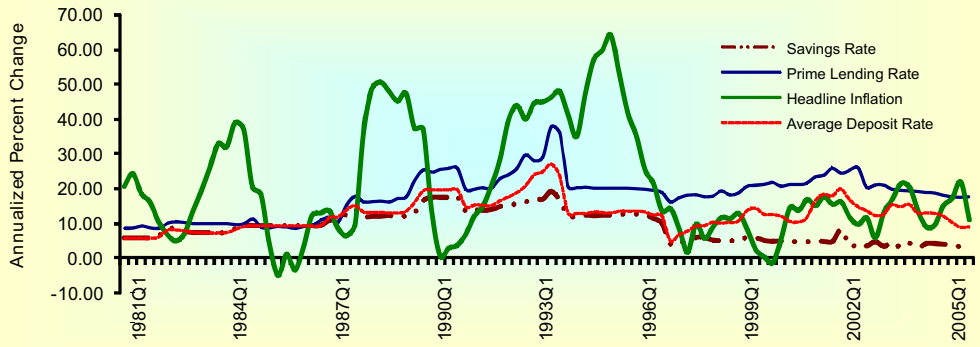


Fig. 7
Core Inflation Rate vs Savings, Deposit and Prime Lending Rates, 1981 - 2005

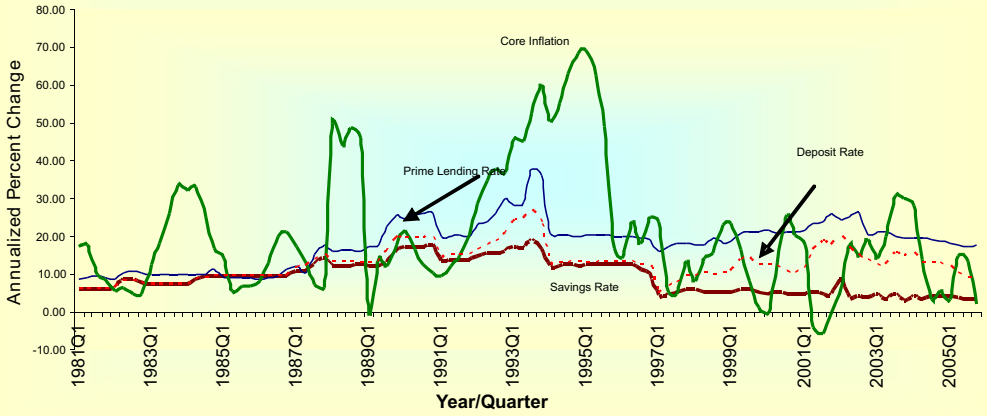
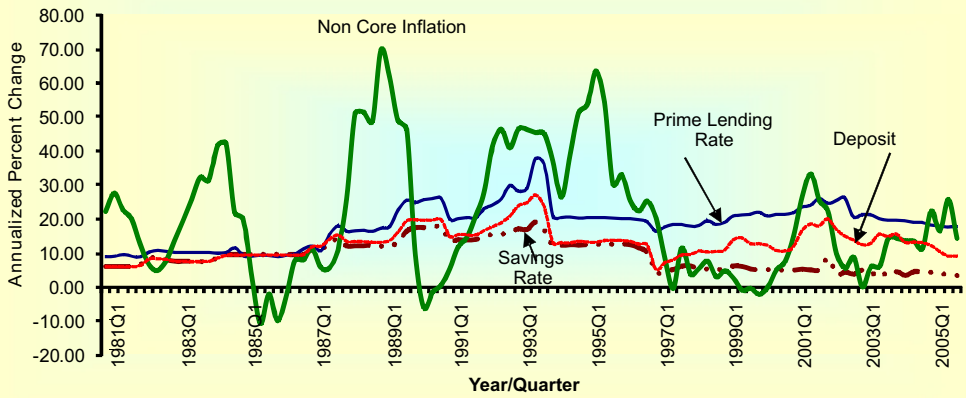
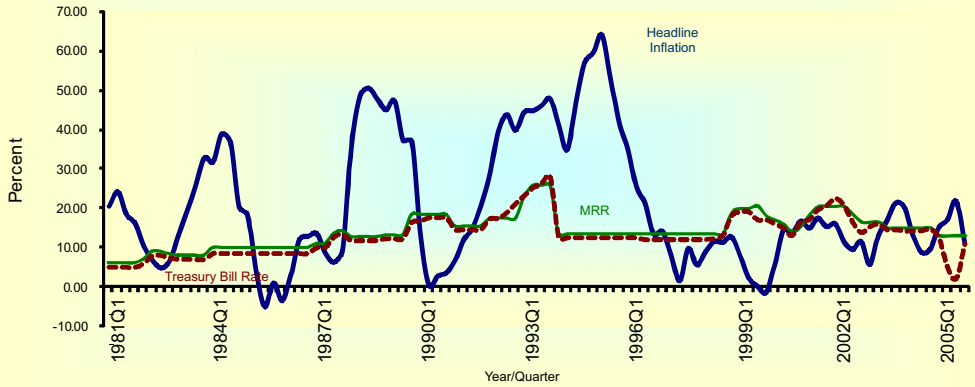


Fig. 8
Food Inflation Rate vs Savings, Deposit and Prime Lending Rates, 1981 - 2005



The relationship between market interest rates and inflation rate is depicted in Figures 6, 7 and 8. As expected the market interest rates savings, deposit, and prime lending rates move in the same direction. Similarly, the market interest rates co-vary with the three variants of inflation, though the relationship with the prime lending rate is most discernible. Core inflation responds more to changes in prime lending rate than headline and non-core inflation. The response lag of all three variants of inflation varied over the period under consideration, ranging from one to three quarters.

Fig. 9
Headline Inflation, MRR and Treasury Bill Rates, 1981 - 2005



Figures 9-11 show the relationship between policy rates MRR and TB rate - and inflation rate. A critical inspection of the chart reveals that the MRR and the TB rate show similar characteristics rising and falling almost simultaneously. Though, there exists a subtle relationship between the policy rates and inflation, the leads and lags are not very evident. From 1999 date, however, inflation appears to be leading the policy rates.

Fig. 10
Core Inflation, MRR and Treasury Bill Rates, 1981 - 2005

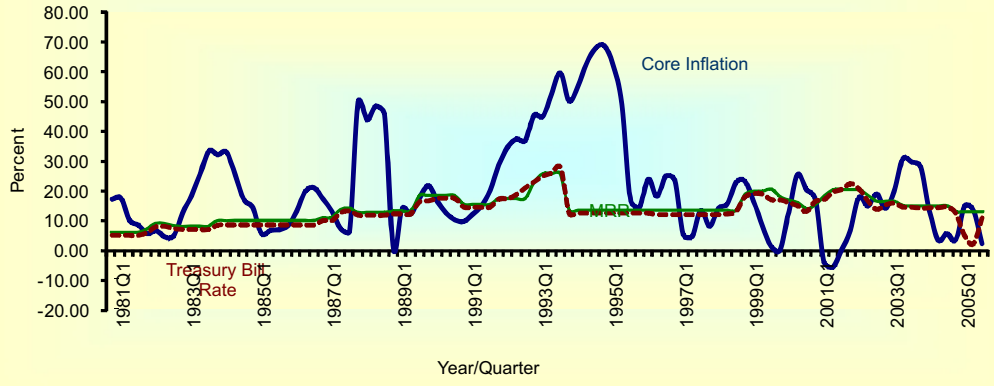
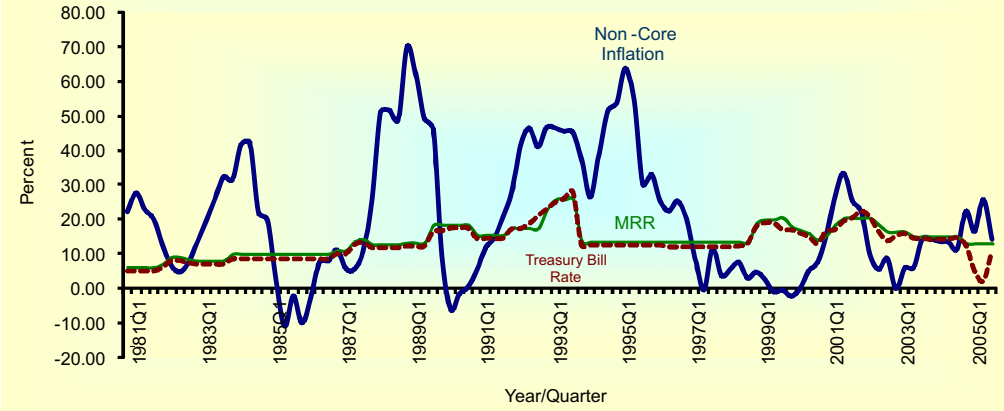


Fig. 11
Food Inflation, MRR and Treasury Bill Rates, 1981 - 2005



The various definitions of inflation are charted against credit to the private sector and aggregate demand in Figures 12-14. Credit to the private sector appears to move inversely with inflation in the charts; this is particularly most visible with core inflation. The reason for the inverse relationship is that private sector credit is expected to boost output production and reduce the pressure on prices. Suffice to note that private sector credit can also be used to boost aggregate consumption and not necessarily investment.

Fig. 12
Headline Inflation Rate vs Credit to the Private Sector and Aggregate Demand, 1981 - 2005

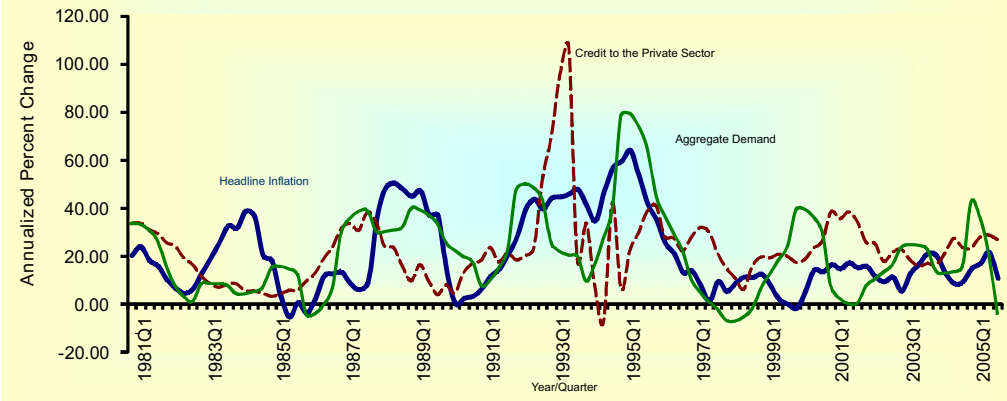
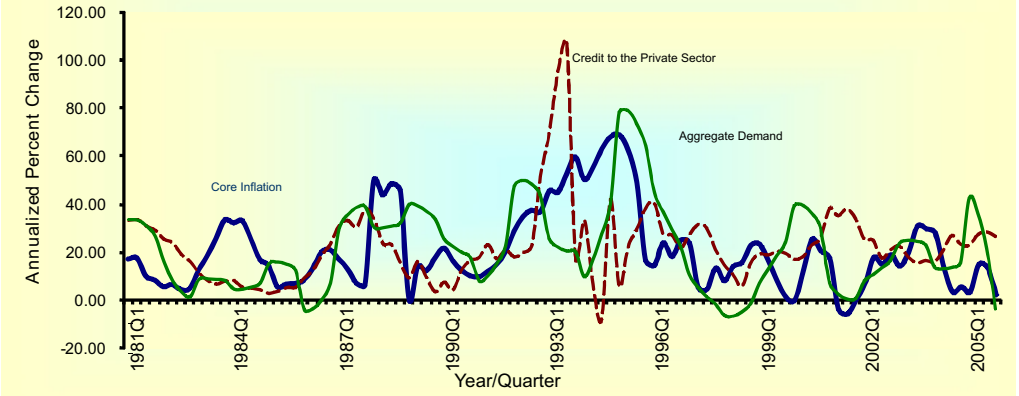


Fig. 13
Core Inflation Rate vs Credit to the Private Sector and Aggregate Demand, 1981 - 2005



However, between 1990-1992 and 2000-2002, growth in credit to the private sector co-varied directly with inflation rate. This could be due to the pass-through effect of the lending rate. Aggregate demand (Gross Domestic Product expenditure), on the other hand, appears to vary directly with inflation rate. Though, all three variants of inflation move in tandem with changes in the aggregate demand, food inflation seems to be the most responsive to changes in the aggregate demand. This could be explained by the relatively high proportion of food in the consumer basket.

Fig. 14
Food Inflation Rate vs Credit to the Private Sector and Aggregate Demand, 1981 - 2005

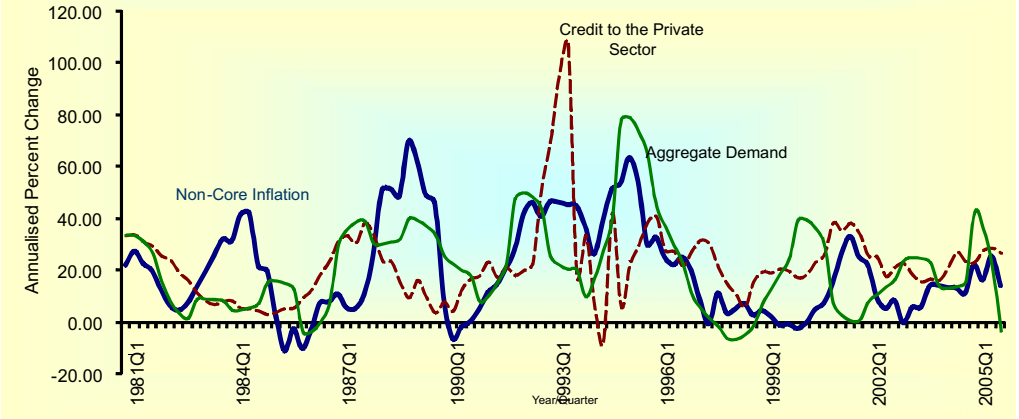
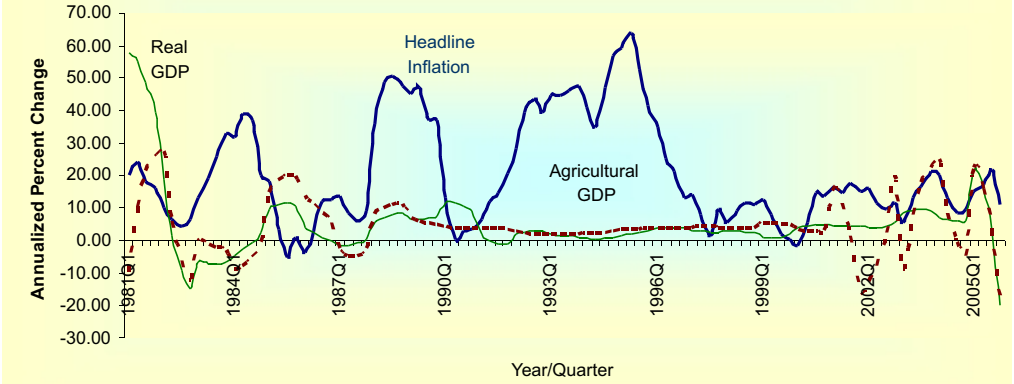
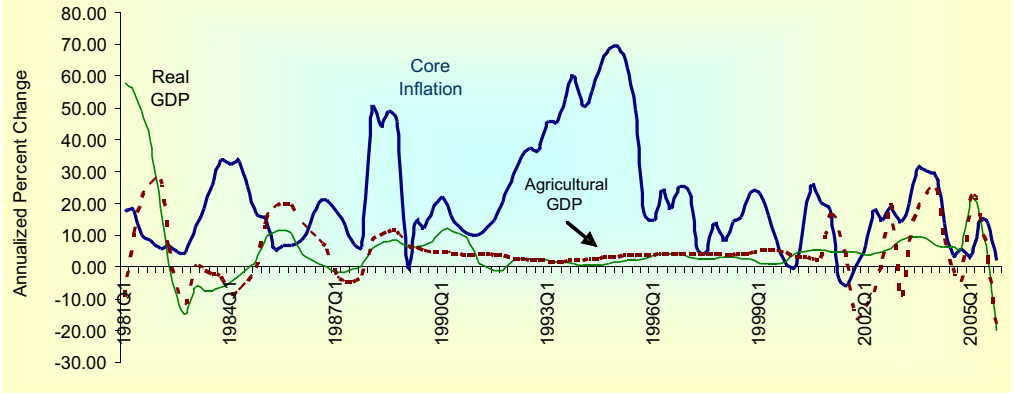


Fig. 15
Headline Inflation vs Overall and Agricultural GDP, 1981 - 2005



Figures 15-17 depict the trend in output growth (overall and agricultural GDP) vis-à-vis the various variants of inflation rate. As expected, the charts indicate that there appears to be an inverse relationship between the inflation rate and output growth.

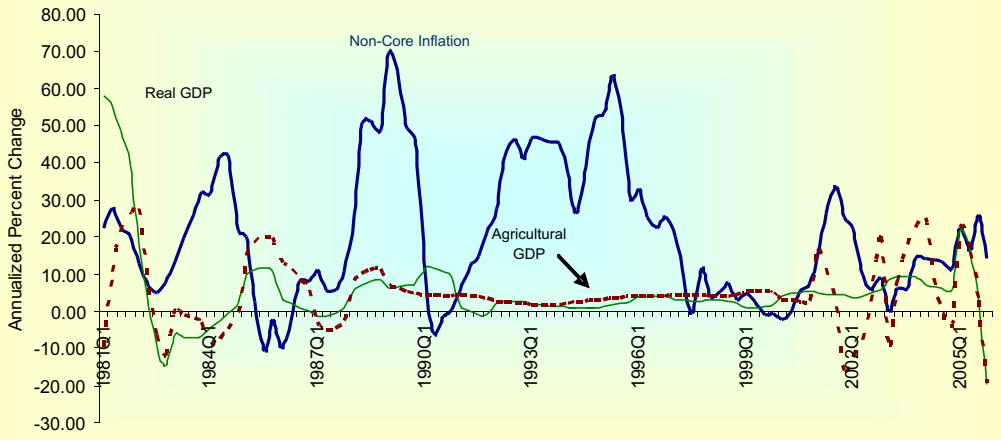
Fig. 16
Core Inflation vs Overall and Agricultural GDP, 1981 - 2005



Overtime, the response of inflation to changes in output, as depicted in the charts takes about one quarter. Basically, the charts show that while headline and core inflation respond more to changes in real output, non-core inflation varies most prominently with Agricultural GDP. Beginning from 1999, however, the pattern of relationship between output growth and inflation becomes less discernible.

[3]Agricultural GDP comprises crops, livestock and fishing, excluding forestry.

Fig. 17
Non-Core Inflation vs Overall and Agricultural GDP, 1981 - 2005



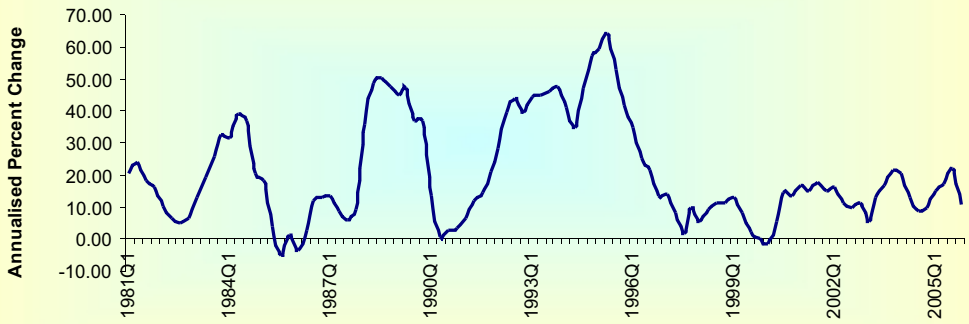
III.4 Trends in Inflation and Policy Response

Episodes of high inflation did not occur until the early 1970's, when inflation rose sharply from a very low level. Prior to that time, headline inflation was relatively stable, averaging 3.5 per cent between 1960 and 1970. Post independence industrial policy, increase in government expenditure to finance the civil war, low levels of production during the war, post-war reconstruction, and the Adebo/Udoji wage increases following the oil boom, were some of the factors that induced high inflation at that time. However, in the last twenty five years (1981-2005), episodes of high inflation have become more frequent. For instance, during the collapse in the oil market in the early 1980's, headline inflation rose from the moderate levels of 16 per cent in 1980 to peak at 38 per cent by mid-1984. Similarly, non-core inflation rose substantially during that period reaching 42.2 per cent by mid-1984. Core inflation also rose rapidly during that time with a spike in 1983. The sharp increase in headline and core inflation were attributable to the persistent output gap and the austerity measures introduced in 1983 to stem the imminent collapse of the economy, factors such as import restriction and foreign exchange constraints led to severe shortages in supply of goods and services. The increase in the non-core component was adduced to non-monetary factors, Dutch-disease syndrome as well as rigid control on the marketing of agricultural commodities.

Even though inflation decelerated from 1985, it was becoming increasingly obvious that monetary tightening and the fiscal measures adopted were inadequate given the magnitude of the problem confronting the Nigerian economy. Thus, by 1986, Nigeria adopted the Structural Adjustment Programme (SAP), which saw a more liberalized economic environment. However, the balance of payments crises that precipitated the adjustment programme persisted. For the first time in a long while, there was a fuel

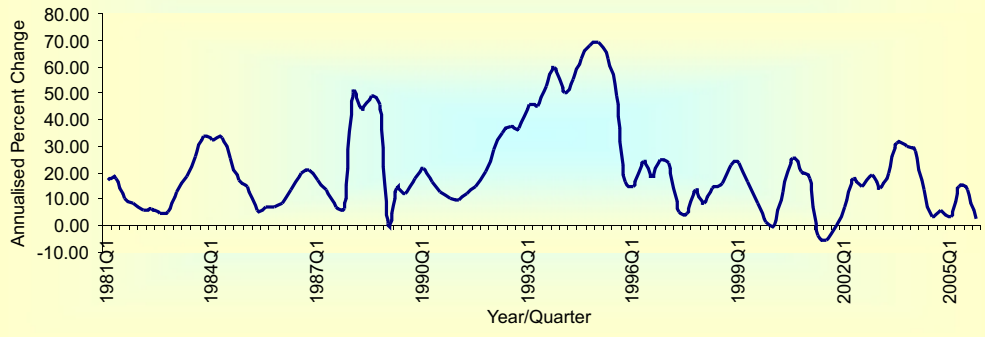
price adjustment in 1988, and a significant depreciation of the exchange rate. Monetary policy became accommodating as government strived to give SAP a humane face following the onset of adjustment fatigue and resistance to the programme. Even though government expenditure was kept rather stable, the financial markets were clearly affected and both long and short-term interest rates rose sharply. Consequently, inflation began to rise and by 1988, headline inflation peaked at 61 per cent on an annualized basis, while core inflation showed a similar trend reaching 50 per cent.

Fig. 18
Headline Inflation Rate (1981 - 2005)



Following this development, the confidence that there would be an improvement in the rising inflation situation did not materialize.

Fig. 19
Core Inflation Rate (1981 - 2005)



In a bid to intervene and reverse the ugly trend, the monetary authority began the withdrawal of public sector funds from the commercial banks, with a view to tightening liquidity in the system. Nevertheless, fiscal expansion largely financed by ways and means advances culminated in an all-time peak in non-core inflation of 69.9

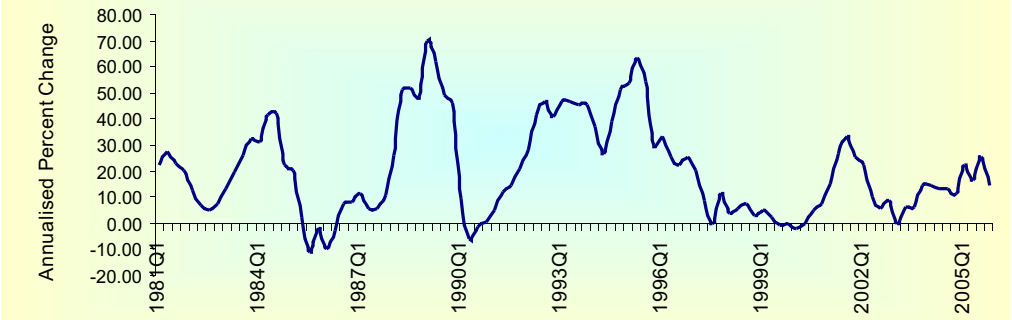
per cent in 1989. Persistent inflation inertia continued to increase the rate of growth in the price level. This was largely attributed to the frequent increases in administered prices on petroleum products, monetization of the Gulf war windfall, and deteriorating political environment with series of industrial actions in the early 1990's. Growth in money supply and fiscal deficit accelerated rapidly. In addition, the management of the agricultural output boom was also poor. This situation was compounded by nominal adjustment of the exchange rate, following the March 1992 devaluation. The result was high inflation in all its components.

By 1993, it was clear that the macroeconomic policies pursued were no longer sustainable and needed drastic change. In response to the ensuing macroeconomic instability, government reverted to a guided de-regulation in 1994. Interest rate again was administratively fixed. The exchange rate regime was changed and the autonomous foreign exchange market (AFEM) was introduced in 1995, while fiscal measures were introduced to curtail deficits. However, because these measures were taken at a time when there were excess money supply, scarce foreign exchange, severe shortages in commodity supply, as well as continual labour and political unrest following the annulment of the June 1993 elections, there was a remarkable rise in the rate of inflation.

Analysis of the non-core inflation in the early 1990s revealed that the adverse conditions of that period caused a huge increase in its level, as it recorded a high of 63.6 per cent in late 1994. Headline inflation rose rapidly by 1995 to reach an all-time high of 72.8 per cent, though it decelerated gradually to single digit by 1997. In the same vein, core inflation, which began a gradual ascent in early 1990, peaked at about 69 per cent in mid-1995 before slowing down in 1997. The deceleration in inflation rate during this period could be attributed to the favourable fiscal balance between 1995 and 1997 coupled with non-accommodating monetary policy stance during that period. The administratively fixed exchange rate regime, tight monetary policy, increased credit to the private sector, and low interest rates, were factors that aided in stabilizing domestic prices. Thus, inflation remained at single digit until 1999.

The low inflation rate regime did not last for too long, with the resurgence of spikes in headline and core-inflation between 1999 and 2000. Policy reversals and inconsistency, the general election of 1999, wage increase, and banking sector distress were mainly responsible for the downturn and by 2001, headline inflation rate had risen to 18.9 per cent. In recent times, particularly, with the second term of the Obasanjo administration in 2003, macroeconomic stability was restored, following the gains of a comprehensive and consistent economic reform programme. Monetary policy has become more proactive, while the fiscal authorities have supported the implementation of monetary policy through frequent consultations. Inflation has, however, remained at moderate levels. The persistence of structural rigidities, the general election of 2003 and the continued effect of fuel price hike are some of the factors that have been adduced for the inability to reduce inflation to single digit.

Fig. 20
Food Inflation Rate (1981 - 2005)



However, the government has mounted an elaborate food programme that would promote food crop production and export as well as pay more attention to the development of the small and medium scale enterprises to promote wealth creation and increase output. The exchange rate has also been relatively stable, with significant real appreciation. With these developments, inflation inertia has been curtailed and high inflation may be a thing of the past, if sustained.

Overall, the following stylized facts emerge from the preceding discussions:

- Monetary expansion, which reflects either demand for credit by the domestic economy or government fiscal expansion is a major determinant of inflation.

- There is a co-movement between aggregate demand and inflation but with a lag.

- Increase in real output, particularly food output has a dampening effect on inflation.

- High inflation seems to be associated with the long-run depreciation of the exchange rate. However, there appears to be inconsistency in the evolution of exchange rate and inflation between 1986 and 1996.

III.5 Decomposition of CPI

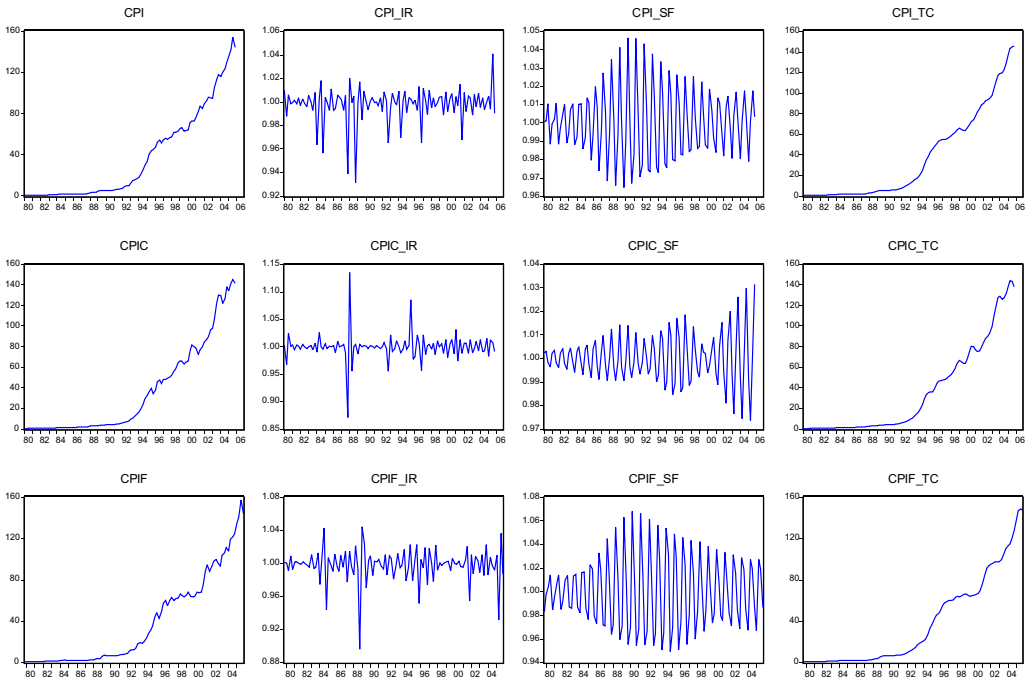
Time series observed at quarterly and monthly frequencies often exhibit cyclical movements that recur every month or quarter. Typically, a time series is made up of a time trend (TC), seasonal factors (SF), irregular variation (IR), and cyclical patterns. In order to understand these movements, a decomposition of the CPI series into its component parts is necessary. This is done for headline, core and non-core CPI series in Figure 21 using the Census X12 seasonal adjustment programme.

The plot of the actual headline, core and non-core series are quite similar in pattern, showing significant upward trending. This is confirmed from the de-trended series (CPI_TC, CPIC_TC, and CPIF_TC) plot. Indeed, the trend was very gradual in the early eighties, but by 1988, it became sharper and steeper. However, the trend was more pronounced for core CPI than the other components.

The prominence of trend in core CPI may be indicative that economic policies determine its evolution. The period of sharp increases in the trend resulted from sustained fiscal expansion, frequent hike in the prices of petroleum products, devaluation of the exchange rate of the Naira, among other factors, suggesting that stabilization policies may have been haphazardly implemented. With respect to seasonal behaviour, the CPI shows unstable and sizeable patterns, but was more prominent around the 3rd and 4th quarters and within the late 1980s and 1990s. It is also typically more pronounced for headline and food CPI, thus confirming the dominance of food in the composite CPI basket. Intuitively, the marked seasonality of food CPI to a great extent results from agricultural production, which is known to show seasonal patterns with peaks during the harvest period in the 3rd and 4th quarters. There were no obvious seasonal patterns in the core CPI except that it peaked from 2000, after being relatively stable in the early 1980s.

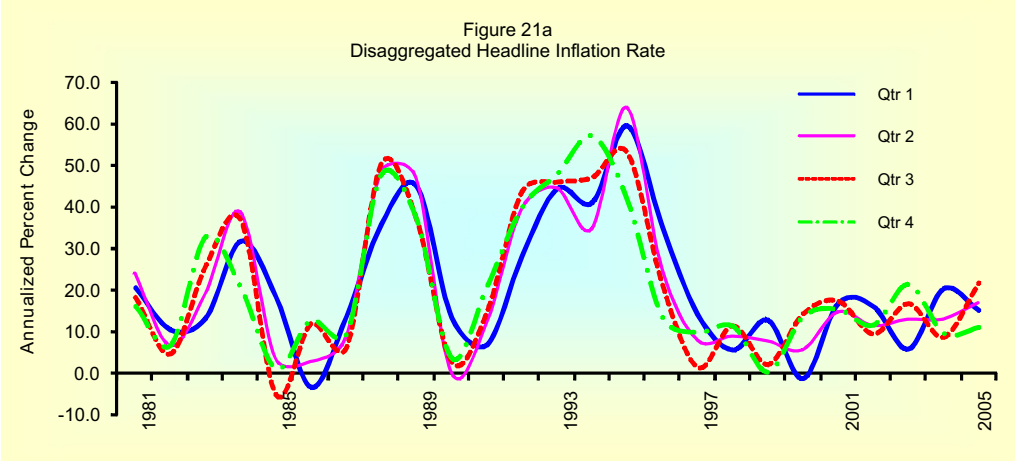
The irregular components for all the series were important over the sample period and featured prominent spikes, peaks and troughs. Since these are mainly unplanned random factors, the spikes seem to capture very well the periods of civil/labour, political, and religious unrests. However, there is a striking feature in 1988 and 1989, with sharp troughs, particularly for headline and food CPI.

Fig. 21 Decomposition of Quarterly Changes of Inflation[1]

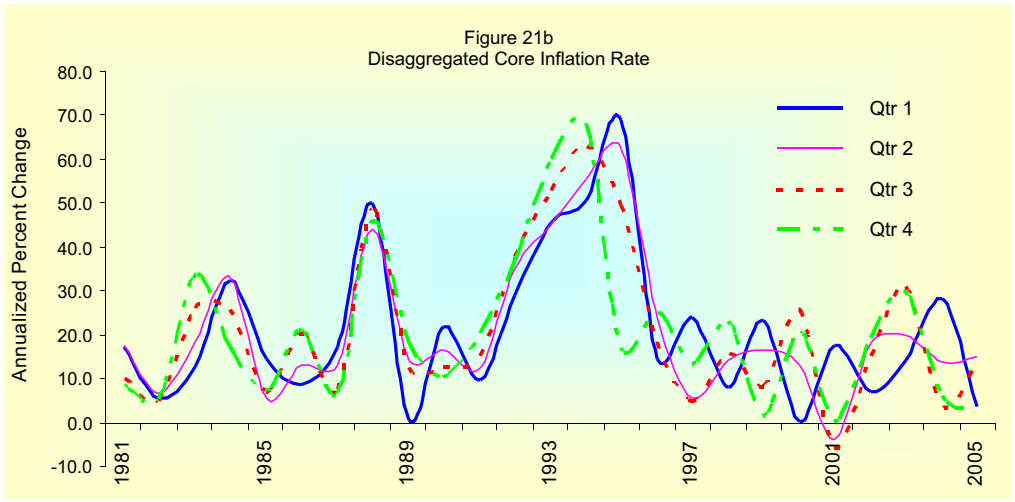


Figures 21a-21c below depict the quarterly disaggregated variants of the CPI for the period 1981 to 2005. Visual inspection of the plots of quarterly headline inflation rate over the study period revealed that headline inflation rate peaked more frequently in the fourth quarter relative to other quarters, while the most troughs are experienced in the first and third quarters. However, adopting the standard deviation as a measure of volatility further showed that it is more volatile in the first quarter at 19.55, with the least volatility in the second quarters at 16.00.

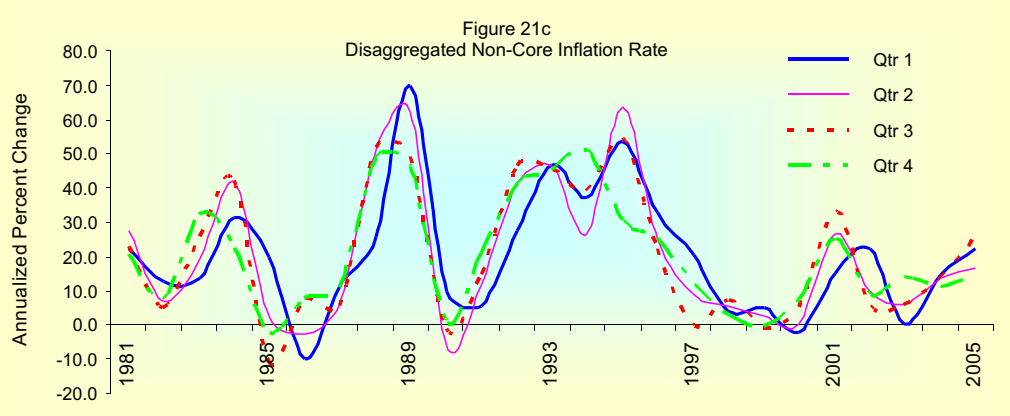
[1] CPI, CPIC, and CPIF are headline, core, and food inflation, respectively.



Although core inflation rate often peaks during the first quarter over the years, its standard deviation reveals that it was more volatile at 18.07 in the third quarter, while the least volatile quarter is the first quarter with a standard deviation of 15.62.



Visual examination of the quarterly disaggregated non-core (food) inflation suggests that it peaks frequently during the third quarter, with frequent troughs in the first and third quarters of the year. It is, however, more volatile in the second and fourth quarters at 20.15 and 17.45, with least volatility in the first quarter of the years.



Overall, it is interestingly observed that non-core (food) inflation is the most volatile at 18.28, while headline inflation at 16.29 exhibited the least volatility over the study period.

Table 2: Volatility of Headline, Core and Non-Core (Food) Inflation*

Inflation	Q1	Q2	Q3	Q4	Overall
Headline	19.55	16.00	17.45	16.24	16.29
Core	15.62	17.26	18.08	17.32	16.80
Non-Core	16.05	20.15	17.14	17.45	18.28

* *Standard deviation was used as a measure of volatility*

IV. Conclusion

This report has discussed the concepts of inflation, the factors determining inflation as well as stylized facts on inflation in Nigeria. The disaggregated nature of the analysis embodies the fact that inflation, for a country like Nigeria, has both non-core components and core components, which are driven by demand shocks.

The composition of the CPI basket is found to be skewed towards food as it constitutes 63.76 per cent, while the core component is 40.95 per cent. Thus, factors affecting food production are critical determinants of inflation in Nigeria. A decomposition of the CPI according to trend, seasonal factors, and irregular variations shows a strong trend for all types of inflation and a strong seasonal component for food inflation.

It is pertinent at this point to note that monetary policy in Nigeria is conducted in an environment characterized by uncertainty and frequent changes in economic policy. Also, the development of an adequate framework for inflation is complicated by inconsistent policies and variations in environmental conditions either of a climatic nature or crises. From the analysis, the following can be deduced:

- Trend has a significant positive relationship with core and headline inflation, while food inflation shows significant seasonal variations. The significant seasonal component exhibited by food inflation confirms that it responds mostly to the predictable conditions of weather, which affects farm produce.

- Inflation inertia is prevalent and persistent. Thus, there is a backward looking behaviour by economic agents in setting future prices. This often has a snow balling effect, as it tends to induce undue pressure. For instance, when producers expect inflation, they raise their prices and inflation tends to rise and producers keep raising their prices, as evidenced from the lag effect.

- Other key variables to consider when designing policies aimed at controlling inflation are: the exchange rate and the level of output.

Overall, policy issues based on the analysis include the following:

- There is the need to take cognizance of the lag effect in the design of monetary policy in order to ensure that policy targets are effectively monitored. In particular, monetary policy needs to be more forward looking to achieve price stability.

- Developments in monetary aggregates still provide important information about future inflation, however, the type of aggregates used need to be re-examined. Even when the Bank finally adopts inflation targeting, information about future inflationary development can still be gleaned from them.

- Headline inflation, which is well understood by the general public, affects households instantly and should continue to be used as a measure of inflation. The use of underlying inflation, which core inflation represents, may not be adequate except its definition takes care of other variable components of the CPI basket, such as energy[5].

[5] *This was not done in this study considering the short time period for which data on core less food and energy were available.*

References

Adamson, Y. K. (2000). "Structural Disequilibrium and Inflation in Nigeria: A Theoretical and Empirical Analysis". Center for Economic Research on Africa. New Jersey 07043: Montclair State University, Upper Montclair.

Agénor, P. and Hoffmaister, A. W. (1997). "Money, Wages and Inflation in Middle-Income Developing Countries". *IMF Working Paper: WP/97/174.*

Alesina, A. and Summers, L. H. (1993). "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence". *Journal of Money, Credit and Banking*, Volume 25, Number 2, May.

Aron, J. and Muellbauer, J. (2000). "Inflation and Output Forecasting for South Africa: Monetary Transmission Implications". Centre for the Study of African Economies, *CSAE Working Paper Series,* 2000-23, December.

Asogu, J.O. (1991). "An Econometric Analysis of the Nature and Causes of Inflation in Nigeria". *Central Bank of Nigeria Economic and Financial Review*, Volume 29, Number 3.

Callen, T. and Chang, D. (1999). "Modeling and Forecasting Inflation in India". *IMF Working Paper*: WP/99/119, Asia and Pacific Department, September.

Colander, D. C. (1995). Macroeconomics. Second Edition. United States of America: Richard D. Irwin, Inc.

Cukierman, A., Webb, S. B. and Neyapti, B. (1992). "Measuring the Independence of Central Banks and its Effect on Policy Outcomes". *The World Bank Economic Review*, Volume 6, Number 3.

De Brouwer, G. and Ericsson, N. R. (1995). "Modeling Inflation in Australia". Reserve Bank of Australia *Research Discussion Paper 9510,* Economic Analysis and Economic Research Departments, November.

Debelle, G. and Fischer, S. (1995). "How Independent Should a Central Bank Be?". Fuhrer, J. C. (Eds.). In Goals, Guidelines, and Constraints Facing Monetary Policymakers, *Proceedings of a Conference* held at North Falmouth, Massachusetts, Conference Series No. 38 (Boston, Massachusetts: Federal Reserve Bank of Boston), June.

Dornbusch, R., Fisher, S. and Kearney, C. (1996). Macroeconomic. Sydney: The McGraw-Hill Companies, Inc.

Duravell, D. and Ndung'u, N. S. (1999). "A Dynamic Model of Inflation for Kenya, 1974-1996". *IMF Working Paper,* WP/99/97, Research Department, July.

Essien, E. A. (2002). "Identifying the Trend of Core Inflation in Nigeria". *Central Bank of Nigeria Economic and Financial Review*, Volume 40, Number 2, June.

Essien, E. A. (2005). "Exchange Rate Pass-Through to Inflation in Nigeria". *West African Journal of Monetary and Economic Integration* (First Half), Volume 5, Number 1, Accra: West African Monetary Institute.

Fakiyesi, O.M. (1996). "Further Empirical Analysis of Inflation in Nigeria". *Central Bank of Nigeria Economic and Financial Review*, Volume 34, Number 1, March.

Fuhrer, J. C. (1995). "The Phillips Curve is Alive and Well". *New England Review*, March April.

Grilli, V., Masciandaro, D. and Tabellini, G. (1991). "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries". *Economic Policy*, Number 13, pp. 341-92.

Hamilton, A. (2001). "Exploding Inflation". *Zeal Intelligence*.

Khan, M. S. and Schimmelpfennig, A. (2006). "Inflation in Pakistan: Money or Wheat?". *IMF Working Paper, WP/06/60,* Middle East and Central Asia Department, March.

Lim, C. H. and Papi, L. (1997). "An Econometric Analysis of the Determinants of Inflation in Turkey", *IMF Working Paper,* WP/97170, European I Department, December.

Masha, I. (2000). "New Perspective on Inflation in Nigeria". *Central Bank of Nigeria Economic and Financial Review*, Volume 38, Number 2, June.

Melberg, H. O. (1992). "Inflation: an Overview of Theories and Solutions". (Www.geocities.com/hmelberg/papers/921201.htm).

Moser, G. (1995). "Money Demand in Nigeria: 1970 1994". Appendix II in Nigeria: Experience with Structural Adjustment, *IMF Occasional Paper* Number 148, by Gary Moser, Scott Rogers and Reinhold van Til (Washington: International Monetary Fund), pp. 55 - 62.

Odusola, A. F and Akinlo, A. E. (2001). "Output, Inflation, and Exchange Rate in Developing Countries: An Application to Nigeria". *The Developing Economies*, June.

Ojo, M. O. (2000). "The Role of the Autonomy of the Central Bank of Nigeria (CBN) In Promoting Macroeconomic Stability". *Central Bank of Nigeria Economic and Financial Review*, Volume 38, Number 1, March.

Olofin, S. (2001). An Introduction to Macroeconomics. Malthouse Social Science Series, Lagos: Malthouse Press Limited.

Phillips, A. W. (1958). "The Relation between Unemployment and Rate of Change in Money Wage Rates in the United Kingdom". *Economica* 25, November.

Piana, V (2001). Inflation Economics. Web Institute.

Pollard, P. S. (1993). "Central Bank Independence and Economic Performance". *Federal Reserve Bank of St. Louis Economic Review*, July-August.

Posen, A. (1993). "Why Central Bank Independence does not Cause Low Inflation: There is no Institutional Fix for Politics". in R. O'Brien (ed.), *Finance and the International Economy*, volume 7, Oxford: OUP.

Stock, J. H and Watson, M. W. (1999). "Forecasting Inflation", National Bureau of Economic Research *NBER Working Paper Series,* Working Paper 7023, March.

Stock J. H. and Watson, M. W. (2000). "Diffusion and Indexes". Princeton University working papers.

Thomas, P. (2006). "*Does the US have a Handle on Inflation*?", Street Insight.

Ubide, A. (1997). "Determinants of Inflation in Mozambique". *IMF Working Paper,* WP/97/145, African Department, October.

Vegh, C. (1992). "Stopping High Inflation: an Analytical Overview". *IMF Staff Paper* 39.

Williams, O. and Adedeji, O. S. (2004). "Inflation Dynamics in the Dominican Republic". *IMF Working Paper*, WP/04/29, Western Hemisphere Department: Washington, D. C., February.

Appendix: Glossary and Data

Glossary

CPIH	Headline consumer price index for Nigeria. It is the composite price index comprising both urban and rural price indexes
CPIC	Core component (all items less farm produce) of the composite consumer price index
CPIF	Non-core component (food) of the composite consumer price index
M2	Broad money supply or money stock
BM	Base money
PLR	Prime lending rate
RGDP	Gross domestic product at 1990 constant basic prices
GDPF	Agriculture component (less contribution of forestry) of RGDP
GAP	Output gap measured as the difference between actual output and potential output

Definitions

CPI
It is the composite consumer price index of the rural and urban price indexes. It can be decomposed as core and non-core consumer price indexes.

Headline Inflation
It is the annualized (year-on-year) inflation rate computed using the CPI. It is computed for each quarter as the growth rate over the corresponding quarter of the preceding year.

Core Inflation
Its computation is based on the core component (all items less farm produce and energy) of the composite CPI. In this paper, however, core inflation is derived from core CPI defined as "all items less farm produce". The quarterly series is derived as the growth rate of the present quarter over the corresponding quarter of the preceding year.

Non-core Inflation
Its computation is based on the food component of the composite CPI. The quarterly series is derived from the food CPI as the growth rate of the present quarter over the corresponding quarter of the preceding year.

Real GDP
It is the gross domestic product at constant basic prices. In this paper, it is defined as the value of productions that took place in the Nigerian economy within a quarter at 1990 basic prices.

GDP Food
It is the gross domestic product of agriculture (crop production, livestock and fishing only) at 1990 basic prices.

Interest Rate
Prime lending rate is used as a proxy for the money market interest rates. The prime lending rate is the interest rate which banks charge on loans and advances to high net-worth and credit worthy customers.

Nominal Exchange Rate
It is the quarterly average price of the US dollar in terms of the naira.

Potential Output
Potential (natural) output is the optimal level of production that an economy can attain without overheating the system.

Output Gap
It is the difference between the economy's actual output and its potential output. The gap is positive when actual output exceeds the economy's potential and vice versa.

Lag
A lag is the amount of time it takes for a variable to respond to changes in its explanatory variables (factors).

Short-Run
The short-run is a period too brief to change the quantity of the explanatory variables; at least one is fixed while the others can be varied. In the model: $\mathbf{Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \ldots + \beta_k X_t + \upsilon_t}$, the short-run is before k periods, whereby at least one explanatory variable is fixed while the others can be varied.

Long-Run
The long-run is a period long enough to vary the quantity of the explanatory variables. In the model: $\mathbf{Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \ldots + \beta_k X_{t-k} + \upsilon_t}$, the long-run is after k

periods, whereby all the explanatory variables X_{t-i} (i = 0, 1, ... , k) can be varied.

Data

Data coverage, on quarterly basis, spanned 1981Q1 to 2005Q4. Quarterly series on gross domestic product (RGDP and GDPF) and government expenditure (GEX) were derived through a process of disaggregation of the annual data series.

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