

**RELATIONSHIP BETWEEN MONEY GROWTH AND INFLATION:
EMPIRICAL EVIDENCE FROM NIGERIA**

By

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ABSTRACT

This study examines the relationship between money growth and inflation in Nigeria using cointegration and causality analysis. The study used annual time series data from 1970 to 2012, Johansen cointegration approach, Vector Error Correction Model (VECM) and Granger causality test are used to identify long run relationship, the short run dynamic and causal relationship among the variables respectively. The empirical results confirm that in the long run money supply growth has significant and positive relationship with inflation while lagged value of money supply growth has negative and insignificant relationship with inflation in the short run. Moreover, the causality test result reveals that money supply growth has unidirectional causal relationship with inflation, the causal relationship runs from money supply growth to inflation. However, interest rates and import have positive and significant relationship with inflation but exchange rates and GDP have negative and significant relationship with inflation in the long run. In the short run lagged GDP variable has significant and positive relationship with inflation, lagged import variable and lagged interest rate variable have significant and negative relationship with inflation, while lagged of exchange rate variable has insignificant and negative relationship with inflation in the short run. Moreover, the causality test result reveals that exchange rate, interest rates and GDP variable have unidirectional, bidirectional and no causal relationship with inflation, respectively. The study concludes that for maintaining price stability and minimum rate of inflation, Nigeria needs to reduce money supply growth, improve GDP, reduce interest rate and impose strong import restrictions measures as well as exchange rate depreciation along with import substitution strategy.

ABSTRAK

Kajian ini mengkaji hubungan antara pertumbuhan bekaln wang dan inflasi di Nigeria dengan menggunakan analisis kointegrasi dan analisis penyebab. Data siri masa tahunan daripada 1970 hingga 2012 digunakan dalam analisis empirik. Pendekatan kointegrasi Johansen, Model Vektor Pembetul Ralat dan Ujian Penyebab Granger masing-masing digunakan untuk mengenal pasti hubungan jangka panjang, jangka pendek dan hubungan penyebab antara pemboleh ubah. Keputusan analisi empirik mengesahkan bahawa pertumbuhan bekaln wang mempunyai hubungan positif yang signifikan dengan inflasi dalam jangka panjang manakala pemboleh ubah tertanggung pertumbuhan bekaln wang mempunyai hubungan negatif yang tidak signifikan dengan inflasi. Selanjutnya, keputusan ujian penyebab menunjukkan pertumbuhan bekaln wang mempunyai hubungan penyebab sehalu dengan inflasi. Walau bagaimanapun, kadar bunga dan import mempunyai hubungan positif yang signifikan manakala kadar pertukaran dan GDP mempunyai hubungan negatif yang signifikan dalam jangka panjang. Dalam jangka pendek, pemboleh ubah tertanggung GDP mempunyai kesan positif yang signifikan dengan inflasi, pemboleh ubah tertanggung import dan pemboleh ubah tertanggung kadar bunga mempunyai hubungan positif yang signifikan dengan inflasi. Pemboleh ubah tertanggung kadar pertukaran mempunyai hubungan negatif yang tidak signifikan dengan inflasi dalam jangka pendek. Selanjutnya, keputusan ujian penyebab mendedahkan bahawa kadar pertukaran, kadar bunga dan GDP masing-masing mempunyai hubungan penyebab sehalu, dua hala dan hubungan penyebab dengan inflasi. Kajian ini juga menjelaskan bahawa kestabilan harga dan kadar inflasi yang minimum dapat dicapai dengan mengurangkan pertumbuhan bekaln wang, memperbaiki GDP, mengurangkan kadar bunga, mengenakan halangan import yang ketat dan depresi kadar pertukaran bersama-sama dengan strategi penggantian import.

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LIST OF ABBREVIATION

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARCH	Autoregressive Conditional Heteroskedastivity
CBN	Central Bank of Nigeria
CPI	Consumer Price Index
ECM	Error Correction Model
ECT	Error Correction Term
GDP	Growth Domestic Product
IMP	Import
INF	Inflation
INR	Interest Rate
LM	Lagrange Multiplier
MS	Broad Money (M2)
NNS	New Neoclassical Synthesis
OLS	Ordinary Least Square
PCE	Personel Consumption Expenditure
PPI	Producer Price Index
PP	Phillip-Peron
RE	Rational Expectation
US	United State
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
USA	United State of America

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

This chapter presents the general introduction of the research. Background of the study is introduced in Section 1.2 while Section 1.3 provides the problem statements, Section 1.4 is about the objectives of the study. Significance of the study, scope of the study and the organization of the study are discussed in Section 1.5, Section 1.6 and Section 1.7, respectively.

Inflation as a macroeconomic phenomenon generates problems and leads to noises in the working of the economy that is liable to adverse effect on economic growth. Conversely, it is not a simple task to handle the problem of inflation effectively. In order to handle the problem successfully, accurate and precise evaluation of the causes of inflation is seriously needed, because wrong approaches in solving the problem will lead to unintended adverse impacts on the economy.

1.2 BACKGROUND OF THE STUDY

In general, the monetary policy as an instrument of macroeconomic management is aimed at promoting price stability, full employment, economic growth and balance of payment equilibrium. In small open economies, however, exchange rate stability becomes a prime concern of the central bank because of its high correlation with price stability. The commercial banks, which constitute the core of the financial system, directly influence price and exchange rate stability through their domestic credit supply, while their impact

on the other macroeconomic goals such as economic growth, reduction in unemployment and balance of payment surplus is more indirect. The central bank formulates and implements the monetary policy to ensure the achievement of those goals.

With the integration of the global economy, central bankers along with policy makers all over the world have come to realize the fact that achieving price stability, known as low and sustain inflation rate, should be serve as the primary concern of the monetary policy (Ojo, 2013).

This is in line with the beliefs that high rate of inflation leads to decline in purchasing power especially for the nominal asset. It also brings about uncertainty concerning the future change in prices as not all prices are expect to rise in similar rate and planning for future production will be hard for firms (Dornbusch *et al.* 1996 as cited in Arif & Ali, 2012). Inflation damages the country's international competitiveness which will result in the appreciation of the local currency as well as the consequence effect of exchange rate overvaluation that will negatively affect export, the poor will significantly be affected since their level of consumption would be affected (Khan & Gill, 2010).

The factors that cause the problem of inflation would be discuss from the balance of payment, monetary and the fiscal aspects point of view (Akinbobola, 2012). From the monetary point of view aspect, excess supply of money could be serve as a major cause of inflation while from the fiscal aspect, inflation is arise because of the budget deficit. Since budget deficit are often finance by the government through the creation of money in most of the developing countries, therefore fiscal aspect is likely to be linked with the explanation of the monetary aspect of inflation. From the balance of payment point of view exchange rate is consider the major emphasis. Explicitly a fall of exchange rate

cause inflation either by higher prices of imports and a rise in the inflationary expectation which are frequently as a result of wage indexation mechanism (Akinbobola, 2012).

Consequently, there is disagreement over these two viewpoints of the causes of inflation; they have commanded different remedies about the proper policy response. Those from the monetary point of view focus on monetary factors with the emphasis of decreasing financing budget deficit by the government and limiting credit to public sectors. While those from the balance of payment point of view have support exchange rate depreciation in order to offset overvaluation cause by the previous inflation and the terms of trade deterioration. By comparison those that lay emphasis on the role of depreciation of exchange rate claim against further adjustment of exchange rate, instead they suggest a combination of price control, demand reduction measures and income policies. Furthermore current literature has started to recognize more on the linkages among exchange rate as well as the tools of macroeconomic management, noticing that fixed exchange rate can be serve to be a “nominal anchor” to the economy and hence limit inflation if being supported by a proper fiscal and monetary policies (Akinbobola, 2012).

As a nation, Nigeria has been battling along with the problem of instability in the general price level, an instance measured through inflation, fluctuating around a double and single digit. High volatility is one of the major features of Nigerian inflation, over the years Nigeria has acknowledge several outbreak of high inflation as illustrated in Figure 1.1.

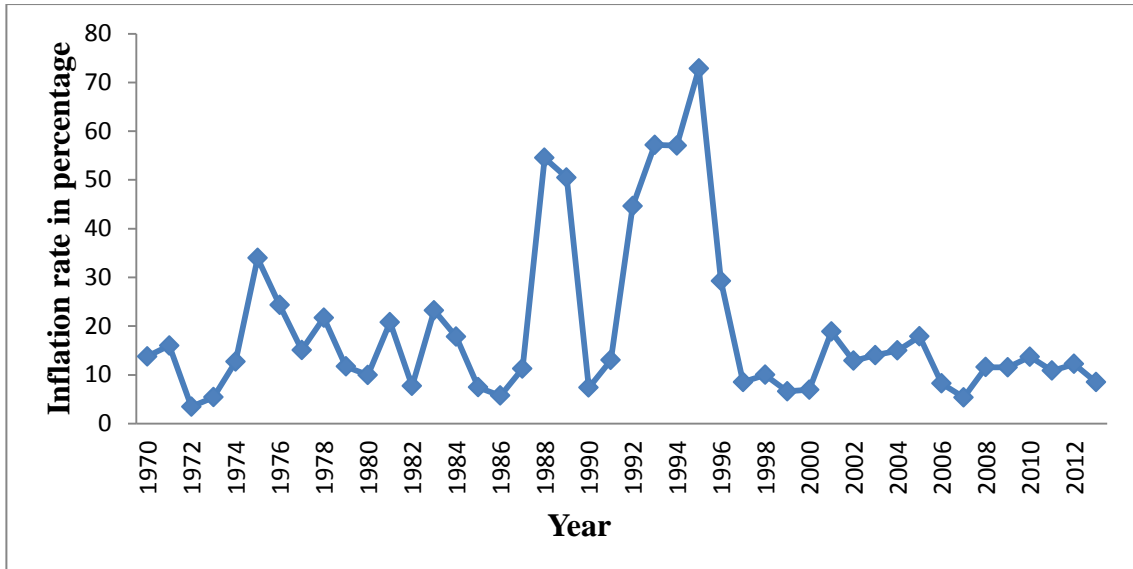


Figure 1. 1: Inflation Rate of Nigeria, 1970 - 2012

As shown in Figure 1.1, the incident of high inflation arises for the first time in Nigeria during the early 1970s. Amidst 1970 to 1980, the inflation rate was relatively stable at an average rate of 3.5 percent. Nevertheless, the rate of inflation stood at 13.7 percent in 1970. A year after, inflation raised and reached 16.0 percent then fall to 3.4 percent in 1972. Subsequently, the rate of inflation steadily increased almost for three years and then reached 34.1 percent. It fall again to 24.3 percent and 15.1 percent in 1976 and 1977, it then rose to 21.7 percent in 1978 and fall to 11.7 percent in 1979. The factors that lead to high inflation at that time include the increase in expenditure by the government to finance the civil war, the fall in production activities during the war, reconstruction after the war, industrial policy after independent, and the oil boom, following the Adebo/Udoji wage increase (Mordi, Essien, Adenuga, Omanukwue, Ononugbo, Oguntade, Abeng & Ajao, 2007).

During the 1980s Nigeria have started to experience inflation at the rate of 9.9 percent, the introduction of Structural Adjustment Program (SAP) of the late 1980s

where aim at diversifying and restructuring the productive base of the economy, so as to minimize high dependency on imports and oil sector. This has led to the depreciation of domestic currency in the foreign exchange market, which increased the price of imported goods such as machines and raw materials as well as excessive growth of money supply throughout the period with the resulting effect of huge deficit in the balance of payment (Anyanwu, 1992). During the period, the rate of inflation escalated to 54.5 percent in 1988.

In 1990, the inflation rate was 7.3 percent, increased to 13.0 percent in 1991 to 44.5 percent in 1992 and the rate rose to 72.8 percent in 1995. It has been noted that from the year 1992 to 1999 Nigeria experience 2.6 percent growth rate on its real gross domestic product (GDP) but it is not adequate for the achievement of sustainable growth and development (Maku & Adelowokan, 2013).

The global economic crisis of 2008 has substantially affected the majority of the world economies, Nigeria, as a developing country with an open economy depending on oil as a major source of income was seriously affected by the crisis (Ojo, 2013). In 2006 and 2007, inflation in Nigeria was at the rate 8.2 percent and 5.4 percent but jumped into a level of 15.1 percent in 2008. Henceforth, the rate has begun to decline to 11.5 percent in 2009. Afterwards, the rate was accelerated to 13.7 percent in 2010. The rate fall and reached a level of 12.7 percent in 2012. Although the inflation rate has currently fall to a level of 12.7 percent, but it is not yet at the required target point. Because inflation at the rate of three to seven percent is the healthy rate of inflation, that is essential for economic growth and development but above seven percent is a warning signal to monetary authority and the government. Therefore, control measures must be put in place in order

to minimize it before it goes into a running inflation that is inflation at rate of 10 to 20 percent per annum (Jhingan, 2003).

Growth of money supply is the wire life of all the economics activities henceforth, it has greater influence on the economic activities of any nation. A rise in money supply makes more money available in the hands of consumers and producers and thus inspiring consumption and investment. As the rate of money growth increases, prices begin to increase, particularly if the growth of output reaches full capacity (Umeora, 2010). In Nigeria, monetary growth has been the leading factor for both the variability and the level of inflation (Olanipekun & Akeju, 2013). The increase in growth rate of money were responsible by the following factors such as the huge monetization of the inflows of oil, wage and salaries minimum adjustment and the increase in budget deficit financing by the government through the Central Bank (Olanipekun & Akeju, 2013). The trend for money supply growth in Nigeria is shown on Figure 1.2.

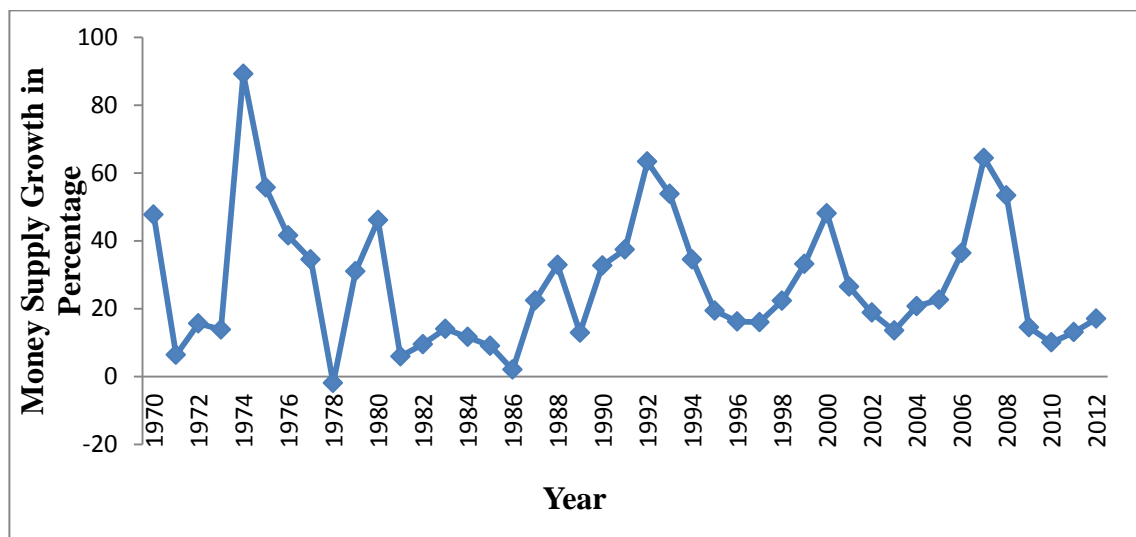


Figure 1. 2: Money Growth in Nigeria, 1970 – 2012.

As shown in Figure 1.2, the money supply growth has been on the increase since 1970s. The recorded money growth stood at 47.8 percent in 1970. The money growth then increased and peaked to 89.2 percent in 1974. Afterwards, the growth of money supply decreased to 46.1 percent in 1980 and fall again to 8.9 percent in 1985. The growth of money supply rose to 32.7 percent in 1990 and slightly went down to 19.4 percent five years after. In 2000, the growth of money supply accelerated to 48.1 percent and then dropped again to 22.6 percent in 2005. The growth of money supply recorded to be 9.9 percent in 2010 and it rose to 17.4 percent in 2012.

Growth of money supply and inflation are fundamental issues in most of the developing countries because of the need to attain a sustainable economic development and growth. A low inflation rate achievement is the monetary policy primary goal in most of the developing countries with Nigeria to be included but many government policies that put in place to achieve low level of inflation at the end accelerate it. In trying to develop infrastructure, most developing countries engage in monetary policy expansion that has a high possibility of fuelling inflation (Olanipekun & Akeju, 2013). Therefore, the relationship between money supply growth and inflation would be shown graphically in Figure 1.3.

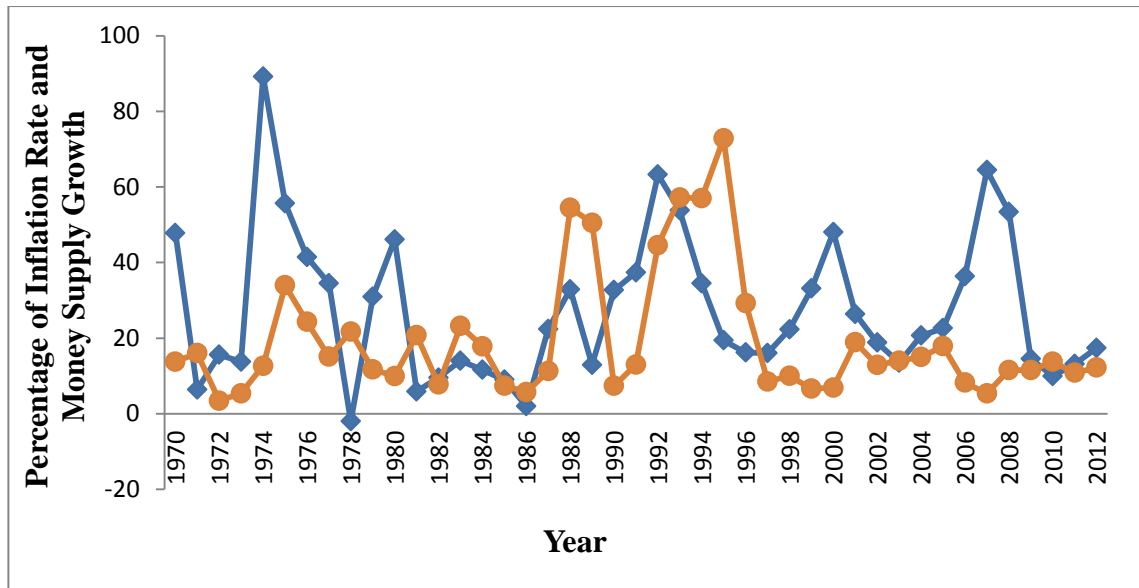


Figure 1. 3: Money Supply Growth and Inflation Rate in Nigeria, 1970 – 2012.

As illustrates in Figure 1.3, the trend relationship between inflation and money growth in Nigeria is neither positive throughout nor negative. This is because the trends are sometimes moving in the same direction while on the other times they move in different direction. For instance in 1971 inflation is falling while money growth is rising, but in 1980 and 2000, inflation is rising while money growth is falling. Contrarily, in 1975 both money growth and inflation are falling, while in 1990 both money growth and inflation are rising.

1.3 PROBLEM STATEMENT

Inflation is a persistent raise in the general price level of goods as well as services in an economy within a given period of time. It seriously affects government and businesses as well as individuals (Mishkin, 2013). It is regarded generally as a significant problem that needs to be solved and the top agendas of policymakers and politicians. To solve the problem of inflation, there is need to know a lot about the factors that cause it (Mishkin,

2013). Consequently, the impact of inflation may take the form of deterioration in the purchasing power of money in an economy, uncertainty about the future of prices changes, redistribution of income by benefiting debtors at the expense of creditors, harms a country's competitiveness thereby leading appreciation of domestic currency and upset savers as prices increases (Khan & Gill, 2010).

In Nigeria, instability as well as continues rise in the general price level is among the leading problems facing the nation, which penetrate every aspect of the nation economy as a whole. As shown in Figure 1.1 the inflation rate was very high in 1975 stood at 33.9 percent, this high level of inflation rate is due to the increase in wages and salaries of private and government workers and the substantial expansion of credit as well as the early 1970s oil boom. All these generate inflationary problem in Nigeria (Maku & Adelowokan, 2013; Olanipekun & Akeju, 2013). Similarly, Akinbobola (2012) argued that the problem of inflation in Nigeria is due to the excessive deficit finance by the government as shown in Figure 1.1 the inflation rate stood at 23.2 percent in 1983 this is due to huge borrowing by the government from the central bank in order to finance its deficit. As shown in Figure 1.1 the inflation rate is relatively very high in 1989 that stood at 50.4 percent. This acceleration in the rate of inflation was due to the unprecedented increase in money supply as well as the local currency devaluation in foreign exchange market, which increase the price of imported goods for instance capital goods and raw materials. The resulting effect was the drastic collapse of agricultural output as raw materials and machines were out of reach by the farmers (Bayo, 2005).

Henceforth, in the year 2012 the rate of inflation stood at 12.2 percent as shown in Figure 1.1. The level of inflation rate in Nigeria is problematic since the inflation rate is not up to acceptable level, because less than seven percent annual inflation rate is the

desirable rate of inflation that considered safe and crucial for economic growth and development (Jhingan, 2003).

It is generally agreed that money growth changes affect the price level in the short run. Excessive money growth encourages aggregate spending and accordingly expansion in output, if the idle resources are available. Conversely, if the available output is inelastic, as a result of constraint in foreign exchange, technological limitation or low productivity. Increase in money growth endangers inflationary pressure.

However, studies on the issue of inflation are lacking still in Nigeria, despite the fact that inflation cause distortion in the country's economic growth and development and it is also one of the most crucial macroeconomic problem the nation is facing (Sola & Peter, 2013).

Similarly, the relationship between money growth and inflation has since been a serious issue in both developed and developing countries. A number of studies have investigated empirically, the relationship between money growth and inflation. Nevertheless, the studies did not reveal conclusive findings. For instance, certain studies such as Ahmed, Muhammad, Noman, and Lakhan (2014), Bashir, Nawaz, Yasin, Khursheed, Khan, and Qureshi (2011), Hossain (2013), Pahlavani and Rahimi (2009) and Umeora (2010) found the relationship between money growth and inflation to be positive and significant. While some other studies such as Arif and Ali (2012), Bakare, Adesanya, and Bolarinwa (2014), Dizaji, Nasab, Najarzadeh and Assari (2012), Iya and Aminu (2014), Maku and Adelowokan (2013), Odusanya and Atanda (2010) found the relationship to be positive but insignificant. In the same vein, several studies have not yet reveal conclusive result in terms of the causal relationship between money growth and inflation. For instance, studies such as Adusei (2013), Ahmad and Suliman (2011),

Dizaji, Nasab, Najarzadeh and Assari (2012), Ghazali, Aminu, Muhammad and Samsu (2009), Iya and Aminu (2014), Mbutor (2014) found that the relationship between money growth and inflation is unidirectional. While certain studies such as Bashir *et al.* (2011), Hossain (2005), Mehrara and Musai (2011) found the relationship to be bidirectional.

In addition, there exist in literature a controversies as to whether inflation is a monetary phenomenon or not. Adesoye (2012) argues that in Nigeria inflation is a phenomenon that is monetary in nature while Doyin and Ikechukwu (2013) as well as Adenuga, Bello and Ejumedia (2012) argue that in Nigeria inflation is not a monetary phenomenon. Nonetheless, most of the above-mentioned studies present a contradictory and inconclusive findings as such additional research are still needed.

Henceforth, in achieving the objectives of this study, the study will give answer to the subsequent research questions; is there any long run relationship between money growth and inflation in Nigeria? Is there any short run relationship between money growth and inflation in Nigeria? Is there any evidence of causality between money growth and inflation in Nigeria?

1.4 OBJECTIVES OF THE STUDY

The general objective of this study is to analyze the relationship between money growth and inflation in Nigeria by using analysis of time series data. The specific objectives of the study are:

- i. to estimates the long-run relationship between money growth and inflation.
- ii. to estimates the short run relationship between money growth and inflation.
- iii. to test whether there is strong evidence of causality between money growth and inflation.

1.5 SIGNIFICANCE OF THE STUDY

It has been generally accepted that ensuring price stability is crucial to economic growth and development, it is also the utmost goal of every economy. Therefore, instability in price and high inflation is not preferred because it will affect the performance and the stability of the economy. Based on this scenario, the monetary policy focus is primarily to the attainment of low inflation instead of unemployment or output.

Based on the aforementioned defect of inflation in the economy, this study will scientifically contribute to the existing literature by examining the impact of money growth on inflation in Nigeria. Since research on this area is quite limited and the issue has not been understood properly in Nigeria. That is why since 2006 the former governor of the CBN made researches on inflation a leading priority because the knowledge is lacking in Nigeria (CBN, 2007). Therefore, more studies on the area are still needed to understand the issue more better from different perspectives.

Therefore, based on the conflicting and inconclusive findings of the previous studies as shown on problem statement, the present study intends to contribute to the existing body of knowledge there by examining and revisiting empirically the effects of money growth on inflation in Nigeria. The links between money growth and inflation will improve our knowledge concerning several interpretations, which have figured money growth and inflation both in practice and theory. Henceforth, the study will give some plausible arrangement suggestions base on the result of the investigation.

Moreover, from the point of view of the practical contribution, the findings of this research would be greatly significant to the government and the policy makers, because it will help them to understand the impact of money growth on inflation as well as developing policies that will help in achieving stability in the economy.

1.6 SCOPE OF THE STUDY

The observational study is concentrate on the impact of money growth on inflation in Nigeria, which blanket the time of 1970 to 2012, the study is based on annul time series data sourced from the world development indicators. The study is limited only to the effect of money supply growth on inflation and including other variables that affect inflation such as exchange rate, GDP, value of import and interest rate as control variables.

1.7 ORGANIZATION OF THE STUDY

The study is divides into five chapters, where the first chapter comprises the background of the study, the problem statement, objectives of the study and the significance of the study. The second chapter reviews relevant and related conceptual, theoretical and empirical literature concerning the relationship between money growth and inflation. Third chapter explains the methodology used to achieve the research objectives. Fourth chapter is the analysis of the empirical result. Lastly, fifth chapter assesses the findings and offer recommendation and implication for further study.

1.8 CONCLUSION

This chapter introduces the background of the study that discussed the link between money growth and inflation in Nigeria, followed by the problem statements that explained the issues concerning the relationship between money growth and inflation in Nigeria. The objectives of the study are also stated in the chapter, the significance of the study shed light on the contribution of the study to the existing body of knowledge as

well as policy makers. The scope and limitation of the study as well as the organization of the study are presented in the chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter consists of three major interrelated parts: the first part is the conceptual part, which is concern with the concept and measurement of inflation as well as the concept and measurement of money growth. While the second part is the theoretical review, it review different theories of inflation and third part is concern with empirical studies on the relationship between inflation and money supply growth.

2.2 CONCEPTS AND MEASUREMENT OF MONEY AND INFLATION

2.2.1 Concept and Measurement of Inflation

In the literature of economics, inflation concept has become an essential part of money, as quoted by Max “inflation is too much money chasing few goods“. Inflation pronounced as an economic phenomenon when the supply of money is increasing faster than the production of goods as well as services in an economy (Mishkin, 2013). Therefore, inflation could be describe as the persistent raise in the general price level of goods as well as services within an economy over a given period of time (Melberg, 1992).

Recently there are three major schools of economics thoughts with regard to the causes of inflation; Structuralists, Neo-Keynesian and Neo-Classical/Monetarist. The Neo-Keynesian characterizes inflation with the law of diminishing return of production.

This happens when the velocity of money increase and the investment is below the current consumption. While the Structuralist, on the other hand, characterize the causes of inflation in terms of the structural factors as well as the underlying features of an economy (Adamson, 2000). For example, in an emerging economy, particularly those with a mighty underground economy, excessive hoarding and hedging, individual expectation of a future increase in prices above the current prices and the goods and services demand are not transactionary but rather it is precautionary. This will manifest into a non-natural shortage of goods henceforth ignite inflationary pressure.

The monetarist, were on the believed that increase in the growth rate of money supply is a driven factor of inflation. Nevertheless, this may not be hold true as shown by the practical experience of the United State (U.S) Federal Reserve. For instance, the rate of money supply growth in U.S has increased much higher than the price itself (Colander, 1995).

The Neo-Keynesian has come out with three types of inflation. First, the demand pull inflation sometimes known as excess demand inflation is the most common and traditional type of inflation. This type of inflation arises when the aggregate demand is increasing while the available supply of goods on the other hand is becoming less. The shortage of the supply of goods may be either because of the available resources is utilize fully or the increase in the production of goods cannot be so rapid to meet with the increasing demand. Therefore, this will cause the price of the goods to rise up. The second type of inflation is the cost-push inflation, “commodity inflation “ or “ supply shocks “ inflation. This type of inflation arises as a result of a sudden fall in aggregate supply. This happens due to increase in the price of factor input or because of the occurrence of natural disaster (Jhingan, 2003). For instance, a sudden fall in oil supply

will lead to a rise in the price of oil and then lead to cost-push inflation. Producers for whom oil is part of their costs could then pass this on to the final consumer in the form of higher prices. Third type of inflation is the structural inflation which on the other hand is arise as a result of the increase of agricultural prices due to supply inelasticity, terms of trade deterioration, devaluation of exchange rate as well as the import substitution cost (Jhingan, 2003).

However, there are other types of inflation, which categorized based on persistent, severity and intensity of the increase in price. Therefore, there is hyperinflation, inflation is said to be hyperinflation when the rise in the price is very fast at a double digit or triple digit ranging from twenty to hundred percent per annum. In real sense, hyperinflation is characterized by a particular phenomenon when the rate of inflation is uncontrollable and absolutely immeasurable. Because of the incessant fall of the purchasing power of money, such a situation may cause an entire collapse of the monetary system. Chronic inflation, on the other hand, is inflation when the speed of the inflation rate is at the rate of ten to twenty percent per annum. The poor as well as the middle classes are adversely affected by such inflation. Judicious monetary and fiscal policies are required in controlling it; otherwise, it will escalate into a hyperinflation. The next is the trotting inflation. This is the type of inflation in which the rate at which the inflation is rising is less than ten percent or between three to seven percent on annual basis, that is to say it is the single digit rate. This type of inflation is a warning signal to the monetary authority or the government to take substantial control measures before it turns into a chronic inflation. The last one is the creeping inflation this kind of inflation arises when the rate at which the price is raising is very small that is at the rate of less

than three percent per annum. Such a type of inflation is considered essential and safe for economic growth (Jhingan, 2003).

Consumer price index (CPI) is a measure of the changes that occur in the price of goods as well as services that are consumed by the household. Such changes affect the consumer's income as well as their welfare since their purchasing power is directly affected (Abel, Bernanke & Croushore, 2008). The *CPI* statistical estimation that is constructed by using a sample of prices of representative items, which are periodically collected. The percentage change of *CPI* on an annual basis is used as a method of measuring inflation, though they can only be used to measure consumer inflation (World Bank, 2014). The index is usually published on a monthly basis or quarterly basis in some countries. Henceforth, they are quickly made available usually two weeks at the end of every month or quarter. *CPI* as a measure of price level is associated with a number of disadvantages. First, the goods as well as services that are bought by the government or firms for instance machineries are not reflected under the *CPI* index measurement. Second, changes that occur in the quality of goods over a given period of time are not revealed by the *CPI* measurement. Third, the substitutable goods price that changes over time are not shown under *CPI* measurement. Lastly, frequently *CPI* as a measure of inflation does not alter regularly. Despite the aforementioned limitations, *CPI* is still one of the most efficient measurements of the overall price level, because it can be used for indexation reasons, for many salary and wages earners. *CPI* is monitored closely and attracts a lot of public attention, because it can be used by the government as well as the central bank authorities for the purpose of monetary policy so as to select an inflation target (Mordi *et al.*, 2007)

Therefore, other price indices that are widely used for measuring inflation comprise producer price indices (PPI). It measure the average price level of whole sale that is charged by the producer and at the same time it is publish as the production of industrial data (Mishkin, 2013). It combined price of some products and services from the beginning of commercial transaction. This is different from the *CPI* because profit, subsidy on prices as well as taxes will make the amount receive by the producer to be different from what will be paid by the consumer. There is delay typically among the increase in *PPI* as well as any subsequent raise in *CPI*. *PPI* pressure is put on producers through their cost of raw materials. Henceforth, this could “pass on” to the consumer or it could be absorbed through profits or through the increasing productivity.

Personel Consumption Expenditure (PCE) is another kind of measure of the level of consumer’s prices. It is calculated the same way with the GDP deflator, nevertheless, it is only dealing with the items that is under the *PCE* class of GDP. It is published on quarterly basis same time with the real GDP data.

GDP deflator is one of the measures of price index that is concerned with measuring the overall price level of goods as well as services that is contained in the GDP (Abel, *et al.*, 2008). This kind of measure of the general price level is usually publish on quarterly basis same time with the real GDP data.

2.2.3 Concept and Measurement of Money Growth

Money supply could be seen as the aggregate amount of money that is available within an economy at a specified period of time (Abel *et al.*, 2008). Central bank defines money supply in different ways from one economy to another. These variations of money supply across different definition, similarly known as monetary aggregate, the money holder’s

norms, financial instruments innovation and the variability of money issuers are the causes of these differences. Therefore, for this reason you cannot certainly find any central bank replicating another central bank adopted definition of money supply. Hence, most of the central banks have generally ranged the aggregate of money supply from narrow to broad that is from *M1* meaning narrow money supply to *M2* or *M3* meaning broad money supply depending on the economy (Mishkin 2012). The following are the two employed criteria of measuring money supply:-

M1 is the narrowest form of money measure, which is reported by the central banks, and it is almost the same across countries. It contains only the currency, traveler's check, demand deposit, account checking deposit and the liquid assets. The component of the currency of *M1* contains only coins and paper money, which is in the hand of the public. It does not contain cash held in bank vault or in ATMs. The component of the demand deposit contains check of the travelers that bank issued and the checking account of the business which pay no interest. The component of the traveler's check contains those that are issue mostly by non-banks. The additional checkable deposit, things for example the interest-bearing checking account owned by the household. These assets could clearly be seen as money because they can be used by the individual as a medium of exchange directly (Mishkin, 2013).

M2 is the monetary aggregate that is consider broader than *M1* but found to be different from one country to another. As categories of money, *M2* represent *M1* as well as other forms of non-liquid assets for instance deposit account in the money market. It contains saving deposits, which can be withdrawn from the bank at any time without any cost and the deposit certificate. This broader definition of money is referred to as *M2* in

the US, while in countries like Britain, Nigeria and India, it is referred to as *M3* (Mishkin, 2013; Jhingan, 2003).

Inflation, as the persistent increase in the general price level, affects businesses, individuals as well as the government. Therefore, it is considered as an essential problem to be solved frequently at the top of policymaking and political agendas. Therefore, it is very important to know the factors that cause inflation in order to solve the problem of inflation (Mishkin, 2013). The relationship among money supply growths as well as the inflation could be seen from the view of the quantity theory of money that is on the view that money supply growth has direct relationship with inflation. While on the practical experience, as noted earlier those countries that have the highest money supply growth are those that have the high rate of inflation. By looking at Zambia, Turkey and Ukraine, their rate of money supply growth were very high during this period and they experienced high inflation rate. By contrast, U.S and Sweden over the same period their money supply growth rate were very low, therefore they have low inflation rate. Such evidences have supported the Milton Friedman famous statement “inflation is always and everywhere a monetary phenomenon”. This is the major reasons of supporting monetary policy as an instrument of controlling inflation (Mishkin, 2013).

2.3 THEORITICAL REVIEW OF INFLATION AND MONEY GROWTH

Diverse hypothesis have been progressed by different theories for the past two centuries about the creation as well as the acceleration of inflation. Such remarkable effort revealed how inflation serves as a crucial concern to macroeconomists. However, regardless of this numerous literature on the theory of inflation, still there is no consensus among the economists from different school of thought with regard to the basic

determinant factors of inflation. Therefore, numerous theories have developed to explain the diverse cause of inflation in order to understand the inflation process better. These different theories on the dynamic of inflation will be discuss and reviewed in this section.

2.3.1 The Quantity Theory of Money

The quantity theory of money is among the most established enduring doctrines of economics. The theory has declared that changes in the overall price level are fundamentally set by alterations in the amount of money available in an economy. The theory framed the focal center of the 19th century analysis of the Classical monetarist, gave the foremost conceptual framework to interpret in modern financial events and shaped the intellectual basis of the orthodox policy remedy designed to sphere the gold standard. The classical economists as well as the few after them gave the first dynamic methodology analysis on how the effect of a monetary changes blowout from one segment of the economy into another, adjusting relative prices as well as the quantity in the process. Hume (1752) gave considerable extension, refinement and elaboration to the quantity theory of money, by identifying a direct relationship between the inflation and money supply.

Ricardo (1810) the most prominent of the classical economists believed that such disequilibrium influences temporarily and is not important in the analysis of long run equilibrium. Henceforth, as pioneer of the Balloonists, Ricardo (1810) indicted that inflation in Britain was exclusively the consequence of the bank of England recklessness about the 1797 issue of money under the anxiety of the Napoleonic wars. Ricardo discourages dialogue on conceivable gainful of the employment and output impacts of monetary injection.

Fisher (1933) spelled out his eminent equation $MV=PT$. This and other different equations, for instance Cash Balance Cambridge equation that relates with the rising utilization of mathematics in the analysis of neo-economics, characterize unequivocally under the condition in which the proportionate assumption is valid. Fisher and other economists, for instance Pigou (1949) of Cambridge revealed that the objectives of monetary policy control could be accomplished in a fractional reserve-banking system through the regulation of an exogenously determined amount of money in stock.

2.3.2 Monetary Theory of Inflation

Monetarism alludes to the adherents of Milton Friedman who believed that “only money matters”, accordingly the instrument of monetary policy is stronger than the fiscal policy instruments in stabilizing the economy. As per the monetarist, supply of money is the “determinant though not exclusive” factor of both the prices and the amount of output in the short run, as well as the price level in the long-run. Therefore, in the long-run the amount of output is not determined by the amount of money supply.

The monetarist accentuated the role that money has. Modern quantity theory headed by Milton Friedman believes that “inflation is always and everywhere a monetary phenomenon” that occurs as a result of quick extension in the amount of money rather in total output. The earliest clarification of the theory where found in the modest quantity theory of money (Omanukwue, 2010; Totonchi, 2011)

2.3.3 Demand Full Theory

John Maynard Keynes as well as his supporters accentuated that the major cause of demand-pull inflation is the rise in aggregate demand. Therefore, the aggregate demand

includes government expenditure, investment, consumptions as well as net export. If the level of aggregate demand surpasses the level of aggregate supply at the level of full employment, the resulting effect is the inflationary gap. Therefore, the greater the gap stuck between the aggregate supply as well as aggregate demand, the higher the rate of inflation.

Keynesian theory is focused around the analysis of short run that assumed prices to be fixed. In fact, non-monetary forces determined prices. Conversely, changes in investment expenditure largely determined output, which is assumed to be varied. The chain of Keynesian causation between the changes in prices and nominal money income is indirect via the interest rate. If the amount of money increase, it will first affect the interest rate to fall. Investment will increase because of a fall in interest rate, which will in turn lead to increase in aggregate demand. An increase in aggregate demand would affect output first not the price as long as unemployed resources are available. When the available resources remain unemployed, a greater raise in aggregate demand would meet some certain restrictions. Certain factor input will be in short supply and hence non-substitutable. This would have a multiplier effect of increasing factor cost and the prices (Jhingan, 2003).

According to the Keynesian theory, a policy that would decrease every component of aggregate demand is more effective and more reliable in reducing demand pressure and inflation. Government expenditure can be decrease through the increase in tax and management of money supply alone or together, this can be efficient in reducing aggregate demand as well as inflation control (Totonchi, 2011).

2.3.4 Cost Push Inflation Theory

The cost-push inflation arises as a result of increase in wages through agitation by union as well as increase in profit by employers. This type of inflation is not a new phenomenon because it exists since the medieval time. Nevertheless, during the 1950s and 1970s, it reviewed as a major cause of inflation. It came to be known additionally as “new inflation”. Cost-push inflation arises as a result of profit-push and wage-push to prices.

The essential reason for cost-push inflation is the increase in money wage over and above the level of labor productivity. The labor unions may demand their employers to increase their wages substantially over and above the increase in their productivity, which would increase the cost of producing commodities. Therefore, the employers would escalate the price of their goods and services. The workers would purchase the products as much as before despite the higher prices since they have higher wages. Then again, the escalation of prices would persuade the union of labors to agitate still for higher wages. Therefore, in this manner, the wage-cost changes continues, which will lead to cost-push inflation.

Cost-push inflation intensified in advance by skyward changes of wages intended for the compensation of an increase in the cost of living. Therefore, a few areas of the economy that is influenced by the money wage increases, the prices of their goods and services will be rising. In several cases, their goods and services are used in other sectors as inputs mainly for the production of other commodities. Therefore, in these areas production cost would increase which will raise their goods and services prices. Thus, in this manner, wages push-inflation in some areas of economy would result into an

escalation of prices in the whole economy. Additionally, cost-push inflation may arise also as a result of a rise in the cost of imported raw-materials.

Profit is another cause of cost-push inflation. Monopolist and oligopolistic firms may increase the price of their goods and services to counterbalance the increase in labor and production cost to generate higher profits. In the case of firms under imperfect competition, they can be able to control the prices of their goods and services. An inflation that arises as a result of profit is call consequently as the price-push inflation or administered inflation (Javed, Farooq & Akram, 2010; Seelig, 1974; Totonchi, 2011)

2.3.5 Structural Inflation Theory

The concept of structural inflation has been in economic research and discussion for almost 40 years ago. It is on the view that structural factors are the causes of inflation. Structuralists are on the belief that inflation is essential with growth. According to this theory as the economy improves, rigidities occurs that would result in structural inflation. In the first stage, a rise in agricultural income in line with the greater percentage of population growth would lead to the escalation in goods as well as services demand. Actually, the pressure on the growth rate as well as the increase in urban income will lead to the increase in first agricultural product prices second the level of general prices and third salaries and wages through the mechanism of chain reaction.

As agricultural goods demand increases, the supply would domestically be inelastic, the agricultural goods prices would be increasing. When the price of goods increases their output would also be increase, the production of the goods is inelastic due to the lack of finance, irrigation, marketing and storage facilities as well as bad harvesting and land tenure defective system. To prevent the shortage of agricultural

products, particularly foods products, they could be imported. Yet to import them in large amount would not be possible because of the constraint in foreign exchange. However, the imported goods prices are higher relatively than the domestic prices. This would result into a further escalation in the general price level in the whole economy.

Therefore, if the prices of the foods products increase, wage earners would demand for wage increase to recompense their real income falls. Nevertheless, wages significantly linked with the cost of living. They can be raised any time the cost of living rise over and above the agreed point which will lead to a further rise in demand for products as well as further increase in their prices (Jhingan, 2003).

2.3.6 New Neoclassical Synthesis

As promoted by Paul Samuelson as an apparatus of enquiry the Neoclassical synthesis presented a view of Keynesian national income determination as well as the principle of Neoclassical to direct macroeconomic enquiry. The alleged New Neoclassical Synthesis (NNS) has turned into a center of investigation in the field of monetary policy is also improving into a framework which will establish itself in literature into a standard model of macroeconomics. Since the beginning of the 1990s, the sharp contrast between the New Classical and New Keynesian economist emphasize on the origin of major business cycles and the movement of price has been softening increasingly and now in the agenda is *NNS* of macroeconomics.

Henceforth, according to the *NNS*, demand or monetary factors are the major determinants of business cycle, because they incorporated assumptions of New Keynesian that is the price stickiness assumption in the short run. However, a large potential function is assigned by *NNS* to supply shocks in clarifying economic activities

really, as New Classical suggested in the theory of business cycle. The *NNS* complex model let the Keynesian as well as mechanism of real business to function through different channels. The price level is made to be an endogenous variable by the IS-LM-PC new form of the *NNS*. Therefore, in this model IS is referred to as saving and investment, that is goods and service equation of market equilibrium. LM is referred to as supply for and demand for money, that is money market equation of equilibrium and PC is referred to as Philips curve. To the inflation process, the expectation is viewed by the *NNS* as critical, the rule of monetary policy accepts to amenably manage the expectations.

The *IS-LM* model distinguishing features is that its major behavioral association was originate from the essential decision-making of firms and households these associations involves consequently expectations in a central manner about a future. The anticipated output growth to the real rate of interest is associated by the IS curve, which is the essential inferences of the modern consumption theory. The Philips curve and aggregate supply section of the model associates current inflation to anticipate inflation in the future and output gap. This association can be generated from the pricing decision of the monopoly that is restraint by stochastic opportunities for adjustment of price together with the price level definition that is consistent (Totonchi, 2011).

2.3.7 New Political Macroeconomics of Inflation

As mentioned above the most essential theories focus mainly on macroeconomic causes of inflation and ignore simply non-economic aspects role such as political process, culture and institution in the inflation process. In this present reality political powers not the social organizers that take economic policy. The consequence of the decision process

is the economic policy that adjusts conflicting interest as a result choice collectively may emerge.

The literature of the new political economy, gives fresh point of view on the relation among the policy makers performance, political instability, elections timing, reputation and policy credibility as well as itself the inflation process. The central bank autonomy case is framed usually as far as the inflation bias introduce in the monetary policies conduct. Nevertheless, the empirical and theoretical work propose that to guarantee high level of central bank independence, monetary constitution ought to be designed.

They additionally disregard the likelihood that maintained government deficit, as a potential foundation for inflation, may be indigenized fully or partially by considering the impact of the process politically as well as possible lobbying exercise on government deficit and hence on inflation (Totonchi, 2011).

2.3.8 Rational Expectation Revolution

The revolutionary idea by the economists of Rational Expectations (RE) dominated the macroeconomic since 1970s, such as Mccallum (1980), Lucas (1975), Hansen and Sargent (1980). Begin with the assumption of monetarist that is imperfect information and the continuous market clearing, the first set of the New Classical economist contended that people would not make consistently a similar forecasting errors as recommended in the idea of adaptive expectations. The macroeconomic expectations of economic agents are form rationally upon all the current and past obtainable pertinent information also not only on the previous information as in the backward-looking case or

in the price expectation adaptive. As indicated by the monetarist view from the 1960s, each of the price expectation errors were related.

The approach of the *RE* to the prices and business cycle created a vertical price curve for both short run as well as long run. When the monetary authority reveals in advance monetary stimulus, people would expect the prices to rise. For this case, completely expected monetary policy will not have any genuine impacts in the short run as contended by monetarists. Therefore, real output as well as employment can be influence by the central bank if it can only figure out how to make a “price surprise”. Then, the “forward looking” economic agent adjustment expectation will guarantee the fail of their pre-pronounces policy. Likewise if the policy makers announces in advance a disinflationary policy. The effect of the policy will not bring the price down if do not accept as true by the people that the government will certainly carry it out. Specifically, in the new classical framework, the price expectation found to be related closely with the obligation of policy credibility as well as reputation for effectively disinflation the economy.

According to New Classical and Monetarists economists, the money supply growth typically stem from the current deficit in public sector which are primarily financed by the central bank. Therefore, in the “unpleasant monetarist framework” offered by Wallace and Sergent (1975), the budget restriction by the government is very important to comprehend the inflation time path. For the recent government deficit, the method of alternative finance determines only the timing of inflation that is not avoidable in the future, beneath the fiscal policy dictate monetary policy Wallace and Sergent (1975).

Conclusively, from the concise review of the different theories of inflation, it could be deduce that the different factors that cause inflation can be generally categorized into four different major groups; supply factors, demand factors, political factors and inertial factors of inflation. The existence of these diverse factors in clarifying the process of inflation gives backing to those studies that regard inflation as a macroeconomic as well as institutional phenomenon.

2.4 EMPIRICAL LITERATURE

Previously many researchers have conducted several studies on the relationship between money growth and inflation as well as the proposition of the quantity theory of money, which is one of the theories that have been extensively studied by previous researches. The studies employed many techniques of econometrics such as Ordinary Least Square (OLS) method, the Granger causality test, the Johansen Cointegration test, the Vector Error Correction model (VECM) as well as the Vector Autoregressive (VAR) model. Henceforth, these studies have come out with conflicting findings on the relationship between inflation and money growth. For instance, a study by Friedman and Schwartz (1982) has shown that positive relationship exist between inflation and money supply growth. However, Grauwe and Polan (2005) used the panel and cross-section analysis for testing the quantity theory of money the from the period 1969-1999 in 116 countries. Their study finds a robust positive relationship between inflation and money growth in countries with a high inflation rate. However, such relationship is weak in countries with low level of inflation rate. Correspondingly, Moroney (2002) tested the quantity theory of money ability to clarify the inflation differences among 81 countries. Moroney (2002) found the modern quantity theory to provide a complete clarification of inflation in

countries that have high rate of inflation. However, in those countries where the inflation rate is low money can explain only about 70 percent of inflation changes as reported from the result. These findings is in support of the stock of money as a guide in directing policies for achieving price stability in those countries with high inflation rate but not in countries where the inflation rate is very low.

In addition, another group of studies was conducted in the form of time series investigation to test the validity of the eminent statement of the Friedman Milton that says, “Inflation is always and everywhere a monetary phenomenon”. For instance, a study by Adusei (2013) examined whether inflation in South Africa is a monetary or structural phenomenon over the period of 1965 to 2006. He used Two Stages Least Square (2SLS) method, cointegration analysis, Granger causality test, Fully Modified Ordinary Least Square (FMOLS) method and ECM. The statistical result of the study shows that broad money supply does not significantly affect inflation in the short-run while in the long-run broad money supply significantly affect inflation. The result from the Granger causality shows the presence of unidirectional causal relationship running from inflation to broad money supply. The study concludes that inflation is both monetary as well as structural phenomenon in South Africa. Therefore, policy makers should moderate inflation by considering both structural as well as monetary aspects of inflation. The finding of this study is more theoretically sound and more applicable for generalization than the finds of studies such as Adenuga, Bello and Ejumedia (2012) and Mirbagherijam (2014), Doyin and Ikechukwu (2013).

In the same vein, Adenuga *et al.* (2012) investigated whether inflation in Nigeria is purely a monetary phenomenon. They used data on annual time series covering the range of 1970 to 2009. Thus, the result from the OLS method reveals that in Nigeria

inflation is not purely monetary phenomenon in nature as the coefficient of the money growth relation with inflation is less than unity. This signifies the fact that other factors other than money growth cause inflation in Nigeria. The main shortcoming of this study is that OLS method used in estimating the relationship among the variables does not specify whether the variables have long run or short run relationship and whether the relationship is unidirectional or bidirectional, which is important especially for testing the validity of a particular theory. Therefore, a study by Mirbagherijam (2014) used the techniques of ECM in his analysis, the findings of his study will be more sound and accurate than the findings of Adenuga *et al.* (2012).

Furthermore, Mirbagherijam (2014) analyzed the dynamic nature of money growth and inflation in Iran. He used a data on quarterly time series from the period of 1990 to 2011. In order to study the interaction among the variables, the study employed the techniques of ECM. The result from the study indicated that cost-push factors are the major factors that lead to inflation in the long run. Therefore, the result of the study concluded that in Iran inflation is not a monetary phenomenon. The finding of this study is against the eminent statement of Friedman Milton that “inflation is always and everywhere a monetary phenomenon”. The main weaknesses of this study is that cointegration analysis does not perform so long run relationship among the variables is not identified unlike the studies by Adusei (2013), Ahmed, Muhammad, Noman and Lakhan (2014) and Dizaji, Nasab, Najarzadeh and Assari (2012) where long run relationship between the variables are estimated. Therefore, the findings of their studies will be in line with theories than the findings of this study.

Similarly, Doyin and Ikechukwu (2013) examined within the context of Nigerian economy whether inflation is everywhere and always a monetary phenomenon. They

used time series annual data for the period of 1970 to 2011. The result from the techniques of ARDL reveals that the relationship between inflation and money growth is negative and statistically insignificant. Therefore, the study concludes that in Nigeria inflation is not a monetary phenomenon purely. However, similar results were obtained by Adusei (2013); Adenuga, Taiwo and Efe (2012); and Mirbagherijam (2014) even though they used different techniques of analysis and the studies was conducted in different countries. Contrarily, the result founds by Qayyum (2006) contrast with the findings of Adusei (2013); Adenuga *et al.* (2012), Mirbagherijam (2014), he used time series annual data for the period of 1960 to 2005 to study the linkages between inflation as well as money growth in Pakistan thereby testing the monetarist stance validity that inflation is always a monetary phenomenon. Therefore, the result from the techniques of ARDL reveals that money growth is the major determinant of inflation in Pakistan. The findings from the study resolved that in Pakistan inflation is a monetarist phenomenon that supports the monetarist proposition.

Moreover, Budina, Maliszewski, Menil and Turlea (2006) examined the relationship between money, inflation as well as output in Romania. They used a monthly data from the period of 1992 to 2000. The study employed the techniques of Johansen cointegration and ECM to analyze the relationship between the variables. Thus, the result of the cointegration revealed the long run relationship existence between money growth and inflation. While ECM result showed that growth of money supply has significant impact on inflation in the short run. This study does not estimate the causal relationship between the variables when compared with the study of Adusei (2013) that includes Granger causality in his analysis, the findings of this study will not be accurate for generalization.

In addition, Ashwani (2014) studied the determinant factors of inflation in India. He used time series annual data covering from 1981 to 2011. In order to accomplish the objectives of the research, cointegration techniques and ECM were employed. The result of the study shows that in India money supply has significant impact on inflation. The short-run and the long-run relationship were found to exist between the inflation and money supply in India. This study is silent in terms of the causal relationship between the variables, which make it one of the weaknesses of the study.

Likewise, Chiaraah and Nkegbe (2014) conducted study on the effect of money growth, GDP growth and exchange rate on inflation in Ghana. They used a time series data from 1980 to 2010. They employed techniques of cointegration and ECM. The findings of the study show the presence of long run equilibrium relationship between inflation and money supply. Based on the theoretical assumptions, the findings of the study presents that in Ghana money supply and inflation is positively related in the long-run. The findings of the study will be suspected because the directional relationship among the variables are not estimated unlike the study of Georgantopoulos and Tsamis (2012) where the long run as well as the short relationship among the variables are estimated as well as the direction of the relationship among the variables. Therefore, the findings of this study will not be appropriate for good policymaking.

As well, Bakare, Adesanya and Bolarinwa (2014) studied the relationship among the money supply, budget deficit and inflation over the period of 1975 to 2012 in Nigeria. They employed Johansen cointegration test and ECM for the purpose of analyzing the relationship amongst the variables. Thus, the study reveals the existence of positive and significant association between money supply and the inflation rate in Nigeria both in the short as well as in the long run. The only deficiency of this research is

its inability to test the causative relationship amongst the variables that will greatly help us to know the direction of the relationship between the variables.

Besides, Asuquo (2012) studied the impact of monetary policy on inflation through the OLS method of estimation and the multiple regression models. The study reports a positive and significant association between money supply and inflation in Nigeria, which implies that inflation should be predict through money supply. The finding of the study recommends that money supply should be serves as the major policy variable that would be manipulated to control inflation in Nigeria. The method used in achieving the objectives of this study is erroneous because the OLS techniques used in this study is not sufficient to prove the nature and the direction of the relationship among the variables.

Similarly, the short run and the long run relationship among the government expenditure, money supply, economic growth and inflation was studied in Cyprus by Georgantopoulos and Tsamis (2012). The study employed the Johansen cointegration test, approach of ECM and the Granger causality test. The result from the study reveals that a unidirectional causal relationship found to exists running from inflation to money supply growth. Henceforth, the relationship between inflation and money growth is positive in both the short run as well as the long run. Base on this result we should conclude that excess supply of money cause inflation in Cyprus. Therefore, when compared with other studies such as Chiaraah and Nkebge (2014), Bakare *et al.* (2014) and Asuquo (2012). The findings of the study by Georgantopoulos and Tsamis can be valid, accurate and appropriate for a good policymaking because not only the long run as well as the short run relationship among the variables is estimated but the directions of the relationship between the variables are also identified.

In the same vein, Bozkurt (2014) examined money, economic growth and inflation relationship, using a quarterly time series data from the period 1992 to 2012 in Turkey. He used Johansen cointegration techniques to test the relationship between the variables. Evidence has shown that money supply growth as well as the velocity of money found to be the major determinant factors of inflation in Turkey. This study fails to identify the important of using ECM that allows for modeling simultaneously both the short and long term forces in a single equation model.

Meanwhile, to determine the macroeconomic elements accountable for inflation in Ghana, Gyebi and Boafo (2013) conducted a study using a time series data from the period of 1990 to 2009. By using OLS method of estimation, the result from the study shows that the major determinant factor that influence the price to move up is the money supply. The finding of this study will not be appropriate for proper generalization unlike the findings of other studies such Chiaraa and Nkegbe (2014) and Adusei (2013) who employed techniques of econometrics analysis such cointegrations techniques, ECM and Granger causality test.

Similarly, Mbutor (2014) examined the effect of money supply on the level of inflation in Nigeria by using VECM and cointegration test. The study used a time series data from 1970 to 2012. The statistical result of the study shows a positive relationship between inflation and money supply as well as the long run relationship among the variables found to exist. The study concluded that money supply serves as one of the crucial determinant factors of inflation in Nigeria. The analysis of short run as well as the long run relationship of the study by Mbutor (2014) has been conducted accurately but the study ignores the Granger causality test, which makes the study less accurate when

compared with other studies such as Aduesi (2013), Yadav and Lagesh (2011) who used it in their analysis.

Furthermore, Onayemi (2013) examined the effect of output growth in combination with monetary policy on price stability in Nigeria. The study employed the techniques of ECM and Johansen cointegration approach in order to test the long run relationship among the variables. The result from the study reveals a positive relationship between money supply and the level of price in the short run. However, the result of the study shows the presence of long run relationship among the money supply and the level of price in Nigeria. The major limitation of this study is that it only analyze the long run and short run relationship between the variables the causal relationship between the variables have not been analyze which make it very difficult to identify the true picture of the relationship.

Likewise, Odusanya and Atanda (2010) used data based on time series from 1970 to 2007. They employed the statistical techniques of cointegration test as well as VECM to analyze the determinant factors of inflation in Nigeria. The study reports that the rates of money supply growth has direct influence on inflation rate both in the short run as well as in the long run in Nigeria. The study is based on the Johansen test of cointegration that has the advantages of estimating the long run relationship between two or more time series variables.

Moreover, Haile (2013) studied the determinant of inflation in Botswana. He used a quarterly time series data from 1990 to 2010. The result from the ARDL techniques reveals that money supply is one of the most determinant factors of inflation in Botswana. The finding of this study is in line with the finding of Qayyum (2006) but contrast wih the findings of Doyin and Ikechukwu (2013) even though they all used

similar method of analysis. The major weakness of these studies is that each of them depends on a single method of analysis.

In addition, Ahmed, Muhammad, Noman and Lakhani (2014) investigated the determinant of recent inflation in Pakistan. They used data on time series from the period of 1973 to 2010. They employed the Johansen cointegration techniques to test the relationship among the variables. Thus, the result of the study found a long run as well as positive relationship between the overall price level as well as the growth of money supply in Pakistan. This result is in consonance with the view of monetary theory of inflation, because according to the result increase in the money supply growth cause inflation. Henceforth, the result of this study will not be reliable when compared with the result of Iya and Aminu (2014), Yadav and Lagesh (2011) and Hussain (2013) who do not only find the long run relationship but also the direction of the relationship between the variables was identified.

Similarly, Dizaji *et al.* (2012) examined both the determinant and behavior of inflation as well as domestic prices in Iran. They used a time series data over the period of 1973 to 2008. The result from the techniques of cointegration test and ECM indicates that money growth has significant impact on inflation in the long run but money growth is not a main determinant factor of inflation rate in the short run in Iran. The study estimates the long run relationship among the variables as well as the short term effect of money growth on inflation, but the direction of the relationship among the variables are not estimated which is one of the defects of the study.

Additionally, Bakare (2011) studied the effect of money supply growth on inflation as well as its determinant in Nigeria. He used a time series data from the period of 1981 to 2006. The study employed a quasi-experimental research design approach.

The statistical result reveals a positive relationship between inflation and money supply growth because one percent increases in money growth would lead to 5.6 percent increase in inflation rate in Nigeria. The shortcoming of this study is that the techniques used in analyzing the relationship between the variables are not appropriate for time series investigation.

Likewise, Maku and Adelowokan (2013) analyzed the dynamic and determinant of inflation in Nigeria. He used a time series data from the period of 1970 to 2011. The result from the ARDL model indicates that money supply growth have direct relationship with inflationary pressure in Nigeria. The result of this study are suspected due to the fact that the study depends on a single method of analysis that is ARDL unlike the study of Khalid (2011) who employed ARDL techniques in addition of cointegration techniques and unrestricted ECM in his analysis.

In the same vein, Bhattarai (2011) examined the effect of money supply as well as exchange rate on inflation, growth as well as interest rate in Britain. The study is based on quarterly time series data from the period of 1970 to 2006. Thus, the results from the econometrics techniques of Indirect Least Square (ILS) and Three Stages Least Square (3SLS) methods show that a significant as well as positive relationship between money supply growth and inflation exist in Britain. The result of the study is in consonance with the theory of the quantity of money. The major weakness of this study is that the long run relationship among the variables is not estimated.

Moreover, Khalid (2011) examined the determinant factors of inflation in Saudi Arabia both in the short run and in long run as well. The study used annual data of time series from the period of 1980 to 2009. He employed the techniques of ARDL model, cointegration test as well as the unrestricted ECM. The result of the study reveals that

money supply as a determinant factor of inflation has significant impact on inflation rate in the long run as well as the short run, nonetheless the effect is relatively higher in the short run than in the long run because of the liquidity increase in the economy of Saudi Arabia. The findings of this study is reliable and accurate because the study employed different techniques of analysis, so different nature of relationship among the variables are obtained unlike the study of Maku and Adelowokan (2013) who depends only on ARDL techniques in his analysis.

As well, Arif and Ali (2012) analyzed the major determinant factors of inflation in Bangladesh over the period of 1980 to 2010. They employed the techniques of Johansen cointegration test and ECM. The result of the study discloses that broad money supply have positive impact on inflation rate in the long run like wise it serves as most influential factor also in the short run. To achieve price stability in Bangladesh government has to pursue a fiscal policy as well as the monetary policy. The limitation of this study is its inability to estimate the causal relationship among the variables that will help imminently to know the direction of the association among the variables in order to control the inflation properly.

Likewise, Armesh, Rad, Azadavar, Zarezadeh and Saeidinia (2011) examined the factors that can help to explain as well as forecast inflation in Iran. They used an annual data based on time series from the period 1961 to 2007. The result from the univariate and multivariate cointegration, ARDL approach and ECM techniques of analysis reveals that liquidity $M2$ significantly influence inflation in the long run also in the short run as well, but the effect in the long run is greater than the short run effect. The study suggests that government should controlled high rate of liquidity growth in order to control or minimize the inflation in Iran. The finding of this study is in consonant with the quantity

theory of money and the study will help greatly especially on a quest of achieving price stability.

Similarly, Ramady (2009) examined the factors that cause and determine inflation in Saudi Arabia. He used annual data based on time series from the period 1986 to 2007. Thus, the study analyzed the data using correlation and regression analysis. The result from the statistical analysis shows that money supply has significantly affect inflation in Saudi Arabia. The use of correlation analysis in achieving the objectives of the study is erroneous because the method alone is not sufficient to analyze the relationship among the time series variables.

In addition, Hossain (2013) investigated the determinant factor of inflation in Bangladesh. He used quarterly time series data from the period 1990 to 2010. By using OLS statistical techniques, the result of the study reveals that money supply have significantly and positively influence inflation, while one year lagged of money supply have significantly and negatively relate with inflation in Bangladesh. This study suggests that money supply should be seriously control to decrease inflation. This study has estimated the relationship between the variables accurately but it ignores other methods of analysis such as cointegration techniques, Granger causality test as well as ECM.

Moreover, Ahmed, Raza, Hussain and Lal (2013) empirically analyzed the determinant factors of inflation in Pakistan from the period 1971 to 2012. They employed the techniques of Johansen cointegration approach and ECM to analyze the relationship between the variables. The statistical result of the study shows that money supply *M2* positively influences the level of inflation in the long run. This study used similar method of analysis with Dizaji *et al.* (2012), Chiaraah and Nkegbe (2013) and Bakare *et al.* (2014) came out with a similar result. However, the major weakness of

these studies is that they failed to explore the causal association among the variables that is very important in identifying the direction of the relationship among the variables.

Contrarily, Onyeiwu (2012) studied the effect of monetary policy on economy in Nigeria, using annual data based on time series from the period 1981 to 2008. The result of the study from the statistical method of OLS indicates that money supply is influencing inflation rate negatively while it is positively relate with balance of payment and GDP in Nigeria. The result of this study is in line with the result of Hossain (2013) who used similar method of analysis with this study. The major defect of these studies is their inability to include dynamic system of analysis such as ECM, impulse response function as well as the variance decomposition that will make the findings of their study accurate and proper for generalization.

Similarly, Oseni (2013) studied the effectiveness of monetary policy and the policy of foreign exchange in the attainment of price stability in Nigeria. He used annual data based on time series from the period 1970 to 2009. The study adopted OLS, cointegration test, and VECM as the methods of analysis. The findings of the study discloses that monetary policy is less effective when compared with foreign exchange policy in achieving stability of general price level in Nigeria. The result of this study will be more reliable and accurate than the result of the studies by Onyeiwu (2012), Okwo, Eze and Nwoha (2012) and Hossain (2013) who depends only on OLS as their methods of analysis.

Furthermore, Okwo *et al.* (2012) examined the efficiency of monetary policy so as to determine its effect on the stability of macroeconomic variables in Nigeria. They used data based on annual time series from the period 1985 to 2010. The result from the OLS method reveals that monetary policy has insignificant effect on inflation.

Henceforth, the study suggests that monetary policy might not effectively influence price level in Nigeria. The result of this study cannot be generalized because the study does not employ techniques of cointegration, Granger causality and ECM in their study that is appropriate for time series analysis.

In addition, Wimanda (2011) used annual data based on time series from the period 1980 to 2008 to study the effect of exchange rate as well as money growth on inflation in Indonesia. The study employed the techniques of Phillip curve equation through the threshold model. The result of the study indicates that the effect of money growth on inflation rate is not linear. The greatest influence of money growth rate is between 0 and 7.1 percent, the moderate influence of money growth rate is between 7.1 percent and 9.8 percent and the lowest influence is when the money growth is above 9.8 percent. As the rate of money growth is getting higher, its effect on inflation rate is decreasing.

Similarly, Gupta and Kabundi (2010) examined the impact of monetary policy on inflation based on the prices of houses in U.S. The study used a quarterly data based on time series from the period 1976 to 2005. The result of the study states that monetary policy shock is negatively relate with house price inflation in U.S.

However, Kisu, Perks, Grant and Mtendere (2012) used the techniques of Granger causality, ECM and cointegration test to investigate the effect of monetary factors that cause inflation in Malawi. They used a monthly data based on time series from the period 1995 to 2011. The result of the study shows that the growth of money supply Granger causes inflation but inflation does not Granger causes the growth of money supply also a positive relationship exist between inflation and money growth in the short run and the long run relationship between the variables exist. Monetary factors

are the major causes of inflation in Malawi. The findings of this study are more accurate and reliable than the findings of Odusanya and Atanda (2010), Mbuto (2014), Tsamis and Georgantopoulos (2012) and Bakare *et al.* (2014). Because the study incorporates Granger causality test in the analysis.

In addition, Wolde-Rufael (2008) studied the causal link between inflation, budget deficit as well as money supply in Ethiopia over the period of 1964 to 2003. The techniques of Granger causality and cointegration test were employed in analyzing the relationship among the variables. The result of the study indicates that a long run relationship between inflation and money supply exist and a unidirectional causal relationship moving from money supply to inflation is present in Ethiopia. This study has conducted Granger causality and cointegration analysis among the interested variables but it disregards ECM in the analysis that is very important in estimating the short run as well as long run effect of one variable on the other.

Furthermore, Mehrara and Musai (2012) used Iran data and examined the relationship among GDP, money and the level of price from the period 1960 to 2008. They used test of cointegration as well as Granger causality in their study. Thus, the result from their study indicates that a long-run equilibrium relationship exist between money and the level of prices and unidirectional causal relationship effect moving from prices to the money supply while in the short run a feedback effect exist running from money supply to prices in Iran. The short coming of this study is that the study have conducted the *F*-test for the multivariate test but they are actually the bivariate test of the causal analysis because the lagged coefficient are considered for a particular variable in the system of a single equation not the other equations within the model. The test of the likelihood ratio only can do this (Enders, 2004).

Additionally, Ahmed and Suliman (2011) used Granger causality and cointegration techniques in studying relationship among real GDP, money supply as well as the level of price in Sudan. They used annual data based on time series from the period 1960 to 2005. Their work proved the presence of a one directional causal relationship moving from money supply towards prices and a long run relationship exist between the overall price level and the money supply in Sudan. Under this study the Granger causality and cointegration analysis are conducted but the dynamic analysis of a single measures such as ECM, variance decomposition (VDCs) and the impulse response functions (IRFs) are not applied.

Moreover, Shams (2012) examined the relationship among money supply, price level and income in Bangladesh. He used annual data based on time series for the period 1972 to 2010. He employed the techniques of cointegration as well as Granger causality to analyze the relationship among the variables. The result from the statistical techniques of the study shows that a long run relationship exist between money supply and price level as well as unidirectional causal relationship moving from money supply towards price level. The findings of this study are in line with the result of Wolde-Rufael (2008), Mehrara and Musai (2012), and Ahmad and Suliman (2011) who used similar methods of analysis even though the studies are conducted in different countries. This makes the result of this study accurate and possible for generalization.

In the same vein, Hussain (2013) studied the relationship between economic growth, money supply and inflation among three countries from the South East Asia, which include Malaysia, Indonesia and Singapore over the period of 1980 to 2008. By using Johansen cointegration as well as Granger causality, the result from the study asserts that a unidirectional causal relationship were found to exist moving from money

supply towards inflation in Singapore and Malaysia also a long run relationship exist among the inflation and money supply in all the countries. The major problem of cross-sectional investigation is that it does not reflect always the circumstances of the individual countries.

Similarly, Ghazali *et al.* (2009) studied the relationship among money supply and price level in Malaysia over the period of 1974 to 2006. Johansen cointegration techniques and Granger causality approach were employed to examine the relationship between the variables. According to their findings, there is equilibrium relationship among the money supply and prices in the long-run as well as unidirectional causal relationship moving from money supply towards prices in Malaysia. The implication of this study is that the direction of the causal relationship is determined by the F -test that is a t -test actually of a single coefficient. The result from such methodological abnormalities may cause policy implication seriously.

Furthermore, Yadav and Lagesh (2011) examined the interrelationship among the exchange rate, real output, money and prices in India. They used monthly data based on time series from the period 1991 to 2007. Cointegration techniques, Granger causality and VECM was employed to study the relationship among the variables statistically. The result from the study shows that a long-run relationship among the money supply and the level of price exist, as well as unidirectional causal relationship moving from money toward prices. The findings of this study are based on VECM analysis which permits a general causation test most among diverse economic variables than is probable in traditional econometrics analysis.

Moreover, Iya and Aminu (2014) analyzed the determinant factors of inflation in Nigeria. They used annual data based time series from the period 1980 to 2012. They

employed Granger causality techniques, cointegration techniques as well as ECM. Thus, the finding from the study reveals that a unidirectional causal relationship exist moving from inflation to money supply and a positive long-run relationship among the inflation and the money supply. Therefore, reducing money supply would lead to good performance of the economy in terms of stability in price level. The ECM used in the analysis of this study excludes the need of developing explicit economic models as well as imposing a priori restriction based on the relationship between the variables.

Contrarily, Bashir *et al.* (2011) studied the determinant factors that cause inflation as well as the causal relationship amongst several macroeconomics variables in Pakistan. They used data based on time series for the period 1972 to 2010. They employed the test of Johansen cointegration, Granger causality and VEC approach to examine the relationship among the variables. Thus the findings from the study reveal that money supply has positive influence on the consumer price index in the long run . Furthermore, the result from the Granger causality stated that a bidirectional causal relationship between money supply and the consumer price index exists. The result of this study is in contrast with the findings of Iya and Aminu (2014) who finds a one directional causal relationship moving from inflation to money supply.

Moreover, Mehrara and Musai (2011) used cointegration techniques and Granger causality techniques to study the dynamic causal relationship among price, income, and money as well as oil revenue among the panel of 11 oil-exporting countries. They used annual data of time series from the period 1970 to 2009. Hence, the findings of the study shows the presence of long run relationship among money supply and the prices and bidirectional causal relationship among the money supply and price but the price found to have stronger effect on money. The result of this study contradict the findings of

Wolde-Rufael (2008), Mehrara and Musai (2012), Ahmad and Suliman (2011) and Shams (2012) who find a unidirectional causal relationship between money growth and inflation.

Similarly, Hossain (2005) examined the relationship among the money supply, economic growth and currency devaluation in Indonesia based on time series annual data from the period 1954 to 2002. Using the test of Granger causality the result of the study reveals the existence of bidirectional causal relationship among the money supply growth and inflation in the short run. The causality running from money supply growth towards inflation is weak when compared with the causality from inflation towards money supply.

In addition, Bilquees, Mukhtar, and Sohail (2012) using annual data based on time series from the period 1972 to 2009 studied the interaction between the interest, exchange rate, output, money supply as well as prices in Pakistan. The study employed the Johansen cointegration techniques, Granger causality and VECM to analyze the relationship between the variables. The statistical result from the study indicates the existence of long-run relationship between the price level and money supply as well as bidirectional causal relationship among the money supply and prices were found. The study concluded that inflation is not purely a monetary phenomenon. This study has the advantages of overcoming the shortcomings of other studies since the study employed different techniques of dynamic analysis such as cointegration techniques, Granger causality test and VECM techniques which make the result of the study more accurate, reliable and proper for good policy making.

Therefore, those studies that use the VAR model analysis have the advantages of investigating the shocks externally on the endogenous variables using the function of

impulse response. The linear interdependency between the variables are captured through the use of VAR model and the VAR model utilize a relatively short number of variables so it is not difficult to revise and update the data series as required. In spite of these advantages, VAR model is associated with a number of shortcomings for instance when the variables incorporated in a VAR model are many a complication may arise, the simultaneous relation between the variables as well as policy innovations will make it difficult to recognize the shocks correctly which will result in a forecast that is less accurate. Numerous studies have empirically investigated the association between money growth and inflation based on a VAR model for instance, a study by Sousa and Zaghini (2008) employed structural VAR model. They used time series quarterly data over the period of 1980 to 2001 for the purpose of analyzing the monetary shocks of international transmission with emphasis on the impact of foreign liquidity on the European area. They found that foreign liquidity shock will positively lead to permanent increase in the price level in Euro area and the global liquidity innovation is an important factor in explaining price fluctuation. This study is silent in terms of the causal and long run relationship among the variables that is very important in establishing a theoretical reasoning of the study.

In addition, Odior (2012) studied the inflation targeting within the developing economy, taking the Nigerian economy as a case study. He used time series annual data from the period 1970 to 2010. He also employed VAR model and IRF to analyze the relationship between the variables. The result of the study indicates that money supply is among the significant factors that cause changes in inflation rate in Nigeria. Therefore, the study suggested that in order to achieve stable rate of inflation in Nigeria

considerable policy attention should be given to the factors that cause changes in inflation.

Similarly, Basco, D'amato and Garegnani (2009) studied the relationship between money and price under low as well as high regime of inflation in Argentina over the period of 1997 to 2006. The study employed the cointegration techniques of analysis and the VAR model. The result from the study reveals a positive association amongst the money growth and money velocity under the period of high inflation but the relationship change under the period of low inflation. Furthermore, the study suggests that money play a very vital role when describing the dynamism of inflation in Argentina.

Furthermore, a study by Tabi and Ondo (2011) in Cameroon from the year 1960 to 2007 investigated the relationship between money supply, economic growth as well as inflation. The result of the study from the VAR model indicates that an increase in the supply of money may not necessarily raise inflation rate as shown by the result when money supply increases, growth will also increase which will indirectly cause inflation.

In the same vein, Adesoye (2012) empirically examined the association among the output, money as well as prices in Nigeria. He used quarterly time series data from the period of 1970 to 2009. By employing Granger causality test, cointegration techniques and VAR model, the findings from the study shows the existence of long run equilibrium association among the money supply as well as prices in the same vein a unidirectional causal relationship running from money supply to price. Thus, this study result is in support of the view of monetarist that excess supply of money is the major cause of inflation.

Additionally, Assenmacher-Wesche and Gerlach (2008) studied the determinant factors as well as the behavior of inflation across frequency band in Pakistan. He used a

time series quarterly data for the period 1970 to 2006. Thus, study employed the techniques of VAR model and the test of Granger causality in order to analyze the association among the variables. The findings from the study indicates that at low frequency band inflation is Granger caused by monetary factors but the running of causality is from money growth to inflation.

Similarly, Mishra, Mishra and Mishra (2010) examined the association among the output, money and prices in India based on time series data over the period 1950 to 2008. Hence, by using VAR model as well as Granger causality, the results from the study disclose presence of unidirectional causal relationship moving from the price level towards money supply. However, in the short run there is presence of bidirectional causality among the money supply and the level of price.

Furthermore, Bello and Saulawa (2013) examined the relationship among money supply, interest rate, income growth as well as inflation in Nigeria based on time series annual data from the period 1980 to 2010. The study applied the cointegration techniques, Granger causality as well as VAR model. The result of the study presents the existence of bidirectional relationship among the money supply and inflation. Contrary to Bakare *et al.* (2014), that reveals a long run relationship amongst the inflation and money supply in Nigeria. Bello and Saulawa (2013) argued that in Nigeria long run relationship amongst the inflation, and money supply does not exist.

In addition, Asenmacher-Wesche and Gerlach (2008) examined the determinant as well as the behavior of inflation in Switzerland. They used time series quarterly data from the period 1970 to 2006. The study employed the techniques of Granger causality as well as VAR model to analyze the association between the variables. The statistical result of the study shows that monetary factors Granger causes inflation at low frequency

band, while at high frequency band output gap Granger cause inflation. Henceforth, a number of previous studies such as Dwyer Jr and Hafer (1998), Lucas (1980) and McCandless and Weber (1995) stated that a significant positive correlation exist between the prices and money in the long run. Such relationship is closely proportional.

2.5 CONCLUSION

Conclusively, understanding the association between money growth and inflation is crucial not because the relationship is positive but because of its policy consequences. when the central bank increase the supply of money growth in circulation the inflation rate will rise up while if the supply of money growth is reduce it will have an effect of minimizing the inflation rate substantially. Therefore, it is evident from the literature review of this study that the issue of the relationship between money growth and inflation has remained inconclusive. This is both at the theoretical and empirical levels. Henceforth, further studies on these issues using Nigerian data would provide a clear view that may help policy makers in planning decision.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter gives a general methodology used in this study. It incorporates five fundamental sections. These sections include the theoretical framework, model specification, justification of the relevant variables, data collection as well as the discussion of the method of analysis.

3.2 THEORITICAL FRAMEWORK

The estimation framework of this study is primarily motivated by the following brief on the link between the money supply growth and inflation based on the *QTM*. According to the proponent of the theory “inflation is always and everywhere a monetary phenomenon, in the first instance produced by an overly speedy growth in the quantity of money” (Friedman, 1968). Friedman’s affirmation is not that, an escalation in the rate of money growth is the sole reason of inflation in the long-run, simply it’s the most important cause (Friedman, 1972). The *QTM* assumes the fact that changes in income happen because the changes in the price level as well as output is at its permanent level always. Therefore, the level of price is influence by the money supply through the real balance effect operation. The *QTM* in its simplest form, which is also called the Cambridge equation is shown on Equation [1].

[1] $MV = PY$

This equation indicates that a relationship exist between the price (P), money supply (M), real income (Y) and the velocity of money (V). By taking (P) as the subject of the formula, Equation [1] can be written also in the form of price equation as shown in Equation [2].

$$[2] \quad P = \frac{MV}{Y}$$

By taking log from both side of the Equation [2], the equation will be transformed into a linear equation as shown in Equation [3].

$$[3] \quad \text{Log } P = \log M + \log V - \log Y$$

Inflation equation will be derived by taking the differenced of the Equation [3] as shown in Equation [4].

$$[4] \quad \frac{1}{p} \cdot \frac{dp}{dt} = \frac{1}{m} \cdot \frac{dm}{dt} + \frac{1}{v} \cdot \frac{dv}{dt} - \frac{1}{y} \frac{dy}{dt} \quad \text{or} \quad gp = gm + gv - gy$$

As shown in Equation [4], gp is the inflation rate, gm represents money growth, gv indicates income velocity of money and gy represents output growth rate respectively, in a *QTM* simplest version Laidler (1997), the theory assumes that the velocity of money and the real income growth remain constant in the long-run. Therefore, the income and velocity grow slowly and this behavior is independent with the behavior of prices and

money supply. This implied the existence of proportional association between inflation and the growth rate of money supply. The summary of the theoretical relationship between inflation and the explanatory variables of this study will be shown on Figure 3.1

QUANTITY THEORY OF MONEY QUANTITY THEORY OF MONEY AND COST PUSH INFLATION THOERY DEMAND FULL THEORY OF INFLATION

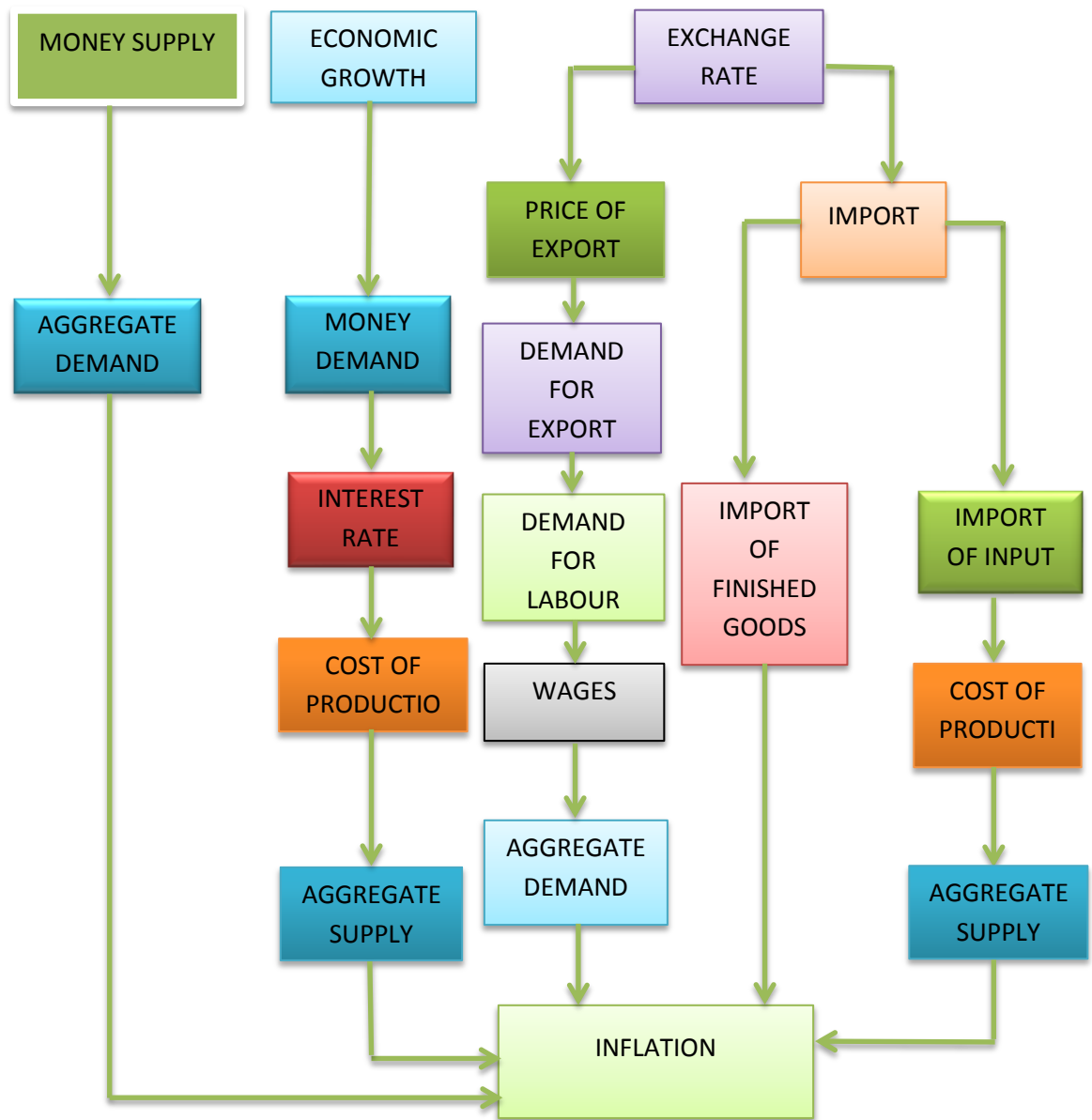


Figure 3. 1: Inflation Rate Determinants

3.3 THE MODEL

Since the determinants of inflation differ across different countries, several studies have developed diverse form of inflation models. The econometric model used in this study has been developed based on the quantity theory of money model, but the model is modified to accommodate other independent variables that influence inflation. Previous researchers used the variables that have been selected and included in the model commonly. Therefore, numerous studies have been done for both developed and developing countries, for instance studies by Basco *et al.* (2009), Umeora (2010), Pahlavani and Rahimi (2009), Armesh *et al.* (2011), Masnan *et al.* (2013), Bilquees (2009), Bello and Saulawa (2013), Amisano and Fagan (2013), Bozkurt (2014), Simwaka *et al.* (2012), Ahmed *et al.* (2014), Taye (2012), Maku and Adelowokan (2013), Akinbola (2012) and Sola and Peter (2013). These mentioned studies have used almost similar variables in their analysis. Therefore, econometrics technique of OLS method is applied to the variables used in this study, such variables are GDP, nominal exchange rate, real interest rate and the value of import as a control variables, while inflation and money supply growth are the focused variables. All these variables are specified in a regression model for simple estimation and better result as shown in Equation [5].

$$[5] \quad INF_t = \alpha_0 + \alpha_1 MS_t + \alpha_2 GDP_t + \alpha_3 EXR_t + \alpha_4 INR_t + \alpha_5 IMP_t + \varepsilon_t$$

where,

INF	=	Inflation Rate (annual %)
MS	=	Broad Money Growth (annual %)
GDP	=	Gross Domestic Product (current US \$)
EXR	=	Real Effective Exchange Rate
INR	=	Real Interest Rate
IMP	=	Import of Goods and Services (current US \$)s

3.4 JUSTIFICATION OF VARIABLES

By reviewing previous studies, an intimate relationship between inflation and some selected macroeconomic variables were found to exist in Nigeria. The dependent variable of this study is the inflation while the explanatory variables are money supply growth, interest rate, exchange rate, economic growth and the value of import. The description and measurement of these variables are provided in detail on the following subsections.

3.4.1 Inflation

This study use inflation as the dependent variable that is regarded as a persistent raise in the general price level of goods as well as services in an economy within a given period of time. Consumer price index is defined as a measure that examines the weighted average of prices of a basket of consumer goods and services such as transportation, foods and medical care and it is calculated based on the price change for each item and averaging them. Consumer price index will be used as a proxy for inflation as used by previous studies such as Hossain (2013), Oseni (2013) and Souza and Zaghini (2008).

3.4.2 Money Supply Growth

Money supply growth is the increase in the entire stock of currency and other liquid instruments in a country's economy at a particular period of time, which includes cash, coins and balanced held in checking and saving accounts. Usually, money supply growth can be measured using broad money growth $M2$. As a measure of money supply growth, $M2$ contains more than just physical money for instance coins as well as currency. It generally contains demand deposit that is kept in commercial banks as well as any type

of money that is kept in any account that will be easy to access. This is the prominent instrument used in measuring money growth also an economic indicator used frequently to evaluate the amount of liquidity in the economy, because it can be trace easily it is used in this study as a proxy of money supply growth as used by previous studies such as Arif and Ali (2012), Onyeiwu (2012) and Mbuto (2014). The money supply growth is expected to be positively related with inflation.

3.4.3 Interest Rate

Interest rate represent the rate that borrower paid to a lender for the purpose of using the borrowed money. The variable is used in this study as an explanatory variable and is represented by the real interest rate. The real interest rate is the lending rate attuned for inflation as measured through the GDP deflator. As a measure of interest rates it is used by prior studies such as Sola and Peter (2013). The expected relationship between interest rate and inflation is positive.

3.4.4 Exchange Rate

Exchange rate represents the value of one currency in relation to another currency. In this research exchange rate is measured through the real effective exchange rate. Real effective exchange rate can be derived by dividing the nominal effective exchange rate by the price deflator, which is used by previous studies such as Haile (2013), Sousa and Zaghini (2008) and Bakare *et al.* (2014). The relationship between exchange rate and inflation is expected to be positive.

3.4.5 Gross Domestic Product

Economic growth is regarded as the explanatory variable in this study that is the increase in the market value of the goods or services produced by an economy within a given period of time. It is measured conventionally as the percentage rate of increase in real GDP. GDP at purchaser's prices is regarded as the sum of gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products. It is calculated by not deducting depreciation of fabricated assets or for depletion and degradation of natural resources. The GDP data used in this research is in current U.S dollars. As an economic growth measure it is used by previous studies such as Maku and Adelowokan (2013), Ahmad and Suliman (2011), Haile (2013) and Shams (2012). The relationship between economic growth and inflation is expected to be negative, this is because an increase economic growth would lead to decrease in inflation.

3.4.6 Import

An import is a good from one country carried into another country. The party passing in the goods is known as importer. An import in the receiving country should be serves as an export by the country that sends the goods or services. The import as an explanatory variable in this study is measured by the value of imports of goods as well as services. The value of Imports is the total value of all the goods and services that is receive by the country from the rest of the world. These comprise the value of merchandise, travel, license fees and so on. They disregard employees' compensation, investment income as well as transfer payments. The expected relationship between the import and the inflation rate is positive. The value of imported goods and services is used in this study as a

measure of import as used by previous studies such as Maku and Adelowokan (2013), Armesh *et al.* (2011), Arif and Ali (2012) and Odusanya and Atanda (2010).

3.6 DATA

This study utilized the secondary type of data based on annual time series covering the period of 1970 to 2012. The data were obtained from the World Development indicators website (2014). The data used in this study contained 42 observations and is reasonably sufficient to perform time series estimation.

3.7 METHOD OF ANALYSIS

This study used the modern time series techniques of analysis in order to analyze and estimate the relationship between the selected macroeconomic variables. The techniques of time series analysis employed in this study include the unit root test, Johansen Cointegration techniques, ECM and the Granger causality. These techniques of analysis are explained in details in the following section.

3.7.1 Unit Root

A unit root is a peculiarity of techniques that develop through time that can result in issues of statistical inferences, which involves models of time series. The unit root are ubiquitous in economics as well as business time series variables, most of the variables of macroeconomics such as interest rate, GDP, inflation and so on have one unit root at least. This is expected somehow because all those variables are closely related even though they are measuring different parts of the economy. In the case of this study, all

the variables such as broad money supply, exchange rate, inflation, import and GDP must be test for unit root.

The unit root test is the official test use to check whether a time series variables is stationary or not. There are different forms of unit root test such as the Phillip-Perron (*PP*) test, the Dickey-Fuller Generalized Least Square (DF-GLS) test, as well as the test of Augmented Dickey Fuller (ADF).

The Dickey and Fuller (1971, 1981) develop a techniques to test for non-stationary formally based on the simplified AR (1) model as shown in Equation [6].

$$[6] \quad Y_t = \phi Y_{t-1} + \varepsilon_t$$

The aim here is to test whether ϕ is equal to 1 (unit root or non-stationary). Henceforth, the null hypothesis $H_0 : \phi = 1$ while the alternative hypothesis $H_1 : \phi < 1$. However, by subtracting Y_{t-1} on both side of the Equation [6].

$$[7] \quad \Delta Y_t = (\phi - 1)Y_{t-1} + \varepsilon_t$$

Which can be written alternatively in the form of Equation [8].

$$[8] \quad \Delta Y_t = \beta Y_{t-1} + \varepsilon_t$$

where the $\beta = (\phi - 1)$ and Δ is the operator of the first difference. Therefore, the null hypothesis now is $H_0 : \beta = 0$ as well as the alternative hypothesis is $H_1 : \beta < 0$. When $\beta = 0$ then $\phi = 1$ that is means there is presence of unit root, which implies that the time

series under investigation is non-stationary. The Dickey and Fuller (1979) also suggested an alternate regression equation, which can be utilized for testing the existence of a unit root. This equation incorporates a constant within the random-walk process as shown in Equation [9]:

$$[9] \quad \Delta Y_t = \alpha_0 + \beta Y_{t-1} + \varepsilon_t$$

The Dickey and Fuller (1984) broaden the procedure of their test proposing an augmented version to deal with serial correlation. The ADF test includes the lagged value of the dependent variable in the regression model so as to wipe out the auto correlation. Therefore, this study used the test of ADF, the test is conducted by expanding Equation [6] through the addition of lagged value of the dependent variable ΔY_t as shown in Equation [10].

$$[10] \quad \Delta Y_{t-1} = (Y_{t-1} - Y_{t-2}), \Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$$

3.7.2 Cointegration Test

Engle and Granger (1987) recommended that it is probable for a linear combination of integrated time series variables to become stationary and hence integrated on the same order. Therefore, the test of cointegration requires the order of integration of all the time series variables to be the same in the long-run. The order of integration involves the number of times that the time series variable is obliged to be difference before it become stationary. Non-stationary time series variable that turns out to be stationary after it difference n times are termed integrated of order n . A set of time series variables are said

to be cointegrated, if the set of individual variables is integrated on a similar order, n . A set of time series variables integrated of the same order n are cointegrated if the linear combination of the time series variables is integrated of order less than n . Succinctly, cointegration analysis is a process of estimating the long run parameters in a relationship with non-stationary variables (Brooks, 2008).

The notion of cointegration makes regression of variables that are integrated of order one $I(1)$ potentially meaningful, it also serves as a pre-test conducted to evade spurious regression, it is one of the analysis used for the estimating, testing and specifying dynamic models, it is also significant for testing the validity of underlying economic theories (Seddighi, 2012).

There are two forms of cointegration method that have been used by previous studies, which are: 1) Johansen cointegration method and 2) Engle-Granger Method of cointegration. This research utilized the Johansen Cointegration method because of its advantage over the method of Engle-Granger. The Engle-Granger method can be run on a maximum of two series only. Since we are dealing with multiple time series variables, we want to test them in a multi-variate framework, taking into consideration the probable detection of two or more cointegrating vectors, which cannot be achieved by Engle-Granger method. In this regard the Johansen's method suits the data of this study better because it can be able to examine two or more test variables and all the test variables can be treated as endogenous.

The Johansen's technique is a method of maximum likelihood that decides the number of cointegrating vectors in a VAR of non-stationary time series with restrictions imposed, known as VECM. The estimation model of Johansen's method is shown in Equation [11]:

$$[11] \quad Y_t = A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \beta X_t + \varepsilon_t$$

where Y_t is a non-stationary $I(1)$ vector of the variables, X_t is a deterministic vector of the variables and ε_t is an innovations vector as indicated in Equation [12].

$$[12] \quad \Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \beta X_t + \varepsilon_t$$

If ε_t is estimated as integrated of order zero $I(0)$ hence the Y_t and X_t variables are integrated of order one $I(1)$. It will have the advantage of having information on both long-run and short-run. For instance if $r = 1$ hence the relationship among the variables would be seen in Equation [13].

$$[13] \quad \begin{bmatrix} \Delta Y_t \\ \Delta X_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \sum_{i=1}^{k-1} \begin{bmatrix} \Gamma_{i,11} & \Gamma_{i,12} \\ \Gamma_{i,21} & \Gamma_{i,22} \end{bmatrix} \begin{bmatrix} \Delta Y_{t-i} \\ \Delta X_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} [\beta_1 \quad \beta_2] \begin{bmatrix} \Delta Y_{t-1} \\ \Delta X_{t-1} \end{bmatrix}$$

where the β vector represent r the cointegrating linear relationship among the variables, where α is referred to as the adjustment parameters (Johansen and Juselius 1990).

Johansen (1991) proposed two distinct test of cointegration under the Johansen method: the Trace (TR) test as well as the Maximum Eigenvalue Test (L-Max). The ratio of the likelihood statistic for the TR test is shown in Equation [14].

$$[14] \quad Tr = -T \sum_{i=r+1}^{p-2} \ln(1 - \lambda_i)$$

The *TR* test is a kind of joint test that test the null hypothesis of no cointegration ($H_0: r = 0$) contrary to alternative hypothesis of there are cointegration ($H_1: r > 0$). While the L-Max test test is based on the Equation [15].

$$[15] \quad L\text{-max} = - T \ln (1 - \lambda_{r+1})$$

The test of the Maximum eigenvalue conducts a test on each eigenvalue separately. It then test the null hypothesis that the number of cointegrating vectors is equal to r contrary to the alternative hypothesis of $r + 1$ cointegrating vectors (Brooks, 2008).

3.7.3 Vector Error Correction Model

Once cointegration between the time-series variables have been detected, long-run equilibrium relationship exist between them so VECM will be used in order to estimate the properties of the short-run cointegrated series. The rationale behind VECM is to show the speed of adjustment from the short-run equilibrium to the state of long-run equilibrium.

A VECM is a restricted VAR designed for use with non-stationary series that are known to be cointegrated. Once the equilibrium conditions are imposed, the VECM describes how the examined model is adjusting in each time period toward its long-run equilibrium state. Since the variables are supposed to be cointegrated, then in the short-run, deviations from this long-run equilibrium will feedback on the changes in the dependent variables in order to force their movements towards the long-run equilibrium state. Hence, the cointegrated vectors from which the error correction terms are derived each indicating an independent direction where a stable meaningful long-run equilibrium

state exists. In other words, it shows the direction of long-run causality among the variables. Therefore, we can developed our vector error correction model as presented on Equation [16].

$$[16] \quad \Delta INF_t = \alpha_0 + \alpha_1 \Delta MS_t + \alpha_2 \Delta GDP_t + \alpha_3 \Delta EXR_t + \alpha_4 \Delta INR_t + \alpha_5 \Delta IMP_t + \alpha_6 ECT_{t-1} + \varepsilon_t$$

From Equation [15], ECT_{t-1} is the error correction term, which is also the estimate of the lagged error series and ε_t is the random error term. However, the adjustment speed of the model of this study will be expressed by this method.

3.7.4 Granger Causality

Is a convenient practical techniques used for identifying the direction of the causal relationship between the variables and therefore, it may also be used within the cointegration analysis when there is an absence of theoretical framework clearly concerning the investigated variables. If let say in a regression equation independent variable X_t influence the explained variable Y_t , indirectly this acknowledge that X_t variable cause Y_t variable, which means that if variable X_t changes it will induce variable Y_t to change also. In a simple term, this is a concept of causality. Therefore, the following cases will be identifying with regard to the direction of the causality:

- i. When Y_t does not cause X_t but X_t cause Y_t , this case will be call as unidirectional causal relationship.
- ii. When X_t and Y_t variables are determined jointly this is a case of feedback or Bilateral causality.

Since a theoretical model with regard to the direction of the causal relationship is not known. Several tests have been recommended to recognize this direction. The most prominent test is the one suggested by Granger (1986). This test is based on the proposition that “the future cannot cause the present or the past” uses the VAR model concept. The Granger causality general specification test in a context of (X, Y) bivariate can be express in Equation [17] and Equation [18].

$$[17] \quad Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \dots + \alpha_i Y_{t-i} + \beta_1 X_{t-1} + \dots + \beta_i X_{t-i} + \varepsilon_t$$

$$[18] \quad X_t = \alpha_0 + \alpha_1 X_{t-1} + \dots + \alpha_i X_{t-i} + \beta_1 Y_{t-1} + \dots + \beta_i Y_{t-i} + \varepsilon_t$$

As indicated in Equation [17] and Equation [18], the subscripts indicate time periods and ε_t is the error term. The constant growth rate of Y and X in Equation eighteen and Equation seventeen is represented by the constant parameter α_0 and hence in these variables the trends can be interpreted as general movements of the cointegration among X and Y that go through the process of unit root. We can acquire from this analysis two different test hypothesis. The first hypothesis test the null hypothesis that Y does not Granger causes X as well as the second hypothesis test the null hypothesis that X does not Granger cause Y . If the first null hypothesis is rejected and the second fail to be rejected, hence this would be concluded that changes in Y Granger causes changes in X . Also between the two variables unidirectional causality will occur if one of the null hypotheses is rejected, bidirectional causality on the other hand is said to exist if both of the null hypotheses is rejected, as well no causality is found if both of the null hypothesis is fail to be rejected.

The standard Wald F -statistic would be used to test the hypothesis with regard to the significance or not significance of the Equation [16] and Equation [17] VAR model coefficient, as shown in equation [18].

$$[19] \quad F_c = \frac{(SSRr - SSRu)/k}{SSRu/(n-2k-1)} \sim F(k, n-2k-1)$$

where SSR_u = unrestricted sum of square residuals.

SSR_r = restricted sum of square residuals.

This kind of hypothesis in this test would be formulated as follows:

Hypothesis one

H_0 : X does not Granger cause Y that is $\{\alpha_{11}, \dots, \alpha_{1k}\} = 0$, if the critical value of $F > F_c$

H_1 : X does Granger cause Y , that is $\{\alpha_{11}, \dots, \alpha_{1k}\} \neq 0$, if the critical value of $F < F_c$

Hypothesis Two

H_0 : Y does not Granger cause X that is $\{\beta_{11}, \dots, \beta_k\} = 0$, if critical value of $F > F_c$

H_1 : Y does Granger cause X that is $\{\beta_{11}, \dots, \beta_k\} \neq 0$, if the critical value of $F < F_c$

It is supposed to be noted that here in the hypothesis one and hypothesis two the hypothesis has not been tested if we found that “ X causes Y ”, but it has been instead tested if it is according to the Granger type that “ X causes Y ”. This is due to the fact that Granger causality test is just a simple statistical tools of analysis that is used for testing the causal relationship between the variables it is not based on a particular theory of causation but rather it is upon the capability of the equation to predict the dependent variable better. However, the test validity depends upon the VAR model order and on whether the variables are stationary (Seddighi, 2012).

However, the hypothesis of Granger causality test of this study will be expressed as:

H_0 : Money Growth does not Granger cause Inflation

H_1 : Money Growth Granger causes inflation.

The null hypothesis should be rejected if the F-test statistic is greater than the critical value of the estimate. This implies that money growth cause Inflation. However, the same test procedure applies to other variables of the study.

3.8 CONCLUSION

The econometrics procedures of this research were explained systematically in this chapter in order to get the result on the relationship between money growth and inflation. The result and analysis of this study would be discussed in chapter four in order to achieve the objectives of the study.

CHAPTER FOUR

DISCUSSION OF RESULTS

4.1 INTRODUCTION

This chapter examines the analysis of time-series results of this study. It discussed the descriptive statistics first. The clarification of the developed model of inflation rate in Nigeria is followed that has been empirically analyzed using the techniques of Cointegration, VECM and the Granger causality test. The details explanation of these methods has been made in Chapter Three.

4.2 DESCRIPTIVE STATISTICS

The variables descriptive statistic results are presented in Table 4.1. The table shows that among the variables of the study, *MS* has the largest variation between the minimum and the maximum values, where the maximum value is 30.341 and the minimum value is – 20.702 respectively. Therefore, *MS* has the highest standard deviation that is 2.912 when compared with the other variables. This implies that from the mean of *MS* the dispersion is more spread for *MS* than the other variables.

Table 4. 1: Descriptive Statistics

	INF	IMP	GDP	EXR	INT	MS
Mean	1.349	24.519	22.881	2.152	2.109	25.492
Median	1.013	24.302	22.884	2.293	2.276	25.094
Maximum	4.823	26.861	25.204	5.059	3.146	30.341
Minimum	-2.301	22.940	20.947	-0.604	0.981	20.702
Std. Dev.	2.411	0.935	1.107	2.269	0.626	2.912
Observations	43	43	43	43	43	43

4.3 UNIT ROOT TEST

The ADF test have been employed to perform the unit root test for all the variables. The unit root test result for all the variables are presented in Table 4.2.

Table 4. 2: The Unit Root Test Results

Variables	Level		First Difference	
	Constant	Constant and trend	Constant	Constant and trend
EXR	0.304[0] (0.956)	- 2.061[0] (0.551)	- 5.102[0] (0.000)*	- 5.051[0] (0.001)*
GDP	0.459[0] (0.983)	- 0.481[0] (0.980)	- 5.331[0] (0.000)*	5.342[0] (0.000)*
IMP	- 0.787[0] (0.812)	- 1.503[0] (0.812)	- 4.622[0] (0.000)*	- 4.216[2] (0.010)*
INF	- 0.503[1] (0.871)	- 2.301[1] (0.424)	- 3.183[0] (0.029)*	- 3.884[1] (0.025)*
INR	- 1.728[0] (0.419)	- 0.880[0] (0.948)	- 6.328[0] (0.000)*	- 6.540[0] (0.000)*
MS	- 0.231[2] (0.926)	- 2.379[2] (0.384)	- 4.011[0] (0.003)*	- 3.982[1] (0.018)*

Notes: * denote rejection of the null hypothesis based on Mackinon's critical value at five percent level of significant respectively. [] show lag specification, () is the Mackinnon (1996) *P*-value.

The result of the test reveals that at level the Mackinon's critical values are greater than the τ -statistic values for all the variables. Therefore, H_0 should be failed to be rejected meaning that the variables are non-stationary at five percent level of significance. This means that all the variables are non-stationary at level.

However, after taking the first difference for all the variables, the standard τ -critical values are less than the τ -statistics values for all the variables. Therefore, H_0 should be rejected that the variables are non-stationary at five percent level of significance. This means that all the variables are stationary after taking the first difference.

Therefore after proven the fact that all the variables are integrated of the same order that is order one $I(1)$, the next step now is to further ahead to cointegration test, through the cointegration test long run relationship between Inflation and the selected macroeconomic variables can be analyze to see whether the long run relationship exist.

4.4 THE LONG RUN RELATIONSHIP

This part reports the result of Johansen cointegration analysis. The discussion begins with the optimum lag length determination. It is followed then with the Johansen cointegration result analysis.

4.4.1 The Optimal Lag Length

The first step of Johansen cointegration test involves the selection of optimal lag length. As per Johansen and Juselius (1990), the optimal lag length ought to be sufficient to obtain the normally distributed error term. The lag order selection statistics is reported in

Table 4.3. The majority of the criteria proposed lag three as the appropriate lag order for cointegration as shown in Table 4.3.

Table 4. 3: VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HG
0	-173.784	NA	0.000	8.989	9.243	9.081
1	82.906	423.538	5.33e-0	- 2.045	-0.272*	-1.404
2	127.690	60.459	3.89e-0	- 2.485	0.809	-1.294
3	189.151*	64.533*	1.55e-09*	- 3.758*	1.057	-2.017*

Notes: * indicates lag order selected by criterion
 LR : sequential modified LR test statistics (each test at 5% evel)
 FPE : Final Predictor Error
 AIC : Akaike Information Criterion
 SC : Schwarz Information Criterion
 HQ : Hannan-Quinn Information Criterion

4.4.2 The Johansen Cointegration Analysis

The test of Johansen cointegration is used basically to test the existence of long run relationship among the series that are not stationary. The requirement for Johansen cointegration test is that all the series must be integrated in the same order that is order one $I(1)$. The procedure of Johansen cointegration test proposes a maximum likelihood techniques of estimation that provides two different test statistics namely eigenvalue test and trace test statistics. The results are presented in Table 4.4.

Table 4. 4: The Johansen Co-integration Test Result

Hypothesized No. of CE(s)	Rank Test (Trace)			Rank test (maximum eigenvalue)			
	Eigenvalue	Trace Statistic	0.05 Critical value	Prob.**	Max- Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.868	210.565	95.754	0.000*	78.856	40.078	0.000*
At most 1 *	0.684	131.709	69.819	0.000*	44.929	33.877	0.002*
At most 2 *	0.621	86.782	47.856	0.000*	37.865	27.584	0.002*
At most 3 *	0.545	48.916	29.797	0.000*	30.669	21.132	0.002*
At most 4 *	0.323	18.247	15.495	0.018*	15.185	14.265	0.036*
At most 5	0.075	3.061	3.841	0.080	3.061	3.841	0.0802

Notes: * denotes significance at five percent level.

Therefore, from Table 4.4 the result of the trace test as well as the maximum eigenvalue test both indicates five cointegrating equation at five percent level of significance. This means that there is conformity among the different test statistics.

In order to stipulate the finest linear regression for the long run amongst the cointegrating equation Ghatak *et al.* (1997) contended that although the presence of multiple cointegrating vectors is viewed as a single equation identification problem of cointegrating estimation. Therefore, in practice this problem might be solved by selecting the specific cointegrating vector where the estimates of the long run is close (in both sign and magnitude) to those envisage by the economic theory as well as those acquired by other alternate techniques of long run estimation. Choudary (1995) and Thornton (1998) also clarified the selection of single error correction term from the cointegrating equation that has multiple cointegrating vectors. The Normalize cointegrating coefficients of the interested macroeconomic variables are presented in Table 4.5.

Table 4. 5: Estimated Long run Coefficients

Independent variables	Coefficient	Standard error	t-statistic
GDP	1.661	0.142	11.729*
IMP	- 0.618	0.149	-4.151*
EXR	0.711	0.079	8.952*
INR	- 1.043	0.137	-7.612*
MS	- 1.347	0.076	-17.788*

Notes: * denotes significance at five percent level.

The focus variables of this study are *MS* and *INF* while the other macroeconomic variables such as *GDP*, *EXR*, *IMP* and *INR* are included in the model as a control variables. As presented in Table 4.5, the result of the study reveals that money supply growth is statistically significant at the conventional level of five percent and is positively related with inflation. This implies that one percent increase in *MS* would lead to 1.35 percent increase in *INF*. This result support the theory as well as the previous studies such as Ahmed *et al.* (2014), Umeora (2010), Hossain (2013), Pahlavani and Rahimi (2009), Arif and Ali (2012) and Bhattarai (2011).

However, the results from Table 4.5 reveals that interest rate is statistically significance at five percent level and positively related with *INF*. This is because one percent increase in *INR* would lead to 1.04 percent increase in *INF*. This result conforms with the a priori expectation as well as the previous findings such as Bayo (2005), Hossain (2013), Bhattarai (2011), as well as Iya and Aminu (2014). However, the result from Table 4.5 shows that *IMP* is statistically significant at five percent level and related positively with inflation rate. This is because if *IMP* increases by one percent, *INF* would also increase by 0.62 percent. The finding of this result is in line with the a priori expectation as well as the previous studies such as Arif and Ali (2012) and Armesh *et al.* (2011).

Consequently, the results in Table 4.5 show that *GDP* is statistically significant at five percent level and negatively related with *INF*. This result indicates that when *GDP* increase by one percent *INF* on the other hand will decrease by 1.66 percent. This result is in consonance with the a priori expectation as well as previous studies such as Yadav and Lagesh (2011), Haile (2013) and Shams *et al.* (2013). *EXR* as shown from the Table 4.5 is statistically significant at five percent level and negatively related with the *INF*, where one percent increase in *EXR* would lead to 0.71 percent decrease in *INF*. This finding contradicts with the a priori expectation as well as previous studies such as Iya and Aminu (2014), Akinbola (2012) and Bayo (2005). The probable justification of this is that the production base of Nigeria is very weak due to the lack of infrastructural facilities, political instability, lack of security and weak technological base all these translate into a high cost of production that make it difficult for the locally produced goods to compete with the foreign goods. The locally produced goods are substandard and comparably expensive than the foreign goods, because of these problems the nominal depreciation in the Naira may not have impact on real price of the imported commodities. Therefore, depreciation in Nigeria will not discourage import since the imported goods are more cheaper than the locally produced ones and exportation will also not be encouraged since the locally produced goods are substandard and expensive. Therefore, there will be no demand pressure on locally produced goods no matter the extents to which the domestic currency is depreciated.

4.5 SHORT RUN RELATIONSHIP

Once cointegration is confirmed to exist between the variables, then the next step requires the construction of VECM to model dynamic relationship. The purpose of VECM is to indicate the speed of adjustment from the short run to the long run equilibrium state. The VECM estimation result is presented in Table 4.6.

Table 4. 6: Estimated Short run Coefficients

Variables	Coefficient	Standard error	t-statistic
Constant	0.231	0.068	3.374*
ECT_{t-1}	-0.674	0.147	-4.590*
ΔINF_{t-1}	0.456	0.217	2.101*
ΔMS_{t-1}	-0.069	0.137	-0.509
ΔGDP_{t-1}	0.398	0.163	2.434*
ΔIMP_{t-1}	-0.151	0.068	-2.216*
ΔEXR_{t-1}	-0.028	0.051	-0.553
ΔINR_{t-1}	-0.251	0.120	-2.083*

Notes: * denotes significance at five percent level.

The *ECT* indicates the rate of adjustment from the short run to the long run equilibrium state. It is derived basically from the Johansen cointegration adjustment coefficient. The VECM result reveals that *ECT* is statistically significant at five percent level with a proper negative sign as needed for dynamic stability. The estimated coefficient of the *ECT* is equal to - 0.67, suggesting that deviation from the long term inflation path is corrected by around 67 percent over the following year. This means that the adjustment take place relatively quickly.

As presented in Table 4.6 the lagged value *INF* is positively related with the current value of *INF* and statistically significant at five percent level in the short run. This means that a one percent increase in the ΔINF would lead to 46 percent increase in

the current *INF*. This result is in line with the result of Akinbola (2012), Shams *et al.* (2013) and Ahmed *et al.* (2013). In the same vein, the lagged value of *MS* is statistically insignificant and negatively related with *INF* in the short run. The result indicates that one percent increase in ΔMS would lead to 7 percent decrease in *INF* in the short run, this result is in line with the findings of Adusei (2013), Doyin and Ikechukwu (2013). Likewise, the lagged value of *GDP* is positively related with *INF* and statistically significance at five percent level in the short run. This implies that when value of ΔGDP increase by one percent *INF* would increase by 39 percent. This result supports the findings of Pahlavani and Rahimi (2009), Odusanya and Atanda (2010) and Shams *et al.* (2013). Similarly, lagged value of *IMP* is statistically significant and negatively related with *INF* in the short run. Meaning that a one percent increases in ΔIMP would result in to 15 percent decreases in *INF* in the short run. This finding supports the results of Ahmed *et al.* (2013) and Arif and Ali (2012). Similarly, lagged value of *EXR* is negatively related with *INF* and statistically insignificant in the short run, which implies that *INF* would decrease by 3 percent if ΔEXR increase by one percent. This result supports the findings of Ashwani (2014), Haile (2013), Ahmed *et al.* (2014) and Akinbola (2012). Lastly, the lagged value of *INR* is negatively related with the *INF* and statistically significant in the short run. Meaning that a one percent increases in the ΔINR would lead 12 percent decrease in *INF*. This result is in line with the findings of Odusanya and Atanda (2012) and Haile (2013).

4.6 GRANGER CAUSALITY

After the long run as well as the short run relationship between the variables are estimated, the next step of this analysis is to test the direction of the causal relationship among the variables. Therefore, a pairwise Granger causality test is used to estimate the causal relationship among the variables. The test result of the Granger causality is presented in Table 4.7.

Table 4. 7: Pairwise Granger Causality Test

Null hypothesis	F-statistics	Probability
GDP does not granger cause INF	1.152	0.342
INF does not granger cause GDP	0.587	0.628
IMP does not granger cause INF	0.953	0.426
INF does not granger cause IMP	1.251	0.307
EXR does not granger cause INF	3.393	0.029*
INF does not granger cause EXR	2.334	0.091
INR does not granger cause INF	3.504	0.026*
INF does not granger cause INR	2.924	0.048*
MS does not granger cause INF	3.424	0.028*
INF does not granger cause MS	1.790	0.168

Notes: * indicate the significance at 5%

As presented in Table 4.7 the results of pairwise Granger causality between *INF*, *MS*, *GDP*, *IMP*, *EXR*, and *INR* reveals that a unidirectional causal relationship exists between money supply growth and inflation, the causal relationship runs from *MS* to *INF*. This result is in line with the findings of previous studies such as Ahmad and Suliman (2011), Kisu *et al.* (2012) and Mishra *et al.* (2010). In the same vein, a unidirectional causal relationship were found to exist between exchange rate and inflation rate running from *EXR* to *INF*. This result supports the findings of Bilquees *et al.* (2012) and contrast with

the findings of Iya and Aminu (2014). However, the result of the study reveals that no causal relationship exist between *INF* and *IMP*. This result contradicts with the findings of Ulke and Ergun (2011) and Bashir *et al.* (2011) Likewise, no causal relationship were found to exist between *GDP* and *INF*, this result contradicts with the findings of Georgantopoulos and Tsamis (2012).

4.7 DIAGNOSTIC TEST ON VECTOR ERROR CORRECTION MODEL

Diagnostic test is carried out in order to check the reliability of a model. Consequently, *LM* test is carried out to check the existence of autocorrelation using Breusch-Godfrey test, ARCH test is used to check the problem of heteroskedasticity and finally the test of normality to detect the distribution of the residuals.

4.7.1 Lagrange Multiplier test

Lagrange Multiplier test is carried out through the Breusch Godfrey test, by using three lags the problem of autocorrelation in a model can be check to see if it exists in a model. The test result is presented in Table 4.8.

Table 4. 8: LM test for Inflation Rate Determination

LM test:			
F-statistic	0.649	Probability	0.598
Obs. R ²	5.449	Probability	0.142

Based on the results in Table 4.8, the *Prob (F)* is 0.598, which is higher than five percent. Consequently, the H_0 that no serial autocorrelation cannot be rejected and

conclude by saying that there is no problem of serial autocorrelation in the model at five percent level of significance.

4.7.2. Autoregressive Conditional Heteroskedastivity Test

ARCH test is carried out in order to check the problem of heteroskedastcity, the ARCH test of this study is carried out through the use of three lags. The results of the test is presented in Table 4.9.

Table 4. 9: ARCH Test for Inflation Rate Determinant

ARCH test:			
F-statistic	1.528	Probability	0.862
Obs. R ²	1.553	Probability	0.702

Based on the results in Table 4.9, the *Prob (F)* is 0.862 which is greater than five percent, consequently, H_0 that no problem of heteroskedasticity exist is failed to be rejected and conclude that there is no heteroskedasticity problem in the model.

4.7.3 Normality test

The normality test is carried out to check whether the error terms are normally distributed. The result of the test is depicted in Figure 4.1. In light of the histogram figure, we can observe that the bell shape suggest that error term are normally distributed even though some parts exhibits high residuals. This is because of the tremor in the economy. We proceed then with statistical techniques to check the normality problem. Based on the *p*-value 0.051, which is higher than five percent, consequently, H_0 is failed

to be rejected at five percent level of significance and conclude that the error term are normally distributed.

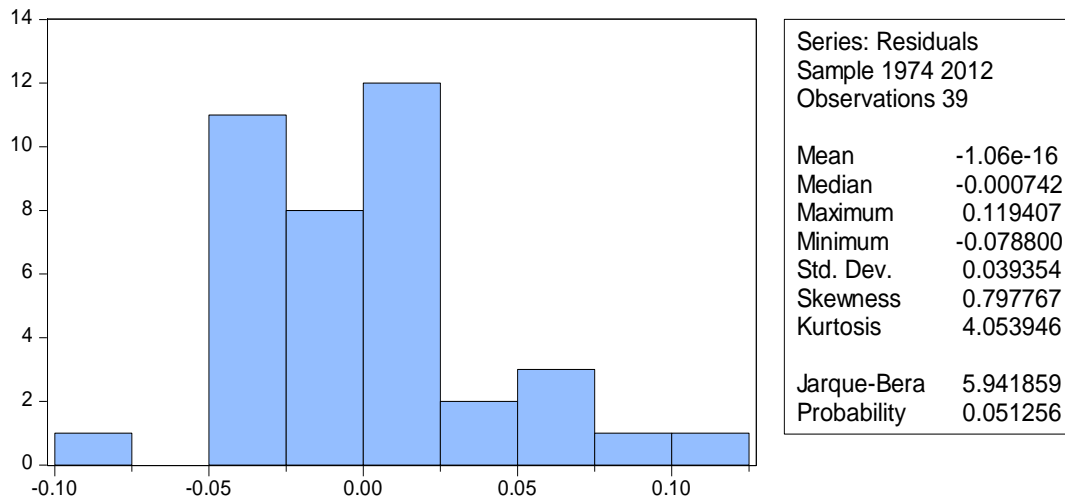


Figure 4. 1: Normality Test for Inflation Rate

4.8 CONCLUSION

It is clear from the result that all the variables have effect on inflation rate in the long-run while in the short-run some variables affect inflation rate while others do not. In the long run *MS* have positive and significant effect on *INF*, *IMP* has direct effect on *INF*, *INR* also has positive effect on *INF* while *GDP* and *EXR* have negative and significant effect on inflation rate. The exchange rate negative relationship with inflation rate contradicts with theory as well as previous studies. Therefore, in the short run ΔGDP , ΔIMP as well as the ΔINR all have significant impact on inflation. Nevertheless, ΔMS and ΔEXR do not have significant impact on inflation in the short run. In the same vein, the Granger causality test results show that a unidirectional causal relationship exist between *MS* and *INF* as well as *EXR* and *INF* while a bidirectional causal relationship exist between *INR*

and *INF* and finally no causal relationship were found to exist between the *GDP* and *INF*.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATION

5.1 INTRODUCTION

This chapter gives the general outline of the study as well as the discussion of the findings, it is partitioned into four sections. The first section take over the summary of the findings, the second section contains the policy implication, the third section provides the limitation of the study and the lastly the fourth section discusses the conclusion of the chapter.

5.2 SUMMARY OF FINDINGS

For quite a while, many theoretical and empirical studies have been undertaken to examine the determinant factors of inflation. According to many scholars of economics, the determinant factors of inflation are many and varied. Each and every scholar identified different causes of inflation. One of the famous economic doctrine that is the quantity theory of money advocated that changes in the level of general price are determined mainly by the changes in the quantity of money in circulation. The demand theory of inflation was introduced by the Keynesians which suggest that inflation arise when there is an increase in demand in relation to the shortage of supply. Similarly, this theory contended that even in the full employment case the demand surpass the supply. This situation creates inflationary pressure. The cost-push theory of inflation on the other hand arises because of a rise in the cost of production. This theory emphasizes wages as a cause of inflation. The structural inflation theory provided new clarification for the

inflation process. The structuralism opinion point out that causal factor of inflation such as the escalation in the price of goods drive up by the increase in demand cannot be serve as the only source of inflation. However, inflation is connected with other factors such as for instance cost of economic growth, unemployment, immigration and the growth of population as well as the social and political issues. In the early of 1970s, the rational expectation group of scholars contended that inflation can be arises as result of the price expectation. In addition, the Neoclassical synthesis connected inflation to the output gap. The new political macroeconomic theory of inflation makes available new perspective of clarifying inflation. The theory is different from the conventional theories which concentrates on the non-monetary determinant factors of inflation. Empirically the causes of inflation are quite different from one country to another. Similarly, the relation between the macroeconomic variables and inflation is not stable it will also take different form and different sign. Therefore, this study uses money supply growth, exchange rate, interest rate, *GDP* as well as the value of import as the determinant factors of inflation in Nigeria. The relationship between the selected variables and the inflation has been tested empirically by employing techniques of Johansen co-integration method, VECM and the Granger causality test.

Furthermore, the result of the long-run analysis reveals that all the selected variables are statistically significant with money supply growth, interest rate, value of import positively related with inflation while exchange rate and *GDP* are negatively related with inflation in the long-run. The long-run result of the selected variables supports the theories as well as the previous findings with the exceptions of exchange rate that is negatively related with inflation and contradicts with the theory as well as previous result.

Moreover, the short-run result from the VECM reveals that lagged of imports, lagged of interest and the lagged of *GDP* have significant effect on inflation while lagged of money supply growth and lagged of exchange rate has no significant effect on inflation in the short-run. In the same vein, the result from the *ECT* reveals that 67 percent of the adjustments are corrected in a year for inflation determinant.

Additionally, the result from the Granger causality test indicates that a unidirectional causal relationship exist between money supply growth and inflation as well as the exchange rate and inflation rate. Bidirectional causal relationship exists between interest rate and inflation rate, no causal relation found between *GDP* and inflation as well as the value of import and inflation.

The final stage of the analysis in this is the diagnostic test that tests the robustness of the constructed inflation model. The result reveals no heteroskedasticity and no serial autocorrelation as well. The normality test result shows that the residuals are normally distributed.

5.3 LIMITATION OF THE STUDY

The limitation of this study was the inaccessibility of data of the genuine variables recommended by the theoretical models on the effect of some selected variables on inflation. This implies that either some of the variables were not included in the empirical model or the variables have been found to be proxies. The risk implicated in finding proxies is that they may not represent correctly the effect of the actual variable, causing an inconsistent finding. Consequently, these issues appears not to fundamentally influence the result to be presented in this study, since they both support the empirical

and theoretical knowledge on the relationship between money supply growth, exchange rate, interest rate, *GDP* as well as the value of import and inflation.

Moreover, a part from the monetary determinant factors of inflation, the non-monetary factors also have effect on price level, inaccessibility of data inhibit from confirming the effect of non-monetary determinant factors of inflation.

5.4 SUGGESTION FOR FUTURE STUDIES

This study utilizes time series data to investigate the effect of money supply growth on inflation in Nigeria. Because, understanding the relationship as well as the direction of the causal relationship between inflation and money supply growth is very vital as it gives opportunity to policy makers and economists in achieving macroeconomic objectives. The following are suggested areas for future research:

The result of this study may perhaps shed lights to readers about the behavior of inflation in Nigeria and may construct an interest for future researchers to study about this matter and enhance the scope. Since the analysis of this study incorporate five independent variables with money supply growth as the focus variable as well as the exchange rate, value of imports, interest rate and the *GDP* as the control variables explaining the behavior of inflation. Therefore, future studies can include other determinant factors of inflation such as fiscal deficit, foreign price, government expenditure, and external debt as well as other explanatory variables that will explain the model better.

Furthermore, this study utilize VECM in evaluating the effect of money supply growth on inflation, future studies should use another multivariate model such as VAR model and ARDL model in order to see the reliability of the model. Besides that, future

research should expand the scope of this study by making a comparison with other African countries in order to see the extent to which the result differ across different countries. This study utilizes time series data only for 42 years, future studies should utilize a longer data or convert the database into quarterly basis in order to provide better and accurate results.

5.5 POLICY IMPLICATION

Both theoretical and empirical consideration reveals that considerable benefit will accumulate when moving from a level of high inflation rate to a level of low inflation rate. However, decreasing inflation to a low level helps to lessen relative price vulnerability thereby enhancing resource allocation. Therefore, policy recommendation should be made based on the empirical result of this study that examined the effect of money growth on inflation in Nigeria. Based on this, the research looked at the basic determinants of inflation to identify the relationship between money growth and inflation in Nigeria. The following are the policy recommendation of this study.

- i. The study reveals that money supply growth is found to be very important in explaining inflation variation in Nigeria. Consequently, the Nigerian government should put in place considerable reforms that will certify that more of the money is being put into the productive sector. The policy makers should also consider monetary policy as a suitable tool of achieving price stability because of the linear interdependency and causality between the price level and money supply growth.
- ii. In respect of the *GDP*, the negative estimated coefficient of the *GDP* form the regression model revealed that an escalation in real production should

drastically reduce the general price level. Therefore, institutional and structural reforms as well as the improvement of infrastructural facilities that will help to increase Nigerian productive base will help to keep the level of inflation under control.

- iii. Moreover, interest rate as one of the most significant determinant of inflation is positively related with inflation rate in Nigeria. Therefore, active financial policy that will help to decrease interest rate interest rate should be put in place because of the resultant outcome of investment crowd-out on the level of price in the economy.
- iv. Furthermore, import as a significant determinant factor of inflation in Nigeria is positively related with inflation as shown by the result of this study. Therefore, the concern policy makers as well as the government who are accountable for optimum level of inflation for sustainable growth and development should utilize import to achieve the planned level of inflation target through changing imposed tax rate on import as well as other import duties.

5.6 CONCLUSION

The aim of this study is to investigate the effect of money supply growth on inflation in Nigeria during the period of 1970 to 2012. The results of this study reveal that inflation in Nigeria is determine mainly by money supply growth, *GDP*, exchange rate, value of import, as well as the interest rate. Therefore, controlling money supply, improvement of *GDP*, reducing interest rate, strong import restrictions as well as the depreciation of exchange rate along with import substitution industrial strategy that will encourage the

production of goods that were imported before are compulsory for price stability and inflation control. Consequently, external factors are also essential in determining inflation in Nigeria and they were not analyzed in details in this study.

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