ANALYSIS OF MONEY DEMAND IN NIGERIA: IMPLICATION FOR INFLATION TARGETING

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TITLE PAGE

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DISSERTATION SUBMITTED TO THE DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES, NNAMDI AZIKIWE UNIVERSITY, AWKA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY (PhD) DEGREE IN ECONOMICS

FEBRUARY, 2021

CERTIFICATION

This is to certify that this dissertation titled Analysis of Money Demand in Nigeria: Implication for Inflation Targeting was carried out by me Okafor, Patricia Nwanyisunday with registration No. 2008117006F in partial fulfillment of the requirements for the award of Doctor of Philosophy (PhD) degree in Economics, Faculty of Social Sciences, Nnamdi Azikiwe University, Awka, and it has not been submitted in any institution for the award of any degree certificate programme.

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DEDICATION

This dissertation is dedicated to my husband Okafor, Chinedu Fred and my children Victoria Ngozi, Emmanuel Ifeanyi, Daniel Ndubuisi and Felicia Chiamaka, for their love, encouragement and patience during this period of study.

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Okafor, Patricia Nwanyisunday

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LIST OF ACRONYMS

CBN = Central Bank of Nigeria

WBDI = World Bank development Indicators

WEO = World Economic Outlook

GDP = Gross Domestic Product

OLS = Ordinary Least Squares

ARDL = Auto Regressive Distributed Lag

VAR = Vector Auto-Regression

JML = Johansen Maximum Likelihood technique

VEC = Vector Error Correction model

CUSUM = Cummulative Sum of Recursive Residuals

CUSUMSQ = Cummulative Sum of Squares of Recursive Residuals

ECM = Error Correction Mechanism

2SLS = Two-Stage Least Squares

PA = Panel Analysis

E-G = Engle-Granger

DD = Demand Deposit

M1 = Narrow Money

M2 = Broad Money

ADF = Augmented Dickey-Fuller

PP = Philip-Peron

STIR = Short Term Interest Rate

REER = Real Expected Exchange Rate

EIR = Expected Inflation Rate

FRIR = Foreign Real Interest Rate

TATOO = Acronym for Tomori, Ajayi, Teriba, Ojo and Odama.

CEM = Closed Economy Model

CEE = Central Eastern European countries

OEM = Open Economy Model

RLS = Robust Least Squares regression model

DOLS = Dynamic Ordinary Least Square

SOS = Static Ordinary Least Squares

PPP = Purchasing Power Parity

NFA = Net Foreign Asset

PQ = Phllips-Quliaris

ERS = Elliot, Rothernberg, Stock Point Optimal method

MPR = Monetary Policy Rate

MRR = Minimum Rediscount Rate

CPS = Credit to the Private Sector

MPC = Monetary Policy Committee

OMO = Open Market Operation

DMB = Deposit Money Bank

NBER = National Bureau of Economic Research

BG = Breusch–Godfrey serial correlation Lagrange Multiplier (LM) test

ABSTRACT

The topic of this work is analysis of money demand in Nigeria and its implication for inflation targeting. Since the publication of Fisher's (1957) equation of exchange, the debate about the stability of money demand has continued unabated. In Nigeria, this debate has continued since the era of the "TATOO" debate (that is, the acronym of Tomori (1972), Ajayi (1974), Teriba (1974), Ojo (1974) and Odama (1974)). The major concern is that the stability of money demand is critical for the implementation of monetary policy and inflation control. If monetary authority assumes that money demand is stable, while it is not, its monetary policy implementation could be misguided and this error could engender devastating implications to the economy. Again, to ensure that money demand is stable, there are macroeconomic factors that must be deliberately controlled. Lack of consensus among the various researchers on money demand determinants and stability status, and the use of single equation to estimate money demand in Nigeria, which could be undermined by simultaneity bias, calls for a re-examination of demand for money, and it is against this backdrop that this study re-examined the stability of money demand in Nigeria using expanded variables and simultaneous equation procedure. The study was anchored on Friedman's theory of money demand within the context of monetarism. The main thrust of this study is to analyse money demand (its determinants and stability) in Nigeria with a view to understanding its implication for inflation control. The study adopted econometric procedure of data analysis using quarterly time series spanning from 1981 to 2017 obtained from Central Bank of Nigeria (CBN) and World Bank Development Indicators. We utilized real money demand as the dependent variable; per capita income, interest rate, expected inflation, stock market returns, financial innovation and effective exchange rate as explanatory variables. We carried out a unit root test and tested for stationarity of data using Elliot, Rothenberg, and Stock Point Optimal method. We tested for cointegration using Phillip-Quliaris cointegration test, as well as carried out an error correction test. Money demand model was estimated using semi-log, two-stage least square simultaneous equation estimation procedure to ascertain the stability status of money demand in Nigeria. We also estimated the inflation model using dynamic ordinary least square to ascertain the impact of the percentage change in real money demand on inflation. The results obtained indicate that real effective exchange rate and financial innovation are significant determinants of money demand in Nigeria. Also that money demand in Nigeria has been unstable since 2009. Again that the income elasticity of money demand in Nigeria is greater than unity (2.32), meaning that money demand is not stable in Nigeria. The findings indicate that money demand is a significant source of inflationary pressure in Nigeria, and that the instability of money demand could be responsible for persistent inflation in Nigeria, which seems to have defied monetary policy responses. We therefore recommend that CBN should concretize its inflation targeting framework.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Demand for money is the desired holding of financial assets in the form of money: that is, cash or bank deposits rather than investments (Omanukwe, 2010). Put differently, it is the desire to hold real balances, either in the form of cash or bank deposits. In its simplest form, demand for money is concerned with the amount that would be kept in the form of cash at hand to meet various requirements. The quantity of demand for money depends mainly on transactions, precautionary, and speculative motives. Transactions and precautionary motives depend on income, while speculative motive depends on interest rate (Mishark, Soldfield and Sickel, 2017).

Money demand function by definition could be seen as a relationship that exists between the level of income and percentage of interest rate. By way of mathematical expression, Md = f(y, r), which implies that a small change in y (income) and r (interest rate) would definitely influence a change in money demand on average. Similarly, money demand function is a very important macroeconomic function that establishes the link between money and the real economic variables such as income, interest rate and inflation, which provides the basis for monetary policy interventions with respect to design and implementation. According to Treichel (1997), the Central Bank and policy makers use money demand in selecting monetary policy options, identifying growth targets for money supply and manipulating interest rates and reserve money to control liquidity in the economy.

The usefulness of money demand in conducting monetary policy is anchored on its stability (Sriram, 1999). The stability of money demand enables one to forecast the influence of policy

driven change in monetary aggregates on output, prices and interest rate. Sriram (1999) and Nachega (2011) also noted that stable money demand acts as a stabilization policy which depends on the ability of central bank to adjust money supply to its demand in order to avoid monetary disturbances from inhibiting real output. Albulescu and Pepin (2018) simplifying stability of money demand further states that money supply has a potential impact on both economic activities and inflation. According to them, **stable money demand shows how effective the use of monetary aggregates is in the conduct of monetary policy**. It is argued that the relationship between money supply on one hand and prices, income, and balance of payment on the other is determined by the demand for money, and an understanding of such relationship plays an important role in the management of the macro-economy.

Several important factors have influenced and shaped the evolution of empirical research on demand for money. First, there is evolving nature of theories on the demand for money. Second, the growing arsenal of econometric techniques that has permitted more sophisticated examination of dynamics, functional forms, and expectations. Third, and most importantly, research has been saved by the apparent breakdown of existing empirical models in the face of newly emerging data (Tahir, 1995; Nwafor, Nwakanma, Nkansah & Thompson, 2007). Thus, in line with maintaining price stability, the apex bank strives to promote and maintain **monetary stability through the management of the key variables in money demand**. In essence, appropriate demand and supply management policies by the Central Bank necessary for economic development requires money to be stable (Halicioglu & Ugur, 2005; Nwafor et al. 2007; Nachega, 2011).

As noted by Owoye and Onafowora (2007), in determining the variables of the demand for money, there are two sets of variables. The first sets are referred to as the **scale variables**

(related to the impact of income or wealth) while the second set are the **opportunity cost variables** (related to substitution based on relative attractiveness of assets regarded as substitutes for money). Owoye and Onafowora (2007) opined that economic agents may hold money either as an inventory to smooth differences between income and expenditures, or for its yield as an asset. According to them, either motive suggests a specification in which the demand for money depends on a scale variable such as real income or wealth and the rates of returns to money and that of alternative assets.

According to Nell (2003) and Kumar, Webber and Fargher (2017), the importance of income as a money demand determinant varies between developed and developing economies. Kumar et al. (2017) observed that in the developed economies, with an organized financial market and the easy access to credit compared with the developing world (which means that more expenditure can be made without cash, for example mortgages, telephone bills, hospital bills, newspaper delivery), there is relatively low desire to hold real balances. Mark and Sul (2003) therefore suggested that income elasticity for developed countries could be less than one. The low income elasticity of money demand in developed countries has however been refuted by Owoye and Onafowora (2007). Owoye and Onafowora (2007) claimed that a study of 19 advanced economies shows that 10 out of 19 advanced economies have income elasticities that are greater than unity.

Contrarily, in developing economies, income is the most significant determinant of money demand (Owoye & Onafowora, 2007). The higher the income of an individual, the higher will be that individual's demand for cash and vice versa. Kumar et al. (2017) argued that the relative underdeveloped financial system means that individuals cannot easily finance their deficits from funds derived from the financial market, hence the need to keep large proportion of their income

in cash. The relative absence or scarcity of financial assets means that even if the people want to buy them, they may not have access to buy such financial assets. This makes them to hold more cash balances.

According to Akinlo (2005) and Kumar et al. (2017), many developing countries have underdeveloped, undiversified financial markets that lack financial sector instruments and payment technologies such that most transactions involve the use of narrow money hence one should expect income elasticity slightly above unity. However, some other researchers obtained very high elasticity of income for money demand in Nigeria. For example, Anoruo (2002), Owoye and Onafowora (2007) and Nwafor et al. (2007) obtained income elasticities of 5.7, 2.0 and 5.4, respectively for Nigeria.

Akinlo (2005) further noted that interest rate is another key variable in the demand for money. The level of interest rate as a major determinant of money demand was first introduced by Keynes and has since, been a major determinant of money demand. The Keynesian theory holds that the higher the level of interest, the lower will be the individual's desire to hold cash because of the increase in the opportunity cost of holding cash as opposed to interest bearing assets and vice versa.

Kumar et al. (2017), however, contends that sensitivity of money demand to interest rate differs from country to country depending on the level of development of the financial market. They opine that money demand is more sensitive to interest rate in economies with relatively more efficient and developed financial markets than economies where the financial market is substantially underdeveloped. Kumar et al. (2017) argued that limited information asymmetry

and easy substitution between money and financial assets enhances the sensitivity of money demand to interest rate.

Other critical variables in the demand for money include exchange rate (Essien et al., 1996; Onafowora & Owoye, 2012), expected inflation (Nwaobi, 2002), stock market returns (Farazmand & Moradi, 2015) and financial innovation (Adofu, 2010).

According to Essien et al. (1996), depreciation of the domestic currency relative to foreign currencies would lead to a rise in the return on foreign assets to domestic holders and vice versa. Recognizing the role of exchange rate as opportunity cost variable, many researchers have used nominal bilateral exchange rate (Kumar et al, 2017), real bilateral exchange rate (Onafowora & Owoye, 2012), as well as effective exchange rate (Nachega, 2001).

On the other hand, there is near consensus that economic agents consider expected inflation rather than current inflation in making money demand decision (Friedman, 1959, 1966; Bitrus, 2011; Opoku, 2017).

Sriram (2000) also opined that financial innovation could be a significant determinant of demand for money. In Nigeria, financial innovations have evolved over time and have moved away from individuals holding cash to assets and the use of automated teller machines (ATM), debit cards, electronic banking as well as easy access to financial assets. As noted by Sloman (2003), **financial innovation can change the pathway of money demand thereby complicating its predictability**. With new financial products, contractionary monetary policy for instance, targeted at reducing excess liquidity may be short-circuited as economic agents can easily move money from less liquid holdings to more liquid packages being offered by financial

intermediaries. In the process, the use of money demand for monetary policy could be undermined.

In addition to the use of interest rate as the cost of holding money or alternative assets, Farazmand and Moradi (2015) contends that stock market returns could be a critical measure of the cost of holding money assets. Although stock market returns have been largely overlooked in modelling money demand in developing economies, Karim and Guan (2004) and Padhan (2011) opine that stock market return is critical in estimating money demand especially in developing but emerging or frontier economies.

The relationship between money demand and inflation was first popularized by the classical economists who demonstrated through the quantity theory that changes in the quantity of money have inflationary consequences. This focus on money-inflation nexus was however downplayed during the periods following Keynes General Theory. Keynes (1936) had argued that changes in money stock cause changes in national output and not the price level. In the late 1970s, the counter-revolution in economics – the idea that in the long run money affected the price level and not the level of output – returned money to the centre stage in economic policy. As Friedman (1966) put it, "inflation is always and everywhere a monetary phenomenon". If inflation was a monetary phenomenon, then controlling the stock of money was the route to low inflation. In this regards, monetary aggregates became central to the conduct of monetary policy.

However, Bental and Eckstein (1997) and Estrella and Mishkin (1997) argued that the Central Banks abandoned monetary aggregates as instruments for controlling inflation. According to Estrella and Mishkin (1997), the fact that the acceptance of the idea that inflation is a monetary phenomenon has been accompanied by the lack of any reference to money in the conduct of

monetary policy by the central banks in many economies is an apparent contradiction. In defense, the former governor of the Bank of Canada, Gerald Bouey once remarked, "we didn't abandon the monetary aggregates, they abandoned us" (Meyer, 2001:p.5).

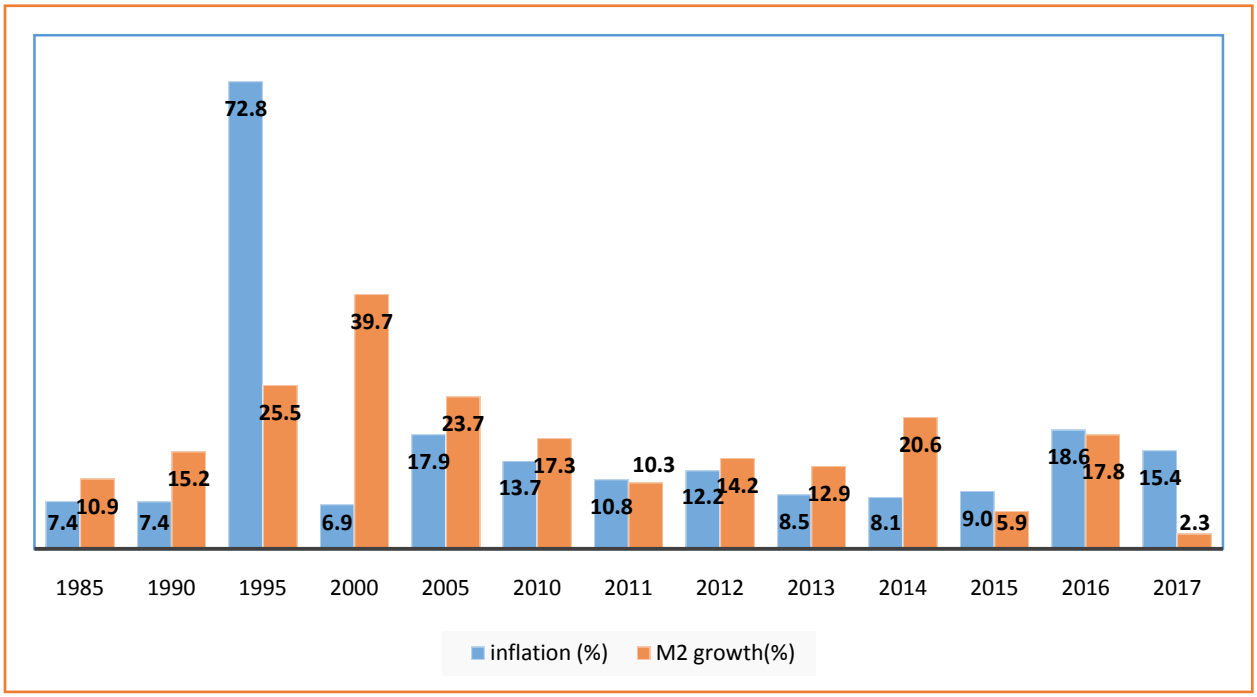


Figure 1.1 Inflation and Money growth Trend in Nigeria (1985 to 2017)
Source: CBN (2014, 2017)

In Nigeria, inflation control has remained major concern for the Central Bank of Nigeria (CBN). This is because inflation rate has largely remained in double digit since the 1990s. As shown in Figure 1.1, Nigeria had its worst inflationary experience in 1995 when it recorded inflation rate of 72.8%. Inflation rate however showed a stable rate of 7.4% in both 1985 and 1990. According to CBN (2014), inflation rate was over 57% in the year preceding 1995. Inflation rate, however, slumped to 6.9% in 2000 and sharply rose to 17.9% in 2005. It however declined to 13.7% and 10.8% in 2010 and 2011 respectively. In 2012, inflation rate slightly increased to 12.2% and slightly declined to 8.5% and 8.1% in 2013 and 2014. This decline was not sustained as inflation rate rose to 9.0% and 18.6% in 2015 and 2016 respectively. In 2017, it declined mildly to 15.4%.

In the same vein, money stock has also shown profound features. It grew by 10.9% and 15.2% in 1985 and 1990. In 1995 and 2000, money growth was somewhat astronomical: it posted growth of 25.5% and 39.7% respectively. However, money stock declined to 23.7%, 17.3% and 10.3% in 2005, 2010 and 2011 respectively. Money stock further grew by 20.6% in 2014 and fell sharply to 5.9% in 2015. Although money stock grew by 17.8% in 2016, its growth declined substantially to 2.3% in 2017. In other words, 2017 has a record of low growth intensity of money stock in Nigeria. According to CBN (2017), the Central Bank of Nigeria was very much concerned about containing the rising inflation through liquidity control.

The discussion on the demand for money has remained active after many years of concerted research and debate on the subject. The decade of the 1970s witnessed pioneering works on the subject by Tomori (1972), Ajayi (1974), Teriba (1974), Ojo (1974) and Odama (1974). These discussions and debates drew a lot of attention in both academic and policy circles at that time and earned the acronym 'TATOO' debate (Adejugbe, 1988). Since then, new entrants into the discussion have tended to build on the pioneering works of these great Nigerian scholars. While there is hardly any consensus on the stability of money demand in Nigeria, persistent inflation has engendered renewed interest in the debate.

1.2 Statement of the Problem

For optimal monetary policy implementation and inflation targeting, money demand is required to be stable. As noted by Deadman and Ghatak (2001), a stable money demand is imperative because it offers a predictable and dependable link between dynamics in monetary aggregates and dynamics in the variables that determine money demand. This implies that, a stable money demand is a necessary prerequisite for establishing a one-to-one relationship between the appropriate monetary aggregates and nominal income; and it equally enables the monetary

authorities and policy makers to stabilize prices. In other words, inflation targeting and stable prices may not be realized under a situation of unstable money demand.

The need to ensure stability of money demand or its corollary-price stability- has reflected in the policy thrust of the Central Bank of Nigeria (CBN). The CBN has focused on the stabilization of national income and interest rate through several output stabilization policies. This is in recognition of income and interest rate as key determinants of money demand. For example, the CBN monetary policy committee (MPC) has continued to maintain a two-digit monetary policy rate averaging 13.5% in the past 7 years. Even in the period of recession, the MPC retained the policy rate at as high as 14% for fear of excess liquidity that may fuel price rise. However, it has become most puzzling that despite the efforts of the monetary authority to tame price inflation, price inflation has remained persistent with inflation rising from 7.36% in 1990 to 18.55% and 15.37% in 2016 and 2017 respectively.

The persistent double-digit inflation in Nigeria has accentuated the worry about the stability of money demand in Nigeria. The major concern about instability of money demand is that it complicates monetary policy implementation and could also undermine inflation targeting. In order words, if money demand is unstable, it will be difficult for the monetary authority to effectively control inflation in the economy. The argument therefore is that if money demand is stable, inflation targets or even stable prices would be realized.

Interestingly, this worry has led to the revival of the TATOO debate. As the debate lingers, a review of empirical outcome shows that the research outcome is far from reaching a consensus. While some researchers obtained evidences that money demand is unstable in Nigeria (Okonkwo et al, 2011; Kumar et al, 2017), others claimed that money demand in Nigeria is stable (Anoruo, 2002; Omotor & Omotor, 2014).

The most worrying situation is that most studies that obtained support for money demand stability also obtained income elasticity in excess of unity. Similarly, some empirical outcome that obtained support for unstable money demand, obtained income elasticity that is approximately unity. The worry about this kind of empirical result is that **economic theory predicts that unstable money demand is associated with large income elasticity of demand (that is, elasticity greater than unity).** This calls for re-investigation of the empirical analysis of the demand for money in Nigeria.

However, Kia (2006) and Kumar et al. (2017) argued that the estimates of money demand model and stability test thereof are sensitive to the **configuration of macroeconomic variables** in the model as well as the **specification cum estimation framework**. Available literature has focused on such macroeconomic variables as income, interest rate, bilateral exchange rate and current inflation rate.

However, given several reforms and observable developments in the financial markets, the importance of **stock market returns** and **financial innovation** in macroeconomic studies is getting traction. Also, the strengthening of Nigerian trade relations has led to increase in the demand for foreign currencies other than the dollar. This implies that the traditional Naira-Dollar exchange rate (bilateral exchange) may not effectively capture exchange rate dynamics in the country: hence the need to interrogate the role of **effective exchange rate** (naira price of basket of other currencies) in the behavior of money demands.

Although, most estimations of money demand in Nigeria follow single-equation procedure, Kia (2006) and Hsing and Jamal (2013) argued that **single-equation estimation of the demand for money could be undermined by simultaneity bias.** Since as argued by Kia (2006) and Hsing and Jamal (2013), misspecification of an economic model may complicate or bias the research

outcome, the empirical results obtained by single-equation models may be a potential source of concern. Thus, to reconcile the nuances in the research outcomes, **this study employed a simultaneous equation framework.**

In addition, unlike previous studies that used bilateral exchange rate and current inflation rate as proxies for exchange rate and expected inflation, **we used real effective exchange rate** and **expected inflation** (obtained using Nerlove transformation of Koyck expectation model). Also, to resolve the divergent estimates of income elasticity of money demand, **we used per capita income (instead of GDP as used in previous studies):** it is per capita income that captures the responses of households to income changes and not the GDP.

From the foregoing, it is apparently evident that there are nuances in the existing literature. Lack of consensus among these various researchers on money demand determinants and stability status, and the use of single equation to estimate money demand in Nigeria, which could be undermined by simultaneity bias, calls for a re-examination of demand for money, and it is against this backdrop that this study re-examined the stability of money demand in Nigeria using expanded variables and simultaneous equation procedure.

1.3 Research Questions

This research work is guided by the following research questions

i. What is the stability status of real money demand in Nigeria?
ii. To what extent do real effective exchange rate, financial innovation and inflation expectation explain changes in real money demand in Nigeria?
iii. What is the effect of real money demand on inflation targeting in Nigeria?

1.4 Research Objectives

The broad objective of this study is to analyze money demand and its implication for inflation targeting in Nigeria. The specific objectives include:

i. To ascertain whether real money demand in Nigeria is stable

ii. To determine whether real effective exchange rate, financial innovation and inflation expectation are significant factors in money demand in Nigeria.

iii. To examine the effect of real money demand on inflation targeting in Nigeria

1.5 Research Hypotheses

The following hypotheses are tested in this study:-

i. H_0: Real money demand in Nigeria is not stable.

ii. H_0: Real effective exchange rate, financial innovation and inflation expectation are not significant variables in real money demand in Nigeria.

iii. H_0: Real money demand does not have significant effect on inflation targeting in Nigeria.

1.6 Significance of the Study

The recent recessionary experience and the failure of both monetary and fiscal policy to offer a quick remedy has ignited a renewed interest in understanding monetary policy dynamics and implementation framework. Most monetary economists believe that understanding the behavior and dynamics of money stock is critical for effective implementation of monetary policy and achievement of stable prices. Thus, this study will offer range of benefits to policymakers and monetary authorities, researchers and economic agents.

To the policymakers and monetary authorities, a stable money demand offers insight into the pathway for monetary equilibrium that is optimal for the economy. It provides the policymakers with a menu of key variables to be manipulated (and how they will be manipulated) to attain a desired monetary condition. It equips monetary authorities with the right tool for inflation targeting, which is the workhorse of monetary policy in developing countries.

Given the nuances in the literature and the debate on the appropriate functional form for money demand, this study addresses such nuances and recommends an appropriate functional form for money demand. It will therefore deepen understanding of the drivers of money demand in a modern economy. It will also ignite chains of empirical inquisition in a quest to validate or otherwise the emergent findings from this study.

Money demand could be used to forecast and predict inflationary pathway. In this regards, this study could broaden the understanding of economic agents in inflation expectation. This will further guide agents in making investment and spending decisions.

Finally, this study interrogates subsisting theories in the context of empirical peculiarities in Nigeria. It is therefore expected that this study will extend the frontier of knowledge on the theoretical behavior of real money demand in a typical developing and emerging economy.

1.7 Scope of and Limitation to the Study

This study spans the time period of 1981 to 2017. The choice of this time period ensures that all episodes of economic and financial events in modern Nigeria are within the net of the study investigation. In other words, the study covers the period of structural adjustment programme (SAP) of the late 80s, financial reforms of late 2000s and economic recessions of 2016/17. This study is a quantitative study that utilizes time series for model estimations.

The main thrust of this study is to analyze money demand in Nigeria with a view to understanding its implication for inflation control. In doing this, the study estimates real money demand in Nigeria in the context of its deterministic variables such as income per capita, short-term interest rate, stock market return, financial innovation, real effective exchange rate and expected inflation. Real money demand (that is, nominal money demand deflated by the general price level) is the dependent variable.

As traditional to research, one of the most tasking constraints in this study is data availability. To mitigate this, data were collected from different sources such as Central Bank of Nigeria (CBN) Annual Report and Statement of Accounts, CBN Statistical Bulletin (various Issues) and World Bank Development Indicators (WDI). Similarly, data required for some variables were constructed based on acceptable standards. In some cases, the required data (for example, expected inflation) were estimated.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This review has been presented under the following sub-headings:

1) Theoretical Literature, among which are the Conceptual issues, Review of Basic Theories, and Other Related Theoretical Issues. 2) Review of Empirical literature, 3) Summary of Literature Reviewed, 4) Justification of the Study, and 5) Conceptual Framework

2.1 Theoretical Literature

In this section, relevant concepts and theories are reviewed. The review of concepts and basic theories enhances the clarification of the relevant concepts so as to avoid ambiguity. It also ensures that the subsisting theoretical arguments and debates are evaluated with a view to understanding the economic behavior and interrelatedness of the variables of interest.

2.1.1 Conceptual Issues

(a) Demand for Money

According to Black (2003), demand for money refers to the amount of money people wish to hold or the function determining this. In other words, it is referred to as the desire to hold cash. Omanukwe (2010) defined demand for money as the desired holding of financial assets in the form of money: that is, cash or bank deposits rather than investments. This definition implies that demand for money is not limited to cash holdings (as suggested by Black, 2003) but includes bank deposits in current and savings accounts that are not held for investment purposes. Jhingan (2004) and Omanukwe (2010) noted that the demand for money arises from two important

functions of money; medium of exchange and the store of value. Thus, individuals and businesses wish to hold money partly in cash and partly in the form of assets.

However, Keynes (1936) highlighted three reasons for demanding money: transactions, precautionary and speculative reasons. He posited that money held for transactions and precautionary purposes is primarily a function of the level of income, while the speculative demand for money is a function of interest rate. Both the transactions and precautionary motives imply money is a medium of exchange while the speculative implies money is a store of value.

Also, demand for money according to Lipsey and Courant (2012), is the amount of wealth that everyone in the economy wishes to hold in form of money balances. Because households are choosing how to divide their given stock of wealth between money and bonds, it follows that if we know the demand for money, we also know the demand for bonds, which means that with a given level of wealth, a rise in the demand for money necessarily implies a fall in the demand for bonds. Dornbusch, Fisher, and Startz, (2008) noted that the demand for money is a demand for real balances. In other words, people hold money for its purchasing power, for the amount of goods they can buy with it. They are not concerned with their nominal money holdings. In other words, an economic agent is interested in a money demand that shows the demand for real balances (M/P), not nominal balances (M).

Owoye and Oluwole (2007) observed that money generally refers to coins or paper notes and in a technical perspective includes a persons' wealth including their property. They further noted that the liquidity approach to the definition of money sees money in two ways. First its narrow sense as the sum of deposit and currency. Since the demand for money is the desire to hold cash, money demand is the sum of deposit demand and currency demand known as M1. Second, the

liquidity approach sees money in a broader sense to include M2 definition which includes both savings and time deposits, with commercial banks along with M1 assets), and M3 definition which includes all other types of deposit with other financial institutions, along with M2 assets, but due to the low degree of liquidity of assets classified under M3, it becomes almost impossible to include any components of M3, hence moneyness, according to Bitrus (2011), is a matter of degree. CBN (2012) noted that M3 does not apply in Nigeria. Monetary targeting is based on M2 which CBN (2012) defines as the sum of currencies (coins and notes), demand deposits, savings deposits, time deposits and foreign currency deposits. Kumar et al. (2017) also opined that the level of development of the financial system of a country determines what is classified as money. In other words, some assets that are not liquid can be categorized as money due to their moneyness as created by the development of a financial system. The more developed the financial system of a country, the higher the liquidity of illiquid assets.

(b) Inflation Targeting

In recent years, many central banks, the makers of monetary policy, have adopted a technique called inflation targeting to control the general rise in the price level. Muth (1999) defined inflation targeting as a central banking policy that revolves around meeting preset, publicly displayed targets for the annual rate of inflation. Similarly, Kuttner (2014) defined inflation targeting as a monetary policy regime in which a central bank has an explicit target inflation rate for the medium term and announces this inflation target to the public. In this framework, a central bank estimates and makes public a projected, or "target," inflation rate and then attempts to steer actual inflation toward that target, using such tools as interest rate changes.

In general, a monetary policy framework provides a nominal anchor to the economy. A nominal anchor is a variable that policymakers can use to tie down the price level (Bernanke & Mishkin,

2015). According to Bernanke & Mishkin (2015), one nominal anchor central banks used in the past was a currency peg—which linked the value of the domestic currency to the value of the currency of a low-inflation country. But this approach meant that the country's monetary policy was essentially that of the country to which it was pegged, and it constrained the central bank's ability to respond to such shocks as changes in the terms of trade (the value of a country's exports relative to that of its imports) or changes in the real interest rate. As a result, many countries began to adopt flexible exchange rates, which forced them to find a new anchor.

As noted by Bernanke & Mishkin (2015), many central banks then began targeting the growth of money supply to control inflation. This approach works if the central bank can control the money supply reasonably well and if money growth is stably related to inflation over time. Ultimately, monetary targeting had limited success because the demand for money became unstable—often because of innovations in the financial markets. As a result, many countries with flexible exchange rates began to target inflation more directly, based on their understanding of the links or "transmission mechanism" from the central bank's policy instruments (such as interest rates) to inflation (Kuttner, 2014; Bernanke & Mishkin, 2015).

(c) Money Demand Stability

In the design of monetary policy, there is overarching assumption that money demand is stable. This implies that if this assumption breaks down, monetary policy implementation may breakdown. According to Haliciogl and Ugur (2005), money demand is said to be stable if the money holding of economic agents can be predicted over a range of period. This implies that if the demand for money for all the three motives can be predicted, the demand for money would be adjudged to be stable. The major difficulty associated with this approach to defining money demand stability is that the motives for holding money may be driven by several factors. As

noted by Dornbusch (2008), transaction motive may be driven by the pattern of payment and receipt. The more irregular the pattern of payment and receipts, the greater the instability in money demand.

The second motive is precautionary motive. As noted by Sloman (2009), how the precautionary motive affects demand for money stability is largely contingent on how stable the risk attitude of economic agents are. Dornbusch (2008) opined that based on life-cycle-permanent-income hypotheses (LC-PIH) formulated by Modigliani and Friedman, individuals will maintain a constant demand for money over their lives based on their expected average income. Deviations are purely due to unforeseen events. However, this conclusion is based on the assumption that individuals have a constant relative risk aversion (CRRA). As Dornbusch (2008), however, noted this assumption does not always hold. For example, as individuals become older, their awareness of the risk of health problems increases so they decide to hold larger precautionary balances. Money demand will be less stable than theory predicts.

Speculation is the final motive for holding money. Unlike the other two which focus on the active balances (M1), speculative balances are held for investment and are referred to as idle balances involving broad money (Sloman, 2009). Tobin(1958) explains how investors aim to find a balance between risks and return (Dornbusch 2008). Accordingly, variations in these two factors determine speculative demand for money. Since there is constant variation in risks and returns, speculation will hardly be stable. From the foregoing, Haliciogl and Ugur (2005) definition of money demand stability requires that the stability of money demand will be largely contingent on income, interest rate and attitude to risks.

Cziraky and Gillman (2006) also conceptualized money demand stability as a situation where income velocity of money is stable. Cziraky and Gillman (2006) noted that instability is illustrated by unexpected changes in the income velocity of money. The income velocity of money will change in response to fluctuations in interest rates as well as to movements in other arguments of money demand which are not related to income. Moreover, velocity changes may be observed because of lags in the adjustment of money demand to income. Wu, Lin, Tiao and Cho (2013), however, argued that such changes are both predictable and transitory and they can be interpreted as movements along an otherwise stable money demand with constant lag structures. In this regard, Setzer and Wolff (2017) opined that money demand stability would rather be gauged with income elasticity of money as predicted by Friedman (1968) rather than income velocity. Friedman (1968) predicts that the income elasticity for a stable money demand would always be unity.

(d) Inflation

Guglielmo and Marinko (2011) defined inflation as a quantitative measure of the rate at which the average price level of a basket of selected goods and services in an economy increases over a period of time. Similarly, Yilmazkuday (2012) defined inflation as the rate at which the prices of goods and services rise. Both Guglielmo and Marinko (2011) and Yilmazkuday (2012) do highlight that inflation is computed based on the prices of baskets of goods and services. In other words, increase in the price of a single commodity may not be inflationary.

Bawa, Abdullahi and Ibrahim (2016) defined inflation as a sustained increase in the general price level of goods and services in an economy over a period of time. This definition is quite intuitive. First, inflation is a sustained upward trend in the general level of prices and not the

price of only one or two goods. Second, inflation is a state of rising prices, but not high prices. It is not high prices but rising price level that constitute inflation. It constitutes, thus, an over-all increase in price level. It can, thus, be viewed as the devaluing of the worth of money. In other words, inflation reduces the purchasing power of money. A unit of money now buys less.

Inflation can also be seen as a recurring phenomenon. While measuring inflation, the National Bureau of Statistics takes into account a large number of goods and services and then calculates average increase in the prices of those goods and services over a period of time. A small rise in prices or a sudden rise in prices is not inflation since they may reflect the short term workings of the market. Often expressed as a percentage, inflation indicates a decrease in the purchasing power of a nation's currency. Bawa et al (2016) definition of inflation is adopted in this study.

Yilmazkuday (2012) and Bawa et al (2016) noted that inflationary pressures can result from two major sources, namely, cost-push factors and demand-pull factors. In the event of cost-push inflation, prices are driven up by the rising costs to make or provide the goods and services. This can cause a supply shortage, but the demand for the goods and services has not decreased. Sometimes in cost-push inflation, the prices of the materials themselves have gone up, leading to the price of related goods increasing as well. This often happens if there is a shortage of a material like oil; the price is driven up significantly. Similarly, natural disasters can make some materials scarce, and that is often taken advantage of by driving the price up.

Another way prices rise, is if wages also rise. Many companies will increase prices in the wake of higher wages to their employees to try and offset the new costs. This is also referred to as wage push inflation. While cost-push inflation is the result of shrinking supplies unable to reach the average level of demand, demand-pull inflation is when the demand skyrockets, and the price

goes up so that companies can attempt to make enough supplies to meet that demand. Demand-pull inflation can develop as a result of too much money being in circulation, devaluing the currency and expectation of increase in price (Yilmazkuday, 2012; Saxena & Bhadauriya, 2013).

Regarding the speed or magnitude of inflation, inflation can be classified as creeping, walking and galloping. If the speed of upward thrust in prices is slow and small, then we have creeping or mild inflation. What the speed of annual price rise is a creeping one has not been stated by economists. However, Wolde-Rufael (2008) opined that inflation rate of about 2% or 3% is mild or creeping. He further argued that if a rate of price rise is kept at this level (2-3%), it is considered to be helpful for economic development. Wolde-Rufael (2008) also classified inflation rate between 3% and 4%, as walking inflation. When mild inflation is allowed to fan out, walking inflation appears. Both mild and walking inflation are described as 'moderate inflation' by Ratnasiri (2009). Ratnasiri (2009) describes inflation in the double or triple digit range of 20%, 100% or 200% as galloping inflation. Ratnasiri (2009) further noted that galloping or hyperinflation is dangerous and could shatter the economy.

2.1.2 Review of Basic Theories

In this subsection, the basic theories are reviewed. The reviewed basic theories are essentially theories of demand for money and theories of inflation. Theories of money demand otherwise known as quantity theory. Origin of quantity theory has been traced to 16^{th} and 17^{th} century theorists such as Nicolaus Copernicus, followers of the School of Salamanca like Martín de Azpilicueta, Jean Bodin, Henry Thornton, David Hume and various others who noted the increase in prices following the import of gold and silver, used in the coinage of money, from the New World (Bieda, 1973; Volckart, 1997; Galbács, 2015). Other notable economists that

contributed to the pre-Fisherian quantity theory include John Stuart Mill who expanded on the ideas of David Hume, Simon Newcomb and Alfred de Foville (Froyen, 1990; Galbács, 2015). As noted by Galbács (2015), Irving Fisher was the first economist to formalize the quantity theory of money. Since the postulation of Fisher's quantity theory several versions of the quantity theory have been developed. In this subsection we explored the Fisher's theory; Cambridge cash balance theory, Keynesian liquidity preference, and Friedman restatement of the quantity theory among others.

(a) Classical Theory of Money Demand

The classical theory of money demand was advanced by Fisher (1911), Pigou (1917) and Marshall (1923). The classical theory of money demand is divided into two main types, namely, Fisher's quantity theory and the Cambridge cash balance version. While the Fisherian typology is known as equation of exchange, the version advanced by Pigou (1917) and Marshall (1923) is known as the Cambridge cash balance version. The assumptions of the classical model are the classical tenets of perfectly competitive economy. First, the theory assumes that demand for money is equal to supply for money and therefore could be used interchangeably. This assumption is predicated on the belief that the money market also clears. Second, it is assumed that economic activities are consistent with the full employment equilibrium level. This assumption implies that the labour market and goods market are constantly in equilibrium such that any changes in money stock could translate to changes in the general price level. Third, the classical theorists assume that the velocity of circulation of money (that is the rate at which money changes, which may be interpreted as showing the amount of "work" done by a unit of money) is constant. Again, this assumption ensures that changes in the quantity of money stock

in the economy, is sufficient to cause a change in the price level. The two typologies of classical theory of money demand discussed below are:

(i) Fisher's Quantity Theory

The quantity theory of money demand was proposed by Fisher (1911). According to Schmitt (2003), Fisher's quantity theory of money states that there is a direct relationship between the quantity of money in an economy and the level of prices of goods and services. The mathematical relationship between money stock and price is popularly called the equation of exchange in Fisher's theory. The equation of exchange predicts that if the amount of money in an economy doubles, price levels also double, causing inflation (the percentage rate at which the level of prices is rising in an economy). The consumer, therefore, pays twice as much for the same amount of the good or service. Mishkin (2004) noted that another way to understand this theory is to recognize that money is like any other commodity: increases in its supply decrease marginal value (the buying capacity of one unit of currency). So an increase in money supply causes prices to rise (inflation) as they compensate for the decrease in money's marginal value. Mishkin (2004) also noted that Fisher's demand for money theory attached emphasis on the use of money as a medium of exchange. In other words, money is demanded for transaction purposes.

Fisher's analysis on the transactions velocity of circulation of money, which refers to the rate at which money passes from one hand to another, begins with a simple identity. There are always two parties to each transaction, represented by a seller and a buyer. This implies that the value of receipts for the aggregate economy must equal the value of sales. This also implies that the value of sales must be equal to the number of transactions conducted over a period of time multiplied

by the average price. Essentially, the equation of exchange holds that like other commodities, the value of money or the price level is also determined by the demand and supply of money. The supply of money consists of the quantity of money in existence multiplied by the number of times this money changes hands, i.e., the velocity of money. Similarly, money is demanded not for its own sake (i.e., for hoarding it), but for transaction purposes. Demand for money is equal to the total market value of all goods and services transacted. Contingent on the classical assumption of full employment, the Fisherian typology implicitly assumes that demand for money equals supply of money. Thus, Fisher's equation of exchange represents equality between the supply of money or the total value of money expenditures in all transactions and the demand for money or the total value of all items transacted. The fisher's version is therefore described as the transaction approach to quantity theory. The theory is best explained with the help of the famous equaton of exchange where MV = PT, or P = MV/1

According to Schmitt (2003), the general price level is influenced by the volume of trade or transactions; the quantity of money; and velocity of circulation of money. The first factor, the volume of trade or transactions, depends upon the supply or amount of goods and services to be exchanged. The greater the amount or supply of goods in an economy, the larger the number of transactions and trade, and vice versa. But the classical and neoclassical economists who believed in the quantity theory of money assumed that full employment of all resources (including labour) prevailed in the economy. Resources being fully employed, the total output or supply of goods (and therefore the total trade or transactions) cannot increase. Therefore, those who believed in the quantity theory of money assumed that the total volume of trade or transactions remained the same. The second factor in the determination of general level of prices is the quantity of money. The third factor influencing the price level is the velocity of circulation.

A unit of money is used for exchange and transactions purposes not once but several times in a year.

Overall, Schmitt (2003) observed that the predictions of the Fisher's quantity theory implies that (i) the general price level in a country is determined by the supply of and the demand for money; (ii) given the demand for money, changes in money stock lead to proportional changes in the price level; (iii) since money is only a medium of exchange, changes in the money supply change absolute (nominal), and not relative (real), prices and thus leave the real variables such as employment and output unaltered. Money is neutral; (iv) under the equilibrium conditions of full employment, the role of monetary (or fiscal) policy is limited; (v) during the temporary disequilibrium period of adjustment, an appropriate monetary policy can stabilize the economy; (vi) the monetary authorities, by changing the money stock, can influence and control the price level and the level of economic activity of the country.

Fisher's theory of money demand reflects as the basis by which money demand analysis is built both in developed and emerging economies of the world, hence it is very relevant in this study.

(ii) Cambridge Cash Balance Version

A different approach to the quantity theory of money was developed by Cambridge economists such as Pigou (1917), Marshall (1920) and Keynes (1923). Keynes contribution to the cash balance version was through his 1923 tract on Monetary Reform (this treatise was written before the 1936 general theory that gave birth to Keynesian liquidity preference). The Cambridge economists advocated a quantity theory of money that paid more attention to money demand than the supply-oriented classical version. The Cambridge economists argued that a certain portion of the money supply will not be used for transactions; instead, it will be held for the

convenience and security of having cash on hand. In other words, the Cambridge cash balance emphasizes that money acts both as a store of wealth and a medium of exchange. Cash balance refers to the amount of money that people want to hold rather than savings. According to Cambridge economists, people wish to hold cash to finance transactions and for security against unforeseen needs. They also suggested that an individual's demand for cash or money balances is proportional to his income. Obviously, larger the income of the individual, greater is the demand for cash or money balances (Schmitt, 2003; Nassar, 2005; Munyankindi, Gichondo, Amahoro, 2008).

According to cash-balance approach, the value of money depends upon the demand for money. But the demand for money arises not on account of transactions but on account of its being a store of value. Money has two characteristics—flatness and roundness—money sitting and money on wings— to serve as a store of value and as a medium of exchange (Munyankindi et al. 2008). Thus, according to the advocates of this theory the real demand for money comes from those who want to hold it on account of various motives and not from those who simply want to exchange it for goods and services: just as the real demand for houses comes from those who want to live in them and not from those who simply want to construct and sell them. The cash balance approach relates the process of determination of the value of money to cash the subjective valuations of individuals who are the real force behind all economic activities. Such an approach enables us to throw more light on the somewhat puzzling phenomenon of the velocity of circulation of money, by enquiring more deeply into the nature of the demand for money, as the demand for the money in the cash-balance approach has reference to the store of value function of money.

As noted by Bahmani-Oskooee (2001), this type of demand for money arises from the fact that holding of money has great utility, as when it is held (hoarded) it acquires wealth value. Hence, instead of interpreting the 'demand for money' with reference to its 'medium of exchange' function as is done in the transactions approach; it is interpreted with reference to the 'store of value' function of money in the cash balance. It is, thus, the demand for 'money sitting' rather than money 'on wings' that matters.

As far as the Cambridge approach is concerned, the principal determinant of people's taste for money holding is the fact that it is a convenient asset to have, being universally acceptable in exchange for goods and services. The more transactions an individual has to undertake the more cash he will want to hold. To this extent the approach is similar to Fisher's, but the emphasis is on want to hold, rather than on have to hold. This is the basic difference between the Cambridge monetary theory and Fisher's framework. The essence of this theory is that the demand for money, in addition to depending on the volume of transactions that an individual might be planning to undertake, will also vary with the level of his wealth, and with the opportunity cost of holding money, the income foregone by not holding other assets (Nassar, 2005; Galbács, 2015).

Dimand (2008) noted that the cash balance version is superior to the equation of exchange. He argues that cash balance version of the quantity theory of money is superior to Fisher's version of the quantity theory of money on the several grounds. First, the cash balances version lays stress on the subjective valuations and human motives which are the basis of all economic activities in sharp contrast to the highly mechanical nature of the concept of velocity in Fisher's equation. Second, the Cambridge version of the theory brings to light a new element, namely, the level of income, changes therein and in its velocity. Instead of being concerned with the total

transactions it is concerned with the level of income, which, in turn, determines the level of economic development, employment and price level. Third, the cash balances equation brings to light the demand for money to hold. This emphasis on the demand side is in sharp contrast with traditional emphasis on the supply side. Actually, the Cambridge equation was put forward to validate the classical quantity theory of money according to which the supply of money is the sole determinant of the price level. Fourth, the cash balance approach links itself with the general theory of value, since it explains the value of money in terms of the demand for and supply of money. Finally, the cash balances approach has given rise to the famous liquidity preference theory, which has become an integral part of the theory of income, output and employment.

(iii) Critique of the Classical Theory of Money Demand

The classical quantity theory has been criticized on several grounds. First, Munyankindi et al (2008) alleged that the quantity theory of money holds only during period of full employment of resources. However, in reality, full employment of resources is a rare possibility. What we find in reality is unemployment or underemployment of resources. During underemployment an increase in money stock will tend to raise output level but not necessarily the price. So, quantity theory of money breaks down when resources remain at full employment.

Second, Keynes (1936) argued that it is aggregate demand and not money stock that affects the price level. Keynes argued that increase in money stock would rather lead to increase in effective demand which would rather lead to increase in national output. However, Keynes also admitted that after attaining the stage of full employment, an increase in effective demand will raise the price level, but not proportionately.

Third, Romer (1993) also argued that the classical theorists over-emphasized on money stock as the costs of inflation to the utter neglect of other factors that are equally critical. Change in price level could be caused by various factors, such as increase in cost of production, increase in wage rate, etc. For example, an increase in wage rate following a revision in the pay scale of employees or an increase in the price of raw materials (say, hike in the price of petroleum products) will definitely push the price level up, whether the economy stays on or below the full employment level.

Fourth, the cash balances approach fails to assign an explicit role to the rate of interest thereby creating an impression that changes in the supply of money are directly related to the price level. A realistic theory of prices can hardly ignore the vital role of the rate of interest.

Despite the short comings of the classical quantity theory, it has much relevance for this study. It sets out the functions of money that are critical for demand for money: use of money for exchange and store of value. This implies that if the value of money is eroding fast, people may hold more money today than necessary. In other words, if the economy is unstable, money demand may be equally unstable. Also, Amato and Gerlach (2002), Schmitt (2003), Nassar (2005) and Baetjer (2008) obtained evidences in support of the classical quantity theory. They noted that whenever money stock rose abnormally in the past in an economy, inflationary situation developed there. Although the relationship may not be proportional, but excessive increase in money stock leads to inflation. Thus, the classical quantity theory is necessary in the study of money demand and inflation dynamics.

(b) Keynesian Theory of Money Demand

It is also known as Keynesian liquidity preference. It was developed by John Maynard Keynes in his book, 'General Theory of Employment, Interest and Money' (Keynes, 1936).The Keynesian theory of money demand treats money as an asset which can be held for three reasons. These reasons are referred to as motives for holding money. The motives for holding money as identified by Keynes (1936) are transaction motives, precautionary motives, and speculative motives. The theory was built on the following assumptions. First, all factors of production are in perfectly elastic supply so long as there is any unemployment. Second, all unemployed factors are homogeneous, perfectly divisible and interchangeable. Third, there are constant returns to scale so that prices do not rise or fall as output increases. Fourth, effective demand and quantity of money change in the same proportion so long as there are any unemployed resources.

Handa (2000) explained that transactions demand refers to people's preference to be liquid for day-to-day expenses. People and firms do not need money for its own sake, but because it can fetch them the necessary goods and services. In other words, money is demanded because it is a good medium of exchange. There is a gap between the receipt of wages, salaries or incomes and their expenditure. Not only individuals and households need money to meet daily transactions, but business firms also need it to meet daily requirements like payment of wages, purchase of raw materials and to pay for transport etc. Demand for money for transaction purposes depends upon income and the general level of business activity and the manner of the receipt of income.

The amount of liquidity desired therefore depends on the level of income, the higher the income, the more money is required for increased spending. This prediction is quite intuitive. Those with higher income would ordinarily have larger budgets, and vice versa. Thus, as one's income

increases, the amount of money he would desire to hold for transaction purposes would also increase. In Keynes view, transaction demand does not respond to interest rate. Valadkhani (2002), however, argued that it may not always be true to say that transactions demand for money is not very responsive to changes in the rate of interest. It may be so at a relatively low rate of interest, but becomes increasingly responsive at relatively high rates of interest. In fact, it may be understood that the need to bridge the gap between income and expenditures and to finance day-to-day transaction, is not the only reason that gives rise to transactions motive for holding cash balances.

On the other hand, Handa (2000) noted that precautionary demand is the demand for liquidity to cover unforeseen expenditure such as an accident or health emergency. Individuals, households and business firms find it a good practice to hold money than what is needed for transactions purposes. They hold more money because they want to take proper precautions against unforeseen future contingencies like sickness, unemployment, accidents, fire, old age etc. An individual who goes shopping will keep more money than what he thinks proper for planned purchases. The demand for this type of money increases as the income level increases. In addition, how much cash a person will hold on account of such unforeseen events will also depend upon his psychology and his views about the future and the extent to which he wants protection or insurance against such events, like individuals, business/firms also hold cash to safeguard against future uncertainties. The cash balances held on account of precautionary motive will differ with individuals and business firms, according to their degree of confidence, wave of optimism or pessimism, access to credit and finance and the facilities for the quick conversion of illiquid assets like bond and securities into cash. As long as individuals and business firms have an easy access to ready cash, the precautionary motive to hold money will be

relatively weak. As noted by Keynes (1936), this type of demand for money is also determined by income and the general level of business activity. Keynes has taken the transaction and precautionary demands for money together, as they both are income determined. Thus, the precautionary demand for money according to Keynes is also income-elastic in much the same way as transactions demand. According to Haines (1995), the precautionary demand for money is influenced by factors like the size of assets, availability of insurance, expectations of future income, availability of credit and the efficiency and safety of financial institutions in making interest-earning assets available. Precautionary balances and their size are determined by the size of the assets owned by firms and individuals.

The last motive for holding money is speculative demand which is the demand to take advantage of future changes in the interest rate or bond prices. Keynes emphasized speculative demand for money as he felt that people kept cash to take advantage of the rise and fall of prices of bonds and securities. It is this demand for money which plays a vital role in the functioning of the economic system, for it is through such a demand for money that prices of fixed income-yielding assets (bonds and securities)- are affected and the rate of interest changes. The speculative demand for money arises on account of the uncertainty regarding the future rate of interest. The individual investors are not sure of the terms and conditions on which debts owned can be converted into cash. Speculative motive is different from other motives as the sole objective of holding money under it is to earn profits by "knowing better than the market what the future will bring." These speculative holdings are especially sensitive to changes in the rate of interest. It is the uncertainty regarding future market rates of interest on different bonds and securities of varying lengths that enable people to do speculation and if their guesses regarding the future turn out to be true, stand to gain. According to Keynes (1936), the higher the rate of interest, the

lower the speculative demand for money. And lower the rate of interest, the higher the speculative demand for money.

According to Eggertsson (2008), Keynes treated money also as a store of value because it is an asset in which an individual can store his (her) wealth. To Keynes an individual's total wealth consisted of money and bonds. Keynes used the term 'bonds' to refer to all risky assets other than money. So money holding was the only alternative to holding bonds. And the only determinant of an individual's portfolio choice was the interest rate on bonds. This would affect an individual's decision to divide his portfolio into money and bonds. To Keynes, it costs money to hold money and the rate of interest is the opportunity cost of holding money. At high rates of interest an individual loses a large sum by holding money or by not holding bonds (Wasso, 2002; Dimand, 2008; Panico, 2008).

As noted by Wasso (2002), another factor affecting an individual's portfolio choice was expected change in the rates of interest which would give rise to capital gain or loss. According to Keynes when the interest rate was high relative to its normal level people would expect it to fall in near future. A fall in the rate of interest would imply a capital gain on bonds. According to Keynes at a high rate of interest there would be low demand for money as a store of value (wealth). This is because at high rate of interest the opportunity cost of money holding (in terms of forgone interest) is high. Second, at a high rate of interest rate, future capital gain on bonds is likely due to a fall in the rate of interest in future. It is because there is an inverse relation between the rate of interest and the price of old bonds. Thus if the present rate of interest is high, people will expect it to fall in near future, in which case they will expect to make capital gain (Fair, 1997; Ericsson & Sharma, 2006).

Nonetheless, the Keynesian version of money demand theory has been criticized on several fronts. For example, Dagher and Kovanen (2011) argued that the Keynesian theory of demand suffers from a fallacy of mutual determination. According to Dagher and Kovanen (2011), Keynes alleges that the rate of interest is determined by liquidity preference. In practice, however, Keynes treats the rate of interest as determining liquidity preference. In addition, Kumo (2015) criticized the Keynesian theory of demand for being inconsistent in-as-much as it goes against the very fact that it attempts to explain. According to the Keynesian theory, in depression period the rate of interest should be the highest because people like to hold maximum cash in depression and a high rate of interest must be offered to induce people to part with liquidity. But in depression period price of everything including the rate of interest is the lowest. Thus, liquidity preference theory becomes inconsistent with facts.

The criticisms notwithstanding, the Keynesian theory of money demand has been the workhorse of money demand theory for over eight decades. The Keynesian theory is therefore very relevant for this study. The Keynesian chain of causation between changes in the quantity of money and in prices is an indirect one through the rate of interest. So when the quantity of money is increased, its first impact is on the rate of interest which tends to fall. Given the marginal efficiency of capital, a fall in the rate of interest will increase the volume of investment. The increased investment will raise effective demand through the multiplier effect thereby increasing income, output and employment. Since the supply curve of factors of production is perfectly elastic in a situation of unemployment, wage and non-wage factors are available at constant rate of remuneration. There being constant returns to scale, prices do not rise with the increase in output so long as there is any unemployment.

(c) Monetarist Theory of Money Demand

The monetarist theory of demand for money was advanced by Friedman (1956) and Friedman and Schwartz (1963). According to Alexandre and Slifi (2016), the monetarists believe that money demand is the most important stable function of macroeconomics. The monetarist theory of demand for money is anchored on the following assumptions. First, money stock is exogenous and that it can be controlled by the monetary authorities. Second, the velocity of circulation is stable. Third, the market process is competitive and there is limited government interference. Another assumption of monetarist theory is that money is a luxury good because of the inclusion of time deposits in money. The demand for money is also assumed to be unitarily elastic.

According to Lee and Chien (2008), Friedman distinguishes between two types of demand for money. In the first type, money is demanded for transaction purposes. It serves as a medium of exchange. This view of money is the same as the old quantity theory. But in the second type, money is demanded because it is considered as an asset. Money is more basic than the medium of exchange. It is a temporary abode of purchasing power and hence an asset or a part of wealth. Friedman treats the demand for money as a part of the wealth theory. Also, Friedman treats the demand for money just like the demand for any durable consumer good. According to the theory, the demand for money depends on three factors: the total wealth to be held in various forms, the price or return from these various assets and tastes and preferences of the asset holders.

Friedman considers five different forms in which wealth can be held, namely, money (M), bonds (B), equities (E), physical non-human goods (G) and human capital (H). In a broad sense, total wealth consists of all types of “income”. By “income” Friedman means “aggregate nominal permanent income” which is the average expected yield from wealth during its life time (Friedman, 1956; Friedman and Schwartz, 1963). As noted by Lee and Chien (2008), the wealth

holders distribute their total wealth among its various forms so as to maximise utility from them. They distribute the assets in such a way that the rate at which they can substitute one form of wealth for another is equal to the rate at which they are willing to do. Accordingly the cost of holding various assets except human capital can be measured by the rate of interest on various assets and the expected change in their prices. Thus Friedman (1956) says there are four factors which determine the demand for money. They are: price level, real income, rate of interest and rate of increase in the price level. The monetarists also conclude that the relationship between the demand for money and real income (output of goods and services) is also direct. But it is not proportional as in the case of price. Thus while changes in the price level cause direct and proportional changes in the demand for money, changes in real income create direct but more than proportional changes in the demand for money. The rate of interest and the rate of increase in the price level constitute the cost of holding cash balances. If money is kept in the form of cash, it does not earn any income. But if the same money is lent out, it could earn some income in the form of interest to the owner. The interest is the cost of holding cash. At higher interest rate the demand for money would be less. On the other hand, a lower rate of interest creates an increase in the demand for money. Thus there is an inverse relationship between the rate of interest and the demand for money (Mehra, 1993; Lee & Chien, 2008).

On the other hand, the monetarist theory holds that if the money stock rises faster than the rate of growth of national income, then there will be inflation. If the money stock increases in line with real output then there will be no inflation. Thus, Friedman (1956) noted that inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output. In other words, inflation everywhere is based on an increased demand for goods and services as people try to spend their cash

balances. Since the demand for money is fairly stable, this excess spending is the outcome of a rise in the nominal quantity of money supplied to the economy. So inflation is always a monetary phenomenon.

Friedman's reformulation of the quantity theory of money has evoked much controversy. One of the criticisms leveled against the theory is that Friedman's definition of money is very broad. Mehra (1993) argued that Friedman's broad definition of money which not only includes currency and demand deposits (M1) but also time deposits with commercial banks (M2) leads to the obvious conclusion that the interest elasticity of the demand for money is negligible. If the rate of interest increases on time deposits, the demand for them (M2) rises. But the demand for currency and demand deposits (M1) falls. Handa (2000) also criticized the monetarist theory for giving more importance to wealth than income. In Friedman's demand for money theory, wealth variables are preferable to income and Handa (2000) argues that the operation of wealth and income variables simultaneously does not seem to be justified. As pointed out by Handa, **income is the return on wealth, and wealth is the present value of income**. The presence of the rate of interest and one of these variables in the demand for money would appear to make the other superfluous. So the overall effect of the rate of interest will be negligible on the demand for money. Handa therefore concluded that Friedman's analysis is weak in that he does not make a choice between long-term and short-term interest rates. In fact, if demand deposits (M1) are used a short-term rate is preferable, while a long-term rate is better with time deposits (M2). Such an interest rate structure is bound to influence the demand for money. In addition, Dagher and Kovanen (2011) criticized the monetarist theory for assuming that money stock is exogenous. The stock of money is varied by the monetary authorities in an exogenous manner in Friedman's system. But the fact is that money stock consists of bank deposits created by changes in bank

lending. Bank lending, in turn, is based upon bank reserves which expand and contract with (a) deposits and withdrawals of currency by non-bank financial intermediaries; (b) borrowings by commercial banks from the central bank; (c) inflows and outflows of money from and to abroad: and (d) purchase and sale of securities by the central bank. The first three items definitely impart an endogenous element to the money stock. Thus the money supply is not exclusively exogenous, as assumed by Friedman. It is mostly endogenous.

Despite the contended shortcomings of the monetarist theory of demand, it has been widely applied in the study of money demand. Thus, the theory is considered relevant for this study. Friedman's contributions to the quantity theory of money are a restatement, an improvement, of money demand by the classical economist. According to Friedman, investors can hold their wealth in the form of money, bonds, equity shares and commodities. He concludes that the demand for money depends on rates of return of these four assets and upon income. According to him, all things being equal, an increase in the expected rate of inflation increase the demand for commodities and reduces the demand for money and vice versa. (Bitrus: 2011). Friedman's work also shows superiority over other quantity theories in its explanation of monetary policy transmission mechanism as to how variations in money demand influence economic activity. He concluded that inflation is a monetary phenomenon. In other words, if money demand is stable then the price level would be stable, ceteris paribus.

(d) Inflation Theories

Over the years, economists have made frantic effort to explain the determinants, patterns and consequences of inflation in an economy. In this regard, several inflation theories have been propounded. These theories include cost-push theory of inflation, demand-pull theory of

inflation, Keynesian theory of inflation, Bent Hansen's theory of inflation, Schultze's sectoral demand-shift theory of inflation, mark-up theory of inflation and money stock theory of inflation . In this subsection, we briefly examined some of these theories.

(i) The Cost-Push Theory of Inflation

The roots of cost-push doctrine go back at least to Sir James Steuart's 1767 "Inquiry into the Principles of Political Economy", a book Lionel Robbins describes as a "sort of compendium of all subsequent anti-quantitative theories of money" (Robbins 1971:102). In the book, Steuart enunciated at least three key strands of cost-push theory. First was his concept of the price level as a nonmonetary phenomenon determined by the same forces that determine the individual prices of specific goods. Identifying these forces as competition and cost, Steuart declared that he had laid it down as a principle, that they determine the standard price of everything (Steuart, 1767; Screpanti & Zamagni, 1993). Increased competition, he said, forces sellers to lower prices just as falling costs also lower them. Here is the notion that real forces drive individual and aggregate prices alike. The second strand of Steuart's cost-push doctrine supplements the first. It states that because general prices are real phenomena, they move independently of money. It denies money (metallic coin in Steuart's day) any role in price determination. "Let the specie of a country . . . be augmented or diminished in ever so great a proportion," Steuart wrote, and the prices of "commodities will still rise and fall according to the principle" of competition and cost, "but never upon the quantity of coin" (p. 345). To explain why money has no effect on prices, Steuart advanced two arguments. First, idle hoards absorb excess coin from circulation just as they release into circulation additional coin to correct a monetary shortage. Consequently, there can be no monetary excess or deficiency to spill over into the commodity market to affect prices. The hoarding-dishoarding mechanism ensures as much. Second, changes in the stock of money

that do spill over into the commodity market induce matching shifts in commodity demand and supply. In so doing, such shifts and the resulting changes in output absorb any excess coin that manages to elude the hoarding mechanism. Either way, prices remain unchanged.

The third strand of Steuart's cost-push doctrine follows logically from the second. Having denied that money drives, or governs, prices, he argued that causation runs in the opposite direction from prices to (velocity-augmented) money. Positing a two-step process, he said that cost and competition first determine prices. Then, with prices settled, the turnover velocity, or rate of use, of money adjusts to render the existing stock of coin just sufficient to accommodate real activity at the given prices. If the stock of coin is excessive, wealth holders will remove the excess (which of course being redundant yields no return in the form of convenience or liquidity) from active circulation, melt it down, and hoard it in the form of utility-yielding plate or "treasures" so that velocity falls (p. 350). Conversely, if coin is deficient, the resulting recourse to "symbolic [paper] money and a thousand other inventions" allows transactors to economize on coin whose velocity therefore rises (p. 345). Via these expedients, velocity adjusts to ensure the stock of coin is just enough to purchase all the goods offered for sale at the predetermined level of prices. In this way, causation runs from prices to velocity-augmented money. Here is the origin of the notion that changes in the stock of circulating media (coin and its paper substitutes) merely validate price changes that have already occurred and do nothing to produce such changes.

According to Screpanti and Zamagni (1993), cost-push doctrine rules out any effect of money stock on price: only cost of production matters for inflation. The cost-push phenomenon is driven by wage-push and profit-push tendencies. It is also noted that, if it is the wage-push inflation, then it is on account of the institutional factors like the full employment policy of the Governments strong trade unions etc. If it is the profit-push inflation, then it is on account of the

monopolistic position of the oligopolists which again indicates the institutional factor of monopoly i.e. Oligopoly.

(ii) **Demand-Pull Theory of Inflation**

Contrary to the doctrine of cost-push, the demand-pull theory argues that it is not the push of cost from behind, but the pull of demand from the fore that causes inflation i.e. the wage-rise and the price rise - both are the results of rising total demand. Total demand for goods in the economy can raise either on account of the increase in the money stock or increase in the velocity of money (Horváth, Komárek & Rozsypal, 2011; Makin, Robson & Ratnasiri, 2017). In the modern economy, liabilities of the non-bank financial intermediaries work as near moneys or near money substitutes and thereby reduce the demand for money that increases its velocity. Makin et al. (2017) observed that the rise in the velocity of money can be understood in two ways. Firstly, the growth of near money substitutes can lessen the demand for money and thereby can increase the velocity of money. Second, money held up on account of pervasive controls, as for example, during war times, may begin to be spent when controls are relaxed or removed, thereby increasing the turnover of money or the velocity of money. The first view regarding the velocity of money takes stock of the change in the financial organization and the second one keeps in view, the removal or relaxation of controls and wrongly thinks that the case of the use of the previously created money that was artificially held up, is the case of increased velocity of money. If there are no controls and no undue increase in money stock and if the velocity of money increases, then alone it is the genuine case of increased velocity of money. Above case, in reality, are the case of the increase in money stock rather than that of enhanced velocity of money.

According to Horváth et al (2011), money-stock was tremendously increased during war times in the US and UK, but the entire amount was not allowed to be spent due to controls and thus its velocity was artificially reduced. Now when controls are relaxed, reduced velocity of money gets increased and accumulated money begins to be spent. Makin et al. (2017) noted that in full employment equilibrium condition, when demand increases, inflation becomes unavoidable. In addition in full employment condition, the economy reaches to its maximum production capacity. At this point, the supply of goods and services cannot be increased further while the demand of products and services increases rapidly. Due to this imbalance between demand and supply, inflation takes place in the economy.

(iii) Keynesian Theory of Inflation

Keynesian theory of inflation was advanced by Keynes and popularized by his followers. According to Ireland (2009), Keynesian theory of inflation works through the investment-saving mechanism. He further stated that there are two Keynesian theories of inflation, namely, demand-pull theory and the cost-push theory. While the demand-pull theory was expressed in the form of an 'inflationary gap' by Keynes in his book 'How to Pay for War' (.Keynes, 1940), the cost-push theory was contained in his "General Theory" (Keynes, 1936). Keynes in his demand-pull theory of demand believes that the immediate cause of inflation is excess demand. Keynes did not emphasize the excess money supply as the cause of excess demand. There may be more than one source of demand. Consumers want more goods and services for consumption purposes. Businessmen want more inputs for investment. Government demands more goods and services to meet civil and military requirements of the country. Thus the aggregate demand comprises consumption, investment and government expenditures. When the value of aggregate demand exceeds the value of aggregate supply at the full employment level, the inflationary gap

arises. The larger the gap between aggregate demand and aggregate supply, the more rapid the inflation. Given a constant average propensity to save, rising money incomes at the full employment level would lead to an excess of aggregate demand over aggregate supply and to a consequent inflationary gap. Thus Keynes used the notion of the inflationary gap to show an inflationary rise in prices.

Keynes explains inflation with the help of excess demand without openly bringing into focus the expansion of money supply and shows the development of the 'inflationary gap.' According to Keynes, excess of investment over saving gives rise to an inflationary gap which results into inflation. Thus, it is inflation through which saving is increased and made equal to investment. Thus an inflationary gap means shortage of saving to support investment. Saving is the release of consumer goods which can be utilized by the persons who are busy with capital formation i.e. investment. But when investment is in excess of saving, it means that some persons who are producing capital goods will not get consumer goods. Thus the demand for consumer goods will be more than the supply of consumer goods and an inflationary gap will develop. This gap will not disappear unless rise in the price level depresses real incomes of wage earners whose propensity to consume is higher and transfers this difference in income to profit earners whose propensity to save is higher and thus saving is equivalently augmented. This is done by the rise in the price level. Price level will continue to rise and thereby saving increased and the inflationary gap reduced until the saving reaches the level of investment. When saving matches investment, the inflationary gap is reduced to nill and the price level ceases to grow.

In the General Theory, Keynes argues that cost-push inflation can occur when the cost of production gets higher rapidly but the demand for those products and services remains the same. Such extra costs of production will be added to the price of goods and services which passed

through the consumer, thereby causing increase in selling prices. If the technique of production and the volume of the capital-stock do not change, then change in the money wage rate will change the cost schedule by changing the expenditure of the employers in producing a certain level of output and so the minimum necessary expenditure by the people on the goods produced as expected by the employers will alter too and so will change the actual expenditure by the people. If the money wage rate is constant, price-level cannot change except on account of diminishing returns when employment gets augmented or on account of the profit-push administered by the oligopolists.

(iv) Money-Stock Theory of Inflation

Money stock theory of inflation was advanced by the monetarists. This theory is akin to monetarist theory of money demand. The monetarist revolution was led by Prof. Milton Friedman. According to Friedman (1965, 1987) inflation is a monetary phenomenon. He claimed that demand for money is a stable and predictable entity which depends on other variables in the economy. According to him, the quantity theory of money is the demand for real money theory rather than the money supply theory. People want to maintain a certain definite part of real output in the form of liquid money. Contrary to the classical belief that velocity of money is constant, Friedman took middle and compromising position and pointed out that the velocity of money is not constant and it is also not unstable.

Friedman (1965) argues that if the money stock is increased, the price-level will rise if there is full employment output. Prof. Friedman puts it very well that "'the relationship between changes in the stock of money and changes in prices, while close, is not of course precise or mechanically rigid" (Friedman, 1965:43). Mumtaz and Surico (2008) noted that there are two major factors

that produce discrepancies - changes in output and changes in the amount of money that the public desires to hold relative to its income. So, only by knowing the growth in money-stock, we cannot say anything regarding the change in the price-level or output or employment level we have to take into account other variables also along with the growth in money supply before we can say anything about the price-level or the level of output or employment. Mumtaz and Surico (2008) further argued that if the stock of money is not rising more than the rise in the demand for money, despite other factors, inflation will not take place.

Tootell (2002) also explained that the general rise in prices can be explained by variation in the supply of money and the demand for money. Demand for money depends on output in a stable fashion. Hence real demand for money increases proportionately or more than proportionately, but in a stable way to the rise in real output. Increase in money supply through the interest rate mechanism is passive and hence money supply through this channel increases only to the extent of the increase in the demand for money based on increase in output. But increase in money supply due to budget deficit or due to the control of the exchange rate when the balance of payment is in surplus and foreign exchange reserves are accumulating, is autonomous and exogenous and is likely to be inflationary if pressed beyond a limit. Intuitively, if inflation has taken place, there is no sense in trying to contract existing money supply or reduce effective demand by applying monetary and fiscal means. Because it will reduce output and curtail employment. Once money supply is increased, it gets absorbed into the economy and so it is suicidal to attempt to withdraw the spent money. Once inflation has come into being, it should be allowed to be an open one and in the present, only that much money supply should be augmented which is necessitated by the rise in the demand for money consequent upon growth in output so that the already high price-level may not rise further. In this regard, we can take only preventive

measures and not curative measures. Curative measures are to be left to the market forces (Tootell, 2002; Mumtaz & Surico, 2008; Monacelli & Sala, 2009). According to Monacelli and Sala (2009), this applies only to the inflationary situation and not necessarily to the situation of depression. Thus, the money stock theory of inflation as advocated by the monetarist holds that it is money demand that matters for inflationary tendencies.

So far, the theories of inflation could be reduced to two theories, institutional theories and money-stock theories, as suggested by Monacelli and Sala (2009). Institutional theories include demand-pull theory, cost-push theory, Keynesian theory, Hansen theory and Schultze theory of inflation. According to Monacelli and Sala (2009), institutional theories of inflation describe the process of inflation rather than explain the cause of inflation. Some institutional factors carry forward the impact of the rising money-stock and some institutional factors bring pressure for the increase in money stock and in the circumstances of the increasing money-stock, they create pressure for further rise in money stock. If this pressurized further rise in money - stock is not allowed to take place, all the institutional factors are helpless and no inflation can come into being. In other words, institutional factors do not explain inflation rather they explain the pressures for the increase in money -stock. Inflation can only be explained by the fact of the rising money - stock. Pressure for increasing money –stock is not itself the increase in money - stock, they are not identical - this pressure may be resisted.

Monacelli and Sala (2009) critique of the institutional theories of inflation was refuted by Moccero, Watanabe and Cournède (2011). Moccero et al. (2011) argued that the institutional theories of inflation are real theories of inflation in the sense that they emphasize the institutional factors that are real and non-monetary in nature. Moccero et al. (2011) also acknowledged that there are other real theories of inflation of lower theoretical status, which are not institutional in

nature e.g. the theories of black money, black markets, smuggling etc., which vainly claim to explain inflation. The distinction between the institutional theories and the non-institutional real theories is that the institutions emphasized by the institutional theories give rise to pressure for the expansion in money supply or increase the velocity of money in the long run (though it remains stable in the short run) while the non-institutional real theories have never claimed to have given vogue to any pressure for the growth in money supply. Guegan and Charfeddine (2014), however, agree with Monacelli and Sala (2009) that without growth in money supply per unit of output, inflation is not possible. Thus, most monetarists will conclude that changes in money stock are the single most important determinant of inflation in modern economies.

2.1.3 Other Related Theoretical Issues

(a) Monetary Policy Framework in Nigeria

Monetary policy is a blend of measures and/or set of instruments designed by the central bank to regulate the value, supply, and cost of money consistent with the absorptive capacity of the economy or the expected level of economic activity without necessarily generating undue pressure on domestic prices and the exchange rate (Mordi, 2009:2). In other words, it is the deliberate use of monetary instruments at the disposal of monetary authorities such as a central bank, in order to achieve macroeconomic stability. The objective of monetary policy is to ensure that the expansion in domestic liquidity is consistent with government's objective of price stability, high and sustainable economic growth and balance of payments equilibrium. There are two types of instruments, the direct and the indirect instruments. The former is characterized by the use of credit ceiling, sectoral credit allocation, administrative control of interest and

exchange rates; moral suasion etc, while the latter are market-based instruments and therefore, requires a well-developed and functional financial market.

In Nigeria, the monetary authority has used two monetary policy frameworks for the implementation of monetary policy – the exchange rate and monetary targeting frameworks.

(i) Exchange Rate Targeting

Exchange rate targeting or exchange rate peg is a monetary policy strategy that involves fixing the value of a national currency in the currency of another nation considered strong. The measure of that nation's strength is the level of inflation rate. Thus, a nation that adopts exchange rate targeting as a monetary policy strategy simply pegs its currency to be responsive to the rate of inflation of the identified mirror country. This is so under the assumption that ceteris paribus, if a fixed exchange rate is sustained, the gap between the inflation rates of the two countries should even-out. This implies that the country with high inflation rate would leverage on the low-inflation country for effective implementation of monetary policy. In practice, exchange rate targeting can be adopted using any of the following three approaches, namely, currency board arrangement, fixed exchange rate, and dollarization. In the case of currency board arrangement, a country's currency is backed 100% by the foreign currency, and provided the high inflation country maintains a large chunk of all its foreign assets in the low-inflation's currency country. Simply, the high-inflation country makes policy pronouncement of fixing its domestic currency's value in terms of the low-inflation country's currency and trade each other's currency on large scale. Dollarization entails deliberate decision of the monetary authority to substitute its local currency for currency of a country assumed to be strong in terms of inflation. In other words, it is

the adoption of the currency of a low inflation country as legal tender. It is believed that since the adopted currency is relatively stable, then monetary policy objective becomes effective.

The conduct of monetary policy in Nigeria at the inception of the Bank prior to Nigeria's independence was influenced and predicated on the economic developments in Britain. The instrument of monetary policy at that time was the fixed exchange rate. The Nigerian pound was fixed in relation to the British pound in line with the prevailing world economic scenario at that time. The fixing of the exchange rate provided a more effective mechanism for the maintenance of balance of payments and inflation control in the Nigerian economy (Ojo, 2000). The Nigerian currency not being a traded currency had its exchange rate, largely, subjected to administrative management. The exchange rate was largely passive as it was dictated by the fortunes or otherwise of the British pound sterling. The naira was pegged to the pound sterling up to 1967 when the pound was devalued and thereafter to the dollar.

Following the breakdown of the IMF par value system in December 1971, the naira was adjusted in relation to the dollar. However, there were problems associated with pegging the Nigerian currency (naira) to a single currency. One of such problems was that the naira had to undergo de-facto devaluation with the dollar, while the economic fundamentals dictated otherwise in 1973 and 1975, respectively. Based on the downsides of pegging to a particular currency, the authority in 1978 decided to peg the naira to a basket of 12 currencies of the major trading partners. However, following the crash in crude oil prices in the international oil market in 1981, the monetary authority adopted a policy of gradual depreciation of the nominal exchange rate of the naira with a view to reversing the observed overvaluation of the naira. A major policy reversal was effected in September, 1986 when the fixed exchange was discarded and replaced with a flexible exchange rate (as it was officially called) mechanism. The system was propelled by

market forces as the naira was allowed to find its level according to the strengths of demand and supply of foreign exchange. Following the structural adjustment program, the monetary authorities abandoned exchange rate targeting with focus shifted to monetary targeting and inflation targeting.

(ii) **Monetary Targeting (1973 - 2017)**

Monetary targeting involves the use of a quantity anchor, usually of monetary aggregates to achieve the ultimate monetary policy objective. It involves the use of direct and indirect instruments. During the direct control, the major objective of the monetary policy was to promote rapid and sustainable economic growth. To achieve this, the monetary authorities imposed differential quantitative ceilings on all sectors of the economy, giving higher credit ceilings at below market lending rate to the preferred sectors, namely: agriculture, manufacturing and construction. This was to ensure that these sectors were given the utmost attention to take the lead in growing the economy through the multiplier effect. The level and structure of interest rates were administratively determined by the CBN.

Both savings deposit and term deposit rates were fixed to attain the social optimum in resource allocation, promote growth of the preferred sectors, achieve orderly growth of the financial market, subdue inflation, and lessen the burden of internal debt servicing of the government. Table 2.1 shows the summary of monetary targets from 1990 to 2017. Monetary targeting had focused on M1 until 1991. The targeted growth in narrow money was surpassed by 277.38% and 535.10% in 1990 and 2000 respectively.

Table 2.1 Monetary Targeting from 1990 to 2017

Year	M2 Growth*			M1 Growth**			MRR/MPR***
	Actual	Target	Variance (%)	Actual	Target	Variance (%)	
1990	45.92	+		49.06	13.00	277.38	18.50
1995	19.41	10.10	92.20	18.90	9.40	101.11	13.50
2000	48.07	14.60	229.23	62.24	9.80	535.10	13.50
2005	24.35	15.00	62.36	29.66	11.40	160.22	13.00
2010	6.91	29.25	-76.38	11.05	22.40	-50.69	6.13
2011	15.43	13.75	12.19	21.54	-	-	9.19
2012	16.39	24.64	-33.48	9.59	-	-	12.00
2013	1.32	15.20	-91.28	-5.23	-	-	12.00
2014	7.20	14.52	-50.41	-11.10	-	-	13.00
2015	5.90	15.24	-61.25	24.14	-	-	11.00
2016	17.78	10.98	61.96	31.50	11.34	177.75	14.00
2017	1.74	10.29	-83.12	-2.09	11.07	-118.85	14.00

Notes: + Quantitative target for M2 is not specified.
**broad money growth*
***narrow money*
**** minimum rediscount rate (MRR) applied from 1990 to 2005 and monetary policy rate (MPR) which was initiated in 2006 applied to the values from 2010 to 2017*

Source; CBN (2017)

In 2005, the targeted narrow money growth was 11.40% while the actual money growth was 29.66%, indicating a positive variance of 160.22%. Narrow money targeting exceeded actual by 50.69% in 2010. There was no narrow money target between 2011 and 2015. Broad money targeting became the focus of monetary policy since 1991. In 1995, it was targeted that broad money would grow by 10.10%. In the same year broad money growth was 19.41% representing 92.20% deviation from the target. In 2000 and 2005, broad money stock grew by 48.07% and 24.35% against the target growth of 14.6% and 15% respectively. In 2010, targeted growth in

broad money exceeded the actual by 76.38%. Similarly from 2012 to 2017, (with the exception of 2016), the targeted growth in broad money exceeded the actual. CBN (2016), however, noted that the gains in M_2 largely reflect uptick in quasi-money (+17.6%) and demand deposit (+12.9%), with the former sufficient to offset decreases in currency outside bank (-4%).

Until 1993, the CBN operated direct monetary policy. By 1993, the central bank switched to the indirect approach to monetary policy. This switch did not preclude nor change the goals of monetary policy, which includes: achievement of domestic price and exchange rate stability; maintenance of a favorable balance of payment position; development of a sound financial system; and promotion of rapid and sustainable rate of economic growth. The CBN focuses on liquidity management to achieve the objective of maintaining price and macroeconomic stability. The primary instruments for liquidity management are OMO, complemented by cash reserve requirements, discount window operations, etc. The anchor for the Bank's monetary policy was the minimum rediscount rate (MRR), which was meant to anchor short term interest rates in the financial system. The intermediate target for monetary targeting was base money, which the Bank sought to control to have a hold on inflation trend in the economy. The MRR has been adjusted downward since 1990. From 18.5% in 1990 it was reduced to 13.5% in 1995 and 2000 and 13% in 2005.

The MRR, as an indicative rate, signals the direction of interest rate and impact of monetary policy. Between 1999 and 2005, the Monetary Policy Committee (MPC), adjusted the MRR in line with monetary conditions. However, in the face of the problem of liquidity overhang that persisted in the banking system over the years from the excessive fiscal operations of preceding governments prior to 1999, the MRR was not effective as an anchor rate because it could not exert immediate impact on short-term rates. Moreover, the rates in the money market remained

largely volatile leading to inefficiencies in the money market as the MRR could not transmit monetary policy effectively. To establish a good truly transactionary policy rate that will effectively signal the direction of monetary policy and smoothen the volatility in the money market rates, a new framework for implementing monetary policy was introduced that took effect on December 11, 2006. The ultimate goal of the new framework was to achieve a stable value of the domestic currency through stability in short-term interest rates around an "Operating Target" interest rate, "Monetary Policy Rate" (MPR). MPR is determined and operated by the CBN to serve as an indicative rate for transactions in the inter-bank money market as well as other Deposit Money Banks'(DMBs) interest rate. The MPR replaced the Minimum Rediscount Rate (MRR), which had been relatively ineffective in mobilizing control of interest rate movements in the financial markets. MPR was initially set at 12.25% in 2006. As shown on Table 2.1 it was later reduced to 6.13% in 2010. It was raised to 9.19% in 2011 and later raised to 12% in 2012 and 2013. In 2013, it was slightly raised to 13%. Given the apparent liquidity squeeze experienced in 2015, the MPR was reduced to 11% in 2015. It was however raised to 14% in 2016 and 2017.

The main principle guiding the use of MPC is to control the supply of settlement balances of banks and motivate the banking system to target zero balances at the CBN, through an active inter-bank trading or transfer of balances at the CBN. This is aimed at engendering symmetric treatment of deficits and surpluses in the settlements accounts, so that for any bank, the cost of an overdraft at the Central Bank would be equal to the opportunity cost of holding a surplus with the Bank. The Central Bank intervention in the market takes the form of a standing lending facility, which ensures orderly market operations or behaviour thereby reducing interest rate volatility. The standing lending facility is available as an overnight lending to banks with

deficits, at a fixed interest rate, i.e. the upper band of the CBN standing facility. The Bank stands ready to supply any amount the banks may require at the standing lending rate. The Central Bank also sets up a standing deposit facility that pays banks with surplus funds, a fixed interest rate in their deposit or reserves, which they keep with the Bank. This arrangement allows the Bank to keep the overnight inter-bank interest rate within a corridor with an upper and lower limit on interest rate.

For policy effectiveness, the CBN adjusts the MPR in line with the liquidity and macroeconomic conditions. Since its introduction, the MPR has varied between 6 per cent, in April 2008, and 14 per cent in December 2018. A major advantage of the new framework is that the CBN is able to operate in the market daily and ensures that adequate liquidity is provided to enable banks trading in the interbank market to complete settlement at interest rates around the MPR. Inter-bank rate is, therefore, maintained at a level between the lending and deposits rates at the CBN. The maintenance of interest rates band has helped significantly to reduce volatility in the money market compared with the inter-bank rates received in the past.

(iii) **Inflation Targeting**

According to Bernake Lauback, Mishkin and Posen (1999), inflation targeting (IT) is a framework for monetary policy, characterized by public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time periods, and by explicit acknowledgement that low and stable inflation is the primary long run goal of monetary policy. Other features of IT as highlighted by Bernake et al (1999) include a vigorous effort to communicate with the public about the plans and objectives of the monetary authorities and measures that strengthen the central bank's accountability for attaining these objectives. Also,

Aliyu and Englama (2009) described IT as a monetary policy framework in which central banks accept and announce certain targets of inflation, over a given period of time, as a measure of policy anchor and are accountable for deviations of actual from set targets. Aliyu and Englama (2009) outlined the characterization of IT as follows:

- An institutional commitment to price stability as the primary goal of monetary policy;
- Mechanisms rendering the central bank accountable for attaining monetary policy goals;
- Public announcement of medium term numerical targets for inflation;
- An information inclusive approach in which many variables (not just monetary aggregates) are used in making decisions about monetary policy; and
- Increased transparency of monetary policy strategy through communication with the public and market about the plans and objectives of monetary policy.

From the above characterization, IT may be described as a monetary policy framework that makes explicit commitment to maintenance of price stability as the overriding objective of monetary policy, sets the numerical target for inflation over a specified time horizon and makes effective communication of same to the public, including explanation for deviation from targets, if and when they occur, with a view to improving the transparency and credibility of monetary policy and the accountability of monetary authorities. Aliyu and Englama (2009) observed that there are three main forms of IT that have been identified in the literature. They are:

(i) Full- fledged IT (FFIT): This occurs when a country is ready to adopt IT as its single nominal anchor upon which macroeconomic stability would be achieved. It is suitable for countries with a robust or sound financial environment, and a central bank, which is transparent, accountable and highly committed to the attainment of the goals of IT.

(ii) Eclectic IT (EIT): This occurs when a country pursues IT along with other monetary policy objectives in a stable financial environment which, however, is less accountable and transparent.

(iii) Inflation Targeting Lite (ITL): This is a low profile form of IT pursued by countries, largely due to lack of strong or credible macroeconomic environment. ITL countries float their exchange rate and announce an inflation target, but are not able to maintain the inflation target as the foremost policy objective

The operational procedure of IT framework requires that the central bank forecasts the future path of inflation and compares it with the target inflation rate (the rate the government believes is appropriate for the economy). The difference between the forecast and the target inflation rates determines how much monetary policy has to be adjusted. More often than not, IT countries set their inflation targets in the low single digits but not at zero since that would not allow real interest rates to fall sufficiently to stimulate overall demand when a central bank is trying to boost the economy (Jahan, 2012).

Both theoretical and empirical arguments have been adduced to justify the increasing popularity and support which IT has enjoyed over the past two decades. First, empirical evidences have tended to support a negative correlation between economic growth and inflation (Barro, 1995; Bruno and Easterly, 1998; Ghosh and Phillips, 1998; Krueger, 2005; Bassey and Onwioduokit, 2011). This negative relationship suggests that a policy that seeks to reduce inflation is growth inducing. Second, it is further argued that IT is readily understood by the public and therefore very transparent. Monetary targeting is less likely to be understood by the public and may not adequately reflect the stance of monetary policy. Also, by committing itself to price stability, monetary authority is held accountable for success of the policy. Third, according to Heintz and

Ndikumana (2010) it is frequently argued that a formal IT allows inflation to be controlled at lower cost than other approaches to monetary policy that focus on reducing inflation. In other words, IT is said to reduce the 'sacrifice ratio' – the amount of output or employment which must be forgone to reduce inflation by a certain amount. Fourth, as noted by Jahan (2012) IT combines elements of both "rules" and "discretion" in monetary policy. This "constrained discretion" framework combines two distinct elements: a precise numerical target for inflation in the medium term and a response to economic shocks in the short term. Thus, rather than focusing on achieving the target at all times, the approach emphasizes achieving the target over the medium term—typically over a two- to three-year horizon. This allows policy to address other objectives—such as smoothing output—over the short term. Thus, IT provides a rule-like framework within which the central bank has the discretion to react to shocks. Because IT focuses on medium-term, policy makers need not feel compelled to meet targets on a year – to – year basis.

In spite of its many benefits, the IT framework is not without some limitations. Some of these limitations are highlighted in the works of Epstein and Yeldan (2008), Kadioglu, Ozdemir and Yilmar (2000) and Bernanke, et al (1999). First, it is argued that the general notion that the top priority of central banks should be to keep inflation as low as possible is neither optimal nor desirable. According to Epstein and Yeldan (2008), the notion is based on the mistaken belief that inflation of any magnitude has a negative impact on output and that economies perform best and generate high levels of economic growth and employment under lower rates of inflation. On the contrary, Epstein and Yeldan (2008) argued that experiences have shown that moderate rates of inflation have very low or no cost and that full IT countries have not performed better than non-IT countries in terms of employment generation and economic growth. Moreover, even if domestic monetary policy has reduced inflation, the hoped for gains in employment have, generally, not materialized; and, for many countries following this orthodox approach, economic growth has not significantly increased. In line with this reasoning, Bernanke, et al. (1999) argued that IT does not reduce the real cost of disinflation while Pollin and Zhu (2006) submitted that a

higher inflation is associated with moderate gains in GDP growth rate up to 15-18 percent inflation threshold. Second, the much vaunted accountability and credibility properties of IT is said to be doubtful.

Bernanke, et al. (1999) returned "no credibility bonus" while Epstein and Yeldan (2008) argued that the supposedly "independence" of the central bank means that they would become less accountable to their governments and more accountable to financial elites and international organizations such as IMF. The accountability and credibility arguments are further weakened by the fact that inflation is difficult to control and the policy instruments show their impacts on inflation after a long and variable lag.

Table 2.2 Inflation Targets from 1990 to 2017

Years	Actual	Target	Differential (%)
1990	3.6	***	
1995	51.6	15.00	243.94
2000	14.5	9.0	61.41
2005	11.6	10.0	15.65
2010	11.8	11.2	5.36
2011	10.3	12.0	-14.31
2012	12.0	9.5	26.12
2013	7.96	9.87	-19.38
2014	7.98	7.50	6.38
2015	9.55	8.00	19.38
2016	18.55	11.90	55.88
2017	15.37	10.71	43.53

***Policy statement is specified as significantly reduce/moderate the rate of inflation

Source: CBN (2017)

Table 2.2 shows the inflation targets and actual inflation in Nigeria between 1990 and 2017. In 1990, inflation target was a policy statement rather than a quantitative target. The policy statement was specified as to 'significantly reduce/moderate the rate of inflation'. The actual inflation in that year was 3.6%. Time problem with qualitative rather than quantitative IT is that ascertaining what 'moderate inflation' is is usually difficult. Thus, it always preferred to have a quantitative IT. In 1995 a quantitative IT of 15% was given. However, the actual inflation rate in 1995 was 51.6% which represents 234% variance in terms of the target. The inflation target was reduced to 9% in 2000. In the same vein, the actual inflation also declined to 14.5% with a positive differential of 61.41%. The inflation targets for 2005 and 2010 were 105 and 11.2% respectively with actual inflation recording 11.6% and 11.8% respectively. The variance of 5.36% in 2010 was the smallest for the period under review.

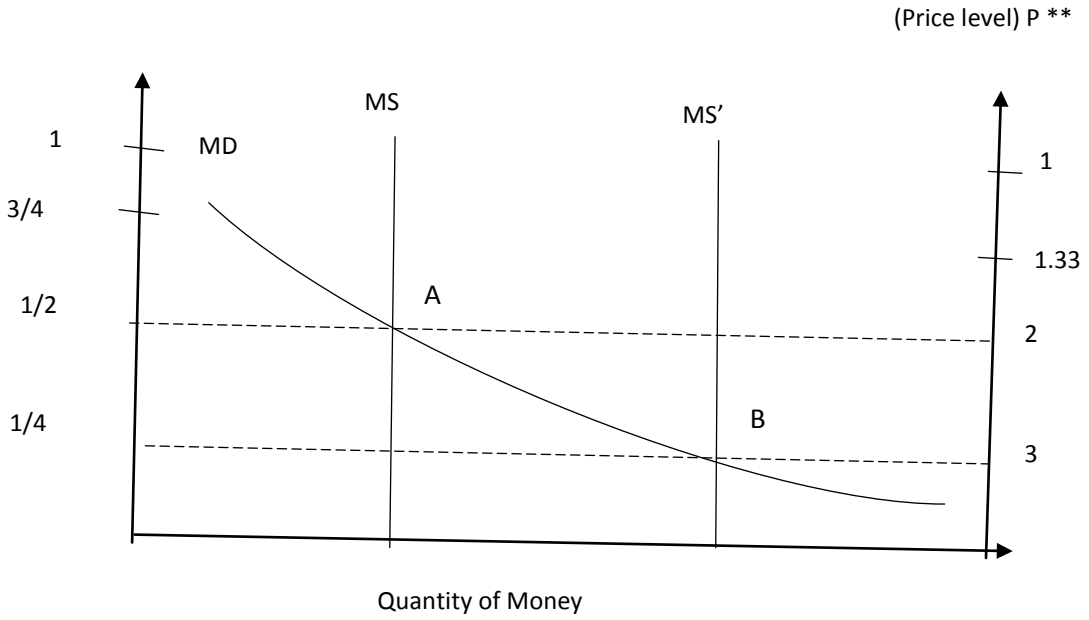
(b)The Relationship between Money Market and Price Behaviour

Basis of pattern of money market for determination of price level and inflation is stable on this issue that value of currency, like value of any goods or other services in an economy, is determined by supply and demand (Froyen, 1990; Mankiw, 2003). For example, Mankiw (2003) noted that as demand and supply of banana determine price or value of banana, supply and demand for money also determine value of money as well. Therefore, if we intend to study the price level and its fluctuations, factors effective on supply and demand for money should first be studied. In economic patterns, supply of money is generally defined as an exogenous variable although variables like monetary base, rate of legal reserves and rate of bank additional reserves can be mentioned as the most significant factors on supply of currency (Wennerlind, 2005). On the other hand, money demand is generally regarded as a function of national income (as a representative for transactional demand for currency) and interest rate (as a representative for

speculative demand of currency). If demand for money is considered as simple form of this statement (i.e. how much money will people intend to keep in their briefcases in one economy?), then price changes could be a consequence of demand for money decisions (Froyen, 1990).

People keep money as an exchange medium and unlike other assets such as bond, stocks, can do shopping with their money. Hence, according to Mankiw (2003), people themselves can select how much money, they can keep with themselves, and it will depend on price of goods and services, that, they want to purchase. At any rate, he refers to this important fact that level of prices is adjusted in such a way that supply and demand for money are balanced with each other.

Figure 2.1: Supply and demand for money and the effect of money supply increase on money market.



***Although scale of right-hand vertical axis is not uniform, the two vertical axes have been displayed in one diagram due to conceptual corresponding between value of money and level of price. At any rate, vertical axis can be shown separately at two diagrams.*

Source: Adapted from Mankiw (2003).

In the same direction, if level of prices stood above equilibrium level, people intend to keep more money with regard to what has been supplied. Hence, prices should be reduced, aimed at balancing supply and demand. On the other hand, if prices are lower than the equilibrium level,

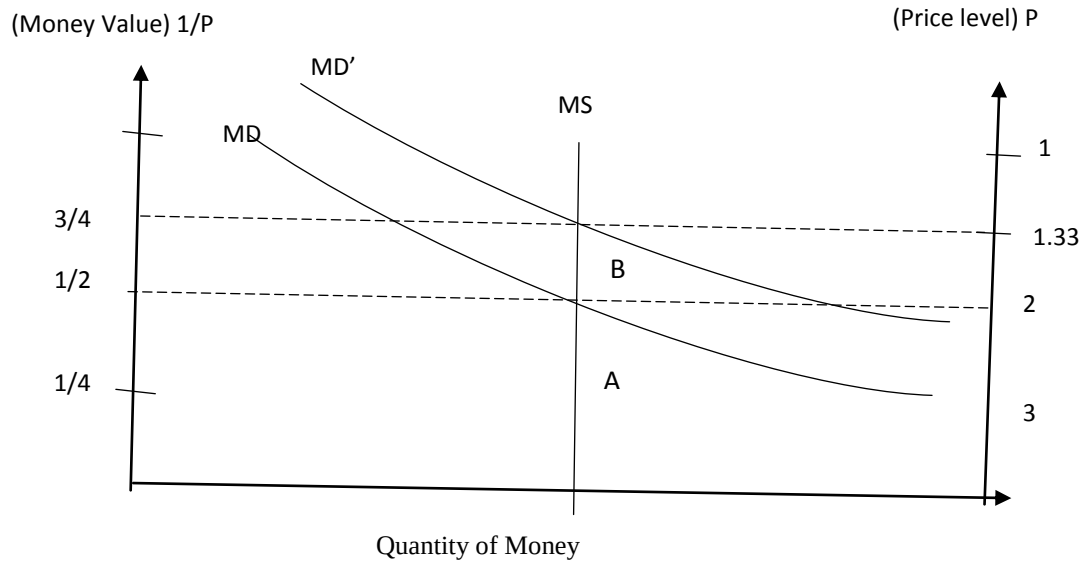
people intend to keep less money with regard to what has been supplied. Consequently, prices should be increased, aimed at balancing supply and demand for currency (Mankiw, 2003; Galbács, 2015). Figure 2.1: illustrates this concept.

In the same vein, horizontal axis shows the nominal quantity of money as well. The vertical axis of left hand shows value of money "*1/P*" and vertical axis of right hand shows level of price "*P*" as well (notice that the axis of price in right hand has been reversed). The Curve *MS* is nominal supply of money while curve *MD* is nominal demand for money as well. The curve supply *MS* is vertical which shows its exogeneity characteristic. The gradient of curve of demand for money is toward down which shows when value of money is low, level of price is above and people demand a great amount of money for purchasing goods and services.

In an equilibrium which has been designated point A, both demand and supply of money are equal. Hence, equilibrium between supply and demand for money will determine value of money and level of price as well. If supply of money is increased and money supply curve is transferred from *MS to MS',* it is observed that equilibrium between demand for money and supply of new money is obtained in point B. Consequently, value of currency, which is specified on left-hand vertical axis, is reduced from ½ to ¼ and level of price, which is specified on right-hand axis, is increased from 2 to 4. As it is observed, increase in supply of money within the above framework will cause reduction of value of money coupled with increasing level of price.

However, we intend to examine the effect of change of effective variables on demand for money on the value of money and level of price within the above mentioned analytical framework. This is shown in Figure 2.2

Figure 2.2: Supply and demand of money and the effect of money demand increase on money market.



Source: Adapted from Mankiw (2003).

Assume that supply of and demand for money stand at Money Supply (MS) and Money Demand (MD) respectively and equilibrium of money market in spot A is established. It should be noted that the value of money in initial equilibrium is equal to½ in a way that level of price is equaled to 2. If one of the effective variables on money demand, is changed with the aim of increasing demand for money (for example, national income is increased or interest rate is decreased), money demand curve is transferred towards right and upper hand, reaching from *MD to MD'*. Hence, new equilibrium will be created at money market in spot B, based on which, value of money is equal to ¾ and level of price is equal to 1.33. As it is observed, adoption of any change in other effective variables on money demand, which resulted in money demand increase, will increase value of money and also will reduce level of price.

On the contrary, adoption of any change in national income and interest rate resulted in reduction of money demand, will reduce value of money and also will increase level of price as well.

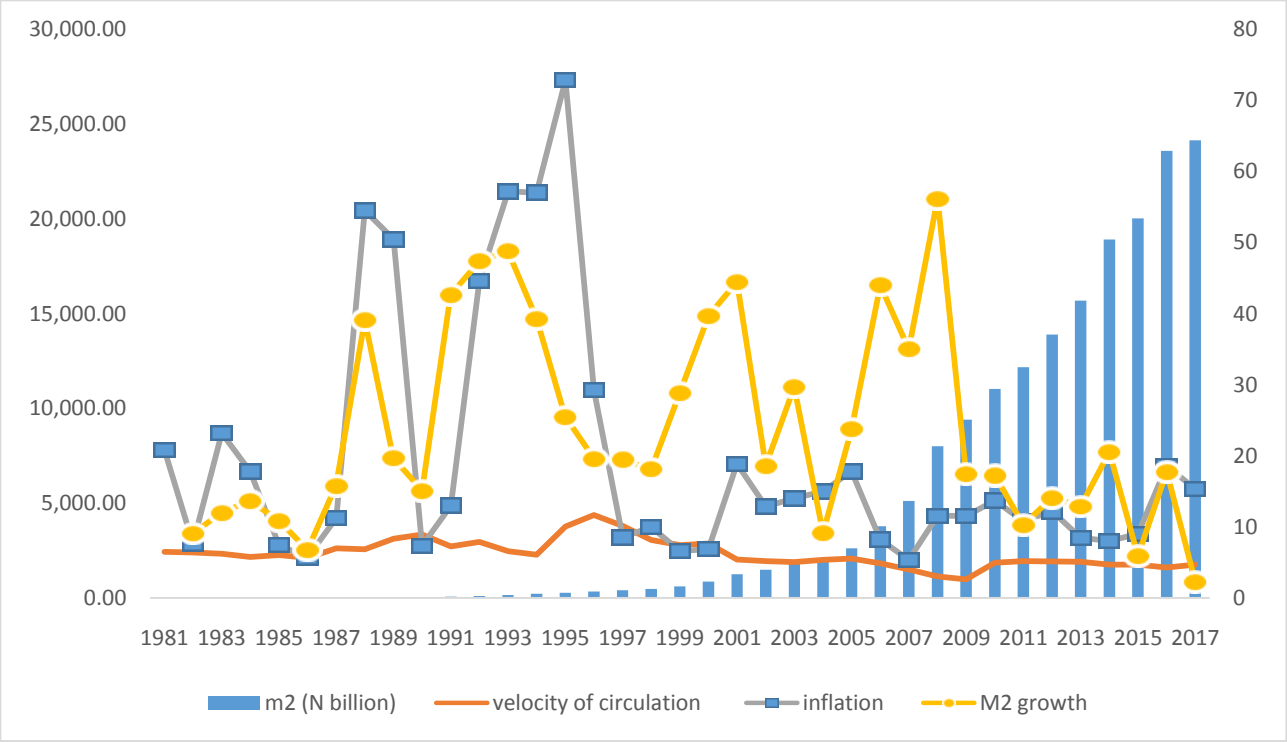
Accordingly, Mankiw (2003) and Froyen (1990) observed that within analytical framework of determination of price in money market, the price level is a direct function of interest rate and money supply and also a reverse function of national income.

(c). Money Stock, Velocity of Circulation and Inflation: Trend and Pattern

The primary target of most central banks is to maintain price stability and subsequently support sustainable economic growth, full employment and effective utilization of resources in general. To achieve this, it regulates the stock of money within the economy. Money could be narrow (M1) or broad (M2 or M3). Narrow money (M1) is defined to include currency in circulation plus current account deposits with commercial banks. Narrow money has been the target of monetary control until early 90s when the CBN started targeting the broad money. Broad money measures the total volume of money supply in the economy and is defined as narrow money plus savings and time deposits with banks including foreign denominated deposits. As noted by Bawa et al (2016), there could be nontrivial implication for the economy if money stock available to economic agents exceeds the level of total output of the economy. When money stock exceeds the level the economy can efficiently absorb, it dislodges the stability of the price system, leading to inflation or higher prices of goods. The CBN can control the quantity of money in the economy through its influence on base money. Base money is made up of currency and coins outside the banking system plus the deposits of banks with the central bank. If the central bank perceives that there is too much money in circulation and prices are rising (or there is potential pressure for prices to rise), it may reduce money supply by reducing the base money. To reduce the base money, the central bank sells financial securities to banks and the non-bank public so as to reduce the ability of deposit money banks to create new money. The central bank can also reduce the money stock by also raising the cash reserve deposits that banks are required to hold

with the central bank. The larger the deposit balances on bank balance sheets, the higher their ability to create more money. Thus, Central bank monetary control targets growth in money stock so as to control price distortions.

Figure 2.3 Trend of M2, Velocity of circulation, Inflation and M2 growth



Source: CBN (2018)

As shown in Figure 2.3, while money stock has increased progressively over the years, growth in money stock has rather been eclectic. Money stock stood at N14.47 billion in 1981. It rose to N22.30 billion in 1985 and further to N52.86 billion in 1990. By 1995, total money stock had risen to N289.09 billion. The advent of the fourth republic and series of reforms of the Obasanjo led administration led to significant economic expansion. Consequently money stock also expanded substantially rising from N878.46 billion in 2000 to N2, 637.91 billion, 11.034.94 billion and N18, 913 billion in 2005, 2010 and 2014 respectively. It further rose slightly to N20,

029.83 billion and N24, 140.63 billion in 2015 and 2017 respectively. On the other hand, M2 growth stood at 9.09% in 1981. Money stock grew by 10.91%, 15.15%, 25.53% and 39.67% in 1985, 1990, 1995 and 2000 respectively.

Following the banking reforms of 2004, money growth decreased to 23.74%, 17.25% and 10.31% in 2005, 2010, and 2011 respectively. It increased to 14.15% and decreased to 12.91% in 2012 and 2013 respectively. Money growth, however, rose sharply to 20.55% in 2014. The built-up to 2015 election may be responsible for this sudden growth. Money growth declined to 5.9% in 2015, rose to 17.78% in 2016, and collapsed sharply to 2.33% in 2017. Figure 2.3 suggest possibility of association between money growth and inflation as inflation appears to co-move with money growth. Inflation rate declined slightly from 7.44% in 1985 to 7.36%. The inflation rate rose sharply to 72.84% in 1995 and fell sharply to 6.93% in 2000. It however rose to 12.22% in 2012 and further to 18.55% in 2016. In 2017, inflation rate fell slightly to 15.37%. According to CBN (2018), broad money (M2) grew by 6.52 per cent in October 2018 over its level at the end-December 2017; and annualized to a growth rate of 7.82 per cent, which was below the provisional benchmark of 10.48 per cent for 2018. The growth in M2 was largely due to the significant growth in Net Foreign Assets (NFA) which grew by 20.71 per cent in October 2018, annualized to 24.85 per cent which is above the 2018 provisional growth benchmark of 14.50 per cent.

Another important monetary variable defined in the quantity theory is velocity of circulation of money stock. The volume of money stock and its speed of circulation link money to the economic activity in a country. Therefore, the velocity of money is very crucial in the design and implementation of monetary policy. Indeed, the numerical value of velocity of money plays a major role in ensuring the effectiveness of monetary control for purpose of ensuring price

stability in any country. Within the framework of the original quantity theory of money, velocity was treated as a constant with the implication that an expansionary monetary policy need not be questioned because it would certainly affect nominal output levels. Only velocity has not been constant, Figure 2.3 shows that trend in the velocity of money in Nigeria has not changed substantially. Velocity of money increased from 6.5 in 1981 to 8.9 in 1990 and declined to 7.6 in 2000. It declined to 5.43, 5.1, 4.9 and 2.6 in 2001, 2003, 2006 and 2009. It however increased to 4.9 in 2010 and 5.1% in 2013. Velocity of money however declined slightly to 4.7% and hovered around that value up till 2017.

2.2 Review of Empirical Literature

There is plethora of empirical literature on the demand for money. In this section, the reviewed studies are presented and discussed under two subheadings, namely oversea studies and Nigerian studies. The oversea studies are studies on all countries of the world other than Nigeria. It also includes cross-country studies. On the other hand, Nigerian studies include all studies that focused exclusively on Nigeria.

2.2.1 International Studies

Simmons (1992) estimated demand for M1 for five African countries (Democratic Republic of Congo, Cote D'lvoire, Mauritius, Morocco, and Tunisia) within an ECM framework. The study utilized quarterly time series for the period 1960 to 1990. The variables included in the ECM are domestic interest rate, US interest rate, M1, and inflation rate. In the case of Cote D'lvoire, Mauritius and Morocco, he found that the domestic interest rate plays a significant role in explaining the demand for M1 in the long-run. However, this finding does not apply in Democratic Republic of Congo and Tunisia.

Fielding (1994) extended the classical money demand to include terms that reflect the variability of real rates of return. Specifically, he applied the Johansen Maximum Likelihood (JML) technique to quarterly data for Cameroon, Ivory Coast, Nigeria and Kenya in order to estimate demand for M2. The obtained income elasticity estimates for Cameroon, Ivory Coast and Nigeria were 1.5, 1.58 and 0.72 respectively. For Kenya, three cointegrating vectors were obtained with a statistically insignificant income elasticity estimate. Fielding's findings imply that given the degree of heterogeneity in the four countries selected, it would be difficult to formulate an efficient monetary policy which is invariant across these four countries; thus monetary policy in developing countries may need to be applied on a case-by-case basis.

Siklos (1995) examined the demand for money in New Zealand using quarterly data for the period 1981:1 – 1994:2. Using the Johansen and Juselius cointegration technique, Siklos found a unique cointegrating vector linking real M3 to income, the expected rate of inflation and the difference between the short-run interest rates in Newzealand (NZ) and the United States (US). He argues that because transactions on capital account have been deregulated, the demand for M3 should include interest rate differential. His results indicate that one cannot reject the null of no cointegrating vector unless the US-NZ interest differential is included in the cointegrating vector. However, he used current inflation rate as a proxy for inflation expectation. This overbearing assumption could engender biased outcome (Gujarati, 2004; Woodridge, 2012).

Ghartey (1998) estimated the demand for narrow money (M1) using the Engel Granger and JML Techniques for the period 1970 – 2002. The study utilized domestic exchange rate, per capita income, consumer price index and term of trade as explanatory variables. The result obtained shows that narrow money is stable in Ghana. This suggests that narrow money could be used for

monetary targeting in Ghana. The result however raises more questions about the stability of the use of narrow money as a measure of money demand.

Nell (1999) also attacked Ghartey (1998) for not including any opportunity cost variables (such as interest) in the money demand model. In this regard, Nell (1999) empirically evaluated the existence of a stable long-run demand for money over the period 1965 – 1997 in South Africa using M1, M2 and M3. The study also included interest rate in the money demand function. The empirical results suggest that M3 was stable while M1 and M2 display parameter instability. This suggests that M3 money stock could serve as an indicator for monetary policy for South Africa.

Bahmani-Oskooee and Barry (2000) carried out an investigation on the stability of the broad money (M2) money demand in Russia using OLS. M2 was used as the dependent variable while income, long-term interest rate, bilateral exchange rate and financial innovation were the independent variables. The result obtained showed evidence of cointegration among the variables and M2 is not stable. The Cumulative Sum (CUSUM) showed that M2 is stable, while the Cumulative Sum of Squares (CUSUMSQ) revealed that M2 money demand is not stable. Due to the divergences in the result findings, it was concluded that the Russian M2 money demand is unstable.

Also, Bahmani-Oskooee (2001) used OLS with data from 1970 to 2008 to examine the determinants and stability of money demand in Japan. M2 was used as the dependent variable while interest rate, exchange rate and inflation rates were used as the explanatory variables. The results obtained revealed that the lagged value of money demand is not only correctly signed, but statistically significant to money demand. The effect of interest rate and exchange rate are also

particularly remarkable. Though the interest rate is not correctly signed, it is statistically significant and plays an important role in the determination of money demand.

Nachega (2001) applied a cointegrated analysis and error correction modeling to investigate the behaviour of broad money demand in Cameroon over 1963/64 – 1993/1994. The variables studied include M2, real GDP, real interest rate, effective exchange rate and price level. The cointegrated VAR analysis identified a stable money demand and an excess aggregate demand relationship for Cameroon. Further empirical estimates provided support for both purchasing power parity (PPP) and an international Fisher parity between Cameroon and France.

Valadkhani (2002) also employed cointegration approach to the study of money demand. He examined the long-run determinants of the demand for M3 in New Zealand using quarterly data for the period 1988:1 to 2002:2. The variables used include real income, the spread between interest on money and non-money assets, the expected rate of inflation, and the effective exchange rate. His result finding was that demand for money is co-integrated with real income, the spread between interest on money and non-money assets, the expected rate of inflation, and the real effective exchange rate. Valadkhani (2002) therefore concluded that money demand in New Zealand is stable. Bahmani-Oskooee (2005), however, argued that cointegration test is not sufficient to conclude that money demand is stable.

Wesso (2002) examined the stability of money demand in South Africa. The study used single equation error correction (with fixed and variable coefficients) model with quarterly data for the period 1970 to 1998. Broad money (M2) was used as the dependent variable while the explanatory variables include real GDP, stock prices, short-term interest rate and inflation rate. The long-run model was estimated using OLS and the stability test was implemented using both

CUSUM and CUSUMSQ at 5% significance level. The result showed that money demand is stable in South Africa. The use of inflation as an explanatory variable in demand for money equation by Wesso (2002) has been contended. Gujarati (2004) showed that inflation expectation is not an approximation of inflation rate. Inflation expectation can be modeled using Koyck transformation and Gujarati (2004) argued that the predicted values are significantly different from current inflation values.

Sterken (2004) used quarterly data over 1996:4 to 1994:4 period to estimate M1 demand for Etiopia. With the use of JML, a long-run equilibrium condition was identified relating to real per capita money demand, real per capita GNP, shortage and the real export price of coffee. The income elasticity exceeds unity and there is some evidence of instability in M1 demand during the period 1974 to 1975, perhaps, due to changes in political regimes and natural disasters. This use of cointegration to test for the stability of money demand was contested by Bahmani-Oskooee (2005). Bahmani-Oskooee (2005) therefore carried out an investigation to examine the stability of money demand for a group of emerging market countries namely India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, and Thailand using panel least square technique as well as CUSUM and CUSUMSQ techniques. The results suggest that in most of those countries money demand could be unstable, even when monetary aggregates are cointegrated with their determinants.

Todani (2005) used a co-integrated VAR to explore the money demand in South Africa. The study used quarterly time series from 1980Q1 to 2002Q4. The variables studied include broad money, GDP, foreign interest rate, net foreign asset, domestic interest rate and price inflation. The result shows a weak relationship between money and inflation, as well as, a stable long-run co-integrated money demand relation.

Sekwati (2008) sought to investigate whether M1, M2 and M3 monetary aggregates in Botswana exhibit stability characteristics. This is achieved by employing stationarity tests and cointegration techniques to monthly data on these aggregates. The results indicate a stable relationship for M2 and M3 aggregates but not for M1, suggesting that M2 and M3 may be used as targets of monetary policy. Although formal tests of convergence on M2 and M3 were not employed, Sekwati (2008) suggested that the fact that M3 is made up of Bank of Botswana certificates among others implies that M3 would be a better target than M2.

Bahmani-Oskooee and Gelan (2015) investigated the stability of M2 money demand using quarterly data for 21 African countries including Nigeria between 1971:1 and 2004:3 using the Autoregressive Distributed Lag (ARDL) technique and obtained a long-run relationship between M2, the inflation rate, income and the nominal exchange rate for all countries. Application of CUSUM and CUSUMSQ tests revealed that the estimated models were stable in all cases.

Azim et al (2016) estimated the demand for money in Pakistan using ARDL technique with annual data from 1973 to 2007. The variables used include M2 (dependent variable) and income, inflation and exchange rate (explanatory variable). The results show that there is a unique co-integrated long-run relationship among M2 monetary aggregate, income, inflation and exchange rate. The income elasticity and inflation coefficients are positive while the exchange rate elasticity is negative. The overall result shows that the M2 money demand is stable.

Drama and Yao (2016) examined the stability of broad money in Cote d'lvoire. The study utilized time series from 1980 to 2007 with Johansen Maximum Likelihood (JML). This technique was used to estimate money demand with GDP, nominal exchange rate, inflation rate

and interest rate as explanatory variables. The result reveals that M2 was not stable within the period under study.

Nchora and Adameca (2017) examined the demand for broad money and its stability in Ghana. The study covered the period of 1990 to 2014, with annual time series on M1, M2, GDP and interest rate. Johansen's cointegration approach and error correction mechanism were employed. The study estimated the results using two set of variables for real demand for money: M1 and M2. This was done given the assumption that the demand for money was equal to the supply of money. The results show that, GDP affects the level of demand for money in the long run while the interest rate affects it in the short run. The error correction term in each of the cases shows that, 18% of deviations in the real demand for money are corrected annually. The CUSUM tests of parameter stability showed that, money demand was stable over the period and the Chow test indicated that there were no structural breaks.

Albulescu and Pépin (2018) studied the long-run money demand in Central and Eastern European (CEE) Countries using open-economy model (OEM), which considers a currency substitution effect, than by a closed-economy model (CEM). They also derived two different measures of monetary overhang and compared the ability of the OEM-based and the CEM-based measures of monetary overhang to predict inflation in the CEE countries, namely the Czech Republic, Hungary and Poland. All estimations were carried out using fixed effect panel least square procedure. While they could not detect a significant difference of forecast accuracy between the two competing models, they showed that the OEM-based forecast model that reveals a stable long-run money demand encompasses the CEM-based version for the CEE countries.

2.2.2: Nigerian Studies

As noted earlier, empirical investigation of the demand for money in Nigeria started with the works Tomori (1972), Ajayi (1974), Teriba (1974), Ojo (1974) and Odama (1974) which later earned the toga, 'TATOO' debate (the word, 'TATOO' was derived from the names of the authors). Thus, any meaningful evaluation of the empirical literature in Nigeria would start from the TATOO debate. Tomori (1972) investigated the demand for money dynamics in the Nigerian economy. As noted by Tomori (1972), the study sought to examine the factors which have influenced the demand for money in the Nigerian economy, establish whether there is or there is not a stable demand for money, and examine what constitutes a better definition of money in the Nigerian context. He adopted a very simple linear model which expressed nominal (and real) narrow (and broad) money as a function of either nominal (or real GNP – a proxy for income or both income and interest rate (official discount rate) representing the opportunity cost of holding money, the model was estimated using annual data for the period 1960 – 1970, while a test for stability was conducted by running a separate regression for the period 1960 – 1966 and comparing the coefficients obtained with that of the full sample. From the results obtained, Tomori (1972) concluded that income is a significant variable explaining variations in the demand for money irrespective of which definition is adopted, income is a more important variable determining the demand for money than the interest rate, the narrow definition of money seems to perform better than the broad definition and the coefficient of interest rate is not significant and this seems to confirm the proposition that there is a stable demand for money in the period under review.

The methodology and conclusions for Tomori's work generated a lot of controversy among monetary economists. Ojo (1974), commenting on Tomori's paper seriously questioned the appropriateness of his statistical methodology, the measure of real interest rate adopted in the

demand for money equation and some of the conclusions reached. Consequently, he specified and estimated (using OLS technique) two kinds of relationship (in log-linear form) between money and its determinants. He first specified real money balances as a function of current nominal income and interest rate. Following the insignificance of interest rate variable in this equation, he specified real money balances as a function of nominal income and rate of inflation. In this framework he adopted the adaptive expectations hypothesis to derive the expected rate of inflation that eventually entered the equation for money demand. His estimate of this equation suggests that the demand for money is inelastic with respect to income and price change expectations. The coefficient of inflation rate appeared with the right (negative) sign and was statistically significant, thus, confirming Ojo's belief that physical goods are close substitutes for money in our type of economy.

In the same vein, Teriba (1974) observed that Tomor's paper suffered from several methodological pitfalls and interpretational defects, including the problems of inadequate model specification. In order to remedy the shortcomings of Tomori's paper, Teriba advocated for the inclusion of different interest rates, either individually or in combination, so as to throw more light on the degree of substitutability between money and other financial assets and also to identify the closest substitutes for money. Employing the OLS technique and the log-linear relationship between real balances (or its components) and its determinants, Teriba specified and estimated a short-run demand for money that relate real balances and a variety of interest rates – federal government long-term interest rate, RL; Central Bank short term interest rate (RS); time deposit interest rate (RM); and savings deposit interest rate. A war dummy was included to account for the civil war years (1967 – 1969. On the basis of his empirical work, Teriba arrived at the following conclusions. First, of all the assets included in the study, time deposits are the

closest substitute for money narrowly defined or its components – currency and demand deposits. Second, real income is the most important variable determining the demand for money as well as the components. Third, there are evidences that to some extent treasury bills are also close substitutes for money or currency, while savings deposit appears to be close substitute for demand deposits than treasury bills.

Ajayi (1974) in addition to criticizing Tomori's (1972) paper, sought to address the short-comings inherent in the paper. Specifically, Ajayi sought to provide answers to such questions as the stability of money demand, the adjustment mechanism and calculation of elasticities for policy decision making. Like Teriba, Ajayi employed the partial adjustment framework, but instead he specified his equation in linear form with real balances (the nominal balances), narrow and broad expressed as a function of current nominal income, short-term interest rate and lagged real (or nominal) balances. Using the OLS technique to estimate the equations, Ajayi came to the following conclusions. First, income alone explains about 81% of the demand for money when the wider definition is used. Second, interest rates have wrong signs and are statistically insignificant. Third, the wider definition of money performs better irrespective of whether real or nominal balances are adopted. And finally, interest elasticity of the demand for money at the mean is low, while the income elasticity is high ranging from 1.5 to 1.9 for nominal money balances, thus, indicating that the demand for money is not sensitive to interest rate. However, income elasticity for real balances using both narrow and broad money are less than unity and the speed of adjustment is fast.

Similarly, Odama (1974) criticized the econometric technique adopted by Tomori emphasizing the error in approaches. Specifically, his comments focused on two aspects of Tomori's results. The first concerns the formulation of an alternative model and the relevance of such a model for

policy actions. The second relates to the statistical results and the conclusion there from. According to him, Tomori's model is devoid of any policy use in view of the fact that the only policy instrument (discount rate) turned out to be statistically insignificant. He cautioned that the result in Tomori's paper should be interpreted with utmost caution. Thus, he estimated the short run demand for money using Engel-Granger error correction procedure. The variables used include M1, nominal income and money market interest rate. His findings indicate that both interest rate and income are significant determinants of money demand in Nigeria.

The World Bank (1991) in a preliminary study of money demand relation in Nigeria specified and estimated log-linear relationship for real broad money for the period 1961 to 1966 and 1974 to 1989 using annual data. Implicitly assuming instantaneous adjustment, the study specified real demand for broad money as a function of non-agricultural GDP, the rate of inflation and the real deposit rate. All the variables turned out with the expected signs and were all significant at the one per cent level. The main conclusions were that the results of the estimates were stable over different periods, the elasticity of money demand with respect to non-agricultural GDP growth was about 1.2, and as inflation rises, depositors are marginally less willing to hold money, while as real interest rate rises, they seem to be slightly less willing to hold money in the banking system.

Anoruo (2002) explored the stability of the M2 money demand in Nigeria in the Structural Adjustment Program (SAP) period. The variables used include M2, discount rate, national output. Johansen and Juselius cointegration technique, Hansen stability test and CUSUM and CUSUMQ stability test were employed to test the stability of money demand. The results from the Johansen and Juselius cointegration test suggest that real discount rate, economic activity and real M2, are cointegrated. The Hansen (1992), CUSUM and CUSUMQ stability test results

indicate that M2 money demand in Nigeria is stable for the study period. The results of the study show that M2 is a viable monetary policy tool that could be used to stimulate economic activity in Nigeria.

Omotor and Omotor (2011) investigated the stability of money demand for the period 1960-2008. The study utilized M2 as a measure of demand for money. Interest rate, actual inflation rate and real GDP were used as explanatory variables. The research model was estimated using ECM. The result obtained indicates that money demand is stable. Structural break was also identified in 1994. The use of actual inflation instead of expected inflation could undermine the estimates (Gujarati, 2004). Again, since it is household income that explains the responsiveness of individuals to income changes, it is more intuitive to use income per head rather than national income.

Onafowora and Owoye (2012) used cointegration vector error correction analysis to test the stability of the demand for real broad money (M2) in Nigeria over the quarterly period 1986:1 to 2001:4 in order to ascertain whether macroeconomic developments such as the implementation of the structural adjustment programme (SAP) in 1986; the liberalization of the exchange rate, domestic interest rate, and capital accounts; financial deepening and innovations; changes in monetary policy regimes; and increased integration of the economy with the rest of the world may have caused the real broad money demand to become structurally unstable. The result obtained indicates that there exists a long-run relationship between the real broad money aggregate, real income, inflation rate, domestic interest rate, foreign interest rate, and expected exchange rate. Furthermore, both the CUSUM and CUSUMSQ tests confirm the stability of the short- and long run parameters of real money demand.

Iyoboyi and Pedro (2013) estimated the narrow money demand for Nigeria from 1970 to 2010 using ARDL procedure. The study first tested for stationarity using Augmented Dickey-Fuller (ADF), and Philip-Peron (pp) unit root tests. Empirically results found co-integration relations among narrow money demand, real income, short-term interest rate (STIR), real expected exchange rate (REER), expected inflation rate (EIR), and foreign real interest rate (FRIR) in the period under review. Real income and interest rate are significant variables explaining the demand for narrow money in Nigeria, although real income is a more significant factor in both the short and long terms.

Nduka, Chukwu and Nwakaire (2013) examined the long-run demand for real broad money and its stability in Nigeria for the period of 1986 to 2011. The study employed Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) tests for unit root, Engle-Granger (1987) approach for cointegration, CUSUM and CUSUMSQ tests for stability. The ADF and PP tests suggest that variables are mean reverting series after first order difference. The results of the stability and cointegration tests confirm that a stable, long-run relationship exists between demand for real broad money and its determinants: income, domestic real interest rate, expected rate of inflation, expected foreign exchange depreciation, and foreign interest rate. The empirical results show that the income elasticity and foreign interest rate coefficients are positive while, the domestic real interest rate, inflation rate, and exchange rate depreciation coefficients are negative respectively.

Imimole and Uniamikogbo (2014) empirically examined broad money demand and its stability in Nigeria for the period 1986Q1 to 2010Q4 using the Autoregressive Distributed Lag (ARDL) Bounds testing procedure. The aim was to ascertain whether the recent macroeconomic developments in the country from the inception of the Structural Adjustment Programme (SAP) in 1986, have resulted in the real broad money demand becoming structurally unstable, and

whether the stability of money demand supports the choice of M2 as a viable instrument for policy implementation in Nigeria. The empirical results indicate that a long-run relationship exists between M2 money aggregate and its determinants during this period, and that M2 money demand in Nigeria is stable. The CUSUM and CUSUMQ test conducted confirm that the short and long run parameters of the real broad money demand are robust, and exhibit remarkable stability. This finding validates the use of M2 monetary aggregate as a nominal anchor for monetary policy implementation.

Doguwa, Olowofeso, Uyaebo, Adamu and Bada (2014) estimated money demand in Nigeria in the aftermath of the recent global financial crisis and examined whether its underlying properties have changed over the years. Specifically, the existence of a stable long-run demand for money during the period 1991:Q1-2013:Q4, while accounting for the possibility of structural breaks is investigated. The Gregory-Hansen residual based test for cointegration detected both intercept and regime shifts in 2007:Q1 as the null of no cointegration is rejected at 1 per cent significance level, indicating that long run relationship exists between real money supply, real income, real monetary policy rate, exchange rate spread and movements in exchange rate in Nigeria. The CUSUMSQ test provides evidence of a stable money demand before and after the crisis.

Okonkwo, Ajudua and Alozie (2014) sought to identify the variables influencing demand for money in Nigeria; and to ascertain the stability of money demand in Nigeria. Related theories and empirical researches in this area were reviewed in order to ensure the relevance of variables under study and possible expectation of their relationship with money demand in Nigeria. Four explanatory variables were specified for this study, namely interest rate, inflation rate, foreign interest and net foreign asset. The ECM and both CUSUM and CUSUMSQ suggest that money demand is unstable.

Onakoya and Yakubu (2016) analyzed the stability of money demand in Nigeria using annual time series data on broad money, real GDP growth rate, inflation rate and interest rate from 1992 to 2014. The study employed the use of OLS regression analysis, stationarity test and stability test. The study found out that the plot of the cumulative sum of recursive residuals (CUSUM) provided evidence of stability, the plot of the cumulative sum of squares of recursive residuals (CUSUMSQ), on the other hand, revealed instability of some parameters between 2000 and 2005, and the parameters are stable after the periods. The study concludes that M2 (broad) money demand is stable in Nigeria for the study period and stood the Nigerian monetary authority in good stead for monetary policy deployment during the study period.

Kumar, Webber and Fargher (2017) present an empirical investigation into the level and stability of money demand (M1) in Nigeria between 1960 and 2008. In addition to estimating the canonical specification, alternative specifications are presented that include additional variables to proxy for the cost of holding money. The variables studied include narrow money (M1), broad money (M2), nominal exchange rate, interest rate and inflation rate. The estimation procedure was OLS. Results suggest that the canonical specification is well-determined, money demand relationship went through a regime shift in 1986 which slightly improved the scale economies of money demand, and money demand is stable for M1 but not for M2.

Akpansung and Umkanagwa (2018) examined money demand and its stability in Nigeria from 1970 to 2016. The study employed robust least squares (RLS) regression method for the estimation of money demand, while CUSUM and CUSUMSQ were used to examine the stability of money demand. Multiple Breakpoints test approach was adopted to investigate structural breakpoints. The study found real income, interest rate, inflation rate, foreign interest rate as key determinants of money demand in Nigeria during the period covered by the study. Stability test

revealed unstable money demand and evidence of structural breaks in 1986, 1987, 1995, 1999, 2002, 2005, 2007 and 2008. This paper inferred that Central Bank of Nigeria should target broad money aggregates to control inflation in Nigeria.

Similarly, Tule, Okpanach, Ogiji and Usman (2018) re-examines broad money (M2) demand and its stability in Nigeria using the Autoregressive Distributed Lag (ARDL) bounds testing procedure. The study covered the period of 1986 to 2016. The variables used include broad money, real income, nominal interest rate and inflation rate. First, the results indicate that a stable long-run relationship exists between M2 and its determinants including GDP, interest rates and inflation rate.

Table 2.3(a) Summary of Reviewed Empirical Literature (International Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Simmons (1992)	Democratic Republic of Congo, Cote D'lvoire, Mauritius, Morocco, and Tunisi	To estimate the demand for M1	domestic interest rate, US interest rate, M1 and inflation rate	ECM framework	In the case of Cote D'lvoire, Mauritius and Morocco, he found that the domestic interest rate plays a significant role in explaining the demand for M1 in the long-run.	The study did not investigate money demand stability
Fielding (1994)	Cameroon, Ivory Coast, Nigeria and Kenya	To estimate demand for money with variability of real rate of return	Interest rate, M2, bond yield, income, inflation	Johansen Maximum Likelihood (JML) technique	Found it would be difficult to formulate an efficient monetary policy which is invariant across these four countries	The study did not investigate money demand stability
Siklos (1995)	New Zealand	examined the demand for money	real M3, short run interest rate, interest, income, exchange rate	Johansen and Juselius cointegration technique	results indicate that money demand function is stable	The study did not include financial innovation and effective exchange rate
Ghartey (1998)	Ghana	To estimate the money demand of money in Ghana	domestic exchange rate, per capita income, consumer price index and term of trade	Engel Granger and JML Techniques	The result obtained shows that narrow money is stable in Ghana. This suggests that narrow money could be used for monetary targeting in Ghana.	The study did not include financial innovation and effective exchange rate
Nell (1999)	South Africa	To evaluate the existence of a stable long-run demand for money over the period 1965 – 1997	M1, M2, M3, interest rate, income, inflation, bilateral exchange rate	OLS	The empirical results suggest that M3 was stable while M1 and M2 display parameter instability.	The study did not include financial innovation and effective exchange rate

Table 2.3(a) Summary of Reviewed Empirical Literature (International Studies) Cont'd

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Bahmani-Oskooee and Barry (2000)	Russia	investigation on the stability of the broad money (M2) money demand	M2, income, long-term interest rate, bilateral exchange rate and financial innovation	OLS	Due to the divergences in the result findings, it was concluded that the Russian M2 money demand is unstable	The study used single equation estimation framework and did not account for simultaneity
Bahmani-Oskooee (2001)	Japan	To examine the determinants and stability of money demand	M2, interest rate, exchange rate and inflation rates	OLS	The results obtained revealed that the lagged value of money demand is not only correctly signed, but statistically significant to money demand.	The study did not include financial innovation and effective exchange rate
Nachega (2001)	Cameroon	To investigate the behaviour of broad money demand	M2, real GDP, real interest rate, effective exchange rate and price level	cointegrated VAR	The analysis identified a stable money demand function and an excess aggregate demand relationship	used single equation estimation framework and did not account for simultaneity
Wesso (2002)	South Africa	To examine the stability of money demand	M2, real GDP, stock prices, short-term interest rate and inflation rate	OLS	The result showed that money demand is stable in South Africa.	used single equation estimation framework and did not account for simultaneity

Table 2.3(a) Summary of Reviewed Empirical Literature (International Studies) Cont'd

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Valadkhani (2002)	New Zealand	To examine the long-run determinants of the demand for M3	M3, real income, the spread between interest on money and non-money assets, the expected rate of inflation, and the real effective (trade weighted index) exchange rate	Johanson co-integration technique	His result finding was that the demand for money is co-integrated with real income, the spread between interest on money and non-money assets, the expected rate of inflation, and the real effective (trade weighted index) exchange rate.	used single equation estimation framework and did not account for simultaneity
Sterken (2004)	Etiopia	To estimate M1 money demand	real per capita money demand, real per capita GNP, shortage and the real export price of coffee	JML	income elasticity exceeds unity and there is some evidence of instability in M1 money demand	used single equation estimation framework and did not account for simultaneity
Bahmani-Oskooee (2005)	India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, and Thailand	To examine the stability of money demand for a group of emerging market countries	M1, M2, money market interest rate, per capita income, price level	Panel OLS	The results suggest that in most of those countries money demand could be unstable, even when monetary aggregates are cointegrated with their determinants	The study did not include financial innovation and effective exchange rate

Table 2.3(a) Summary of Reviewed Empirical Literature (International Studies) Cont'd

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Todani (2005)	South Africa	to explore the demand for money	broad money, GDP, foreign interest rate, net foreign asset, domestic interest rate and price inflation.	co-integrated VAR	The result shows a weak relationship between money and inflation, as well as, a stable long-run co-integrated money demand relation.	The study did not include financial innovation and effective exchange rate
Todani (2005)	South Africa	to explore the demand for money	broad money, GDP, foreign interest rate, net foreign asset, domestic interest rate and price inflation.	co-integrated VAR	The result shows a weak relationship between money and inflation, as well as, a stable long-run co-integrated money demand relation.	The study did not include financial innovation and effective exchange rate
Sekwati (2008)	Botswana	to investigate whether M1, M2 and M3 monetary aggregates in Botswana exhibit stability characteristics	M1, M2, M3, per capita income, interest rate, inflation	JML	The results indicatea stable relationship for M2 and M3 aggregates but not for M1, suggesting thatM2 and M3 may be used as targets of monetary policy	The study did not include financial innovation and effective exchange rate
Bahmani-Oskooee and Gelan (2015)	African countries	To investigate the stability of M2 money demand	M2, the inflation rate, income and the nominal exchange rate	Autoregressive Distributed Lag (ARDL)	Application of CUSUM and CUSUMSQ tests revealed that the estimated models were stable in all cases.	The study did not include financial innovation and effective exchange rate

Table 2.3(a) Summary of Reviewed Empirical Literature (International Studies) Cont'd

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Azim et al (2016)	Pakistan	To estimate the demand for money	M2, and income, inflation and exchange rate	ARDL	The results show that there is a unique co-integrated long-run relationship among M2 monetary aggregate, income, inflation and exchange rate.	The study did not investigate stability of money demand
Drama and Yao (2016)	Cote d'lvoire	To examine the stability of broad money in Cote d'lvoire	GDP, nominal exchange rate, inflation rate and interest rate	Johansen Maximum Likelihood (JML)	The result reveal that M2 was not stable within the period under study.	The study did not include financial innovation and effective exchange rate
Nchora and Adameca (2017)	Ghana	To examine the demand for broad money and its stability	M1, M2, GDP and interest rate	Johansen Maximum Likelihood (JML)	The results show that, GDP affects the level of demand for money in the long run while the interest rate affects it in the short run	The study did not investigate stability of money demand
Albulescu and Pépin (2018)	Central and Eastern European (CEE) Countries	To study the long-run money demand in Central and Eastern European (CEE) Countries using open-economy model (OEM),	M1, M2, inflation, bilateral exchange rate, interest rate, income	fixed effect panel least square	they showed that the OEM-based forecast model that reveals a stable long-run money demand encompasses the CEM-based version for the CEE countries.	The study did not include financial innovation and effective exchange rate

Table 2.3 (b) Summary of Reviewed Empirical Literature (Nigerian Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Tomori (1972)	Nigeria	To investigate the demand for money dynamics in the Nigerian economy	Nominal and real GNP, M1, M2, interest	OLS	the narrow definition of money seems to perform better than the broad definition and the coefficient of interest rate is not significant and this seems to confirm the proposition that there is a stable demand for money in the period under review	used single equation estimation framework and did not account for simultaneity
Ojo (1974)	Nigeria	To model the demand for money in Nigeria	M1, M2, current nominal income and interest rate, inflation	OLS	Found that the demand for money is inelastic with respect to income and price change expectations	used single equation estimation framework and did not account for simultaneity
Teriba (1974)	Nigeria	To examine the determinants of demand for money in Nigeria	M2, federal government long-term interest rate, RL; Central Bank short term interest rate (RS); time deposit interest rate (RM); and savings deposit interest rate,	OLS	real income is the most important variable determining the demand for money as well as the components	used single equation estimation framework and did not account for simultaneity

Table 2.3 (b) Summary of Reviewed Empirical Literature (Nigerian Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Ajayi (1974)	Nigeria	sought to provide answers to such questions as the stability of money demand, the adjustment mechanism and calculation of elasticities for policy decision making	real balances (the nominal balances), current nominal income, short-term interest rate and lagged real (or nominal) balances	OLS	the wider definition of money performs better irrespective of whether real or nominal balances is adopted	used single equation estimation framework and did not account for simultaneity
Odama (1974)	Nigeria	To reinvestigate the determinants of money demand in Nigeria.	M1, income and interest rate	ECM	His findings indicate that both interest rate and income are significant determinants of money demand in Nigeria.	used single equation estimation framework and did not account for simultaneity
World Bank (1991)	Nigeria	study of money demand relation in Nigeria	real demand for broad money, non-agricultural GDP, the rate of inflation and the real deposit rate	OLS	The main conclusions were that the results of the estimates were stable over different periods	used single equation estimation framework and did not account for simultaneity
Anoruo (2002)	Nigeria	Explored the stability of the M2 money demand in Nigeria in the Structural Adjustment Program (SAP) period.	M2, discount rate, national output	JML	The results of the study show that M2 is a viable monetary policy tool that could be used to stimulate economic activity in Nigeria.	The study did not include financial innovation and effective exchange rate

Table 2.3 (b) Summary of Reviewed Empirical Literature (Nigerian Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Kumar et al (2017)	Nigeria	empirical investigation into the level and stability of money demand (M1) in Nigeria between 1960 and 2015	narrow money (M1), broad money (M2), nominal exchange rate, interest rate and inflation rate	OLS	Results suggest money demand is stable for M1 but not for M2.	The study did not include financial innovation and effective exchange rate
Omotor and omotor (2011)	Nigeria	Investigating the stability of the demand for the period 1960-2008.	M2, Interest rate, actual inflation rate and real GDP	ECM	The result obtained indicates that money demand is stable. Structural break was also identified in 1994.	The study did not include financial innovation and effective exchange rate
Onafowora and Owoye (2012)	Nigeria	Test for stability of money demand	real broad money aggregate, real income, inflation rate, domestic interest rate, foreign interest rate, and expected exchange rate	ECM	confirm the stability of the short- and long run parameters of the real money demand.	The study did not include financial innovation and effective exchange rate
Iyoboyi and Pedro (2013)	Nigeria	estimated the narrow money demand for Nigeria from 1970 to 2010	narrow money demand, real income, short-term interest rate (STIR), real expected exchange rate (REER), expected inflation rate (EIR), and foreign real interest rate (FRIR)	ARDL	Real income and interest rate are significant variables explaining the demand for narrow money in Nigeria, although real income is a more significant factor in both the short and long terms.	Did not investigate stability of money demand

Table 2.3 (b) Summary of Reviewed Empirical Literature (Nigerian Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Nduka et al (2013)	Nigeria	examined the long-run demand for real broad money and its stability in Nigeria for the period of 1986 to 2011	income, domestic real interest rate, expected rate of inflation, expected foreign exchange depreciation, and foreign interest rate, broad money	OLS	The empirical results show that the income elasticity and foreign interest rate coefficients are positive while, the domestic real interest rate, inflation rate, and exchange rate depreciation coefficients are negative respectively.	used single equation estimation framework and did not account for simultaneity
Imimole and Uniamikogbo (2014)	Nigeria	empirically examined the broad money demand and its stability in Nigeria	M2, interest rate, nominal income, price level, bilateral exchange rate	ARDL	The empirical results indicate that a long-run relationship exists between M2 money aggregate and its determinants during this period, and that M2 money demand in Nigeria is stable	The study did not include financial innovation and effective exchange rate
Doguwa et al (2014)	Nigeria	estimated the money demand in Nigeria in the aftermath of the recent global financial crisis	real money supply, real income, real monetary policy rate, exchange rate spread and movements in exchange rate	OLS	The CUSUMSQ test provides evidence of a stable money demand before and after the crisis.	used single equation estimation framework and did not account for simultaneity
Okonkwo, et al (2014)	Nigeria	sought to identify the variables influencing the demand for money in Nigeria	interest rate, inflation rate, foreign interest and net foreign asset	ECM	Money demand is unstable	The study did not include financial innovation and effective exchange rate

Table 2.3 (b) Summary of Reviewed Empirical Literature (Nigerian Studies)

Author/Year	Location	Purpose of Study	Variables	Method of Analysis	Findings	Gap in Literature
Onakoya and Yakubu (2016)	Nigeria	analyzed the stability of money demand in Nigeria	broad money, real GDP growth rate, inflation rate and interest rate	OLS	The study concludes that M2 (broad) money demand is stable in Nigeria for the study period	used single equation estimation framework and did not account for simultaneity
Akpansung and Umkanagwa (2018)	Nigeria	examined money demand and its stability in Nigeria from 1970 to 2016	real income, interest rate, inflation rate, foreign interest rate	robust least squares (RLS)	Money demand is not stable	used single equation estimation framework and did not account for simultaneity
Tule, et al (2018)	Nigeria	re-examines broad money (M2) demand and its stability in Nigeria	broad money, real income, nominal interest rate and inflation rate	ARDL	Money demand is stable	The study did not include financial innovation and effective exchange rate

Researcher's Compilation

2.3 Summary of Literature Reviewed

In Nigeria, the discussion of money demand starts with the TATOO debate. The debate on the behavior and stability of money demand has continued to gather momentum since the early works christened the TATOO debate. On the stability of money demand, Tomori (1972), Anoruo (2002) and Omotor and Omotor (2014) obtained evidences that money demand is stable. However, Tomori (1972) and Anoruo (2002) used M1 as a measure of money demand while Omotor and Omotor (2014) used M2. Contrarily, Kumar et al (2017) and Okonkwo et al (2011) obtained evidence that money demand for Nigeria measured by M2 is unstable. According to Kumar et al (2017), M1 is, howbeit, stable.

Early researchers had specified money demand in terms of income and interest rate (Tomori, 1972, Ojo, 1974). However, since late 80s, researchers have continued to explore other potential determinants of money demand in Nigeria. Some of the determinants examined in recent literature include actual inflation (Omotor & Omotor, 2014), savings rate (Teriba, 1974; Onafowora & Owoye, 2012), time deposit rate (Nduka et al., 2013), nominal bilateral exchange rate (Kumar et al, 2017), discount rate (Anoruo, 2002), trade liberalization (Onafowora & Owoye, 2012) and capital balance (Onafowora & Owoye, 2012).

The findings documented so far indicate a near consensus that income is a key determinant of money demand (Tomori, 1972; Onakoya & Yakubu, 2016; Akpansung &Umkanagwa, 2018).

However, regarding the income elasticity of money demand, there is hardly any consensus. While some obtained income elasticity greater than unity, others obtained approximately unity. In addition, some others obtained evidences that money demand is income inelastic. In this case, income elasticity of demand for money is less than one (Ojo, 1974; Doguwa et al. 2014; Onafowora & Owoye, 2012).

Above all, the argument that money demand estimated using single equation model could be undermined by simultaneity bias is yet to gain traction in Nigeria. Most of the studies reviewed are estimated using single-equation model (Ojo, 1974; Anoruo, 2002; Onafowora & Owoye, 2012; Doguwa et al. 2014; Onafowora & Owoye, 2012; Omotor & Omotor, 2014; Onakoya & Yakubu, 2016; Akpansung &Umkanagwa, 2018).

2.4 Justification of the Study

From the review of empirical literature, it is clear that there is need to re-examine money demand for the following reasons:

First, Kia (2006) and Hsing and Jamal (2013) argument that **single-equation estimation** of the money demand could be undermined by **simultaneity bias necessitates a re-examination** of money demand in Nigeria within the context of **simultaneous equation system**. The problem is that the nuances in the existing research on stability of money demand could stem from estimation or specification inadequacies. Money demand and money supply are equally measured by the quantity of money. As noted by Gujarati (2004) and Woodridge (2003), except there is a money supply equation, money demand equation cannot be identified. Thus, if money demand is estimated as a single equation, or even recursively, there will be danger of **simultaneity bias**. Such bias could affect the measurement of elasticity and test of stability of the estimates. The indication is that the estimates obtained may have poor inferential properties. Thus, in this study, **we estimated money demand using simultaneous equation estimation procedure.**

Second, **the estimates of income elasticity** of money demand obtained in previous studies **are rift with substantial divergence.** For example, income elasticity obtained by Anoruo (2002), Owoye and Onafowara (2007), Kumar et al. (2017) and Nwafor et al (2007) are 5.7, 2.07, 1.2 and 5.4 respectively. **These conflicting estimates necessitate a re-examination of the demand for money**. Besides, although there is an overwhelming consensus that income is a key scale variable in money demand. Whether the income elasticity of money demand is unity (as proposed by Friedman) or not has remained unsettled. Income elasticity of money demand is very important: it is a barometer that predicts the inflationary effects of money growth. Thus, ascertaining the true value of income elasticity of money demand is critical.

Third, the dynamic nature of money demand suggests that money demand responds to changing economic complexities. One of such changing complexities that need to be interrogated in the

context of money demand is **financial innovation**. Since late 2000s, there is upsurge of financial innovation in Nigeria, and as noted by Maki and Kitasaka (2006) and Caporale and Gil-Alana (2005), financial innovation could be **a source of substantial instability** in money demand. **Thus, there is a need to re-examine money demand in the context of financial innovation.**

Fourth, the traditional model of money demand uses interest rate as the opportunity cost variables. However, in recent time, there is a subsisting argument that given the development of the stock markets and foreign sector, short term interest rate may not sufficiently capture the substitution effect. **For this reason, we adapted stock market returns** as an opportunity measure of money demand in similar manner as interest rate.

In addition, nominal exchange rate has been widely used in most studies in Nigeria. But as Nachega (2001) contended, effective exchange rate has a higher predictive power than bilateral exchange rate. Thus, the effect of exchange rate is better captured using effective exchange rate rather than bilateral exchange rate. **Thus, we adapted real effective exchange rate** as a determinant of money demand**.**

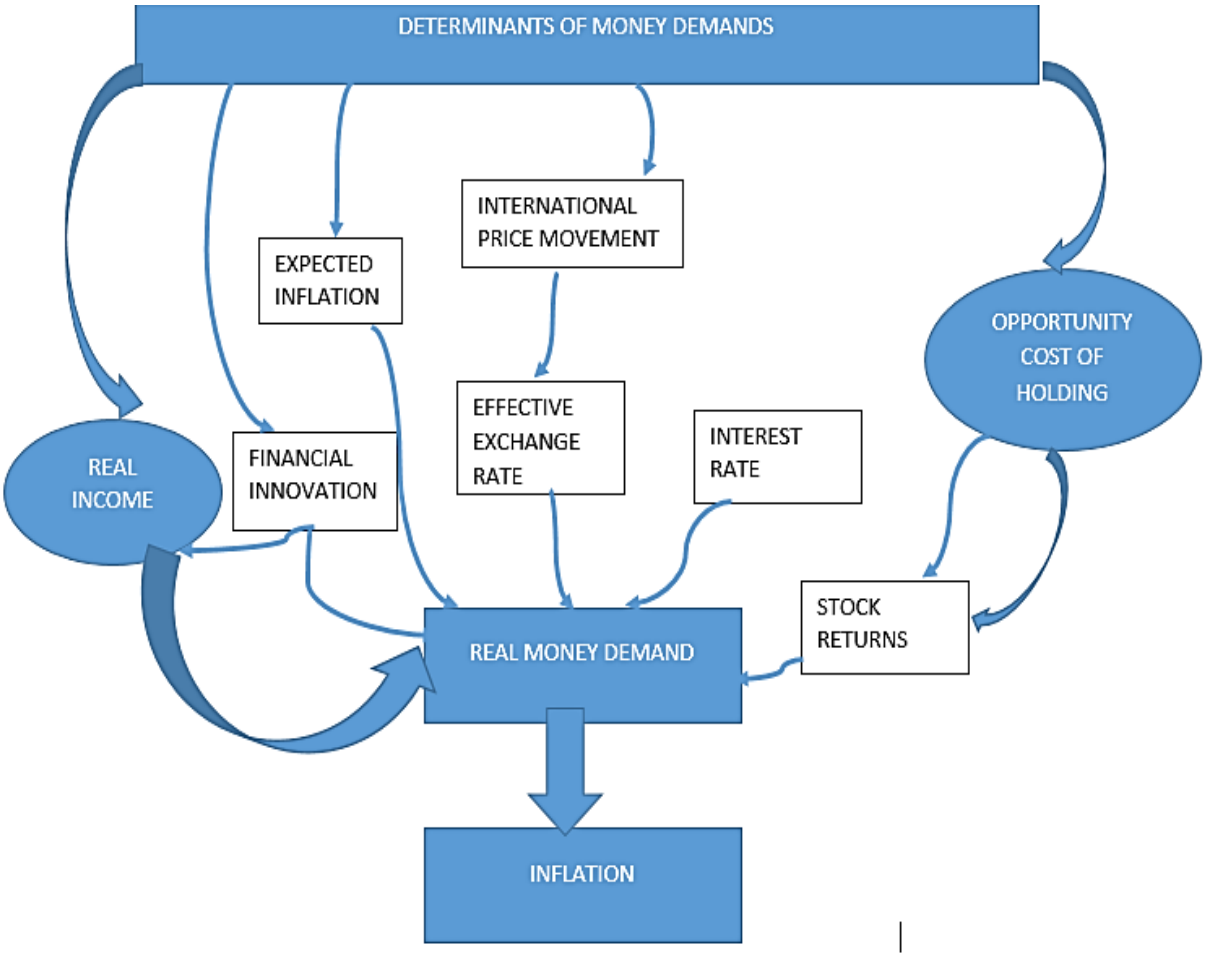
Finally, reliable quantitative estimates of money demand are critical for the management of price stability. This makes it expedient to obtain estimates that could be relied on by policy makers for the monetary and price management.

Conceptual Framework

Demand for real balances is a multipronged macroeconomic variable: it is determined by the interplay of several variables on one hand and could influence the equilibrium values of several other macroeconomic variables. During the era of TATOO debates, there were only two variables that were identified to be critical for the equilibrium value of demand for money. These

variables are income and interest rate (Tomori, 1972; Ajayi, 1974; Teriba, 1974; Ojo; 1974; Odama, 1974).

According to Keynes (1936), one of the motives for demanding money is for transaction purpose. Owoye and Onafowora (2007) also noted that the higher the income of an individual, the higher will be that individual's demand for cash and vice versa. Owoye and Onafowora (2007) view is quite intuitive since people with higher income are more likely to have greater transactions need.



Sources: Researchers Contribution
Figure 2.4 Conceptual Framework of the Study

Kumar et al. (2017), however, argued that the effect of real income on money demand would largely depend on financial innovation in the country. As shown in Figure 3.1, financial innovation has a direct impact on real income. If the financial system is well developed, there will be limited need to hold large cash for transaction purposes. This is largely because there is high access to credit. Easy access to credit implies that more expenditure can be made without cash, for example mortgages, telephone bills, hospital bills, newspaper delivery. People can also undertake transactions spending using credit cards. Again, if the financial system is well developed, economic agents would easily buy financial instruments, thereby holding limited cash balances.

Similarly, exchange rate and expected inflation could have nontrivial effect on money demand. Depreciation of the exchange rate could make economic agents desire to convert their naira holdings into foreign currencies (for example dollar) or foreign currency-denominated bonds, thereby reducing the holdings of real balances. Again, if exchange rate depreciation leads to price increases, real balances will decline. In the same vein, inflation expectation could change the proportion of real balances that people want to hold. If people expect that there will be inflation, they would demand for more balances.

Another important determinant of the demand for real balances is opportunity cost of holding real balances. Opportunity cost of holding real balances is the alternative earnings that one can get from investing on financial assets instead of holding cash. In Keynesian model, speculative demand for money is inversely related to the opportunity cost of holding real balances. For example, if interest rate is high, the opportunity cost of holding real balances increases and real balances decline. As shown in Figure 2.4, opportunity cost of holding real balances could be captured using money market interest rate and stock market returns.

Overall, demand for money could have serious implication for the price level. Figure 2.4 indicates that changes in demand for real balances could have price effect. Suppose the supply of money is fixed, increase in the demand for real balances will lead to increase in the value of money and decrease in the general price level. In other words, all things being equal, changes in real balances will lead to changes in the inflationary trend in the country.

CHAPTER THREE

RESEARCH METHODS

Scientific research requires stating explicitly the research procedure or method used to carry out a research. The essence of this requirement is to enable others interrogate the research outcome. In this chapter, the research methods adopted in this study are discussed. First, we presented the theoretical framework of this study. This is followed by model specification, estimation procedure and the protocol for estimation evaluation.

3.1 Theoretical Framework

The theoretical framework for this study is anchored on the monetarist theory of demand for money. The monetarist demand for money theory advanced by Friedman (1965, 1968, and 1984) has been viewed as a restatement of the classical quantity theory. As noted by Jhingan (2004), the classical economists did not explicitly formulate demand for money theory but they emphasized the transactions demand for money in terms of the velocity of circulation of money. This, according to the classical economist, is because money acts as the medium of exchange and facilitates the exchange of goods and services. Their views were expressed in the fisher's equation of exchange:

$$MV = PQ \qquad 3.1$$

Where; M = the quantity of money; V = its velocity of circulation; P = price level and Q = total output Here, MV = Money supply, while PQ represents the demand for money.

At equilibrium, money demand (PQ) equals money supply (MV). Jhingan (2004) further noted that the underlying assumption in the equation of exchange is that people hold money to buy

goods and does not explain fully why people hold money. Friedman (1956) faulting the classical theory argued that money is held for purposes other than transactions purposes. He argued that money is held as an asset or part of wealth, in addition to being held for transaction purposes. According to Friedman (1956), investors can hold their wealth in the form of money, bonds, equity shares and commodities. He concludes that demand for money depends on rates of return of the four assets and upon income. According to Akinlo, (2005), the monetarist demand for money is specified as follows:

$$M = f\left[p, r_b - \frac{1}{r_b}.\frac{dr_b}{dt}; r_e + \frac{1}{p}.\frac{dp}{dt} - \frac{1}{r_e}\frac{dr_e}{dt}; \frac{1}{p}.\frac{dp}{dt}; w; y; m\right] \quad 3.2$$

Where M is the total demand for money, P is the general price level, r_b is the market interest rate on bonds, r_e is the market interest rate on equities, 1/p. dp/dt is the nominal return from physical goods, W is the ratio of non-human to human wealth, Y is the money income available to the wealth holder, m is the variables affecting tastes and preferences on the wealth holders.

By assuming r_b and r_e to be stable, Friedman replaces the variables representing the return on bonds and equities ($\left[r_b, \frac{1}{r_b}.\frac{dr_b}{dt}\right] + \left[r_e + \frac{1}{p}.\frac{dp}{dt}.\frac{dr_e}{dt}\right]$) in Equation 3.2 by simply r_b and r_e. As a result of this replacement, money demand equation can be written as

$$M = f\left[p, r_b - \frac{1}{r_b}.\frac{dr_b}{dt}; r_e + \frac{1}{p}.\frac{dp}{dt} - \frac{1}{r_e}\frac{dr_e}{dt}; \frac{1}{p}.\frac{dp}{dt}; w; y; m\right]$$

$$M = f\left(P, r_b; r_e; \frac{1}{P}.\frac{dp}{dt} w; y; \mu\right) \quad 3.3$$

$$M = f\left[p, r_b; r_e; \frac{1}{p}.\frac{dp}{dt} w; y; \mu\right]$$

Further Friedman says that when there are changes in price and money income, there will be a proportionate change in the demand for money. This means that equation 3.3 must be regarded as homogenous of the first degree in P and Y, so that equation 3.3 becomes:

$$\gamma M = \text{f}(\gamma \text{P}, r_b, r_e \ \tfrac{1}{P}.\tfrac{dp}{dt} \text{w}; \gamma y; \ \mu) \qquad 3.4$$

Putting $\gamma = \frac{1}{P}$

Equation 3.4 can be written as:

$$\frac{M}{P} = \text{f}(r_b; \ r_e \ \tfrac{1}{P}.\tfrac{dp}{dt}; \text{w}\tfrac{\gamma}{P}; \ \mu) \qquad 3.5$$

In this form, the equation 3.5 expresses the demand for real cash balances as a function of "real" variable.

Putting $\gamma = \frac{1}{Y}$, equation 3.4 can be written as:

$$\frac{M}{Y} = \text{f}(r_b; \ r_e \ \tfrac{1}{P}.\tfrac{dp}{dt}; \text{w}; \tfrac{P}{y}; \ \mu) \qquad 3.6$$

Or

$$M = \text{f}(r_b; \ r_e \ \tfrac{1}{P}.\tfrac{dp}{dt}; \text{w}\tfrac{\gamma}{P}; \ \mu)\text{Y} \qquad 3.7$$

In Friedman's modern quantity theory of money, the supply of money is independent of demand for money. Due to the actions of the monetary authorities, the supply of money changes, whereas the demand for money remains more or less stable. It means that the amount of money which people want to have as cash or bank deposits is more or less fixed to their permanent income. For example, if the central bank purchases securities, people who sell securities to the central bank

receive money and this leads to an increase in their cash holdings. The people will spend this excess money partly on consumer goods and partly by purchasing assets. This spending will reduce their cash balances and at the same time there is a rise in the national income. On the other hand, when the central bank sells securities, the money holding of the people reduces, in relation to their permanent income. Therefore, they will try to increase their cash partly by reducing their consumption and partly by selling their assets. This will reduce national income. Thus in both cases the demand for money remains stable.

3.2 Model Specification

3.2.1 Money Demand

In a simultaneous demand for money in Canada, Hsing, Abul and Jamal (2013) specified the following equations:

$$\frac{M^d}{P} = f(Y, i, \pi^e) \qquad 3.8$$

$$\frac{M^s}{P} = f(Y, i, \pi^c) \qquad 3.9$$

Where:

Equation 3.8 and 3.9 are money demand and money supply equations respectively;

Y, *i* and π^e and π^c are income, interest rate, expected inflation and current inflation rate respectively;

$\frac{M^d}{P}$ and $\frac{M^s}{P}$ are real demand and real supply of money. According to Hsing, Abul and Jamal (2013), Equation 3.8 and Equation 3.9 are exactly identified and could be estimated using two-stage least squares.

Since there is limited argument about the macroeconomic drivers of money supply, we shall focus our adjustment on money demand. Given the gaps identified earlier in line with the objectives of this study, we modify Equation 3.8 as follows.

M2/P = F (PCI, INTR, STOR, EINF) 3.10

Although real income has been identified as a key determinant of demand for real balances, Hassan (2016) in a study of Pakistan economy argued that real per capita income is a better measure of income effect. He argued that even in Friedman (1966), it was real per capita income that was used as a proxy for permanent income. This argument is plausible since demand for real balances is more likely to be contingent on individual income than nation-wide income. Thus, we adapted real per capita income (RPCI) instead of real GDP.

Similarly, Friedman (1966) and Farazmand and Moradi (2015) argued that returns on alternative assets to money are more important candidates for models of real balances than interest rate. Thus, in addition to interest rate, we adapted returns on stock market assets (STOR).

Although Onakoya and Yakubu (2016) and Farazmand and Moradi (2015) utilized inflation as a measure of expected price changes, we shall follow Hsing et al. (2013) and retain expected inflation in our model. As argued by Bitrus (2011) and Opoku (2017) economic agents make decision of real cash balances based on expected inflation (EINF) and not current inflation. However, admitting the unobservability of expected inflation, Opoku (2017) used current

inflation as a measure of expected inflation. However, since current inflation is a poor measure of expected inflation (Bitrus, 2011), we estimated expected inflation using Nerlove (1956) procedure.

In addition, exchange rate is a key macroeconomic variable that economic agents may consider in making critical decisions. Although Kumar et al (2017) and Onafowora and Owoye (2012) utilized nominal naira-to-dollar and real naira-to-dollar exchange rate respectively, Nachega (2001) contended that two-country exchange rate does not capture the exchange rate basket of a nation. He therefore advocated for effective exchange rate. Thus, we incorporated real effective exchange rate (REER) in the function.

Also, it has been argued that financial innovation is a critical factor in predicting macroeconomic outcomes (Adofu, 2010; Okonji, Igbanugo & Nnadi, 2018). Thus, we adapted financial innovation (FIN) as a determinant of money demand. Consequently, Equation 3.10 becomes:

$$M2/P = RMD = F (PCI, INTR, STOR, EINF, REER, FIN) \quad 3.11$$

The equation 3.11 can be expressed mathematically with economic apriori expectation sign thus:

$$M2/P = bo + b1PCI – b2INTR – b3STOR + b4EINF - b5REER + b6FIN \quad 3.12$$

One unresolved area of debate in estimation of money demand is whether it will be estimated as single equation or simultaneous equation. The major problem encountered in single-equation estimate of money demand is simultaneity bias (Gujarati, 2004; Woodrige, 2005). Given the difficulties encountered in the estimation of simultaneous equations, most researchers estimate money demand equation with the assumption that money supply is exogenous (Sekwati, 2008; Hsing & Jamal, 2013; Onakoya & Yakubu, 2016). Hsing and Jamal (2013) however argued that the assumption of exogeneity of money supply is not tenable. He contended that the assumption

of an exogenous money supply may be inconsistent with the notion that a higher interest rate is likely to cause banks to make more loans and create more money supply. Thus, to estimate a money demand that is unbiased and consistent we employ two-stage least square (2SLS) procedure within the framework of simultaneous equation system (the corresponding equation is money supply equation). Equation 3.10 is rewritten in semi-log multiple regression econometric form as follows:

$$RMD = \theta_0 + \theta_1 ln\text{PCI}_t + \theta_2 ln\text{INT}_t + \theta_3 ln\text{STOR}_t + \theta_4 EINF_t + \theta_5 REER_t + \theta_6 FIN_t + \mu_t \qquad 3.13$$

The money supply (MS) equation which is the instrumental equation is re-specified as follows:

$$\text{MS}_t = \alpha_0 + \alpha_1 \text{INT}_t + \alpha_2 \text{Y}_t + \alpha_3 \text{INF}_t + \varepsilon_t \qquad 3.14$$

Where Y = national output, θ_0 and α_0 are intercept coefficients, and θ_1, θ_2 …, θ_6 are slope parameters and μ is the error term.

Model Justification

One of the major contentions in the estimation of money demand highlighted by Poloz (1980), Gregory and McAleer (1981) and Hsing and Jamal (2013) is the inappropriateness of single equation estimation procedure for money demand. Given that the explanatory variables of the money demand have been proven to be correlated with the error term, estimates of money demand from single equation model is undermined by simultaneity bias (Gujarati, 2004; Woodridge, 2003; Hsing & Jamal, 2013). Hsing and Jamal (2013) therefore contended that to avoid simultaneity bias, money demand equation needs to be estimated using simultaneous equation technique. One, the simultaneous equation technique that has been proven to produce consistent and unbiased estimated result irrespective of the order of identification is two-stage

least square (2SLS). In addition, for consistent parameter estimation, the *sine qua non* assumption of ordinary least squares is that the error terms are uncorrelated with the right hand side variables. When this assumption fails, Johnston and DiNardo (1997) opined that econometricians turn to two-stage least squares, or 2SLS, a member of the instrumental variable, or IV family.

3.2.2 Inflation Model

The traditional single-equation monetarist model derived from the simple transformation of the conventional demand-for-money function (a stable function of real income and cost of holding money balances), is widely recognized and used in the empirical studies for analyzing and estimating the determinants of the rate of inflation (Fakiyesi, 1996; Asekunowo, 2016) and written as:

$$\ddot{P} = \ddot{M} - a\ddot{Y} + b\ddot{C} \qquad 3.15$$

Where, a and b are constants, and dot over the respective variable denotes percent change, P is the percent change in consumer prices, M is the percent change in money stock, Y is the percent change in real income, and C is the percent change in the cost of holding money balances.

The foregoing specification of the price inflation assumes instantaneous adjustment of monetary changes and no money illusion. To overcome this, researchers have frequently modified it by admitting some lagged responses to the specification to take account of the lagged adjustment. The most common modification to Equation (3.15) is as follows:

$$\ddot{P}_t = a_o + a_1\ddot{M}_t + a_2\ddot{M}_{t-1} + a_3\ddot{Y}_t + a_4\ddot{P}_{t-1} \qquad 3.16$$

Where, a_3 = a in equation (3.15), and all variables are defined as before, $\ddot{M}_{t-1}$ is the percent change of money supply in the previous period, and $\ddot{P}_{t-1}$ is the changes in the past inflation. $\ddot{P}_{t-1}$ is used as a proxy for the changes in the cost of holding money. The lagged value of money growth variable estimates the lagged adjustment process in money supply on the inflation rate.

Given that Fakiyesi (1996) and Asekunowo (2016) contended that the **major source of inflation in Nigeria is the behaviour of the prices of the imported goods**. To test the validity of this contention, the above stated price equation is augmented by the inclusion of a variable representing the changes in the **import prices**. Therefore the empirical specification to be estimated using dynamic ordinary least square (DOLS) is expressed as follows:

$$\ddot{P}_t = a_o + a_l\ddot{M}_t + a_2\ddot{M}_{t-1} + a_3\ddot{Y}_t + a_4\ddot{P}_{t-1} + a_5\ddot{P}_{mt} \qquad 3.17$$

where $\ddot{P}_{mt}$ *refers to percentage change in import prices*

Model Justification

The model specified in equations (3.17) was estimated using dynamic ordinary least square advocated by Stock and Watson (1993). According to Stock and Watson (1993), DOLS produces unbiased, efficient and consistent estimates even when the data are autocorrelated or multicollinear. Again, the DOLS transformations asymptotically eliminate the endogeneity caused by the long run correlation of the cointegrating equation errors and the stochastic regressors innovations, and simultaneously correct for asymptotic bias resulting from the contemporaneous correlation between the regression and stochastic regressor errors. Thus, this study employed DOLS estimation procedure in the estimation of inflation model to guarantee

robustness of the estimates so as to provide reasonable assurances for using the estimates for inferences.

3.3 Measurement of Variables and Apriori Expectation

Real Money Demand (RMD): Real money demand is broad money stock deflated by the price level (M2/P). It is the real cash balance that all economic agents desire to hold on annual basis. It is the dependent variable in this study.

Per capita income (PCI): This is described as income per head. According to Friedman (1966), permanent income is a key determinant of money demand in the US. Given that permanent income is pretty difficult to estimate, we employed per capita income as a measure of income effect. PCI entered the model as an explanatory variable. Money demand is expected to be an increasing function of per capita income.

Interest Rate (INT): This is the short-term rate of interest. Using short term interest rate as a measure of opportunity cost is also recommended by Heller (1995). According to Heller, the short term interest rate is of greater importance (than the long term interest rate) in money demand. The closest substitute for money available, a 60 to 90 day commercial paper, is most influential in deciding whether to hold assets in the form of money or not. A measure of short-term interest rate used in this study is Treasury bill rate. It is expected that increase in interest rate will dampen the incentive to hold money.

Stock Market Rate of Return (STOR): STOR captures the effect of alternative assets on money demand. Although the rate of return of risk-free assets such as Treasury bill is usually used as the sole opportunity cost of holding money, Bertaut and Starr-McCluer (2000) contends that the rising role of stock market as a more important store of wealth for households has

necessitated the inclusion of stock market variables in money demand determinants. Although, at a certain extent, agents are willing to give up the higher return of alternative assets in order to receive the benefit of liquidity that money provides, the average behavior is that consistently increasing stock market rate of return would entice the households to swap liquidity for stock market earning.

Expected Inflation (EINF): EINF is the rate of inflation, that workers, businesses, and investors think will prevail in the future, and that they will therefore factor into their decision-making. If agents expect rising inflation in the future, they may prefer to hold more real balances today. We obtained time series for expected inflation using Nerlove transformation of Koyck expectation model. The derivation of EINF is as follows. Suppose the equation for expected inflation (EINF) is written as:

$$EINF_t = \beta_0 + \beta_1 M2_t + u_t \qquad 3.18$$

Since the expected inflation is not directly observable, Nerlove postulates a partial adjustment model as follows:

$$INF_t - INF_{t-1} = \delta(EINF_t - INF_{t-1}) \qquad 3.19$$

where δ, such that $0 < \delta \leq 1$, is known as the coefficient of adjustment and $INF_t - INF_{t-1}$ = actual change in inflation and $EINF_t - INF_{t-1}$ = expected change in inflation .

Equation (3.19) shows that the actual change in inflation in any given time period *t* is some fraction δ of the expected change in inflation for that period. Equation (3.19) can be re-written as:

$$INF_t = \delta EINF_t + (1- \delta)INF_{t-1} \qquad 3.20$$

Equation (3.20) shows that the observed inflation at time *t* is a weighted average of the expected inflation at that time and the inflation existing in the previous time period, δ and (1 − δ) being the weights. Now substitution of (3.18) into (3.20) gives:

$$INF_t = \delta(\beta_0 + \beta_1 M2_t + u_t) + (1-\delta)INF_{t-1} \quad 3.21$$

or

$$INF_t = \delta\beta_0 + \delta\beta_1 M2_t + (1-\delta)INF_{t-1} + \delta u_t \quad 3.22$$

Essentially, equation of expected inflation (EINF), which is Equation 3.18, can be determined once Equation 3.22 is estimated, and δ is obtained from the coefficient of INF_{t-1} once β_0 and β_1 from Equation 3.22, the time series for EINF would be obtained from Equation 3.18.

Real Effective Exchange Rate (REER): The effective exchange rate is an index that describes the strength of a currency relative to a basket of other currencies. As noted by Nachega (2001) bilateral exchange rate does not give the full picture of the open economy complexes that exchange rate is intended to capture in international macroeconomic models. He recommended the use of an effective exchange rate, which is a weighted average of a basket of foreign currencies. A real effective exchange rate (REER) adjusts nominal exchange rate by the appropriate foreign price level and deflates by the home country price level. Exchange rate depreciation is expected to reduce cash balances given that agents would prefer to hold money in non-spendable alternative currencies.

Financial Innovation (FIN): FIN captures increasing provision of financial services by financial institutions. It can be measured using measures of financial deepening such as M2/GDP ratio or CPS/GDP ratio. However, Luka, Akila, Samson & Lugu (2015) argued that CPS/GDP is

a reflection of direct measure of financial intermediations. Bank credit to the private sector (CPS) as a ratio of GDP may be seen as a more superior measure of financial deepening. Thus, we use CPS/GDP as a measure of financial deepening. On apriori, we expected that real money demand is a positive function of financial innovation.

3.4 Estimation Techniques and Procedure

The main estimation techniques are two-stage least square (2SLS) and dynamic ordinary least square (DOLS). The demand for money model was estimated using 2SLS while DOLS was used to estimate inflation model. However, before estimating both models, the time series properties of the data were investigated using unit root test and cointegration test. The subsections that follow show brief discussion of econometric procedure and methods used in the study.

(a) Stationarity Test

A series is said to be (weakly or covariance) stationary if the mean and autocovariances of the series do not depend on time. Any series that is not stationary is said to be nonstationary. A common example of a nonstationary series is the random walk:

$$Y_t = Y_{t-1} + \varepsilon_t$$

Where, ε is random disturbance term. The series has a constant forecast value, conditional on Y, and the variance is increasing over time. A difference stationary series is said to be integrated and is denoted as I (d) where d is the order of integration. The order of integration is the number of unit roots contained in the series, or the number of differencing operations it takes to make the series stationary. For the random walk above, there is one unit root, so it is I (1) series. Similarly, a stationary series is I (0).

The study examined the random nature of the variables by testing for stationarity using Elliot, Rothenberg, and Stock Point Optimal (ERS) Test of unit root test. The decision rule was based on 5% level of significance for acceptance or rejection of the null hypothesis ($\beta i = 0$; has unit root: $i = 1, 2, 3 \ldots k$). At this level, the study tests for the stationarity or otherwise of each of the explanatory variables and also examines the order of integration of each of them.

(b) Cointegration Test

The notion of cointegration among variables has introduced a new flexibility into the modelling of economic time series. As defined by Engle and Granger (1987), two variables are cointegrated of order (1, 1)) if each variable individually is stationary in first differences (integrated of order 1), but some linear combination of the variables is stationary in levels (integrated of order 0). The notion of cointegration is a special case of the notion of dynamic aggregation introduced by Aoki (1968, 1971). Many economic variables might plausibly be cointegrated when correctly measured, sometimes in natural or sometimes in log units; examples are consumption and income, short and long term interest rates, and stock prices and dividends.

This study employs Phillips-Ouliaris (1990) cointegration test. Phillips-Ouliaris is a residual-based cointegration test in which unit root test is applied to the residuals obtained from Static Ordinary Least Square (SOLS) estimation of Equation of the model equation. Under the assumption that the series are not cointegrated, all linear combinations of, including the residuals from SOLS, are unit root nonstationary. Therefore, a test of the null hypothesis of no cointegration against the alternative of cointegration corresponds to a unit root test of the null of nonstationarity against the alternative of stationarity.

Phillips-Ouliaris tests differ from Engle-Granger test in the method of accounting for serial correlation in the residual series; the Engle-Granger test uses a parametric, augmented Dickey-Fuller (ADF) approach, while the Phillips-Ouliaris test uses the nonparametric Phillips-Perron (PP) methodology (Verbeek, 2012). This approach is also able to identify all the co-integrating vectors within a given set of variables and therefore has an advantage over the Engel-Granger, Engel and Yoo approaches, which do not test the hypothesis on the co-integrating relationships (Kmenta, 2013).

(c) Two-Stage Least Square (2SLS)

To obtain long-run estimates of the research model, we implemented both panel and individual countries' regression. Panel regression is important for ascertaining the implication of global trade paradigm shift on Nigeria trade relation. But to observe country-specific characteristics with respect to the paradigm shift and trade relations we also implemented country-specific regression. We utilized two-stage least square (2SLS) procedure.

2SLS regression analysis is a statistical technique that is used in the analysis of structural equations. This technique is the extension of the OLS method. It is used when the dependent variable's error terms are correlated with the independent variables. Additionally, it is useful when there are feedback loops in the model. In implementing the 2SLS regression, instrumental variable method is used.

Instrumental variable methods allow for consistent estimation when the explanatory variables (covariates) are correlated with the error terms in a regression model. Such correlation may occur when changes in the dependent variable change the value of at least one of the covariates ("reverse" causation), when there are omitted variables that affect both the dependent and

independent variables, or when the covariates are subject to measurement error. Explanatory variables which suffer from one or more of these issues in the context of a regression are sometimes referred to as endogenous. In this situation, ordinary least squares produces biased and inconsistent estimates. However, if an instrument is available, consistent estimates may still be obtained.

3.5 Evaluation of Estimates

The parameter estimates of the model is evaluated under three sub-headings:

3.5.1 Economic "A priori" criterion

Economic apriori criterion seeks to ascertain whether the parameter estimates comply predicted theoretical behavior. According to Koutsoyiannis (1973), apriori criterion is one of the criteria used in determining whether parameter estimates are theoretically meaningful. Therefore based on economic theory, the independent variables are expected to take the signs discussed earlier in relation to the dependent variables in their respective functions.

The summary of apriori expectation is presented in Table 3.1

Explanatory Variable	Apriori Expectation	Remarks
Per capita income (PCI)	$\theta_1 > 0$	Positively related with RMD
Interest rate (INT)	$\theta_2 < 0$	Negatively related with RMD
Stock market returns (STOR)	$\theta_3 < 0$	Negatively related with RMD
Expected inflation (EINF)	$\theta_4 > 0$	Positively related with RMD
Real effective exchange rate (REER)	$\theta_5 < 0$	Negatively related with RMD
Financial innovation (FIN)	$\theta_6 > 0$	Positively related with RMD

Source: Researcher's Compilation

3.5.2 Statistical criterion

Statistical criterion is also referred to as first order test. It seeks to ascertain whether the parameter estimates and the regression models are statistically robust. To ascertain the statistical significance of variables of a regression model, Z-test was used. F-test and R-squared (R^2) are employed to ascertain the statistical significance and robustness of the regression equations. The techniques for statistical evaluation are briefly explained below:

The R-squared (R^2) Test

The test measures the proportion of the variation in the dependent variable that is explained by the variations in the independent variables. It is used to evaluate the explanatory power of the reggessers on the regressand. Its value ranges from 0 to 1 ($0 \leq R^2 \leq 1$). The closer it is to 1, the better the goodness of fit and vice versa.

The Z-test

This is used to test for the statistical significance of the individual regression coefficient.

Decision Rule:

If Z-cal>t 0.025, we reject the null hypothesis (Ho) and accept the alternative hypothesis (H_A) and vice versa.

The F-Test

The F-test is carried out to check the overall significance of the entire regression plane. It is also a test for the joint significance of all the coefficients in the model. This will be done at 5% level of significance.

Decision Rule:

If F*-cal> F0.05 (K-I, N-K) df, we will reject the null hypothesis (Ho) and accept the alternative hypothesis (H_A) and vice versa.

3.5.3 Econometric Criterion

Econometric criterion is also known as second-order test. This aims at investigating whether the assumptions of classical regression function are met. They determine the reliability, consistency and unbiasness of the regression models. Under the econometric criterion are normality test, serial correlation test and heteroscedascity test. The econometric post estimation evaluation techniques are explained below:

Heteroscedasticity

Heteroscedasticity (also spelled heteroskedasticity) is the absence of homoscedasticity. According to Bickel (2008), it refers to the circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it. Suppose there are a sequence of random variables Y_t and a sequence of vectors of random variables, X_t. In dealing with conditional expectations of Y_t given X_t, the sequence $\{Y_t\}_{t=1}^{n}$is said to be heteroscedastic if the conditional variance of Y_t given X_t, changes with *t*. When using some statistical techniques, such as ordinary least squares (OLS), a number of assumptions are typically made. One of these is that the error term has a constant variance. This might not be true even if the error term is assumed to be drawn from identical distributions (Box, Jenkins, & Reinsel, 1994).

The presence of heteroscedasticity has some consequences for regression analysis. One of the assumptions of the classical linear regression model is that there is no heteroscedasticity. Breaking this assumption means that the Gauss–Markov theorem does not apply, meaning that OLS estimators are not the Best Linear Unbiased Estimators (BLUE) and their variance is not the lowest of all other unbiased estimators. Heteroscedasticity does not cause ordinary least squares coefficient estimates to be biased, although it can cause ordinary least squares estimates of the variance (and, thus, standard errors) of the coefficients to be biased, possibly above or

below the true or population variance. Thus, regression analysis using heteroscedastic data will still provide an unbiased estimate for the relationship between the predictor variable and the outcome, but standard errors and therefore inferences obtained from data analysis are suspect. Biased standard errors lead to biased inference, so results of hypothesis tests are possibly wrong ((Box, Jenkins, & Reinsel, 1994; Bickel, 2008). There are several methods to test for the presence of heteroscedasticity. These include Levene's test Goldfeld–Quandt test, Park test, Glejser test, Breusch–Pagan-Godfrey test and White test. The Breusch-Pagan-Godfrey test developed by Godfrey (1978) and Breusch and Pagan (1979) was utilized in this study. Breusch-Pagan-Godfrey test is a Lagrange multiplier test of the null hypothesis of no heteroscedasticity.

Serial Correlation Test

Serial correlation (also called autocorrelation) is the relationship between a variable and a lagged version of itself over various time intervals. Repeating patterns often show serial correlation when the level of a variable affects its future level. Let $\{X_t\}$ be a random process, and t be any point in time (t may be an integer for a discrete-time process or a real number for a continuous-time process). Then X_t is the value (or realization) produced by a given run of the process at time t. suppose that the process has mean μ_t and variance δ_t at time t, for each t. Then the definition of the auto-correlation function between times t_1 and t_2 is:

$$R_{XX}(t_1, t_1) = E[X_1\overline{X_2}]$$

where E is the expected value operator and the bar represents complex conjugation. Note that the expectation may be not well defined.

In linear regression analysis, the error term is assumed to be serially uncorrelated. A violation of this requirement may have certain consequences on the regression estimates. As noted by Bickel (2008), if the error term is serially correlated, it may result to having exaggerated goodness of fit,

standard errors that are too small, T-statistics that are too large. You can test for autocorrelation with a plot of residuals, a Durbin-Watson test, a Lagrange multiplier test, Ljung Box test and correlogram.

In this study we employed Breusch-Godfrey Lagrange Multiplier (LM) test (Breusch, 1978; Godfrey, 1978). The Breusch–Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no serial correlation of any order up to p. As observed by Bickel (2008), the test is more general than the Durbin–Watson statistic (or Durbin's h statistic), which is only valid for nonstochastic regressors and for testing the possibility of a first-order autoregressive model (e.g. AR (1)) for the regression errors. The Breusch-Godfrey (BG) test has none of these restrictions, and is statistically more powerful than Durbin's h statistic (Verbeek, 2012; Kmenta, 2013).

3.5.4 Stability of Demand for Money

The money demand model for Nigeria is subjected to stability test. This test examines whether the variables of the model are stable across various subsamples of the data. If the money demand model is found to be stable it means that it is useful for policy analysis and on the contrary an unstable money demand model cannot be used for policy analysis. Using an unstable money demand for policy analysis will result in misleading forecasting as the model will not give consistent results. The CUSUM test was used to test stability of the demand for money.

3.6 Test of Research Hypotheses

The research hypotheses are tested using the **confidence interval approach instead of the commonly used point estimate approach.** Instead of relying on point estimates alone, we constructed an interval around the point estimate such that the interval has 95% probability of

including the true population value(s). To construct a 100 (1-α) % confidence interval for the parameters, we take $\hat{\Pi}_j \pm t_{\alpha/2} Se(\Pi_j)$

where $t\ \alpha_{/2}$ is the critical value of t with n-2 degree of freedom and a probability to the right.

Decision rule

- Reject the null hypothesis if the true population parameter (Π_j) falls within the limits, otherwise accept.

3.7 Nature and Sources of Data

The models were estimated using quarterly time series data spanning from 1981 to 2017. We obtained annual time series from CBN Annual Report and Statement of Accounts, CBN Statistical Bulletin (various Issues) and World Bank Development Indicators (WDI). All model estimations were implemented using the quarterly time series. The quarterly time series were obtained through frequency conversion proposed by Chow & Lin (1971) and used in Fernández (1992) and Onyeiwu (2017). Table 3.2 summaries the nature and sources of data.

Table 3.2 Summary of Nature and Sources of Data

Real money demand (RMD)	Inflation-adjusted M2	CBN (2017)
Per capita income (PCI)	GDP divided by population	WDI (2018)
Interest rate (INT)	3-months Treasury bill was used as a proxy for short-term interest rate	CBN (2017)
Stock market return (STOR)	Quarterly rate of returns on NSE stocks	CBN (2017)
Expected inflation (EINF)	Computed using Nerlove transformation of Koyck expectation model. The variables used in the computation include M2 and inflation rate	CBN (2017)
Financial Innovation (FIN)	CPS/GDP used as a proxy *(CPS refers to deposit banks' credit to private sector)*	CBN (2017)
Inflation rate (INF)	Annual CPI rate of inflation *(CPI refers to consumer price index)*	CBN (2017)
Real effective exchange rate (REER)	Weighted average of basket of foreign currencies	CBN (2017)
Import price (Pm)	Import price index was used as a proxy	WDI (2018)

Researcher's Compilation

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULT

In this chapter, the regression results are presented, analyzed and discussed. First, the summary of tests of unit root and cointegration were presented and discussed. Second, adjustment processes in the short run was examined using error correction framework. Thereafter, the results of the estimated money demand model and inflation model were presented, analyzed and discussed.

4.1 Presentation of Results

Before estimating the hypothesized models, time series are tested for stationarity, cointegration and error correction. The results are presented as follows.

4.1.1 Stationarity Test

We employed Elliott, Rothenberg and Stock (1996) method of unit root test. As argued by Schwert (1989), Campbell and Perron (1991) and Elliott, Rothenberg and Stock (1996), the traditional unit root test methods such as Dickey Fuller test (Dickey & Fuller, 1979), Augmented Dicker Fuller test (Said and Dickey, 1984) and Phillip-Perron test (Phillip and Perron, 1988) have poor power properties and poor size properties. Elliott, Rothenberg and Stock (ERS) stationarity test developed by Elliott, Rothenberg and Stock (1996) and utilized in Maddala and Kim (1998) is said to have optimal power and size properties.

The result of the ERS stationarity test shown in Table 4.1 suggests that macroeconomic and financial time series are realization of stochastic processes. As shown in Table 4.2 real money demand (RMD), per capita income (PCI), interest rate (INT), broad money (M2) and import

price (Pm) are integrated of order zero [I(0)]. In other words, they are stationary at levels. Other variables, namely stock market return (STOR), expected inflation (EINF), financial innovation (FIN), inflation rate (INF) and real effective exchange rate (REER) are integrated of order one [I(1)]. This corroborates Campbell and Perron (1991) and Elliott, Rothenberg and Stock (1996) assertion that financial and macroeconomic time series are realization of stochastic processes.

Table 4.1 Summary of stationarity Test

	Level statistics		Difference statistics		Nature of trend	Remark
	Critical	ERS	Critical	ERS		
Real money demand (RMD)	2.970	8.446	-	-	Intercept	I(0)
Per capita income (PCI)	2.970	40.078	-	-	Intercept	I(0)
Interest rate (INT)	5.720	11.018	-	-	Linear Trend	I(0)
Stock market return (STOR)	5.720	4.343	5.720	12.019	Linear Trend	I(1)
Expected inflation (EINF)	5.720	5.649	5.720	10.699	Linear Trend	I(1)
Financial Innovation (FIN)	2.970	1.764	2.970	14.503	Intercept	I(1)
Inflation rate (INF)	2.970	2.181	2.970	17.677	Intercept	I(1)
Real effective exchange rate (REER)	5.720	1.358	5.720	5.825	Linear Trend	I(1)
Broad money (M2)	5.72	24.047	-	-	Linear Trend	I(0)
Import price (Pm)	2.970	35.231	-	-	Intercept	I(0)

Source: Regression Results Estimated with EVIEW 10.1 (see appendix B)

4.1.2 Cointegration Result

Given that all the series are not stationary at levels, we proceed to test for the existence of cointegration. This test is necessary for two reasons. First, it helps us to ascertain whether there

is long run relationship among the series to be estimated. If there is no long run relation among the series, long run estimates obtained may not be useful. Second, it helps to guarantee that estimated regression is not a spurious or nonsense regression. A regression is said to be spurious if the estimated standard errors are meaningless. This implies that inferences made based on such standard errors are not useful. We employed Phillips-Ouliaris (PQ) cointegration. The null hypothesis of no cointegration is rejected for an equation if and only if the prob (tau-statistic) or prob (Z-statistic) is less than 0.05. The result is shown in Table 4.2.

Table 4.2 Summary of PQ Cointegration Result

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*	Remarks
STOR	-4.086649	0.7601	-16.00603	0.9718	Not cointegrated
INT	-5.173762	0.3279	-29.55616	0.3914	Not cointegrated
FIN	-8.151813	0.0029	-40.23073	0.0322	Cointegrated
REER	-4.614514	0.5482	-23.40715	0.7460	Not cointegrated
RMD	**-7.302283**	**0.0140**	**-42.84233**	**0.0122**	**Cointegrated**
EINF	-5.644789	0.1882	-26.24020	0.5880	Not cointegrated
Y	-6.130870	0.0961	-31.58411	0.2824	Not cointegrated
INF	**-7.996609**	**0.0039**	**-41.77722**	**0.0186**	**Cointegrated**
PCI	-7.784161	0.0058	-40.31467	0.0313	Cointegrated
M2	-5.344397	0.2715	-28.74423	0.4379	Not cointegrated

*MacKinnon (1996) p-values.

Source: Cointegration Estimates Using Eview 10.1

As shown in Table 4.2, there are ten equations. The PQ method estimates each variable as a function of all other variables. **The time series is said to be cointegrated if there is at least one cointegrating equation in the system of equations (Woodridge, 2012).** Greene (2010), however, stated that it is required that the cointegration exists for the equation of the **variable**

that will be used as the dependent variable in the estimation of long run relationship. In the context of this study, Greene (2010) condition implies that **real money demand** (RMD) and **inflation** (INF) equations are required to be cointegrated. As shown in Table 4.2, both Woodridge (2012) and Greene (2010) conditions are met. There are four (4) cointegrated equations in the system, and RMD and INF are cointegrated. We therefore conclude that there is long run relationship among the series.

4.1.3 Error Correction Mechanism

Having obtained evidences that there is long-run relationship among the variables of real money demand model and inflation model, we proceed to ascertain how short run disequilibrium is corrected. Table 4.3 is a summary of the error correction terms for real money demand and inflation models.

Table 4.3 Error Correction Mechanism

	Real money demand		Inflation	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
C	-73.40097	-1.082327	17.21614	1.514968
EINF	0.008725	1.388212		
D(EINF(-1))	-0.010712	-1.593923		
FIN	0.439593	9.041402		
D(FIN(-1))	-2.577651	-0.663487		
lnINT	-0.344860	-0.222494		
lnPCI	0.000790	2.340328		
REER	0.060354	0.570462		
D(REER(-1))	0.075946	10.26019		
STOR	0.002540	2.679317		
D(lnSTOR(-1))	-0.000358	-0.352382		
D(INF(-1)			0.503406	2.987454
RMD			-0.028134	-0.331071
PM			0.062443	0.538306
Y			-0.043373	-1.156629
ECM(-1)	-0.401700	-8.006617	-0.179376	-5.973823
R-squared	0.899021		0.503678	
Durbin-Watson stat	1.795251		1.751878	
F-statistic	15.37796		5.277079	
Prob(F-statistic)	0.000000		0.001778	

Source: Regression Results Estimated with EVIEW 10.1

As shown in Table 4.3, the error correction term for real money demand and inflation models are -0.402 and -0.179 respectively. All error correction terms are negative and significant, indicating that short run disequilibrium are corrected in the short run. To be specific, the result indicates that 40.2% and 17.9% of the disequilibrium in real money demand and inflation are corrected in the year in which the disequilibrium occurs. The result also suggests that while real money demand is moderately fast, inflation adjusts rather slowly.

4.4 Long-Run Estimates

The main thrust of this study is to estimate the real money demand model, determine the elasticity of income and interest rate and ascertain the stability of the model. The secondary

objective of this study is to ascertain the implication of real money demand for inflation in Nigeria. The summary of real money demand estimates and inflation estimates are presented in the following subsections.

(a) Real Money Demand Model

Table 4.4 is the summary of the result of estimation of real money demand. In the model, income and opportunity cost of holding money proxied by short-term interest rate and stock market returns were expressed in logarithm so as to obtain the elasticity of estimates. Other explanatory variables were expressed in level values. Thus, the model is a semi-log model. The result is shown on Table 4.4.

Table 4.4 Real Money Demand Model

Dependent Variable: Ln(RMD)				
Variable	Coefficient	Std. Error	t-Statistic	Prob
FIN	0.140112***	0.037554	3.730987	0.0001
Ln(STOR)	-0.750445***	0.107503	-6.980675	0.0000
Ln(INT)	-0.641289***	0.128005	-5.009876	0.0000
REER	-0.092908***	0.015260	6.086785	0.0000
Ln(PCI)	2.319087***	0.293254	7.908124	0.0000
EINF	0.000608	0.012530	0.055708	0.8790
C	-2.00987	13.21520	-0.908792	0.5008
R-squared	0.780567			
Adjusted R-squared	0.720098			
S.E. of regression	0.256078			
Durbin-Watson stat	1.709027			
F-statistic (Prob)	170.00996(0.0000)			
T-statistic	0.000000			
Estimation Method	Two-Stage Least Square			
Obs	156			

* ** and *** indicates statistically significant at 10%, 5% and 1% respectively

Source: Regression Results Estimated with EVIEW 10.1

As shown on Table 4.4, the model was estimated using two-stage least square. The R-square obtained is 78.1%. The result also shows that the F-statistics and Durbin-Watson are 170.10 and 1.71 respectively. The result shows that income elasticity is 2.32. Interest rate and stock market elasticities (that is, elasticities of opportunity cost of holding money) are -0.641 and -0.750 respectively. Both elasticity of income and elasticity of opportunity cost of holding money are significant even at 1% level of significance. The result also shows that financial innovation (FIN) is positively related with real money demand. FIN entered the model with coefficient of 0.140. Similarly, the coefficient of real effective exchange rate is -0.093. This suggests that one-unit increase in real effective exchange rate will trigger agents to reduce their demand for real cash balances by 0.093 units. The coefficient of expected inflation is 0.000608. In other words, expected inflation is positively related to real money demand. If agents expect that inflation will double, they would increase their cash balances by 0.06%.

(b) **Effect of Real Money Demand on Inflation**

Table 4.5 summarizes the estimates of inflation. The model was estimated using dynamic ordinary least square (DOLS) procedure. The estimation utilized 37 sample periods. The obtained adjusted r-square is 93% with standard error of regression equation of about 0.118. The result shows that inflation is a positive function of real money demand (RMD), national output (Y), import price (Pm), lagged inflation (INF_{t-1}) and lagged real money demand (RMD_{t-1}). The coefficient of RMD is 0.315. This indicates that one-unit in real money demand would raise inflation by 0.315 units. Import price has a higher coefficient of 0.517 suggesting that raising importing price by one-unit could raise inflation by 0.517 units. National output entered the model with insignificant parameter of 0.147. Lagged inflation and lagged real money demand entered the model with coefficients of 0.042 and 0.004 respectively.

Table 4.5 Inflation Model

Dependent Variable: INF

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	2.471991	8.484402	0.291357	0.7748
National Output (Y)	0.146744	0.098690	1.486925	0.0000
Import Price (PM)	0.517338***	0.146238	3.537641	0.1578
Real Money Demand (RMD)	0.314509***	0.038615	8.144764	0.0014
@TREND	-0.081198***	0.019430	-4.179019	0.0000
@TREND^2	0.001798***	0.000254	7.076908	0.0000
Lagged Inflation (INF-1)	0.041652***	0.011336	3.674379	0.0010
Lagged Real Money demand RMD(-1)	0.004325*	0.002255	1.918125	0.0743
R-squared	0.940214			
Adjusted R-squared	0.926928			
S.E. of regression	0.117527			
Estimation Method:	Dynamic Least Squares (DOLS)			
Obs	156			

*, ** and *** indicates statistically significant at 10%, 5% and 1% respectively

Source: Regression Results Estimated with EVIEW 10.1

4.2 Evaluation of Estimates

The estimates of both model I and II are evaluated based on economic, statistical and econometric criteria.

4.2.1 Economic Criterion

Economic criterion seeks to examine the conformity of the parameter estimates to theoretically predicted behavior. Conventionally, structural equations are specified in accordance with apriori

expectations. Table 4.6 is the summary of sign test which is used to evaluate the economic criterion. As shown in the Table, all the estimates conformed to the apriori expectation.

Table 4.6 Sign Test

Explanatory Variable	**Expected**	**Obtained**	**Remark**
	Real Money Demand		
Per capita income (PCI)	Positive	Positive	Conform
Interest rate (INT)	Negative	Negative	Conform
Stock market returns (STOR)	Negative	Negative	Conform
Expected inflation (EINF)	Positive	Positive	Conform
Real effective exchange rate (REER)	Negative	Negative	Conform
Financial Innovation (FIN)	Positive	Positive	Conform
	Inflation		
Real money demand (RMD)	Positive	Positive	Conform
National Output (Y)	Positive	Positive	Conform
Import price (Pm)	Positive	Positive	Conform
Lagged inflation INF(-1)	Positive	Positive	Conform
Lagged real money demand RMD(-1)	Positive	Positive	Conform

Source: Regression Results Estimated with EVIEW 10.1

4.2.2 Statistical Criterion

Statistical validity of the parameters and the regression equations were evaluated under the statistical criterion. While the statistical validity of the parameter estimates were evaluated using t-test, the validity of the regression equations were evaluated using the r-square (real money demand and inflation estimates) and f-test (RMD estimates)

T-test

T-test evaluates the statistical significance of the individual parameter estimates. T-test proceeds as follows:

Null hypothesis: Parameter estimates are not statistically significant.

Table 4.7 Summary of t-test

Variable	Coefficient	t-Statistic (t_a)	*prob* (t_a)	Remark
		RMD		
Financial innovation (FIN)	0.149914	3.739940	0.0011	Statistically significant
Stock market returns (STOR)	-0.750890	-7.419652	0.0000	Statistically significant
Interest rate (INT)	-0.646074	-5.367893	0.0000	Statistically significant
Real effective exchange rate (REER)	-0.099261	5.936990	0.0000	Statistically significant
Per capita income (PCI)	2.132804	7.008149	0.0000	Statistically significant
Expected inflation (EINF)	0.000713	0.055786	0.9560	Not statistically significant
		Inflation		
Real money demand (RMD)	0.314509	8.144764	0.0000	Statistically significant
National Output (Y)	0.146744	1.486925	0.1578	Not statistically significant
Import price (Pm)	0.517338	3.537641	0.0014	Statistically significant
Lagged inflation INF(-1)	0.041652	3.674379	0.0010	Statistically significant
Lagged real money demand RMD(-1)	0.004325	1.918125	0.0743	Not statistically significant

Source: Regression Results Estimated with EVIEW 10.1

Test statistics and decision rule: The test statistics for the t-test is probability value of the t-statistic (*prob* (t_a)). At 5% level of significance, the null hypothesis is rejected if *prob* (t_a) ≤ 0.05.

The summary of t-test is shown in Table 4.7. As shown in Table 4.7, the null hypothesis of parameter insignificance is rejected for all the estimates of real money demand except expected inflation. Similarly, the null hypothesis is also rejected for all the estimates of inflation equation except national output and lagged inflation. However, the null hypothesis of parameter insignificance can be rejected for lagged real money demand at 10% level of significance.

R-square test

R-square is a measure of goodness of fit of the regression equation. It evaluates the predictive power of the sample regression equation. In other words, it measures the extent to which the sample regression (predicted) equation predicts the population (theoretical) regression equation.

Null hypothesis: The estimated regression equation does not have a good fit

Test statistics and decision rule: The test statistics is r-square (R^2). The null hypothesis is rejected if $R^2 \geq 0.50$. Table 4.8 is a summary of R^2 obtained from real money demand and inflation equations. As shown in Table 4.8, the R^2 for real money demand and inflation equations are 0.78 and 0.94 respectively. This suggests that the explanatory variables of real money demand and inflation equations explain 78% and 94% of the variables in real money demand and inflation respectively.

Table 4.8 Summary of R^2 test

Regression equation	**Obtained R^2**	**Critical R^2**	**Remark**
Real money demand	0.782656	0.50	Good fit
Inflation	0.940214	0.50	Good fit

Source: Regression Results Estimated with EVIEW 10.1

F-test

F-test is employed to evaluate the joint significance of all the parameter estimates. In other words, it evaluates the robustness of the regression equation.

Null hypotheses (H_0): $\beta_0 = \beta_1 = \ldots = \beta_5 = 0$: the parameter estimates are not jointly statistically significant

Test statistics and decision rule: The test statistic is the probability value of f-statistics (*prob* (f_a)). The decision rule is to reject the null hypothesis if (*prob* (f_a)) ≤ 0.05.

As shown in Table 4.4, the f-statistic is 170.0278 with *prob* (f_a) = 0.0000. In other words, *prob* (f_a) is less than 0.05. Thus, the null hypothesis is rejected and we conclude that estimated parameters of real money demand are jointly significant.

4.2.3 Econometric Criterion

Under the econometric criterion, the robustness of the regression equation is evaluated. It also evaluates the compliance of the regression model with classical regression assumptions. Given that there are different sets of techniques of evaluation on the basis of econometric criterion depending on the techniques of analysis, the two models are evaluated differently.

4.2.3.1 Real Money Demand Model

Real money demand is evaluated using serial correlation test, Heteroskedasticity test and normality test.

(a) Serial Correlation Test

Serial correlation test was implemented using Breusch-Godfrey Serial Correlation LM test. It investigates whether the residual of the regression model is correlated with the RHS variables. The null hypothesis of no serial correlation will only be rejected if and only if probability value of any of the three test statistics (namely F-statistic and Obs*R-squared) is less than 0.05. Table 4.9 shows that the F-statistic and Obs*R-squared are 1.02 and 1.51 with probability values of 0.236 and 0.103 respectively. This implies that the null hypothesis of no serial correlation for the real money demand model cannot be rejected. Thus, we conclude that real money demand model does not suffer from serial correlation.

Table 4.9 Breusch-Godfrey Serial Correlation LM Test:

Null Hypothesis: The residual is not serially corrected with the RHS variables

F-statistic	1.016899	Prob. F(2,22)	0.2364
Obs*R-squared	1.508902	Prob. Chi-Square(2)	0.1030

Source: Regression Results Estimated with EVIEW 10.1

(b) Heteroskedasticity Test

The heteroskedasticity test was executed using Breusch-Pagan-Godfrey test of heteroscedasticity. The Breusch-Pagan-Godfrey test approach regresses the squared residuals on lagged squared residual and a constant. The null hypothesis that the residuals are homoscedastic is rejected if and only if any of the test statistics (F-statistic, Obs*R-squared and Scaled explained SS) is statistically significant at 5% level of significance.

Table 4.10 Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null Hypothesis: The residuals are homoscedastic

F-statistic	1.891007	Prob. F(6,23)	0.1256
Obs*R-squared	9.910350	Prob. Chi-Square(6)	0.1285
Scaled explained SS	5.921957	Prob. Chi-Square(6)	0.4320

Source: Regression Results Estimated with EVIEW 10.1

Table 4.10 shows that F-statistic, Obs*R-squared and Scaled explained SS are 1.891007, 9.910350 and 5.921957 with probability values of 0.1256, 0.1285 and 0.4320 respectively. Given that none of the statistics is significant (the probabilities of the test statistics are all greater than 0.05), we conclude that there is no problem of heteroscedasticity in all the three models. The absence of heteroskedasticity and autocorrelation indicate that the t-statistics on which hypothesis testing is based are indeed unbiased, consistent and efficient. They are therefore fit for inferences.

(c) Normality Test

Wooldridge (2013) observed that the implication of the normality assumption of classical regression estimates is that if the error terms are not normally distributed, the residuals should not be used in Z-tests or in any other tests derived from the normal distribution, such as t-tests, F tests and chi-squared tests. In other words, inferences cannot be made from regression estimates if the normality assumptions are violated.

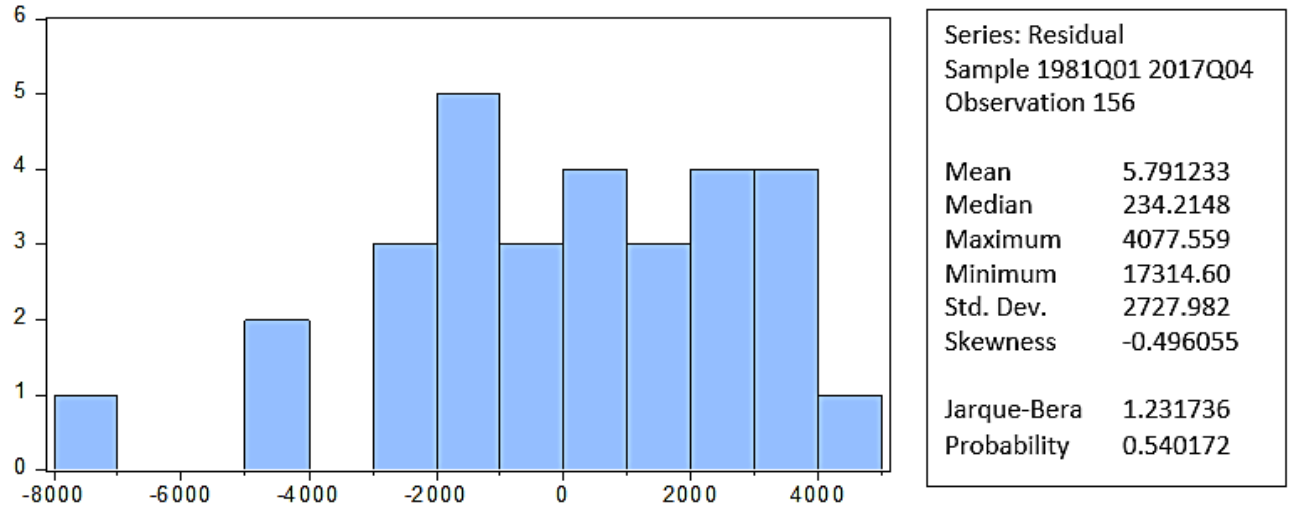


Figure 4.1Normality Histogram for RMD

Source: Estimated Using Eview 10.1

Figure 4.1 shows the histogram of the distribution of the residuals as well as some statistics pertaining to Jarque-Bera, skewness and kurtosis for real money demand. The null hypothesis that the residual is normally distributed is conditional on the p-value of Jaque-bera statistic. The null hypothesis can be rejected if and only if the p-value of Jaque-Bera statistic is less than 0.05. Given the Jaque-Bera statistics of 1.23 with probability of 0.540, the null hypothesis cannot be rejected. Thus, we conclude that the residual is normally distributed. This implies that the inferences made from the regression estimates are valid.

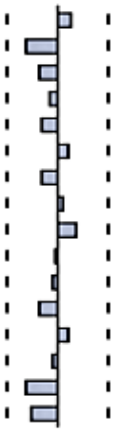
4.2.3.2 Inflation Model

Robustness and validity of the inflation regression equation was evaluated on the basis of econometric criterion using correlogram Q-statistics and normality test. The Q-statistic at lag *k* is a test statistic for the null hypothesis that there is no autocorrelation up to order *k.* As shown in Table 4.11, The Q-statistic of the correlogram plot indicates that at 5% significance level, the

null hypothesis cannot be rejected. Thus, we conclude that there is no autocorrelation in the inflation equation from lag 1 to lag 16.

Table 4.11: Autocorrelation Plot and Q-Statistics

Date: 02/05/19 Time: 11:54
Sample: 1981Q01 2017Q04
Included Observations: 35

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.098	0.098	0.3642	0.546
		2	-0.227	-0.238	2.3787	0.304
		3	-0.131	-0.085	3.0691	0.381
		4	-0.061	-0.098	3.2233	0.521
		5	-0.103	-0.150	3.6845	0.596
		6	0.070	0.048	3.9044	0.690
		7	-0.114	-0.226	4.5090	0.720
		8	0.041	0.074	4.5885	0.801
		9	0.119	0.022	5.2980	0.808
		10	-0.013	-0.061	5.3066	0.870
		11	-0.036	0.030	5.3762	0.912
		12	-0.118	-0.195	6.1621	0.908
		13	0.079	0.187	6.5325	0.925
		14	-0.031	-0.200	6.5919	0.949
		15	-0.228	-0.232	9.9671	0.822
		16	-0.181	-0.165	12.211	0.729

Source: Estimated Using Eview 10.1

Figure 4.2 is the normality histogram for the inflation model. It shows the normal distribution of the residual of the regression equation. The null hypothesis that the residual is normally distributed is tested using the Jaque-Bera statistics. The null hypothesis cannot be rejected given that the p-value of Jaque-Bera statistics is greater than 0.05 (0.856 > 0.05). Thus, we conclude that the inflation equation is normally distributed.

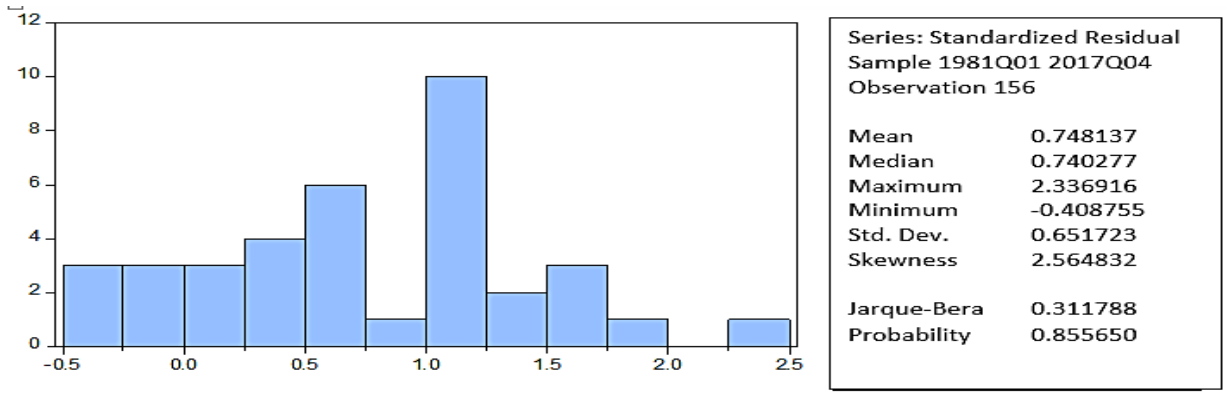


Figure 4.2 Normality Histogram and Statistics for the Inflation Model

Source: Estimated Using Eview 10.1

4.3 Test of Hypotheses

The test of hypotheses is contingent on the robustness and validity of the regression estimates. The evaluation of estimates in subsection 4.2 indicates that the regression equations and estimates are robust and could be used for inferences. Thus, we proceed to test the hypotheses in this subsection. The hypotheses are restated as follows:

i. H_0: Real money demand in Nigeria is not stable.

   H_1: Real money demand in Nigeria is stable.

ii. H_0: Real effective exchange rate, financial innovation and inflation expectation are not significant variables in real money demand in Nigeria.

   H_1: Real effective exchange rate, financial innovation and inflation expectation are significant variables in real money demand in Nigeria.

iii. H_0: Real money demand does not have significant effect on inflation targeting in Nigeria.

   H_1: Real money demand has significant effect on inflation targeting in Nigeria.

Test of Hypothesis One: Real money demand in Nigeria is not stable

Hypothesis one was tested using CUSUM test and Hansen stability test.

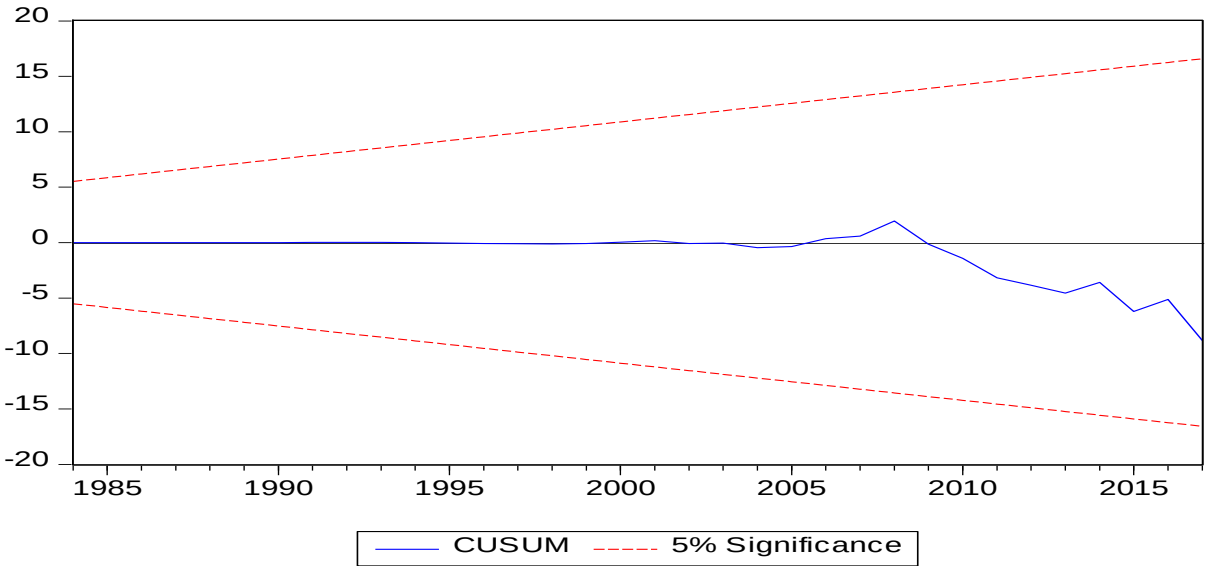


Figure 4.3 CUSUM Test of Parameter Stability

Source: Estimated Using Eview 10.1

The CUSUM test developed by Brown, Durbin & Evans (1975) is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines. Figure 4.3 shows the CUSUM plot. As shown in the plot, the cumulative sum goes outside the area between the two critical lines indicating that real money demand is not stable. The instability of money demand started in 2009. The plot shows that since 2009, money demand has not returned to stability.

Table 4.12 Estimates of Hansen Instability Test

Null hypothesis: Parameter estimates are stable					Remarks
	Stochastic	Deterministic	Excluded		Null hypothesis
Lc statistic	Trends (m)	Trends (k)	Trends (p2)	Prob.*	rejected
0.669282	1	0	0	0.0109	

*Hansen (1992b) Lc(m2=1, k=0) p-values, where m2=m-p2 is the number of stochastic trends in the asymptotic distribution

Source: Estimated Using Eview 10.1

In another test using Hansen instability test, Table 4.12 also shows that the null hypothesis of parameter stability is rejected. Based on the CUSUM test and Hansen instability test, the null hypothesis that money demand is not stable cannot be rejected. We therefore concluded that money demand is not stable over the study period.

Test of Hypotheses Two and Three

Hypothesis two and three were tested using T-test of significance. The regression model for testing hypothesis two is the money demand model while that of hypothesis three is the inflation model. All tests of hypotheses are implemented at 5% significance level. The test statistic is the t-stat (t_a^R) reported in the regression output. The critical t-stat (t_a^C) as reported by Gujarati (2004) is 2.021.

Decision Rule: Reject H_0 if $(t_a^R) \geq (t_a^C)$, otherwise accept H_0.

The test of hypotheses is summarized in Table 4.13. As shown in Table 4.13, all two hypotheses are rejected. Thus, we conclude as follows:

i. Real effective exchange rate has significant negative effect on money demand. This implies that real effective exchange rate is a critical determinant of money demand. It however, has a negative effect on money demand.
ii. Financial innovation is a significant and positive determinant of money demand
iii. Inflation expectation does not have significant impact on money demand in Nigeria, at least, within the period under study.
iv. Real money demand has a significant positive effect on inflation in Nigeria.

Table 4.13 Summary of Hypotheses Test

	Estimates	T-stat	Outcome	Remark
Hypothesis Two: Real effective exchange rate, financial innovation and inflation expectation are not significant factors for money demand in Nigeria.				
REER ⇔RMD	-0.092908	6.086785 (0.000)	$(t_a^R) \geq (t_a^C)$	Reject H_0
FIN⇔ RMD	0.140112	3.730987 (0.0001)	$(t_a^R) \geq (t_a^C)$	Reject H_0
EINF ⇔ RMD	0.000608	0.055708 (0.8790)	$(t_a^R) \leq (t_a^C)$	Do not reject H_0
Hypothesis Three: Real money demand does not have significant impact on inflation in Nigeria				
RMD ⇔ INFR	0.314509	8.144764 (0.000)	$(t_a^R) \geq (t_a^C)$	Reject H_0

Source: Estimated Using Eview 10.1

4.4 Discussion of Findings

One of the key findings of this study is that income elasticity of money demand is greater than unity. This finding is not in tandem with Friedman's postulation that income elasticity of money demand is unity. The assumption that income elasticity of real money demand is unity implies that the rate of growth of nominal money equals the rate of growth of nominal income, even though real income changes over time. If this expectation holds, monetary policy will be very effective and the general price level will be largely stable. Unitary income elasticity of money demand has been found in the US (Teles &Zhou, 2015) and Canada (McPhail, 1991). Contrarily, our findings indicate that income elasticity of money demand is greater than unity. Similarly, Kallon (1992), Nachega (2001) and Nwaobi (2002) obtained evidences that income elasticity of money demand is greater than unity in Ghana, Cameroon and Nigeria respectively. As noted by

Nell (2003), economists disagree about the size of the income elasticity of money demand. At the theoretical level, the predicted elasticities range between one-third and one: a strict interpretation of the Baumol-Tobin model of the transactions demand for money predicts an income elasticity of one-half. This is true if transaction costs are thought to be independent of income. This assumption, however, is not completely realistic. For instance, if transaction costs are related to the time needed to go to the bank, then the cost is related to the wage rate, which, in turn, will be positively correlated with the aggregate level of income. The overall income elasticity would in this case be greater than one-half. The stochastic version of the model (developed by Merton Miller and Daniel Orr) reduces the prediction to about one-third. The elasticity predicted by the popular "cash-in-advance" model is unity (Nell, 2003; Kallon, 1992; McPhail, 1991; Nachega, 2001).

According to Nell (2003), there are two implications of income elasticity of demand that is different from unity. First, an income elasticity different from unity would make nominal income grow at a different rate than nominal money- at a lower rate for the greater than unity elasticity that we have found to characterize the Nigerian economy, and at higher rate for the less than unity elasticity that was found to characterize the United Kingdom (Horváth *et al.,* 2011). Our result implies that money demand grows by about 2.3% for every one percent growth in income. In other words, money demand in Nigeria induces inflationary pressure. This view that a greater-than-unity income elasticity of money demand induces inflation was corroborated by the findings from our inflation model. **The findings indicate that money demand is a significant source of inflationary pressure in Nigeria.**

The second implication of greater-than-unity income elasticity of money demand is that it is a *prema facia* evidence of instability in the demand for money (Mankiw, 1997). Instability of

money demand further suggests that it is difficult to predict money demand without serious accuracy errors. In other words, monetary policy is largely ineffective. A stable money demand is generally considered essential for the formulation and conduct of efficient monetary policy as it enables a policy-driven change in monetary aggregates to have a predictable influence on output, interest rates and ultimately price (Sriram, 2001). Unstable money demand implies that monetary policy could be hardly relied on to influence the real sector in a predictable pattern. Deadman and Ghatak (2001) also noted that a stable money demand is imperative because it offers a predictable and dependable link between dynamics in monetary aggregates and dynamics in variables that determine money demand. This implies that, a stable money demand is a necessary prerequisite in establishing a one-to-one relationship between appropriate monetary aggregates and nominal income; and it equally enables the monetary authorities and policy makers to stabilize prices. Kumar, Fargher and Don (2017) also posited that a better understanding of the stability of money demand influences the choice of monetary policy option. In other words, the conduct of a sound monetary policy is also dependent on the stability of money demand. It is in this respect that the stability of demand for money is imperative for effective conduct of monetary policy.

Another key finding of this study is that **financial innovation is critical for the stability of money demand.** Financial innovations have evolved over time and have moved away from individuals holding cash to assets, and the use of Automated Teller Machines, debit cards, Electronic banking among others. In the 21st century, financial innovation is becoming increasingly important as **it poses a serious problem for monetary policy**, **as with new financial products the ability of monetary policy to be effective diminishes, as it changes one variable vital for effective monetary policy; the demand for money.** Different forms of

financial innovations can have different effects on money demand. For example new products such as ATMS/ Debit cards or financial instruments could potentially improve efficiency and reduce transaction costs, as cash that would have been carried in wallets is replaced by these innovations and this could lead to a decline in demand for cash. Similarly, as individuals move away from more liquid assets (cash or M1) to less liquid assets (broad money or M2, M3), they are more likely to demand less money. In contrast, financial innovations could potentially lead to an increase in money demand if payments systems improve but individuals demand more liquid assets. For example in the case of mobile banking, where individuals demand electronic money and cash through the use of cell phone technology but do not necessarily move away from more liquid assets to less liquid assets. Since the 1980s countless deregulation and liberalization policies, Central Banks in many advanced economies switched between instruments of monetary policy by moving away from policies that influence the money supply towards those which influence the bank rate. A large number of developed country case studies show that demand for money has become unstable due to financial reforms and hence support the targeting of the rate of interest by central banks (Maki & Kitasaka, 2006; Caporale & Gil-Alana, 2005). The Central banks in many developing economies have followed suit and switched towards monetary policies directed at the bank rate. A major part of this policy switching is grounded on the view that their financial market reforms and liberalizations might have contributed to the instability in their own money demand.

The findings also indicate that stock market returns play critical role in explaining the behavior of money demand. Conceptually, money is an asset with a particular set of characteristics, most notably its liquidity. Like other financial assets, demand for money is part of a portfolio allocation decision, in which an agent's wealth is distributed among competing assets based on

each asset's relative benefits (see e.g., Tobin 1969). To a certain extent, agents are willing to give up the higher return of alternative assets in order to receive the benefit of liquidity that money provides. Thus, standard money demand equations include an interest rate or interest rate spread to measure the opportunity cost of holding non-interest earning money. Typically the assumed alternative asset used to measure the opportunity cost of holding money is a risk-free instrument, such as a Treasury security, though this is often viewed as a proxy for all substitute assets for money. Through time, the stock market has become a more important store of wealth for households. Growth and innovations in mutual fund industry and the emergence of internet trading have reduced transaction costs and thus increased the substitutability between equities and money. Bertaut and Starr-McCluer (2000) in a study of household portfolio noted that stock market activities have become a major component of household investment profile.

As noted by Bertaut and Starr-McCluer (2000), increase in the stock prices has two effects on demand for money, positive wealth effect and negative substitution effect. Positive wealth effect arises due to the three factors namely, (i) increase in nominal wealth (ii) increase in expected return in the risky assets relative to the safe assets which induces the economic agents to hold larger amounts of safe assets, such as money (iii) induced rise in the volume of financial transactions which will require higher money balances to facilitate them. On the other hand negative substitution effect of real stock prices on money demand implies that, as stock prices rise, equities become more attractive when compared to other components in a portfolio; thus there may be a shift from money to stocks. According to Bertaut and Starr-McCluer (2000), if positive effect dominates then higher stock prices imply that the monetary authorities can allow faster monetary growth to achieve a given nominal income or inflation target to avoid the target being undershot. On the contrary, if the substitution effect dominates, higher stock prices imply

the need to tighten monetary policy. Choudhry (1996) and John Thornton (1998) obtained evidence that stock market returns are drivers of money demand.

The findings also indicate that interest rate has significant negative effect on demand for real balances. It also shows that interest rate elasticity of demand for money is less than unity. Although our findings corroborate Sekwati (2008); Arize and Nam (2012) and Opoku (2017), it does not agree with Terriba (1973) and Pathak (1981). Researchers have often argued that interest rate does not play a significant role in determining the demand for money in developing countries because of the dearth of financial assets (Terriba, 1973). However, in the light of our findings, it could be argued that given the deepening and liberalization of financial markets and financial instruments in Nigeria, interest rate is fast gaining traction. Keynes (1936), in his liquidity preference theory, showed that the amount of money held is inversely related to interest rate.

According to Keynes, interest rate, which influences money demand appreciably determine the demand for real cash balances. Although Keynes limited his proposition of the sensitivity of money demand to interest to speculative demand for money, Baumol (1952) and Tobin (1956) argued that transactions demand for money is also interest-sensitive. Given a person's degree of risk aversion, a higher expected return (nominal interest rate plus expected capital gains on bonds) will cause agents to shift away from safe money and into risky assets. This creates a negative relationship between the nominal interest rate and the demand for money. Similarly, if money demand is less interest sensitive, then monetary policy changes affect equilibrium income to a larger degree. If money supply is assumed to be fixed, the adjustment to a new equilibrium in the money sector has to come solely through changes in money demand. If money demand is less interest sensitive, any increase in money supply requires a larger increase in income and a

larger decrease in the interest rate in order to bring the money sector into a new equilibrium (Sloman, 2003).

Another finding of this study is that changes in effective exchange rate have significant negative effect on demand for money in Nigeria. This indicates that exchange rate depreciation reduces demand for money. This finding was also corroborated by Bahmani-Oskooee (2012), Azim, Ahmed, Ullah and Zakaria (2010) and Renani and Hosein (2017). Changes in exchange rate may have two effects on the demand for domestic currency: wealth effect and currency substitution effect. Suppose wealth holders evaluate their asset portfolio in terms of their domestic currency. Exchange rate depreciation would increase the value of their foreign assets held and hence be wealth enhancing. To maintain a fixed share of their wealth invested in domestic assets, they will repatriate part of their foreign assets to domestic assets, including domestic currency. Hence, exchange rate depreciation would increase the demand for domestic currency (Mcgibany & Nourzad, 2005; Marashdeh, 2007).

On the other hand, exchange rate movements may generate a currency substitution effect, in which investors' expectation plays a crucial role. If wealth holders develop an expectation that the exchange rate is likely to fall further following an initial depreciation, they will respond by raising the share of foreign assets in the portfolio. Currency depreciation in a sense means higher opportunity cost of holding domestic money, so currency substitution can be used to hedge against such risk. In this regard, exchange rate depreciation would decrease the demand for domestic money. The substitution effect has been more consistent to empirical findings. Bahmani-Oskooee (2012), Azim et al. (2010) and Renani and Hosein (2017) obtained evidences in support of substitution effect in Hong Kong, Pakistan and Iran respectively.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Summary

Since the publication of Fisher's (1957) equation of exchange, the debate about demand for money has continued unabated. Also, given the failure of the Cambridge cash balance model, Keynesian model and even the Friedman model of money demand, researchers have continued to search for deeper understanding of money demand. In Nigeria, this quest has continued since the era of the "TATOO" debate.

In Nigeria, researchers have largely estimated the demand for money using income and interest rate as the scale and opportunity cost variables respectively.

Again, the question of stability of money demand has remained unanswered given that the research outcomes have hardly had any reasonable consensus. Hsing, Abul and Jamal (2013) argued that the nuances associated with money demand, is largely attributed to the functional form of the money demand model. He argued that single-equation specification of money demand amounts to mis-specification.

Similarly, Bertaut and Starr-McCluer (2000) and Maki & Kitasaka (2006) also argued that models of money demand that exclude stock market returns and financial innovation respectively may overestimate/under estimate the demand for money. Furthermore, unstable money demand could have substantial implication for monetary policy implementation and price stabilization. It is against this backdrop that this study examined the stability of money demand and its implication for inflation targeting in Nigeria.

The study was anchored on Friedman theory of money demand within the context of monetarism. Friedman postulates a demand for money quite different from that of Keynes. The demand for money on the part of wealth holders as a function of many variables is formally identical with that of the demand for a consumption service. He regards the amount of real cash balances (M/P) as a commodity which is demanded because it yields services to the person who holds it. Thus money is an asset or capital good. Hence demand for money forms part of capital or wealth theory.

Specifically, Friedman argued that equities or shares are another form of asset in which wealth can be held. The yield from equity is determined by the dividend rate, expected capital gain or loss and expected changes in the price level. Based on this insight, Bertaut and Starr-McCluer (2000) noted that stock market is an opportunity of holding money as much as money market interest rate. Intuitively, we included stock market returns in our model of money demand.

Review of demand for money literature in Nigeria shows that other critical variables that are popular candidates in existing empirical models include financial innovation and effective exchange rate.

The study adopted econometric procedure of data analysis using quarterly time series spanning from 1981Q01 to 2017Q04. To start with, the time series properties of the data were examined using unit root test and cointegration test. The result obtained from Elliot, Rothenberg, and Stock Point Optimal (ERS) unit root test indicates that the time series are difference stationary. The results of the Philip-Quliaris approach to cointegration test also reveal that the time series are cointegrated processes. To ascertain the critical determinants of money demand in Nigeria, we utilized real money demand as the dependent variable and per capita income, interest rate,

expected inflation, stock market returns, financial innovation and effective exchange rate as explanatory variables.

The money demand model has a concomitant money supply model in the context of simultaneous equation system. Hsing et al. (2013) contended that single-equation model of money demand is undermined by simultaneity bias. Thus, we estimated money demand using two-stage-least-square approach to simultaneous equation estimation.

The results obtained show that money demand is a negative function of stock market returns, interest rate and effective exchange rate as well as a positive function of income and financial innovation.

Although, Friedman postulated that expected inflation is a critical determinant of money demand, our estimation reveals that expected inflation is not significant in the case of Nigeria which may be attributed to the dynamics of inflation.

Furthermore, the result shows that money demand has not been stable since 2009. Following the significance of financial innovation and the argument of Maki and Kitasaka (2006), we infer that the instability of money demand could be largely explained by the wide range of financial innovations that have been predominant since 2009. Maki and Kitasaka (2006) had argued that most countries experience unstable money demand at the peak of its cycle of financial innovation.

As noted by Nachega (2001), unstable and unpredictable exchange rate could be a substantial cause of instability in money demand. Nigerian exchange rate has been largely adjudged volatile, unpredictable and unstable (Omotosho, 2015; Igbanugo & Eze, 2017).

The findings also show that income elasticity of money demand is greater than unity indicating that money demand is a potential driver of price stability in Nigeria. This view is substantiated from the result obtained from the estimated inflation model. The estimated inflation model shows that money demand is a significant driver of inflation in Nigeria over the range of period covered in this study.

5.2 Conclusion

The main thrust of this study is to analyze money demand (its determinants and stability) in Nigeria with a view to understanding its implication for inflation control. The model of money demand was estimated using 2SLS procedure after testing for unit root and cointegration. From the result obtained, we conclude as follows.

1. Income elasticity of money demand in Nigeria is greater than unity (2.32).
2. Money demand in Nigeria has not been stable since 2009.
3. Money demand is a significant driver of inflation targeting in Nigeria
4. The instability of money demand has substantial implication for inflation control. It frustrates the use monetary policy as a tool for inflation control. Thus, the instability of money demand could be responsible for persistent inflation in Nigeria which seems to have defied monetary policy responses.
5. Real effective exchange rate and financial innovation are significant determinants of money demand in Nigeria.
6. Inflation expectation is a weak determinant of money demand in countries where data, information and forward guidance are poor. Notice that the monetary theory predicts that inflation expectation is as important as income and interest rate in predicting money

demand behaviour. However, in Nigeria (where economic agents prompt access to official data, and government hardly communicates its policy path), inflation expectation is a poor determinant of demand for money.

7. We also obtained evidence that as the financial sector development deepens with ease of access to financial services, stock market becomes increasingly important for predicting the behavior and pattern of money demand.

5.3 Recommendation

The key finding from our study is that money demand is technically unstable and this has led to persistent inflation. This suggests that there is need for the CBN to concretize its inflation targeting framework. In this framework, a central bank estimates and makes public a projected, or "target," inflation rate and then attempts to steer actual inflation toward that target, using such tools as interest rate changes. Because interest rates and inflation rates tend to move in opposite directions, the likely actions a central bank would take to raise or lower interest rates become more transparent under an inflation targeting policy.

To successfully implement inflation targeting, the CBN must satisfy the following conditions:

- The first is that central bank must be able to conduct monetary policy with some degree of independence. No central bank can be entirely independent of government influence, but it must be free in choosing the instruments to achieve the rate of inflation that the government deems appropriate. Fiscal policy considerations cannot dictate monetary policy. Thus, we recommend that the independence of the CBN be deepened to enable it achieve its inflation targeting.

- The second requirement is that the CBN must communicate and publicize its inflation targets. In this regards, we also recommend that the CBN utilizes forward guidance to strengthen the effectiveness of its inflation targeting role.
- One of the key inferences from our findings is that exchange rate volatility could be one of the reasons for instability of money demand in Nigeria. In the light of this, we also recommend the abandonment of the current multiple exchange rate system and the adoption of unified exchange rate system. A multiple exchange rate regime is a systemic policy tool adopted by emerging markets to promote certain activities through subsidies. This price adjustment mechanism involves the use of different exchange rates for different transactions. This creates an official rate for selected transactions and a parallel market rate. For a unified exchange rate, only one market rate will be at play at which all transactions will be embarked on. Transparency in exchange rate objectives will bolster confidence in the foreign exchange market. For instance increasing market information on the sources and uses of foreign exchange will improve information symmetry, a move towards efficient market hypothesis which in turn will reduce uncertainty and instability of money demand.

5.4 Contribution to Knowledge

The need for a robust inflation target forecasting model cannot be over-emphasized. However, what has been documented in this study is a good starting point from where an improved model could be developed. The study notes that no developing and emerging economy of the world ever uses simultaneous equation estimation procedure for estimation of money demand model.

This approach generally tends to perform better and tends to be more reliable and intuitively appealing than what is obtainable from a single equation model. It is pertinent at this point to

note that monetary policy in Nigeria is conducted in an environment characterized by uncertainty and frequent changes in economic policy. Hence, this approach is recommended for the central bank of Nigeria.

The contributions to knowledge in this study are as outlined below:

1. We adapted the demand for money simultaneous equation model used by Hsing et al (2013) in Canada, which to the best of our knowledge has not been used by any researcher in Nigeria, as against the use of single equation model usually used by other authors in Nigeria, to estimate money demand equations.

2. We adapted some variables suggested by other researchers, that is, by modifying and incorporating them to enrich our work. For example we adapted stock market returns, real per capita income, expected inflation, real effective exchange rate, financial innovation, and import price, as introduced by Farazmand and Moradi (2015), Friedman (966), Hassan (2016), Hsing et al, (2013), Nachega (2001), Adofu (2010), Fakiyesi (1996) and Asekunowo (2016) respectively. We also used import price as a proxy for imported inflation.

5.5 Suggestion for further Studies

The mixed policy of money demand such as fiscal, monetary and stabilization policies could be used to achieve money demand stability for effective control of macroeconomic objectives such as inflation targeting, that is beyond the scope of this study. From our findings money demand in Nigeria was unstable since 2009 which could be attributed to financial innovation and exchange rate variability. Hence, we recommend that an econometric study be carried out to ascertain the extent to which money demand through mixed policy would influence inflation targeting in Nigeria.

REFERENCES

Adejugbe, M. O. (1988). The Demand for Money in Nigeria: Further Considerations: *The Nigerian Journal of Economic and Social Studies: 30(2), 215 – 229.*

Adofu I. (2010). Accelerating Economic Growth in Nigeria: The Role of Foreign Direct Investment: *Current Research Journal of Economic Theory. 2(1), 11 – 15.*

Ajayi, S. I. (1974). The Demand for Money in the Nigerian Economy, Comments and Extensions: *Nigerian Journal of Economic and Social Studies (NJESS), 165-193.*

Akinlo, A. E. (2005). The Stability of Money Demand in Nigeria: An Autoregressive Distributed Lag approach: *Journal of Policy Modeling: 28, 445 – 452.*

Akpansung, A. O. & Umkanagwa, M. P. (2018). Money Demand Function in Nigeria: Stability and Structural Breaks: *Journal of Economics and Sustainable Development: 9(14),*

Albulescu C. F. & Pepin D. (2018). Monetary Integration, Money Demand Stability and the Role of Monetary Overhang in Forecasting Inflation in CEE Counties: *Journal of Economic integration: 33(4), 841 – 879.*

Alexandre, R. & Slifi, A. (2016).The influence of monetarism on federal reserve policy during the 1980s.' *Cahiers d'économie Politique/Papers in Political Economy, (1), 107–50*

Aliyu, S. U. R. & Englama, A. (2009). Is Nigeria ready for inflation targeting? *MPRA Paper No. 14870 at http://mpra.ub.uni-muenchen.de/14870*

Amato, J. D. & Gerlach, S. (2002). Inflation Targeting in Emerging Market and Transition Economies: Lessons from a decade: *European Economic Review 46(4-5), 781 - 790*

Anoruo, E. (2002). Stability of the Nigerian M2 money demand function in the SAP period: *Economics Bulletin 14, 1 – 9.*

Aoki Y. (1968, 1971). Comparative Institutional Analysis: Corporate Governance: *Wikipedia*

Asekunowo, V. O. (2016).The causes of persistent inflation in Nigeria. *CBN Journal of Applied Statistics 7(2), 49-79*

Azim, P., Nisar Ahmed, N., Ullah, S. & Zakaria (2010). Demand for money in Pakistan: An ADRL approach. *Global Journal of Management and Business Research, 10(9), 76 – 88.*

Azim, P; Ahmed, N., Ullah, S., Zaman, B. & Zakari, M. (2016). Demand for Money in Pakinstan: An Ardle Approach: *Global Journal of Management and Business Research, 10(9), 76.*

Baetjer H. (2008). Review of Jack(ed) Humane Economic Essay in Honour of Don Lavoie: *The Review of Australian Economics, Springer, Society for the Development of Australian Economies: 21(4), 349 – 353.*

Bahmani-Oskooee, M. & Barry, M. P. (2000). Stability of the Demand for Money in an Unstable Country: Russia *Journal of Keynesian Economics, 22(4), 619 - 629.*

Bahmani-Oskooee, M. (2001). How stable is M2 Money Demand Function in Japan. *Japan and World Economy, 13, 455 - 461.*

Bahmani-Oskooee, M. & Gelan, A. (2015). How stable is the Demand for Money in African Countries: *Journal of Economic Studies* 36, 216 – 235

Bahmani-Oskooee, M. & Rehman, H. (2005). Stability of the Demand for Money Function in Asian Developing Countries: *Applied Economics* 37, 773 -792

Barro R. J. (1995). Inflation and Economic Growth: *NBER Working Paper No. 5326, October*

Bassey, G. E. & Onwioduokit, E. A. (2011). An Analysis of the Threshold Effects of Inflation on Economic Growth in Nigeria: WestAfrican Financial and Economic Review

Bawa, 1, S., Abdullahi, I. S. & Ibrahim, A. (2016). Analysis of Inflation Dynamics in Nigeria (1981 – 2015) *CBN Journal of Applied Statistics, 7(1), 255 - 289.*

Bental, B. & Eckstein, Z. (1997). On the Fit of a Neoclassical Monetary Model in High inflation: *Journal of Money, Credit and Banking. 29(4), 725 - 752.*

Bernanke, B. S. & Mishkin, F.S. (2015). Inflation targeting: A new framework for monetary policy? *The Journal of Economic Perspectives*, 29 (2), 97 - 116.

Bernanke, B. S., Laubach,T., Mishkin,F. S. & Posen,A. S. (1999).*Inflation Targeting: Lessons From the International Experience*:New Jersey:Princeton University Press

Bertaut, C. & Starr-McCluer, M. (2000). Divisions of Research and Statistics and Monetary Affairs: *Federal Reserve Board; 47 pages*

Bieda K. (1973). Corpernicus as an Economist: *The Economic Record 49(125), 89 – 103.*

Bickel, P. J. (2008). Using Residuals Robustly: Test for Heteroscedasticity and Nonlinearity: *Annals of Statistics, 46, 266-291.*

Bitrus, Y. P. (2011). The Determinants of the Demand for Money in Developed and Developing Countries: *Journal of Economics and International Finance* 3 (15), 771–779.

Black P. (2003). In Praise of Educational Research, Formative Assessment: *British Educational Journal, 2595), 623 - 637.*

Borio, C. & Filardo, A. (2007). Globalization and Inflation: New Cross-Country-Evidence on the Global determinants of Domestic Inflation: *BIS Working Papers No.27*

Box, G. E., Jenkins, G. M. & Reinsel, G. C. (1994). *Time Series Analysis: Forecasting and Control* (3rd Ed.). Upper Saddle River, NJ: Prentice–Hall.

Breusch, T. S. (1978). Testing for Autocorrelation in Dynamic Linear Models: *Australian Economic Papers. 17, 334 – 355.*

Breusch, T. S. & Pagan, A.R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation: *Econometrica, 47, 1287- 1294.*

Brown, R. L., Durbin, J. & Evans, J. (1975). Techniques for Testing the Constancy of

Regression Relationships over Time: *Journal of the Royal Statistical Society Series B, 37, 149 - 192.*

Bruno, M. & Easterly, W. (1998). Inflation Crisis and Longrun Growth: *Journal of Monetary Economics: 41(1), 3 - 26.*

Campbell, J. & Perron, P. (1991). Pitfalls and Opportunities: What Macroeconomists should Know about Unit Roots: *NBER Macroeconomic Annual 1991:6, 141 - 220.*

Caporale, G. M. & Gil-Alana, L. A. (2005). Fractional Cointegration and Aggregate Money Demand Functions: *The Manchester School.* 73, 737 - 753

Choudhry T. (1996). Real Stock Prices and the Long-run Demand Function: Evidence from Canada and the U.S. A.: *Journal of International Money and Finance. 15(1), 1 – 17.*

Chow, G. C. & Lin, A. L. (1971). Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Time Series by Related Series: *The Review of Economics and Statistics, 53(4), 372 - 375.*

Ciccarelli, M. & Mojon, B. (2010). Global Inflation - Econpapers: *The Review of Economics And Statistics. 92(3), 524 – 535.*

Conrad C. & Karanasos M. (2015).Modeling the Link between US Inflation and Output: The Importance of the Uncertainty Channel: *Scottish Journal of Political Economy, 62(5), 431 – 453.*

Cziraky, D. & Gillman, M. (2006). Money Demand in an EU Accession Country: A VECM Study of Croatia: *Bulletin of Economic Research, 58(2), 73 - 159.*

Dagher A. & Kovnen A. (2011). On the Stability of Money Demand in Ghana: A Bound Testing Approach: *Vol.11IMF Working papers.*

Deadman & Ghatak (2001). A Test of the Stability of the Demand for Money: *Scottish Journal Of Political Economy: 25(3), 239 – 51.*

Dickey, D. A. & Fuller, W. A. (1979).Theory and Method Distribution of the Estimators for Autoregressive Time Series with a Unit Root: *Journal of the American Statistical Association: 74(366a), 427 – 431.*

Dimand, R. W. (2008).Macroeconomics, Origins and History of: In Durlauf, Steven N.; Blume, Lawrence E: The New Palgrave Dictionary of Economics: The New Palgrave Dictionary of Economics. Palgrave Macmillan: Doi:10.1057/9780230226203.1009, ISBN 978-0-333 78676-5.

Doguwa S. I., Olowofeso O. E., Uyaebo S. O.U., Adamu I. & Bada A. S. (2014).Structural Breaks, Cointegration and Demand for Money in Nigeria: *CBN Journal of Applied Statistics: 5(1), 15.*

Dornbusch, R, Fischer, S &Startz R. (2008).*Macroeconomics (10*th Ed): Chapters 13 & 15, McGrawHill Education, New York, United States.

Drama, B. H. G. & Yao, S. (2016). The Demand for Money in Cote d'Ivoire: Evidence from the Cointegration Test. Doi: 10. 5539/ijef.v3n1p188

Eggertsson, G. B. (2008). *Liquidity Trap:* The New Palgrave Dictionary of Economics, 2nd Edition. Bookmark Print.

Elliot G. Rothernberg T. J. & Stock J. (1996). Efficient Tests for an Autoregressive Unit Root: *Econometrica. 64(4), 813 – 36.*

El-shagi, M. & Giesen, S. (2010).Money and Inflation: The Role of Persistent Velocity Movements. *Discussion paper No. 2. 2010. Halle Institute for Economic Research, 2010. Available from: http://ideas.repec.org/p/iwh/dispap/2-10.*

Epstein, G. & Yeldan, E. (2008). Inflation Targeting, Employment Creation and Economic Development: Assessing the Impacts and Policy Alternatives: *International Review of Applied Economics Journal: 22(2), 131 - 144.*

Essien, E. A.., Onwioduokit, E. A., & Osho, E. T. (1996). Demand for Money in a Debt-constrained Economy: A case study of Nigeria. *CBN Economic and Financial Review 34 (2), 579 – 605.*

Estrella, A. & Miskin, F. (1997). The Term Structure of Interest Rate and its Roll in Monetary Policy for the European Central Bank: *European Economic Reviews: 41(125), 1 – 14,*

Fair, R. C. (1997). International Evidence on the Demand for Money: *Review of Economics and Statistics, 79, 473 - 490.*

Farazmand, H. & Moradi, M. (2015). Determinants of Money demand: Evidence from MENA. *European Journal of Business and Management*, 7(22), 2222 - 2839.

Fasanya, I. O & Onakoya, A. B. O. & Agholuaja, M. A (2018): Does Monetary Policy Influence Economic Growth in Nigeria? *Asian Economic and Financial Review: 8(5), 635- 646.*

Fielding, D (1994). *Money Central Banking in: The Future of Central Banking*. Tercentenary Symposium of the Bank of England: Cambridge University Press.

Fisher, I. (1911). *The Purchasing Power of Money*: New York; Macmillan, 1911.

Folawewo,A.O. & Osinubi,T.S. (2016). Monetary policy and Macroeconomic Instability in Nigeria: A Rational Expectation Approach. *Journal of Social Sciences*: *22(2), 93- 100.*

Friedman, M. (1966). Interest Rates and the Demand for Money: *Journal of Law and Economics*, 9(10), 71-85

Froyen R. T. (1990). *Macroeconomics: Theories and Policies*, (7th Ed.) Prentice Hall.

Galbacs P. (2015). The theory of New Classical Macroeconomics: a Positive Critique: *Budapest Business School, Department of International Economics, 1 – 281, www.springr.com/gp/book/9783319175775.*

Ghartey, E. E. (1998). Monetary Dynamics in Ghana: Evidence from Cointegration, Error Correction Modeling and Exogeneity: *Journal of Development Economics* 57, 473 – 86.

Ghosh A. & Phillips S. (1998): Inflation, Disinflation, and Growth: *IMF Working Paper No. 98/68, 44 pages*

Godfrey, L. G. (1978). Testing Against General Autoregressive and Moving Average Error Models When the Regressors Include Lagged Dependent Variables: *Econometrica. 46: 1293–1301*.

Greene, W. H. (2010). Testing Hypotheses about Interaction Terms in Nonlinear Models: *Economic Letters, 107(2), 291 – 296.*

Gregory, A.W. & McAleer, M. (1981). Simultaneity and the Demand for Money in Canada: Comments and Extensions. *The Canadian Journal of Economics*/*Revue Cana- dienne d'Economique*: *14(3), 488-496. doi:10.2307/134901*

Guegan, D. & Charfeddine L. (2014). Which is the Best Model for the US Inflation Rate? A Structural Change Model or a long Memory Process. www.semanticscholar.org/paper

Guglielmo, M. & Marinko S. (2011). Short and Longrun Linkage between Employment Growth, Inflation and Output Growth: Evidence from a Large Panel, *Working Paper 44, 11 -17.*

Gujarati, D.N. (2004). *Basic Econometrics*: (4th Edition), McGraw-Hill Companies.

Gupta, K. L. & Moazzami, B. (1990). Nominal Vs New Adjustment I Demand for Money Functions: *Applied Econometrics Journal, 22, 5-12.*

Halicioglu, F. & Ugur, M. (2005). On Stability of the Demand for Money in a Developing OECDCountry: The Case of Turkey. *Global Business and Economics Review, 7 (2/3), 203 - 213.*

Haines, G. K. (1995). *Expanding the Economic Pie the Corportist Way*: New Haven: Yale University Press iv + 273 pp. Accessed on 17th January, 2019.

Handa, J. (2000). *Monetary Economics* (2nd Ed): Routledge, London.

Hansen, B. (1957). *The Economic Theory of Fiscal Policy*: Harvard University Press p xv, 450

Hassan G. M. (2016). Growth Effects of Remittances in Bangladesh: Is there a U-shaped Relationship International Migration? *Wiley Online Library.*

Heintz J. & Ndikumana L.(2010). Political Economy: *Institute Working paper Series No.218*

Heller A. (1995). Thesis Seven: *Sage Journals: Doi. 10.1177/072551369504.*

Horvath A.O., Del Re A. C., Fluckiger C. & Symonds D. (2011). *Psychology Therapy (Chic). 48(1), 9 – 16*

Hsing, Y., Abul M. & Jamal, M. (2013). A Simultaneous-Equation Model of Money Demand and Money Supply for Canada. *Modern Economy, 4, 32 – 36.*

Igbanugo C. I. & Eze A. E. (2017). Empirical Analysis of Exchange Rate Regime and External Reserves Accumulation in Nigeria (1970 – 2015). *International Macroeconomics View project 7(7), 69 – 79.*

Imimole B. & Uniamikogbo S. O. (2014). Testing for the Stability of Money Demand Function in Nigeria: *Journal of Economics and Sustainable Development: 5(5).*

Ireland R., Covin J. G. & Kuratko D. F. (2009). Conceptualizing Corporate Entrepreneurship

Strategy: *Article in Entrepreneurship Theory and Practice 33(1), 19 - 46*

Iyoboyi, M. & Pedro, L. M. (2013). The Demand for Money in Nigeria: Evidence from Bounds Testing Approach: DOI: 10.4172/2151-6219.1000076.

Jahan, S. (2012). Inflation Targeting: Holding the Line, Back to Basics: Economics Concepts Explained – *Finance and Development – IMF, Accessed on the 26th November, 2018.*

Jhingan, M. L. (2004): *Macroeconomic Theory*, (11th edition), Delhi, Vrinda Publications (P) Ltd.

John Thornton (1998). Real Stock Prices and the Long-run Demand or Money in Germany: *Applied Financial Economics, Taylor and Francis Journals, 8(5), 513 – 517.*

Johnson J. & DiNardo J. (1997). *Econometric Methods* (4th ed). New York, N. Y. McGraw-Hill.

Kadioglu F, Ozdemir N. & Yilma G. (2000): Inflation Targeting in Developed Countries: *CBN Journal of Applied Statistics: 9(1), 47 -75.*

Kallon, K. (1992). An econometric analysis of money demand in Ghana. *Journal of Developing Areas* 26, 475 - 488

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. Cambridge: MacMillan

Koenker, R., (2011). A Note on Studentizing a Test for Heteroscedasticity: *Journal of Econometrics, 37, 107 - l 12.*

Kmenta, J. (2013). *Elements of Econometrics* (2nd ed.). New York: Macmillan. 298–334.

Krueger T. M. (2005). Capital Management Results across Industries: *American Journal of Business, 20(2), 11 – 20.*

Kumar S, Webber D.J & Fargher, S. (2017). Money Demand Stability: A case of Nigeria: *Journal of Policy Modeling 35(6) DOI: 10.1016/j..jpolmod.2013.03.012*

Kuttner, K. N., (2014). The Role of policy rules in inflation targeting. *Federal Reserve Bank of St Louis: Review,* 96 (4), 89 - 11.

Lee C. C. & Chien C. P. (2008). Energy Consumption and Economic Growth in Asian Economies: A more Comprehensive Analysis Using Panel Data: *Resource and EnergyEconomics 30 (1), 50 – 65.*

Lipsey, R. G. & Courant, P. N. (2012). *Economics,* (11th ed.). U.S.A., Harper Collins College Publishers.

Luka, Y.D., Akila A., Samson R. & Lugu C. T. (2015). Financial Deepening and Economic Development of Nigeria: An Empirical Investigation (1981 – 2013): *European Journal of Business and Management, 7(33), 105 -124.*

Maddala G. S. & Kim I.M. (1998): Unit Roots, Cointegration and Structural Change: Cambridge *Journal of the American Statistical Association, 96(453), 346 – 347.Doi:102307/2670379*

Maki, D. & Kitasaka, S. (2006). The Equilibrium Relationship among Money, Income, Prices, And Interest Rates: Evidence from a Threshold Cointegration Test. *Applied Economics 38, 1585 - 1592.*

Mankiwi N. G. (2003). What Measure of Inflation should a Central Bank Target? *Journal of the European Economies association – Wiley Online Library. Doi/abs/10.1162/1542476*

Marashdeh, O. (2007). The demand for money in an open economy: The case of Malaysia. *Journal of International Money and Finance*: *23, 107–14.*

Mark C. & Sul D. (2003). Cointegration Vector Estimation by Panel dynamics, OLS and Long-Run Money Demand: *Oxford Bulletin of Economics and Statistics, 65(5), 665 - 680.*

Mayer, L. H., (2014). Practical problems and obstacles to inflation targeting: *Federal Reserve Bank of St. Louis Review, 96 (4), 151 - 160*

Mcgibany, J.M. &Nourzad.F. (2005). Exchange rate volatility and the demand for money in the U.S. *International Review of Economics and Finance, 14(4), 411 - 425*

McPhail, K. (1991). The Long-run Demand for Money, Canada Savings Bonds and Treasury Bills in Canada: *Available at* *http://www.esri.go.jp/en/archive/dis/discussion-e.html* Accessed on 27th November, 2018.

Mehra Y. P. (993). Unit Labour Costs and the Price Level; *Richmond Economic Quarterly, 79(4), 35 - 51*

Meyer M. (2001). *Between Theory, Method, and Politics: Positioning of the Approaches of CDA*. In Wodak, R. & Meyer, M. (Eds.), Methods of Critical Discourse Analysis. London: Sage Publications, 14 – 32.

Miller D. (2001). Distributing Responsibilities: *The Journal of Political Psychology, 9(4), 453 – 471.*

Mishkin F. S. (2004). *The Economics of Money, Banking and Financial Markets (7th Ed)* Eddison Wesley, ASIN: B003YZBIRM; Shipping.

Moccero D. Watanabe S. & Cournede B. (2011). What Drives Inflation in the Major OECD Economies: *OECD Economics Department Working Papers No.854. Publishing, Paris. http://dx.doi.org/10.1787/5kgdx1jgvtf8-en*

Mohsen Bahmani-Oskooee, M. (2012). Long-run demand for money in Hong Kong: An application of the ARDL model. *International Journal of Business and Economics, 11(2), 147-155*

Monacelli T. & Sala L. (2009). The International Dimension of Inflation: Evidence from Disaggreated Consumer Price Data: *Journal of Money, Credit and Banking; 41(1), 101 – 120.*

Mordi R. M.(2009:2). Monetary Sector Model for Nigeria: Research Department, *Central Bank of Nigeria*

Munyankindi P, Gichondo A. & Mamahoro A (2008). Monetary Transmission Mechanisms in

Rwanda: *cited in Ngarambe et al (2016): International Journal of Advanced Research, 4(8), 1085 – 1096.*

Mumtaz H. & Surico P. (2008). The Great Moderation of the Term Structure of UK Interest Rates: *Journal o Monetary Economics, Elsevier: 56(6), 856 – 871.*

Muth, J. F. (1999). Rational expectations and the theory of price movements: *Econometrica*. 69 (3), 315–335

Nachega, J. (2001). A Cointegration Analysis of Broad Money Demand in Cameroon: *DOI:10.5089/9781451844382.001*

Nassar K. B. (2005). Money Demand and Inflation in Madagascar: *Do: 10.5089/9781451862553.001*

Nchora D & Adameca V. (2017). Investigating the Stability of Money Demand in Ghana: *Procedia – Social and Behavioural Sciences, 220, 288 – 293.*

Ndikumana L. (2010). Is there a case for Formal Inflation Targeting in Sub-Saharan Africa? *Political Economy Research Institute Working Paper Series No. 108*

Nduka E. K., Chukwu J. & Nwkaire O. N. (2013). Trade Openness and Economic Growth: A Comparable Analysis of the Pre and Post Structural Adjustment Programme (SAP) Periods in Nigeria: *Asian Journal of Business and Economics; 3, 3 - 4.*

Nell, K. S. (2003). The Stability of M3Money Demand and Monetary Growth Targets: The Case Of South Africa: *Journal of Development Studies, 39, 151 - 180.*

Nwafor, F., Nwakanma, H. Nkansah, P. & Thompson, F. (2007). The Quantity Theory of Money in a Developing Economy: Empirical Evidence from Nigeria. *African Economic and Business Review*, 5(1), 45-89.

Nwaobi, G. (2002). A Vector Error Eorrection and Non-Nested Modeling of Money Demand Function in Nigeria. *Economics Bulletin 3, 1- 8*

Odama, J. S. (1974). The Demand for Money in the Nigerian Economy: A Comment: The *NJESS, Vol. 16 (March) No. 1, pp. 175 – 178.*

Ojo, O. (1974). The Demand for Money in the Nigerian Economy: Some comments: *NJESS, Vol. 16, pp. 149 – 152.*

Ojo, O. (1974b). The Demand for Money: Evidence from an Underdeveloped Money Market: *NJESS 16, 235 – 242.*

Okonji S.O. Igbanugo C. I. & Nnadi K. U. (2018). Financial Sector Development and Nigerian Macroeconomic Performance*: International Journal of Economics, Commerce, and Management, 6(2), 1 – 23.*

Okonkwo O.N. Ajudua E. I. & Alozie S. T. (2014). Empirical Analysis of Money Demand Stability in Nigeria: *Journal of Economics and Sustainable Development: 5(14), 2222 - 2855*

Omanukwe P. N. (2010). The Quantity Theory of Money: Evidence from Nigeria: *CBN Economic and Financial Review*, 48(2), 95-127.

Omotor, D. G. & Omotor, P. E. (2011). Structural Breaks, Demand for Money and Monetary Policy in Nigeria: A Cointegration Analysis using the Gregory and Hansen Procedure *(Processed). Ekonomski Pregled, 62(9), 559 – 582.*

Omotosho, B. S. (2015). Is Real Exchange Rate Misalignment a Leading Indicator of Currency Crises in Nigeria? *CBN Journal of Applied Statistics, 6(1), 153-179.*

Onafowora, O. A. & Owoye, O. (2012). Modeling International Tourism Demand for the Caribbean: *Sage Journals: Sage PublicationsDOI: 10.55367/te2012.0102*

Onokoya A. B. & Yakubu M.M. (2016). The Stability of Money Demand Function: Renewed Evidence from Nigeria: *Yobe Journal of Economics (YOJE), 3(1) 2016*

Onyeiwu, C., (2017). Monetary Policy and Economic Growth of Nigeria: *Journal of Economic and Sustainable Development*: *8(7), 62 -70.*

Opoku, E. (2017). Determinants of Money Demand in Ghana*: International Journal of Economics & Management Sciences,* 6(6), *91-134*

Owoye O. & Onafowora O. A. (2007). M2 Targeting, Money Demand and Real GDP Growth in Nigeria. Do Rules Apply? *Journal for Business and Public Affairs, 1(2), 34-59*

Panico, C. (2008). *Liquidity Preference*. In Durlauf, Steven N.; Blume, Lawrence E. *The New Palgrave Dictionary of Economics. www.palgrave.com/gp/book/9780333786765*

Phillip P. C. B. & Perron P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika, 75, 335 – 346.*

Pigou, A. C. (1917). The Value of Money: *Quarterly Journal of Economics, 32, 38 – 65.*

Pollin R. & Zhu A. (2006). Inflation and Economic Growth: A Cross-country Non-linear Analysis: *Journal of Post Keynesian Economics: 28, 593 – 614.*

Poloz, S. S. (1980). Simultaneity and The Demand for Money in Canada: *The Canadian Journal of Economics*/*Revenue Canadienne d'Economique*, 13(3), 407-420. doi:10.2307/134701

Ratnasiri, H.P.G.S. (2009). The Main Determinants of Inflation in Sri Lanka: A VAR Based Analysis, *Central Bank of Sri Lanka Staff Studies*, 39(1 & 2), 1-14 *DOI:10.4038/s.v39i1.3151*

Romer D. (1993). The New Keynesian Synthesis: *Journal of Economic Perspectives: 7(1), 5 – 22.*

Said, S. E. & Dickey, D. A. (1984). Testing for Unit Roots in Autoregressive-Moving Average Models of Unknown Order. *Biometrika, 7(3), 599 – 607.*

Saxena, S.P. & Bhadauriya, S. (2013). Co-integration Analysis of the Determinants of Inflation in India *Indian Journal of Economics and Research, 2(2), 4 – 12.*

Schmitt B. H. (2003). Customer Experience Management: A Revolutionary Approach to Connecting with your Customer, *John Wiley and Sons: New York, 7(5) Accessed on the 15th February, 2019.*

Schultze H. (1959). *Macroeconomics and the Phillip-Curve Myth*: Oxford University Press: https.//books.google.com.ng

Schwert, G.W. (1989). Why Does Stock Market Volatility Change over Time? *Journal of Finance, 44, 1115-1153. http://dx.doi.org/10.1111/j.1540-6261.1989.tb02647.x*

Screpanti E. & Zamagni S. (1993). *An Outline of the History of Economic Thought(2nd Ed)*: Academia edu/9734436. Online publication, Accessed on the 17th January, 2019

Sekwati L.(2008). An Analysis of the Stability of Monetary Aggregates in Botswana: Botswana *Journal of Economics: 5(7), http//dx.doi.org/10.4314/boje.v5i7.60303*

Setzer, R. & Wolff, G. B. (2017). Money demand in the Euro Area: New insights from disaggregated data. *International Economics and Economic Policy, 14, 297–315.*

Sharma, S. (2006). Broad Money Demand and Financial Liberalization in Greece. *International Discussion Paper 559, Board of Governors of the Federal Reserve System (U.S) 1 - 51*.

SharifiRenani, S. &Hosein, N. (2017). Demand for money in Iran: An ARDL approach. *Journal of Macroeconomics, 38, 171 – 176.*

Siklos, P. L. (1995a). The Demand for Money in New Zealand in an Era of Institutional Change: Evidence from the 1981 – 1994 period: *New Zealand Economic Papers, 29(1), 21 – 40.*

Siklos, P. L. (1995b). Long-run and Short-run Money Demand: which Price Deflator to Use? Some evidences using New Zealand Economic Letters, 2(6), 19 – 202.

Simmons, R. (1992). Error Correlation Approach to Demand for Money in Five African Developing Countries: *Journal of Economic Studies 19, 29 – 48.*

Sloman J. (2003). *Essentials of Economics*: Published by Financial Times/Prentice Hall.

Sloman, J &Wride, A (2009). *Economics (*7th ed.) Chapters 13-15, 19&20.Pearson Education Limited, Harlow, UK.

Sriram S.S. (1999). Demand for M2 in an Emerging-market Economy: an Error-Correction Model for Malaysia: *IMF Working Paper WP/99/173*.

Sterken, E. (2004). Demand for Money and Shortages in Ethiopia: *Applied Economic letters 11, 759 – 769.*

Stock, J. H. & Watson, M. W. (1993). A Simple Estimator of Co-integrating Vector in Higher Order Integrated System: *Econometrica 61:4, 783 – 820.*

Tahir, J. (1995). Recent Developments in Demand for Money Issues: Survey of Theory and Evidence with Reference to Arab Countries. *Economic Research Forum Working Paper 9530, 1 - 29.*

Teles, P. & Zhou, R. (2005). A Stable Money Demand: Looking for the Right Monetary Aggregate: *Federal Reserve Bank of Chicago Economic Perspectives*. *6 (2), 50 - 63.*

Teriba, A. O. (1974). The Demand for Money in the Nigerian economy: Some Methodological Issues and further evidence: *NJESS, Vol. 16, 153 – 163.*

Tobin, J. (1958): Liquidity Preference as Behaviour towards Risk: *Review of Economic Studies, Vol. 25, pp 65 – 86.*

Todani, K. (2005). A Cointegrated VAR Model of M3 Demand for Money in South Africa: *Occasional Paper South African Reserve Bank, Research Department.*

Tomori, S. (1972). The Demand for Money in the Nigerian Economy: *NJESS, Vol. 14, 337 – 345.*

Treichel, V. (1997). Broad Money Demand and Monetary Policy in Tunisia: *IMF Working Paper 97/22.*

Tule M. K.,Okpanachi U.M, Ogiji P. & Usman N. (2018). A Reassessment of Money Demand in Nigeria – *CBN Journal of Applied Statistics, 9(1), 47 – 75.*

Valadkhani, A. (2002). Long – and Short-Run Determinants of the Demand for Money in New Zealand: a Cointegration Analysis: *New Zealand Economic Papers, 36(2), pp. 235 – 250.*

Verbeek, M. (2012). *A guide to modern econometrics* (Fourth ed.). Chichester: John Wiley, 112–116

Volckart O. (1997). Early Beginnings of the Quantity: *The Economic History Review, 50(3), 430 - 449.*

Wasso, G. R. (2002, November). Broad Money Demand and Financial Liberalisation in South Africa Reserve Bank, *Occasional Paper No. 18/ 47.*

Wennerlind C. (2005). David Hume's Monetary Theory Revisited: Was He Really a Quantity Theorist or an inflationist?: *University of Chicago Press: 113(1), 223 – 252.*

Wolde-Rufael, Y. (2008). Budget deficits, Money and Inflation: The Case of Ethiopia, *The Journal of Developing Areas, 42(1), 183 –199.*

Woodford M. (2003). *Interest and Prices:* Foundation of a Theory of Monetary Policy: Princeton University Press, 785 pp

Woodridge, J. M. (2003). Cluster-Sample Methods in applied Econometrics; *American Economic Review, 93(2), 133 -138.*

Woodridge, J.M. (2005). The Demand for Real Money Balances in Nigeria: *https://www.idpublication.org*

Woodridge, J.M. (2012). Demand for money: *https://en.m.wikipedia.org>wiki*

Woodridge, J.M. (2013). *Introductory Econometrics: A Modern Approach (5th ed)* Southwestern Publication: Mason

Wu, C. S., Lin, J. L., Tiao, G. C. & Cho, D. D. (2013). Is money demand in Taiwan stable? Economics Modelling, 32, 327 – 346.

Yilmazkuday, H. (2012). Inflation Threshold and Growth: *International Economic Journal http.:10.1080/10168737.2012.658831.*

APPENDIX

1. Data

Years	m2(NB)	FIN(CPS/M2)	STOR (weighted index)	INT (%)	EINF (%)
1981	14.47	5.9	Nil	5.00	17.60962
1982	15.79	6.9	nil	7.00	7.77331
1983	17.69	7.2	Nil	7.00	19.40925
1984	20.11	7.3	nil	8.50	15.3654
1985	22.30	6.8	117.3	8.50	7.576509
1986	23.81	7.5	149.8	8.50	6.287864
1987	27.57	8.5	176.9	11.75	10.46774
1988	38.36	8.5	210.8	11.75	42.88342
1989	45.90	7.3	273.9	17.50	39.85002
1990	52.86	6.7	423.7	17.50	7.5233
1991	75.40	6.9	671.6	15.00	11.75523
1992	111.11	6.4	931	21.00	35.7259
1993	165.34	10.1	1,229.00	26.90	44.11017
1994	230.29	8.1	1,913.20	12.50	44.02114
1995	289.09	6.2	3,815.10	12.50	54.557
1996	345.85	6.3	5,955.10	12.25	25.5122
1997	413.28	7.7	7,638.60	12.00	11.68658
1998	488.15	7.7	5,961.90	12.95	12.66425
1999	628.95	8.1	5,264.20	17.00	10.41225
2000	878.46	7.7	6,701.20	12.00	10.62219
2001	1,269.32	9.4	10,185.10	12.95	18.58243
2002	1,505.96	8.2	11,631.90	18.88	14.58439
2003	1,952.92	8.2	15,559.90	15.02	15.35452
2004	2,131.82	8.2	24,738.70	14.21	15.99869
2005	2,637.91	8.3	22,876.70	7.00	17.909
2006	3,797.91	8.0	27,647.50	8.80	11.49302
2007	5,127.40	11.2	48,773.30	6.91	9.588149
2008	8,008.20	17.7	50,424.70	7.03	13.71866
2009	10,780.63	23.1	23,091.50	3.72	13.69178
2010	11,525.53	18.0	24,775.50	5.6	15.1468
2011	13,303.49	22.5	23,393.60	11.16	13.2272
2012	15,483.85	21.1	23,432.60	13.6	14.14467
2013	15,688.96	20.2	36,207.10	10.42	11.65055
2014	18,913.03	20.4	39,409.80	12	11.37159
2015	20,029.83	19.9	30,867.20	9.14	12.01179
2016	23,591.73	21.7	26,624.10	10.85	15.06989
2017	24,140.63	19.6	32,161.10	13.99	19.00285

2. Data

Years	REER (weighted price)	PCI (N)	INF (%)	Price level (index)	real Y (NB)	Pm (index)
1981	325.415	247876.9	20.81282	48	15,258.00	48
1982	333.7526	238954.8	7.697747	50	14,985.08	50
1983	395.0773	221196.5	23.21233	44	13,849.73	44
1984	546.0458	211302.8	17.82053	29	13,779.26	29
1985	489.6104	223088.3	7.435345	22	14,953.91	22
1986	267.4681	198319.6	5.717151	23	15,237.99	23
1987	85.21027	172402.7	11.29032	37	15,263.93	37
1988	85.62725	180584.5	54.51122	73	16,215.37	73
1989	76.24929	187298.5	50.46669	64	17,294.68	64
1990	70.74786	205824.7	7.3644	70	19,305.63	70
1991	59.96911	199405.9	13.00697	87	19,199.06	87
1992	49.74448	195279.5	44.58884	82	19,620.19	82
1993	54.50264	194427.8	57.16525	123	19,927.99	123
1994	100.7953	191358.2	57.03171	101	19,979.12	101
1995	160.1284	186069	72.8355	98	20,353.20	98
1996	207.6352	190545.7	29.26829	107.9897	21,177.92	107.9897
1997	235.9242	191055.2	8.529874	84.00233	21,789.10	84.00233
1998	272.3437	191397.7	9.996378	105.9997	22,332.87	105.9997
1999	70.14651	187546.1	6.618373	98.00088	22,449.41	98.00088
2000	69.86901	192616.4	6.933292	98.99429	23,688.28	98.99429
2001	77.83401	196104.4	18.87365	100	25,267.54	100
2002	78.07733	198437.8	12.87658	97.46316	28,957.71	97.46316
2003	73.19964	213475.7	14.03178	96.94523	31,709.45	96.94523
2004	74.90702	278249	14.99803	102.2243	35,020.55	102.2243
2005	85.54604	280457.1	17.86349	112.6797	37,474.95	112.6797
2006	91.49797	295636.1	8.239527	120.7299	39,995.50	120.7299
2007	89.64502	307593.6	5.382224	129.2816	42,922.41	129.2816
2008	99.12561	318307.7	11.57798	141.3588	46,012.52	141.3588
2009	92.13577	331407.7	11.53767	158.7911	49,856.10	158.7911
2010	100	347934.4	13.7202	146.4303	54,612.26	146.4303
2011	100.3078	355255	10.84079	152.8499	57,511.04	152.8499
2012	111.3897	360615.2	12.21701	172.5472	59,929.89	172.5472
2013	118.8138	370004.2	8.475827	171.145	63,218.72	171.145
2014	127.0929	383023.4	8.057383	167.4004	67,152.79	167.4004
2015	126.0637	382985.4	9.017684	164.7705	69,023.93	164.7705
2016	80.36	371980.8	11.23	146.2169	67,931.24	146.2169
2017	85.62	379764.9	16.5	156.9	68,490.98	158.0968

UNIT ROOT TEST

STOR @ level

Null Hypothesis: STOR has a unit root
Exogenous: Constant, Linear Trend
Lag length: 1 (Spectral OLS AR based on SIC, maxlag=7)
Sample (adjusted): 1982Q01 2017Q04
Included observations: 152

		P-Statistic
Elliott-Rothenberg-Stock test statistic		4.343080
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	87857406

STOR @ 1st Diff

Null Hypothesis: D(STOR) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 1 (Spectral OLS AR based on SIC, maxlag=7)
Sample (adjusted): 1921Q01 2017Q04
Included observations: 152

		P-Statistic
Elliott-Rothenberg-Stock test statistic		1 2.019306
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	1.53E+08

INT @ level

Null Hypothesis: INT has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		11.01807
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	12.44745

PCI @ level

Null Hypothesis: PCI has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		40.07853
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	2.24E+08

RMD @ level

Null Hypothesis: RMD has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		8.446899
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	725.7176

EINF @ level

Null Hypothesis: EINF has a unit root
Exogenous: Constant, Linear Trend
Lag length: 1 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981 2017
Included observations: 37

		P-Statistic
Elliott-Rothenberg-Stock test statistic		5.649630
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	11554178

EINF @ 1st Diff

Null Hypothesis: D(EINF) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample (adjusted): 1981Q02 2017Q04
Included observations: 155 after adjustments

		P-Statistic
Elliott-Rothenberg-Stock test statistic		10.69961
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	1006210.

FIN @ level

Null Hypothesis: FIN has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		1.764363
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	4.541369

FIN @ 1st diff

Null Hypothesis: D(FIN) has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample (adjusted): 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		14.50343
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	4.654927

INF @ level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		2.186982
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	195.8192

INF @ 1st diff

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample (adjusted): 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		17.67736
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	243.3629

REER @ level

Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		13.58145
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	4171.325

REER @ 1st Diff

Null Hypothesis: D(REER) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral OLS AR based on SIC, maxlag=9)
Sample (adjusted): 1981Q03 2017Q04
Included observations: 154 after adjustments

		P-Statistic
Elliott-Rothenberg-Stock test statistic		5.825024
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 36

HAC corrected variance (Spectral OLS autoregression)	4300.750

M2 @ level

Null Hypothesis: M2 has a unit root
Exogenous: Constant, Linear Trend
Lag length: 7 (Spectral OLS AR based on SIC, maxlag=8)
Sample (adjusted): 1981Q21 2017Q04
Included observations: 155 after adjustments

		P-Statistic
Elliott-Rothenberg-Stock test statistic		24.04697
Test critical values:	1% level	4.220000
	5% level	5.720000
	10% level	6.770000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 35

HAC corrected variance (Spectral OLS autoregression)	452.0804

PM @ level

Null Hypothesis: PM has a unit root
Exogenous: Constant
Lag length: 1 (Spectral OLS AR based on SIC, maxlag=9)
Sample: 1981Q01 2017Q04
Included observations: 156

		P-Statistic
Elliott-Rothenberg-Stock test statistic		35.23119
Test critical values:	1% level	1.870000
	5% level	2.970000
	10% level	3.910000

*Elliott-Rothenberg-Stock (1996, Table 1)
Warning: Test critical values calculated for 50 observations
and may not be accurate for a sample size of 37

HAC corrected variance (Spectral OLS autoregression)	128.8222

PHILIP-QULIARIS COINTEGRATION

Date: 06/15/19 Time: 18:33
Series: STOR INT FIN REER RMD EINF Y INF PCI M2
Sample (adjusted): 1981Q02 2017Q04
Included observations: 155 after adjustments
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth)
No d.f. adjustment for variances

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
STOR	-4.086649	0.7601	-16.00603	0.9718
INT	-5.173762	0.3279	-29.55616	0.3914
FIN	-8.151813	0.0029	-40.23073	0.0322
REER	-4.614514	0.5482	-23.40715	0.7460
RMD	-7.302283	0.0140	-42.84233	0.0122
EINF	-5.644789	0.1882	-26.24020	0.5880
Y	-6.130870	0.0961	-31.58411	0.2824
INF	-7.996609	0.0039	-41.77722	0.0186
PCI	-7.784161	0.0058	-40.31467	0.0313
M2	-5.344397	0.2715	-28.74423	0.4379

*MacKinnon (1996) p-values.
Warning: p-values may not be accurate for fewer than 40 observations.

Intermediate Results:

	STOR	INT	FIN	REER	RMD	EINF	Y	INF	PCI	M2
Rho – 1	-0.526954	-0.873583	-1.275671	-0.810805	-1.209373	-0.933663	-1.021735	-1.269988	-1.282174	-0.987871
Bias corrected Rho - 1 (Rho* - 1)	-0.457315	-0.844462	-1.149449	-0.668776	-1.224066	-0.749720	-0.902403	-1.193635	-1.151848	-0.821264
Rho* S.E.	0.111905	0.163220	0.141005	0.144929	0.167628	0.132816	0.147190	0.149268	0.147973	0.153668
Residual variance	6.453456	304329.0	435311.8	28500.36	3.049528	180.9660	39603.51	7.642721	21127.87	1.57E+08
Long-run residual variance	4.897252	286437.2	319433.1	20557.19	3.143458	113.3973	30122.55	6.391193	15765.68	1.12E+08
Long-run residual autocovariance	-0.778102	-8945.889	-57939.36	-3971.584	0.046965	-33.78438	-4740.479	-0.625764	-2681.096	-22556911
Bandwidth	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of observations	35	35	35	35	35	35	35	35	35	35
Number of stochastic trends**	10	10	10	10	10	10	10	10	10	10

**Number of stochastic trends in asymptotic distribution

Error Correction Mechanism:

Dependent Variable: INF
Method: Least Squares
Date: 08/28/19 Time: 17:26
Sample (adjusted): 1981Q01 2017Q04
Included observations: 156

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.21614	11.36403	1.514968	0.1418
D(INF(-1))	0.503406	0.168507	2.987454	0.0061
RMD	-0.028134	0.084979	-0.331071	0.7432
PM	0.062443	0.116000	0.538306	0.5949
Y	-0.043373	0.037500	-1.156629	0.2579
ECM(1)	-0.179376	0.030027	-5.973823	0.0000

R-squared	0.503678	Mean dependent var	19.74061
Adjusted R-squared	0.408232	S.D. dependent var	18.70668
S.E. of regression	14.39038	Akaike info criterion	8.338358
Sum squared resid	5384.162	Schwarz criterion	8.613184
Log likelihood	-127.4137	Hannan-Quinn criter.	8.429455
F-statistic	5.277079	Durbin-Watson stat	1.751878
Prob(F-statistic)	0.001778		

Dependent Variable: lnRMD
Method: Least Squares
Date: 08/28/19 Time: 16:58
Sample : 1981Q01 2017Q04
Included observations: 156

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-73.40097	67.81773	-1.082327	0.2927
EINF	0.008725	0.006285	1.388212	0.1811
D(EINF(-1))	-0.010712	0.006721	-1.593923	0.1275
FIN	0.439593	0.048620	9.041402	0.0000
D(FIN(-1))	-2.577651	3.885007	-0.663487	0.5150
lnINT	-0.344860	1.549974	-0.222494	0.8263
lnPCI	0.000790	0.000338	2.340328	0.0303
REER	0.060354	0.105799	0.570462	0.5750
D(REER(-1))	0.075946	0.007402	10.26019	0.0000
STOR	0.002540	0.000949	2.679317	0.0115
D(lnSTOR(-1))	-0.000358	0.001016	-0.352382	0.7284
ECM(-1)	-0.401700	0.050171	-8.006617	0.0000

R-squared	0.899021	Mean dependent var	117.8461
Adjusted R-squared	0.840559	S.D. dependent var	59.57049
S.E. of regression	23.78652	Akaike info criterion	9.460761
Sum squared resid	10750.18	Schwarz criterion	10.01585
Log likelihood	-134.6418	Hannan-Quinn criter.	9.641707
F-statistic	15.37796	Durbin-Watson stat	1.795251
Prob(F-statistic)	0.000000		

1. Demand for Money Result

Dependent Variable: LN(RMD)
Method: Two-Stage Least Squares
Date: 12/08/19 Time: 09:04
Sample (adjusted): 1981Q02 2017Q04
Included observations: 155 after adjustments
Instrument specification: MS Y INT STOR(-1) REER (-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FIN	0.140112	0.037554	3.730987	0.0001
LN(STOR)	-0.750445	0.107503	-6.980675	0.0000
LN(INT)	-0.641289	0.128005	-5.009876	0.0000
REER	-0.092908	0.015260	6.086785	0.0000
LN(PCI)	2.319087	0.293254	7.908124	0.0000
EINF	0.000608	0.012530	0.055708	0.8790
C	-12.00987	13.21520	-0.908792	0.5008

R-squared	0.782656	Mean dependent var	6.833619
Adjusted R-squared	0.725957	S.D. dependent var	2.185984
S.E. of regression	0.330265	Sum squared resid	2.508724
F-statistic	170.0278	Durbin-Watson stat	1.614325
Prob(F-statistic)	0.000000	Second-Stage SSR	27.30268
J-statistic	0.000000	Instrument rank	5

2. Inflation Model

Dependent Variable: INF
Method: Dynamic Least Squares (DOLS)
Date: 02/03/19 Time: 13:29
Sample (adjusted): 1981Q02 2017Q04
Included observations: 155 after adjustments
Cointegrating equation deterministics: C @TREND @TREND^2 INT INF(-1)
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RMD	0.314509	0.038615	8.144764	0.0000
Y	0.146744	0.098690	1.486925	0.1578
PM	0.517338	0.146238	3.537641	0.0014
C	2.471991	8.484402	0.291357	0.7748
@TREND	-0.081198	0.019430	-4.179019	0.0000
@TREND^2	0.001798	0.000254	7.076908	0.0000
INF(-1)	0.041652	0.011336	3.674379	0.0010
RMD(-1)	0.004325	0.002255	1.918125	0.0743

R-squared	0.940214	Mean dependent var	6.377575
Adjusted R-squared	0.926928	S.D. dependent var	2.319401
S.E. of regression	0.117527	Sum squared resid	0.207189
Long-run variance	0.016784		