ANALYSIS OF THE TRANSMISSION MECHANISM OF MONETARY POLICY ON THE NIGERIAN ECONOMY: 1987 – 2018

BY

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NSU/MSC/ECO/0070/16/17

M.Sc ECONOMICS

FEBRUARY, 2021

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRAGUATE STUDIES, NASARAWA STATE UNIVERSITY KEFFI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE (M.Sc) IN ECONOMICS

DEPARTMENT OF ECONOMICS

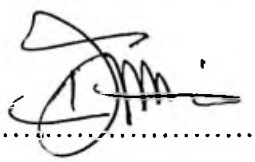
FACULTY OF SOCIAL SCIENCES

NASARAWA STATE UNIVERSITY, KEFFI

NIGERIA

DECLARATION

I hereby declare that this dissertation has been written by me and it is a report of my research work. It has not been presented in any previous application for state diploma or degree. All quotations are indicated and sources of information specifically acknowledged by means of references.



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BELLO IDRISS MUHAMMAD

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CERTIFICATION

The dissertation Analysis of Transmission Mechanism of Monetary Policy in the Nigerian Economy for the period 1987 – 2018 meets the regulations governing the award of Master of Science (M.Sc) degree in Economics, of the School of Postgraduate Studies, Nasarawa State University, Keffi, and is approved for its contribution to knowledge.

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DEDICATION

This research work is dedicated to to my late grandfather Alhaji Adamu Duniyan Allah (May his gentle soul rest in perfect peace).

ACKNOWLEDGEMENTS

My profound gratitude goes to the almighty Allah (SWT), the most Merciful, the most Beneficent, the Sustainer and the Creator, for his blessings, guidance and protection throughout the course of my study. Praise is to him Allah (SWT).

I would like to express my utmost appreciation to my distinguished supervisor, Prof. J.M. Ibbih for his valuable suggestions, constructive comments, encouragement, intellectual guidance, patience and understanding toward the compilation of this research study.

I would also like to thank all the members of my dissertation examining committee, specifically, Dr. Bala I. Ahmed (Head of Department) and internal examiner, and Prof. Francis Akawu (my research reviewer) for their criticism, guidance and contributions.

My sincere gratitude also goes to the entire departmental course lecturers; the versatile Prof. E.D. Anzaku, Prof. F.A. Akawu, Dr. D.M. Rabo, Dr. Salihu H.M. Gani, Dr. H.A. Eggon, Mr. M.S. Ajidani, and those that are not mentioned, for their scholarly guidance, useful comments and contributions. I would as well like to appreciate the other staff of Economics Department for their support and contributions in one way or another.

My special gratitude also goes to my uncle, guardian and mentor, Alh. Hamza Ibrahim Naibbi for his guidance, finances and support. I remain highly indebted.

My appreciation also goes to the entire M.Sc Economics class of 2016/2017, especially David Onah, for his kind contributions, support and enlightment toward the econometric analysis. Also include among others; Kamaludden Olaitan, Emmanuel Aluga, Shafiu, Kenneth, Benjamin, Sadiya, Ene. Also to my colleagues, friends, and

brothers in the academic arena; Adamu Musa Alhaji, Abubakar Umar Yerima, Nasir Auwal Maimanja, and Fatima Garba, among others.

My deepest appreciation and gratitude goes to my beloved parents, Muhammad Bello and Zuwairah Idriss, for their parental upbringing, cares, efforts and support. Especially, to my late grandfather Alḥ. Adamu Duniyan Allah (may his gentle soul rest in perfect peace), for his enormous guidance and my literacy foundation. Also to my siblings; Ibrahim, Aisha, Fatima, Maimuna, Al-amin and Abubakar, for their cares.

Furthermore, my compliment and gratitude also goes to Mr. Mukhari Garba for his brotherly advice, supports, encouragements and unrelenting guidelines throughout my course of study. I am also expressing my appreciation to Prof. D.U. Sangari, and Dr. B. Jamri, for their intellectual contributions, support and concern.

I also own a debt of gratitude to my pioneer lecturers; Mal. Sadiq B. Gaidam, Mr. Louis N. Sevitenyi, Prof. D.H. Balami, Prof. Sheka and Dr. A.M. Fagge for their orientation and contributions toward my academics.

The following also deserve my acknowledgement and sincere mention for their enrouragements, supports and well-wishing, uncle Umar Abba Ibrahim, Pharm. Babayo Audu Babayo, Mr. Umar Mashio, Mr. Abdulsalam Aji, Mr. Yakubu and those that are not mentioned.

I am as well expressing my appreciation to my family in general, specifically, the families of Alh. Ibrahim Na Ibbi, Alh. Gambo Abba, Alh. Saidu Abba, Mohammed Tukur Abba, Usman Abba Kale, and the entire Aguda kingdom.

In the end, I would also like to acknowledge and say big thanks to those scholars and publishers, whose literature work and publications were consulted. Most especially, CBN, NBS and other related journals.

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ABSTRACT

The study investigated on the analysis of transmission mechanism of monetary policy on the Nigerian economy for the period 1987 to 2018. The study examined the level of success of monetary policy measures against desired objectives and the appropriate measures for achieving it. The study employed quantitative research approach, which involves the utilization of annual time series data using Autoregressive Conditional Heteroscedascity (ARCH) and Generalize Autoregressive Conditional Heteroscedascity (GARCH) techniques. ARCH LM test and JB normality test were also employed as diagnostic tests to investigate the reliability of the variables used. The result in model one showed that Money Supply (MS) and Monetary Policy Rate (MPR) have impacted significantly on Real Gross Domestic Product (RGDP) in Nigeria without the result of liquidity ratio. And in model two, both Monetary Policy Rate (MPR), Prime Lending Rate (PLR) and Treasury Bills (TRB) affect Cost of Capital (CCAP). While in model three, both Money Supply (MS) and Cash Reserve Requirement (CRR) have impacted positively on Household Investment Expenditure (HEXP) except Maximum Lending Rate (MLR). The study showed that, the transmission of monetary policy is fairly strong in the entire three models. This implies that the effectiveness of Monetary Policy Rate (MPR) on the third model depends on its effect on money supply. The study therefore recommends that Open Market Operations (OMO) may be critical to the effectiveness of monetary policy in Nigeria. Specifically, the government through the CBN should set the lending rates at optimum level as these would help to boost credit expansion, money supply and invariably returns and profitability of deposit money banks in Nigeria, as well as redefining reserve requirement by setting the CRR at an equilibrium level in order to make more funds available for loans and investments in the economy thus, leading to economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Monetary policy is the most actively used tool for macroeconomic stabilization in countries with independent currencies. Yet, as the Global Financial Crisis has made manifest, the effectiveness of monetary policy in influencing aggregate demand varies with circumstances. This is as true from one country to another as it is at different times for the same country. To be effective, therefore, central banks pursuing an active monetary policy require at least an approximate quantitative as well as qualitative understanding of the effectiveness of monetary transmission in the specific country and under the specific circumstances in which they operate (Prachi, Peter, & Rajeswari, 2016). Monetary policy is an economic strategy taken by the government normally through the Central Bank of a nation to influence the economy. It is direct towards creating stability in the economy and sustaining economic growth which have been the pursuit of every nation of the world. It also referred to as the control of money supply and interest rates by the monetary authority of a nation, in order to ensure that inflationary pressure does not reach an economy-threatening level as well as avoiding currency depreciation (Sulaiman & Migiro, 2014).

However, the emergence of a truly global market economy and the associated changes in monetary policy regimes worldwide has sharpened the debate about how monetary policy affects the economy. To be successful in conducting monetary policy, the monetary authorities must have an accurate assessment of the timing and effect of their policies on

the economy, thus requiring an understanding of the mechanisms through which monetary policy affects the economy (Mishkin, 1995). Kapur (2018) asserts that a stylised fact of the conduct of monetary policy across major central banks is the inertia in the process of changes in the policy rate ("baby steps" approach). A comparative analysis of monetary policy rules on the appropriate degree of inertia suggests that a less inertial rule has the benefit of minimizing deviations of inflation and output from the policy objectives, but such a rule would also require stronger monetary policy responses to any shocks which lead inflation and output to deviate from their policy objectives. For instance, the Reserve Bank of India transited from the multiple indicator approach towards a flexible inflation targeting (FIT) framework of monetary policy in 2014. In other words, monetary policy is usually taken to be formulated by an independent or quasi independent central bank in pursuit of broad macroeconomic objectives, rather than with the objective of meeting the government's financing needs. In the United States, for example, this situation dates to the Fed-Treasury Accord of 1951, which freed the Fed to pursue its own macroeconomic objectives, rather than simply pegging the interest rate on Treasury bills for fiscal reason (Prachi, Peter, & Antonio, 2012).

Moreover, Luis, Douglas and Adrian (2008) noted that the widespread adoption of inflation-targeting (IT) regimes by emerging-market economies (EMEs) has generated considerable interest in the channels through which monetary policy shocks affect output, inflation and other relevant aggregates. For instance, the introduction of the IT framework in Brazil in 1999 has generated significant interest in understanding the monetary transmission mechanism and, as a result, there has been a growing subsequent literature seeking to identify and measure the channels through which the central bank's

policy interest rate (SELIC) affects output and inflation. Kapur and Behera (2012) further pointed that the interest rate channel gained importance in the EMEs during the 2000s. As such, monetary policy frameworks in the EMEs became more credible, and central banks were more flexible in their operations, benefitting from reduced fiscal dominance and greater exchange rate flexibility. These shifts and the associated balance sheet changes strengthened the interest rate channel and inflation in most EMEs became lower and less volatile.

Generally, economic theory, as well as laws and practices in most countries, assumes a low inflation rate and a stable domestic currency as the most important objectives of a central bank. Majority of countries also indicate economic growth (GDP growth) as a goal of their monetary policies, however, in the hierarchy of goals it is lower than monetary and financial stability. Monetary theory gives an absolute priority to the stability goals and low inflation rate, and almost all economists agree that the use of monetary policy for economic growth usually leads to higher inflation, with no real impact on growth. This is known as the concept of long-term monetary neutrality, although most of the monetary policy theorists and practitioners do not challenge the short-term impact of monetary policy on economic growth (Bojan & Ivan, 2012).

Monetary policy is a vital instrument deploy by a nation for the maintenance of domestic price and exchange rate viability, as a means for the achievement of sustainable economic growth and external viability (Amassoma, Ditimi, Nwosa, & Olaiya, 2011). It is also concerned with the use of changes in money supply and /or interest rates to influence the level of economic activity. Moreover, it is anchored on the use of some or all the instruments of monetary .policy, viz; open market operation (OMO), the reserve

requirements, the liquidity ratio, sectoral credit guidelines, credit ceilings and cash reserve requirements, administrative fixing of interest rates, exchange rates and the imposition of special deposits. However, in most developing countries, like Nigeria, the use of these policy instruments is ineffective due to the underdeveloped nature of both the money and capital markets (Udoka & Roland, 2014).

Kalu, Benson and Paul (2015) noted that monetary policy is an indispensable economic weapon of stabilization which involves different measures articulated to regulate and control the quantum, cost, availability and direction of money and credit with the sole purpose of achieving some predetermined macroeconomic goals. The attainment of this intention has to do with the existing transmission mechanism and the modus operandi capable of touching effectively on appropriate macroeconomic variables, thereby stabilizing the economy and impacting on economic growth and development. However, economists have paid much attention on the monetary transmission mechanism over the years. One of the basic concerns is to have a good grasp of the ways monetary policy affect the entire economy so as to take appropriate steps in ensuring positive results.

On the other hand, transmission mechanism of monetary policy is a process whereby the action of central banks in terms of manipulation of money supply and interest rates are transmitted to the economy via several channels. It describes how changes in policy transmit through the financial system, via financial prices and quantities, to the real economy, affecting aggregate spending decisions of households and firms, and from there to aggregate demand and inflation (Pétursson, 2001). Moreover, Ishioro (2013) observed that the transmission mechanism of monetary policy works through various channels namely exchange rate channel, interest rate channel, bank credit channel and other assets

price effect channel (also known as equity price channel) to affect different markets, institutions, sectors at different speeds and intensities.

Acoording to Adeoye and Shobande (2017), the theoretical position on how monetary policy transmission mechanism affect the real economic activities and stimulate the system is classified into two; firstly, an increase in money supply which will lead to an increase in price which in turn generate inflation thereby lowering the interest rate which tend to stimulate investment and speed up the growth of the economy. And second, the scholastic criticism of the monetary policy presented by Keynesian economists that the interest rate channel is the standard Keynesian channel of monetary transmission. However, Keynes further suggests that a fall in real interest rates lowers the cost of capital, causing a rise in investment spending, thereby leading to an increase in aggregate demand and a rise in output. Therefore, it is the real rather than the nominal interest rate that affects consumer and business decisions.

In other words, Hassan (2015) noted that the monetarists led by the Milton Friedman posited that money matters and argued that monetary policy is transmitted through either interest rate, exchange rate channel or both. While for early Keynesians oppose the effectiveness of the monetary policy and held the belief that monetary policy works through bank lending and balance sheet channel. And again, for the intermediary school (i.e. Real business cycle) sees money as neutral- that is they neither belief that money matters nor deny the effectiveness of monetary policy on the economy. However, they argue that there is reverse causation running from other important economic variables such as asset price to the supply of money (i.e. asset price channel). The goal of every central bank in the world is to achieve primarily, price stability in the economy. Just like

any central bank in the world, Nigeria embarks on inflation targeting regimes in order to respond appropriately to the challenges posed by various channels of monetary policy transmission mechanism. Morerover, Adekunle, Baba, Ogbuehi, Idris and Zivoshiya (2018) claimed that the primary instrument of price stability-oriented monetary policy is interest rate.

However, the various channels of monetary transmission are important in this work, but which one is dominant with the highest speed of transmission in Nigeria remains a major concern. Bature (2014) asserted that many writers have expressed their views on individual transmission mechanism in Nigeria. Yet, whatever argument there is remains a matter of explanation on how output in Nigeria is raised within the shortest period of time as this will be measured by the rate of growth of the economy. When a central bank takes a policy action, it sets in motion a number of economic events which change the monetary policy as it changes price and output. This is the process that is referred to as the transmission mechanism of monetary policy. For instance, short-term interest rate and aggregate bank credit can help in protecting the system from both domestic and external shocks. However, external shocks affect the real economy through inflationary pressures, especially in a small, open and oil export-oriented economy such as Nigeria, which generates capital inflows and outflows from the current account balances and, hence, net foreign assets (NFA) in the foreign exchange component of the financial markets. Additionally, imported inflation may put pressures on the domestic inflation rate, through their impact on aggregate demand as reflected in the private final consumption expenditure, the aggregate economy, and output production. Therefore, measures targeting the stabilization of changes in output to maintain a stable output growth in the

real economy require not just monetary stability, but also financial stability, given the interface of monetary and financial markets in the process of credit supply and its accessibility (Ndekwu, 2013).

Furthermore, Abdulazeez (2016) posited that monetary policy can only be successful when the operating economic environment, the institutional framework adopted, and the choice and mix of the instruments are effectively utilised. As such, Nkwatoh (2012) opined that different channels through which monetary policy affects the economy exist. These channels are supposed to transmit monetary policy effectively to the real sector. However, they mostly seem not be clear due to the imperfect nature of the market for money, goods and services, as well as price flexibility. Moreover, the existence of a large informal sector alongside a large informal credit market and exchange rate markets in Nigeria has many implications for the effectiveness of monetary policy. For instance, there exist divergences between the official and parallel market exchange rates which induce in the short run, a chain of speculative activities, thus weakening the smooth implementation of monetary policy.

According to CBN (2011), the Central Bank of Nigeria (CBN) organizes monetary policy targets into three (3) stages thus: firstly, operational target i.e. manipulation of reserve money over which it has substantial direct control, to intermediate target being the level of broad money supply (M2) which in turn impacts on the ultimate target the stage or final objective of monetary policy in the areas such as inflation and output. More so, in carrying out these functions, Central Bank of Nigeria (CBN) combines amongst others, the use of nominal anchor in executing her monetary policy. Moreover, Nigeria economy is faced with unemployment, low investment and high inflation rate and these factors

militate against the growth of the economy. Thus, adopting a monetary policy in manipulating the fluctuations experienced so far in the economy, CBN undertakes both contractionary and expansionary measures in tackling the problems observed above. However, it is against this backdrop that this study would examine empirically the transmission mechanism of monetary policy in the Nigerian economy, by employing higher frequency and updated data.

1.2 Statement of the Problem

The persistent rise in prices of goods and services in Nigeria gives rise to question the efficiency and effectiveness of the monetary policy transmission mechanism. However, since inception of the CBN, the achievement of general monetary policy objectives has been a crucial problem. Sound policies have been formulated with respect to key macroeconomic variables in the economy, but its full effectiveness is yet to prevail (Adigwe, Echekoba, & Justus., 2015). A developing country such as Nigeria has myriad of problems that in various ways debilitate smooth transmission of monetary policy. Regulation of money supply has never been easy given the nature of the economy and the role of the government officials. The economy has witnessed varieties of instability due to management of interest rate and other policy instruments. This has impacted adversely on inflation control which called for questioning on the effectiveness of monetary policy in reducing inflation. They also note that the informal sector in Nigeria accounts for about 30 percent of the GDP, thus the existence of a large informal credit market and exchange rate market in Nigeria has many implications for the transmission mechanism of monetary policy

It is worthy to note that, from 1985 to 2004, CBN used the minimum rediscount rate (MRR) to influence economic activities. Remarkably within this time frame was the fact that, the spread between banks' deposit and lending rates remained unacceptably wide with adverse implications for savings mobilization and investment promotion. According to the Monetary Policy Committee (2004), there was no justification why the MRR was fixed at 15.0%, when the year-on-year inflation rate for December 2004 was about 9.5%. This showed the ineffectiveness of MRR in influencing both the financial sector and the real sector. In 2005 a new monetary strategy was adopted which was to render the MRR more proactive and allow it to become a true anchor on which other rates in the money market would be predicted. But in 2006, the MRR shifted to a new monetary policy rate (MPR). The shift to MPR was based on two conclusions. First, the MRR was no longer relevant as it only influenced the setting of commercial bank loan rates and did not seem to have any linkage with other interest rates, either interbank rates (the operational target) or the intermediate targets. These constrained CBN ability to influence economic variables through the conduct of monetary policy. Second, the application of MRR over the years could also not eliminate the macroeconomic imbalances typified by the co-movements of interest rates and inflation rates, which led to several policy inconsistencies and misappropriations (Alade, 2007).

Furthermore, there have been various regimes of monetary policy in Nigeria. The economy often witnessed either expansionary or contractionary monetary policy in an attempt to achieve its set objectives. However, there is evidence of relatively high rate of unemployment, increased poverty rate, low standard of living, unacceptable rate of inflation etc. despite efforts made towards the achievement of the desired

macroeconomics objectives through monetary policy, especially in developing economies like Nigeria (Anowor & Okorie, 2016; Adegbemi & Mariam, 2013). As such, comparing the trend of monetary policy rate with economic growth, it is clear that stability has not been achieved. Also, the tight monetary policy with the recent implementation of single treasury account (TSA) – leading to less liquidity in circulation have not resulted in lowering inflation, as well as the dualistic nature of both financial and product market in the economy which constitutes a fundamental constraint militating against the smooth transmission of monetary policy.

From the discussion above, this therefore shows that policies have been designed and implemented by the monetary authorities (CBN), with minimal impact of those policies on both the operational target, intermediate target as well as on the final goals of monetary policy in Nigeria. As such, this study will further analyse the link existing between the transmission mechanism of monetary policy and the Nigeria economy for the period under review.

1.3 Research Questions

The study will answer the following questions:

i. Does money supply affect aggregate output in Nigeria?

ii. What is the effect of monetary policy rate on the cost of capital in Nigeria?

iii. What is the effect of reserve requirement on the household investment expenditure in Nigeria?

1.4 Objectives of the Study

The broad objective of the study is to examine the influence of monetary policy transmission mechanism on the Nigerian economy. And the specific objectives are as follows:

i. To evaluate the impact of money supply on aggregate output in Nigeria.
ii. To examine the impact of monetary policy rate on the cost of capital in Nigeria.
iii. To investigate the effect of reserve requirement on the household investment expenditure in Nigeria.

1.5 Research Hypotheses

Ho_1: There is no significant relationship between money supply and aggregate output in Nigeria.

Ho_2: There is no significant relationship between monetary policy rate and cost of capital in Nigeria.

Ho_3: Reserve requirement have no significant effect on household investment expenditure in Nigeria.

1.6 Scope of the Study

A large number of empirical studies have been conducted in the field of monetary policy in Nigeria. However, this research study is restricted to the transmission mechanism of monetary policy in Nigeria, using some tools of monetary policy management viz; Monetary Policy Rate (MPR), Broad Money Supply (MS), Cash Reserve Requirements

(CRR), Liquidity Ratio (LR), Maximum Lending Rate (MLR), Prime Lending Rate (PLR) And Treasury Bills (TRB), with specific attention to the priced-based nominal anchor i.e. Monetary Policy Rate (MPR) as one of the key monetary instrument in Nigeria on one hand, as well as Real Gross Domestic Product (RGDP), Cost of Capital (CCAP) and Household Investment Expenditure (HEXP) as the tools for economic growth and price stability (i.e. final objectives of the monetary policy), on the other hand. Moreover, the study is specifically limited to Nigerian economy for the period 1987 to 2018. This period 1987 is considered because of the introduction of instruments of Second Tiers Foreign Exchange Market (STFEM), as well as the activities of the interbank market which started in 1996.

1.7 Significance of the Study

The monetary management in Nigeria has been relatively more successful during the period of financial sector reform, yet the effectiveness of monetary policy transmission mechanism has been undermined by the effects of fiscal dominance, political interference and the operating environment. As Uchendu (2009), noted that over time changes are bound to occur in the transmission mechanism of monetary policy.. Some channels that used to be strong either get degraded in significance or become irrelevant due to changes in economic activities. Therefore there is the need to continuously monitor these transmission channels of monetary policy since their influence in the economy is determined by changes in the domestic and international economic and financial developments causing the channels to change or making them to become less significant over time.

The study will shows the importance of the monetary policy transmission mechanism of the Central Bank of Nigeria as a powerful tool which can be use to influence the growth process in Nigerian economy. Hence, economic growth can be achieved if these monetary policies would be effectively implemented and monitored appropriately. However, at the end of the analysis, the result of the study will provide useful suggestions to solve identified areas of problems. More so, findings that will precede this work, no doubt will be economically viable, particularly this time of financial reforms in the economy geared towards economic growth and development as contained in the Economic Recovery and Growth Plan (ERGP) for 2017-2020 in Nigerian economy.

Furthermore, the study will provide sound understanding on the rate as well as the extent to which changes in the CBN instruments of monetary policy impact on both operational, intermediate and the ultimate or final targets. The study will also bring out the links between policy instruments and the key economic variables, as well as provide information about the appropriate policy-mix that will lead to a better choice of instruments and targets, as well as the timing of policy changes. It will equally serve as an avenue for identifying the most effective channel(s) of monetary policy transmission mechanism (MPTM) in Nigeria. In specific terms, this research study will essentially contribute to the body of already existing knowledge in the academia. It will also help the academicians, students, policy-makers, as well as independent researchers. Moreover, it will serve as additional literature on the analysis of monetary policy transmission mechanism in the Nigerian economy, as well as provide data on the topic for further research in the area.

1.8 Organization of the Study

This research study is structured into five (5) chapters. Where, Chapter one (introduction) contains the background of the study, statement of the problem, research questions, objectives of the study, research hypothesis, scope of the study, significance of the study, and outline of the study.

Chapter two discusses the related literature reviews, which contains the conceptual, theoretical and empirical reviews.

Chapter three presents the methodology of the study, which deals with the research design, theoretical framework, model for the study, model specification, a priori expectations, explanation of variables, nature and sources of data, estimation techniques, method of data analysis, evaluation of the model as well as justification of model.

Chapter four focuses on data presentation, analysis and interpretation which consist of descriptive statistics, unit root test result, co-integration analysis, ARCH and GARCH regression result, Residual test results thus; ARCH LM test and Jarque-Bera normality test others include; statistical test of hypotheses and discussion of findings.

Finally, chapter five discusses the summary, conclusion and recommendations which comprise of summary of major findings, conclusions, recommendations, limitations to the study, contribution to knowledge and suggestion for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Monetary Policy

The term monetary policy has been defined by experts from many perspectives. According to Nnenna, Ihemeje and Anumadu (2016), monetary policy is defined as the combination of measures or actions designed to regulate the value, supply and cost of money in an economy in consonance with the level of economic activities. It involves controlling of the direction and movement of monetary and credit facilities in pursuance of stable price and economic growth in the economy. In other words, monetary policy is the policy of managing the economy to bring about sustainable economic growth and development. It involves management of money supply and interest rate and is the demand side economic policy used by the government of a country to achieve macroeconomic objectives like inflation, consumption, growth and liquidity (Balami, 2006). Moreover, monetary policy rests on the relationship between the rates of interest in an economy, that is the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of tools to control one or both of these, to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment (Irfan & Amen, 2011).

CBN (2011) posits that monetary policy refers to the specific actions taken by the Central Bank (i.e. monetary authority) to regulate the value, supply and cost of money in the economy with a view to achieving predetermine macroeconomic goals. Ezema (2009)

also opined that monetary policy is the deliberate use of monetary instruments (direct and indirect) at the disposal of monetary authorities such as central bank in order to achieve macroeconomic stability. Macroeconomic stability refers to achievement of internal and external balance. Internal balance here refers to: price stability (low inflation), low unemployment, high and stable economic growth, external balance, balance of payment equilibrium, exchange rate stability. However, Jhingan (2002) refers monetary policy as the credit measures adopted by the central bank of a country.

On the stance of monetary policy, however, monetary policy can either be expansionary or contractionary, depending on the overall policy thrust of the monetary authorities. Monetary policy is expansionary when the policy adopted by the central bank increases the supply of money in the system. It is conventionally used to stimulate economic activity, usually in a recession. Conversely, it is contractionary when the actions reduce the quantity of money supply available in the economy or constrains the growth or ability of the deposit money banks to grant further credit. It is conventionally used to reduce inflationary pressures in the economy (CBN, 2011).

A close observation of these definitions of monetary policy shows that monetary policy boils down to adjusting the supply of money in the economy to achieve some combination of inflation and output stabilization. Koshy (2009) posits that most economists agree that in the long run output usually measured by gross domestic product (GDP) is fixed, so any changes in the money supply only cause prices to change. But in the short-run, because prices and wages usually do not adjust immediately, changes in money supply can affect the actual production of goods and services. However, the growing importance of monetary policy as opined by Chipote and Makhetha-Kosi (2014)

has made its effectiveness in influencing economic growth a priority to most governments. Nkoro (2005) as cited in Chipote and Makhetha-Kosi (2014) pointed that despite the lack of consensus among economists on how monetary policy actually works and on the magnitude of its effect on the economy; there is a remarkable strong agreement that it has some measure of effects on the economy. Thus, three basic kinds of monetary policy decision can be made - the amount of money in circulation; the level of interest rate; and the functions of credit markets and the banking system. The combination of these measures is designed to regulate the value, supply and cost of money in an economy, in line with the level of economic activity (Anowor & Okorie, 2016).

Furthermore, the role of monetary policy was perceived to have no impact on real economic activity but in late 1980s empirical research in macroeconomics showed that monetary policy significantly affects the short term course of the real economy (Seyed, 2016). And the major policy concern of monetary economics is with the impact of monetary policies on the economy. Monetary policy also impacts the lives of individuals because of the influence of money supply on the allocation of resources in the economy. Money supply in the economy can be controlled if the monetary authorities observe that the supply of money is growing faster than the economy's capacity to produce goods and services. If the monetary authorities do not intervene to control the growth in money supply under the circumstance, it will lead to demand pull inflation. This is a signal that the amount of money in circulation is more than what the current volume of goods and services produced could optimally accommodate, and this is likely to be inflationary. If money supply is not controlled, economic agents would be discouraged from planning

and further investment as they consider that their investments are not secure. This is because when there is inflation, the value of investments and currency holdings would be eroded (CBN, 2011). Also, Adekunle et al. (2018) believed that monetary policy have significant impact on financing conditions of the economy. Besides its effect on the cost of capital, it also impact on the credit creation capability of banks through availability or otherwise of loanable funds as well as reshape banks appetite for specific risks.

2.1.2 Monetary Policy Transmission Mechanism

Monetary policy transmission mechanism according to Ishioro (2013), describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact on real variables such as aggregate output and employment. However, Bature (2014) noted that monetary policy transmission mechanism in Nigeria traces the relationship between changes in the supply of money and real variables such as output, employment, and prices of goods and services. These arguments have been discussed through different theoretical explanation as well as in different channels of transmission. For instance, changes in domestic demand influences current production levels, wages and employment. In the process, it leads to changes in domestic prices as well.

Moreover, according to CBN (2017), transmission mechanism of monetary policy is a set of channels through which monetary policy influences the real economy, particularly output and inflation. In other words, it is a process through which changes in money supply or other monetary aggregates pass through some intermediate variables to affect prices (interest, exchange and inflation rates), output/employment and external balance. Traditionally it can be viewed as the linkage between monetary policy and aggregate

demand. When the central bank makes changes to the interest rate, there are channels through which the change transmits to the real sector of the economy. However, understanding the transmission mechanism provides great insight into the conduct of monetary policy. Although, Adeoye and Shobande (2017) argues that in studying monetary transmission mechanism process, consideration should be given to its impact on policy and less emphasis on random shocks basically because shocks account for less fraction of the policy instruments inconsistency. Abdullahi (2014) also argued that an understanding of transmission process is essential to the appropriate design and implementation of monetary policy.

According to Ishioro (2013), the economic literature is filled with the debate on how the workings of the monetary transmission mechanism as it affects sectors of the economy or key economic variables or as its effects in a multiplier process throughout the economy. As such, the issue concerning the impact of monetary policy transmission on the economy in general and on output, prices, investment and other key economic variables in particular has long been a crucial issue of debate. He further argued that it is difficult to understand the issue of whether monetary policy shocks affect real macroeconomic aggregates or not, and have been acknowledged as a significant gap that remains unfilled with regard nature of the channels through which monetary response are transmitted to the specific sectors or the entire economy. However, Rasheed (2002) is of the view that the financially restrictive policies in Nigeria from the late 1980s seem to have made the understanding of the channels of monetary transmission more difficult due to interest rate stickiness.

The most traditional channel of monetary transmission affecting macroeconomic variables involve the effect of interest rates on the cost of capital and consequently on households investment expenditure such as residential and consumer durables investment. Kalu et al. (2015) posited that when the apex bank lowers the interest rates, the return on local assets decline vis-a-vis foreign assets. The effect is that the cost of local assets in comparison with other value of assets falls, and lowers the currency of the local economy. This makes output of the local economy relatively cheaper than foreign goods and so resulting to a rise in export. This is an injection into the economy which increases aggregate demand, thereby impacting on income, output and employment. So also, exchange rate plays a pivotal role on the way monetary policy impact on the economy. Moreover, Bernanke and Gertler (1995) asserted that "the impact of monetary policy on the real economic variables has been a contentious area of debate in macroeconomics". However, there exist a dispute among most economists as well as theoretical thinkers about the actual and magnitude of the impact of monetary policy on real economic activities and how it is transmitted.

A successful implementation of any monetary policy regime requires an accurate and informed assessment of how fast the effects of policy changes propagate to other parts of the economy and how large these effects the mechanism through which monetary policy actions and other forms of shocks affect economic activity. Specifically, the channels through which monetary policy affects prices and economic activity Lavally (2015). The transmission channels of monetary policy vary across countries. For instance, according to Obafemi and Ifere (2015), certain factors that may be responsible for this variations may include; "macroeconomic environment and structural economic conditions, the

extent of development of capital markets, the health of and extent of development within the financial system as well as the major monetary policy instruments used by a country." In other words, Sanusi (2009) assert that "an efficient and effective transmission mechanism of monetary policy can only be assured in an economically safe and sound environment characterized by a competitive banking system".

Furthermore, it is the role of the transmission mechanism to ensure that changes in the behaviour of the monetary sector influence various monetary variables, affect the level of money supply, or influence the level and structure of interest rates and the relative quantities of financial assets (Onyemachi & Lezaasi, 2012). As such, to perform its transmission function optimally, the indicators and targets must respond appropriately to the dictates of the monetary policy instruments. They further restates that the extent to which the goals of monetary policy can be achieved will depend on the strength and size of the monetary policy instruments. The strength and size of an instrument determines the strength and size of the impact to be unleashed on the indicator variables and which is further transmitted proportionately to the target variable which finally produces the desired results or goals in proportion to the impact initially generated by the instruments.

Thus, the outcome of a Conference on Financial Innovation and Monetary Transmission, concluded that "monetary transmission is a complex and interesting issue because there is not one, but many channels through which monetary transmission operates" (Kutter & Mosser, 2002). This makes monetary or inflation targeting of little or no relevance, but really an inflation sign-post, in the monetary policy transmission mechanism. As pointed out by Taylor (1995), the study of financial intermediation and their empirical supportive role to the monetary policy transmission mechanism is essential given the position of

financial markets, comprising interest rate, credit, foreign exchange and the exchange rate, in effecting the transmission of monetary policy to the real economy. However, Rudrani, Shruti & Sahana, (2019), noted that the dominant channels of monetary policy transmission are different across countries, and also often changes over time as and when countries introduce new financial instruments, new macro-prudential regulations or change the degree of global integration. Nevertheless, a general consensus in the literature is that the transmission channels are not only different in emerging and less developed countries but also they are much weaker as compared to the developed nations.

2.2 Theoretical Review

So many complementary theories offer insight into the theoretical link between monetary policy transmission mechanism and economic growth. Here, we will discuss the different schools of thought and their views of the role of money in attaining policy objectives.

2.2.1 The Classical Theory of Money

According to Anyanwu (1993), the classical school evolved through concerted efforts and contribution of economists like Jean Baptist Say, Adam Smith, David Ricardo, Pigou and others who shared the same beliefs. The classical model attempts to explain the determination, savings and investment with respect to money. The classical model on say's law markets which states that "supply creates its demand". The classical economist believes that the economy is always at or near the natural level of real GDP. Thus, they assume that in the short run, the Y in the equation of exchange is fixed. They further

argue that the velocity of circulation of money tends to remain constant. So that V can also be regarded as Fixed. Given that both Y and V are fixed, it follows that if the Central Bank of Nigeria (CBN) was to engage in expansionary (or contractionary) monetary policy, it will lead to an increase (or decrease) in money supply (M), the only effect would be to increase (or decrease) the price level P, in direct proportion to the change in money supply (M) (Nnenna et al., 2016).

2.2.2 The Keynesian Theory of Money

The Keynesian theory assumes a close economy and a perfectly competitive market with fair price- interest aggregate supply function. The economy is also assumed not to exist at employment equilibrium and also that it works only in the short run because as Keynes aptly puts it "In the long run, we also will be dead". The Keynesian theory is rooted in one notion of price rigidity and the possibility of an economy setting at a less than full employment level of output, income and employment. The Keynesian macro economy brought into focus the issue of output rather than prices as being responsible for changing economic conditions. In other records, they were not interested in the quantity theory per say (Udude, 2014). Furthermore, Nnenna *et al.* (2016) posits that the Keynesian theory is a rejection of Say's Law and the notion that the economy is self-regulating.

According to Keynesian analysis, the quantity of money could not affect the real economy in any direct way but only indirectly through variations in the interest rate. In contrast, a different view has been expressed by economists at the University of Chicago. Specifically, Milton Friedman (1912–2006) claimed that money matters and is responsible for almost every economic phenomenon (Mishkin, 2003).

2.2.3 The Monetarist Theory of Money

The term "monetarism" was coined in Karl Brunner's (1968) article, but many of the issues in the monetarist-Keynesian controversy had been brought to professional attention much earlier by Friedman (1956). Monetarism is neither the quantity equation rediscovered nor the quantity theory reborn. Thomas Mayer's comparison of quantity and Keynesian theories suggests that the quantity theory and monetarism are related but distinct. The monetarist-Keynesian debate does not depend on the truth of the traditional interpretation of the quantity theory or the belief that all relative prices are forever constant. Nor does it depend solely on the slopes of *IS* and LM as in Keynesian or neo Keynesian theories (Allan, 1977).

Monetarist is a school of thought led by Milton Friedman. The monetarist essentially adopted Fisher's equation of exchange to illustrate their theory, as a theory of demand for money and not a theory of output price and money income by making a functional relationship between the quantities of real balances demanded a limited number of variables (Udude, 2014). In other words, this school of thought is a modern variant of classical macroeconomics. They developed a subtler and relevant version of the quantity theory of money. Like any school of thought, Friedman emphasized on the supply of money as the key factor affecting the well-being of the economy and as well, accepted the need for effective monetary policy to stabilize an economy.

2.2.4 The Quantity Theory of Money

This theory posited that there is a direct relationship between prices, income, and the amount of money circulating in the economy. The quantity theory was first propounded

in its most basic form by French philosopher Jean Bodin (1530–1596), who observed that the large amounts of gold and silver being brought back from the New World were driving up prices across Europe. Later two British philosophers, John Locke (1632–1704) and David Hume (1711–1776), noted that when the quantity of money grew, so did purchasing power and economic activity. Thus, if a government wanted to lower prices to combat inflation, according to the quantity theory, all it had to do was decrease the amount of money in circulation. Consumers would have less money to spend, demand would fall, and prices would drop (Dornbusch, 1980).

The quantity theory continued in the writings of the neoclassical economists, with the issue of exogeneity predominant in the work of Irving Fisher (1867–1947). The Fisher's equation of exchange (1911) can be stated as: $MV + M'V' = PT$, where M is currency and M' is demand deposits; V and V' are the respective velocities; and T stands for total volume of transactions and not only of final goods. Another interesting development is that associated with Knut Wicksell (1851–1926), who stressed the endogenous character of the money supply, which is responsible for the variations in the price level. (Green, 1982)

The quantity theory of money refers to the proposition that changes in the quantity of money lead to, other factors remaining constant, approximately equal changes in the price level. Thus, the QTM is written as $MV = PY$, where M is the supply of money; V is the velocity of the circulation of money, that is, the average number of transactions that a unit of money performs within a specified interval of time; P is the price level; and Y is the final output. The quantity theory is derived from an accounting identity according to which the total expenditures in the economy (MV) are identical to total receipts from the

sale of final goods and services (*PY*). This identity is transformed into a behavioral relation once *V* and *Y* are assumed as given or known variables (Fisher, 1931).

2.2.5 The Friedman's Modern Quantity Theory of Money

This theory is build based on the earlier works on quantity theory of money by Milton Friedman, who improved on Keynes's liquidity preference theory by treating money like any other asset. He concluded that economic agents (individuals, firms, governments) want to hold a certain quantity of real, as opposed to nominal, .money balances. If inflation erodes the purchasing power of the unit of account, economic agenjts will want to hold higher nominal balances to compensate, to keep their real money balances constant. The level of those real balances, Friedman argued, was a function of permanent income (the present discounted value of all expected future income), the relative expected return on bonds and stocks versus money, and expected inflation. According to Friedman (1956), the model is explained below. Thus;

$$M d / P: \ f(Y p <+>, \ r b - r m <->, \ r s - r m <->, \ \pi e - r m <->) \ldots\ldots\ldots (2.1)$$

Where:

M_d/P = demand for real money balances (M_d = money demand; P = price level)

f means "function of" (not equal to)

Y_p = permanent income

$r_b - r_m$ = the expected return on bonds minus the expected return on money

$r_s - r_m$ = the expected return on stocks (equities) minus the expected return on money

$\pi^e - r_m$ = expected inflation minus the expected return on money

<+> = increases in

<–> = decreases in

According to Friedman, the demand for real money balances increases when permanent income increases and declines when the expected returns on bonds, stocks, or goods increases versus the expected returns on money, which includes both the interest paid on deposits and the services banks provide to depositors. However, the modern quantity theory is generally thought superior to Keynes's liquidity preference theory because it is more complex, specifying three types of assets (bonds, equities, goods) instead of just one (bonds). It also does not assume that the return on money is zero, or even a constant. In Friedman's theory, velocity is no longer a constant; instead, it is highly predictable and, as in reality and Keynes's formulation, pro-cyclical, rising during expansions and falling during recessions. Finally, unlike the liquidity preference theory, Friedman's modern quantity theory predicts that interest rate changes should have little effect on money demand. The reason for this is that Friedman believed that the return on bonds, stocks, goods, and money would be positively correlated, leading to little change in $r_b - r_m$, $r_s - r_m$, or $\pi^e - r_m$ because both sides would rise or fall about the same amount. That insight essentially reduces the modern quantity theory to $M_d/P = f(Y_p <+>)$. Nevertheless, the modern quantity theory of money is more properly understood as a theory of the demand for money, which asserts that money demand is a demand for real money

balances, and that that demand is a stable function of a few variables, including (but not limited to) income and nominal interest rates (Dornbusch, 1980).

2.2.6 The Rational Expectation Hypothesis

A subsequent theoretical development was the belated flowering of a seed planted in 1961 by John F. Muth, in a long-neglected article on "Rational expectations and the theory of price movements". The theory of rational expectations offers no special insight into stationary-state or long-run equilibrium analysis. Its contribution is to dynamics – short-run change, and hence potentially to stabilization policy. The theory of rational expectations asserts that economic agents should be treated as if their anticipations fully incorporate both currently available information about the state of the world and a correct theory of the interrelationships among the variables (John, Murray, & Newman 1987).

According to Nkwatoh (2012), rational expectations, is a hypothesis which suggests that agents' predictions of future values of relevant economic variables are not systematically wrong in that all errors are random. That is expectations are based on the information people have on hand and that this information may be imperfect and therefore, people will make errors which are considered random. In economic modeling, it is assumed that the expected value of a variable is equal to the expected value predicted by the model. For instance, suppose P is the equilibrium price in a simple market. According to the theory of rational expectations, the actual price will only deviate from the expected price if there is an 'information shock' caused by unforeseen information:

$$P = P* + \varepsilon \quad (2.2)$$

$$E[P] = P* \quad (2.3)$$

Where, P^* is the rational expectation and ε is the random error term, which has an expected value of zero, and is independent of P^*.

Moreover, Minford (2009) in Nkwatoh (2012) posited that the rational expectations hypothesis largely supports Sargent & Wallace (1975) proposition on policy ineffectiveness. To them any attempt to lower unemployment through expansionary monetary policy, will cause economic agents' to anticipate the effects of the change of policy and raise their expectations of future inflation accordingly. This in turn will counteract the expansionary effect of the increased money supply.

2.2.7 The New Keynesian Theory

This theory is as a result of the rational expectations and perfectly flexible wages and or prices assumption with significant contributions from Mankiw & Romer, (1991). The theory is centered on two assumptions: i.e. sticky price and wages, and firms are monopolistic competitors. New Keynesian economists fully agree with New Classical economists that in the long-run, changes in the money supply are neutral. Though prices are sticky in the New Keynesian sense, an increase in money supply (or equivalently, a decrease in the interest rate) does increase output and lower unemployment in the short run. Therefore, they don't advocate for the use of expansionary monetary policy for short run gains in output and employment, as it would raise inflationary expectations and thus store up problems for the future. Instead, monetary policy should be used for stabilization. That is, when the economy is hit by some unexpected external shock, it may be a good idea to offset the macroeconomic effects of the shock with monetary policy (Nkwatoh, 2012).

2.2.8 The Active-Passive Money View Theory

According to an active-money view, the quantity of money is subject to the independent influence of the central bank. This influence, among other things, can lead to a real quantity of money holdings that is larger (smaller) than desired. In contrast to the passive money view, the attempt to eliminate these excess balances is considered to have an important role in the transmission of monetary policy. The interpretation of a nominal "monetary shock" highlights the distinction between the two views. Furthermore, the passive-money view, a monetary shock is the consequence of a change in the demand for money caused by an output shock, for example that is accommodated by the central bank as it targets short-term interest rates. In contrast, the active-money view interprets a monetary shock as the consequence of a change in the supply of money induced by the central bank that is unanticipated by agents. If there is a positive shock, initially, agents have to hold the additional nominal balances (Gylych & Musa, 2016).

2.2.9 The Taylor's Rule

An eminent offspring of the use of a rule in monetary policy is the notable Taylor rule, whose grand-child is monetary or inflation targeting (Svensson, 1999). The two, in a way, are not the same, though both have similarities in their propositions on the monetary policy transmission mechanism. While the former is concerned with targeting monetary aggregates, such as money supply or credit growth, the latter specifically targets the rate of inflation. The original Taylor (1989) rule specifies how a central bank might adjust its interest rate target to try to maintain stability and employment. The proposed rule has been subjected to considerable extension and interpretations. However, the linear relationship of the variables in the Taylor rule can be functionally expressed below;

$R_t = R^* + \lambda (Y^e - Y^*) + \lambda (\pi^e - \pi^*)$ ..... (2.4)

R_t = central bank's current interest rate target,

R^* = equilibrium interest rate target,

$Y_t^e - Y^*$ = expected output gap;

$\pi_t^e - \pi^*$ = the expected inflation gap.

Thus, a central bank would set its interest target above the equilibrium level when the output gap is positive, i.e. $(Y_t^e - Y^e) > 0$,

Where:
The expected output, Y_t^e exceeds potential output, Y^* or when the inflation gap is positive, i.e. $(\pi_t^e - \pi^*) > 0$,

While the expected inflation π^e exceeds the inflation objective. It is postulated that a negative interest rate is possible, especially if, for example, $(\pi_t^e - \pi^*) < 0$.

However, as Taylor (1995) argues, "the results of his research, while not leading to any single specific mainstream model of the monetary transmission mechanism, have a number of common structural characteristics and thereby constitute a general framework for discussion and analysis". While acknowledging the progress being made in empirical research on this issue, Taylor (1995:24) expresses optimism on the need for the role of financial intermediaries in the monetary policy transmission mechanism. In the words, Taylor (1995) also acknowledged that there are many different views of the monetary transmission mechanism, depending on whether the emphasis is on money, credit, interest rate, exchange rates, asset prices, or the role of commercial banks and other financial institutions.

2.2.10 The IS-LM Model

According to Colander (2004), the IS–LM model was first introduced at a conference of the Econometric Society held in Oxford during September 1936. The model was developed by John Hicks in 1937, and later extended by Alvin Hansen, as a mathematical representation of Keynesian macroeconomic theory. Between the 1940s and mid-1970s, it was the leading framework of macroeconomic analysis. The IS–LM model is used to study the short run when prices are fixed or sticky and no inflation is taken into consideration. But in practice the main role of the model is as a path to explain the AD - AS model (Mankiw, 2012). In other words, IS–LM model, or Hicks–Hansen model, is a macroeconomic tool that shows the relationship between interest rates (ordinate) and assets market (also known as real output in goods and services market plus money market). The intersection of the "investment-saving" (IS) and "liquidity preference-money supply" (LM) curves. Moreover, the IS–LM model explains changes in national income when price level is fixed in the short-run, and also shows why an aggregate demand curve can shift. Hence, this tool is sometimes used not only to analyse economic fluctuations but also to suggest potential levels for appropriate stabilization policies (Sloman & Alison 2009).

Furthermore, Handa (2009) noted that the standard assumption of monetary analysis was that the central bank exercises control over the economy by exogenously controlling the money supply. The central banks of several developed economies, including those of the United States, Canada and Britain, now seem to rely more on the interest rate rather than on the money supply as the primary monetary policy instrument. However, the IS–LM technique of analysis is inappropriate for economies in which the central bank sets the

interest rate, rather than the money supply, in its attempts to control aggregate demand in the economy. In such case, aggregate demand is determined by the IS equation and the interest rate set by the central bank. He further laments that the IS–LM analysis assumes that the central bank uses the money supply rather than the interest rate as the monetary policy instrument and sets its level exogenously. Therefore, the LM equation/curve, and therefore the IS–LM analysis, is inappropriate for the macroeconomic analysis of such economies. Instead, the more appropriate analysis for such economies is the IS–IRT one. The IS–LM model of macroeconomic analysis is a mode of exposition of the determination of aggregate demand in models of the classical paradigm, as well as in models of the Keynesian paradigm (Handa, 2009).

2.3 Empirical Review

There are ample studies that have demonstrated the existence of longrun relationship between monetary policy transmission mechanism and the Nigerian economy. In view of this, few of the studies are selected for review as follows:

Adeoye and Shobande (2017) examined the Monetary Policy Transmission Mechanism and Macroeconomic Aggregates in Nigeria, using the time series data for the period: 1985:Q10 to 2015:Q4. The model employed Vector Error Correction (VEC) technique to determine the effect of interest rate channel of monetary transmission mechanism on the real economy variables considered. However, findings from the study showed that money supply, expected inflation, real interest rate and exchange rate are crucial for any meaningful economic growth, suggesting that manipulation of these variables is essential

for the effectiveness of monetary policy in Nigeria. They further recommended that the effectiveness of monetary policy through the manipulation of interest rate and exchange rate is essential for stability in the economy.

Lucky and Kingsley (2017) examined the effects of monetary policy transmission mechanisms on the domestic real investment in Nigeria, using time series data for the period 1981 to 2015. Domestic real investment was modelled as the function of percentage of credit to private sector to gross domestic product, naira exchange rate per US dollar, maximum lending rate, monetary policy rate, prime lending rate, net domestic credit, savings rate and Treasury bill rate. Granger causality test and Johansen co-integration test in the Vector Error Correction Model (VECM) setting were employed. The result proved that CPS/GDP, MLR, MPR, NDC and SR have positive relationship with Nigeria real domestic investment while EXR, PLR, and TBR have negative relationship with domestic real investment.

Obafemi and Ifere (2015) examined the comparative analysis of Monetary Policy Transmission Mechanism in Nigeria. The study compared the Factor-augmented vector–auto regression (FAVAR) framework which exploits large data set with the traditional VAR model that estimates 6 variables to ascertain the exact channel of transmission. The result shows that the exact channel of monetary policy transmission in Nigeria is mixed. Findings from the two models conclude that although both methods generate qualitatively related results, but the FAVAR model is a superior alternative over VAR on grounds that monetary policy shocks are better identified using the FAVAR model. Also the FAVAR model does not exhibit the prize puzzle problem found in the VAR but allows for the computation of impulse responses of a large number of variables. Results from both

models show that interest rate and credit channels are dominant and strongest channels of monetary policy transmission in Nigeria. Exchange rate and money channels were not significant and pronounced.

Kalu et al. (2015) examined the monetary policy transmission mechanism in Nigeria focusing on empirical studies and happenings in the country that retarded the efficiency of the Central Bank of Nigeria over the years in the pursuant of effective transmission mechanism. The result shows that interest rate, credit channels and exchange rate are among the channels of monetary policy transmission to the economy.

Hassan (2015) examined the transmission mechanism of monetary policy in Nigeria, using Vector Autoregressive (VAR) model, applying monthly time series data covering the period of 2000M1 to 2014M12. The result shows that there is no long run relationship among monetary policy variables and real economic variables and that monetary policy is relatively effective in Nigeria. In addition, the study reveals three stylized facts about the transmission mechanism of monetary policy: (i) the two primary traditional channels of monetary policy (interest rate & asset price channels) are very weak in Nigeria; (ii) the bank lending channel is not operative in the country; and (iii) the credit and exchange rate channel are the most effective channels through which monetary policy is transmitted in the case of Nigeria.

Ishioro (2013) examined the channels of monetary transmission in Nigeria for the period 1970 to 2011, using interest rate, investment, per capital GDP, exchange rate, prices, and private domestic credit. The study adopted the Granger causality test in the estimation of the relationship between the various channels and selected macroeconomic aggregates.

The results indicated that three channels were functional in Nigeria namely: Interest rate, exchange rate and credit channel.

Ndekwu (2013) analysed the monetary policy transmission mechanisms to the real economy in Nigeria. The study used both quarterly and annual data from 1981 to 2006. The study also adopted vector auto regression with dynamic logarithmic form and the ordinary least squares (OLS) methods. However, the study found that the credit channel in the financial market for credit supply and accessibility to the private sector provided the effect of a linchpin in the process by which monetary policy transmitted to the real economy. And the interest rate and exchange rate channels appeared to have had a weak effect on the real economy during the period 1981 to 2008.

Nkwatoh (2012) examined the monetary policy transmission mechanism and the effectiveness of monetary policy in Nigeria for the period 1996 to 2010. The study used secondary data and employed the ARCH and GARCH techniques. The results showed that the interest rate effect dominates the first two stages while the quantity effect dominates the last stage. This implies that the effectiveness of monetary policy rate (MPR) on the final goals depends on its effect on money supply.

Mbutor (2009) analysed the transmission channels of monetary policy in Nigeria. The study adopted vector auto regression (VAR). The following variables were employed in his model; GDP (y_t), CPI (p_t), domestic short term nominal interest rate (s_t), broad monetary aggregate ($m2_t$), and the real effective exchange rate (x_t). The results showed that the lending rate had the highest impact on GDP in the 10th quarter of the study

period. He further concluded that the quantity of money supply still remained relevant and had to be reckoned with in policy making.

Adekunle et al. (2018) investigates the monetary policy transmission mechanism in Nigeria: how important is asset prices channel, using quarterly time series data for the period: 1985Q1 to 2017Q4. The study employed a multi-model approach of Johansen and Autoregressive Distributed Lag (ARDL) techniques to determine the prevalence of the channels of monetary policy transmission mechanism. However, the result shows that exchange rate channel is the most prevalent, while equity channel occupies third position. They suggests that the CBN should make close monitoring of the market in order to take proactive policy decisions, since it affect the general price level.

Nwosa and Saibu (2012) examined the monetary transmission mechanism in Nigeria: a sectoral output analysis, using quarterly time series data for the period 1986 to 2009. The study employed granger causality and Vector Auto-regressive Method of analysis. The results showed that interest rate channel was most effective in transmitting monetary policy to Agriculture and Manufacturing sectors while exchange rate channel was most effective for transmitting monetary policy to Building/Construction, Mining, Service and Wholesale/Retail sectors. The study concluded that interest rate and exchange rate policies were the most effective monetary policy measures in stimulating sectoral output growth in Nigeria.

Lavally (2015) examined the effectiveness of transmission mechanisms of monetary policy in Sierra Leone, with particular focus on the interest rate, exchange rate, and credit channels. Using the annual time series data for the period: 1980 to 2012. The model

employed Vector Autoregression (VAR) techniques. The cointegration test result revealed that cointegration exists. The Granger causality test showed that gross capital formation Granger causes exchange rate and real interest rate. The impulse response function showed that output responded positively to monetary shocks, as interest rate increased. Output increased for a short period and then declined. In the case of exchange rate and private domestic credit, output showed that even in the long run, the effects of the shocks might not be transitory in order to converge towards a steady state. The variance decomposition indicated that fluctuations in gross domestic product per capita (GDPPC) were attributed to itself. While the total contribution of real interest rate (RIR) and exchange rate (ER) was relatively insignificant. The error forecast of RIR was attributed by itself with an insignificant contribution of GDPPC and none by ER and private domestic credit (PDC). In sum, the results provided evidence of ineffective channels in the Sierra Leone economy.

Amechi, Romanus, Glorial and David (2020) examined the effect of monetary policy transmission mechanism and innovation in the banking system on economic growth in Nigeria, for the period: 1981–2015. The study employed vector auto-regression and auto-regressive distribution lag approaches for the analysis. The study revealed that, due to the large informal banking sector, monetary policies have not been effective and also supervisory and intermediary financial institutions lack dependence due to frequent government interventions.

Rudrani et al. (2019) analysed the financial structure, institutional quality and monetary policy transmission: A Meta-Analysis. The study investigates to what extent these factors explain the variation in the extent of monetary policy transmission in a comprehensive set

of developed and developing economies using meta-analysis framework. Fragile financial system, low level of financial integration and weak institutions are often cited as the reasons for lack of monetary policy transmission in these economies. The study found that the degree of financial development captured by various financial indicators explain cross-country variations in the magnitude and time lag of monetary policy transmission.

Hillary, Imo, Ibe, Uche, Modebe, and Emmanuel (2018) analysed the industry effects of monetary policy transmission channels in Nigeria within the period 1981 to 2014. The study employed the Johansen cointegration and the error correction model (ECM). Findings from the result revealed that the private sector credit, interest rate, and exchange rate channels have negative effects on real output growth, both in the long run and in the short run. The results further showed that, relatively, the degrees of the established effects are higher in the long run than in the short run. while the Johansen cointegration results showed that, in the Nigerian case, monetary policy transmission channels jointly have a long-run relationship with real output growth of the industrial sector, and disequilibrium in the system is corrected at the speed of 72.2% annually.

Kapur (2018) analysed the Macroeconomic Policies and Transmission Dynamics in India, the move to an inflation targeting monetary policy framework beginning 2014 with consumer price index (CPI) inflation as the nominal anchor. The study assesses transmission in a broader, disaggregated model incorporating external sector, fiscal policy, banking sector and financial market variables to capture the interactions among key macroeconomic policies and macroeconomic aggregates. The empirical analysis confirms the role of monetary policy in containing demand and inflationary pressures. He added that in view of the ongoing structural reforms, deregulation and opening up of the

Indian economy, as well as ongoing initiatives in the monetary policy operating framework to improve the efficacy of monetary transmission, the transmission dynamics can be expected to evolve over time.

Henry and Imegi (2017) examined the effects of monetary policy transmission mechanism on liquidity of Nigerian capital market, for the period 1981 to 2016. The study employed Vector Error Correction Model to determine the variables and its relationship to the dependent variables. The study found that monetary policy transmission mechanism has significant impact on the liquidity of the capital market. And the study further recommends that monetary policies should be aimed at enhancing the liquidity of Nigerian capital market in view of its impact on the capital market and that the channels of monetary policy transmission should achieved liquidity of the objective of the capital market.

Prachi et al. (2016) examined the Monetary Transmission in Developing Countries: Evidence from India, using a monthly VAR with data from April 2001 to December 2014. The study employed the Structural Vector Autoregression (SVAR). The study found that positive shocks to the policy rate result in statistically significant effects on the bank-lending rate in the direction predicted by theory. Specifically, a tightening of monetary policy is associated with an increase in bank lending rates, consistent with evidence for the first stage of transmission in the bank-lending channel. While pass through from the policy rate to bank lending rates is in the right direction, the pass through is incomplete. Generally, the empirical tests yield a mixed message on the effectiveness of monetary policy in India, but perhaps one that is more favourable than is typical of many countries at similar income levels.

Adeleke and Harold (2016) examined the relationship between monetary policy and growth of the manufacturing sector in Algeria, using quarterly frequency data for the period 1980Q1 to 2010Q4. The study employed a structural vector autoregressive model. The study revealed that there is no evidence that money supply responds to fluctuations in manufacturing sector growth or GDP growth. Interest rates, however, are seen to explain nearly a third of the variations in manufacturing output growth, suggesting that the manufacturing sector is sensitive to interest rates. The study also revealed that money supply variations are largely explained by changes in interest rates.

Emmanuel and Ken (2015) analysed the Transmission of Monetary Policy in Emerging Market Economies (EMEs) in a Changing Financial Environment: A Longitudinal Analysis. The study investigated how the bank lending channel acts above and beyond the traditional money channel that most macroeconomic models emphasizes. They revealed that, particularly in EMEs with high bank reliance, changes in the volume of bank credit are important drivers of fixed capital formation. They further show how monetary policy and sovereign risk premia affected bank credit growth in EMEs between 2001 and 2013, using micro-level bank balance sheet data. The study also found that both, changes in the monetary policy stance and changes in risk premia have had significant effects on credit volumes. Furthermore, they show that these effects tend to affect smaller banks more strongly. The study suggests that the accommodative monetary policies that have been seen recently were contributing factors to the rapid expansion of credit in many EMEs.

Abdullahi (2014) examined the importance of interest rate channel of monetary policy transmission mechanism on monetary policy target; using time series data for the period

1980 to 2010. The study employed Vector Autoregressive model (VAR) to determine the vector autoregressive estimates. The result revealed that: i. the interest rate channel of monetary policy transmission mechanism was the most effective channel of monetary policy transmission in Nigeria within the period; ii. The credit channel is not an efficient monetary policy transmission mechanism in Nigeria and iii. Exchange rate channel is weak in explaining monetary policy transmission mechanism in Nigeria. The study further recommends, among others, that the role of deposit money banks as agents of financial intermediation in the Nigerian economy should not be neglected. Thus, the Central Bank of Nigeria should strive to make these deposit money banks in Nigeria loans transaction more amendable to monetary policy actions or seek a more effective channel of transmitting monetary actions to the economy. Such measures will include sufficient control over the reserves of deposit money banks and the timely application of reserve requirements in monetary policy control. The study also recommends that further studies could be undertaken to establish the suitability of asset price channel, balance sheet channel and expectation channel in cash based economy like Nigeria.

Ogunsakin (2014) examined the analysis of the transmission mechanism of monetary policy in Nigeria. The model employed vector auto-regression approach to achieve the broad objective of the paper. Findings from the result revealed that an increase in the interest rate tends to be accompanied by a reduction in inflation and an increase in exchange rate but show insignificant impact on the level of production. The study finally suggests that monetary authority in Nigeria should endeavour to undertake structural reforms aiming at addressing the weakness in the financial sector, and then effort should

also be put in place in ensuring that commercial banks in Nigeria follow central bank of Nigeria directives for financial intermediation in our economy.

Anil and Wickramanayake (2013) examined the effectiveness, relative importance of different transmission channels, distributional effects of monetary policy across different financial institutions as well as the structural changes in monetary transmission in Sri Lanka, using monthly and quarterly aggregate data and disaggregated data. The study employed both unrestricted and structural vector auto regressions. The study mainly suggests that monetary policy is quite effective to influence target variables of Central Bank of Sri Lanka, i.e. output and prices. It also shows that monetary policy changes affect target variables through intermediate transmission channels such as exchange rates, asset prices as well as bank credit. Based on the bank-wise data, consistent predictions are observed to support the view that small financial institutions find it more difficult to shield their activity against a monetary policy shock than large institutions. Finally, the results suggest that transformations in the economic and financial environment play a role in increasing the sensitivity of output and prices to interest rates suggesting the changes in monetary transmission.

Prachi et al. (2012) analysed the monetary transmission mechanism in low-income countries (LICs). They use the standard description of monetary transmission as a benchmark to identify aspects of the transmission mechanism that may operate differently in LICs. Specifically, they focus on the effects of financial market structure on monetary transmission. The study revealed that weak institutional framework prevalent in LICs drastically reduces the role of securities markets. Consequently, traditional monetary transmission through market interest rates and market determined asset prices

are weak or non-existent. The exchange rate channel, in turn, tends to be undermined by heavy central bank intervention in the foreign exchange market. Moreover, the weak institutional framework also has the effect of increasing the cost of bank lending to private firms. They further highlights that the imperfect competition in the banking sector induces banks to maintain chronically high excess reserves and to invest in domestic public bonds or in foreign bonds. With the financial system not intermediating funds properly, the bank lending channel also becomes impaired. These factors undermine both the strength and reliability of monetary transmission, which has important implications for the conduct of monetary policy in LICs.

Kapur and Behera (2012) examined monetary transmission mechanism for India in the context of a small macro model using quarterly data. The study models overall growth and inflation as well as non-agricultural growth and non-food manufactured products inflation to monetary actions. Model simulations for a one quarter 100 bps increase in the nominal effective policy rate show that the peak effect on non-agricultural growth is almost 40 bps with a lag of 2 quarters and that on non-food manufactured products inflation is 25 bps with a lag of 5 quarters. Therefore, the interest rate channel is effective in the Indian context and the magnitude of the impact on growth and inflation is comparable to that in major advanced and emerging economies; however, the evidence for both India and other countries suggest that the impact of monetary policy actions on inflation is modest and subject to lags. The results are sensitive to alternative measures of real interest rate. Despite the monetary tightening by Reserve Bank of India during 2010 and 2011, inflation remained high and this could be attributed to the structural component

of food inflation as well as the surge in international commodity prices beginning the second half of 2010 and continuing into the first half of 2011.

Luis et al. (2008) examined the Monetary Transmission in an Emerging Targeter: The Case of Brazil. The study used an SVAR representation of the model to study the monetary transmission in Brazil. The study lays out a structural model that incorporates key features of monetary transmission in typical emerging-market economies, including a bank-credit channel and the role of external debt accumulation on country risk premia and exchange rate dynamics. The study revealed that interest rate changes have swifter effects on output and inflation compared to advanced economies and that exchange rate dynamics plays a key role in this connection. Importantly, the response of inflation to monetary policy shocks has grown stronger and the output-inflation tradeoff improved since the introduction of inflation targeting.

Pétursson (2001) examined the Transmission Mechanism of Monetary Policy: Analysing the Financial Market Pass-through. The study employed a structural vector autoregressive approach to identify the effects of monetary policy innovations on different sub-markets of the Icelandic financial system. The study revealed that an innovation to monetary policy has a significant within-the-month effect on the money market rate. The innovation is then propagated through the money market to the bond market and from there to the bank loan rate market, with the effect peaking one to four months after the initial monetary policy shock and lasting for about eight to nine months. The study suggests that the bond rate is the most important determinant of the marginal cost of loan funding.

From the various empirical studies and findings reached, it is cleared that most of the channels of monetary transmission mechanisms had a significant impact on output in the Nigerian economy. Also in a good number of the studies, there had been at most two channels of transmission of monetary policy that were found to exist effectively. However, it is worthy to note that both studies from Kalu et al. (2015) and Hassan (2015) shows that the credit and exchange rate channel are the most effective channels through which monetary policy is transmitted in the case of Nigeria. While, Ishioro (2013) recommended that the exchange rate and interest channels should form a fundamental basis for inflation targeting in the Nigerian economy. In other words, Kalu et al. (2015) also noted that the instruments of monetary policy such as interest rate and exchange rate that are known to be effective in some sectors should be properly managed and monitored.

2.4 Gaps in the Literature

It is evident that numerous studies have been carried out by various scholars in the past on the analysis of monetary policy transmission mechanism on economic growth in Nigeria, using different techniques. However, most of these studies have not focused on the relationship and impact between the instruments of monetary policy, the intermediate targets passing via the operational target and the real gross domestic product, cost of capital and household investment expenditure as determinant of aggregate output in Nigerian economy. Given the fact that the CBN's monetary policy principal objective is very crucial in determining her final goal (economic growth and price stability), which anchors all other rates (or targets). As such, this study intended to fill this gap by critically examining the parts of the monetary policy transmission mechanism from the

instruments of monetary policy, to the CBN's operational target, intermediate targets, and the final targets of monetary policy, with specific attention to the nominal anchor (MPR).

In other words, studies from different scholars blame the consequence of this process on different channel through which monetary policy works. However, lack of consensus from existing studies conducted in this area has led to a rise in the need to further re-examine the understanding of the process for designing and implementation of monetary policy. Moreover, from the empirical literature reviewed, it is also visible that there exist some gaps in the nature of variables used, methodology and time period. This is because most of the studies reviewed used FAVAR, VAR, VECM and Granger causality. But, GARCH method is assumed to give more robust and reliable result. Similarly, in terms of variables, none of the studies measure this relationship using three (3) combine but segregated model equations (i.e. real gross domestic product, cost of capital and household investment expenditure) as dependant variables (i.e. regressands). This study also incorporates money supply and monetary policy rate (MPR) as strong measures of both household spending, cost of capital and aggregate output in Nigeria, also include; treasury bills, prime and maximum lending rates (i.e. regressor), all as control variables. Additionally, in terms of time period, the study covered the period up to the year 2018. Hence, none of the studies reviewed extends its scope to that period. Again, the study used more updated data and current analysis, to fill in the gaps on the analysis of monetary policy transmission mechanism in Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This chapter focus on the methodology adopted in carrying out this research study. However, the study employed quantitative research approach, since it involved the utilization of actual time series data of secondary source. The aim of this study is to examine the impact of monetary policy transmission mechanism in Nigerian economy. Moreover, the chapter covers theoretical framework, nature and source of data, model specification, and the method of data analysis. The study employed appropriate statistical and econometric method to determine the time series characteristics of the variables that are used in the study, thus; Descriptive statistics, trends analysis, ADF test (unit root) and Co-integration test. Generalize Autoregressive Conditional Heteroskedasticity GARCH (1,1) models with an autoregressive (AR) term is adopted to investigate the impact of monetary policy transmission mechanism in Nigerian economy, because of its suitability. As such, variables like monetary policy rate (MPR), broad money supply (MS), cash reserve requirements (CRR), liquidity ratio (LR), prime lending rate (PLR), maximum lending rate (MLR) and treasury bills (TRB) are used as independent variables, while real gross domestic product (RGDP), cost of capital (CCAP) and household investment expenditure (HEXP) are used as dependent variables.

3.2 Theoretical Framework

The theoretical framework of the study is based on the Friedman's modern quantity theory of money developed in 1956. The theory proved itself superior to both the

Keynes's liquidity preference theory and the Fisher's quantity theory, because its complexity, accounting for equities and goods as well as bonds. According to Friedman, the demand for real money balances (M_d/P) is directly related to permanent income (Y_p) - the discounted present value of expected future income - and indirectly related to the expected differential returns from bonds, stocks (equities), and goods vis-à-vis money ($r_b - r_m$, $r_s - r_m$, $\pi^e - r_m$), where inflation (π) proxies the return on goods. He believed that the return on money would increase (or decrease) as returns on bonds, stocks, and goods increased (decreased). In Nigeria, this is link with key goals of the monetary targeting framework, which determines the intermediate target (broad money), the intermediate target (reserve money), the operating and final targets - inflation and output stabilization.

3.2.1 Model for the Study

The model for this study is GARCH (AR) (1,1) model as adopted from the work of Nkwatoh (2012) in trying to examine Monetary Policy Transmission Mechanism and the Effectiveness of Monetary Policy in Nigeria. The model equations were constructed based on four linkages which traced the path of the transmission channel starting from the instruments of monetary policy to the intermediate targets via the operational targets to the final goals of monetary policy. The different models are briefly specified below:

The link between the Monetary Policy Instrument and the Operational Target;

$$INBKt = \alpha o + \alpha 1 MPRt + \alpha 2 OMOt + \alpha 3\, AR(1) + \mu 1t \quad \text{.....(3.1)}$$

The link between the Operational Target and the Intermediates Targets;

$$PLRt = a0 + a1 MPRt + a2 IBKt + a3\, OMOt + a4\, AR(1) + ut \quad \text{.....(3.2)}$$

$$MLRt = a0 + a1MPRt + a2IBKt + a2OMOt + a4\,AR(1) + ut \quad \text{.....(3.3)}$$

$$St = a0 + a1MPRt + a2IBKt + a3OMOt + a4\,AR(1) + ut \quad \text{..... (3.4)}$$

$$DEPt = a0 + a1MPRt + a2IBKt + a2OMOt + a4\,AR(1) + ut \quad \text{.....(3.5)}$$

$$REERt = a0 + a1MPRt + a2IBKt + a3\,OMOt + a4\,AR(1) + ut \quad \text{.....(3.6)}$$

$$MCt = a0 + a1MPRt + a2IBKt + a2OMOta4\,AR(1) + ut \quad \text{.....(3.7)}$$

$$M1t = a0 + a1MPRt + a2IBKt + a2OMOt + a4\,AR(1) + ut \quad \text{.....(3.8)}$$

$$M2t = a0 + a1MPRt + a2IBKt + a2OMOta4\,AR(1) + ut \quad \text{.....(3.9)}$$

The link between the Intermediate Targets and Aggregate Demand (AD);

$$CONSt = \alpha0 + a1MPRt + a2IBKt + a3PLRt + a4\,MLRt + a5MCt + a5St + a6DEPt + a7REERt + a8OMOt + a9\,AR(1)t + \mu t \quad \text{..... (3.10)}$$

$$INVTt = \alpha0 + a1MPRt + a2IBKt + a3PLRt + a4\,MLRt + a5MCt + a5St + a6DEPt + a7REERt + a8OMOt + a9\,AR(1)t + \mu t \quad \text{..... (3.11)}$$

The link between Aggregate Demand and the Finally Targets;

$$GDPt = \alpha0 + a1MPRt + a2IBKt + a3PLRt + a4M1t + a5M2t + a6MLRt + a7REERt + a8OMOt + a9INVTt + a9CONSt + a10\,AR(1) + \mu t \quad \text{..... (3.12)}$$

$$CPIt = \alpha0 + a1MPRt + a2IBKt + a3PLRt + a4M1t + a5M2t + a6MLRt + a7REERt + a8OMOt + a9INVTt + a9CONSt + a10\,AR(1) + \mu t \quad \text{..... (3.13)}$$

3.3 Model Specification

The study adopt the Generalize Autoregressive Conditional Heteroskedasticity GARCH (1,1) model with an autoregressive AR(1) term from the framework of Nkwatoh (2012) to determine the links between monetary policy transmission mechanism and the real gross domestic product and inflation. Koutsoyiannis (1973) noted that the specification of an econometric model will be based on economic theory and any available information relating to the phenomenon under study. On that premise, this study as mentioned above adopted the modern quantity theory of money by Milton Friedman (1956), considering its closeness as well as its functional relationship with the study.

In specifying the model, the study is also constructed based on the equations in (3.2.1) above, with some modifications in both the dependant and explanatory variables, so as to make the model more robust and dynamic as well as suit the study. The model equations are expressed as follows:

$$RGDP = f(MS, MPR, LR) \quad \text{..... (3.14)}$$

$$CCAP = f(MPR, PLR, TRB) \quad \text{..... (3.15)}$$

$$HEXP = f(MS, MLR, CRR) \quad \text{..... (3.16)}$$

To hold firm the influence of the random variable, and also to standardize the variables as well as interpret the resulting coefficients as elasticities, the model equations above are explicitly transformed; the modified econometric model of this study is functionally represented in the following model equations:

Model Equation 1

Real Gross Domestic Product (RGDP) and Money Supply (MS), Monetary Policy Rate (MPR), Liquidity Ratio (LR):

$$RGDP_t = a_0 + a_1 MS_t + a_2 MPR_t + a_3 LR_t + a_4 AR(1) + U_t \quad (3.16)$$

$$MS_t = a_0 + a_1 RGDP_t + a_2 MPR_t + a_3 LR_t + a_4 AR(1) + U_t \quad (3.17)$$

$$MPR_t = a_0 + a_1 RGDP_t + a_2 MS_t + a_3 LR_t + a_4 AR(1) + U_t \quad (3.18)$$

$$LR_t = a_0 + a_1 RGDP_t + a_2 MS_t + a_3 MPR_t + a_4 AR(1) + U_t \quad (3.19)$$

Model Equation 2

Cost of Capital (CCAP) and Monetary Policy Rate (MPR), Prime Lending Rate (MLR), Treasury Bills (TRB):

$$CCAP_t = \beta_0 + \beta_1 MPR_t + \beta_2 PLR_t + \beta_3 TRB_t + \beta_4 AR(1) + U_t \quad (3.20)$$

$$MPR_t = \beta_0 + \beta_1 CCAP_t + \beta_2 PLR_t + \beta_3 TRB_t + \beta_4 AR(1) + U_t \quad (3.21)$$

$$PLR_t = \beta_0 + \beta_1 CCAP_t + \beta_2 MPR_t + \beta_3 TRB_t + \beta_4 AR(1) + U_t \quad (3.22)$$

$$TRB_t = \beta_0 + \beta_1 CCAP_t + \beta_2 MPR_t + \beta_3 PLR_t + \beta_4 AR(1) + U_t \quad (3.23)$$

Model Equation 3

Household Investment Expenditure (HEXP) and Money Supply (MS), Maximum Lending Rate (MLR), Cash Reserve Requirement (CRR):

$$HEXP_t = \gamma_0 + \gamma_1 MS_t + \gamma_2 MLR_t + \gamma_3 CRR_t + \gamma_4 AR(1) + U_t \quad (3.24)$$

$$MS_t = \gamma_0 + \gamma_1 HEXP_t + \gamma_2 MLR_t + \gamma_3 CRR_t + \gamma_4 AR(1) + U_t \quad \text{..... (3.25)}$$

$$MLR_t = \gamma_0 + \gamma_1 HEXP_t + \gamma_2 MS_t + \gamma_3 CRR_t + \gamma_4 AR(1) + U_t \quad \text{..... (3.26)}$$

$$CRR_t = \gamma_0 + \gamma_1 HEXP_t + \gamma_2 MS_t + \gamma_3 MLR_t + \gamma_4 AR(1) + U_t \quad \text{..... (3.27)}$$

Where: $RGDP =$ *Real Gross Domestic Product (also used as aggregate output)*

$CCAP =$ *Cost of Capital (proxified by total debt of the capital market)*

$HEXP =$ *Household Investment Expenditure*

$MS =$ *Broad Money Supply*

$MPR =$ *Monetary Policy Rate*

$PLR =$ *Prime Lending Rate*

$MLR =$ *Maximum Lending Rate*

$LR =$ *Liquidity Ratio*

$CRR =$ *Cash Reserve Requirement*

$TRB =$ *Treasury Bills*

$\alpha_0, \beta_0, \gamma_0 =$ *Parameter Constant*

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \beta 1, \beta 2, \beta 3, \beta 4, \gamma 1, \gamma 2, \gamma 3, \gamma 4 =$ *Parameter Estimates*

U_t = *Error term or Stochastic variable*

$AR(1)$ = *Auto − Regressive.*

However, the different model equations were specified in their auto-regressive AR(1) form, since past and current values of monetary policy variable tend to be highly correlated. The AR(1) term in the equations will be use to correct for serial correlation. It is the Cochran-Orcut method for correcting serial correction. And the econometric form represents the actual population representation of the true relationship or the structural or explicit function of the relationship.

3.3.1 A Priori Expectation

The a priori expectations for all the variables in the model equations of the study are expected to be positive and greater than zero (>0), with the exception of Lending Rates (LR) and Monetary Policy Rate (MPR) that is expected to be negative and less than zero (<0). Thus, are expected to have positive impact on the aggregate output, cost of capital and household investment expenditure. Theoretically, we expect that an increase in money supply (MS) by the monetary authorities via open market operations (i.e. through the purchase of treasury bills and certificates) when the economy is facing a deflationary pressure will affect economic growth and vice-versa. Also, a decrease in the monetary policy rate (MPR) will raise the level of aggregate output, through reduction in the level of prices. And a reduction in the cash reserve requirements and liquidity ratio by the Central Bank will reduce the operational target making it less volatile, thereby making bank credit and other loanable assets more assessable to both households and private investors. This will in turn affect the intermediate targets which will in turn increase aggregate demand, thus increasing the level of output and price stability, thereby enhancing the level of economic growth.

3.4 Explanation of the Variables

3.4.1 Real Gross Domestic Product (RGDP): is an inflation-adjusted measure that reflects the value of all goods and services produced by an economy in a given year, expressed in base-year prices, and is often referred to as "constant-price," or "inflation-corrected" GDP. Real GDP can account for changes in price level and provide a more accurate figure of economic growth. In other words, it also allows to understand how much economic output has grown (or contracted) independent of price changes.

3.4.2 Cost of Capital (CCAP): this refers to the opportunity costs of making a specific investment. Thus, it is the rate of return required to persuade the investor to make a given investment. It consists of both the cost of debt and cost of equity used for financing a business. It is usually calculated by using the weighted average cost of capital. It is also defined by Ibbih (2018), as the minimum acceptable rate of return on funds committed into a project. Moreover, some of its components include among others; cost of debt, premium for tax, premium for financial and business risk e.t.c.

3.4.3 Household Investment Expenditure (HEXP): this is the amount of final consumption expenditure made by resident households to meet their daily needs (or wants), such as: food, clothing, housing (rent), utility, health costs, leisure and miscellaneous services. It consists of residential fixed investment and expenditure in durable consumer goods.

3.4.4 Broad Money Supply (MS): this measures the total volume of money supply in the economy. This includes narrow money plus savings and time deposits, as well as foreign denominated deposits. It is a calculation of the money supply that includes all elements of M1 as well as "near money." In other words, M2 includes cash and checking deposits,

while near money refers to savings deposits, money market securities, mutual funds and other time deposits." Moreover, M2 is used to regulate either inflationary or deflationary pressures, through the use of open market operation (OMO) to stimulate or stabilize the money in circulation.

3.4.5 **Monetary Policy Rate (MPR):** this is the principal instrument used to control the direction of interest rates and anchor inflation expectations in the economy. Therefore, the use of monetary policy rates (interest rates) as the major operating instrument of monetary policy occurs because it plays a pivotal intermediate role by which investment and aggregate demand in the economy can be influenced. In other words, MPR (also known as bank rates) shows the interest rate charge by the CBN to commercial bank. However, when it's high, it reduces the lending capacity of commercial banks, thereby reducing the volume of money in circulation, and vice-versa.

3.4.6 **Cash Reserve Requirements (CRR):** is a regulation employed by CBN that sets the minimum amount of reserves that must be held by a commercial bank. The minimum reserve is generally determined by the CBN to be no less than a specified percentage of the amount of deposit liabilities the commercial bank owes to its customers. It is also called cash reserve ratio.

3.4.7 **Liquidity Ratio (LR):** refers to the proportion of deposits the commercial bank is required to maintain with them in the form of liquid assets in addition to the cash reserve ratio. It is determined by the CBN as the percentage of total demand and time liabilities. It is also determined and maintained by the CBN to control the bank credit, ensure the solvency of commercial banks and compel banks to invest in the government

securities. A penalty at a rate of 3% per annum above the bank rate is imposed if any commercial bank fails to maintain the liquidity ratio.

3.4.8 Maximum Lending Rates (MLR): This refers to the average of the highest lending rates charged by deposit money banks in Nigeria. It is sometimes called maximum interest rate or interest rate ceiling.

3.4.9 Prime Lending Rates (PLR): it is the interest rate that commercial banks charge their most creditworthy customers (usually large corporations). It is largely determined by the federal funds rate, which is the overnight rate that bank uses to lend to one another.

3.4.10 Treasury Bills (TBR): refers to the short-term sovereign debt securities maturing in one year or less. They are sold at a discount and redeemed at par. They are naturally the most liquid money market securities and are backed by the guarantee of the government of a nation.

3.5 Nature and Sources of Data

The influence of monetary policy on macroeconomic performance in Nigeria required three sets of variables. Thus; measures of the level of macroeconomic performance, measures of monetary policy stance, variables indicative of channels of monetary policy transmission. The commonly used measures of macroeconomic performance are real output (Y) and the general level of prices (P) (Nkwatoh, 2012). However, to investigate the response of the transmission mechanism of monetary policy with respect to changes in policies, the study used real gross domestic product (RGDP), cost of capital (CCAP) and household investment expenditure (HEXP) as measures of aggregate demand to

achieve economic growth and price stability. As such, the instruments of monetary policy considered are; the monetary policy rate (MPR) which is the key short-term interest rate used by the CBN to signal its monetary policy stance, broad money supply (MS) i.e. as a financial deepening indicator - which is often used by the CBN to influence the quantity of money in circulation. Others include; cash reserve requirements (CRR) and liquidity ratios (LR) - which are used to compliments the MPR and other instruments in moderating pressures on consumer prices and exchange rate. Prime lending rate (PLR) and maximum lending rates (MLR) i.e. bank rate that usually meets the short- and medium-term financing needs of the private sector, and is normally differentiated according to creditworthiness of borrowers and objectives of financing. And treasury bills (TRB) measured in the value of outstanding in both CBN including rediscounts, DMBs and Non-Bank Public holdings. Furthermore, the study employed the use annual time series data (Secondary data) from 1987 to 2018. The data are obtained from sources such as: Central Bank of Nigeria (CBN) statistical bulletin, Annual Reports and Statement of Accounts (of various issues), National Bureau of Statistics (NBS various issues), Federal Ministry of Finance Reports, CBN Economic and Financial Reviews (various issues), Journals, textbooks, unpublished papers, seminar papers and Articles.

3.5.1 Estimation Technique

The ordinary least squares (OLS) technique is used in estimating the specified Generalize Autoregressive Conditional Heteroskedasticity (GARCH) model equations. The OLS estimation is carried out using econometric views (E-Views) 9 software package. Moreover, time series diagnostic tests such as ADF i.e. Unit Root test, Co-integration

test, ARCH LM test and Jarque-Bera (JB) test of normality are also used to examine the reliability and validity of the regression estimates.

3.6 Methods of Data Analysis

3.6.1 Augmented Dickey-Fuller (Unit Root Test)

This is used to determine the order of integration of a variable. It is the pre co-integration test. It explained how many times it has to be differenced or not to become stationary. Gujarati (2004) posits that the reason for the unit root test is to avoid obtaining spurious regression results arising from Non-Stationary of the time series variables. The equation to be estimated for the Augmented Dickey-Fuller (ADF) unit root test is stated as follows:

$$\Delta y_t = \omega + \beta + \sum_{i=1}^{m} \theta_i \Delta y_{t-i} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.30)$$

Where Δ is the first difference operator; y_t is a time series variable at current time (t); ω is the drift term; y_{t-1} is the one period lagged value of y_t; β is the coefficient of y_{t-1} i.e., auto regression coefficient; $\Delta y_{t-i}$is the lagged valued of the first difference of y_t; m is the maximum lag length; θ_i is the coefficients of Δy_{t-i}; and μ_t is the white noise error term.

3.6.2 Cointegration Test

Cointegration analysis is used to estimate and test stationary linear relations, or cointegration relations, between non-stationary time series variables such as consumption and income, interest rates at different maturities, and stock prices. In the modelling of cointegrated systems, the determination of the number of co integrating relations, or the

cointegration rank, is the most important decision. Cointegration is said to exist between two or more non-stationary time series if they possess the same order of integration and a linear combination (weighted average) of these series is stationary (Granger & Newbold, 1974). Below is the functional equation form for cointegration test:

$$Y1t = \beta 2Y2t + \cdots + \beta nYnt + Ut \quad \text{..... (3.31)}$$

Where; Y_t is the time series variable at current time (t), β is the coefficient of $Y_{t,\ Ut}$ (0) referred to as the disequilibrium error or the cointegrating residual. In long-run equilibrium, the disequilibrium error U_t is zero and the long-run equilibrium relationship is: $Y1t = \beta 2Y2t + \cdots + \beta nynt$ (Gurajati, 2004). In this study, the cointegration test will help to achieve the long run impact relationship among the variables.

3.6.3 Autoregressive Conditional Heteroskedasticity LM Test

This test is used to assess the validity of some of the modelling assumptions inherent in applying regression-like models to observed data series. ARCH LM test is a Lagrange Multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals (Engle, 1982). This particular heteroskedasticity specification was motivated by the observation that in many financial time series, the magnitude of residuals appeared to be related to the magnitude of recent residuals. The ARCH LM test statistic is computed from an auxiliary test regression. However, the Obs*R-squared statistic is Engle's LM test statistic, computed as the number of observations times the R^2 from the test regression. In other words, a time series exhibiting conditional heteroskedasticity – or autorrelation in the squared series - is said to have autoregressive conditional heteroscedastic (ARCH) effects.

Decision Rule

The decision rule to accept the null hypothesis for this diagnostic test is that; the probability-value (P-value) of each has to be greater than 5 percent level of significance. If otherwise reject the null hypothesis and accept the presence of serial correlation.

3.6.4 Jarque-Bera (JB) test

This test is carried out to check whether the error term follow a normal distribution. The normality test adopted the Jarque-Bera (JB) test of normality. It is usually applied based on the OLS residuals. And can also be derived using Histogram-Normality test. When using the Jarque-Bera test for normal distribution, the JB statistic is expected to be statistically indifferent from zero. Thus:

Ho: The sample data are not significantly different than a normal population

H1: the sample data are significantly different than a normal population for a normal distribution, probability should be greater than 0.1

Decision Rule

The decision rule to accept the null hypothesis for this diagnostic test is that; the probability value has to be greater than 5 percent level of significance to accept that the estimated value of the Jarque-bera normality is small. If otherwise reject the null hypothesis and conclude that the observed value of $\hat{JB}$ is sufficiently large.

3.6.5 Regression Analysis of the GARCH Model

GARCH model considered the conditional variance as significant measure of information, thus extending the ARCH model to the GARCH model. The conditional

variance suggests that error variance is a function of past squared error and past error variance i.e. the influence of the past p period of the residual error term and past q period of conditional variancě (Bollerslev, 1986). However, Engle (1982) advanced an Autoregressive Conditional Heteroscedasticity (ARCH) model which treats heteroscedasticity as a variance to be modelled and also test for the presence of volatility with the test hypothesis as follows:

H_0: No ARCH effect exist

$$Y_t = \beta X_t + \varepsilon_t \quad (3.28)$$

$$\varepsilon_t | \Omega_{t-1} \sim N(0, \delta_t^2)$$

$$\varepsilon^2{}_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon^2{}_{t-i} + e_i \quad (3.29)$$

Whereas Y_t is the endogenous variable X_t exogenous and ε_t is the white noise residual. The LM test statistic indicates that $TR^2 \sim \chi^2(q)$. If $TR^2 > \chi^2(q)$ then the model rejects H_0 and considers the presence of an ARCH effect. Whereas T is the sample size and R^2 is the regression's coefficient.

Decision Rule

Generally, the decision rule for test of ARCH/GARCH effect is as: If probability value is less than 5%, we reject H_0 (which say that there is no ARCH effect) and accept H_1. In other words, we conclude that there is an ARCH effect. However, the decision rule to accept the null hypothesis i.e. whether there is present of heteroscedasticity is that the probability-value (p-value) of the F- statistic test has to be greater than 0 and less than 1

(precisely 0.5 to 0.99) at 5 percent level of significance. If otherwise reject the null hypothesis and accept the presence of homoscedasticity.

3.7 Evaluation of the Model

The study evaluates the result based on the three basic principles, i.e. economic, statistic and econometric. The data in the model were first regressed to verify the underpinned theories on monetary policy vis-à-vis monetary policy transmission mechanism on economic stability under economics principles, using theories explained in the literatures review. Furthermore, validity and reliability tests conducted on the model like autocorrelation, heteroskedasticity and multicolinearity were interpreted under econometric principle also. After the regression and other tests are ascertained, statistical principles were carried out under significance of the study using the test statistic as well as the interpreted stated hypothesis.

R-Squared and Adjusted R–Squared

These are used to measure the goodness of fit of the estimated model. They measure the proportion of the total variations in the dependent variable that is explained by variations in the explanatory variables. The adjusted R-squared is a modified version of R-squared that has been adjusted for the number of predictors in the model. The adjusted R-squared can be negative, but it's usually not and it is always lower than the R-squared. The adjusted R-squared increases only if the new term improves the model more than would be expected by chance. It decreases when a predictor improves the model by less than expected by chance.

F–Statistics

This is the test for the existence of a significant liner relationship between the independent variables taken together with the dependent variable. The F–statistics is specially used to test for the overall significance of the estimated model. These sums of squares are constructed so that the statistic tends to be greater when the null hypothesis is not true. In order for the statistic to follow the F-distribution under the null hypothesis, the sums of squares should be statistically independent, and each should follow a scaled χ^2-distribution. The latter condition is guaranteed if the data values are independent and normally distributed with a common variance.

T–Statistics

This is used to decide whether the estimated parameters in the model are statistically significant or not as a given level of significance before accepting or rejecting the null hypothesis.

Econometric Criteria (Second – Order Test)

This aimed at detecting the possible validity of some of the assumptions on which the particular econometric method was based. Here, the Durbin–Watson (D–W) criterion is used to test for the absence or presence of autocorrelation in the model. The value of d always lies between 0 and 4. If the Durbin–Watson statistic is substantially less than 2, there is evidence of positive serial correlation, and a value higher than 2 indicates a negative serial correlation. According to rule of thumb, if Durbin–Watson is less than 1.0, there may be cause for alarm. Small values of d indicate successive error terms are positively correlated. If $d > 2$, successive error terms are negatively correlated. This implies an underestimation of the level of statistical significance.

3.8 Justification of the Model

The estimation of the GARCH (1,1) models with an AR(1) term in this case improved the results of the study. The advantage of using an AR(1) term is to solve the possible simultaneity bias resulting from weak exogeneity of the contemporaneous term (endogenous variables) and the higher explanatory power associated with the GARCH (1,1) and an AR(1) term. In other words, Engle (1982) noted that the GARCH (1,1) is the simplest and most robust of the family of volatility models. However, the model can be extended and modified in many ways. Moreover, it is also opined that the significance of the GARCH effect shows the presence of the spill-over effect. While, the rationale for using OLS method in estimating the GARCH (1,1) is due to the fact that its estimates possess the desirable BLUE (i.e. Best, Linear, Unbiased, Estimator) properties of the Ordinary Least Square (OLS) econometric method. This is because it has a minimum variance and it is more efficient when compared to other techniques of model estimation.

CHAPTER FOUR

DATA PRSENTATION AND ANALYSIS

4.1 Data Presentation

To empirically analyze the impact of monetary policy transmission mechanism in Nigerian economy, model estimation was carried out using annual time series data covering the period 1987 to 2018. The data on variables such as Real Gross Domestic Product, Cost of Capital, Household Investment Expenditure, Money Supply, Monetary Policy Rate, Liquidity Ratio, Cash Reserve Requirement, Treasury Bills, Prime and Maximum Lending Rate are used for the analysis. See Appendix I for the regression data.

4.2 Data Analysis

This section presents the empirical results of the study, which include; the Descriptive Statistics, ADF Unit Root test results, Cointegration test results, the ARCH and GARCH regression result, Residuals test (ARCH LM test and JB normality test results) and Statistical test of hypotheses.

4.2.1 Descriptive Statistics

Table 4.1(A): Descriptive Statistics Result

	RGDP	CCAP	HEXP	MS	MRR/MPR
Mean	37296.70	170.8667	1.49E+13	6116.079	13.89063
Median	30333.58	4.950000	2.98E+12	1729.440	13.50000
Maximum	69810.02	1400.434	7.70E+13	25079.72	26.00000
Minimum	15263.93	0.000000	93.05352	27.57000	6.000000
Std. Dev.	19339.71	403.9578	2.20E+13	7857.044	3.897341
Skewness	0.530676	2.579533	1.535794	1.092266	0.664583
Kurtosis	1.715434	8.026328	4.280982	2.810996	4.779703
Jarque-Bera	3.702103	69.17326	14.76742	6.410539	6.578703
Probability	0.157072	0.000000	0.000621	0.040548	0.037278
Sum	1193494.	5467.736	4.76E+14	195714.5	444.5000
Sum Sq. Dev.	1.16E+10	5058639.	1.50E+28	1.91E+09	470.8672
Observations	32	32	32	32	32

Source: Computed using E-Views 9 software.

Table 4.1(B): Descriptive Statistics Result

	CRR	LR	MLR	PLR	TRB
Mean	772.7657	46.58983	23.78938	18.98969	968.7990
Median	98.37165	46.22500	22.56500	17.96500	579.7326
Maximum	4699.702	65.00000	36.09000	29.80000	3579.799
Minimum	0.000000	29.10000	17.60000	13.54000	24.12600
Std. Dev.	1396.381	9.361649	4.493990	3.481942	1097.757
Skewness	1.694486	0.128945	0.870582	1.470856	1.115974
Kurtosis	4.305210	2.667587	3.121157	4.942422	2.829517
Jarque-Bera	17.58494	0.236008	4.061773	16.56890	6.680874
Probability	0.000152	0.888693	0.131219	0.000252	0.035421
Sum	24728.50	1490.874	761.2600	607.6700	31001.57
Sum Sq. Dev.	60446273	2716.854	626.0744	375.8415	37357149
Observations	32	32	32	32	32

Source: Computed using E-Views 9 software.

The table above shows the behaviour of the variables during the period under review (i.e 1987-2018). The table contains the details for the mean, maximum values, minimum values, range, standard deviation, skewness, kurtosis and Jarque-Bera for 32 observations. RGDP, CCAP and HEXP which are the dependant variables represent the Real Gross Domestic Product, Cost of Capital and Household Investment Expenditure respectively. While, MS, MRR/MPR, CRR, LR, MLR, PLR and TRB represents Money Supply, Monetary Policy Rate, Cash Reserve Ratio, Liquidity Ratio, Maximum Lending Rate, Prime Lending Rate and Treasury Bills respectively.

From the observed summary statistics, with reference to the JB Normality test estimates and probability values for RGDP, MS, LR and MLR were normally distributed because to their high probability values (approx.) of 0.16, 0.05, 0.89 and 0.13 respectively, which are higher than the probability of 0.05 (significance level). This explains that the results will not be biased. On the other hand, the probability values for CCAP, CRR, HEXP, MPR, PLR and TRB were not normally distributed because of their low probability values (approx.) of 0.00, 0.01, 0.04, 0.00 and 0.04 respectively, which are lower than the probability value of 0.05. However, non-normality does not affect mean values since Least Squares parameters are mean values. Therefore, the non-normality of the other variables does not affect the parameters in the estimated models.

4.2.2 Trend Analysis of the Data

The regression data in appendix I shows the trend behaviour of the data on Monetary Policy Rate (MPR), Broad Money Supply (MS), Cash Reserve Requirements (CRR), Liquidity Ratio (LR), Maximum Lending Rate (MLR), Prime Lending Rate (PLR),

Treasury Bills (TRB), Real Gross Domestic Product (RGDP), Cost of Capital (CCAP) and Household Investment Expenditure (HEXP) over the period 1987-2018.

It is observed that CCAP, HEXP, MPR, LR, PLR and MLR were more volatile than the other variables (i.e. RGDP, MS, CRR and TRB) in the period under study. Moreover, the data shows that there was considerable stability in the trend behaviour of some variables for a period of 4 to 5 years. However, some of the variables begin to exhibit instability from 2006. The implication of the trend behaviour of each variable is that to a large extent it affects their stationarity status.

4.2.3 Unit Root Test Result

Table 4.2: Augmented-Dickey Fuller (ADF) Test Result

Variables	ADF Statistics			Remark
	Level Difference	First Difference	Second Difference	
RGDP	0.056831	-2.220030	-5.764083**	I(2)
MS	6.302891**	-1.079324	-	I(0)
MPR	-3.010373	-7.711454**	-	I(1)
LR	-2.723622	-5.795295**		I(1)
CCAP	-2.366492	-5.025382**	-	I(1)
PLR	-4.072379	-7.666888**	-	I(1)
TRB	-1.151726	-2.582045	-4.047955**	I(2)
HEXP	1.826556	-5.058384**	-	I(1)
MLR	-3.381071	-6.787008**	-	I(1)
CRR	2.608953	-3.441849	-	I(1)

Source: Computed by Author, 2021. See Appendix II

Note: ** Indicates the rejection of the null hypothesis of existence of unit root at 5% significance level. Lags are selected based on Schwarz Information Criteria (SIC).

The ADF unit root test results as reported in table 1 (See Appendix II) showed that, MPR, LR, CCAP, PLR, HEXP, MLR and CRR were stationary at first difference except MS that was stationary at level difference while RGDP and TRB where stationary at second difference. This means that MPR, LR, CCAP, PLR, HEXP, MLR and CRR have mean, variance and covariance that are not constant overtime. However, after first differencing, each of these time series variables tested became stationary. The implication of the unit root test results is that MPR, LR, CCAP, PLR, HEXP, MLR and CRR are integrated of order one, i.e., 1(1) while MS is integrated of order zero, i.e., 1(0), and RGDP and TRB were integrated of order 1(2).

4.2.4 Cointegration Analysis

The study proceeds with Johansen co-integration test having established that all series are not stationary at the same order. The co-integration test allows for the testing of the long-run equilibrium relationships among the series. The result obtained from Johansen cointegration test is presented in table 4.2. The result is based on eigenvalue test and trace test to determine the number of co-integration vectors.

Table 4.3: Johansen Co-integration Test Result for Model Equation 1

Series: RGDP, MS, MPR, LR				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.616534	28.75515	24.15921	0.0111
At most 1 *	0.479113	19.56668	17.79730	0.0268
At most 2	0.114610	3.651803	11.22480	0.6842
At most 3	0.020791	0.630317	4.129906	0.4880

Source: Author's Computation; 2021. See Appendix IV

The table above shows that there is long run relationship among the following variables i.e. RGDP and MS. This indicates that RGDP and MS are variables that are converge in the long run, thereby depicting the existence of long run relationship among them. The long run relationship exists at 5% level of significance according to the maximum eigenvalue test while MPR and LR have no long run relationship among them, therefore the variables are not converge in the long run.

Table 4.4: Johansen Co-integration Test Result for Model Equation 2

Series: CCAP, MPR, PLR, TRB				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.594385	64.92003	55.24578	0.0056
At most 1 *	0.499212	37.84953	35.01090	0.0242
At most 2	0.289743	17.10235	18.39771	0.0752
At most 3 *	0.203836	6.838487	3.841466	0.0089

Source: Author's Computation; 2021. See Appendix V

The table above show there is long run relationship among the following variables which are CCAP, MPR and TRB. These indicate that the results between CCAP, MPR and TRB are variables that are converge in the long run thereby depicting the existence of long run relationship among them. The long run relationship exists at 5% level of significance according to the trace statistic test while PLR has no long run relationship among them. Therefore, the variable is not converging in the long run.

Table 4.5: Johansen Co-integration Test Result for Model Equation 3

Series: HEXP, MS, MLR, CRR				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.788006	101.8708	47.85613	0.0000
At most 1 *	0.668177	55.33493	29.79707	0.0000
At most 2 *	0.496528	22.24032	15.49471	0.0041
At most 3	0.053625	1.653506	3.841466	0.1985

Source: Author's Computation; 2021. See Appendix VI

The table above show there is long run relationship among the following variables which are HEXP, MS, and MLR. These indicate that the result between HEXP, MS and MLR are variables that are converge in the long run thereby depicting the existence of long run relationship among them. The long run relationship exists at 5% level of significance since the Trace statistic test value for HEXP, MS and MLR are greater than eignvalue while CRR has no long run relationship among them since the Trace statistic test value of the variable is less than eignvlaue therefore the variable is not converge in the long run.

4.2.5 ARCH and GARCH Regression Results

Model Equation 1

The ARCH and GARCH regression results for model one coefficients are as follows;

Table 4.6: Results of Money Supply on the Aggregate Output in Nigeria.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.436163	3.622620	1.224573	0.0000
MS	2.667167	0.095047	28.06165	0.0000
MPR	-403.6642	134.5535	-3.000028	0.0027
LR	-2.609953	70.72483	-0.036903	0.9706
Variance Equation				
C	6.667070.	6.597447.	1.010553	0.2404
ARCH (-1)^2	1.286833	0.791881	1.625035	0.1042
GARCH(-1)	-0.174963	0.012559	-13.93167	0.0000
R-squared		0.909475	Mean dependent var	37296.70
Adjusted R-squared		0.899776	S.D. dependent var	19339.71
S.E. of regression		6122.588	Akaike info criterion	19.44431
Sum squared resid		1.05E+09	Schwarz criterion	19.76494
Log likelihood		-304.1090	Hannan-Quinn criter.	19.55059
Durbin-Watson stat		0.238822		

Source: Author's Computation; 2021. See Appendix VII(A)

From the results above, we observed that the coefficient of money supply (MS) is positive, while that of monetary policy rate (MPR) and liquidity ratio (LR) were negative. The evaluation of the signs associated with the estimated regression coefficients indicated that the coefficient of money supply (MS) as explanatory variable is positively related to the aggregate output.

The result shows that a unit increases in money supply (MS) by 2.667167 holding other variables (i.e. MPR and LR) constant will significantly increase the aggregate output by 266.72 units. This shows that money supply (MS) has a positive relationship with the

aggregate output. And a percentage change in monetary policy rate (MPR) by -403.6642 holding other variables (i.e. MS and LR) constant will significantly decrease the aggregate output by 40366.42 units. The negative relationship of monetary policy rate (MPR) with the aggregate output shows that banks and other financial actors are not pursuing the same policy objective with the government. However, monetary policy rate (MPR) has a higher magnitude in the model equation. A percentage change in liquidity ratio (LR) by -2.609953 holding other variables (i.e. MPR and MS) constant will insignificantly decrease the aggregate output by 260.99 units.

The result also indicates that the ARCH coefficient is positive but not statistically significant, while the coefficient of GARCH is negative but statistically significant. The variation equation from the table was use to test whether if there is presence of volatility.

The ARCH term from the variation equation is significant which indicates the presence of volatility while the significance of the low GARCH term implies that effect may rapidly die down. The sum of the ARCH and GARCH term (1.286833) + (-0.174963) = 1.46 shows that the Central Bank can control money supply to increase the Aggregate output (RGDP) in Nigeria.

R^2 (R-square)

The R^2 (R-square) value of 0.909475 revealed that money supply has a very good impact on aggregate output (RGDP) in Nigeria. It indicates that about 91 percent of the variation in RGDP was caused by money supply, while the remaining unaccounted variation of 9 percent is captured by the white noise error term.

Durbin Watson (DW) Statistic

It was used to test for the presence of autocorrelation among the error terms. Generally, the acceptable Durbin- Watson range is between 0 and 2, but if the DW statistic is substantially less than 2, there is evidence of positive serial correlation. This model indicates that there is no autocorrelation among the variables as indicated by Durbin Watson (DW) statistic of 0.238822. This demonstrates that the estimates are unbiased and can be relied upon for economic decisions.

Model Equation 2

Table 4.7: Results of Monetary Policy Rate on the Cost of Capital

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-31.15967	19.10058	-1.631346	0.1028
MPR	0.191565	0.224633	0.852791	0.3938
PLR	0.356314	0.843526	0.422410	0.6727
TRB	0.209501	0.034062	6.150492	0.0000
Variance Equation				
C	39.14789	120.4532	0.325005	0.7452
ARCH (-1)^2	3.282099	2.211193	1.484312	0.1377
GARCH(-1)	-0.223995	0.668768	-0.334937	0.7377
R-squared		0.820969	Mean dependent var	170.8666
Adjusted R-squared		0.813930	S.D. dependent var	403.9574
S.E. of regression		360.4220	Akaike info criterion	12.05758
Sum squared resid		3637313.	Schwarz criterion	12.37821
Log likelihood		-185.9213	Hannan-Quinn criter.	12.16386
Durbin-Watson stat		2.10095		

Source: Author's computation; 2021. See Appendix VII(B)

From the results above, we observed that the coefficient of monetary policy rate (MPR), prime lending rate (PLR) and Treasury bill (TRB) were all positive. The evaluation of the signs associated with the estimated regression coefficients indicated that the coefficient of monetary policy rate (MPR), prime lending rate (PLR) and Treasury bill (TRB) as explanatory variables are positively related to the cost of capital.

The result shows that a percentage increases in monetary policy rate (MPR) by 0.191565 holding other variables (i.e. PLR and TRB) constant will insignificantly increase the cost of capital by 19.16 units. And a percentage increase in prime lending rate (PLR) by 0.356314 holding other variables (i.e. MPR and TRB) constant will insignificantly decrease the cost of capital by 35.64 units. A unit increase in Treasury bill (TRB) by

0.209501 holding other variables (i.e. PLR and MPR) constant will significantly increase the cost of capital by 20.95 units. The positive relationship of monetary policy rate (MPR), prime lending rate (PLR) and Treasury bill (TRB) with the cost of capital indicates a significant relationship.

The result also indicates that the ARCH coefficient is positive but not statistically significant, while the coefficient of GARCH is negative and statistically insignificant. The variation equation from the table was use to test whether if there is presence of volatility. The ARCH term from the variation equation is significant which indicates the presence of volatility while the significance of the low GARCH term implies that effect may rapidly die down. The sum of the ARCH and GARCH term (3.282099) + (0.223995) = 3.0580149 shows that the Central Bank can control monetary policy rate to reduce the cost of capital (CCAP) in Nigeria.

R^2 (R-square)

The R^2 (R-square) value of 0.820969 revealed that monetary policy rate has a very good impact on cost of capital (CCAP) in Nigeria. It indicates that about 82 percent of the variation in CCAP was caused by monetary policy rate, while the remaining unaccounted variation of 18 percent is captured by the white noise error term.

Durbin Watson (DW) Statistic

It was used to test for the presence of autocorrelation among the error terms. The acceptable Durbin- Watson range is between 0 and 2. The model also indicates that there is no autocorrelation among the variables as indicated by Durbin Watson (DW) statistic of 2.10095. This demonstrates that the estimates are unbiased and can be relied upon for economic decisions.

Model Equation 3

Table 4.8: Results of Reserve Requirement on Household Investment Expenditure in Nigeria.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-48.19677	608.4605	-0.079211	0.9369
MS	3.346178	0.493940	6.774465	0.0000
MLR	-1.074119	21.61614	-0.049691	0.9604
CRR	4.511566	3.726327	1.210727	0.2260
Variance Equation				
C	-9040.542	22161.35	-0.407942	0.6833
ARCH (-1)^2	0.396969	0.419669	0.945912	0.3442
GARCH(-1)	1.028534	0.250354	4.108319	0.0000
R-squared		0.983343	Mean dependent var	23805.21
Adjusted R-squared		0.981558	S.D. dependent var	31553.07
S.E. of regression		4284.914	Akaike info criterion	17.82780
Sum squared resid		5.14E+08	Schwarz criterion	18.14843
Log likelihood		-278.2449	Hannan-Quinn criter.	17.93408
Durbin-Watson stat		1.320195		

Source: Author's Computation; 2021. See Appendix VII(C)

From the results above, we observed that the coefficients of money supply (MS) and cash reserve requirement (CRR) were positive, while that of maximum lending rate (MLR) is negative. The evaluation of the signs associated with the estimated regression coefficients indicated that the coefficient of money supply (MS) and cash reserve requirement (CRR)

as explanatory variables are positively related to the household investment expenditure.

The results shows that a unit increases in money supply (MS) by 3.346178 holding other variables (i.e. MLR and CRR) constant will significantly increase the household investment expenditure by 334.18 units. This shows that money supply (MS) has a positive relationship on the household investment expenditure. However, Money Supply (MS) has a higher magnitude in the model equation. And a percentage change in maximum lending rate (MLR) by -1.074119 holding other variables (i.e. MS and CRR) constant will insignificantly decrease the household investment expenditure by 107.42 units. The negative relationship shows that banks and other financial actors are not pursuing the same goal with households. A unit increase in cash reserve requirement (CRR) by 4.511566 holding other variables (i.e. MLR and MS) constant will insignificantly increase the household investment expenditure by 451.16 units.

The result also indicates that the ARCH coefficient is positive but not statistically insignificant, while the coefficient of GARCH is positive and statistically significant. The variation equation from the table was use to test whether if there is presence of volatility.

The significance of GARCH term implies that the spill-over effect will last for longer periods. The sum of the ARCH and GARCH term (0.396969) + (1.028534) = 1.425506 shows that the Central Bank of Nigeria can control the reserve requirement to increase the household investment expenditure in Nigeria.

R^2 (R-square)

The R^2 (R-square) value of 0.983343 revealed that money supply has a very good

impact on household investment Expenditure in Nigeria. It indicates that about 98 percent of the variation in HEXP was caused by money supply, while the remaining unaccounted variation of 2 percent is captured by the white noise error term.

Durbin Watson (DW) Statistic

It was used to test for the presence of autocorrelation among the error terms. The acceptable Durbin- Watson range is between 0 and 2. The model also indicates a positive autocorrelation among the variables as indicated by DW statistic of 1.320195. This demonstrates that the estimates are unbiased and can be relied upon for economic decisions.

4.2.6 Residuals Test Results

Model Equation 1

Table 4.8: Residual Test Results for Model 1

Tests	Outcomes		
		Coefficients	**Probability**
ARCH LM Test :	F- Stat.	0.406414	0.8309
	Obs*R-squared	0.409535	0.8239
Jarque-BeraNormality Test Stat.		0.878088	0.644653

Source: Computed by Author, 2021. See Appendix VIII(A) and IX(A)

As may be recalled, ARCH and GARCH is a Classical linear regression model and therefore the underlying assumptions of classical linear regression model (CLRM) have to be verified through diagnostic checks. These assumptions are tested to know whether if the model is correctly specified. With this reason ARCH LM and JB normality post diagnostic tests were conducted. These tests are necessary before one can draw inferences or policy implications from findings of the study.

The homoscedasticity assumption must be satisfied for the regression results to be valid. Therefore, testing for the presence of heteroskedasticity in a classical linear regression model is inevitable. Here, the study employed ARCH LM heteroskedasticity test. The null hypothesis of the test is that the variance of the error term is homoscedastic. The ARCH LM heteroskedasticity test is also based on two statistics labelled "F-statistic" and "Obs*R-squared" statistic. A glance at table 6 reveals that the null hypothesis of homoscedastic variance of the error term cannot be rejected since the probability values of the F- test statistics (0.406414 and 0.409535) are individually greater than 0.05 (i.e., 5% level of significance). We therefore reject the null hypothesis and conclude that there is a presence of homoscedasticity since the value fall within (0.8309 and 0.8239).

Finally, the Jarque-Bera statistic shows that the error term is normally distributed since the result revealed that the JB probability value of (0.644653) is greater than 0.05 percent level of significance.

Model Equation 2

Table 4.9: Residual Test Results for Model 2

Tests		Outcomes	
		Coefficients	**Probability**
ARCH LM Heteroscedasticity Test:			
	F Statistic	0.295570	0.5908
	Obs* R^2	0.312767	0.5760
Jarque-Bera Normality Test Stat.		15.89239	0.354000

Source: Computed by Author, 2021. See Appendix VIII(B) and IX(B)

The homoscedasticity assumption must be satisfied for the regression results to be valid. Therefore, testing for the presence of heteroskedasticity in a classical linear regression model is inevitable. Here, the study employed ARCH LM heteroskedasticity test. The null hypothesis of the test is that the variance of the error term is homoscedastic. The ARCH LM heteroskedasticity test is also based on two statistics labelled "F-statistic" and "Obs*R-squared" statistic. A glance at table 6 reveals that the null hypothesis of homoscedastic variance of the error term cannot be rejected since the probability values of the F- test statistics (0.5908 and 0.5760) are individually greater than 0.05 (i.e., 5% level of significance). We therefore reject the null hypothesis and conclude that there is a presence of homoscedasticity since the value fall within (0.5908 and 0.5760).

Finally, the Jarque-Bera statistic shows that the error term is normally distributed since the result revealed that the JB probability value of (0.354000) is greater than 0.05 percent level of significance.

Model Equation 3

Table 4.10: Residual Test Results for Model 3

Tests		Outcomes	
		Coefficients	**Probability**
ARCH LM Heteroscedasticity Test:			
	F Statistic	0.555466	0.4621
	Obs* R^2	0.582615	0.4453
Jarque-Bera Normality Test Stat.		0.339916	0.843700

Source: Computed by Author, 2021. See Appendix VIII(C) and IX(C)

The homoscedasticity assumption must be satisfied for the regression results to be valid. Therefore, testing for the presence of heteroscedasticity in a classical linear regression model is inevitable. Here, the study employed ARCH LM heteroscedasticity test. The null hypothesis of the test is that the variance of the error term is homoscedastic. The ARCH LM heteroscedasticity test is also based on two statistics labelled "F-statistic" and "Obs*R-squared" statistic. A glance at table 6 reveals that the null hypothesis of homoscedastic variance of the error term cannot be rejected since the probability values of the F- test statistics (0.4621 and 0.4453) are individually greater than 0.05 (i.e., 5% level of significance). We therefore reject the null hypothesis and conclude that there is a presence of homoscedasticity since the value fall within (0.4621 and 0.4453).

Finally, the Jarque-Bera statistic shows that the error term is normally distributed since the result revealed that the JB probability value of (0.843700) is greater than 0.05 percent level of significance.

4.2.7 Statistical Test of Hypotheses

The three hypotheses formulated in the study were tested using Probability z-statistics value. The level of significance for the study is 5% (0.05) for a two-tailed test. The decision rule is thus; if probability value is less than 0.05 (5% level of significance) we accept H_0 and conclude and if otherwise reject the null hypothesis. Hypothesis one, two and three will be tested from the regression result. That is, using the Probability z-statistics, a variable is statistically significant if the probability value is less than 0.05 (5% level of significance) and it is statistically insignificant if the probability value is greater than 0.05 (5% level of significance).

Hypothesis 1

H_{O1}: There is no significant relationship between money supply and aggregate output in Nigeria. Thus, the estimated regression result in appendix VII(A), indicated that the z-statistic probability value of MS and MPR whose values are 0.000 and 0.0027 respectively, were found to be less than 0.05 percent level of significance. While LR is greater than 0.05 percent level of significance with probability of 0.9706. As such, the study discovered that there is significant impact between MS and MPR on aggregate output, except LR that is found to be less than 0.05 was found to be statistically insignificant. The study therefore accept the null hypothesis and conclude that there is significant relationship between money supply and aggregate output in Nigeria, since two out of the three explanatory variables are statistically significant.

Hypothesis 2

H_{O2}: There is no significant relationship between monetary policy rate and cost of capital in Nigeria. Thus, the estimated regression result in appendix VII(B), indicated that the z-statistic probability value of MPR and PLR whose values are 0.3938 and 0.6727 respectively, were found to be greater than 0.05 percent level of significance. While TRB is less than 0.05 percent level of significance with probability of 0.0000. As such, the study discovered that there is no significant relationship between MPR and PLR on cost of capital, except TRB that is found to be less than 0.05 was found to be statistically significant. The study therefore reject the null hypothesis and conclude that there is no significant relationship between monetary policy rate and cost of capital in Nigeria, since two out of the three explanatory variables are statistically insignificant.

Hypothesis 3

H_{O3}: Reserve requirement have no significant effect on household investment expenditure in Nigeria. Thus, the estimated regression result in appendix VII(C), indicated that the z-statistic probability value of MLR and CRR whose values are 0.9604 and 0.2260 respectively, were found to be greater than 0.05 percent level of significance. While MS is less than 0.05 percent level of significance with probability of 0.0000. As such, the study discovered that there is no significant relationship between MLR and CRR on household investment expenditure, except MS that is found to be less than 0.05 was found to be statistically significant. The study therefore reject the null hypothesis and conclude that there is no significant relationship between cash reserve requirement and

household investment expenditure in Nigeria, since two out of the three explanatory variables are statistically insignificant.

4.3 Discussion of Results and Findings

The findings from the study revealed that in model equation one; the general impact of money supply on the aggregate output is positive. This is in line with the statistical significance of the explanatory variables MS and MPR as against the negative coefficients of the explanatory variables of MPR and LR. Thus, indicating that money supply has influence on aggregate output. Also finding of hypothesis one shows that there is significant relationship between MS and MPR on aggregate output. This is in agreement with Nkwatoh (2012), whose finding showed that the effectiveness of monetary policy rate (MPR) on the final goals depends on its effect on money supply. While the implication of LR being insignificant. The implication of this is that most commercial banks in Nigeria have no adequate liquid cash to keep as a percentage of their deposits liabilities. And that keeping such deposits with the CBN only result to limiting the commercial banks ability to issue more loans and other debt instruments to private individuals, as well as the subsequent mergers and acquisitions in the banking industry. Although, such deposits are aimed at curbing the sudden collapse of commercial banks with customers deposit assets experienced in recent past.

The findings from model equation two also shows that the general effect of monetary policy rate (MPR) on cost of capital is positive. This is evidence with regards to the positive coefficients of both monetary policy rate (MPR), prime lending rate (PLR) and Treasury bill (TRB). However, the results also showed that monetary policy rate (MPR)

and prime lending rate (PLR) are statistically insignificant. This is in agreement with lucky and Kingsley (2017) whose finding showed that prime lending rate has not contributed significantly to domestic real investment. Moreover, Hassan (2015) also noted that the bank lending channel is not operative in the country despite certain policy initiatives and guidelines that were constantly set up, the economy still witness varieties of instability in lending rate as a result of management of interest rate and other policy instrument. Thus the existence of a large informal credit and exchange market in Nigeria has many implications for the transmission mechanism of monetary policy.The findings from hypothesis two also showed that there is no significant relationship between MPR and PLR on cost of capital, because they are not statistically significant.

Furthermore, findings from model equation three show that the impact of reserve requirement (CRR) on household investment expenditure is positive. This is evidence with the positive coefficients of money supply (MS) and cash reserve requirement (CRR). Also, finding from hypothesis three showed that maximum lending rate (MLR) and cash reserve requirement (CRR) are statistically insignificant. This is in agreement with the work of Adeode and Shobande (2017) whose findings show that money supply being significant is very crucial for any meaningful economic growth. As a result of the significant relationship of money supply on household investment expenditure (HEXP) invariably increase the maximum lending rate (MLR) and the cash reserve requirement of the nation. This is as result of increase in money supply in circulation during the period under study. It means when there is increase in money supply inversely will increase both the maximum lending rate (MLR) as well as increase the cash reserve requirement of the Nation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Major Findings

The study examined the transmission mechanism of monetary policy and the Nigeria economy over the period 1986 to 2018. The generalize autoregressive conditional heteroscedasticity model was estimated using ARCH-GARCH. The study conducted unit root and Cointegration tests before model estimation was performed, in order to ascertain the stationarity status and longrun properties of the variables used for the study. More so, findings from the unit root test showed that almost all the time series considered were non-stationary at level but became stationary after first differencing and second differencing. Also, the Cointegration test result from the Johansson Cointegration showed that the variables are cointegrated, which implies that the time series variables considered have long-run equilibrium relationship.

This research study findings also show that all the explanatory variables in model equations 1 where significant exception of liquidity ratio (LR) that is statistically insignificant. While from the ARCH and GARCH regression result, the findings show that the coefficient of liquidity ratio (LR) and monetary policy rate (MPR) affect the real gross domestic product (RGDP) negatively while money supply positively affect real gross domestic product (RGDP).

On the other hand, findings from the explanatory variables in model equation 2 shows that MPR and PLR where statistically insignificant except TRB that is statistically significant. And the ARCH and GARCH regression result in model 2 show that the coefficients of all the explanatory variables positively affect the cost of capital (CCAP).

Furthermore, findings from the explanatory variables in model equation 3 show that MLR and CRR were statistically insignificant except money supply that is statistically significant. While from the ARCH and GARCH regression result in model equation 3 also indicates that the coefficients of the explanatory variables i.e. MS and CRR positively affect household investment expenditure (HEXP) while MLR negatively affect household investment expenditure.

However, in sum they were statistically significant. The coefficient of determination in model 1 show that R^2 (R-square) indicates that about 91 percent (%) of the variation in RGDP was caused by money supply, while the remaining unaccounted variation of 9 percent (%) is captured by the white noise or error term. On the other hand, in model 2, R^2 (R-Square) value of 0.820969 indicates that monetary policy rate has a very good impact on cost of capital (CCAP) in Nigeria. It shows that about 82 percent (%) of the variation in CCAP was caused by monetary policy rate, while the remaining unaccounted variation of 18 percent (%) is captured by the white noise or error term. Moreover, in model 3, R^2 (R-Square) value of 0.983343 indicates that money supply has a very good impact on household investment Expenditure in Nigeria. It shows that about 98 percent (%) of the variation in household investment expenditure (HEXP) was caused by money supply (MS), while the remaining unaccounted variation of 2 percent (%) is captured by the white noise or error term. However, using the Durbin-Watson statistic, it was also found that in all the three models, there was no autocorrelation among the variables.

Furthermore, the diagnostic tests carried out on the estimated model equations showed that the estimated ARCH and GARCH in all the three models was well-specified and also

normally distributed with the absence heteroscedasticity problems. In real sense, this indicates that empirical findings from the research study are not spurious.

5.2 Conclusion

The eventual purpose of monetary policy is to achieve certain national goals. These includes among others; full employment (or a low unemployment rate), full-employment output (or a high output growth rate), a stable price level (or a low inflation rate), and a stable exchange rate (or a desirable balance of payments position). However, the central bank achieves these goals by its monetary policy instruments, which are variables that it can operate on directly. Among the instruments available to the central bank are open market operations and changes in its discount/bank rate at which it lends to commercial banks and other bodies. The central bank can also change the required reserves (i.e. the minimum reserves the commercial banks must hold against the public's deposits with them), which changes the monetary base multiplier (i.e. the money supply per naira of the monetary base). These measures subsequently change the money supply in the economy.

The study showed that, the transmission of monetary policy is fairly strong in the entire three models. Where, the interest rate effect dominates the first two model equations while the quantity effect dominates the third model. This implies that the effectiveness of monetary policy rate (MPR) on the third model equation depends on its effect on money supply. It seems therefore, that effective open market operations (OMO) may be critical to the effectiveness of monetary policy in Nigeria.

It is pertinent to note that the success of a sound monetary policy in the Nigerian economy depends on the effectiveness of transmission mechanism. It can be concluded

from the study that some of the explanatory variables have minimal impact on the mechanism through which monetary policy is transmitted in Nigeria within the period under review. The monetary authorizes (i.e. CBN) have made certain policy guidelines over the years, but only little have been achieved with regard to the effective positive monetary changes to the economy. However, the CBN should design new policies to consolidate the already implemented policies that are geared towards the achievement of a sound and effective monetary policy.

5.3 Recommendations

From the empirical findings above, the study recommends that government should try to avoid any form of disguise or indirect interference into the monetary policy management. There should be strict adherence of the autonomy of Central Bank of Nigeria by all the government organs. This is because the effects of such interference in the recent past have played a devastated role in the achievement of effective monetary policy transmission mechanism as well as enhance central banking in Nigeria. Other recommendations made are as follows;

i. First and foremost, in order to strengthen the effectiveness of the monetary targeting strategy, the monetary authorities (i.e. CBN) should ensure that the empirical specification of sustaining the stability of money demand functions should be address appropriately at the departmental level, and subsequently at the monetary policy committee. The instruments of money supply (MS), that is known to be effective in almost all sectors should be properly managed and monitored, so as to consolidate with the existing achievements recorded in recent years as it is shown in the findings. This implies effective surveillance of the roles of such instrument be enhance in

accordance with the desired policy objectives of the government. This will subsequently ensure increase in aggregate output.

ii. The insignificance effect of other instruments like liquidity ratio (LR), prime and maximum lending rates (PLR and MLR) as shown in the findings can be reverted and make significant by making such lending rates very attractive for both borrowers and investors in the country through the application of favourable interest rate and the implementation of more business oriented policies that would encourage entrepreneurship and profitable business ventures in the country, as well as sustaining the significance of both monetary policy rate (MPR) and treasury bill (TRB). Specifically, the government through the CBN should set the lending rate on optimum level as these would help to boost credit expansion, money supply and invariably returns and profitability of deposit money banks in Nigeria.

iii. The CBN should redefine cash reserve requirement by setting CRR at an equilibrium level in order to make more funds available to deposit money banks (DMBs) for advancing loan and investing in the economy for growth and development. As well as making the capital market more robust through developing the stock exchange market, by expanding its scope and trading activities from private sector participants only, to include the household sector, thereby making the cost of capital favourable and more attractive. This would attract the huge unused non-banking population into the normal conventional banking sector, as well as reducing the size of its informal sector. As the low patronage of banking services by many Nigerians would prevents the effective control of money supply which often results to persistent inflation in the country.

iv. Strict compliance of stipulated prudential guidelines by commercial banks and other financial intermediaries must be pursued in all ramifications to ensure positive results from all quarters. However, any deviation from the set regulations should be punished to serve as a deterrent to others. As such, government and monetary policy makers should strengthen and improve on financial regulatory reforms like Nigeria Deposit Insurance Corporation (NDIC). This will strengthen the transmission of monetary policy to the macro-economy.

5.4 Limitations of the Study

The research study was limited by certain limitations, some of which include among others; the inability and or challenges incurred in the process of securing the most recent data for some of the variables used, especially, the cost of capital. As well as the challenges relating to time, funds and also logistics which make the researcher limit the scope of the study.

Specifically, the gathered information might inhibit the ability to conduct a thorough empirical analysis of the results in the process of measuring the data collected, due to the omission of a specific variable that could help to address certain problem in the study. As such, the relationship between monetary policy transmission mechanism and economic growth in Nigeria may not be actually examined.

5.5 Contribution to Knowledge

This research study will essentially contribute to the body of already existing knowledge in the academia. The study have demonstrated the existence of longrun relationship between monetary policy transmission mechanism and the Nigerian economy, thereby exposing the role of monetary policy on the overall efficiency of economic growth and its

positive impact to the relevant monetary authorities (CBN). It also gives a better understanding of the variables that can best be used to describe or analyses how transmission mechanism of monetary policy impact on the Nigerian economy. The study also contributes to the body of knowledge specifically with regards to the scope or period covered as well as well the method and variables-mix used in analysing the models. Moreover, it will also help the government, academicians, students, policy-makers, independent researchers as well as additional literature on the analysis of monetary policy transmission mechanism in the Nigerian economy. And also provide data on the topic for further research in the area.

5.6 Suggestion for Further Studies

This research study suggests that further studies should be conducted on other key monetary policy variables which aid in achieving economic growth through the transmission mechanism, as well as adopting most appropriate and more complex models using a collection of large dataset. However, as a means of suggestion to other researchers, the following research topics can be considered, so as to bridge the limiting gap and further expanding the role played by monetary policy to the macro-economy of Nigeria. Some of these are as follows:

i. Analysis of the impact of monetary policy transmission mechanism in stabilizing output and prices in Nigeria.

ii. Effect of transmission mechanism of monetary policy on inflation in Nigeria.

iii. Impact of transmission mechanism of monetary to agricultural sector in Nigeria.

iv. Asymmetric effect of monetary policy transmission mechanism on price stability and unemployment in Nigeria.

v. Nexus between monetary policy transmission mechanism and business cycles in Nigeria.

vi. Assessment of monetary policy transmission mechanism on foreign investment in Nigeria.

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APPENDICES

Table 5.1: Appendix 1. Time Series Data

YEAR	RGDP (N'Billion)	CCAP (N'Billion)	HEXP (N'Billion)	MS (N'Billion)
1987	15,263.93	0.00	93.05	27.57
1988	16,215.37	0.40	131.15	38.36
1989	17,294.68	0.60	100.22	45.9
1990	19,305.63	0.80	168.30	47.42
1991	19,199.06	1.40	186.31	75.4
1992	19,620.19	1.80	416.81	111.11
1993	19,927.99	2.10	294.20	165.34
1994	19,979.12	2.10	385.20	230.29
1995	20,353.20	2.10	509.95	289.09
1996	21,177.92	3.00	632.50	345.85
1997	21,789.10	2.80	652.20	413.28
1998	22,332.87	3.10	728.80	488.15
1999	22,449.41	3.10	2,859.17	628.95
2000	23,688.28	4.10	3,100.26	878.46
2001	25,267.54	5.80	5,059.87	1,269.32
2002	28,957.71	3.50	7,829.73	1,505.96
2003	31,709.45	8.40	9,411.90	1,952.92
2004	35,020.55	7.90	10,774.13	2,131.82
2005	37,474.95	9.83	13,674.0	2,637.91
2006	39,995.50	3.49	15,113.0	3,797.91
2007	42,922.41	16.98	21,257.60	5,127.40
2008	46,012.52	16.41	26,643.75	8,008.20
2009	49,856.10	10.05	29,471.90	9,411.11
2010	54,612.26	56.37	36,309.64	11,034.94
2011	57,511.04	1,341.29	43,249.20	12,172.49
2012	59,929.89	1,400.43	42,834.0	13,893.22
2013	63,218.72	1,394.00	59,336.94	15,154.64
2014	67,152.79	144.96	69,720.0	16,238.52
2015	69,023.93	205.89	77,027.0	18,525.22
2016	67,931.24	281.97	100,650.00	21,624.63
2017	68,490.99	276.50	91,800.00	22,363.43
2018	69,810.02	256.56	91345.86	25,079.72

Appendix: I. Cont.

MRR/MPR (%)	CRR (N'Billion)	LR (%)	PLR (%)	MLR (%)	TRB (N'Billion)
12.75	0.00	46.5	17.50	19.20	25.23
12.75	0.00	45.0	16.5	17.6	35.48
18.50	0.00	40.3	26.8	24.6	24.13
18.50	0.00	44.3	25.5	27.7	25.48
15.50	0.00	38.6	20.01	20.8	56.73
17.50	3.35	29.1	29.8	31.2	103.32
26.00	6.74	42.2	18.32	36.09	103.33
13.50	8.41	48.5	21	21	103.33
13.50	10.86	33.1	20.18	20.79	103.33
13.50	16.95	43.1	19.74	20.86	103.33
13.50	22.74	40.2	13.54	23.32	221.80
13.50	27.74	46.8	18.29	21.34	221.80
18.00	62.00	61.0	21.32	27.19	361.76
14.00	77.78	64.1	17.98	21.55	361.76
20.50	125.26	52.9	18.29	21.34	584.54
16.50	139.70	52.5	24.85	30.19	584.54
15.00	152.28	50.9	20.71	22.88	825.05
15.00	157.96	50.5	19.18	20.82	871.58
13.00	101.10	50.2	17.95	19.49	854.83
10.00	206.51	55.7	17.26	18.7	695.00
9.50	148.10	48.8	16.94	18.36	574.93
9.75	150.71	44.3	15.14	18.7	471.93
6.00	87.03	30.7	18.99	22.62	797.48
6.25	95.65	30.4	17.59	22.51	1,277.10
12.00	770.05	42.0	16.02	22.42	1,727.91
12.00	1,338.80	49.7	16.79	23.79	2,122.93
12.00	2,270.44	63.2	16.72	24.69	2,581.55
13.00	3,578.54	38.3	16.55	25.74	2,815.52
11.00	3,086.00	42.3	16.85	26.71	2,772.87
14.00	3,439.99	46.0	16.87	27.29	3,277.28
14.00	3,944.10	54.8	17.58	30.68	3,579.80
14.00	4,699.70	65.0	16.91	31.09	2,735.97

Source: Central Bank of Nigeria (CBN) Statistical Bulletin, 2018 & 2019.

www.cbn.gov.ng

Appendix II:

Augmented Dickey-Fuller (ADF) Unit Root Tests Results using E-Views 9 Software

(A) ADF for RGDP at Level

Null Hypothesis: RGDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.056831	0.9567
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP)
Method: Least Squares
Date: 11/02/19 Time: 19:58
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	0.000676	0.011888	0.056831	0.9551
D(RGDP(-1))	0.700806	0.150031	4.671083	0.0001
C	518.1311	449.6957	1.152181	0.2593

R-squared	0.500083	Mean dependent var	1786.488
Adjusted R-squared	0.463052	S.D. dependent var	1469.408
S.E. of regression	1076.734	Akaike info criterion	16.89589
Sum squared resid	31302642	Schwarz criterion	17.03601
Log likelihood	-250.4384	Hannan-Quinn criter.	16.94072
F-statistic	13.50446	Durbin-Watson stat	1.926164
Prob(F-statistic)	0.000086		

Appendix II(B)

ADF for RGDP at First Difference

Null Hypothesis: D(RGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.220030	0.2037
Test critical values:	1% level	-3.670170	

	5% level	-2.963972
	10% level	-2.621007

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP,2)
Method: Least Squares
Date: 11/02/19 Time: 19:59
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1))	-0.295540	0.133124	-2.220030	0.0347
C	536.6107	305.0526	1.759076	0.0895

R-squared	0.149674	Mean dependent var	12.25300
Adjusted R-squared	0.119305	S.D. dependent var	1126.742
S.E. of regression	1057.395	Akaike info criterion	16.82935
Sum squared resid	31306386	Schwarz criterion	16.92276
Log likelihood	-250.4402	Hannan-Quinn criter.	16.85923
F-statistic	4.928534	Durbin-Watson stat	1.931495
Prob(F-statistic)	0.034686		

Appendix II(C)

ADF for RGDP at Second Difference

Null Hypothesis: D(RGDP,2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.764083	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP,3)
Method: Least Squares
Date: 11/02/19 Time: 20:02
Sample (adjusted): 1990 2018
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1),2)	-1.111077	0.192759	-5.764083	0.0000
C	6.765935	215.4957	0.031397	0.9752

R-squared	0.551679	Mean dependent var	21.77276
Adjusted R-squared	0.535074	S.D. dependent var	1701.821
S.E. of regression	1160.395	Akaike info criterion	17.01738
Sum squared resid	36355948	Schwarz criterion	17.11168
Log likelihood	-244.7520	Hannan-Quinn criter.	17.04691
F-statistic	33.22465	Durbin-Watson stat	2.016372
Prob(F-statistic)	0.000004		

Appendix II(D)
ADF for MS at Level

Null Hypothesis: MS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		6.302891	1.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MS)
Method: Least Squares
Date: 11/02/19 Time: 20:03
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS(-1)	0.099383	0.015768	6.302891	0.0000
C	261.0957	141.0812	1.850676	0.0744

R-squared	0.578037	Mean dependent var	808.1339
Adjusted R-squared	0.563487	S.D. dependent var	937.3176
S.E. of regression	619.2778	Akaike info criterion	15.75733
Sum squared resid	11121643	Schwarz criterion	15.84984
Log likelihood	-242.2385	Hannan-Quinn criter.	15.78748
F-statistic	39.72643	Durbin-Watson stat	1.727426
Prob(F-statistic)	0.000001		

Appendix II(E)
ADF for MS First Difference

Null Hypothesis: D(MS) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.079324	0.7102
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MS,2)
Method: Least Squares
Date: 11/02/19 Time: 20:06
Sample (adjusted): 1990 2018
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MS(-1))	-0.165992	0.153793	-1.079324	0.2904
D(MS(-1),2)*	-0.546144	0.193920	-2.816338	0.0091
C	234.9014	170.2124	1.380049	0.1793

R-squared	0.339155	Mean dependent var	93.40517
Adjusted R-squared	0.288320	S.D. dependent var	791.3969
S.E. of regression	667.6312	Akaike info criterion	15.94305
Sum squared resid	11589017	Schwarz criterion	16.08449
Log likelihood	-228.1742	Hannan-Quinn criter.	15.98734
F-statistic	6.671769	Durbin-Watson stat	2.153764
Prob(F-statistic)	0.004585		

Appendix II(F)

ADF for MPR at LEVEL

Null Hypothesis: MPR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.010373	0.0449
Test critical values:	1% level	-3.661661	

	5% level	-2.960411
	10% level	-2.619160

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPR)
Method: Least Squares
Date: 11/02/19 Time: 20:07
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR(-1)	-0.474767	0.157710	-3.010373	0.0054
C	6.633459	2.274752	2.916124	0.0068

R-squared	0.238092	Mean dependent var	0.040323
Adjusted R-squared	0.211819	S.D. dependent var	3.854703
S.E. of regression	3.422187	Akaike info criterion	5.360778
Sum squared resid	339.6296	Schwarz criterion	5.453293
Log likelihood	-81.09206	Hannan-Quinn criter.	5.390936
F-statistic	9.062346	Durbin-Watson stat	2.170604
Prob(F-statistic)	0.005359		

Appendix II(G)
ADF for MPR at First Difference

Null Hypothesis: D(MPR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.711454	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MPR,2)
Method: Least Squares
Date: 11/02/19 Time: 20:08

Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MPR(-1))	-1.359755	0.176329	-7.711454	0.0000
C	0.056656	0.679735	0.083351	0.9342

R-squared	0.679878	Mean dependent var	0.000000
Adjusted R-squared	0.668445	S.D. dependent var	6.465425
S.E. of regression	3.722847	Akaike info criterion	5.531195
Sum squared resid	388.0684	Schwarz criterion	5.624608
Log likelihood	-80.96792	Hannan-Quinn criter.	5.561078
F-statistic	59.46653	Durbin-Watson stat	2.106457
Prob(F-statistic)	0.000000		

Appendix II(H)
ADF for LR at Level

Null Hypothesis: LR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.723622	0.0815
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LR)
Method: Least Squares
Date: 11/02/19 Time: 20:10
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LR(-1)	-0.471191	0.173002	-2.723622	0.0108
C	22.27155	8.100521	2.749397	0.0102

R-squared	0.203693	Mean dependent var	0.596774
Adjusted R-squared	0.176234	S.D. dependent var	9.278236
S.E. of regression	8.421070	Akaike info criterion	7.161692
Sum squared resid	2056.518	Schwarz criterion	7.254207
Log likelihood	-109.0062	Hannan-Quinn criter.	7.191849
F-statistic	7.418118	Durbin-Watson stat	1.734720

Prob(F-statistic)	0.010820

Appendix II(I)

ADF for LR at First Difference

Null Hypothesis: D(LR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.795295	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LR,2)
Method: Least Squares
Date: 11/02/19 Time: 20:10
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LR(-1))	-1.108642	0.191300	-5.795295	0.0000
C	0.696724	1.742679	0.399801	0.6923

R-squared	0.545347	Mean dependent var	0.390000
Adjusted R-squared	0.529110	S.D. dependent var	13.90330
S.E. of regression	9.540644	Akaike info criterion	7.413340
Sum squared resid	2548.669	Schwarz criterion	7.506753
Log likelihood	-109.2001	Hannan-Quinn criter.	7.443223
F-statistic	33.58545	Durbin-Watson stat	1.994644
Prob(F-statistic)	0.000003		

Appendix II(J)

ADF for CCAP at Level

Null Hypothesis: CCAP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.366492	0.1590
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CCAP)
Method: Least Squares
Date: 11/02/19 Time: 20:13
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCAP(-1)	-0.321465	0.135840	-2.366492	0.0249
C	62.31508	59.39734	1.049122	0.3028

R-squared	0.161857	Mean dependent var	8.276129
Adjusted R-squared	0.132955	S.D. dependent var	327.8674
S.E. of regression	305.2946	Akaike info criterion	14.34277
Sum squared resid	2702938.	Schwarz criterion	14.43529
Log likelihood	-220.3130	Hannan-Quinn criter.	14.37293
F-statistic	5.600285	Durbin-Watson stat	1.707882
Prob(F-statistic)	0.024851		

Appendix II(K)

ADF for CCAP at First Difference

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.025382	0.0004
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CCAP,2)
Method: Least Squares
Date: 11/02/19 Time: 20:15
Sample (adjusted): 1991 2018
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CCAP(-1))	-1.549649	0.308364	-5.025382	0.0000
D(CCAP(-1),2)	0.543357	0.247801	2.192720	0.0383
D(CCAP(-2),2)	0.495987	0.177437	2.795283	0.0100
C	13.31974	60.11622	0.221566	0.8265

R-squared	0.616072	Mean dependent var	-0.719286
Adjusted R-squared	0.568081	S.D. dependent var	483.4949
S.E. of regression	317.7553	Akaike info criterion	14.49200
Sum squared resid	2423242.	Schwarz criterion	14.68232
Log likelihood	-198.8881	Hannan-Quinn criter.	14.55019
F-statistic	12.83726	Durbin-Watson stat	1.967565
Prob(F-statistic)	0.000033		

Appendix II(L)

ADF for PLR at Level

Null Hypothesis: PLR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.072379	0.0036
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PLR)
Method: Least Squares
Date: 11/02/19 Time: 20:16
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PLR(-1)	-0.730546	0.179391	-4.072379	0.0003

C	13.90282	3.474534	4.001349	0.0004

R-squared	0.363816	Mean dependent var	-0.019032
Adjusted R-squared	0.341878	S.D. dependent var	4.261416
S.E. of regression	3.457061	Akaike info criterion	5.381055
Sum squared resid	346.5868	Schwarz criterion	5.473571
Log likelihood	-81.40636	Hannan-Quinn criter.	5.411213
F-statistic	16.58427	Durbin-Watson stat	2.096532
Prob(F-statistic)	0.000329		

Appendix II(M)
ADF for PLR at First Difference

Null Hypothesis: D(PLR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.666888	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PLR,2)
Method: Least Squares
Date: 11/02/19 Time: 20:21
Sample (adjusted): 1990 2018
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PLR(-1))	-2.034905	0.265415	-7.666888	0.0000
D(PLR(-1),2)	0.379636	0.153802	2.468344	0.0205
C	-0.324879	0.581257	-0.558924	0.5810

R-squared	0.828830	Mean dependent var	-0.378276
Adjusted R-squared	0.815663	S.D. dependent var	7.290292
S.E. of regression	3.130049	Akaike info criterion	5.217672
Sum squared resid	254.7274	Schwarz criterion	5.359116
Log likelihood	-72.65624	Hannan-Quinn criter.	5.261970
F-statistic	62.94786	Durbin-Watson stat	2.259331
Prob(F-statistic)	0.000000		

Appendix II(N)

ADF for TRB at Level

Null Hypothesis: TRB has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.151726	0.6816
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRB)
Method: Least Squares
Date: 11/02/19 Time: 20:21
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRB(-1)	-0.065590	0.056949	-1.151726	0.2595
D(TRB(-1))	0.596975	0.315677	1.891095	0.0694
C	81.02650	62.29639	1.300661	0.2044

R-squared	0.117073	Mean dependent var	90.01633
Adjusted R-squared	0.051671	S.D. dependent var	260.9324
S.E. of regression	254.1016	Akaike info criterion	14.00799
Sum squared resid	1743326.	Schwarz criterion	14.14810
Log likelihood	-207.1198	Hannan-Quinn criter.	14.05281
F-statistic	1.790054	Durbin-Watson stat	1.521763
Prob(F-statistic)	0.186202		

Appendix II(O)

ADF for TRB at First Difference

Null Hypothesis: D(TRB) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.582045	0.1077
Test critical values:	1% level	-3.670170	

	5% level	-2.963972
	10% level	-2.621007

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRB,2)
Method: Least Squares
Date: 11/02/19 Time: 20:22
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TRB(-1))	-0.633696	0.245424	-2.582045	0.0153
C	46.61456	54.98137	0.847825	0.4037

R-squared	0.192314	Mean dependent var	-28.46933
Adjusted R-squared	0.163469	S.D. dependent var	279.4368
S.E. of regression	255.5787	Akaike info criterion	13.98928
Sum squared resid	1828973.	Schwarz criterion	14.08269
Log likelihood	-207.8392	Hannan-Quinn criter.	14.01916
F-statistic	6.666957	Durbin-Watson stat	1.374962
Prob(F-statistic)	0.015345		

Appendix II(P)
ADF for TRB at Second Difference

Null Hypothesis: D(TRB,2) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.047955	0.0042
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TRB,3)
Method: Least Squares
Date: 11/02/19 Time: 20:23
Sample (adjusted): 1991 2018
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TRB(-1),2)	-2.063179	0.509684	-4.047955	0.0004

D(TRB(-1),3)	0.680849	0.309583	2.199245	0.0373
C	-13.88321	52.40268	-0.264933	0.7932

R-squared	0.458062	Mean dependent var	-41.39464
Adjusted R-squared	0.414707	S.D. dependent var	358.7540
S.E. of regression	274.4627	Akaike info criterion	14.16847
Sum squared resid	1883245.	Schwarz criterion	14.31120
Log likelihood	-195.3585	Hannan-Quinn criter.	14.21210
F-statistic	10.56537	Durbin-Watson stat	1.596618
Prob(F-statistic)	0.000472		

Appendix II(Q)
ADF for HEXP at Level

Null Hypothesis: HEXP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.726263	0.9995
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HEXP)
Method: Least Squares
Date: 11/02/19 Time: 20:24
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HEXP(-1)	0.059761	0.034619	1.726263	0.0949
C	1651.213	1253.662	1.317112	0.1981

R-squared	0.093183	Mean dependent var	2943.639
Adjusted R-squared	0.061913	S.D. dependent var	5780.498
S.E. of regression	5598.695	Akaike info criterion	20.16080
Sum squared resid	9.09E+08	Schwarz criterion	20.25331
Log likelihood	-310.4923	Hannan-Quinn criter.	20.19095
F-statistic	2.979984	Durbin-Watson stat	2.151721
Prob(F-statistic)	0.094941		

Appendix II(R)
ADF for HEXP at First Difference

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.107928	0.6983
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HEXP,2)
Method: Least Squares
Date: 11/02/19 Time: 20:25
Sample (adjusted): 1991 2018
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HEXP(-1))	-0.300582	0.271301	-1.107928	0.2789
D(HEXP(-1),2)	-0.949369	0.279238	-3.399861	0.0024
D(HEXP(-2),2)	-1.080442	0.321210	-3.363665	0.0026
C	1576.808	1292.207	1.220245	0.2342

R-squared	0.657069	Mean dependent var	-18.65071
Adjusted R-squared	0.614202	S.D. dependent var	8258.229
S.E. of regression	5129.401	Akaike info criterion	20.05493
Sum squared resid	6.31E+08	Schwarz criterion	20.24524
Log likelihood	-276.7690	Hannan-Quinn criter.	20.11311
F-statistic	15.32830	Durbin-Watson stat	1.199687
Prob(F-statistic)	0.000009		

Appendix II(S)
ADF for HEXP at Second Difference

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.642015	0.8449
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HEXP,3)
Method: Least Squares
Date: 11/02/19 Time: 20:26
Sample (adjusted): 1992 2018
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HEXP(-1),2)	-0.630274	0.981713	-0.642015	0.5272
D(HEXP(-1),3)	-1.021109	0.773579	-1.319981	0.1998
D(HEXP(-2),3)	-1.156082	0.373005	-3.099369	0.0051
C	-425.6320	956.8407	-0.444831	0.6606

R-squared	0.919186	Mean dependent var	312.8122
Adjusted R-squared	0.908646	S.D. dependent var	14922.26
S.E. of regression	4510.237	Akaike info criterion	19.80204
Sum squared resid	4.68E+08	Schwarz criterion	19.99402
Log likelihood	-263.3275	Hannan-Quinn criter.	19.85913
F-statistic	87.20192	Durbin-Watson stat	1.208370
Prob(F-statistic)	0.000000		

Appendix II(T)
ADF for MLR at Level

Null Hypothesis: MLR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.381071	0.0195
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MLR)
Method: Least Squares
Date: 11/02/19 Time: 20:30
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MLR(-1)	-0.593252	0.175463	-3.381071	0.0021

C	14.35693	4.200881	3.417600	0.0019

R-squared	0.282740	Mean dependent var	0.383548
Adjusted R-squared	0.258007	S.D. dependent var	4.867706
S.E. of regression	4.192995	Akaike info criterion	5.767048
Sum squared resid	509.8549	Schwarz criterion	5.859564
Log likelihood	-87.38925	Hannan-Quinn criter.	5.797206
F-statistic	11.43164	Durbin-Watson stat	1.933625
Prob(F-statistic)	0.002081		

Appendix II(U)
ADF for MLR First Difference

Null Hypothesis: D(MLR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.787008	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MLR,2)
Method: Least Squares
Date: 11/02/19 Time: 20:31
Sample (adjusted): 1990 2018
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MLR(-1))	-1.834280	0.270263	-6.787008	0.0000
D(MLR(-1),2)	0.452062	0.169415	2.668372	0.0130
C	0.522296	0.806796	0.647371	0.5231

R-squared	0.721147	Mean dependent var	-0.227241
Adjusted R-squared	0.699697	S.D. dependent var	7.867075
S.E. of regression	4.311149	Akaike info criterion	5.857983
Sum squared resid	483.2361	Schwarz criterion	5.999427
Log likelihood	-81.94075	Hannan-Quinn criter.	5.902282
F-statistic	33.61960	Durbin-Watson stat	1.944178
Prob(F-statistic)	0.000000		

Appendix II(V)
ADF for CRR at Level

Null Hypothesis: CRR has a unit root
Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.608953	1.0000
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CRR)
Method: Least Squares
Date: 11/02/19 Time: 20:32
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRR(-1)	0.128435	0.049229	2.608953	0.0142
C	68.62268	67.02712	1.023805	0.3144

R-squared	0.190094	Mean dependent var	151.6032
Adjusted R-squared	0.162166	S.D. dependent var	358.8844
S.E. of regression	328.4985	Akaike info criterion	14.48928
Sum squared resid	3129427.	Schwarz criterion	14.58180
Log likelihood	-222.5839	Hannan-Quinn criter.	14.51944
F-statistic	6.806635	Durbin-Watson stat	1.745214
Prob(F-statistic)	0.014212		

Appendix II(W)
ADF for CRR First Difference

Null Hypothesis: D(CRR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.441849	0.0172
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CRR,2)
Method: Least Squares
Date: 11/02/19 Time: 20:33
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CRR(-1))	-0.641544	0.186395	-3.441849	0.0018
C	109.5304	68.10860	1.608173	0.1190

R-squared	0.297300	Mean dependent var	25.18667
Adjusted R-squared	0.272204	S.D. dependent var	407.9936
S.E. of regression	348.0633	Akaike info criterion	14.60699
Sum squared resid	3392146.	Schwarz criterion	14.70040
Log likelihood	-217.1048	Hannan-Quinn criter.	14.63687
F-statistic	11.84632	Durbin-Watson stat	2.036475
Prob(F-statistic)	0.001833		

Appendix III:
Result for PHILIP-PERON
(A) HEXP at Level

Null Hypothesis: HEXP has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.826556	0.9996
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

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

Residual variance (no correction)	29323098
HAC corrected variance (Bartlett kernel)	27293015

Phillips-Perron Test Equation
Dependent Variable: D(HEXP)
Method: Least Squares
Date: 11/02/19 Time: 20:28
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HEXP(-1)	0.059761	0.034619	1.726263	0.0949
C	1651.213	1253.662	1.317112	0.1981

R-squared	0.093183	Mean dependent var	2943.639
Adjusted R-squared	0.061913	S.D. dependent var	5780.498
S.E. of regression	5598.695	Akaike info criterion	20.16080
Sum squared resid	9.09E+08	Schwarz criterion	20.25331
Log likelihood	-310.4923	Hannan-Quinn criter.	20.19095

F-statistic	2.979984	Durbin-Watson stat	2.151721
Prob(F-statistic)	0.094941		

Appendix III(B)

HEXP at First Difference

Null Hypothesis: D(HEXP) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.058384	0.0003
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Residual variance (no correction)	32951752
HAC corrected variance (Bartlett kernel)	44772889

Phillips-Perron Test Equation
Dependent Variable: D(HEXP,2)
Method: Least Squares
Date: 11/02/19 Time: 20:29
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HEXP(-1))	-0.927902	0.188797	-4.914819	0.0000
C	2820.095	1228.792	2.295014	0.0294

R-squared	0.463143	Mean dependent var	-16.40800
Adjusted R-squared	0.443970	S.D. dependent var	7968.411
S.E. of regression	5941.839	Akaike info criterion	20.28177
Sum squared resid	9.89E+08	Schwarz criterion	20.37518
Log likelihood	-302.2265	Hannan-Quinn criter.	20.31165
F-statistic	24.15545	Durbin-Watson stat	2.030999
Prob(F-statistic)	0.000035		

Appendix IV:

Cointegration Result for Model Equation 1

Date: 11/02/19 Time: 20:42
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments
Trend assumption: No deterministic trend

Series: RGDP MS MPR LR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.616534	52.60395	40.17493	0.0018
At most 1	0.479113	23.84880	24.27596	0.0565
At most 2	0.114610	4.282119	12.32090	0.6701
At most 3	0.020791	0.630317	4.129906	0.4880

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.616534	28.75515	24.15921	0.0111
At most 1 *	0.479113	19.56668	17.79730	0.0268
At most 2	0.114610	3.651803	11.22480	0.6842
At most 3	0.020791	0.630317	4.129906	0.4880

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

RGDP	MS	MPR	LR
0.000117	-0.000122	-0.235357	0.049946
0.000160	-0.000235	0.154030	-0.128684
-0.000170	0.000479	-0.008736	0.042853
0.000183	-0.000492	-0.221866	-0.010587

Unrestricted Adjustment Coefficients (alpha):

D(RGDP)	213.9843	-560.3417	-189.3552	-29.08823
D(MS)	401.8840	172.9938	84.01501	-34.66692
D(MPR)	1.073935	-0.150546	0.191364	0.464812
D(LR)	2.035488	4.169735	-1.505115	0.328882

1 Cointegrating Equation(s): Log likelihood -657.5446

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	MS	MPR	LR
1.000000	-1.048652	-2020.186	428.7078
	(0.30463)	(451.338)	(167.721)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	0.024930

	(0.02373)		
D(MS)	0.046820		
	(0.01238)		
D(MPR)	0.000125		
	(7.9E-05)		
D(LR)	0.000237		
	(0.00019)		

2 Cointegrating Equation(s): Log likelihood -647.7613

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	MS	MPR	LR
1.000000	0.000000	-9435.629	3496.616
		(1903.72)	(705.546)
0.000000	1.000000	-7071.408	2925.575
		(1481.90)	(549.215)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	-0.064485	0.105372	
	(0.03361)	(0.04501)	
D(MS)	0.074425	-0.089701	
	(0.01985)	(0.02659)	
D(MPR)	0.000101	-9.59E-05	
	(0.00013)	(0.00018)	
D(LR)	0.000903	-0.001227	
	(0.00027)	(0.00036)	

3 Cointegrating Equation(s): Log likelihood -645.9354

Normalized cointegrating coefficients (standard error in parentheses)

RGDP	MS	MPR	LR
1.000000	0.000000	0.000000	-567.4600
			(126.464)
0.000000	1.000000	0.000000	-120.1940
			(83.5039)
0.000000	0.000000	1.000000	-0.430716
			(0.02659)

Adjustment coefficients (standard error in parentheses)

D(RGDP)	-0.032212	0.014589	-135.0179
	(0.04327)	(0.09081)	(46.6683)
D(MS)	0.060106	-0.049421	-68.67375
	(0.02585)	(0.05425)	(27.8770)
D(MPR)	6.85E-05	-4.12E-06	-0.277618
	(0.00018)	(0.00037)	(0.19017)
D(LR)	0.001159	-0.001949	0.176348
	(0.00035)	(0.00073)	(0.37411)

Appendix V:

Cointegration Result for Model Equation 2

Date: 11/02/19 Time: 20:46
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments
Trend assumption: Quadratic deterministic trend
Series: CCAP MPR PLR TRB
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.594385	64.92003	55.24578	0.0056
At most 1 *	0.499212	37.84953	35.01090	0.0242
At most 2	0.289743	17.10235	18.39771	0.0752
At most 3 *	0.203836	6.838487	3.841466	0.0089

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.594385	27.07050	30.81507	0.1342
At most 1	0.499212	20.74718	24.25202	0.1361
At most 2	0.289743	10.26386	17.14769	0.3734
At most 3 *	0.203836	6.838487	3.841466	0.0089

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CCAP	MPR	PLR	TRB
-0.000661	0.006228	-0.473813	0.001037
-0.002598	-0.302220	0.157520	0.000631
-0.002428	0.374547	-0.244236	-0.000806
0.000892	-0.003227	-0.135573	-0.002084

Unrestricted Adjustment Coefficients (alpha):

D(CCAP)	-25.31372	211.3450	53.84161	36.37254
D(MPR)	0.916449	1.225258	-1.245052	-0.183901
D(PLR)	2.682402	-0.281825	0.329269	0.443635
D(TRB)	-27.65983	3.205648	-47.89309	98.49712

1 Cointegrating Equation(s): Log likelihood -566.6814

Normalized cointegrating coefficients (standard error in parentheses)

CCAP	MPR	PLR	TRB
1.000000	-9.418581	716.5782	-1.568363
	(125.052)	(146.708)	(0.64377)

Adjustment coefficients (standard error in parentheses)

D(CCAP)	0.016738	
	(0.04497)	
D(MPR)	-0.000606	
	(0.00042)	
D(PLR)	-0.001774	
	(0.00035)	
D(TRB)	0.018289	
	(0.03264)	

2 Cointegrating Equation(s): Log likelihood -556.3078

Normalized cointegrating coefficients (standard error in parentheses)

CCAP	MPR	PLR	TRB
1.000000	0.000000	658.3637	-1.469095
		(116.727)	(0.54010)
0.000000	1.000000	-6.180814	0.010540
		(1.04980)	(0.00486)

Adjustment coefficients (standard error in parentheses)

D(CCAP)	-0.532342	-64.03038
	(0.13890)	(15.6616)
D(MPR)	-0.003789	-0.364590
	(0.00154)	(0.17371)
D(PLR)	-0.001041	0.101878
	(0.00141)	(0.15858)
D(TRB)	0.009961	-1.141069
	(0.13234)	(14.9217)

3 Cointegrating Equation(s): Log likelihood -551.1759

Normalized cointegrating coefficients (standard error in parentheses)

CCAP	MPR	PLR	TRB
1.000000	0.000000	0.000000	0.023812
			(0.16588)
0.000000	1.000000	0.000000	-0.003476
			(0.00144)
0.000000	0.000000	1.000000	-0.002268
			(0.00086)

Adjustment coefficients (standard error in parentheses)

D(CCAP)	-0.663051	-43.86418	32.13496
	(0.18293)	(24.3447)	(28.1145)
D(MPR)	-0.000767	-0.830920	0.062864
	(0.00185)	(0.24675)	(0.28496)
D(PLR)	-0.001841	0.225205	-1.395768
	(0.00188)	(0.25032)	(0.28908)
D(TRB)	0.126228	-19.07927	25.30775
	(0.17484)	(23.2678)	(26.8708)

Appendix VI:

Cointegration Result for Model Equation 3

Date: 11/02/19 Time: 20:50
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: HEXP MS MLR CRR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.788006	101.8708	47.85613	0.0000
At most 1 *	0.668177	55.33493	29.79707	0.0000
At most 2 *	0.496528	22.24032	15.49471	0.0041
At most 3	0.053625	1.653506	3.841466	0.1985

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.788006	46.53585	27.58434	0.0001
At most 1 *	0.668177	33.09462	21.13162	0.0007
At most 2 *	0.496528	20.58681	14.26460	0.0044
At most 3	0.053625	1.653506	3.841466	0.1985

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

HEXP	MS	MLR	CRR
0.000453	-0.001391	0.087488	-0.003148
-2.92E-05	-0.000369	0.130648	0.000956
-8.49E-05	0.000512	0.291573	-0.001030
4.17E-05	0.000118	-0.097771	-0.001988

Unrestricted Adjustment Coefficients (alpha):

D(HEXP)	-4055.030	-873.7928	357.8739	-504.4133
D(MS)	-12.17828	-334.9866	-109.4337	-107.9036
D(MLR)	-0.995489	-0.774785	-2.424877	0.619401
D(CRR)	-61.50351	-162.0835	132.5275	31.32983

1 Cointegrating Equation(s): Log likelihood -811.3825

Normalized cointegrating coefficients (standard error in parentheses)

HEXP	MS	MLR	CRR
1.000000	-3.073363	193.2598	-6.954837
	(0.13525)	(80.7029)	(0.57593)

Adjustment coefficients (standard error in parentheses)

D(HEXP)	-1.835692	
	(0.30041)	
D(MS)	-0.005513	
	(0.05911)	
D(MLR)	-0.000451	
	(0.00041)	
D(CRR)	-0.027842	
	(0.02833)	

2 Cointegrating Equation(s): Log likelihood -794.8352

Normalized cointegrating coefficients (standard error in parentheses)

HEXP	MS	MLR	CRR
1.000000	0.000000	-719.8450	-11.99947
		(338.350)	(1.37403)
0.000000	1.000000	-297.1028	-1.641405
		(108.172)	(0.43928)

Adjustment coefficients (standard error in parentheses)

D(HEXP)	-1.810207	5.964242
	(0.28996)	(0.92006)
D(MS)	0.004257	0.140578
	(0.05046)	(0.16013)
D(MLR)	-0.000428	0.001671
	(0.00041)	(0.00130)
D(CRR)	-0.023115	0.145390
	(0.02410)	(0.07647)

3 Cointegrating Equation(s): Log likelihood -784.5418

Normalized cointegrating coefficients (standard error in parentheses)

HEXP	MS	MLR	CRR
1.000000	0.000000	0.000000	-14.27123
			(1.11917)
0.000000	1.000000	0.000000	-2.579033
			(0.35860)
0.000000	0.000000	1.000000	-0.003156
			(0.00069)

Adjustment coefficients (standard error in parentheses)

D(HEXP)	-1.840580	6.147576	-364.5782
	(0.29305)	(0.97019)	(210.354)
D(MS)	0.013545	0.084517	-76.73868
	(0.05029)	(0.16650)	(36.1009)
D(MLR)	-0.000222	0.000429	-0.895346
	(0.00035)	(0.00115)	(0.25011)

D(CRR)	-0.034363 (0.02110)	0.213283 (0.06986)	12.08477 (15.1470)

Appendix VII:

ARCH AND GARCH
(A) ARCH AND GARCH for Model Equation 1

Dependent Variable: RGDP
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 11/02/19 Time: 20:52
Sample: 1987 2018
Included observations: 32
Failure to improve likelihood (non-zero gradients) after 53 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.436163	3.622620	1.224573	0.0000
MS	2.667167	0.095047	28.06165	0.0000
MPR	-403.6642	134.5535	-3.000028	0.0027
LR	-2.609953	70.72483	-0.036903	0.9706
	Variance Equation			
C	6.667070.	6.597447.	1.173879	0.2404
ARCH(-1)^2	1.286833	0.791881	1.625035	0.1042
GARCH(-1)	-0.174963	0.012559	-13.93167	0.0000

R-squared	0.909475	Mean dependent var	37296.70
Adjusted R-squared	0.899776	S.D. dependent var	19339.71
S.E. of regression	6122.588	Akaike info criterion	19.44431
Sum squared resid	1.05E+09	Schwarz criterion	19.76494
Log likelihood	-304.1090	Hannan-Quinn criter.	19.55059
Durbin-Watson stat	1.8738822		

Appendix VII(B)
ARCH AND GARCH for Model Equation 2

Dependent Variable: CCAP
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 11/02/19 Time: 21:09
Sample: 1987 2018
Included observations: 32
Failure to improve likelihood (non-zero gradients) after 51 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

C	-31.15967	19.10058	-1.631346	0.1028
MPR	0.191565	0.224633	0.852791	0.3938
PLR	0.356314	0.843526	0.422410	0.6727
TRB	0.209501	0.034062	6.150492	0.0000
	Variance Equation			
C	39.14789	120.4532	0.325005	0.7452
RESID(-1)^2	3.282099	2.211193	1.484312	0.1377
GARCH(-1)	-0.223995	0.668768	-0.334937	0.7377

R-squared	0.820969	Mean dependent var	170.8666
Adjusted R-squared	0.813930	S.D. dependent var	403.9574
S.E. of regression	360.4220	Akaike info criterion	12.05758
Sum squared resid	3637313.	Schwarz criterion	12.37821
Log likelihood	-185.9213	Hannan-Quinn criter.	12.16386
Durbin-Watson stat	2.10095		

Appendix VII(C)
ARCH AND GARCH for Model Equation 3

Dependent Variable: HEXP
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 11/02/19 Time: 21:17
Sample: 1987 2018
Included observations: 32
Convergence achieved after 49 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-48.19677	608.4605	-0.079211	0.9369
MS	3.346178	0.493940	6.774465	0.0000
MLR	-1.074119	21.61614	-0.049691	0.9604
CRR	4.511566	3.726327	1.210727	0.2260
	Variance Equation			
C	-9040.542	22161.35	-0.407942	0.6833
RESID(-1)^2	0.396969	0.419669	0.945912	0.3442
GARCH(-1)	1.028534	0.250354	4.108319	0.0000

R-squared	0.983343	Mean dependent var	23805.21
Adjusted R-squared	0.981558	S.D. dependent var	31553.07
S.E. of regression	4284.914	Akaike info criterion	17.82780
Sum squared resid	5.14E+08	Schwarz criterion	18.14843
Log likelihood	-278.2449	Hannan-Quinn criter.	17.93408
Durbin-Watson stat	1.320195		

Appendix VIII:

ARCH LM Test

(A) ARCH LM Test for Model Equation 1

Heteroskedasticity Test: ARCH

F-statistic	0.046414	Prob. F(1,29)	0.8309
Obs*R-squared	0.049535	Prob. Chi-Square(1)	0.8239

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 11/02/19 Time: 21:00
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.931351	0.323018	2.883278	0.0073
WGT_RESID^2(-1)	0.040143	0.186331	0.215438	0.8309

R-squared	0.001598	Mean dependent var	0.969805
Adjusted R-squared	-0.032830	S.D. dependent var	1.474954
S.E. of regression	1.498970	Akaike info criterion	3.709774
Sum squared resid	65.16040	Schwarz criterion	3.802289
Log likelihood	-55.50150	Hannan-Quinn criter.	3.739932
F-statistic	0.046414	Durbin-Watson stat	1.988704
Prob(F-statistic)	0.830934		

Appendix VIII(B)
ARCH LM Test for Model Equation 2

Heteroskedasticity Test: ARCH

F-statistic	0.295570	Prob. F(1,29)	0.5908
Obs*R-squared	0.312767	Prob. Chi-Square(1)	0.5760

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 11/02/19 Time: 21:15
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.115300	0.419906	2.656071	0.0127
WGT_RESID^2(-1)	-0.100487	0.184832	-0.543664	0.5908

R-squared	0.010089	Mean dependent var	1.013274

Adjusted R-squared	-0.024046	S.D. dependent var	2.066758
S.E. of regression	2.091459	Akaike info criterion	4.375941
Sum squared resid	126.8518	Schwarz criterion	4.468457
Log likelihood	-65.82709	Hannan-Quinn criter.	4.406099
F-statistic	0.295570	Durbin-Watson stat	1.975262
Prob(F-statistic)	0.590828		

Appendix VIII(C)
ARCH LM Test for Model Equation 3

Heteroskedasticity Test: ARCH

F-statistic	0.555466	Prob. F(1,29)	0.4621
Obs*R-squared	0.582615	Prob. Chi-Square(1)	0.4453

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 11/02/19 Time: 21:26
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

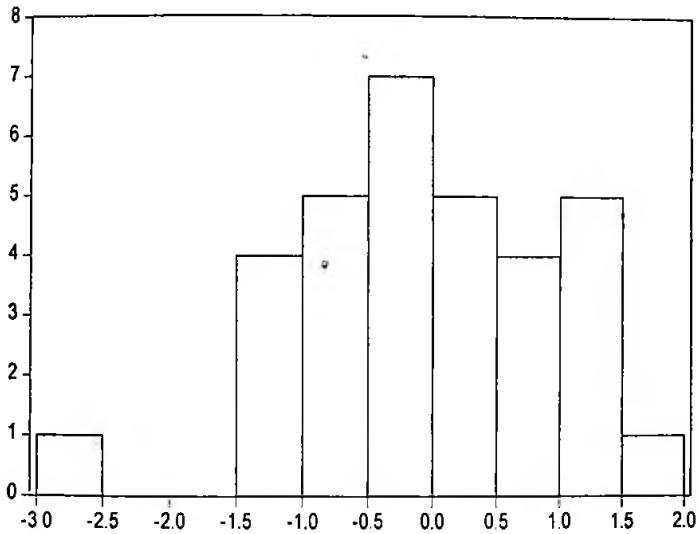
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.801291	0.261450	3.064798	0.0047
WGT_RESID^2(-1)	0.136088	0.182596	0.745296	0.4621

R-squared	0.018794	Mean dependent var	0.921325
Adjusted R-squared	-0.015041	S.D. dependent var	1.138176
S.E. of regression	1.146703	Akaike info criterion	3.174000
Sum squared resid	38.13292	Schwarz criterion	3.266515
Log likelihood	-47.19700	Hannan-Quinn criter.	3.204158
F-statistic	0.555466	Durbin-Watson stat	2.026316
Prob(F-statistic)	0.462091		

Appendix IX:

Normality Test

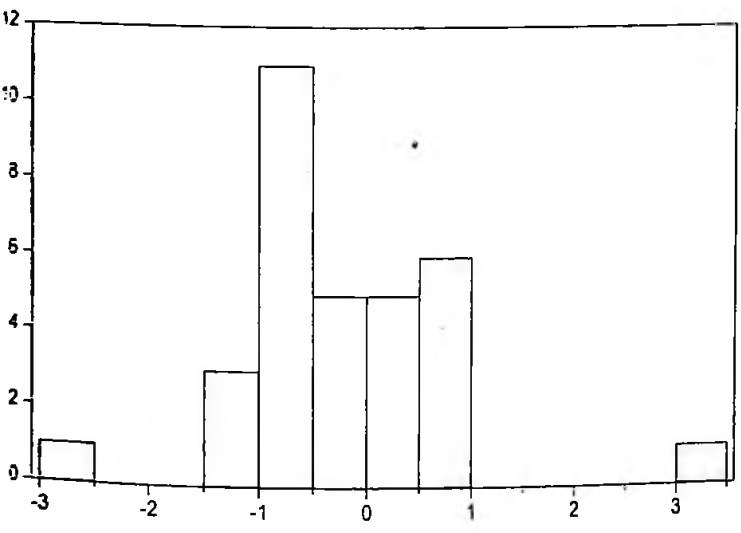
Figure 5.1: (A) Normality Test for Model Equation 1



Series: Standardized Residuals	
Sample 1987 2018	
Observations 32	
Mean	-0.043928
Median	-0.139025
Maximum	1.534483
Minimum	-2.834791
Std. Dev.	1.008464
Skewness	-0.405461
Kurtosis	3.031174
Jarque-Bera	0.878088
Probability	0.644653

Appendix IX(B)

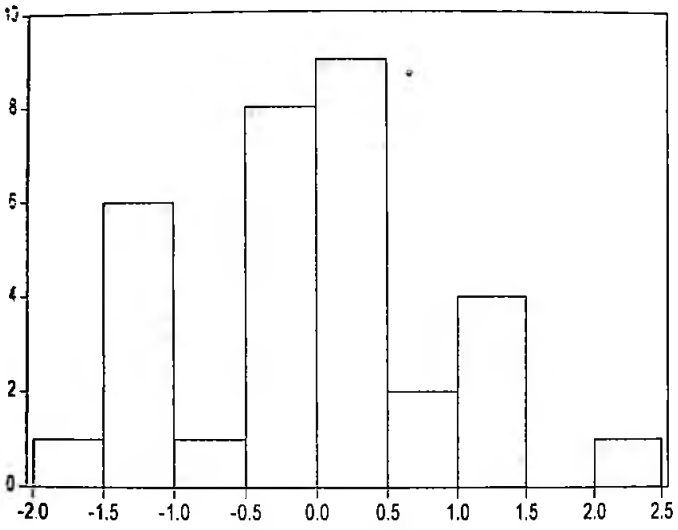
Figure 5.2:Normality Test for Model Equation 2



Series: Standardized Residuals	
Sample 1987 2018	
Observations 32	
Mean	-0.225080
Median	-0.467726
Maximum	3.128670
Minimum	-2.631958
Std. Dev.	0.983789
Skewness	0.776584
Kurtosis	6.083335
Jarque-Bera	15.89239
Probability	0.000354

Appendix IX(C)

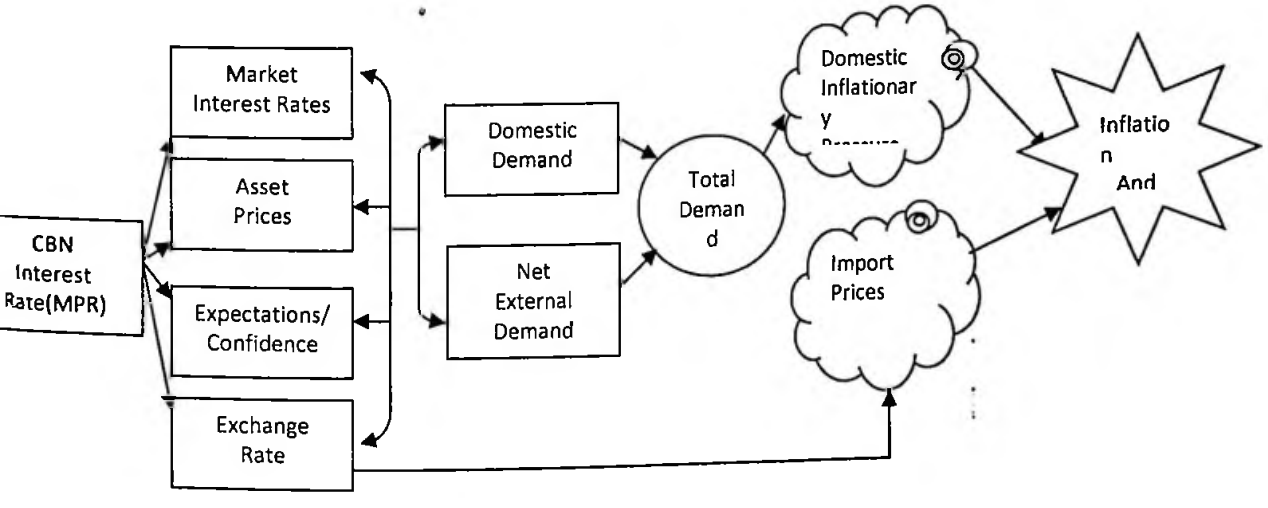
Figure 5.3: Normality Test for Model Equation 3



Series: Standardized Residuals	
Sample 1987 2018	
Observations 32	
Mean	-0.019598
Median	-0.022271
Maximum	2.130079
Minimum	-1.758139
Std. Dev.	0.960602
Skewness	0.120608
Kurtosis	2.556432
Jarque-Bera	0.339916
Probability	0.843700

Appendix X:

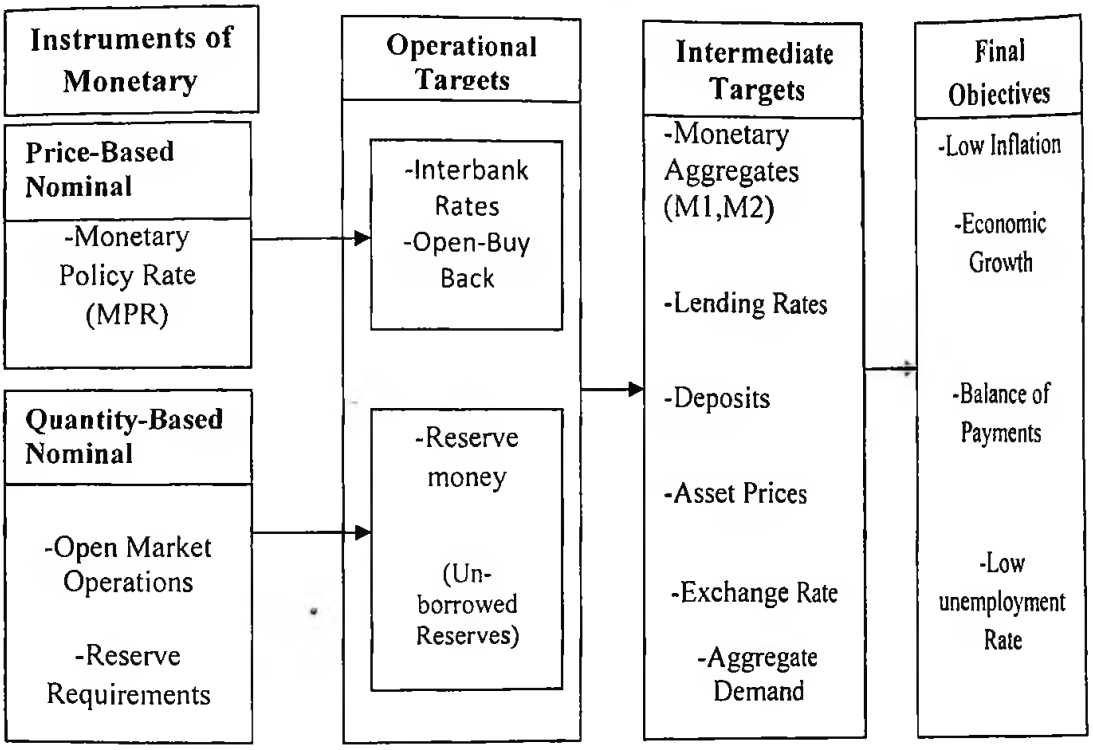
Figure 5.4: Transmission Mechanism of Monetary Policy



Source: www.cenbank.org/Out/EduSeries/Series3.pdf

Appendix XI:

Table 5.2: Monetary Policy Tools, Targets and Goals



Source: Handa (2009).

Appendix XII:

Table 5.3: Summary of Hypotheses Results

Research Hypotheses	Findings	Z-statistic prob. value
Relationship between money supply and aggregate output	MS affect Real gross domestic product (RGDP) positively and significantly.	0.000(***)
	MPR affect real gross domestic product (RGDP) negatively and significantly.	0.0027 (**)
	LR affect real gross domestic product negatively and insignificant	0.9706 (*)
Relationship between monetary policy rate and cost of capital	MPR affect cost of capital (CCAP) positively but insignificant.	0.3938(***)
	PLR positively and insignificantly affects cost of capital (CCAP).	0.6727(**)
	TRB positively and significantly affects cost of capital (CCAP)	0.000 (*)
Relationship between money supply and reserve requirement on cash reserve requirement	MS positively and significantly affect household investment expenditure (HEXP).	0.000 (***)
	MLR negatively and insignificantly affects household investment expenditure (HEXP).	0.9604 (**)
	CRR positively and insignificantly affect household investment expenditure (HEXP)	0.2260 (*)

Source: Author's Computation; 2019.