

Impact of Monetary Policy on Agricultural Performance in Nigeria

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Degree (MSc) in Economics**

Certification

This is to certify that Emmanuel Abiodun, ADEKUNLE with Matriculation number LCU/PG/001790 carried out this research work titled “Impact of Monetary Policy on Agricultural Performance in Nigeria.” in the department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan, Oyo state, for the award of Master Degree (M.Sc) in Economics and that this has not been previously submitted.

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Dedication

This Thesis is dedicated to God Almighty who dwells among the Cherubim, God who fetches water without a bucket, He who overtakes without running, my providence and benefactor for He reigns in Majesty.

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Acknowledgement

My sincere gratitude goes to Almighty God who remembered me in my low estate, when I sat down to think whether I am worthy of this program, then I realized that I have been granted an unmerited favour from God. What will I offer to fulfill my profound gratitude unto God? I thought of preparing delicious meal for him but I remembered that He is the bread of life, I thought of buying florescent light to lighten and brighten the whole heaven, but I remembered He said “I am the light of the world”, I thought of setting him on a very high hill for the whole world to see, I remembered that He said “I am from above” He that is from above, is above all. Then I thought of building a mansion for him with a mighty gate, then I quickly remembered, He said “in my father’s house, there are lot of mansions...” and “I am the door of the sheep”. I finally thought of inviting great men and women of gospel songs to sing praises and worship Him but I remembered that there are Angels singing praises day and night unto him in His majesty. What then will I offer to appreciate Him? Assuming all my hairs are tongues, I would have used them instead to praise and adore the most high God. I truly lack the words to express my thanks to God but I say thank you Jesus.

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Abstract

Over the last years, access to cheap and affordable credit for the purchase of land and necessary machinery towards the development of farm produce, services, production technologies and marketing strategies have been one of the major challenges facing many farmers in the developing countries like Nigeria. Yet, deposit money banks are often reluctant to lend money to farmers for agricultural enterprises, development and expansion due to the lack of credit facilities and collateral. As a result, this study investigates the asymmetric effect of monetary policy on agricultural performance for the periods of 1981-2021. The non-linear ARDL estimator showed that low monetary policy rate ensures a greater performance in the agriculture sector in the long run. A positive change in monetary policy rate and lending rate influences short run agricultural performance. Also, a high liquidity ratio significantly influences short run agricultural output, whereas its long run impact was not significant. This means that financial bank solvency affects their ability to provide financial assistance which ultimately influenced short run agricultural output. Further, for both positive and negative changes in deposit money bank credit to agriculture, they have a negative influence on short run agricultural performance. According to the study's shocks analysis, agricultural performance responds to 44.35%, 32.64%, 18.78%, and 4.32% of total shocks in monetary policy rate, liquidity ratio, lending interest rate, and deposit money bank credit to agriculture from 23.79% of monetary policy shocks. The study recommends an expansionary but non-inflationary monetary policy to improve value addition to the agricultural sector of the Nigerian economy. This should be performed by ensuring low and affordable lending interest rates for farmers employed in tandem with government spending in the agricultural sector as an effective way of improving its performance.

Keywords: Monetary policy rate, lending rate, financial credit, liquidity, agriculture output, asymmetric analysis, Nigeria

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Chapter One

Introduction

1.1 Background of the Study

Agriculture has often been labeled crucial in the economic development as well as one of the major windows out of poverty of most developing countries¹. Previous studies on the causes of development and underdevelopment have identified investment in agriculture as the key to the economic emancipation of emerging economies of the world. The development of the agricultural sector is seen as the major determinants of ways out of poverty and achievement of long-term economic development of developing nations². The agricultural sector contributions to the development of an economy can be viewed in four major ways: product contribution, factor contribution, market contribution and foreign exchange contribution and all this is accompanied in multiplier effect³.

Growth in African economies has witnessed enormous improvement recently. The real production growth increased by 3.6 percent in 2017 and grew to 4.1 percent in 2018⁴. In general, growth recovery, particularly in non-resource-intensive economies, has been stronger than expected. Similarly, global economic development has improved financial markets, which has promoted growth and development across the nations, yet obstacles remain, in particular, for the systemic changes that will produce more employment and mitigate poverty by expanding agricultural investment and growth of agricultural value chains to promote new outputs and services⁵.

The Nigerian Central Bank has implemented policies and programmes via monetary policy to stimulate economic development. However, most of these policies are characterized by discontinuity and mismanagement of resources over time⁶. Similarly, the high unemployment rate and poverty's prevailing problems continue despite the

Nigerian government's attempts. The Agricultural Promotion Policy (APP) was introduced in 2016 to cover the period from 2016 to 2020. The policy aimed to provide food security, encourage import substitution, create employment and economic diversification. Most of the policies and programmes were geared towards making the agricultural sector fundamental to dynamic structural effects and promote growth and development throughout the sector⁷.

The promotion of the agricultural sector in Nigeria is an avenue to accelerating economic development, reducing poverty and promoting broad-based growth. Oil and gas currently contribute to around 99 percent of exports and almost 85 percent of government revenue, while the employment contribution was estimated at only 4 percent in 2019. Exports from agriculture are negligible and accounted for an average of 0.2 percent of total exports in the last decade. Over the last few years, agricultural production has increased slowly. However, the growth rate in agricultural production in recent times was not enough to avoid a rise in rural deprivation. Subsequently, since the reduction of oil demand in the international market during 2016, Nigeria's economy continued its slow pace of recovery; this was followed by tightening monetary measures by the Nigerian government to stabilize the economy.

The stability of the economy is an important prerequisite to ensuring sustainable development and growth. However, promoting the economy's growth rate via an improved standard of living with increased per capita consumption should be prioritized to achieve broad-based growth⁸. The implications of monetary policy on agricultural performance have not been given adequate attention in literature, especially in connection with employment and export. However, studies have documented that monetary policy affects the economy through the money, interest rate, exchange rate, credit, asset price and expectation channels⁹.

The sector serves all other sectors in the economy especially the industrial sector and at the same time capable for generating broad based sustained growth necessary for development. It is equally fundamental to the sustenance of life and has remained the bedrock of economic development, especially in the provision of adequate and nutritious food vital for human development. More than 70 percent of Nigeria's population depends on agriculture, which contributes roughly 25 percent of GDP and 60 percent of non-oil exports¹⁰.

Monetary policy refers to the combination of measures designed to regulate the value, supply and cost of money in an economy through the credit and investment operations of the deposit money banks, monetary policy influences the economy and the agricultural sector through a variety of channels, interest rates, credit and/or bank lending, asset prices via exchange rates, equity and housing prices. In recent times, increasing attention has focused on the sectoral effects of monetary policy given that sectors respond differently to monetary policy shocks¹¹. Monetary policy of central bank of Nigeria through its influence on the financial sector of the economy is capable of playing a major role in and engineering credit available to the agricultural sector¹².

Understanding the sectors that are affected adversely by monetary tightening for example, provide valuable policy information for the monetary authority¹³. Such information helps to uncover the underlying nature of transmission mechanism of monetary policy actions. Monetary policy in the Nigerian context refers to the actions of the Central Bank of Nigeria to regulate the money supply which could be through discretionary monetary policy instruments such as the open market operation (OMO), discount rate, reserve requirement, moral suasion, direct control of banking system credit, and direct regulation of interest rate¹⁴. Monetary policy facilitates the establishment of agricultural businesses through availability of credit and finance for

start-up, investments, and expansion. The CBN controls the availability of credit through monetary policy instruments. These instruments affect agricultural output through agricultural banks and other financial institutions¹⁵.

Monetary policy includes the selection of various monetary tools to impact the supply of money available for use to accomplish price stability, economic growth, employment and equilibrium balance of payment¹⁶. Monetary policy as the macroeconomic instruments with which the monetary authority of a nation controls the supply of money, frequently focusing on interest rate to advance economic growth and stability. Monetary authority forms rules directed towards the upgrade and improvement of strategy intended to guarantee optimal performance of the banking industry and furthermore to advance the macroeconomic objectives or goals¹⁷.

Monetary policy assumes significant part in accomplishing macroeconomic objective of price stability, equilibrium of balance of payment, full employment, output growth and sustainable development. These macroeconomic goals can be accomplished either by expansionary or contractionary monetary policy. Expansionary monetary policy is generally formed to enhance the level of economic activities through the increment in money supply and decrease in monetary policy rate while contractionary monetary policy is embraced to direct the economy during boom or inflationary pressure through reduction in money supply and a reduction in the monetary policy rate¹⁸.

The agricultural sector is one of the significant drivers of development and advancement in most developing nations from time immemorial. Verifiably, agriculture fills in as significant occupation to human and contributed altogether to the economy by giving sources of livelihood to human kinds through the development of plants and rearing of animals for human and industrial utilization. In the early 60's Nigeria was a significant exporter of cash crops and there was the groundnut pyramid in the north and

the south was known for cultivation of cash crops like cocoa, palm oil and timber for export. It was believed by other scholars that agriculture which joins labour, land or soil, animals, plants and sun powered energy in the creation of agricultural output for utilization and sales purpose has been assuming significant part in most non-industrial nations like Nigeria^{19,20}.

A major challenge facing Nigeria is the inability to capture the financial services requirements of farmers and agribusiness owners who constitute about 70 percent of the population. According to some researchers, farmers need access to capital to purchase land and equipment and to invest in the development of new products, services, production technologies and marketing strategies yet banks are often reluctant to lend money to farmers for agricultural enterprises, development and expansion due to the lack of credit facilities and collateral²¹. Most of these problems could be solved if appropriate monetary policies are put in place. In a bid to address the problems, the Nigerian government, from 1975 became directly involved in the commercial production of food crops. Interest rate structure was employed principally to direct cheap credit to specific sectors such as agricultural sector²². This was done by consistently stipulating relatively lower interest rates for loans and advances of the sector. So, therefore this study is set to examine the impact of monetary policy on agricultural performance in Nigeria.

1.2 Statement of the Problem

Nigeria was a significant exporter of agrarian produce like cotton, palm oil, palm bit, cocoa, groundnuts, and rubber and so on before the quick expansion in the oil revenue export. In any case, lately, the oil sector has not actually satisfied expectations. Notwithstanding, both the range and volume of agricultural exports has dropped

significantly and the rate at which agrarian produce are imported is disturbing and of incredible worry as it affects the value of the naira²³.

Commercial banks, for example loans simply 5 to 10 percent of their credit portfolios to the areas they see to be safer, similar to the oil and gas, telecommunication and of later, the religion organizations²⁴. It is of significance to specify that Nigeria's food import bill is estimated at 5 to 7 billion US dollar, in light of variety in various data sources including the Federal Ministry of Agriculture, National Bureau of Statistics and the World Bank. It was stated by other researchers that the country's 2017 budget which remains at N7.4 trillion when changed over at the Central Bank of Nigeria (CBN) conversion standard of N305 to \$1 gives about \$24 billion, by implication, food importation alone is corresponding to about a fourth of the annual national budget²⁵.

The agricultural sectors has been faced with diverse problems of inadequacies in the supply and delivery of farm inputs, inadequate agricultural education and extensions, irrigation problems, low level of technology, poor post -harvest processing, poor storage facilities, inconsistent and poorly conceived government policies, shortage of working capital, problems of pests and diseases, pest infestation, negative attitude of people towards farming due to low reward, poor transportation, lack of credit facilities, lack of investment, lack of basic infrastructure, inadequate fertilizers and farm implements, environment hazards, labour and land use constraints. Most of these problems could be solved if appropriate monetary policy is put in place. Besides, many studies have shown that monetary effect causes shocks to the economy in general, whereas others stressed its long-run impacts^{26,27}. In Nigeria, most studies ignored these channels²⁸.

While many empirical studies have focused on how monetary policy influence the level of economic activities Nigeria with much attention given to linearity, only a few studies have directed efforts towards assessing the differential effects (asymmetry) of monetary policy on agricultural output in Nigeria. In addition, there is the need to also investigate the shocks and long-run effects of monetary policy channels on Nigeria's agricultural performance. Hence, this study is set to explore on the impact of monetary policy on agricultural performance in Nigeria between the period of 1981- 2021.

1.3 Research Questions

The study seek to answer the following questions

- a. What is the asymmetric (non-linear) relationship that exists between monetary policy and agricultural performance?
- b. How does agricultural performance respond to shocks in monetary policy?

1.4 Objectives of Study

The main objective is to evaluate the impact of monetary policy on agricultural performance in Nigeria for the period of 1981 - 2021.

Specifically, the objectives of this study are to;

- a. examine the asymmetric (non-linear relationship) between monetary policy and agricultural performance in Nigeria.
- b. investigate the response of agricultural performance to shocks in monetary policy.

1.5 Hypotheses

H₀₁: There is no asymmetric (non-linear) relationship between monetary policy and agricultural performance.

H₀₂: There is no response of agricultural performance to shocks in monetary policy.

1.6 Significance of the Study

This research work is being carried out to examine the overall impact of monetary policy on agricultural performance in Nigeria. The findings of this work will be of immense use and benefit to government ministries like Ministry of Agriculture and Monetary Authorities (Central Bank of Nigeria), Department and Agencies at federal level in solving some macro-economic problems, state and local, policy makers and intellectual researchers who may be willing to improve the work subsequently. Lastly, it will educate the students, intellectuals and the general public on various government policies as related to monetary and agricultural issues.

1.7 Scope of Study

This research seeks to investigate the impact of monetary policy on agricultural performance in Nigeria. The study shall be carried out using secondary time series data, from 1981 to 2021. This is the period following the Green Revolution Programme introduced by the Shagari administration in 1980 aimed at ensuring self-sufficiency in food production.

1.8 Operational Definition of Terms

Agricultural Performance: This connotes the results or achievements attained in the field of agriculture including all aspects – land, fertility, marketing, technology and labor productivity.

Broad Money Growth: This is the total volume of money supply in the economy and is defined as narrow money plus savings and time deposits with banks including foreign denominated deposits. There is excess money supply when the amount of money in circulation is higher than the level of total output of the economy.

Interest Rate: This is the amount a lender charges a borrower and is a percentage of the principal the amount loaned. The interest rate on a loan is typically noted on an annual basis known as the annual percentage rate (APR).

Monetary Policy: This is a set of actions available to a nation's central bank to achieve sustainable economic growth by adjusting the money supply.

Money Supply: This is the total quantity of currency that can be included in a nation's economy. Money supply includes the total money both in the form of cash as well as deposits that can be used as cash easily.

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Chapter Two

Literature Review

This chapter presents the review of related literature on the links between monetary policy and agricultural performance in Nigeria. The discussion focuses on concepts, theories and findings of past literature as well as gaps identified in the reviewed empirical literature.

2.1 Conceptual Review

2.1.1 Agricultural Sector in Nigeria

Agriculture in the context of the economy is tied with the various sectors and is essential for generating broad based growth necessary for development. Agriculture is fundamental to the sustenance of life and is the bedrock of economic development, especially in the provision of adequate and nutritious food vital for human development. This sector is a catalyst and major source of raw materials for industrial sectors and provides most of the staple food consumed by the 120 million Nigerians. More than 70 percent of the population depends on Agriculture, which contributes roughly 25 percent of GDP and 60 percent of non-oil exports. Low agricultural output has a negative effect on the economy as a whole; there is a low production of food and raw materials for industries. A major challenge facing Nigeria is the inability to capture the financial services required of farmers and agribusiness owners who constitute about 70 percent of the population. Farmers need access to capital to purchase land and equipment and invest in the development of new products, services production technologies and marketing strategies. Yet many banks are often reluctant to grant loans to farmers for agricultural enterprises due to lack of creditability and collateral.

Due to the sector's importance successive governments have propounded policy programmes and strategies both monetarily and otherwise to revitalize agriculture in Nigeria from 1960 with all programmes aimed at increasing agricultural output for consumption and export, provide inputs and subsidies to small scale farmers, make credit facilities accessible to a large segment of rural farmers, eradicate poverty, create employment and raise the standard of living. These programmes included the Farm Settlement Scheme policy of 1959, the National Accelerated Food Production Programme (NAFPP) launched in 1972, the Agricultural Development Programme (ADP) of 1974 and 1989, Operation Feed the Nation (OFN) in 1976, the River Basin Development Authorities (RBDAs) was launched in 1976, and the Green Revolution (GR) launched in 1980. The Directorate for Food Roads and Rural Infrastructure (DFRRI) launched in 1986, the Better Life Programme (BLP) For Rural Women introduced in 1987, the National Agricultural Land Development Authority (NALDA), launched in 1992, the Family Support Programme (FSP)/ Family Economic Advancement Programme (FEAP) launched in 1994 and 1996 respectively, the National Fadama Development Project (NFDP) of the early 1990s, the National Economic Empowerment and Development Strategy (NEEDS) launched in 1999, the National, Special Programme on Food Security (NSPFS) launched in 2002, the Root and Tuber Expansion Programme (RTEP) launched in 2003, Seven Point Agenda of 2007 and Transformation Agenda of 2011¹.

The potential contribution of agriculture to economic development in Nigeria is discussed in two important government policy documents; National Economic Empowerment and Development Strategies (NEEDS) and the New Agricultural Policy Thrust (NAP)².

National Economic Empowerment and Development Strategies (NEEDS)

NEEDS implemented in 2004 as Nigeria's home-grown poverty reduction strategy emphasizes the importance of increasing agricultural production and safeguarding food security as the country pursues its overarching goal of diversifying the economy away from oil³⁶. NAP, adopted in 2001 does not present a detailed action plan but articulates a vision of how agriculture can become an engine of growth and poverty reduction, identifies binding constraints to the realization of that vision and proposes policies to overcome those constraints³.

With Nigeria's agricultural sector continuity to underperform relative to the target ambitions set by government, hard questions are being asked about the quantity and quality of public expenditure decisions in agriculture, as well as the appropriateness of the institutional environment in which public expenditure decisions are made.

Monetary policy has always been seen as a fundamental stability, often viewed as prerequisite to achieving sustainable output growth. Thus, in the pursuit of macroeconomic stability, the managers of monetary policy have often set targets on intermediate variables which include the short-term interest rate, growth of money supply and exchange rate. Among these intermediate variables of monetary, the exchange rate is argued to have a greater influence on the economy through its effect on the value of domestic currency, domestic inflation etc. Increased exchange rate directly affects the prices of imported farm machines and other agricultural input which directly contribute to increase in inflation⁴.

The National Agricultural Policy

In an attempt to tackle the problems facing the Agricultural Sector in Nigeria, Government has put in place the National Agricultural Policy, which was jointly

formulated by the national stakeholders and International Development Partners and approved by the Federal Government in 2002. The major components of the National Agricultural Policy feed the National Economic Empowerment and Development Strategy (NEEDS) document. Specifically, the National Agricultural Policy assigns supportive roles to the government, while investments in the sector are left to the private sector initiative. The broad objectives of the National Agricultural Policy include: Promotion of self-sufficiency in food and raw materials for industries; recognition that agriculture is business, hence a private sector concern where the role of government is to facilitate and support private sector initiatives; promoting reliance on local resources; diversification of the sources of foreign exchange earnings through increased agricultural exports arising from adoption of appropriate technologies in food production and distribution, which specifically responds to the needs of women, bearing in mind that they constitute over 50% of the labour force in agriculture⁵.

2.1.1.1 Agricultural Financing in Nigeria

Agricultural finance is basically related to agricultural development. It is based on the economic belief that agricultural development is a process that involves adoption by farmers of new production practices and the acquisition of new input materials. Unfortunately, the rural capital market cannot supply the needed funds to finance such innovations. As a result, agricultural development in Nigeria as in similar developing nations is stunted. The problem of agricultural finance then becomes that of finding adequate fund for agricultural development, identifying the right farmers who could benefit from such fund, extending such fund to the right farmers on terms acceptable to both the sponsor and the receiving farmers. The programmes discussed in this section are the Nigerian farm credit corporation and the New Programmes⁶.

The Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) has been restructured and is being recapitalized for greater efficiency and to provide credits to individual farmers, cooperatives societies/bodies for all classes of agricultural projects. The Bank is also concentrating on the promotion of its popular —group lending scheme whereby a much higher proportion of the active farming population is being reached by its retail outlets across its six Zonal offices⁷. The Bank Management is supporting the new policy orientation of the present administration regarding poverty alleviation by emphasizing micro credit. The Bank is now strongly committed to the promotion of grass roots based, small and medium farming activities in the country. The ongoing injection of N50 billion equity shares into NACRBD by the Federal Government is to empower the Bank to meet the challenges of poverty alleviation and food production through timely disbursement of credits. The bank is also supporting the promotion of Animal Traction and Hand Tool Technology. It has instituted several credits and savings schemes for farmers and rural dwellers that constitute about 70% of the nation's population⁸.

The Agricultural Credit Guarantee Scheme (ACGS)

The Agricultural credit guarantee scheme was established in 1977. The act provides for a fund of N100 million subscribed to by then federal military government (60%) and the central bank of Nigeria (40%) for the year ended 31st December 1980. In 2001, the capital base of the fund was increased to N3.0 billion in order to enhance its coverage and performance. The purpose of the fund is to provide guarantee in respect of loans granted by commercial and merchant banks for agricultural purposes with the aim of increasing the level of bank credit to agricultural sector. In order to guard against the misuse of the funds, the decree provided that in the event that such loans are used to purchase livestock, machinery or farming equipment, the loan should not be paid

to the borrower but to the supplier who should furnish the Bank with the document in evidence of the delivery of the items⁹. The scheme has granted over N3.3 billion to beneficiaries since inception. There is the tendency for all investors to use the credit for purpose other than with it was granted. There is the temptation to utilize the credit outside any planned programme with the result that the farmer may push himself into over-expansion, over trading, extravagant living or even fraudulent or highly speculative ventures. There is also the endemic problem with most of the peasant farmers concerning their lack of knowledge of even the sources of credit or terms of loans owing to the low level of literacy among the preponderance of the full time farmers, and also due to inadequate communication facilities in the country, most of the farmers are not in a position to indicate or understand the names, locations and types of existing credit resources, much less of the import of interest rates which apply to farm loans¹⁰.

Again, certain credit institutions notably banks could want to be satisfied with the quality of the management of any venture into which they are being called upon to invest. But unfortunately, very few farmers in Nigeria possess the necessary managerial skill or the technical knowledge which could adequately meet the standard expected by these credit institutions. Finally while small farmers have been exempted from fulfilling the obligation in as far as loans under the ACGSF is concerned, there is nothing to indicate that the banks do not demand such a report from the small farmers for loans outside the guarantee scheme¹¹. Available statistics shows that these banks have not made any significant impact since inception. For instance, the banks failed to meet the prescribed minimum, except in 1979 when they exceeded the minimum by 5 percent. It is not possible to classify commercial bank credit to agriculture, but one could indicate that greater part of the loans have gone to the bigger, as opposed to the smaller

farmers, and may have been for marketing function rather than production functions. This indicates that the small farmers are still left out. The problem persists and hence constitutes a trait to the economic development of the country in ensuring balance growth of the economy. With respect to the Nigerian Agricultural and Co-operative Bank, emphasis seem to have been placed on loans to co-operative organizations rather than small scale farmers. They always complain of loan shortage to meet their obligations. The point here is that the bank allocates greater share of its loan to co-operatives and the government and hence the greater part of the 90 percent of the Nigerian farmers still have no access to a dependable source of agricultural credit. The fact is that the nation will continue to wallow in the ocean of economic backwardness since the greater percentage of the population is still in the poverty stage¹².

Agricultural Credit Support Scheme (ACSS)

The Federal Government and the Central Bank of Nigeria have initiated the establishment of an Agricultural Credit Support Scheme (ACSS), with the active support and participation of the Bankers' committee. The Scheme had a fund of N50.0 billion (Fifty billion Naira) contributed by the following participants;

- i. N30 billion (N1 billion each) from the Universal banks. N5 billion additionally from the 5 big banks i.e. First Bank, Union Bank, UBA, Zenith and GTB;
- ii. N6 billion from SMEEIS;
- iii. N5 billion from NACRDB;
- iv. N2.5 billion from ACGSF;
- v. N0.7 billion from debt relief (MDG);
- vi. N200 million each from the State Governments. (N 72billion).

The purpose of the ACSS is to develop the agricultural sector of the Nigerian economy by providing credit facilities to farmers at single digit interest rate. This is to enable farmers exploit the untapped potentials of the sector with a view to reducing the cost of agricultural production, and increase output on a sustainable basis. These efforts are expected to lead to fall in prices of agricultural produce, especially food items, thereby leading to reduction in inflation rate, generate surplus for export, diversify the revenue base and increased foreign exchange earnings for the country. The willingness of deposit money banks to dedicate part of their loan able funds to participate is indicative of their readiness to actively promote the growth and development of the real sector of the economy. As custodians of shareholders/depositors' funds, participating banks are expected to exhibit high degree of due diligence in appraising credit requests under the ACSS as is applicable in their normal course of business¹³.

Public expenditure analysis in Nigeria is complicated by the country's federal system of government, under which responsibility for the provision of public goods and services is spread across three tiers of government. The roles and responsibilities assigned to the federal, state, and local governments regarding the provision of public goods and services in agriculture are defined principally in the 1999 constitution, the 2001 New Agricultural Policy Thrust, and 2004 National Empowerment and Economic Development Strategy. The 1999 constitution specifies, under the exclusive list, the areas in which the federal government has exclusive powers to make laws (through the National Assembly) The constitution also specifies, under the concurrent list, the areas in which the federal and state governments both can make laws (the latter through their house of assembly). In addition, the constitution identifies the activities for which local government are primarily responsible and it describes the areas in which local governments are empowered to participate alongside the state governments¹⁴.

In 2001, the government of Nigeria formulated a national agricultural development policy, which was articulated in the New Agricultural Policy Thrust (NAP) document.

The goals of the national agricultural development policy as stated in NAP included:

1. Improving the macroeconomic environment for private sector investment in agriculture.
2. Clarifying the roles of each tier of government in the sector.
3. Improving the institution framework for government interventions.
4. Prioritizing integrated rural development.
5. Increasing public spending to agriculture.
6. Using trade policy measures to improve fiscal incentives in agriculture and
7. Increasing the use of agricultural machinery and modern inputs (IFPRI).

2.1.1.2 Agricultural Sector Performance

Agriculture constitutes one of the most important sectors of the Nigerian economy. It is also a veritable tool in combating poverty in third world countries and achieving long-term economic development. Although Nigeria depends heavily on the oil industry for its budgetary revenues, the country is predominantly still an agricultural society with approximately 70% of the population engaging in agricultural production at a subsistence level. Based on the varying climatic conditions of regions and the vast and rich soil, the country produces varieties of crops while a significant portion of the agricultural sector in Nigeria involves livestock production, fishing, poultry, and lumbering, hence, agricultural products were major export product in the 1960s and early 1970s with the sector contribution to the GDP standing at 35% in 2013¹⁵.

Agriculture provided 41% of the country's GDP, with its contribution to the GDP dropping to 35% in 2013¹⁶. Today, less than 50 percent of the country's cultivable

agricultural land is being cultivated with smallholder and traditional farmers who use crude agricultural tools cultivating most of this land. This has not been helped by the discovery of oil in the country¹⁷.

The sector is bedeviled by problems such as organizational and weak policy, limited access to improved technologies in the form of improved seeds and the use of mainly crude farm tools such as hoes and cutlasses. Also, there are infrastructural inadequacies as the sector suffers from poor road network, lack of storage/processing facilities as well as inadequate irrigation facilities and under funding leading to the problem of high food importation. Government has played a more dynamic role in agricultural production by ensuring stability of the financial system as well as guarantee sources of credit to the farmers through the manipulation of interest rate. Concessionary interest rate was given to the sector between 1970 and 1985. However, the SAP programme led to the deregulation of interest rates in 1990 and indirect monetary policy control was put in place. Hence agricultural sector had to compete for funding with the other sectors of the economy leading to the stoppage of sectoral credit allocation policy. This led to increased food import bills and hike in prices with food import increasing from 6.36% in 1991 to 27.02% and 30.56% in 1999 and 2011 respectively (NBS 2012). Due to the above negative impact of SAP and to safe-guard the sector from competition as well as enhance flow of credit, the Agricultural Credit Guarantee Scheme (ACGS) was established in 1977 with the share capital of the ACGS increased from ₦199 million in 1977 to ₦3 billion in 2001. Other financial institutions were formed to complement the funding capacity of ACGS.

In 2000, the Nigerian Agricultural Commerce and Rural Development Bank (NACRDB) was formed. The National Micro Finance Policy was also launched in 2006 with the aim of creating accessible and easy credit facilities to rural Nigerians. Also,

Agricultural Credit Support Scheme (ACSS) was established to provide credit facilities to farmers at single digit interest rate with a view to reduce the cost of agricultural production and increase output on a sustainable basis¹⁸.

The effectiveness of these policies remained questionable as the interest rate remained high as well as inflation rate throughout the period. The average interest rate stood at 12.475% between 1970 and 2005, it increased to 17.26 in 2006, stood at 17.59% and 16.79% in 2010 and 2012 respectively (CBN 2012). Also, food inflation rose from 3.9 % in 2006 to 8.2 % in 2007 and 18.0 % in 2008. It fell 15.5% in 2009 and 12.7% in 2010¹⁹.

Agriculture was given the highest priority both for poverty reduction in the rural areas, and for the improvement of the economy generally, government embarked on massive expansion of agricultural extension services and tried to ensure better and easier delivery of credits to farmers. The government also embarked on a massive campaign, with appropriate policies designed to achieve self-sufficiency and extended export volumes in crops such as rice, maize, sorghum, ginger, groundnuts, cocoa, coffee etc. as well as self-sufficiency in industrial crops such as Soya beans, palm produce, rubber and cotton. Government also encouraged the involvement of non-governmental organizations in all these measures. The agricultural sector is seen as one of the major sectors in the economy and a key determinant of long run economic development in Nigeria with the sector contributing to development of an economy through production of goods, foreign exchange and exports. In the global world, the contribution of agriculture in food production has been worsening and resulted in food price hikes in 2007 and 2008²⁰.

According to the central bank of Nigeria's data, oil still accounts for our major revenue (gearing towards 80%) and almost 100% of our earnings. The economic salvation cannot be preached without due regard to agricultural development. Agriculture is the most certain path to economic growth and sustainability. Poverty has taken over Nigeria although, economy cannot get out of it today by just relying on oil and gas. The importance of agriculture cannot be neglected in order to move the economy forward²¹.

2.1.2 Monetary Policy

Monetary policy in the Nigerian context refers to the actions of the Central Bank of Nigeria to regulate the money supply which could be through discretionary monetary policy instruments such as the open market operation (OMO), discount rate, reserve requirement, moral suasion, direct control of banking system credit, and direct regulation of interest rate²²

Contractionary or expansionary monetary policy are being implemented depending on existing circumstances, the success of monetary policy in an economy however, depends on the operating economic environment, the institutional framework adopted and implementation with a view that there is a stable relationship between the quantity of money in an economy and her economic activities with the prime aim being to make sure that money supply is in consonance with the growth level of the economy without committing errors²³.

Monetary policy as the action taken by the monetary authorities usually the Central Bank to affect monetary and other financial conditions through influence over the availability and cost of credit in pursuit of the broad objectives of sustainable growth of output, price stability and a healthy balance of payments position²⁴. The discretionary control of the money stock to him involves the expansion or contraction of money and

influencing interest rate to make money cheaper or more expensive depending on the prevailing economic conditions and thrust of policy. He went further to classify the instruments of monetary control into two broad categories - direct and indirect instruments. Under a system of direct monetary control, the Central Bank uses some criteria to determine monetary, credit and interest rate targets that would achieve the goals of economic policy. In a regime of indirect monetary control, the monetary base (specifically bank reserves) is managed while the market is left to determine interest rates and credit allocation²⁵.

The Central Bank of Nigeria (CBN) derives its mandate from the CBN Act of 1958. Section one of the CBN Decree No. 24 of 1991, stipulates that the principal objects of the Bank shall be to issue legal tender currency in Nigeria; maintain external reserves to safeguard the international value of the legal tender currency, promote monetary stability and a sound financial system in Nigeria, and act as banker and financial adviser to the Federal Government²⁶. Therefore, the central bank is the principal monetary authority.

Monetary policy is a central bank's actions to influence the availability and cost of money and credit, as a means of helping to promote national economic goals²⁷. It was stressed by a scholar in a study that monetary policy regulates the supply of money and the cost and availability of credit in the economy. It deals with both the lending and borrowing rates of interest for commercial banks. The monetary policy aims to maintain price stability, full employment and economic growth. The Central Bank of Nigeria is responsible for formulating and implementing monetary policy. It can increase or decrease the supply of currency as well as interest rate, carry out open market operations, control credit and vary the reserve requirements. It was argued that

monetary policy is an effective instrument in relation to influencing demand. He noted that it is crucial to generating an environment for sustainability of lower inflation²⁸.

2.1.2.1 Monetary Policy in Nigeria

During the independence era in the 1960s, with the creation of the CBN, the monetary issues that needed prompt attention were the issue of the Nigerian currency, the establishment of a strong financial base and the promotion of domestic financial infrastructures such as the money and capital market institutions and instruments. This led to the introduction of the first Nigerian money market instrument- the Treasury bill and the establishment of the Lagos stock exchange. Between 1964 and 1966 the defense of the BOP was the focus of monetary policy due to the credit expansion policy adopted in 1962 which subsequently led to increase in the demand for imports causing a drain on the foreign reserves. Policy instruments such as discount rate control, interest rate, moral suasion etc were used to reverse the trend with a ceiling of 15% imposed on commercial bank's credit and granting credit to finance imports and construction were restrained, minimum rediscount rate was rate from 4% to 5% in 1965. Thus, a restrictive monetary policy was pursued in Nigeria during this period²⁹. With the end of the civil war in 1970, which disrupted economic activities and an upsurge in wages due to revenues from the oil boom, inflationary trends were noticed in the economy. Anti-inflationary measures were introduced with the aim of reducing commercial bank's liquidity and also, encourage the channeling of greater credit to productive sector. Consequently, the monetary authority imposed quantitative interest rate and stabilization securities and advocated sectoral credit allocation to the various sectors of the economy with preference to agricultural sector, manufacturing sector and construction sector (sectors believed will revamp the economy) with a below market lending rate³⁰.

Loans and advances to these sectors were fixed at 30 to 40% of banks aggregate loans and advances in the early 1980s, but was reduced by 7% in 1985 while the number of sectors attracting credit was reduced from about 18 in the 1970s to 4 in 1986³¹. With the deregulation of the economy through the adoption of the Structural Adjustment Programme (SAP) aimed at achieving fiscal balance and balance of payment equilibrium due to the economic crisis of the early 1980s occasioned by the collapse of world oil price, monetary policy in the era aimed at stimulating output and employment, promote domestic and external stability through a market oriented financial saving and efficiency resources allocation. strategy involved the deregulation of the financial system to accomplish a market-oriented financial system characterized by the free entry and free exit of banks and the use of indirect instruments for monetary control that would support efficient financial intermediation so as to increase competition, strengthen the supervisory and regulatory capacity of the CBN, improve the financial structure and redress the financial repression already identified³².

However, some direct control measures were maintained and new ones introduced to check excess liquidity. For instance, Stabilization Securities were introduced in 1990. Similarly, Special Treasury Bills (STBs) were also introduced in April 1999 and discontinued before the end of 2000. Specifically, under the SAP regime, the objectives of monetary policy have been the stimulation of output and employment and the promotion of domestic and external sector stability while ensuring price stability and inflation control.

2.1.2.2 Factors Influencing Monetary Policy in Nigeria.

Exchange Rate

Exchange rate is the rate at which a country currency is exchanged for other countries

currency. The external value of each currency is reflected in the country's economic conditions in general and the purchasing power of the currency relative to that of other currencies in particular⁴². It was observed that the performance and profitability of industries and companies that depend mainly on importation are considerably affected by the exchange rate of the Naira against major currencies of the world. If there is depreciation of the local currency, this makes the export growth of the economy and consequently increase the returns on Stock³³. The reverse is the case when there is an appreciation of the local currency. This therefore implies that the depreciation of the local currency has a positive effect on stock prices.

Movements in the exchange rate have ripple effects on other economic variables such as interest rate, inflation rate, import, export, output, etc. These facts underscore the importance of exchange rate to the economic well-being of every country that opens its doors to international trade in goods and services. The importance of exchange rate derives from the fact that it connects the price systems of two different countries making it possible for international trade to make direct comparison of traded goods. In other words, it links domestic prices with international prices through its effects on the volume of imports and exports. Exchange rate exerts a powerful influence on a country's balance of payments position³⁴.

Money Supply

Money supply is the total amount of all forms of money in circulation in a given country at a given period of time¹³. Total money supply can be grouped into three broad categories as defined by the Central Bank of Nigeria: These money (M_1) and broad money (M_2)³⁵. M_1 indicates currency in circulation plus current account deposits with

commercial banks while M_2 is M_1 plus savings and time deposits. If the apex Bank wants to curtail money supply by reducing the power of participants (commercial banks), it will increase interest rates, while in case of an expansionary monetary policy the reverse will be the case³⁶. However, the Central Bank of Nigeria adopts M_2 definition which it refers to as total money aggregate³⁷.

There is excess money supply when the amount of money in circulation is higher than the level of total output of the economy. When money supply exceeds the level the economy can efficiently absorb, it dislodges the stability of the price system, leading to inflation or higher prices of goods. Money Supply is the life wire of all economic activities and so has powerful effects on the economic life of any nation. An increase in Money Supply puts more money in the hands of producers and consumers and thereby stimulating increased investment and consumption. Consumers increase purchases and business firms respond to increased sales by ordering for more raw materials and other resources to achieve more production, the spread of business and capital goods. As the economy goes buoyant, Stock Market prices rise and firms issue more equity and debt instruments. As the Money Supply expands, prices begin to rise, especially if output growth reaches full capacity. Lenders insist on higher interest rates to offset expected decline in purchasing power over the life span of their loans. Opposite effects occur when the Money Supply falls or when there is decline in its growth rate, economic activities decline and disinflation (reduced inflation) or deflation (falling price) results³⁸.

Interest Rate

Interest rate is the rate at which interest is paid by a borrower (debtor) for the use of

money that they borrow from a lender³⁹. Interest rate policy in Nigeria is a major instrument of monetary policy with regards to the role it plays in the mobilization of financial resources aimed at promoting economic growth and development. Interest rate is the price paid for the use of money. It is the opportunity cost of borrowing money from a lender. It can also be seen as the return being paid to the provider of financial resources. It is an important economic price. This is because whether seen from the point of view of cost of capital or from the perspective of opportunity cost of funds, interest rate has fundamental implications for the economy either impacting on the cost of capital or influencing the availability of credit, by increasing savings⁴⁰.

Interest rate is an economic variable that depicts the cost of acquiring credit for investment in an economy. It is negatively related to investment; this means that high interest rate discourages investment while low interest rate encourages investment. It often changes as a result of inflation, productivity of capital and Federal Reserve policies and also affects both the future cash flow of firms and discount rate. According to other scholars, a rise in interest rate decreases corporate profitability and likewise leads to an increase in the discount rate applied to equity investors; both of which affects the stock prices adversely. Consequently, a rise in interest rate is expected to impact negatively on the performance of the organization and thus on stock market prices⁴¹. It has also been discovered in a related study that a negative long-run relationship between interest rates and stock returns in Nigeria and also a uni-directional causality running from interest rates to stock returns⁴².

Inflation Rate

Inflation refers to the persistent and the continuous rise in the general level of prices of

goods and services in an economy. There is no gainsaying the fact that different economies in different parts of the world experience inflation. For some economies, it could be mere fluctuations, while for some others; it is consistent and continuous rise in price⁴³.

The issue of inflation has been a matter of concern for economists over time as it remains a fact that the real income of the citizens are affected during inflation unless with compensatory income via subsidy or outright increase in the workers' salaries. The latter is another economic problem which, when not accompanied by increased productivity, will lead to more inflationary tendencies in the economy because the value of money would have fallen when the increased incomes fail to bring about more productivity from the wage increases⁴⁴. According to some researchers, in Nigeria, notwithstanding the several efforts directed by the government to curb inflation, these efforts have not yielded positive or desired results as high price level continued to cause setbacks in the growth rate of the living standard of most Nigerians who are either on fixed income or are unemployed. He added that it has adverse effects on investment productivity, balance of payment and therefore reduced growth rate of the Gross Domestic Product (GDP)⁴⁵.

High inflation means a decline in real income; investors react by selling off their assets (stocks inclusive) to enhance their purchasing power. On the contrary, low inflation motivates investors to acquire more assets. Another argument is that increase in the rate of inflation reduces stock prices because of the interaction of inflation with the tax system. Investors undervalue corporate stock during inflationary period because they fail to consider capital gain on corporate debt, and also, they price stock to give an Earning Price Ratio that could be comparable to nominal rather than real interest rates⁴⁶.

The several impulses of inflation in any economy have made it an issue of concern for

policy makers.

2.1.2.3 Evolution of the Monetary Policy Framework in Nigeria.

Generally, central bankers and economists are less divided in their perceptions of the objectives of monetary policy than in their views about what role the central bank should play in accomplishing these objectives. Consistent with its legal mandates, the objectives of monetary policy of the CBN since its inception have been to achieve domestic price and exchange rate stability, maintenance of a favorable balance of payment, development of sound financial system and promotion of rapid and sustainable rate of economic growth and development. Against this background, it is therefore important to discuss the evolution of Nigeria's monetary policy in the past forty years.

a) The Exchange Rate Targeting Regime (1959-1973)

The conduct of monetary policy in Nigeria under the colonial government was largely by the prevailing conditions in Britain. The instrument of monetary policy at that time was the exchange rate, which was fixed at par between the Nigerian naira and the British pound. This was very convenient, as fixing the exchange rate provided a more effective mechanism for the maintenance of balance of payment viability and for control over inflation in the Nigerian economy. This fixed parity lasted until 1967 when the British pound was devalued²¹. Owing to the civil unrest in the later part of this period, the monetary authorities did not consider it expedient to devalue the Nigeria naira in sympathy with the British pound. Two major reasons accounted for this; first, a considerable proportion of the Nigerian naira would only raise the domestic price of imports without any appreciable impact on exports, which were largely the primary products. Rather than devalue, the monetary authorities decided to peg the Nigerian

currency to the US-dollars, but imposed severe restrictions on imports via strict administrative controls on foreign exchange⁴⁷.

Following the international financial crisis of the early 1970s, which led to the devaluation of the US dollar in relation to Nigerian currency, Nigeria abandoned the dollar peg and once again kept faith with the pound until 1973, when the Nigerian currency was once again pegged to the US dollar. With those developments, the severe drawbacks in pegging the Nigerian naira to a single currency became obvious. A clear case was that the naira had to undergo a “de facto” devaluation in sympathy with the dollar when the economic fundamentals dictated otherwise, in 1973 and 1975 respectively. It was against this backdrop that the need to independently manage the exchange rate of the naira became very imperative and was firmly established. Hence, in 1978, Nigeria pegged her currency to a basket of 12 currencies of her major trading partners.

b) Monetary Targeting Regime 1974 to date

From 1970, the economy witnessed a major structural change that affected the conduct of monetary policy. Oil dominated the export in 1970 and over 96 percent from 1980. While non-oil export (mostly agriculture) declined rapidly from 42.4 percent in 1970 to 16.9 percent in 1973 as a result of the increased revenue accessing to the government from oil, the imbalance in the balance of payments and low external reserves became things of the past. Indeed, Nigeria’s external reserves rose rapidly by over 1,000 percent in 1975 from about ₦100 million in the late sixties approximately ₦3.4 billion in 1975⁴⁸. The need to finance post-war developments also led to a considerable growth in public expenditure, thus intensifying inflationary pressures. Under the circumstances, the monetary authorities adopted a new monetary policy framework.

This development marked the beginning of monetary targeting in Nigeria, which involved the use of market (indirect) and non-market (direct) instruments. Consequently, the major focus of monetary policy was predicted on controlling the monetary aggregates, a policy stance which was largely based on the belief that inflation is essentially a monetary phenomenon⁴⁹.

c) Direct Control 1974 - 1992

The major objective of monetary policy during this period was to promote rapid and sustainable economic growth. Consequently, the monetary authority imposed quantitative interest rate and presented sectoral credit allocation to the various sectors of the economy. Overall, the “preferred” sectors, such as agriculture, manufacturing and construction were singled out for the most favored treatment, in terms of generous credit allocation and a below market lending rate⁵⁰.

The most important instrument of monetary control the CBN relied upon was the setting of targets for aggregate credit to the domestic economy and the prescription of low interest rates. With these instruments, the monetary authority hoped to direct the flow of loanable funds with a view to promoting rapid development through the provision of finance to the preferred sectors of the economy⁵¹. The level and structure of interest rates were administratively determined by the CBN. Both deposit and lending rates were fixed in order to achieve social optimum in resource allocation, promote the orderly growth of the financial market, curtail inflation and lessen the burdens of internal and international debt servicing of the government. In implementing the policy, the sectors were classified into three categories:

- (1) “preferred” agriculture, manufacturing and residential housing,
- (2) “less preferred” imports and general commerce; and

(3) “others”. This classification enabled the monetary authorities to direct financial resources at concessionary rates to sectors considered as priority areas.

These rates were typically below the CBN. Determined minimum rediscount rate (MRR) which itself was low and not determined by market forces. Empirical evidence during the control regime era revealed that the flow of credit to the prior sectors did not meet the prescribed targets and failed to impact positively on investment, output and domestic price level. Overall, banks tended to practice adverse selection in their credit allocation. The major factor which impaired the effectiveness of monetary policy during the era of control regime was the lack of instrument autonomy by the Central Bank. During this period, monetary policies were dictated by the Ministry of Finance and as such, were influenced by short-term political considerations. Beginning from mid-1981, crude oil prices to a downturn as prices fell from the peak of US & 40 per barrel to US & 14.85 in 1986. This led to severe external sector imbalance. The emerging economic development made Nigeria adopt the Structural Adjustment Programme (SAP) under General Ibrahim Babangida as the Military Head of State, as a policy option to put the economy back on the path of sustainable growth. In a broad term, the SAP strategy involved both structural and sectoral policy reforms⁵². The reforms included the deregulation of the financial system to accomplish a market-oriented financial system that would support efficient financial intermediation. The programme, thus, entailed reforming and dismantling the control regime which was characterized by a system of fixed credit allocations, a subsidized and regulated interest rate regime, exchange controls and import licensing. The emergence of SAP ushered in a regime of financial sector reforms characterized by the free entry and free exit and the use of indirect instruments for monetary controls⁵³.

2.1.2.4 Review of Monetary Policy before the Structural Adjustment Programme (SAP).

Prior to the introduction of the Structural Adjustment Programme (SAP) in 1986, the economic environment which guarded the administration of monetary policy was characterized by the growing importance of the oil sector which could be termed as the period of boom and burst, the expanding role of the public sector, in the economy and over dependence on the external sector. The sectoral allocation of banks credit in CBN guidelines was to stimulate the production sector and thereby stem inflationary pressure²⁶. The control of interest rate to relatively low level was done to promote investment and growth. Occasionally, special deposit was imposed to reduce the amount of free reserves and credit creating capacity of banks.⁵⁴.

Minimum cash ratios were imposed on banks in mid 1970s on the basis of their total deposit liabilities but since cash rates were usually lower than those voluntarily maintained by the banks, they proved less effective as a restraint on their credit operation. However, in the seventies, it became increasingly difficult to achieve the aims of monetary policy with the large increase in government expenditure; the financial sector experienced rapid monetary expansion in this period because expenditure stemmed up from the monetization of its huge oil revenue⁵⁵

Generally, monetary aggregate, government fiscal balance of payments position moved in undesirable direction. Compliance of banks to credit guidelines was less than satisfactory in the sense that the low rate on government debt instrument did not sufficiently attract private sector savers and since CBN was required by law to absorb unsubscribed portion of government instrument, high powered money was usually injected into the economy. Consequent to the effectiveness of the direct monetary tools

in controlling money supply and employed in the pre-SAP era, there was a consensus for a shift towards the technique of indirect control via a market oriented financial system to promote effective mobilization of financial saving and efficient allocation. Equally in 1981, the reserve requirement was scrapped. The banks now rely on the desired nations of cash liquid assets to total deposit that commercial banks adopt in their own self-interest. With well-developed markets for liquid assets, modern banks can get better with cash reserves of only 1 or 2 percent of deposit. Although, the CBN is still committed to act as lender of last resort, then commercial banks have to guess how much of a penalty will be imposed if they have to borrow from the CBN. To further concentrate the mind, official target paths for the money supply and this was announced in 1980 in the government medium term financial strategy⁵⁶.

2.1.2.5 Monetary Policies Under the Structural Adjustment Programme (SAP).

The SAP was adopted in July 1986 against the crash in international oil market and the resultant deteriorating economic condition in the country. The Structural Adjustment Programme (SAP) was designed to achieve fiscal balance and the balance of payment visibility by altering and structuring the production and consumption pattern of the economy's elimination of price distortion, reduce the heavy dependency on crude oil export base and achieving sustainable growth. The objectives of monetary policy on the introduction of SAP have remained as earlier stated "The stimulation of output and employment and the promotion of domestic and external stability" monetary policy is then aimed at inducing the emergency of a market oriented financial saving and efficiency resources allocation. In pursuant of this view, monetary policy framework, the ceiling imposed on individual banks credit was removed for banks which met some specific programmed criteria set by the CBN⁵⁷. The criteria comprised specific cash reserves and liquidity ratio, presidential guidelines, statutory minimum paid up capital,

adequate ratio and sound management. The meeting the requirement was also to efficient market operations.

Despite the monetary reforms introduced at the initial period of SAP, some of the problems of monetary policy management have persistently increased over time. The control constraint continues to be ineffective control framework and the uncertainties created by fiscal operations. Some dynamic reforms have been introduced since 1990. For example, in 1990, the ceilings in banks credit expansion were henceforth not to allow for exemptions as before. Also, commercial and merchant banks were subject to equal treatment, since their operations were formed from experience to reduce similar effect on the system. In 1991, the cash reserve requirement was modified such that its base was expanded to include all deposits, liability comprising demand, savings and time deposit⁵⁸. Also in 1991, the CBN brought into operation the risk weighted measure of capital adequacy requirement and statement of accounting standards, the Presidential guidelines amongst others, spot out the criteria to be employed by the banks for classifying non-performing loans.

In 2011, the Asset management Company of Nigeria (AMCON) purchased the non-performing loans from the commercial banks. The first round of the purchase of non-performing loans that was done was actually restricted to margin lending by intervened banks and non-performing loans (NPLs) of those intervened banks, but limiting the purchase of the loans that they bought from the non-intervened banks to only margin loans. AMCON have gone round to purchase all NPLs from all the banks. The CBN had targeted a total non-performing loan ratio of five percent across the sector⁵⁹. The CBN would not allow bad loans to stack up again to more than five per cent of total loans across the banking industry. In March 2011, AMCON said it had bought about ₦1tn non-performing loans of 22 reserved and non-reserved banks in the second phase

of its rescuer programme in the banking sector. AMCON is going to issue at this point, a shelf-registration of ₦3tn, but the corporation issued about ₦1.7tn bonds on April 6. The ₦30bn tranche was the only portion of the series 1 bonds that was open to the public; the amount was large enough to determine where the price of the bonds should be. Commencement of operations of AMCON and the inherent benefit will trickle down the entire economy and sustain financial stability before the expiration of the company⁶⁰.

Financial sector reform (FSR) became a major component of the structural adjustment programme in Nigeria with the deregulation of interest rates in August 1987. However, in terms of attention, research efforts in this regard have been minimal, when compared to the effort into the other components of the programme such as trade liberalization and exchange rate reforms. Even where research is available, emphasis has tended to be placed on the institutional aspects of the programme and here the focus has been on the banking sub-sector⁶¹. In recent times, however, more attention has started to focus on the reform of the financial sector. First, it is realized that the structure of the commercial banks and non-bank intermediaries can affect macro-economic performance; it provides an excellent survey on the connection between the efficiency of financial markets and macro-economic performance. For instance, the behavior of monetary aggregates has great implication for the level of prices and the balance of payments⁶². Secondary, it is becoming increasingly clear that the ability to sustain stabilization policies such as exchange rate reforms may hinge critically on these structural changes in the financial sector. Specifically, such structural changes in the financial sector may be crucial to the efficient conduct of monetary policy. Without such structural changes it would be difficult to make any substantial progress with macro-economic stability⁶³.

Thirdly, some recent literature has started to focus on the issue of sequencing and timing of both the overall stabilization programme and the liberalization of the financial sector. The speed, sequence and timing of specific components of financial sector reforms may hinder the attainment of the objectives of the goals of stabilization policy. The reverse is also true. Forth and more important for our present purpose, the adoption of indirect methods of monetary control may make easier the transition from a regulated to the deregulated economic. Over the years, there has been a gradual shift in the overall approach to economic management in Nigeria and other LDCs.

After several unsuccessful decades of emphasis on the role of government interventions in promoting growth, developing countries are now devoting more efforts to having market signal guidelines towards the allocation of resources. This has been accompanied by the promotion of private sector development⁶⁴.

However, it is conceived that such efforts at promoting the private sector is better implemented through an increased role of market forces in the allocation of resources in the economy. Thus, direct control of monetary aggregates which places emphasis on the imposition of limits on the price or quantity of credit must yield way to indirect methods aimed at influencing financial institutions' liquidity through market forces⁶⁵.

This has several implications for th3e conduct of monetary policy on the Nigerian economy. The objectives of commercial sector reform during the SAP up to date is to defined in a broad manner is to increase the size, improve the efficiency and raise the diversity of the financial system of the economy. This objective is attained through financial liberalization which is viewed as the process of moving towards market determined interest rate as well as market determined prices on all classes of financial products, banking system characterized by symmetric entry and exit conditions to all participants, increasing internationalization or the opening up of domestic markets to

international competition and limited barriers to the introduction of new financial products. Within the context of Nigeria and within the framework of this research, this became operational through allowing market determine interest rate to prevail for most of the reform period, eliminating direct credit restructuring balance sheets of financial intermediaries and improving commercial banks infrastructure. These well developed financial systems are needed to ensure that indirect methods of monetary management work well. However, the transition away from poorly developed, depressed or thin financial market is very difficult to achieve so long as the direct methods of control are in place. This then is a paradox⁶⁶. The objective of this literature is to examine how this relationship between the liberalization of the commercial financial sector and monetary policy framework has worked itself out over the period of adjustment in Nigeria. From our discussion so far, three issues which this study will attempt to focus on emerges as;

1. The important linkages in the monetary policies framework under indirect controls.
2. The problem on the initial conditions, especially the fiscal deficit and bank restructuring arrangement may vary in magnitude from country to country
3. Added to these is the fact that countries may also differ in the preexisting depth and sophistication of their financial system.

2.1.2.6 An Appraisal of the Performance of Monetary Policy in Nigeria.

The short coming of direct instrument of monetary policy is well known and documented and need to be emphasized again. Despite the progressive deregulation of the financial sector and the commencement of transition to market-based instrument of monetary management, the conduct of the effective monetary policy in Nigeria has been constrained by a number of factors particularly the absence of fiscal discipline until

1995. The lack of instrument autonomy for the Central Bank frequent policy changes and reversal and widespread distress in the financial sector have constrained the effectiveness of monetary policy in the post SAP period. From the inception of Structural Adjustment Programmer (SAP), the thirst for monetary policy in Nigeria has largely been restrictive and aimed at containing demand pressure on domestic prices and foreign exchange market among other stabilization objectives⁶⁷. Consequently, the shift to market-based approach refers to have p9otential to enhance effectiveness in addressing the real cause of monetary instability and financial distress. Also, growth target for monetary and credit aggregates were exceeded by substantial margin resulting in the acceleration of inflation rate to double digit and increased pressure on exchange rate. Equally, there is virtually no effect in self-regulation. The level of liquidity outside the commercial band system is yet another facto hindering the effectiveness of monetary policy. Apart from volume of the monetary authorities do not have a measure of that liquidity⁶⁸. Thus, it is impossible to target such substantial liquidity with monetary policy and because of aggregate economy is impaired. It involves five main elements;

1. The public announcement to medium term target for inflation.
2. The institutional commitment to price stability as the primary goal of monetary policy to which other goals are subordinates.
3. Information exclusive strategy in which many variables and monetary aggregates in the exchange rate used for deciding the setting of policy instrument.
4. Increase transparency of policy strategy through communication with the public and the market about the plans, objectives, and decisions of the monetary authorities.

5. Increase transparency and accountability of the Central Bank for attaining its inflation objectives.

The commercial banks are the main operators of the monetary policies with the CBN being the monetary authority. The aim of the monetary policies are basically to control inflation, maintain healthy balance of payments position for the country order to safeguard the external value of the national currency and promote adequate and sustainable level of economic growth and development. The commercial banks play a crucial role in the implementation of monetary policies whole the monetary policy is aimed to achieving some macro-economic objectives. A counter cyclical monetary expansion may raise output and help to bring down the level of unemployment in the short run but may aggregate th3e problem of inflation in extremely high extent, it will overshadow the benefit of increase in output and employment level, the level of feedback effect to the commercial banks would go below savings by customers⁶⁹.

Direct monetary control techniques, which have been in vogue in the 60s and 70s, were restrained up to June 1986. The instrument had significant influence on the Nigerian economy. Thus, during 80s, the permissible aggregate credit expansion ceiling was on the downward trend reflecting the policy of restraining the growth in the liquidity of the banking system⁷⁰. The direct monetary control was not used only to control overall credit expansion but also to determine;

1. The proportion of bank loans.
2. Merchant bank asset portfolio.
3. Proportion of bank loans to small-scale indigenous enterprises.
4. Proportion of bank loans to indigenous borrowers.
5. Proportion of rural deposit granted as loan to rural dwellers.

6. Categories of banks exempted from credit ceiling.
7. Cash deposit for imports.
8. Lid on interest rate etc.

The above justified the claim that the financial sector particularly the banking subsector in the most regulated sector of the economy. According to research, it is a sector whose players are literally told not only what business to do. How much to charge for its products and services? How to distribute its profit? The implication of this is that commercial banks in the performance of their role as financial intermediaries especially during this period have a little control over the utilization of their funds. With the introduction of indirect monetary control, Nigerian economy witnessed mopping up excess liquidity in the same through the issuance of stabilization securities, since October 1990 (though suspended since March 1993) and increase in commercial bank cash reserve ratio in 1989 and 1990. The ability of bank to grant credit was further reduced by raising the maximum liquidity ratio for commercial banks from 25 per cent to 30 per cent in 1987 and this was retained up to 1999⁷¹. The experience of monetary policy in Nigeria originated from the CBN Act of 1958 and its subsequent amendment form the act of the bank drew inspiration as to what should constitute its short-term and long-term monetary policy objectives, the short to medium term objectives compliment the Federal Government budget objectives. The CBN Act of 1958 stated the objectives of the bank as being;

1. Issuance of legal tender currency in Nigeria.
2. Maintaining external reserves to safeguard the international values of the legal tender currency.
3. Promoting monetary stability and a sound financial system in Nigeria and;
4. Acting as banker and financial adviser to the government.

Over the years, the principal objectives have metamorphosed into maintaining a single digit inflation rate, maintaining exchange rate stability, promoting sound financial system, high level of output growth and employment generation and enhancing the overall efficiencies of the economy. The present agitation for the deregulation of petroleum sector will stem up the price of goods and services in the market by over 100 per cent. Survey has shown that there has been a significant price increase in the market owing to the minimum wage demand by the labor unions and this price increase had doubled. Also, the partial removal of the subsidy on petroleum products had again created another price increase. In the heydays of the oil boom, the naira in relation to the U.S dollars averaged about 50.65%. Federal government satisfied all conditions for an IMF loan except the call for devaluation of the Naira. In pursuance of the monetary policy objectives, the CBN over the years employed direct and indirect policy measures and instruments. The direct measures include the imposition of ceilings on interest rate and credit expansion on banks, enforcement of sectional allocation of credit expansion, administratively determination of the level of structures of interest rates and other quantitative control measures. The indirect measures include required cash ratio, market-based interest rate policy minimum rediscount rate, liquidity rate, open market operation and moral suasion. The direct monetary control era lasted through 1992. However, since 1993, the CBN has shifted market-based instrument in line with the global trend towards a market-based framework for monetary control⁷².

Monetary policy instruments used under indirect control regime have evolved over the years with the monetary authority time-turning than as dictated by trends in the economy especially the overall money aggregates, such major instruments are;

1. **Open Market Operation (OMO):** It refers to the purchase, sale of government securities (Nigeria Treasury Bill NTB) including the CBN for the purpose of increasing

or reducing the money supply. Open Market Operation expands monetary base, thereby raising the money supply and lowering shorter, interest rates. In 2002, the CBN introduced another monetary instrument known as the CBN certificate to compliment the use of government security for conduction open market operation⁷³. The CBN certificate is different from other instrument in the sense that, it cannot be discounted for this is to enhance the efficiency of monetary policy actions, given the instability of the only available treasury. In terms of impact, the sales and purchase of CBN certificate has the same impact as the sales and purchase of other government securities. The last tranches of the Central Bank of Nigeria certificate matured in August 2002 and has since then extinguished CBN plans as currently underway to introduce a new short-term instrument called “CBN-OMO” bill to compliment the NTBs in CBN’s portfolio for OMO especially for liquidity management. The OMO bill have maturity period of 30 to 60 days to be issued on the basis of need based on the Dutch auction system and targeted at the authorized deals only¹⁸. Equally, Open Market Operation (OMO) will be conducted weekly in the secondary market, mainly in short term government securities of carrying maturities, or in order to meet the various preferences of participant in the market. OMO will be complimented by reserve requirements and discount window operation including Re-purchase Agreement (REPOS) while discount houses will continue to play the role of principal dealer in the market⁷⁴.

2. **Discount (Rediscount) policy:** It refers to the condition under which and how much the CBN lends to commercial banks in forming its rate as a lender of last resort. It primarily involves changes in the discount rate (for minimum rediscount ratio MRR) and affects the volume of loans to the banks, and to monetary base and expand the money supply, a fall in discount rate reduces the monetary base and shrinks the money supply. The CBN facility at which discount loans or discounts are made to banks is

called the “Discount Window”. The MRR is also used to influence the level and direction of other rates determines whether the commercial bank is adopting a policy of monetary ease or monetary restraint. The MRR is currently fixed at 18.5 percent.

3. **Reserve Requirement -:** Cash and liquid assets are the requirement imposed by the CBN that commercial banks must hold at a certain amount of reserves. It is the minimum amount of reserve (or eligible liquid asset) that commercial banks must hold in proportion to total deposit liabilities. For each category of the deposit liabilities, a rise in the cash ratio or liquidity ratio reduces the amount of deposit that can be supported by a given level of monetary base and will lead to contraction of the money supply. Conversely, a fall in the ratio leads to an expansion of the money supply because more multiple deposit creation can take place. The reserve required is currently by the CBN fixed at 12.5 percent for cash reserve ratio. However, for those in the bank that shows evidence that 20 percent outstanding loan is to real sector, the cash reserve ratio has been reduced.
4. **CBN-certificate-:** This was issued for the liquidity first time in year 2001 to mop up the excess liquidity generated by the rapid monetization of the windfall going from the crude oil receipts. It will be issued as the need arises to compliment traditional monetary policy tool to contain growth in liquidity to desired level.
5. **National Saving Certificate-:** This is medium for long term securities intended to broaden and offer alternative investment options for both banks and the public. It is used to supplement effort at managing on a more sustainable basis, the persistence excess liquidity on the economy while facilitating saving and investment growth.
6. **Federal Government Development Stock-:** This is meant to encourage the government to source its long-term financing needs from the capital market. This will also change the direction of bank credit fair in favor of the private sector. The instrument

was suspended in 1980s and efforts are not being made to resume its floatation.

7. **Moral Suasion:** This involves subtle appeals to banks through bank committee and other communication channels to briefly correct compel and give guideline. The use of moral suasion has not off course been confirmed to CBN alone. Nearly every government functioning has used the opportunity of their public address to urge banks to pursue one type of policy or the other.

From the above explained instruments, it is pertinent to know that three out of these instruments are currently as a monetary policy tool in Nigeria. They have been reviewed and compressed with the other stated tools above, the three tools are;

- 1) Open Market Operation (OMO).
- 2) Discount (Rediscount) policy and;
- 3) Reserve Requirement

2.2 Theoretical Review

2.2.1 Solow Growth Theory

The Solow-Swan Neoclassical growth model attributed long-run growth to two exogenous variables which include technical progress and growth in labour and capital. That is, an equilibrium state can be attained by varying the quantities of capital and labour in the production process. It also emphasized the critical role of technological change on economic growth. However, the model did not establish any clear link between macroeconomic policies and labour force growth, thus, suggesting limited influence of government policies⁷⁵.

The observed deficiencies noticed in the Solow-Swan Neoclassical growth model prompted the development of the Endogenous Growth Theory⁷⁶. According to this theory, technological change can be endogenously influenced and that changes in both

human and non-human capital could result in positive externalities. However, the model failed to clearly assign any role to macroeconomic policies in determining growth. In contrast to the above-mentioned theories, the experiences of the 1970s and 1980s provided sufficient evidence to suggest that sound macroeconomic policies are necessary to achieve long-term sustainable economic growth. For instance, the impressive growth performance of the four Asian Tigers as well as South East Asian economies were largely attributed to changes in macroeconomic policies that promoted low inflation and favourable fiscal policies. Similarly, the awful performance of some Latin American and African economies in the 1980s popularly referred to as the 'lost decade' could be traced not only to unstable political environment but also to weak macroeconomic policies⁷⁷.

2.2.2 The Classical Theory

The classical theory, credited to Adam Smith, David Ricardo, and others attempts to explain the determination, savings and investment with respect to money. The classical model was built on Say's law of markets which states that "supply creates its own demand". Thus, classical economists believe that the economy automatically tends towards full employment level⁷⁸ Theory shows how money affects the economy. It may be considered in terms of the equation of Exchange:

$$MV = PY.$$

In the transaction version – associated with Fisher and Newcomb, some assumptions were made: that the quantity of money (m) is determined independently of other variable, velocity of circulation (V) is taken as constant, the volume of transactions (T) is also considered constant. Thus, of price (p) and the assumption of full employment of the economy, the equation of exchange is given as:

$$MV = PT$$

Which can readily establish the production that – the level of price is a function of the supply of money. That is, $p = F(m)$ which implies that, any change in price changes money supply. In cash balances version – associated with Walras, Marshall, Wicksell and Pigou, the neoclassical school (Cambridge school), changed the focus of the quantity theory of without changing its underlying assumptions⁷⁹. This version focuses on the fraction (K) of income, held as money balances. The Cambridge version can be expressed as:

$$M = Kpy$$

Where K= Fraction of income, M =Quantity of money, P= price level, y =value of goods and services. The K in the Cambridge equation is merely inversion of V, the income Velocity of money balances, in the original formulation of quantity theory. This version directs attention to the determinants of demand for money, rather than the effects of changes in the supply money.

2.2.3 Keynesian Theory

The Keynesian model assumes a close economy and a perfect competitive market with fairly 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”. In other records, they were not interested in the quantity theory per se. For the Keynesian, monetary policy works by influencing interest rate which influences investment decisions and consequently, output and income via the multiplies process. Thus, the Keynesian theory is a rejection of Say's Law and the notion that the economy is self-regulating⁸⁰.

2.2.4 The Monetarist Theory

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. Monetarists like Friedman emphasized money supply as the key factor affecting the well-being of the economy. Thus, in order to promote steady of growth rate, the money supply should grow at a fixed rate, instead of being regulated and altered by the monetary authorities⁸¹. Friedman equally argued that since money supply is substitutive not just for bonds but also for many goods and services, changes in money supply will therefore have both direct and indirect effects on spending and investment respectively such that demand for money will depend upon the relative rates of return available or different competing assets in which wealth can be⁸².

2.3 Review of Empirical Studies

Past studies have examined the performance of the agricultural sector in Nigeria and the implication of different monetary policy tools with varying findings. Some of this results are discussed as follows. Scholars have also examined the effects of monetary policy in Nigeria, challenges faced by the monetary authorities in achieving the set goals. A study was therefore carried out with the objective of investigating how policy induced shocks by monetary agents impacts the Nigerian economy. Specifically, the scholars seek to identify the actual effect of monetary policy changes, in the face of macroeconomic disturbances on real economic outcomes in Nigeria between 1980 and 2018. The study used quarterly time series data from 1980:Q1 to 2018:Q4. The econometric technique applied in the study is the small and open-economy structural vector autoregression (SVAR). The result of the study indicated that monetary policy

innovations estimated on the quantity based nominal anchor, M2, is the most significant source of variation in output and prices with a very fast speed of adjustment while other policy variables were insignificant. The study therefore, recommended that there should be emphasis on the manipulation of the quantity-based nominal anchor (M2) for managing the economy⁸³.

While observing the performance of the agricultural sector, some researchers have found that government effort have failed to improve agricultural sector output which motivated the investigation of macroeconomic policy and agricultural output in Nigeria: implications for food security. The objective of the researchers was to investigate the impact of macroeconomic policies on the Nigerian agricultural output in relation to its role as a source of food supply. Time series data between 1978 and 2011 were used. The Multivariate Vector Error Correction approach was employed to examine both short run and long run relationship between the variables of interest. The study finds a cointegrating relationship among agricultural output, government expenditure, agricultural credit, inflation, interest and exchange rates. It was revealed that in the long run, agricultural output is responsive to changes in government spending, agricultural credit, inflation rate, interest rate and exchange rate. From the impulse response function analysis, the study found that one standard deviation on government expenditure and interest rate reduces the agricultural output thereby threatening food security in the short, medium and long run. The variance decomposition result revealed that a significant variation in Nigeria's agricultural food output is due to changes in exchange rate and government expenditure movements. The implication of this according to the researchers is that the imperative role played by both fiscal and monetary policy in an effort to ensure food security. The study therefore recommended that to achieve a sustainable food security, an expansionary fiscal policy

that is not inflationary should be rigorously pursued along with a realistic exchange rate that takes account of the prevailing internal macroeconomic environment rather than the dynamics of international undertones⁸⁴.

In another study, the researcher question whether monetary policy matter for agricultural sector performance in Nigeria. The aim of the study is to investigate the effects of monetary policy on agricultural sector performance in Nigeria. Time series data for five selected variables covering 1981 to 2016 were used for the analysis. The variable of interest include agriculture value added, real exchange rate, money supply, inflation and maximum lending rate. Data for these variables were sourced from the Central bank of Nigeria website and the World Bank website. The study employed the Autoregressive Distributed Lag (ARDL) methodology. The study employed the Autoregressive-Distributed Lag (ARDL) approach and established a long- run relationship between agriculture value added and some monetary policy variables. More specifically, the study found that in the long-run, money supply and maximum lending rate have significant effects on agriculture value added while exchange rate and inflation do not. According to the researcher , the implication of the result is that monetary policy plays a significant role in improving agricultural sector performance in Nigeria. The study therefore recommended that an expansionary but non-inflationary monetary policy to improve value addition to the agricultural sector of the Nigerian economy⁸⁵.

An empirical analysis of the impact of interest rate on agriculture in Nigeria was conducted to determine whether interest rate has a positive or negative relationship with agricultural output and to ascertain the significance of this relationship. Correlation analysis was carried out on the data covering the period of 1999 to 2016. The the result

of the analysis showed that interest rate had a strong significant negative relationship with agricultural sector activity. This according to the researcher is because interest rate and monetary policy is currently not the main tool used by the federal government to improve the agricultural sector. The study suggested that there should be a more favorable lending interest rates for farmers and industries to be used in sync with government spending in the agricultural sector as an effective way of improving its performance⁸⁶.

Scholars have also investigated the monetary policies and instruments used in promoting agricultural performance in Nigeria and how effective the policies have been in improving the agricultural sector performance. The study's main objective was to investigate the impact of monetary policies in determining the performance level of agriculture in Nigeria between 1986 to 2013. The technique of analysis employed in the study was the Ordinary Least Square (OLS) regression technique. The findings of the study revealed that there exist a relationship between monetary policy and agricultural sector performance in Nigeria with an increase in the budgetary allocation to agricultural sector, and the effective utilization of these allocated funds, an effective and prudent management of monetary policies with concessionary low interest rate to encourage investment in the sector all proffered as recommendations to improve the agricultural sector. It was therefore concluded that there exist a relationship between monetary policy and agricultural sector performance in Nigeria. Thus, it was recommended by the scholar that government should increase the budgetary allocation to agricultural sector in a consistent manner due of the primary and vital importance it plays in the national economy, hoping that with proper monitoring of fund, it would contribute more significantly to the economy of the country⁸⁷.

Similar study also investigated the effect of monetary policies on agricultural output in Nigeria between 1981 and 2016. The objectives of the study were to determine the effect of money supply on Nigeria's agricultural output, examine the effect of prime lending rate on Nigeria's agricultural output and determine the effect of deposit money bank loans and credit on Nigeria's agricultural output. The data for the study were sourced from Central Bank of Nigeria statistical bulletin and National bureau of statistics. The techniques employed in the study were the ADF test and the Ordinary Least Squares (OLS), co-integration and ECM methods. The study found that money supply and deposit money banks' credits to agriculture are important drivers of agricultural output while inflation rate contracted agricultural output during the period covered. It was further discovered that prime lending rate does not significantly influence the output of the agricultural sector. It was therefore concluded that the effectiveness of monetary policy in the agricultural sector is mirrored from the monetary aggregates and credit channels. The study then recommended that the Central Bank of Nigeria (CBN) should place more emphasis expansionary monetary policy framework with a view to increasing monetary aggregates to boost output in the agricultural sector⁸⁸.

In a related study, some scholars explored the role of macroeconomic policy on agricultural value chain in Nigeria. The study used time series data covering the period between 1980 and 2016. The data were obtained from the World Development Indicators. The study employed the autoregressive distributed lag (hereafter ARDL) bounds testing approach technique of analysis. The result of the study showed a long run a long-run equilibrium relationship was found among the variables used in the investigation. The result further showed that government expenditure and broad money supply were found to have significant positive impact on the agricultural value chain.

Energy was also found to also have a direct statistically significant impact on agricultural value chain. The study concluded that macroeconomic policy is critical to agricultural value chain in Nigeria. Based on the results, it is recommended that there should be an enabling macroeconomic policy framework, which gives emphasis to improved budgetary allocation to the agricultural sector, increases money supply, and promotes agencies that can directly impact the level of finance to agricultural value chain related businesses in Nigeria. Above all, electricity supply should be enhanced⁸⁹.

Similarly, another scholar examined the role of monetary policy in agricultural sector performance in Nigeria for the period 1970 to 2010. The study utilized time series data collected on annual basis between 1970 and 2010. The data for the study was obtained from the Central Bank of Nigeria Statistical Bulletin. The researcher in the study captured both monetary and non-monetary policy variables such as lending rate, commercial banks credit to agriculture, exchange rate, government expenditure in agriculture and inflation rate in examining the effect of monetary policy on agricultural output. The method of analysis employed for the study was the Auto- Regressive Distributed Lag (ARDL) Bound Testing Approach. The result from the study showed that exchange rate and government expenditure had positive and significant effect on agricultural output and, hence agricultural sector in Nigeria. It was recommended by the researcher that a sound exchange rate policy should be implemented aimed at boosting agricultural exports in Nigeria⁹⁰.

Agricultural financing is another area that researchers have explored, investigating how agro-financing impacts on food production in Nigeria which support the second goal of the 2030 Sustainable Development Goals (SDGs). This goal aims to “end hunger, achieve food security, improve nutrition, and promote sustainable agriculture”. The

study used data sourced from World Development Indicators (WDI) of the World Bank, Central Bank of Nigeria (CBN) Statistical Bulletin covering a period 1981–2018. The data were analyzed with respect to the objectives of the study using the Johansen and the Canonical Cointegration approaches. Findings from the study shows that agro-financing is statistically significant in explaining the level of food production in Nigeria. This result aligns with the expectations as it is expected that more agro-funding at low-interest rates motivates farmers to secure high-yield seedlings, machinery and other farm implements, organic inputs that positively impact on total agricultural yield, leading to more food production. Therefore, the study recommends that more funding be allocated to the agrarian sector with less stringent credit conditions, and more arable land be allotted for farming purposes amongst others⁹¹.

Similarly, other studies investigated the effect of commercial bank on real sector development in Nigeria over a period of 37 years (1981-2017). The study employed ADF unit root test, Johansen cointegration test and error correction model techniques in analyzing the data. The result showed that there exists a long-run relationship between the bank credit and Agricultural development in Nigeria. The study found that the ECM is negative and statistically significant at 5% level of significance. The study also found that commercial banks' credit to Agriculture and Agricultural credit guarantee scheme are positively related to Agricultural development while interest rate was found to be negatively related to Agricultural development in Nigeria. It was therefore concluded that commercial bank significantly affect Agricultural development in Nigeria and suggested that delay and stringent conditions in assessing commercial bank credit and facility should be completely eliminated⁹².

Being an area of particular interest to several scholars as a result of food challenges and prices in the economy, some researchers further investigated how agricultural financing

impacts the Nigerian economy. This was motivated by the importance of agricultural surplus for the structural transformation which accompany economic growth. The study employed secondary data and econometric techniques of Ordinary Least Square (OLS) of multiple regression estimates. The result of the model used suggests that the productivity of investment will be more appropriately financed with resources administered by the commercial and specialized financial institutions. In addition, there are an urgent and sincere needs to expand the credit size to the agricultural sector in order to enhance the productivity growth of the sector⁹³.

In relation to this, another study examined the bank credits and it's impact on agricultural output in Nigeria. This is as a result of inadequate capital which is considered as one of the major factors affecting Agricultural productivity in Nigeria and both previous and current governments in Nigeria do not seem to have harnessed properly availability of this capital to farmers and the institutions involved in its administration mostly the banking sector. The study employed Ordinary Least Square (OLS) and Error Correction Modeling (ECM) as the method of analysis from which it was discovered that that apart from Interest rate that has a negative but significant relationship, Banks' Credit to Agriculture (BCRA), Foreign Exchange Rate (FREX), Government Expenditure on Agriculture (GEXA) and Money Supply (MSPL) have a positive and significant relationship with Agricultural Gross Domestic Product (AGDP)⁹⁴.

The performance of agricultural sectors has also been examined with respect to its influence on the Nigerian economic growth. The study specifically investigated the causality between agricultural sector and economic growth, as well as the impact of the sector on the growth of the Nigerian domestic economy. The study carried out cointegration test, Vector Error Correction Model (VECM) and granger causality test

using the variables; real gross domestic product (RGDP), value of agricultural output (VAO), foreign private investment (FPI) and financial development (FD). From the analysis of the study, it was observed that the value of agricultural output (VAO) has positive and insignificant contribution to real GDP. It was further discovered that significant causality exist between the two variables, with causality running from agricultural output to RGDP. It therefore, implies that agricultural sector output contributed positively and insignificantly to the growth of Nigerian domestic economy⁹⁵.

Scholars have also examined the impact of monetary policy on agricultural sector performance in Nigeria, using annual data spanning the period 1981 to 2016. This is as a result of its key role in providing employment to about 60 % of the economically active population and 70% of the country's poorest communities and in addition having huge potential for achieving poverty reduction in Nigeria. The study employed the Autoregressive-Distributed Lag (ARDL) approach and established a long- run relationship between agriculture value added and some monetary policy variables. It was found that in the long-run, money supply and maximum lending rate have significant effects on agriculture value added while exchange rate and inflation do not⁹⁶.

Evidence from South Africa was also depicted in the study of monetary policy and agricultural sector outcomes, the objective of the study was to examine the linkages between monetary policy, stock prices, macroeconomy and the agricultural sector. Time series data from 1970 to 2011 were utilized and the estimation technique utilized was the Vector Error Correction Model (VECM). The result of the estimation carried out was that inflationary shocks and the money market rate have an enormous negative impact on the performance of the Agricultural GDP whereas, the manufacturing index and the stock market help to improve the agricultural GDP. The study concluded that it

is imperative for South Africa's monetary policy authority and agricultural sector policy makers as well participants to consider carefully the interaction between the macroeconomic environment, agricultural sector and stock prices⁹⁷.

In Kenya, it was observed that by monetary policy regulation results in a decline in demand for agricultural output. Based on this, a study then seek to analyze the impacts that the monetary policies have on the performance of agricultural sector in Kenya. The study used annual data covering the period of 1981 to 2019. Ordinary least square estimation technique was employed in the study to determine the relationship between monetary policy and agricultural domestic product. The monetary policy tools selected by the researcher were broad money supply (M2), Central Bank Rates (CBR), Cash Reserve Ratio (CRR) and Exchange Rate (ER). The result of the analysis showed that broad money supply has a positive influence on agricultural GDP while exchange rate displayed a negative impact on the performance agricultural sector. It was therefore concluded that the monetary policy instruments have an impact on the performance of agricultural sector in Kenya. It was then recommended that government should increase budgetary allocation to support the agricultural sector and that the monetary policy commission commitment to maintain exchange rate volatility are necessary to realize full potential of agricultural sector⁹⁸.

Despite the important role played by the monetary policy in influencing credits to the private sector in Eswatini, some scholars observed that there has been little study conducted on the effects of monetary policy on agricultural output. Based on this, the researchers proceeded to study the effect of monetary policy on agricultural output in Eswatini. The objective of the study was to examine whether there is a long-run relationship between monetary variables to the Eswatini's agricultural growth. Using annual data for the period starting from 1980 to 2016, the study employed the Vector

Error Correction model (VECM) technique of analysis. The study found that in the long run, agriculture GDP, exchange rate, interest rate, inflation, broad money supply, and agriculture credit have a negative effect on agriculture GDP in Eswatini. In the short run however, the study showed that the variation in agriculture GDP is largely significant caused by the lagged agricultural GDP, interest rate, exchange rate as well as inflation. The study concluded that lagged agriculture GDP, the exchange rate and interest rates are the main contributors to the variation in agriculture GDP. Based on the findings, the researcher recommended that programs aimed at availing affordable credit to farmers should be prioritized to cushion the agriculture sector against adverse monetary policy shocks in the short to medium term, specifically interest rates, to ensure continuous production⁹⁹.

2.4 Gaps in Literature.

The reviewed literature have attempted to show evidence of the impact of monetary policy on agricultural performance. Monetary policy have been shown to be a core variable in determining the level of agricultural output of a nation given the increasing role of government in the economy especially developing countries. However, studies which have been carried out in Nigeria are very few and generally based on output. It is therefore the aim of this study to contribute to the existing literature in Nigeria, using time series data by exploring the impact of monetary policy on agricultural performance in Nigeria between the periods of 1981 to 2020.

2.5 Theoretical Framework

The framework of this study will be based on the Solow's neoclassical growth theory. The Solow Growth Model is an exogenous model of economic growth that analyzes changes in the level of output in an economy over time as a result of changes in input which include the population growth rate, the savings rate, and the rate of technological

progress. Solow theory assumes full employment of both labour and capital. The fundamental methodology of the growth analysis commenced with the neoclassical Solow production function in the form of;

$$Y_t = f(K_t, A_t, L_t) \quad (2.1)$$

Where Y is the aggregate real output, K is the capital stock, L is the labour input, A is the production efficiency and t is the time dimension. Stating the model, using the Cobb-Douglas production function, it becomes;

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} \quad 0 < \alpha < 1 \quad (2.2)$$

In the work of Mankiw, Romer, and Weil, as well as and Aremo, the capital stock is divided into two components; human capital and physical capital¹⁰⁰. With the introduction of human capital into the model, a new version of the production is produced as;

$$Y_t = K_t^\beta H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad (2.3)$$

Where Y is the aggregate real output, K is the physical capital, H is the stock of human capital, L is the labour force and A is the level of technology. The component $(A_t L_t)$ implies effective labour.

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Chapter Three

Methodology

This chapter presents the methodology that will be used to achieve the research objectives. It presents the model specification, estimation techniques a priori expectation, definition and sources of data and variable measurement.

3.1 Model Specification

The model for this study is based on the theoretical framework above in order to study the relationship between monetary policy and agricultural performance. The baseline model for this study will be established from the equation 2.3 above.

If we log equation 2.3, it gives

$$\text{Log}(Y_t) = \alpha \log(K_t) + \beta \log(H_t) + (1-\alpha-\beta) \log A_t L_t \quad (3.1)$$

Log Y_t is the log of Gross Domestic Product.

Log K_t is the log of industrial output.

Log H_t is the log of human capital.

However, this study intend to build a single equation that would involve specifying a multiple regression equation to estimate the economic relationship between agricultural performance as the dependent variable, with Agriculture Gross Domestic Product (AGDP) as a proxy, and the independent variables which comprises of monetary policy variables (interest rate, Liquidity ratio, monetary policy rate and deposit money bank credit to agriculture).

From equation 2.4, log Y_t can be identically represented by log of agricultural GDP (LAGDP), and Log K_t can be represented by monetary policy (interest rate, Liquidity

ratio, monetary policy rate and deposit money bank credit to agriculture). The model can therefore be re-expressed as;

$$LAGDP = \alpha_0 + \alpha_1 LINT + \alpha_2 LLR + \alpha_3 LMPR + \alpha_4 LDMA \quad (3.2)$$

It is also important to note that there are other macroeconomic factors that influence the performance of the agricultural sector which include government expenditures and inflation. Integrating these, into the model and expressing it statistically, the baseline model can therefore be expressed as;

$$LAGDP = \alpha_0 + \alpha_1 LINT + \alpha_2 LLR + \alpha_3 LMPR + \alpha_4 LDMA + \alpha_5 LGE + \alpha_6 LINF + \varepsilon_t \quad (3.3)$$

Where,

LAGDP is the log of agricultural contribution to GDP

LINT is the log of interest rate

LLR is the log of liquidity ratio

LMPR is the log of monetary policy rate

LDMA is the log of deposit money bank credit to agriculture

LGE is the log of government expenditure

LINF is the log of inflation

α_0 is the intercept

α_{1-6} are the coefficient of the independent variables

ε is the error term

3.1.1 Model of the Asymmetric (Non-Linear Relationship) Effects of Monetary policy on Agricultural Performance in Nigeria.

To capture the asymmetric (non-linear relationship) effect of monetary policy on

agricultural performance in Nigeria, the study adapts the asymmetric ARDL of Shin, Yu and Greenwood which was derived from the expansion of the linear ARDL¹.

Following the works of these scholars, the non-linear long run equation is specified as

$$agdp_t = \alpha_0 + \alpha_1 mic_t^+ + \alpha_2 mic_t^- + \alpha_3 llr_t + \alpha_4 lmpr_t + \alpha_5 lge_t + \alpha_6 ldma_t + \alpha_7 linf_t + \alpha_8 lint_t + \mu_t \quad (3.4)$$

Where mic_t is a vector of int , mpr and lr with each being a $k \times 1$ vector of regressors.

Given that mic_t is defined to be a random walk, such that:

$$mic_t = mic_{t-1} + \mu_t, \quad \mu_t \sim N(0, \sigma_\mu^2) \quad (3.5)$$

The above data generating process may be re-written as follows after recursive substitution;

$$mic_t = mi_0 + \sum_{j=1}^t \mu_j, \quad t=1, \dots, \quad (3.6)$$

Assuming zero threshold, the error term can be partitioned as;

$$\mu_t = \mu_t^+ + \mu_t^- \quad (3.7)$$

Taking partial sum yield;

$$\sum_{j=1}^t \mu_j = \sum_{j=1}^t \mu_j^+ - \sum_{j=1}^t \mu_j^- \quad (3.8)$$

From the foregoing, the following expression follows:

$$\mu_j^+ = \Delta mic_j^+ \text{ and } \mu_j^- = \Delta \mu_j^- \quad (3.9)$$

μ_t^+ and μ_t^- are partial sums of the positive and negative changes in msg_t .

Thus, μ_t which is a $k \times 1$ vector of regressors is defined as;

$$int_t = int_t + int_t^+ + int_t^- \quad (3.10)$$

When equation 3.2 is linked to the symmetric ARDL of Shin, Yu, and Greenwood, the

following non-linear variant of the unrestricted ECM is obtained;

$$\begin{aligned} \Delta agdp_t = & \alpha_0 + \rho agdp_{t-1} + \alpha_1 mic_{t-1}^+ + \alpha_2 mic_{t-1}^- + \sum_{j=1}^{\rho-1} \theta_j \Delta agdp_{t-1} + \\ & \sum_{j=0}^{q-1} \pi_j^+ \Delta int_{t-j}^+ + \sum_{j=0}^{q-1} \pi_j^- \Delta int_{t-j}^- + \mu_t \end{aligned} \quad (3.11)$$

Where $\alpha_1 = -\rho\beta^+$ and $\alpha_2 = -\rho\beta^-$ and θ_j is the autoregressive parameter; π_j^+ and π_j^- are the symmetric distributed lag parameters; μ_t is the stochastic error term that is independently and identically distributed with zero mean and constant variance.

Equation (3.13) may be re-written as;

$$\begin{aligned} \Delta agdp_t = & \alpha_0 + \rho agdp_{t-1} + \alpha_1 mic_{t-1}^+ + \alpha_2 mic_{t-1}^- + \sum_{j=1}^{p-1} \theta_j \Delta agdp_{t-1} + \\ & \sum_{j=0}^{q-1} (\pi_j^+ \Delta mic_{t-j}^+ + \pi_j^- \Delta mic_{t-j}^-) + \mu_t \end{aligned} \quad (3.12)$$

The restricted ECM may be written as;

$$\Delta agdp_t = \kappa_1 ecm_{t-1} + \sum_{j=1}^{p-1} \theta_j \Delta agdp_{t-1} + \sum_{j=0}^{q-1} (\pi_j^+ \Delta mic_{t-j}^+ + \pi_j^- \Delta mic_{t-j}^-) + \mu_t \quad (3.13)$$

3.1.2 Model for the Investigation of the Response of Agricultural Performance to Shocks in Monetary policy.

To achieve this second objective, the study adapts the unrestricted vector autoregressive (VAR) approach developed by Sims in estimating five-variable VAR models using $agdp_t, int_t, lr_t, mpr_t, ge_t, inf_t, dma_t$ to provide an empirical insight on the response of agricultural performance to shocks in monetary policy in Nigeria². The model is stated as:

$$X_t = u + A_1 X_{t-1} + \dots + A_p X_{t-p} + u_t \quad (3.4)$$

Where X_t is an 6×1 vector matrix incorporating

$agdp_t, int_t, lr_t, mpr_t, ge_t, inf_t, dma_t$ as variables; A is a matrix polynomial for the lag operator of considered variables; and u_t is a vector of un-estimated shocks for each of the oil revenue and other controlling variables and it is assumed to be serially uncorrelated structural disturbance for $\text{Var}(u_t) = \Omega$. where Ω is a diagonal matrix, so the structural disturbances are assumed to be mutually uncorrelated.

3.2 Estimation Procedure

In order to achieve the objectives of this study using the specified model, the variables will be subjected to the test of stationarity using the Augmented Dickey-Fuller test which uses non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms.

The co-integration test by Johansen will be then employed to test for the presence of a long-run relationship between the dependent variable and the independent variables. In this test type, the numbers of co-integrating relations will be ascertained via the trace statistics and maximum Eigen statistics. In order to empirically analyse the non-linear long-run relationships and short run dynamic interrelationship among the variables of interest (agriculture expenditure as a ratio of GDP, monetary policy rate, lending interest rate, liquidity ratio, deposit money bank credit to agriculture as a ratio of GDP, government expenditure as a ratio of GDP, and inflation rates), we will apply the linear and non-linear autoregressive distributed lag (ARDL) cointegration technique and Once the long-term relationship has been established, an Error Correction Model (ECM) that captures both the long-run and short-run dynamics will be estimated by the analysis. The ECM's option is to allow it accounts for both the short-run and long-run explanatory power of the regressors, as well as deciding the dynamics of achieving long-run equilibrium. Two econometric method will be applied impulse response function (IRF) and variance decomposition analysis (VDA) to examine the response of

agricultural performance to shocks in monetary policy in Nigeria among the variables of interest.

3.3 Data Requirement and Sources

For this study, time series (annual) data on inflation , cash reserve ratio, interest rate, liquidity ratio, government expenditure and deposit money bank credit to agriculture, were obtained from the CBN Statistical Bulletin and the World Bank World Development Indicators³.

3.4 Apriori Expectation

Variable	sign
INT	-
LR	-
DMA	+
MPR	+
GE	+
INF	-

The apriori expectation for this study is based on the general believe in economics theories and in the review of literature. Negative relationship is expected between Interest rate, Liquidity ratio, Inflation rate and Agricultural performance in Nigeria while Positive relationship is expected between Monetary Policy rate, Deposit money bank credit to Agriculture, government expenditure and Agricultural performance in Nigeria.

Endnotes

¹ Shin, Yongcheol, and Matthew Greenwood-nimmo. “*Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework*” (2004), 44(0): 1–44.

² C. A. Sims, (1980b), *Comparison of Interwar and Postwar Business Cycles: Monetarism Reconsidered*, **American Economic Review** 70 (2), 250–257

³ <https://www.cbn.gov.ng/rates/mnycredit.asp>

Chapter Four

Results and Discussion of Findings

The empirical results of the study are discussed in this chapter. The sub-sections are presented in three parts, where the first sub-section discussed the result of the descriptive statistics analysis while the second sub-section addresses the empirical results according to the stated objectives while the last sub-section presents the summary of findings. The discussion of results started with descriptive analysis and summary statistics, which provided trend analysis of basic indicators of monetary policy and agricultural performance in Nigeria. The chapter also provided some diagnostic tests using some test statistics in order to ensure that the estimated results are reliable for meaningful inferences.

4.1 Data Presentation

The data used for analyzing the relationship between monetary policy and agricultural performance in Nigeria is presented in Appendix 1 (see Appendix section).

4.2 Preliminary Analysis

4.2.1 Descriptive, Trend and Correlation Analysis

The preliminary analysis on descriptive statistics, trend and correlation analysis of our intended variables for empirical analysis based on formulated hypotheses are presented in this section. This section provides findings on the trend and pattern of monetary policy and agricultural performance in Nigeria. Charts and tables were employed for the presentation of these results. Also, the interval growth rate of monetary policy and agricultural performance in Nigeria were computed in respect of successive political

dispensation as parts of findings to trend and patterns of the variables under study.

The descriptive statistics of agriculture expenditure as a ratio of GDP (agdp), monetary policy indicators monetary policy rate (mpr), lending interest rate (int), liquidity ratio (lr), deposit money bank credit to agriculture as a ratio of GDP (dma), and other controlling variables, government expenditure as a ratio of GDP (ge), and inflation rates (inf) between the year 1981 and 2021 are presented in Table 4.1. The summary statistic of the variables in the table shows that the average of agriculture contribution to GDP stood at 22.87%. This implies that the actual economic activities of the agricultural sector have increased and consequently improvement in income generation has also been recorded over the years as it grows at an average of 22.87%. This is also evident that the average monetary policy rate of 13% has grown from minimum value of 6% to maximum value 26%. The average annual lending interest rate of 17.45% showed that it has a maximum rate of 31.65% and a minimum of 8.92% in Nigeria. Additionally, the interval growth rates of monetary policy rate and lending interest rate of 1.6% and 0.62% from 1981 to 2021 respectively show low growth rates which has influenced the interval growth of agriculture expenditure to GDP at 1.59% indicates that the two monetary policy variables have been the major contributors to improved agricultural productivity in Nigeria (see Table 4.2).

Table 4.1: Descriptive Statistics

Variables	Measurements	Mean	Std. Dev.	Max.	Min.	Kurtosis	Skewness	Jarque-Bera	Prob.
<i>agdp</i>	Agriculture Expenditure (% of GDP)	22.866	4.589	36.965	12.240	4.741	0.450	6.564	0.038
<i>mpr</i>	Monetary Policy Rate (%)	13	3.959	26	6	4.543	0.734	7.751	0.021
<i>int</i>	Lending interest rate(%)	17.446	4.811	31.65	8.917	3.646	0.319	1.409	0.494
<i>lr</i>	Liquidity Ratio	49.067	14.668	104.20	26.393	6.402	1.465	34.429	0.000
<i>dma</i>	Deposit Money Bank Credit to Agriculture (% of GDP)	0.593	0.223	1.0040	0.163	2.189	0.114	1.212	0.546
<i>ge</i>	Government Expenditure (% of GDP)	8.408	2.532	17.286	5.089	5.872	1.533	30.145	0.000
<i>inf</i>	Inflation, consumer prices (annual %)	18.949	16.659	72.836	5.388	5.307	1.854	32.581	0.000

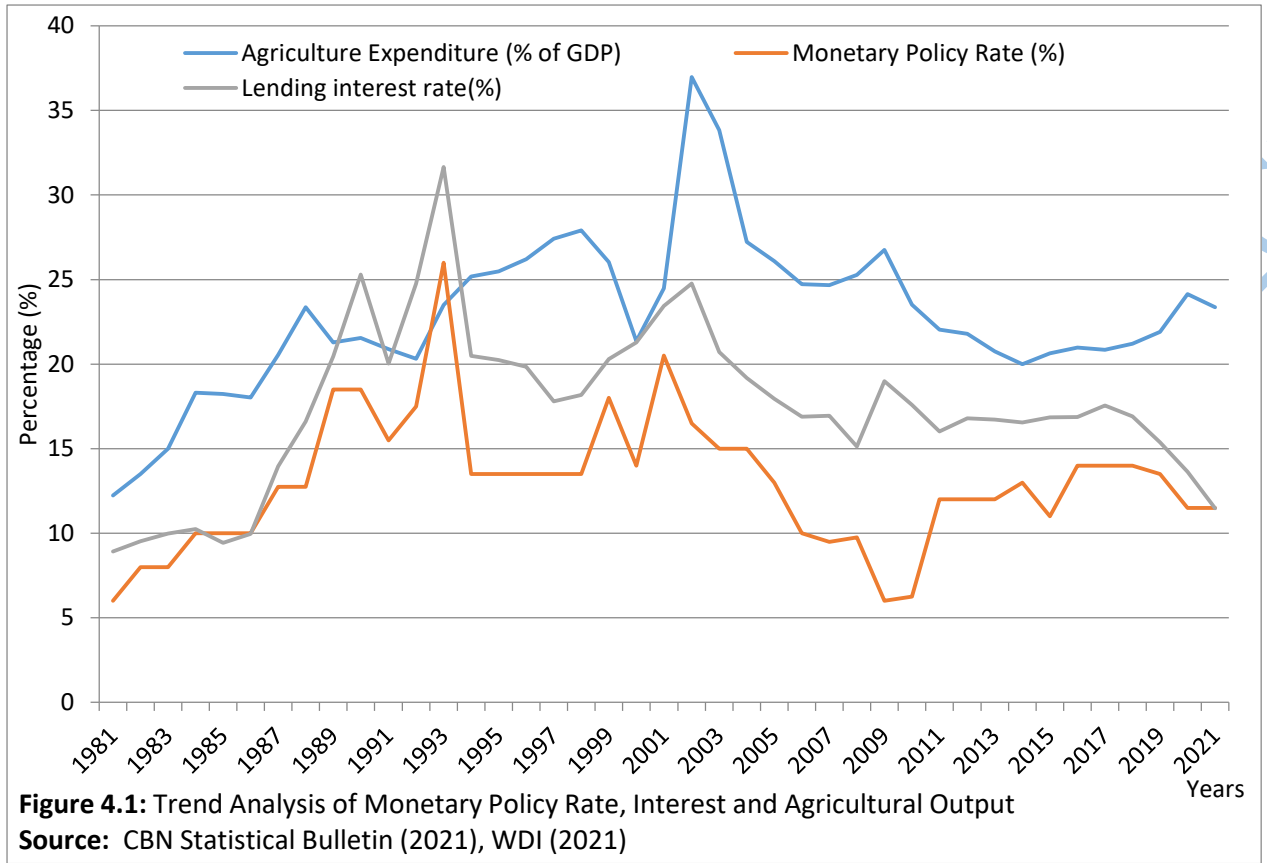
Note: Std. Dev. – standard deviation; Max. – maximum; Min. – minimum; Prob. – probability.

Source: Author's computation.

As for liquidity ratio and deposit money bank credit to agriculture sector as a ratio of GDP were 49.067 and 0.59% respectively. The maximum and minimum values of liquidity ratio were 104.2 and 26.393 whereas that of deposit money bank credit to agriculture sector as a ratio of GDP were 1.00% and 0.163% correspondingly. Concerning other co-founding factors, the mean of government expenditure as a ratio of GDP and inflation rate were 8.41% and 18.95% respectively. Meanwhile, their respective maximum values are 17.29% and 5.39%, whereas the minimum values are 5.87% and 5.31% respectively. Also, the standard deviation of the variables is low in relations to their mean values. More so, all the variables are positively skewed, implying rightward skewed variables.

Of all the variables, the kurtosis showed that average of deposit money bank credit to agriculture sector as a ratio of GDP is less than three, indicating a platykurtic form of distribution, while other variables agriculture expenditure as a ratio of GDP, monetary policy rate, lending interest rate, liquidity ratio, government expenditure as a ratio of GDP (ge), and inflation rates were higher than three and they displayed leptokurtic form in distribution. Thus, this means that all of the variables are not normally distributed. More so, the Jarque-Bera statistics revealed that five variables are significant at 0.05 critical values while others are not. The implication is that there is presence of outliers in the values of some variables, indicating some level of asymmetry and discreteness in the data sets.

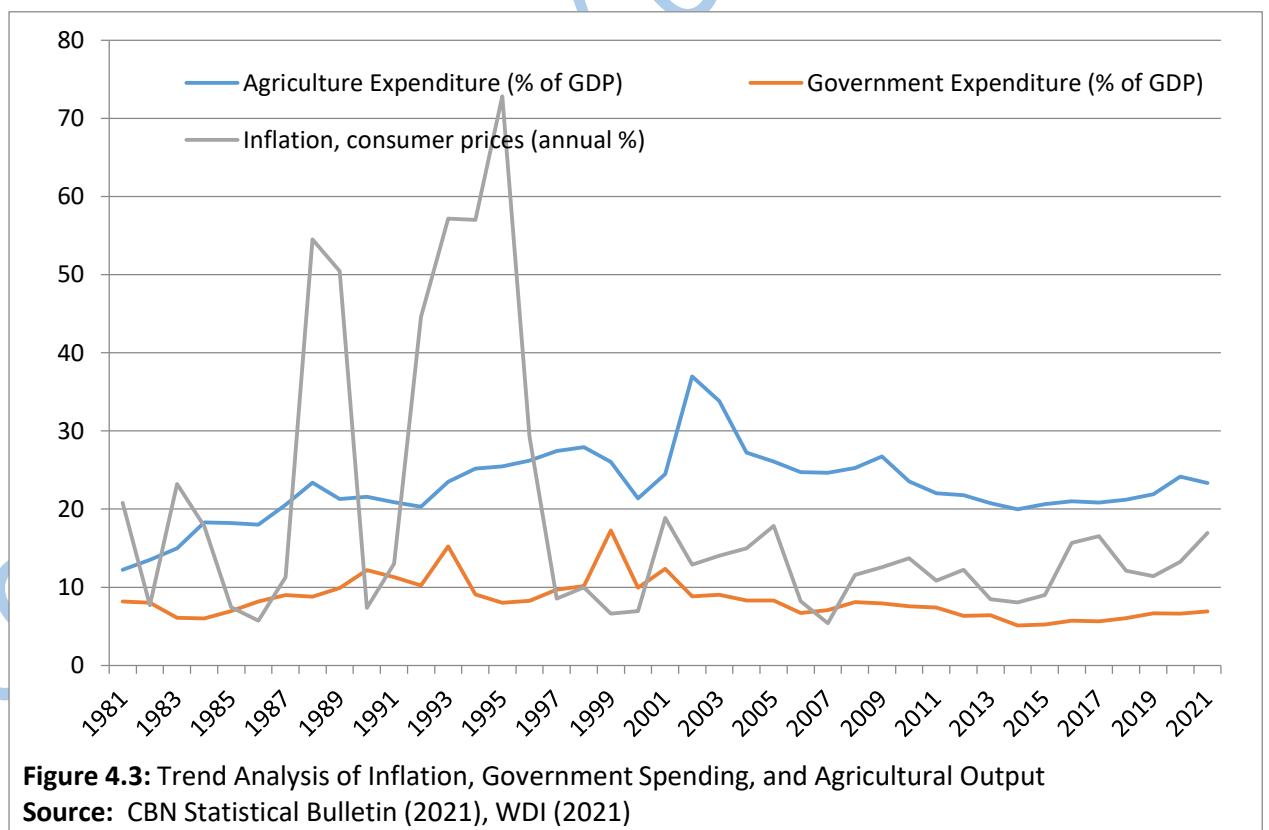
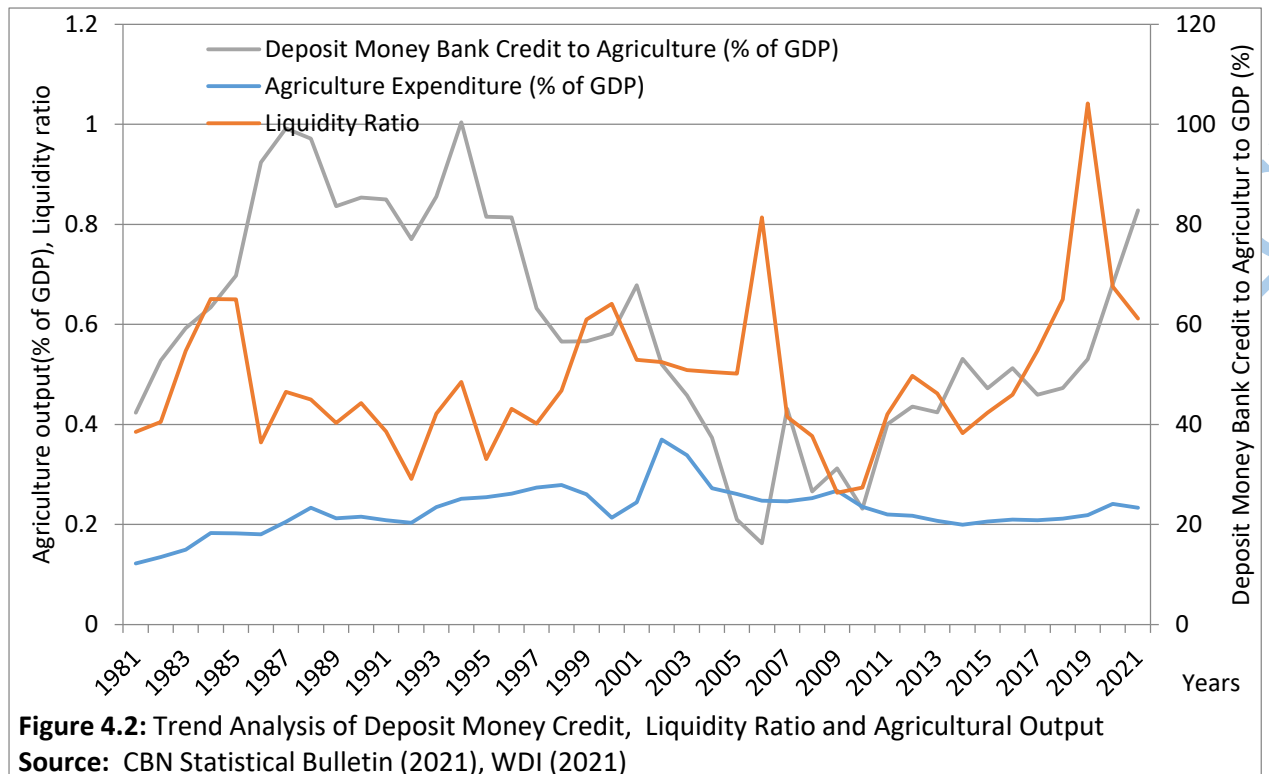
Figure 4.1 shows the trend analysis of agricultural output to GDP, monetary policy rate and lending interest rate in Nigeria between the year 1981-2021. The figure above shows that the agricultural output to GDP slopes upward from 12.24% in 1981 to 23.37% in 1988, fall to 20.32% in 1992, later, rises to 27.91% 1998 and also deep to 21.27% in 2000. During the beginning of the fourth republic under the President Olusegun Obasanjo, the agriculture sector experienced a tremendous growth as its output to GDP peaked at 36.97% in 2002. Afterwards, the contribution of the sector's output to GDP dropped to 19.99% in 2014, and starts to grow for the remaining periods. As to the monetary policy rate and lending interest rate, their series flow approximately in the same direction for the whole periods. This is due to the fact that the lending interest rate is determined by the minimum rediscount and monetary policy rate set by the monetary policy committees. The highest rate was at 26% and 31.65% in 1993 for monetary policy rate and lending interest rate. Overall, the rate flows in a zigzag manner throughout the whole periods.



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Figure 4.2 reveals the trend analysis of liquidity ratio, deposit money bank credit to agriculture to GDP and agricultural performance in Nigeria between 1981 and 2021. In the beginning of the periods, deposit money bank credit to agriculture to GDP moves upwards to 0.99% in 1987, dragged and deepened to 0.77% in 1992, but grew to 1.004% in 1994. After that, the series falls for the subsequent periods to 0.16% in 2006, later rose to 0.43% in 2007. It then drops to 0.23% in 2010 and grows drastically for the remaining periods to 0.83% in 2021. Concerning the liquidity ratio, the series fluctuates through the periods, and it peaked at 65.1% in 1984, 64.1% in 2000, 81.42%, and 104.2% in 2019.

Figure 4.3 shows the trend plot of the Nigerian inflation, government expenditure to GDP, and agricultural output to GDP. The macroeconomic variables behaviours were observed to follow different patterns, where the annual percentage growth of government spending to GDP grew from 8.19% in 1981 to 12.18% in 1990, 15.2% in 1993, and 17.29% in 1999. Subsequently, the series slopes steeply downwardly for the remaining periods. Also, inflation rate were noticed to be lower in percentage change (7.4353) in 1985 through 1986 and 1987 with percentage change value of 5.7171 and 11.2903 respectively until 1988 that an acute rise were experienced followed by the highest rate of 72.8355 per cent ever recorded in the history of the Nigerian economic performance. Nonetheless, the consistent growth in government spending has taken the lead over other variables of agricultural performance in Nigeria.



Also, the interval growth of the Nigerian economy measured using the adopted macroeconomic variables as reported in Table 4.2 in which the year intervals represents

each political dispensation which is further broken down as follows; the civilian government era that spill over to 1981 through 1983 headed by Shehu Usman Aliyu Shagari; followed by military regime of Major General Muhammadu Buhari between 1983 and 1985, another military era by General Ibrahim Badamasi Babangida from 1985 to 1993 and late General Sani Abacha (1994–1998), Olusegun Obasanjo (1999–2007), late President Yardua and President Goodluck Jonathan (2007–2015) and Buhari administration (2015–2021). The table revealed that the agriculture expenditure to GDP grew at an average rate of 1.59% between 1981 and 2021. A negative growth rate was recorded against agriculture expenditure to GDP during the fourth republic of President Olusegun Obasanjo (-0.6%) 1997–2007 and Late President Yardua and President Goodluck Jonathan (-1.96%) 2007–2015. Also, the interval growth rate of monetary policy rate was negative during the administration of President Olusegun Obasanjo (-6.85%) 1999-2007, whereas that of lending interest rate was negative during the administration of President Olusegun Obasanjo (-2.35%) 1997–2007 and Late President Yardua, President Goodluck Jonathan (-0.06%) 2007–2015, and President Buhari (-5.33%) 2015-2022. As to lending interest rates, a negative interval rates was recorded during the following periods 1983–1985, 1994–1998, 1999–2007, 2007–2015, and 2015–2021, at -1.85%, -2.35%, -1.99%, -0.06%, and -5.33% respectively. Liquidity ratio has its interval rate at negative during the administration of General Ibrahim Babangida (-4.69%), General Sani Abacha (-0.71%), and President Olusegun Obasanjo (-4.18%).

Table 4.2: Interval Growth of Monetary Policy and Agriculture Performance (1981-2021)

Variables	1981-1983	1983-1985	1985-1993	1994-1998	1999-2007	2007-2015	2015-2021	Average 1981-2021
Agriculture Expenditure (% of GDP)	6.99	6.73	2.86	2.08	-0.60	-1.96	1.79	1.59
Monetary Policy Rate (%)	10.06	7.72	11.20	0.00	-6.85	1.64	0.64	1.60
Lending interest rate(%)	3.82	-1.85	14.40	-2.35	-1.99	-0.06	-5.33	0.62
Liquidity Ratio	12.42	5.92	-4.69	-0.71	-4.18	0.21	5.40	1.14
Deposit Money Bank Credit to Agriculture (% of GDP)	11.80	5.60	2.29	-10.84	-2.98	1.01	8.36	1.65
Government Expenditure (% of GDP)	-9.51	4.58	9.11	2.19	-9.46	-3.27	4.02	-0.42
Inflation (annual %)	3.70	-31.58	25.44	-29.41	-2.26	5.88	9.45	-0.50

Note: The computation is based on the emergence of different government dispensation in Nigeria within the periods of 1981 and 2021.

Source: Author's computation.

Within the intervals of 1994 and 1998, deposit money bank credit to agriculture showed -10.84% of GDP while in 1999–2007, it accounted for -2.98% respectively, the average interval growth rate of deposit money bank credit to agriculture to GDP from 1981 to 2021 is 1.65%. The government expenditure to GDP has shown a negative growth rate of -9.51% between 1983 and 1985, -9.46% within 1999–2007, -3.27% within 2007–2015, and the overall average from 1981 to 2021 is -0.42%. The average inflation growth rate between 1981 and 2021 is -0.5%, the period of 1983 to 1985 also revealed a negative inflation growth of -31.58%, 1994–1998 showed -29.41% and 1999–2007 showed -3.27%. General Ibrahim Babangida regime of 1985–1993 recorded highest inflation growth rate of 25.44%. The table further showed that inflation growth rate is gradually gathering momentum as revealed in 2007–2015 (5.88%) and 2015–2021 (9.45%).

The correlation analysis presenting the level of association between monetary policy variables and agricultural performance for the empirical analysis between 1981 and 2022 is reported in Table 4.3. The magnitude of the various relationships of the economic performance and overall behaviour of monetary policy variables are moderate but none of them is up to 0.8. Monetary policy indices have positive correlation with agricultural performance except deposit money bank credit to agriculture to GDP which has negative coefficient. Similarly, the level of associations between the variables of agricultural performance was reported in the table. Summarily, the correlation values suggest the absence of perfect multicollinearity among the predictive variables, as positive and negative relationships were reported among the variables of interest in varying magnitudes and signs.

Table 4.3: Correlation Matrix

	<i>agdp</i>	<i>mpr</i>	<i>int</i>	<i>lr</i>	<i>dma</i>	<i>ge</i>	<i>inf</i>
<i>agdp</i>	1						
<i>mpr</i>	0.3339	1					
<i>int</i>	0.5640	0.7988	1				
<i>lr</i>	0.0211	0.0653	-0.1897	1			
<i>dma</i>	-0.1369	0.4166	0.1411	-0.1015	1		
<i>ge</i>	0.2509	0.6665	0.6101	-0.1433	0.3501	1	
<i>inf</i>	0.0510	0.3608	0.3744	-0.2540	0.5088	0.2224	1

Note: *agdp* - agriculture output to GDP; *mpr* - monetary policy rate; *int* - interest rate; *lr* – liquidity ratio; *dma* - deposit money bank credit to agriculture; *ge* – government expenditure; *inf* - Inflation rate.

Source: Author's computation.

4.2.2 Unit Root Test

This test is necessary to examine the stationarity level of individual variables. It indicates whether the variables are stationary or non-stationary. Shocks in stationary time series will be temporary and its effects over time eliminated as the series revert to their long run mean values. Meanwhile, non-stationary time series contain permanent components of shocks and its means and variances depend on time. In this current study the conventional Augmented Dickey-Fuller unit root test was employed to carry out the test and the result is reported in Table 4.4.

The ARDL bounds test is based on the assumption that the variables are $I(0)$ or $I(1)$. So, before applying this test, we determine the order of integration of all variables using the unit root tests. The objective is to ensure that the variables are not $I(2)$ so as to avoid spurious results. The ADF unit root tests under the conventional methods revealed the following decision on stationary level of variables of interest at varying significant levels for monetary policy rate, liquidity ratio and inflation rate which were found to reject the null hypothesis “not stationary at level” at 5% McKinnon significance levels. It shows that monetary policy rate, liquidity ratio and inflation rate stationary and integrated of order zero. However, the time series variable of agricultural performance, interest rate, deposit money bank credit to agriculture, and government expenditure were found not to reject the null hypothesis “unit root at level” but reject the null hypothesis of “unit root at first difference” at 5% significance level. This indicates that at first difference, the time series agricultural performance, interest rate, deposit money bank credit to agriculture, and government expenditure were stationary at first difference and integrated of order one.

Table 4.4: Conventional Unit Root Test for the time series data, 1981 - 2021

Variables	Level	First Difference	I(d)
	ADF	ADF	
<i>agdp</i>	-2.5686(3)[-3.6156]	-6.9636(1)[-3.6156]***	I(1)
<i>mpr</i>	-3.3346(0)[-2.9369]**	-	I(0)
<i>int</i>	-2.3074(0)[-3.6056]	-6.8439(0)[-3.6105]***	I(1)
<i>lr</i>	-3.5639(0)[-2.9369]**	-	I(0)
<i>dma</i>	-1.4900(0)[-3.6056]	-6.0883(0)[-3.6105]***	I(1)
<i>ge</i>	-1.8646(1)[-3.6105]	-10.1222(0)[-3.6105]***	I(0)
<i>inf</i>	-4.1023(1)[-3.5298]**	-	I(0)

Note: *** significant at 1%; ** significant at 5%; Calculated at trend and intercept and lag lengths selected automatically using the Schwarz Info Criterion. *agdp* - agriculture output to GDP; *mpr* - monetary policy rate; *int* - interest rate; *lr* – liquidity ratio; *dma* - deposit money bank credit to agriculture; *ge* – government expenditure; *inf* - Inflation rate.. see results in appendix for details

Source: Author's computation.

4.2.3 Empirical Results of the Asymmetric Effect of Monetary Policy on Agricultural Performance

The discussion in this subsection answers the first hypothesis that there is no asymmetric relationship between monetary policy and agricultural performance in Nigeria. As part of the preliminary analysis, trend analysis, descriptive statistics and unit root test were used to test the properties and profiles of monetary policy indicators as well as agricultural performance in Nigeria. The trend relationship among the variables is not clear enough to indicate whether it is positive or negative. Thus, there is the need for empirical analysis with more appropriate econometrics tools owing the fact that the directions of the variables can best be described as inconclusive.

In order to empirically analyse the non-linear long-run relationships and short run dynamic interrelationship among the variables of interest (agriculture expenditure as a ratio of GDP, monetary policy rate, lending interest rate, liquidity ratio, deposit money bank credit to agriculture as a ratio of GDP, government expenditure as a ratio of GDP, and inflation rates), we apply the linear and non-linear autoregressive distributed lag (ARDL) cointegration technique. The symmetric ARDL has the following three attributes which are: (a) series are integrated of order 0, that is, stationary in level (this requires no differencing), (b) series are integrated of order 1 that is, stationary after first difference, (c) series are integrated of different orders that is, having a combination of I(0) and I(1) series.

Table 4.5: Symmetric Cointegration Test Results using ARDL Bound Test

Models	AIC Lags	Functions						F-statistics	Decision
ARDL Model (1, 3, 2, 3, 1, 3, 3)	2	$F_{agdp}(agdp mpr, int, lr, dma, ge, inf)$						3.2279	No Cointegration
Significance Level		1%		5%		10%			
Upper and Lower Bounds		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)		
Critical bound values		1.99	2.94	2.27	3.28	2.88	3.99		

Note: ***, ** and * denote rejection of null hypothesis at 1%, 5% and 10% significance levels respectively). agdp - agriculture output to GDP; mpr - monetary policy rate; int - interest rate; lr - liquidity ratio; dma - deposit money bank credit to agriculture; ge - government expenditure; inf - Inflation rate. [see] results in appendix for details.

Source: Author's computation (2022).

Table 4.6: Asymmetric Cointegration Test Results using NARDL Bound Test

Models	AIC Lags	Functions						F-statistics	Decision
ARDL Model (2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1)	2	$F_{agdp}(agdp mpr^+, mpr^-, int^+, int^-, lr^+, lr^-, dma^+, dma^-, ge, inf)$						8.7856	No Cointegration
Significance Level		1%		5%		10%			
Upper and Lower Bounds		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)		
Critical bound values		2.41	3.61	1.98	3.04	1.76	2.77		

Note: ***, ** and * denote rejection of null hypothesis at 1%, 5% and 10% significance levels respectively). agdp - agriculture output to GDP; mpr - monetary policy rate; int - interest rate; lr - liquidity ratio; dma - deposit money bank credit to agriculture; ge - government expenditure; inf - Inflation rate. [see] results in appendix for details.

Source: Author's computation (2022).

The study checks the appropriateness of the ARDL cointegration approach for this analysis due to the following advantages it has over previous and traditional cointegration methods. The first is that the ARDL does not require that all variables under study be integrated in the same order, and it can be used when the subordinate variables are integrated in order one, order zero, or fractionally integrated. The ARDL test is also relatively more efficient in the case of small and finite sample data sizes. The third advantage of using the ARDL technique is that we get unbiased estimates of the long-run model. Table 4.5, on the other hand, shows the F-statistics estimates for testing the existence of a long-run relationship between monetary policy and agricultural performance. At 5% significance level, the estimated F-statistics of the normalized equations were found to be greater than the lower but less than the upper critical bound. It means that the null hypothesis of no long-run relationship is not rejected at the 5% level of significance. This suggests that the symmetric cointegration is inconclusive.

Table 4.6 also shows the asymmetric long-run cointegration among the regressors and regressand. The Akaike Information Criterion is used to select the appropriate lag structure of the NARDL framework (AIC). The table results show that the asymmetric bound F-statistics values in Nigeria exceed the upper bound values at 5% critical levels for the asymmetric relationship between monetary policy and agricultural performance. As a result, we reject the null hypothesis and conclude that the variables have a non-linear long-run equilibrium cointegration relationship at the conventional level. Furthermore, the NARDL bound results support an asymmetric long-run relationship between Nigerian monetary policy and agricultural performance. Since the above submission indicated that the variables have non-linear cointegration, the non-linear short-run and long-run estimates using the NARDL estimator are shown in Tables 4.7a

and 4.7b.

Table 4.7a: Short-run Estimates of Average Agricultural Performance in Nigeria

NARDL Error Correction Regression				
Dependent Variable: D(AGDP)				
Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1)				
Sample: 1981 2921				
Included observations: 38				
ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGDP(-1))	0.713821	0.052192	13.67677	0.0000
D(MPR ⁺)	0.672814	0.104117	6.462090	0.0007
D(MPR ⁺ (-1))	0.726350	0.115833	6.270670	0.0008
D(MPR ⁻)	-0.822311	0.125115	-6.572463	0.0006
D(MPR ⁻ (-1))	1.915841	0.138056	13.87725	0.0000
D(INT ⁺)	-0.226530	0.143623	-1.577259	0.1658
D(INT ⁺ (-1))	2.183414	0.163494	13.35472	0.0000
D(INT ⁻)	-0.170143	0.168304	-1.010922	0.3511
D(INT ⁻ (-1))	-1.957567	0.154804	-12.64547	0.0000
D(LR ⁺)	0.051626	0.016108	3.204996	0.0185
D(LR ⁺ (-1))	0.154141	0.022753	6.774576	0.0005
D(LR ⁻)	-0.115288	0.034524	-3.339315	0.0156
D(LR ⁻ (-1))	-0.338508	0.026917	-12.57578	0.0000
D(DMA ⁺)	-5.838382	3.911401	-1.492657	0.1861
D(DMA ⁺ (-1))	-42.79661	3.994970	-10.71262	0.0000
D(DMA ⁻)	-22.42302	2.564404	-8.743950	0.0001
D(DMA ⁻ (-1))	-26.01512	3.339829	-7.789358	0.0002
D(GE)	0.653633	0.091524	7.141687	0.0004
D(GE(-1))	-1.040338	0.095204	-10.92746	0.0000
D(INF)	-0.092715	0.011777	-7.872480	0.0002
ECT(-1)	-0.716613	0.070393	-10.18917	0.0000
R-squared	0.876291	F-Statistics(Prob.)		14.294(0.0015)
Adjusted R-squared	0.848398	Durbin-Watson stat		2.008899
Diagnostic Tests				
Serial Correlation	2.1847(0.2284)	Heteroskedasticity test		0.8751(0.6385)
Normality Test	1.9424(0.3786)	Ramsey RESET Test		2.3291(0.0803)

[see] results in appendix for details

Note: ***,**&* denotes rejection of the hypothesis at the 0.01, 0.05 and 0.1 level respectively.

Source: Author's computation (2022).

Thus, this answers the null hypothesis which state that monetary policy does not have asymmetric significant impact on agricultural performance in Nigeria between 1981 and 2021. The error correction mechanism that measure the speed or degree of adjustment are reported in the short-run estimation results in Table 4.7a. It is the rate of adjustment at which the dependent variable changes due to changes in the independent variables. The ARDL test automatically choose the lag length on all variables as the model was set at two to ensure sufficient degree of the freedom based on automatic selection of Akaike Information Criterion (AIC). The coefficients of the error correction term (ECT) were found to be negative and statistically significant for the models of average agriculture performance. Correspondingly, the ECT values implied that the models correct its short-run disequilibrium by 71.66% speed of adjustment in order to return to the long run equilibrium.

In Table 4.7a, the short run estimate revealed that the lag one of agriculture output to GDP positively drive agricultural productivity in Nigeria. Concerning the monetary policy determinants of agricultural performance, the positive change of monetary policy rate at current and lag 1 directly and significantly impacted short run agricultural performance. When monetary policy rate witnessed a negative change, its current and lag one coefficient indirectly and directly influenced agricultural performance. This shows that the positive changes of monetary policy rate have higher influence on agricultural performance than the negative change in monetary policy rate. As to lending interest rate, its positive and negative change at lag one have positive and negative impact on agricultural performance in the short run. The study showed that agricultural performance is directly influenced by positive changes in liquidity ratio and indirectly affected by the negative changes in liquidity ratio at 5% significance level. Concerning deposit money bank credit to agriculture, all the coefficients for positive

and negative changes are negative and statistically significant at 5% except its current positive change which is insignificant. The current government expenditure has a direct and significant impact on agricultural performance but its lag one adversely impacted agricultural performance in the short run. Inflation rate at the current level was found to negatively and significantly influence agricultural performance at the conventional level.

As for the long-run estimates presented in Table 4.7b, the coefficients of positive change in monetary policy rate was positive and insignificant for the agricultural performance model but the negative change of monetary policy rate has negative and statistical impact on agricultural performance. It implies that negative changes in monetary policy rate indirectly influences agricultural performance in the long run. As for the positive and negative changes in lending interest rate, they negatively and significantly impacted on long run agricultural performance.

Meanwhile, the positive and negative change in liquidity ratio has indirect and direct effect on agricultural performance. It was shown in the table that both positive and negative changes in deposit money bank credit to agriculture positively influence agricultural performance in the long run. For the controlling variables, government expenditure positively impacted agricultural performance. Inflation rate is found to negatively impacted on agricultural performance in the long run.

Table 4.7b: Long-run Estimates of Average Agricultural Performance in Nigeria

Variables	Dependent Variable: Agricultural Performance (agdp)			
	Coefficient	Std. Error	t-Statistic	Prob.
Monetary Policy Rate ⁺	0.450021	0.633644	0.710211	0.5042
Monetary Policy Rate ⁻	-1.519951	0.456928	-3.326453	0.0159
Interest Rate ⁺	-0.676213	0.592838	-1.140637	0.2975
Interest Rate ⁻	-0.266036	0.571525	-0.465485	0.6580
Liquidity Ratio ⁺	-0.120463	0.088942	-1.354394	0.2244
Liquidity Ratio ⁻	0.085699	0.189993	0.451065	0.6678
Deposit Money Bank Credit to Agriculture ⁺	13.97014	13.67639	1.021478	0.3464
Deposit Money Bank Credit to Agriculture ⁻	26.55842	7.368758	3.604191	0.0113
Government Expenditure	0.980271	0.426332	2.299316	0.0612
Inflation	-0.169465	0.045489	-3.725428	0.0098
Constant	10.39414	3.692165	2.815187	0.0305

[see] results in appendix for details

Note: ***,**&* denotes significance at 0.01, 0.05 and 0.1 level respectively.

Source: Author's computation (2022).

The regression for the underlying ARDL equation of average agricultural performance fits very well and the model is significant at 1% level. It also passes all the diagnostic tests against serial correlation (Breusch-Godfrey test, heteroscedasticity, White Heteroskedasticity Test, and normality of errors (Jarque-Bera test). The Ramsey RESET test also suggests that the model is well specified. Their results are reported in Table 4.7a. The stability of the long-run coefficient is tested by the short-run dynamics. Once the ECM model given by agricultural performance equation has been estimated, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests are applied to assess the parameter stability. Figure 4.4 plots the average agricultural performance. The results for CUSUM and CUSUMSQ test results for average agricultural performance indicates the absence of any instability of the coefficients because the plot of the CUSUM and CUSUMSQ statistic fall inside the critical bands of the 95% confidence interval of parameter stability. By implication, this model is not suffering from structural change.



Figure 4.4: Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMSQ)

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4.2.4 Test of Hypothesis Two

The discussion in this subsection answers the second hypothesis that the shocks in monetary policy do not significantly influence the response of the agricultural performance in Nigeria. The section carried out two econometric methods; impulse response function (IRF) and variance decomposition analysis (VDA) to examine the response of agricultural performance to shocks in monetary policy in Nigeria. For the estimation result, responses of shocks in monetary policy to agricultural performance were reported in this section. The estimates and plots from the analysis of the techniques are presented in Figures 4.5. For the purpose of this shock analysis, the considered economic performance variables are classified into relevant shocks as shown on Table 4.8.

Table 4.8: Classification of shocks

Shocks	Variables
Monetary Policy shocks	Monetary Policy Rate shocks
	Interest Rate shocks
	Liquidity Ratio shocks
	Deposit Money Bank Credit to Agriculture shocks
Fiscal Policy shock	Government Expenditure shocks
Unstable Price shocks	Inflation rate shocks

Source: Author's classification.(2022).

4.3.1 Impulse Response Analysis of Average Agricultural Performance to Monetary Policy

The contemporaneous response of agricultural performance to Cholesky one squared variances shocks exerted on itself, monetary policy rate, lending interest rate, liquidity ratio, deposit money bank credit to agriculture (*as exogenous monetary policy shocks*), government expenditure and inflation rate (*as other exogenous shocks*). This section presents findings that show the mechanism through which life expectancy respond to one-standard deviation of monetary policy shocks as a result of innovation distortion.

Figure 4.5 presents the IRF plots of average agricultural performance to monetary policy shocks in Nigeria. The IRF analysis reveals that average agricultural performance positively responds to monetary policy rate at the initial period to the fifth period, and thereafter slopes downward to the seventh period while steep for the remaining periods. Also, a one standard deviation shock to lending interest rate causes significant increases in average agricultural performance from the first to fourth period, which later affect performance of the agriculture sector negatively for the remaining periods. As regards liquidity ratio, an increase was observed between period 1 through 3 after which it consistently decline again till period 6, and later showed an increasing response of average agricultural performance for the remaining periods in Nigeria. In the first to second period, average agricultural performance responds negatively to one standard deviation shocks exerted on deposit money bank credit to agriculture in Nigeria. Afterwards, it rises steeply through the fifth period, moves upward to the seventh periods while maintaining a steep movement for the remaining periods.

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

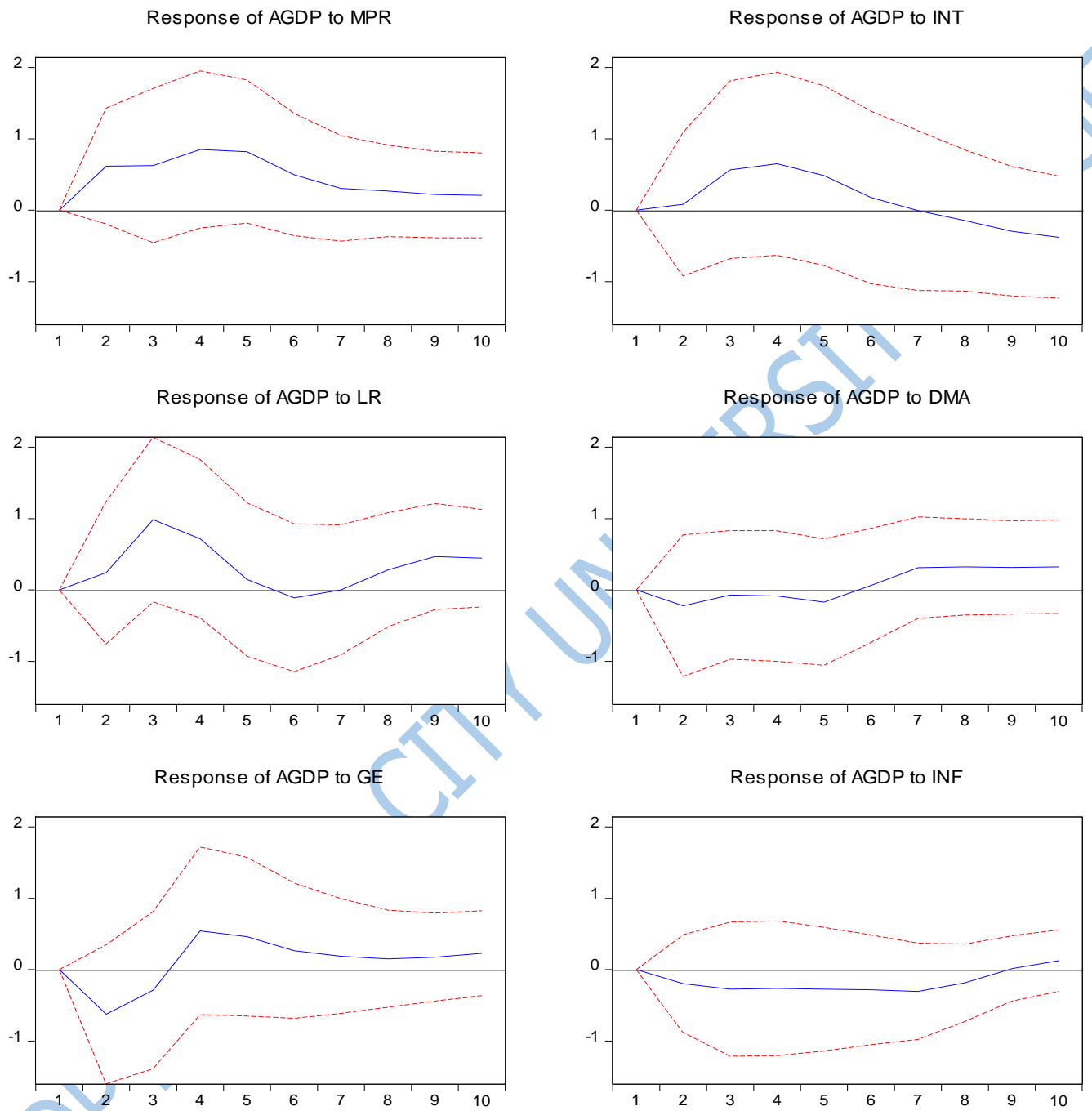


Figure 4.5: Impulse Response Graph of Agricultural Performance to Monetary Policy Shocks

The impulse response of average agricultural performance to shocks in government expenditure showed that a one standard deviation shock to government expenditure causes significant decrease in average agricultural performance for the 1st and 2nd periods after which it sharply rose through the 3rd and 4th periods. But, between 4th and 8th it declined drastically, and it sustained a steady state through the remaining periods. Also, for the response of agricultural performance to inflation rate shocks, a one standard deviation shock given to average inflation will start with decreasing inflation rate in the first period to 2nd period while remaining steep through the 3rd to 7th periods and then have an increasing slope for periods 8, 9 and 10. This implied that inflation will have negative impact on average agricultural productivity in Nigeria.

4.3.2 Variance Shocks Decomposition Analysis of Agricultural Performance and Monetary Policy Shocks

This section is complementary to the previous section 4.3.1 which analyses the impulse response function of agricultural performance to one standard deviation innovation of monetary policy shocks. While, the impulse reaction functions traced the effects of a shock to one endogenous variable on the other variables in the VAR, Variance Decomposition separates the variation in an endogenous variable into the component shocks of the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR system. Table 4.9 show the variance regression (VAR) model and variance decomposition analysis (VDA) of agricultural performance and monetary policy shocks in Nigeria.

Also, it determines the proportion of the forecast error variance of average agricultural performance accounted for by innovations to its individual shocks, monetary policy rate shocks, lending interest rate shocks, liquidity ratio shocks, deposit money bank credit

to agriculture shocks, government expenditure shock, and inflation rate shock in the unrestricted VAR model system.

The result of variance decomposition of average agricultural performance to individual innovation shocks in the VAR is presented in Table 4.9. Table 4.9 presents separate variance decomposition for each endogenous variable. The second column, labelled "S.E", contains the forecast error of the variable at the given forecast horizon. The source of this forecast error was the variation in the current and future values of the innovations to each endogenous variable in the VAR. The other columns for each of the monetary policy indices and other macroeconomic variables give the percentage of the forecast variance due to each innovation, with each row adding up to 100. Also, the forecast period of 10 years is selected but split into short-run and long-run where 1 to 5 years is considered short-run while 6 through 10 years is the future or long-run.

Table 4.9: Variance Decomposition Analysis for Average life Expectancy

Period	S.E.	AGDP	MPR	INT	LR	DMA	GE	INF
1	2.592274	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3.445698	92.23419	3.196249	0.059951	0.495393	0.410661	3.281914	0.321639
3	3.842223	81.27094	5.229924	2.224464	6.951433	0.364038	3.194026	0.765178
4	4.114983	71.66708	8.833897	4.441764	9.101274	0.360223	4.529382	1.066377
5	4.263774	66.75279	11.93033	5.434286	8.594001	0.492505	5.392504	1.403593
6	4.315805	65.15298	12.97731	5.474375	8.453232	0.502102	5.642481	1.797518
7	4.359481	64.16513	13.21544	5.365374	8.284712	1.005580	5.720999	2.242772
8	4.408721	63.23875	13.29828	5.352582	8.509750	1.517584	5.715129	2.367925
9	4.465748	61.74501	13.20265	5.654231	9.392147	1.973865	5.722901	2.309190
10	4.528400	60.07246	13.05171	6.191047	10.10242	2.432789	5.825033	2.324552

Cholesky Ordering: agdp mpr int lr dma ge inf

Source: Author's computation (2022).

In the first year, 100% forecast error is explained by the variable itself in which other variables have exogenous impact as they do not influence average agricultural performance in the short-run. This fact is also established in the vector autoregression estimate where average agricultural performance at lag 1 accounted for highest t-statistics value. Similarly in the second period, except liquidity ratio that has a strong influence in predicting average agricultural performance in the 3rd period, its own shock still has greater influence. For the remaining periods, shocks from within has greater influence on the response of agricultural performance. In the long-run, 60.07% forecast error is explained by the variable itself indicating a moderate influence into the future, this result is confirmed in the VAR estimates in which the variables moderately influenced by agricultural performance. Looking at monetary policy, its influence rises year by year with a strong influence. Similarly, the influences of lending interest rate and deposit money banks credit to agriculture increase in a yearly basis although their influence is weak as well as their likelihood of predicting average life expectancy in the future. For liquidity ratio, its influence is strong but the influence rises for periods 2, 3 and 4, falls through periods 5, 6, and 7, and later gains momentum for the remaining periods.

Table 4.10: Percentage of Agriculture Performance Variation due to Monetary Policy Shocks

Overall % Share of Macroeconomic Variables Shocks						
Agriculture Performance Shocks	Monetary Policy Shocks	Fiscal Shocks	Policy	Price	Stability	Shocks
69.59%	23.79%	5.00%				1.62%
Overall % Share of Monetary Policy Shocks						
Monetary Rate Shocks	Policy	Interest Shocks	Rate	Deposit Bank Money Credit to Agriculture Shocks	Money	Liquidity Ratio
44.35%		18.78%		4.23%		32.64%

Source: Author's computation.

For the purpose of clarity and simplicity, the variation in agricultural performance due to various shocks within and outside is decomposed into different monetary policy variables, fiscal policy indices and price stability indicators. Thus, the results of the percentage share of agricultural performance changes accounted for by the considered shocks from various monetary policy variables, fiscal policy indices and price stability indicators are presented in Table 4.10.

The table showed that agricultural performance shocks (shocks from itself) accounted for 60.59% of the total variation in agricultural performance in Nigeria respectively. Afterwards, monetary policy variables account for 23.79% of the total variation in agricultural performance, subsequently followed by shocks in fiscal policy (5.0%), and shocks in price stability (1.62%) respectively. Concerning the 23.79% shocks in monetary policy indicators, shocks in monetary policy rate accounted for 44.35% of the total variation in agricultural performance, followed by shocks in liquidity ratio (32.64%), lending interest rate (18.78%), and deposit money bank credit to agriculture (4.32%) respectively.

4.3 Discussion of Findings

The study established an asymmetric relationship between monetary policy and agricultural performance in Nigeria for the periods understudied. In the short run, the study found that positive changes in monetary policy rate positively impacted agricultural performance than the negative changes in monetary policy rate. In the long run, the study discovered that only a negative change in monetary policy rate adversely and significantly impacted agricultural performance. It means that low monetary policy rate ensures a greater performance in the agriculture sector. A decreasing monetary policy rate will improve the agricultural output as a ratio of GDP. This aligns with the existing studies that ensuring low interest on financial credit guarantees improvement

in the agricultural sector^{1,2,3,4,5,6,7}.

As regards lending interest rate, its positive changes have direct influence on agricultural performance whereas the negative changes indirectly affect agricultural performance in Nigeria. It implies that lending rate play a key role in the determination of agricultural performance in the short run. In the case of long run, direct and indirect changes in lending interest rate negatively influenced agricultural performance, albeit not significant at 5% level. It aligns with a previous Nigerian studies that prime lending rate does not significantly influence the output of the agricultural sector⁸. This does not align with the exiting studies that high lending rate positively resulted to an increasing long run agricultural performance^{1,2,3,4,5,6,7}. It shows that the increasing rate of interest levied on funds provided by the financial institutions to the agricultural sector do not have significant impact on the agriculture performance. This may result from the fact that lending interest rate is currently not the main tool used by the federal government to improve the agricultural sector.

Similarly, the positive changes in liquidity ratio have positive impact on agricultural performance while the negative changes adversely influence agricultural performance in Nigeria. It means that the liquidity ratio of financial institution which influences the financial credit provided to investor play a key role on agricultural performance. Thus, the financial solvency of banks affects their ability to provide financial assistance which ultimately influenced agricultural output to the level of overall economic activities in the short run. The long run positive and negative changes in liquidity ratio have no significant impact on agricultural performance in Nigeria. It indicates that it plays no key role on agricultural performance in the long run.

Both positive and negative changes in deposit money bank credit to agriculture have a negative influence on short run agricultural performance. The long run negative

changes in deposit money bank credit to agriculture have positive and significance impact on agricultural performance in Nigeria. This goes against the findings of previous studies that deposit money banks' credits to agriculture are important drivers of agricultural output⁸. Similarly, it contradicts the results that that commercial banks' credit to Agriculture and Agricultural credit guarantee scheme are positively related to Agricultural development⁴.

As to the second objective, agricultural performance reacts more positively to monetary policy instruments such as monetary policy rate, lending interest rate, deposit money bank credit to agriculture and liquidity ratio. Statistically, monetary policy variables account for 23.79% of the total variation in agricultural performance. In the order of shocks, shocks in monetary policy rate accounted for 44.35%, followed by liquidity ratio (32.64%), lending interest rate (18.78%), and deposit money bank credit to agriculture (4.32%). This negates the results of past studies that Nigeria's agricultural food output is due to changes in exchange rate and government expenditure movements⁹.

Endnotes

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Chapter Five

Conclusion

This chapter presents the conclusion on the impact of monetary policy on agricultural performance, followed by policy recommendations for improved agricultural performance for sustainable development in Nigeria.

5.1 Summary

From the discussion in the previous chapter, the summary of findings is discussed as follows: First, the variables of interest were stationary at level and first difference indicating a likelihood reduction in spurious results of the regression analysis. Also, the cointegration results showed that there is the possibility of an asymmetric long run equilibrium relationship between monetary policy and agricultural performance in Nigeria in all the three models. The descriptive statistics analysis revealed that agricultural performance has 22.87% of GDP between 1981 and 2021. The trends of monetary policy indicators are difficult to interpret as their relationships with agricultural performance could not be established which therefore required a more sophisticated econometric analysis to determine their relationships. In addition, correlation result also presented negative relationship between deposit money bank credit to agriculture and agricultural performance. However, monetary policy rate, lending interest rate and liquidity ratio have a positive level of association with agricultural performance. Further, the interval growth rate of monetary policy and agricultural performance in Nigeria showed a growth interval rate of the variables through the period of 1981 and 2021.

For the first objective, an asymmetric long-run relationship was found between monetary policy and agricultural performance, the error correction term (ECT) of

average agricultural performance from the short-run estimates revealed that the models correct their short-run disequilibrium by 71.66% speed of adjustment in order to return to the long-run equilibrium. The study found that the positive changes of monetary policy rate have higher influence on agricultural performance than the negative change in monetary policy rate. As to lending interest rate, its positive and negative change at lag one have positive and negative impact on agricultural performance in the short run. The study showed that agricultural performance is directly influenced by positive changes in liquidity ratio and indirectly affected by the negative changes in liquidity ratio at 5% significance level. Concerning deposit money bank credit to agriculture, all the coefficients for positive and negative changes are negative and statistically significant at 5% except its current positive change which is insignificant. As for the long-run estimates, the negative changes in monetary policy rate indirectly influences agricultural performance in the long run. As for the positive and negative changes in lending interest rate, they negatively and significantly impacted on long run agricultural performance. Meanwhile, the positive and negative change in liquidity ratio has indirect and direct effect on agricultural performance. It was shown in the table that both positive and negative changes in deposit money bank credit to agriculture positively influence agricultural performance in the long run.

Regarding the second objective, the result of the impulse response showed that the average agricultural performance positively responds to monetary policy rate at the initial period to the fifth period, and thereafter slopes downward to the seventh period while steep for the remaining periods. Also, a one standard deviation shock to lending interest rate causes significant increases in average agricultural performance from the first to fourth period, which later affect performance of the agriculture sector negatively for the remaining periods. As regards liquidity ratio, an increase was observed between

period 1 through 3 after which it consistently decline again till period 6, and later showed an increasing response of average agricultural performance for the remaining periods in Nigeria. In the first to second period, average agricultural performance responds negatively to one standard deviation shocks exerted on deposit money bank credit to agriculture in Nigeria. Afterwards, it rises steeply through the fifth period, moves upward to the seventh periods while maintaining a steep movement for the remaining periods.

The variance decomposition analysis also showed that monetary policy rate, liquidity ratio, lending interest rate and deposit money bank credit to agriculture constituted exogeneity influence and does not strongly predict the future, but each variable explains the variation which occurs in its own self. Specifically, monetary policy variables account for 23.79% of the total variation in agricultural performance, subsequently followed by shocks in fiscal policy (5.0%), and shocks in price stability (1.62%) respectively. Concerning the 23.79% shocks in monetary policy indicators, shocks in monetary policy rate accounted for 44.35% of the total variation in agricultural performance, followed by shocks in liquidity ratio (32.64%), lending interest rate (18.78%), and deposit money bank credit to agriculture (4.32%) respectively

5.2 Conclusion

This study investigates the impact of monetary policy on agricultural performance over the periods of 1981 to 2021 using the non-linear ARDL bound resting approach. The study equally examines the response of agriculture performance to shocks in monetary policy instruments using the impulse response and variance decomposition estimators. Findings from the empirical model revealed that positive changes in monetary policy rates had a greater positive impact on short-run agricultural performance than negative changes in monetary policy rates. Only a negative change in monetary policy rate had

an adverse and significant impact on agricultural performance in the long run, according to the study. A positive change in lending rates has a direct impact on short-run agricultural performance, whereas negative changes have an indirect impact. Thus, the lending interest rate is critical in determining agricultural performance. Positive changes in the liquidity ratio only have a direct impact on short-run agricultural performance, whereas negative changes have a negative impact on agricultural performance. Changes in deposit money bank credit to agriculture have a negative impact on short run agricultural performance, but the long run positive impact was not statistically significant. According to the study's shocks analysis, agricultural performance responds to 44.35%, 32.64%, 18.78%, and 4.32% of total shocks in monetary policy rate, liquidity ratio, lending interest rate, and deposit money bank credit to agriculture from 23.79% of monetary policy shocks.

5.3 Recommendations

Following the reported findings discussed in the subsequent chapters of this study, below policy recommendations are suggested.

- a) The study recommended that an expansionary but non-inflationary monetary policy to improve value addition to the agricultural sector of the Nigerian economy. This should be performed by ensuring low and affordable lending interest rates for farmers employed in tandem with government spending in the agricultural sector as an effective way of improving its performance.
- b) Since the concluded that the effectiveness of monetary policy in the agricultural sector is mirrored from the monetary aggregates and credit channels, the apex bank should place more emphasis expansionary monetary policy framework with a view to increasing monetary aggregates to boost output in the agricultural sector.

- c) Also, the study found that deposit money bank credit to agriculture significantly affects agricultural performance; it becomes imperative that delay and stringent conditions in assessing commercial bank credit and facility should be completely eliminated.
- d) Programmes aimed at availing affordable credit to farmers should be prioritized to cushion the agriculture sector against adverse monetary policy shocks in the short to medium term, specifically interest rates, to ensure continuous production.
- e) Government should increase the budgetary allocation to agricultural sector in a consistent manner due of the primary and vital importance it plays in the national economy, hoping that with proper monitoring of fund, it would contribute more significantly to the economy of the country.

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Appendix

Appendix I: Data of Money Policy and Agricultural Performance

Year	Monetary Policy Rate (%)	Lending interest rate (%)	Inflation, consumer prices (annual %)	Liquidity Ratio	Government Expenditure (% of GDP)	Agriculture Expenditure (% of GDP)	Deposit Money Bank Credit to Agriculture (% of GDP)
1981	6	8.916667	20.81282	38.5	8.192993	12.24041	0.423945
1982	8	9.5375	7.697747	40.5	7.999398	13.50269	0.527738
1983	8	9.976667	23.21233	54.7	6.070229	14.99073	0.592377
1984	10	10.24167	17.82053	65.1	5.985739	18.30836	0.634352
1985	10	9.433333	7.435345	65	6.943011	18.22764	0.697543
1986	10	9.959167	5.717151	36.4	8.188694	18.02043	0.923819
1987	12.75	13.96167	11.29032	46.5	8.99897	20.55211	0.991948
1988	12.75	16.61667	54.51122	45	8.79219	23.37165	0.971658
1989	18.5	20.44167	50.46669	40.3	9.889653	21.2756	0.836546
1990	18.5	25.3	7.3644	44.3	12.18416	21.55626	0.853422
1991	15.5	20.04167	13.00697	38.6	11.28435	20.88528	0.849524
1992	17.5	24.75833	44.58884	29.1	10.24221	20.32116	0.770273
1993	26	31.65	57.16525	42.2	15.211	23.49113	0.855331
1994	13.5	20.48333	57.03171	48.5	9.096222	25.17385	1.003945
1995	13.5	20.23333	72.8355	33.1	8.024169	25.48651	0.81538
1996	13.5	19.83667	29.26829	43.1	8.252869	26.19916	0.814086
1997	13.5	17.795	8.529874	40.2	9.690958	27.41665	0.632296
1998	13.5	18.18417	9.996378	46.8	10.13731	27.90837	0.565657
1999	18	20.29	6.618373	61	17.28619	26.02849	0.566284
2000	14	21.27417	6.933292	64.1	9.926032	21.35724	0.58092
2001	20.5	23.43833	18.87365	52.9	12.36259	24.47535	0.678197
2002	16.5	24.77083	12.87658	52.45	8.852606	36.96508	0.520367
2003	15	20.71417	14.03178	50.9	9.04323	33.82706	0.458087
2004	15	19.18083	14.99803	50.475	8.299465	27.23045	0.37375
2005	13	17.94833	17.86349	50.175	8.302526	26.08928	0.210024
2006	10	16.89333	8.225222	81.42032	6.709426	24.73499	0.162611

2007	9.5	16.93917	5.388008	41.55516	7.068003	24.66258	0.431362
2008	9.75	15.13583	11.58108	37.7155	8.111334	25.27975	0.266189
2009	6	18.99083	12.55496	26.39276	7.944949	26.74885	0.312234
2010	6.25	17.585	13.7202	27.38945	7.561972	23.52451	0.23149
2011	12	16.02	10.84003	42.02	7.39572	22.03278	0.400552
2012	12	16.79167	12.21778	49.71872	6.343421	21.78523	0.435765
2013	12	16.7225	8.475827	46.23471	6.40084	20.75862	0.424265
2014	13	16.54833	8.062486	38.26655	5.089349	19.99025	0.531316
2015	11	16.84917	9.009387	42.34715	5.24163	20.63189	0.472072
2016	14	16.86802	15.67534	45.95	5.711464	20.98311	0.51274
2017	14	17.55333	16.52354	54.7897	5.619443	20.84657	0.459745
2018	14	16.9039	12.09473	65.04402	6.053086	21.20377	0.472666
2019	13.5	15.37659	11.39679	104.2024	6.670354	21.9063	0.530335
2020	11.5	13.64202	13.24602	67.59854	6.633112	24.14331	0.680494
2021	11.5	11.48313	16.95285	61.195	6.908484	23.35706	0.827953

Source: CBN Statistical Bulletin (2021), World Development Indicators (2021).

Appendix II

Unit Root Test

Null Hypothesis: AGDP has a unit root
 Exogenous: Constant
 Lag Length: 2 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.558632	0.1103
Test critical values: 1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(AGDP)
 Method: Least Squares
 Date: 11/13/22 Time: 18:05
 Sample (adjusted): 1984 2021
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGDP(-1)	-0.261536	0.102217	-2.558632	0.0151
D(AGDP(-1))	0.245058	0.138591	1.768213	0.0860
D(AGDP(-2))	-0.409384	0.141668	-2.889739	0.0067
C	6.370040	2.402393	2.651540	0.0121
R-squared	0.387501	Mean dependent var		0.220166
Adjusted R-squared	0.333457	S.D. dependent var		2.919006
S.E. of regression	2.383137	Akaike info criterion		4.674013
Sum squared resid	193.0977	Schwarz criterion		4.846391
Log likelihood	-84.80625	Hannan-Quinn criter.		4.735344
F-statistic	7.170103	Durbin-Watson stat		1.910852
Prob(F-statistic)	0.000741			

Null Hypothesis: D(AGDP) has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.963517	0.0000
Test critical values:		
1% level	-3.615588	
5% level	-2.941145	
10% level	-2.609066	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(AGDP,2)
 Method: Least Squares
 Date: 11/13/22 Time: 18:07
 Sample (adjusted): 1984 2021
 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGDP(-1))	-1.348456	0.193646	-6.963517	0.0000
D(AGDP(-1),2)	0.513785	0.146019	3.518613	0.0012
C	0.304561	0.419315	0.726330	0.4725
R-squared	0.591880	Mean dependent var		-0.059850
Adjusted R-squared	0.568559	S.D. dependent var		3.905094
S.E. of regression	2.565029	Akaike info criterion		4.797473
Sum squared resid	230.2780	Schwarz criterion		4.926756
Log likelihood	-88.15199	Hannan-Quinn criter.		4.843471
F-statistic	25.37955	Durbin-Watson stat		1.929143
Prob(F-statistic)	0.000000			

Null Hypothesis: MPR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.334522	0.0198
Test critical values: 1% level	-3.605593	
5% level	-2.936942	
10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(MPR)
 Method: Least Squares
 Date: 11/13/22 Time: 18:08
 Sample (adjusted): 1982 2021
 Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR(-1)	-0.410431	0.123085	-3.334522	0.0019
C	5.488496	1.676827	3.273143	0.0023
R-squared	0.226369	Mean dependent var		0.137500
Adjusted R-squared	0.206011	S.D. dependent var		3.452494
S.E. of regression	3.076382	Akaike info criterion		5.134092
Sum squared resid	359.6368	Schwarz criterion		5.218536
Log likelihood	-100.6818	Hannan-Quinn criter.		5.164624
F-statistic	11.11904	Durbin-Watson stat		2.255953
Prob(F-statistic)	0.001916			

Null Hypothesis: INT has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.307376	0.1747
Test critical values:		
1% level	-3.605593	
5% level	-2.936942	
10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(INT)
 Method: Least Squares
 Date: 11/13/22 Time: 18:09
 Sample (adjusted): 1982 2021
 Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT(-1)	-0.222050	0.096235	-2.307376	0.0266
C	3.971147	1.753002	2.265340	0.0293
R-squared	0.122888	Mean dependent var		0.064162
Adjusted R-squared	0.099806	S.D. dependent var		3.024688
S.E. of regression	2.869781	Akaike info criterion		4.995055
Sum squared resid	312.9544	Schwarz criterion		5.079499
Log likelihood	-97.90110	Hannan-Quinn criter.		5.025587
F-statistic	5.323984	Durbin-Watson stat		2.036512
Prob(F-statistic)	0.026576			

Null Hypothesis: D(INT) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.843991	0.0000
Test critical values:		
1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(INT,2)
 Method: Least Squares
 Date: 11/13/22 Time: 18:10
 Sample (adjusted): 1983 2021
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT(-1))	-1.124082	0.164244	-6.843991	0.0000
C	0.064922	0.493646	0.131516	0.8961
R-squared	0.558684	Mean dependent var		-0.071275
Adjusted R-squared	0.546757	S.D. dependent var		4.575399
S.E. of regression	3.080311	Akaike info criterion		5.137859
Sum squared resid	351.0677	Schwarz criterion		5.223169
Log likelihood	-98.18824	Hannan-Quinn criter.		5.168467
F-statistic	46.84021	Durbin-Watson stat		2.029348
Prob(F-statistic)	0.000000			

Null Hypothesis: LR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.553888	0.0114
Test critical values:		
1% level	-3.605593	
5% level	-2.936942	
10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(LR)
 Method: Least Squares
 Date: 11/13/22 Time: 18:11
 Sample (adjusted): 1982 2021
 Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LR(-1)	-0.501056	0.140988	-3.553888	0.0010
C	25.00068	7.174167	3.484820	0.0013
R-squared	0.249459	Mean dependent var		0.567375
Adjusted R-squared	0.229708	S.D. dependent var		14.77135
S.E. of regression	12.96427	Akaike info criterion		8.010978
Sum squared resid	6386.745	Schwarz criterion		8.095422
Log likelihood	-158.2196	Hannan-Quinn criter.		8.041510
F-statistic	12.63012	Durbin-Watson stat		1.972517
Prob(F-statistic)	0.001034			

Null Hypothesis: DMA has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.490024	0.5283
Test critical values: 1% level	-3.605593	
5% level	-2.936942	
10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(DMA)
 Method: Least Squares
 Date: 11/13/22 Time: 18:13
 Sample (adjusted): 1982 2021
 Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMA(-1)	-0.117127	0.078607	-1.490024	0.1445
C	0.078828	0.049254	1.600449	0.1178
R-squared	0.055200	Mean dependent var		0.010100
Adjusted R-squared	0.030337	S.D. dependent var		0.110944
S.E. of regression	0.109248	Akaike info criterion		-1.541677
Sum squared resid	0.453539	Schwarz criterion		-1.457233
Log likelihood	32.83353	Hannan-Quinn criter.		-1.511144
F-statistic	2.220173	Durbin-Watson stat		1.852186
Prob(F-statistic)	0.144472			

Null Hypothesis: D(DMA) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.088310	0.0000
Test critical values: 1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(DMA,2)
 Method: Least Squares
 Date: 11/13/22 Time: 18:14
 Sample (adjusted): 1983 2021
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DMA(-1))	-1.012019	0.166223	-6.088310	0.0000
C	0.007777	0.018099	0.429684	0.6699
R-squared	0.500456	Mean dependent var		0.001120
Adjusted R-squared	0.486955	S.D. dependent var		0.157513
S.E. of regression	0.112822	Akaike info criterion		-1.476087
Sum squared resid	0.470967	Schwarz criterion		-1.390777
Log likelihood	30.78370	Hannan-Quinn criter.		-1.445479
F-statistic	37.06751	Durbin-Watson stat		1.971840
Prob(F-statistic)	0.000000			

Null Hypothesis: GE has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.864578	0.3450
Test critical values:		
1% level	-3.610453	
5% level	-2.938987	
10% level	-2.607932	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GE)
 Method: Least Squares
 Date: 11/13/22 Time: 18:15
 Sample (adjusted): 1983 2021
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GE(-1)	-0.269312	0.144436	-1.864578	0.0704
D(GE(-1))	-0.341233	0.157896	-2.161119	0.0374
C	2.234531	1.266465	1.764383	0.0862
R-squared	0.296345	Mean dependent var		-0.027972
Adjusted R-squared	0.257253	S.D. dependent var		2.365265
S.E. of regression	2.038451	Akaike info criterion		4.336061
Sum squared resid	149.5901	Schwarz criterion		4.464027
Log likelihood	-81.55318	Hannan-Quinn criter.		4.381974
F-statistic	7.580715	Durbin-Watson stat		1.930510
Prob(F-statistic)	0.001788			

Null Hypothesis: D(GE) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.12224	0.0000
Test critical values:		
1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GE,2)
 Method: Least Squares
 Date: 11/13/22 Time: 18:16
 Sample (adjusted): 1983 2021
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GE(-1))	-1.480270	0.146239	-10.12224	0.0000
C	0.200221	0.722367	0.277173	0.7832
@TREND("1981")	-0.011781	0.030332	-0.388404	0.7000
R-squared	0.739997	Mean dependent var		0.012025
Adjusted R-squared	0.725553	S.D. dependent var		4.066134
S.E. of regression	2.130154	Akaike info criterion		4.424069
Sum squared resid	163.3521	Schwarz criterion		4.552036
Log likelihood	-83.26935	Hannan-Quinn criter.		4.469983
F-statistic	51.23009	Durbin-Watson stat		2.014870
Prob(F-statistic)	0.000000			

Null Hypothesis: INF has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.102317	0.0131
Test critical values:		
1% level	-4.211868	
5% level	-3.529758	
10% level	-3.196411	

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

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(INF)
 Method: Least Squares
 Date: 11/13/22 Time: 18:17
 Sample (adjusted): 1983 2021
 Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.588495	0.143454	-4.102317	0.0002
D(INF(-1))	0.345009	0.154737	2.229650	0.0323
C	18.48310	5.993241	3.083990	0.0040
@TREND("1981")	-0.334544	0.193068	-1.732778	0.0919
R-squared	0.327716	Mean dependent var		0.237310
Adjusted R-squared	0.270091	S.D. dependent var		14.84038
S.E. of regression	12.67883	Akaike info criterion		8.014659
Sum squared resid	5626.344	Schwarz criterion		8.185281
Log likelihood	-152.2858	Hannan-Quinn criter.		8.075876
F-statistic	5.687106	Durbin-Watson stat		1.807882
Prob(F-statistic)	0.002789			

Objective I

ARDL Long Run Form and Bounds Test
 Dependent Variable: D(AGDP)
 Selected Model: ARDL(1, 3, 2, 3, 1, 3, 3)
 Case 2: Restricted Constant and No Trend
 Date: 11/13/22 Time: 18:57
 Sample: 1981 2921
 Included observations: 38

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.439917	5.606832	-1.683645	0.1129
AGDP(-1)*	-0.556339	0.159887	-3.479573	0.0034
MPR(-1)	-1.086253	0.488294	-2.224585	0.0419
INT(-1)	1.004705	0.437074	2.298708	0.0363
LR(-1)	0.279780	0.080228	3.487297	0.0033
DMA(-1)	4.658879	6.016492	0.774351	0.4508
GE(-1)	0.252342	0.339498	0.743279	0.4688
INF(-1)	0.028883	0.098728	0.292554	0.7739
D(MPR)	-0.327608	0.322618	-1.015467	0.3260
D(MPR(-1))	0.787222	0.302365	2.603550	0.0200
D(MPR(-2))	0.403428	0.218528	1.846113	0.0847
D(INT)	0.352695	0.284550	1.239483	0.2342
D(INT(-1))	-0.273700	0.255295	-1.072094	0.3006
D(LR)	0.054354	0.037529	1.448322	0.1681
D(LR(-1))	-0.157629	0.062036	-2.540916	0.0226
D(LR(-2))	-0.134625	0.056285	-2.391858	0.0303
D(DMA)	-3.788134	4.998027	-0.757926	0.4602
D(GE)	0.125632	0.311175	0.403736	0.6921
D(GE(-1))	-0.812878	0.312841	-2.598376	0.0202
D(GE(-2))	-0.801390	0.304382	-2.632839	0.0188
D(INF)	0.012652	0.058267	0.217145	0.8310
D(INF(-1))	-0.019527	0.061793	-0.316009	0.7564
D(INF(-2))	-0.060725	0.044493	-1.364819	0.1924

* p-value incompatible with t-Bounds distribution.

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR	-1.952501	1.034941	-1.886581	0.0787
INT	1.805921	0.887549	2.034728	0.0600
LR	0.502895	0.183629	2.738642	0.0152
DMA	8.374171	11.29496	0.741408	0.4699
GE	0.453575	0.580706	0.781076	0.4469
INF	0.051916	0.180139	0.288203	0.7771
C	-16.96792	12.56109	-1.350832	0.1968

$$EC = AGDP - (-1.9525*MPR + 1.8059*INT + 0.5029*LR + 8.3742*DMA + 0.4536*GE + 0.0519*INF - 16.9679)$$

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)

		Asymptotic: n=1000		
F-statistic	3.227909	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
		Finite Sample: n=40		
Actual Sample Size	38	10%	2.218	3.314
		5%	2.618	3.863
		1%	3.505	5.121
		Finite Sample: n=35		
		10%	2.254	3.388
		5%	2.685	3.96
		1%	3.713	5.326

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Dependent Variable: AGDP
 Method: ARDL
 Date: 11/13/22 Time: 19:59
 Sample (adjusted): 1984 2021
 Included observations: 38 after adjustments
 Maximum dependent lags: 2 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (2 lags, automatic): MPR_POS MPR_NEG INT_POS
 INT_NEG LR_POS LR_NEG DMA_POS DMA_NEG GE INF
 Fixed regressors: C
 Number of models evaluated: 118098
 Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2, 2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
AGDP(-1)	0.497209	0.159557	3.116190	0.0207
AGDP(-2)	-0.713821	0.195085	-3.659022	0.0106
MPR_POS	0.672814	0.429486	1.566558	0.1683
MPR_POS(-1)	0.601037	0.527730	1.138909	0.2982
MPR_POS(-2)	-0.726350	0.401174	-1.810561	0.1202
MPR_NEG	-0.822311	0.397582	-2.068281	0.0841
MPR_NEG(-1)	0.888960	0.515508	1.724434	0.1354
MPR_NEG(-2)	-1.915841	0.457761	-4.185245	0.0058
INT_POS	-0.226530	0.570871	-0.396814	0.7052
INT_POS(-1)	1.587255	0.519033	3.058102	0.0223
INT_POS(-2)	-2.183414	0.670746	-3.255202	0.0174
INT_NEG	-0.170143	0.660999	-0.257402	0.8055
INT_NEG(-1)	-2.111087	0.684631	-3.083542	0.0216
INT_NEG(-2)	1.957567	0.563943	3.471216	0.0133
LR_POS	0.051626	0.050592	1.020426	0.3469
LR_POS(-1)	-0.044041	0.088200	-0.499335	0.6353
LR_POS(-2)	-0.154141	0.083432	-1.847504	0.1142
LR_NEG	-0.115288	0.153810	-0.749550	0.4819
LR_NEG(-1)	-0.118957	0.130400	-0.912246	0.3968
LR_NEG(-2)	0.338508	0.135934	2.490230	0.0471
DMA_POS	-5.838382	14.61878	-0.399375	0.7034
DMA_POS(-1)	-19.96198	13.33153	-1.497351	0.1849
DMA_POS(-2)	42.79661	18.90584	2.263672	0.0642
DMA_NEG	-22.42302	7.144689	-3.138418	0.0201
DMA_NEG(-1)	28.71920	7.382883	3.889970	0.0081
DMA_NEG(-2)	26.01512	7.302413	3.562538	0.0119
GE	0.653633	0.278852	2.344019	0.0575
GE(-1)	-0.501361	0.338644	-1.480497	0.1892
GE(-2)	1.040338	0.400365	2.598474	0.0407
INF	-0.092715	0.039811	-2.328859	0.0587
INF(-1)	-0.113459	0.027439	-4.134974	0.0061
C	12.64564	4.166482	3.035088	0.0229
R-squared	0.986640	Mean dependent var		23.59886
Adjusted R-squared	0.917614	S.D. dependent var		3.888567
S.E. of regression	1.116132	Akaike info criterion		2.895999
Sum squared resid	7.474506	Schwarz criterion		4.275019
Log likelihood	-23.02399	Hannan-Quinn criter.		3.386644
F-statistic	14.29377	Durbin-Watson stat		2.008899
Prob(F-statistic)	0.001538			

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
 Dependent Variable: D(AGDP)
 Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2, 2, 1)

Case 2: Restricted Constant and No Trend
Date: 11/13/22 Time: 20:01
Sample: 1981 2921
Included observations: 38

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.64564	4.166482	3.035088	0.0229
AGDP(-1)*	-1.216613	0.207249	-5.870306	0.0011
MPR_POS(-1)	0.547501	0.757409	0.722861	0.4970
MPR_NEG(-1)	-1.849191	0.628315	-2.943097	0.0258
INT_POS(-1)	-0.822690	0.728199	-1.129760	0.3017
INT_NEG(-1)	-0.323663	0.705697	-0.458643	0.6626
LR_POS(-1)	-0.146556	0.109242	-1.341571	0.2283
LR_NEG(-1)	0.104263	0.238659	0.436870	0.6775
DMA_POS(-1)	16.99624	17.66418	0.962187	0.3731
DMA_NEG(-1)	32.31130	6.880408	4.696132	0.0033
GE(-1)	1.192610	0.607464	1.963260	0.0973
INF(-1)	-0.206174	0.049206	-4.190027	0.0057
D(AGDP(-1))	0.713821	0.195085	3.659022	0.0106
D(MPR_POS)	0.672814	0.429486	1.566558	0.1683
D(MPR_POS(-1))	0.726350	0.401174	1.810561	0.1202
D(MPR_NEG)	-0.822311	0.397582	-2.068281	0.0841
D(MPR_NEG(-1))	1.915841	0.457761	4.185245	0.0058
D(INT_POS)	-0.226530	0.570871	-0.396814	0.7052
D(INT_POS(-1))	2.183414	0.670746	3.255202	0.0174
D(INT_NEG)	-0.170143	0.660999	-0.257402	0.8055
D(INT_NEG(-1))	-1.957567	0.563943	-3.471216	0.0133
D(LR_POS)	0.051626	0.050592	1.020426	0.3469
D(LR_POS(-1))	0.154141	0.083432	1.847504	0.1142
D(LR_NEG)	-0.115288	0.153810	-0.749550	0.4819
D(LR_NEG(-1))	-0.338508	0.135934	-2.490230	0.0471
D(DMA_POS)	-5.838382	14.61878	-0.399375	0.7034
D(DMA_POS(-1))	-42.79661	18.90584	-2.263672	0.0642
D(DMA_NEG)	-22.42302	7.144689	-3.138418	0.0201
D(DMA_NEG(-1))	-26.01512	7.302413	-3.562538	0.0119
D(GE)	0.653633	0.278852	2.344019	0.0575
D(GE(-1))	-1.040338	0.400365	-2.598474	0.0407
D(INF)	-0.092715	0.039811	-2.328859	0.0587

* p-value incompatible with t-Bounds distribution.

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MPR_POS	0.450021	0.633644	0.710211	0.5042
MPR_NEG	-1.519951	0.456928	-3.326453	0.0159
INT_POS	-0.676213	0.592838	-1.140637	0.2975
INT_NEG	-0.266036	0.571525	-0.465485	0.6580
LR_POS	-0.120463	0.088942	-1.354394	0.2244
LR_NEG	0.085699	0.189993	0.451065	0.6678
DMA_POS	13.97014	13.67639	1.021478	0.3464
DMA_NEG	26.55842	7.368758	3.604191	0.0113
GE	0.980271	0.426332	2.299316	0.0612
INF	-0.169465	0.045489	-3.725428	0.0098
C	10.39414	3.692165	2.815187	0.0305

$$EC = AGDP - (0.4500*MPR_POS - 1.5200*MPR_NEG - 0.6762*INT_POS - 0.2660*INT_NEG - 0.1205*LR_POS + 0.0857*LR_NEG + 13.9701 *DMA_POS + 26.5584*DMA_NEG + 0.9803*GE - 0.1695*INF + 10.3941)$$

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.	I(0)	I(1)	
			Asymptotic: n=1000		
F-statistic	8.785629	10%	1.76	2.77	
k	10	5%	1.98	3.04	
		2.5%	2.18	3.28	
		1%	2.41	3.61	
			Finite Sample: n=40		
Actual Sample Size	38	10%	-1	-1	
		5%	-1	-1	
		1%	-1	-1	
			Finite Sample: n=35		
		10%	-1	-1	
		5%	-1	-1	
		1%	-1	-1	

ARDL Error Correction Regression
 Dependent Variable: D(AGDP)
 Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2, 1)
 Case 2: Restricted Constant and No Trend
 Date: 11/13/22 Time: 20:03
 Sample: 1981 2921
 Included observations: 38

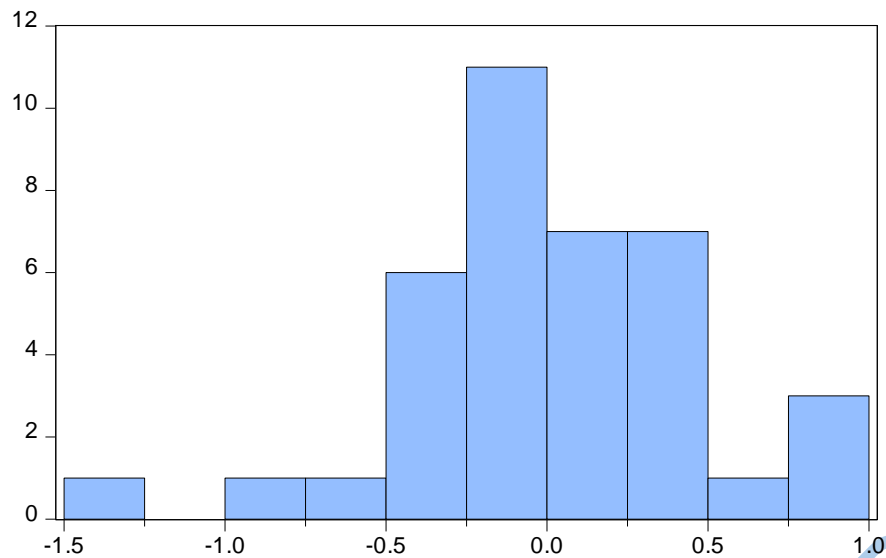
ECM Regression
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGDP(-1))	0.713821	0.052192	13.67677	0.0000
D(MPR_POS)	0.672814	0.104117	6.462090	0.0007
D(MPR_POS(-1))	0.726350	0.115833	6.270670	0.0008
D(MPR_NEG)	-0.822311	0.125115	-6.572463	0.0006
D(MPR_NEG(-1))	1.915841	0.138056	13.87725	0.0000
D(INT_POS)	-0.226530	0.143623	-1.577259	0.1658
D(INT_POS(-1))	2.183414	0.163494	13.35472	0.0000
D(INT_NEG)	-0.170143	0.168304	-1.010922	0.3511
D(INT_NEG(-1))	-1.957567	0.154804	-12.64547	0.0000
D(LR_POS)	0.051626	0.016108	3.204996	0.0185
D(LR_POS(-1))	0.154141	0.022753	6.774576	0.0005
D(LR_NEG)	-0.115288	0.034524	-3.339315	0.0156
D(LR_NEG(-1))	-0.338508	0.026917	-12.57578	0.0000
D(DMA_POS)	-5.838382	3.911401	-1.492657	0.1861
D(DMA_POS(-1))	-42.79661	3.994970	-10.71262	0.0000
D(DMA_NEG)	-22.42302	2.564404	-8.743950	0.0001
D(DMA_NEG(-1))	-26.01512	3.339829	-7.789358	0.0002
D(GE)	0.653633	0.091524	7.141687	0.0004
D(GE(-1))	-1.040338	0.095204	-10.92746	0.0000
D(INF)	-0.092715	0.011777	-7.872480	0.0002
CointEq(-1)*	-0.716613	0.070393	-10.18917	0.0000
R-squared	0.876291	Mean dependent var		0.220166
Adjusted R-squared	0.848398	S.D. dependent var		2.919006
S.E. of regression	0.663081	Akaike info criterion		2.317052
Sum squared resid	7.474506	Schwarz criterion		3.222034
Log likelihood	-23.02399	Hannan-Quinn criter.		2.639038
Durbin-Watson stat	2.008899			

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.785629	10%	1.76	2.77
k	10	5%	1.98	3.04
		2.5%	2.18	3.28
		1%	2.41	3.61



Series: Residuals	
Sample 1984 2021	
Observations 38	
Mean	3.88e-15
Median	-0.038466
Maximum	0.953057
Minimum	-1.305906
Std. Dev.	0.449459
Skewness	-0.165466
Kurtosis	4.057006
Jarque-Bera	1.942399
Probability	0.378629

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.184713	Prob. F(2,4)	0.2284
Obs*R-squared	19.83866	Prob. Chi-Square(2)	0.0000

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.875050	Prob. F(31,6)	0.6385
Obs*R-squared	31.11730	Prob. Chi-Square(31)	0.4603
Scaled explained SS	1.185778	Prob. Chi-Square(31)	1.0000

Ramsey RESET Test

Equation: NARDL

Specification: AGDP AGDP(-1) AGDP(-2) AGDP(-3) MPR_POS
 MPR_POS(-1) MPR_POS(-2) MPR_NEG MPR_NEG(-1) MPR_NEG(-2)
 INT_POS INT_POS(-1) INT_POS(-2) INT_NEG INT_NEG(-1)
 INT_NEG(-2) LR_POS LR_POS(-1) LR_POS(-2) LR_NEG LR_NEG(-1)
 LR_NEG(-2) DMA_POS DMA_POS(-1) DMA_POS(-2) DMA_NEG
 DMA_NEG(-1) DMA_NEG(-2) GE GE(-1) GE(-2) INF INF(-1) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	2.329094	4	0.0803
F-statistic	5.424681	(1, 4)	0.0803

F-test summary:

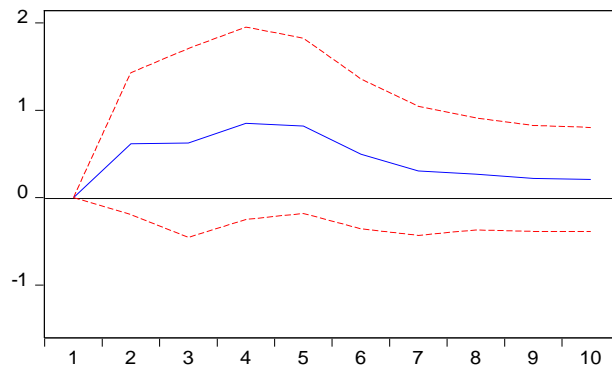
	Sum of Sq.	df	Mean Squares
Test SSR	3.411211	1	3.411211
Restricted SSR	5.926538	5	1.185308
Unrestricted SSR	2.515327	4	0.628832

Objective II

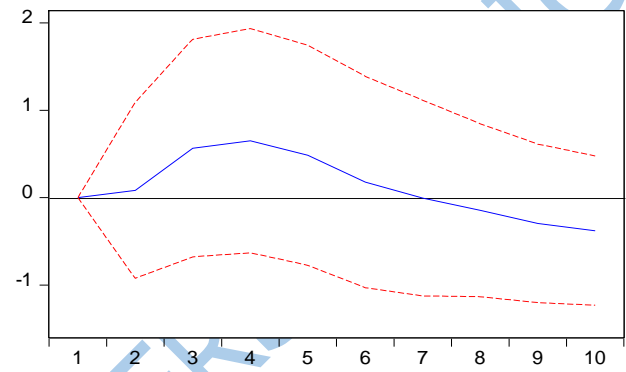
Impulse Response

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

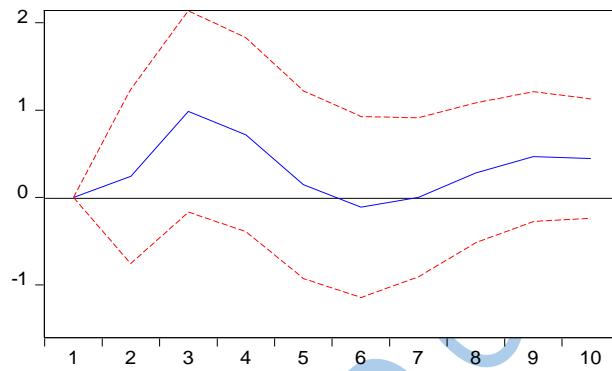
Response of AGDP to MPR



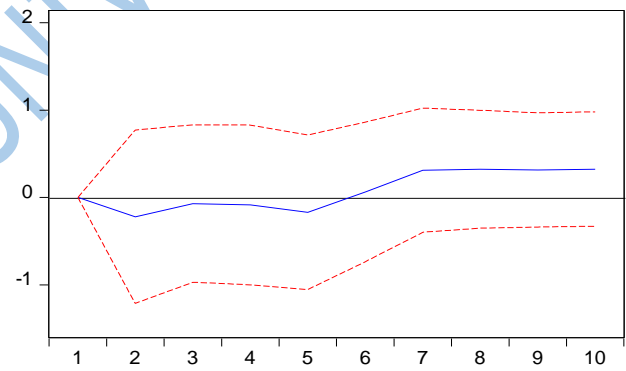
Response of AGDP to INT



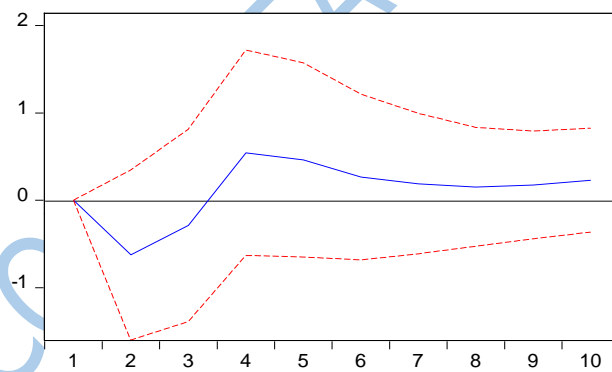
Response of AGDP to LR



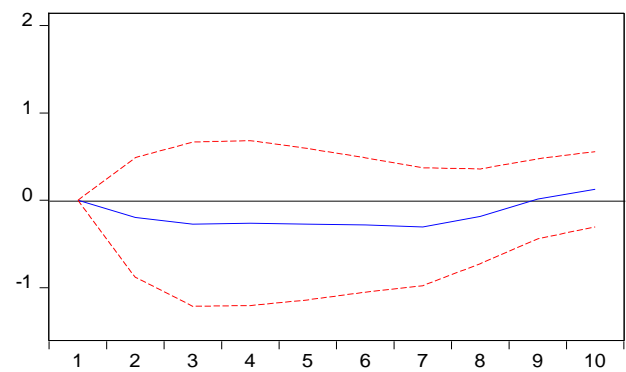
Response of AGDP to DMA



Response of AGDP to GE



Response of AGDP to INF



Variance Decomposition

Period	S.E.	AGDP	MPR	INT	LR	DMA	GE	INF
1	2.592274	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3.445698	92.23419	3.196249	0.059951	0.495393	0.410661	3.281914	0.321639
3	3.842223	81.27094	5.229924	2.224464	6.951433	0.364038	3.194026	0.765178
4	4.114983	71.66708	8.833897	4.441764	9.101274	0.360223	4.529382	1.066377
5	4.263774	66.75279	11.93033	5.434286	8.594001	0.492505	5.392504	1.403593
6	4.315805	65.15298	12.97731	5.474375	8.453232	0.502102	5.642481	1.797518
7	4.359481	64.16513	13.21544	5.365374	8.284712	1.005580	5.720999	2.242772
8	4.408721	63.23875	13.29828	5.352582	8.509750	1.517584	5.715129	2.367925
9	4.465748	61.74501	13.20265	5.654231	9.392147	1.973865	5.722901	2.309190
10	4.528400	60.07246	13.05171	6.191047	10.10242	2.432789	5.825033	2.324552

Cholesky Ordering: AGDP MPR INT LR DMA GE INF

Bio Data

A. Personal Data:

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B. Educational Background

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- i. Primary Education: C&S Primary School, Igboho (1991-1997)
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C. Working Experience With Dates

**Procurement and Maintenance Officer: Jubaili Agrotec Ltd., Podo Ibadan
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**Procurement Officer: Global Alliance for Chemical Industry, Alomaja,
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D. Awards and Fellowships (if any)

E. Membership of Academic Professional Bodies

F. Publications (if any)

1 Thesis/Dissertations

2 Books

3 Scholarly Articles

4 Notable Scholarly or Professional Accomplishments

5 Major Conferences/ Workshop Attended

Signature

Date

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University Compliance Certification

This is to certify that this thesis written by Emmanuel Abiodun, ADEKUNLE with Matriculation Number LCU/PG/001790 in the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan is in full compliance with the approved University format and style.

Signature

Date

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