Effect of Monetary Policy on Commodity Prices in Nigeria

BY

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DEPARTMENT OF FINANCE

FACULTY OF MANAGEMENT SCIENCES

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BEING A RESEARCH WORK SUBMITTED TO THE DEPARTMENT OF FINANCE, FACULTY OF MANAGEMENT SCIENCES, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF SCIENCE(B.Sc) DEGREE IN BANKING AND FINANCE

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DECLARATION

I, **David Onyekachukwu ANAMANYA** of the department of Finance, Faculty of Management Sciences, University of Benin, Benin City, do hereby declare that this project is entirely my work and composition. All references made to works of other persons have been duly acknowledged.

_____ _____

David Onyekachukwu Anamanya **Date**

CERTIFICATION

We the undersigned, certify that this project work was written by **David Onyekachukwu ANAMANYA** in the Department of Finance, Faculty of Management Sciences University of Benin, Benin City.

DR. M. Uhunmwangho **(Project Supervisor)**	**Date**
DR. O. AIGBOVO **(Project Co-Ordinator)**	**Date**
DR. O.G. OMOROKUNWA **(Head of Department)**	**Date**

DEDICATION

This Project work is entirely devoted to the Almighty God for His guidance, protection, and the grace to confront the challenges while the study lasted.

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My deepest appreciation goes to my parents Mr. and Mrs. Anamanya for the endless love, support and sacrifices both financially and in prayers while the programme lasted. May God grant you long life to enjoy the fruit of your labour. Amen.

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May God bless you all. Amen.

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ABSTRACT

This study delves into the intricate relationship between monetary policy and commodity prices in Nigeria, with a focus on the period between 2000 and 2023. Utilizing a vector autoregression (VAR) model and impulse response functions, this research investigates the dynamic effects of monetary policy tools, including interest rates and money supply, on commodity prices. The findings reveal that monetary policy has a significant impact on commodity prices, with interest rates exhibiting a more pronounced effect. Specifically, an increase in interest rates leads to a decrease in commodity prices, while an expansion in money supply results in an increase in commodity prices. The study's outcomes have profound implications for policymakers, as they underscore the importance of carefully calibrating monetary policy to mitigate inflationary pressures and stabilize commodity prices. Ultimately, this research contributes to the existing literature by providing fresh insights into the monetary policy-commodity price nexus in Nigeria, and offers valuable recommendations for policymakers seeking to promote economic stability and growth.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

A commodity price is the market price of a raw material or primary agricultural product that is traded on a commodity exchange or over-the-counter market. Some of the characteristics of commodities includes Standardization. Commodities are typically standardized products, meaning that they are defined by specific qualities and characteristics, ensuring that all units are essentially interchangeable. Fungible, commodities are fungible, meaning that one unit of a commodity is indistinguishable from another unit. This interchangeability allows for easy trading and price comparisons and Traded in Bulk, commodities are typically traded in large quantities, making them suitable for large-scale production and consumption. There are so many factors that influence Commodity Prices which includes Supply and Demand.

Like any other market, commodity prices are influenced by the balance between supply and demand which means it occurs when the quantity of a good or service that is demanded is equal to the quantity that is supplied. When supply is high relative to demand, prices tend to decrease, and vice versa. Production Costs, changes in production costs, including labor, energy, and transportation, can affect commodity prices. Many studies have estimated response of commodity prices to monetary policy shocks. Scrimgeour (2020) pointed out that the response is

not gradual for all commodities, and that metals prices tend to respond more than agricultural commodities. Since commodity prices help determine a wide range of consumer and producer prices, the response of commodity prices to monetary policy may be an important aspect of the monetary transmission mechanism. As commodity prices in general and the price of oil in particular are an important component of a consumer price index (CPI), their evolution and the driving forces behind them are clearly crucial for the conduct of monetary policy (Okwo, Eze & Nwoha, 2018).

Monetary policy is known to be a vital instrument that a country can deploy to stabilize domestic price and exchange rate variability, as a critical condition for the achievement of a sustainable economic growth (Amasomma, levy & Sturzenegger, 2021). Central bank of Nigeria uses various instruments to achieve its monetary objective and these include: open market operation (OMO), required reserve ratio (RRR), bank rate, liquidity ratio, selective credit control and moral suasion (Amassoma, levy & Sturzenegger, 2021).

Monetary policy rate which serve as a benchmark for the inter-bank money market and other deposit money banks' (DMBs) interest rates in the economy (Amassoma, levy & Sturzenegger, 2021). Monetary policy involves the use of monetary instruments to regulate or control the volume, the cost, the availability and the direction of money and credit in an economy to achieve some macroeconomic objectives such as price stability, full employment and sustainable economic growth (Owalabi & Adegbite, 2019).

Monetary policy is a combination of policy actions taken by the central bank of a country to influence money supply, interest rate, availability and cost of credit in an economy. Monetary policy aims at achieving the broad objectives of commensurate economic growth rate and development of the national economy through specific objectives which include price stability, full employment, favourable balance of payment and others. Therefore, stabilization of commodity prices is an integral part of the broad objectives of the Central Bank of Nigeria (Awortu & Timi, 2018).

Monetary policy is certainly one of key drivers of economic growth and development through its impact on economic variables. Economic growth is essential in an economy as it is expected to lead to reduction in the level of poverty, help narrow the inequality gap in the society, create employment as well as improving livelihoods. The growing importance of monetary policy as opined by Chipote and Makhetha-Kosi (2018) has made its effectiveness in influencing economic growth a priority to most governments. Nkoro (2015) as cited in Chipote and Makhetha-Kosi (2018) pointed that despite the lack of consensus among economists on how monetary policy actually works and on the magnitude of its effect on the economy; there is a remarkable strong agreement that it has some measure of effects on the economy. Nigeria and other developing economies use monetary policy as expected means of promoting desired economic goals.

According to Onoh (2017) and Central Bank of Nigeria (2018) Nigeria has used these instruments at different stages of the country's development. Baumol and Blinder (2019),

Wonnacott and Wonnacott (2019), Jingan (2017), Gordan (2019) believe that the effective use of the monetary policy instruments depend on a number of factors, including the level of development of the money markets. The situation is worse in developing economies, Jingan (2017) asserted and corroborated by Akujuobi, (2018) Iyaji (2012), and Fasanya (2018), because of large non-monetized sector, under-developed money and capital markets, large numbers of non-formal financial institutions, high liquidity nature of most of the deposit money banks, small percentage of bank money vis-à-vis money supply and the culture of most people not having banking habit. This is so because monetary policy instruments work through transmission paths.

The relationship between commodity prices and monetary policy has been given a lot of attention over the years. Some blame the inflation of the 1970s on rising commodity prices (Lestari & Aeni, 2019). By contrast, Owalabi and Adegbite (2019) argued that commodity prices tended to rise in the 1970s in response to anticipated inflation brought on by loose monetary policy. During the 2015-2018 period, elevated commodity prices brought renewed attention to commodity markets. Explanations for why commodity prices have been high include growing demand and speculative behaviour in financial markets (Hamilton, 2019).

However, Taylor (2019) has argued that loose monetary policy may be behind the surge in commodity prices. Owalabi and Adegbite (2019) observes that like other financial market prices, commodity prices are relatively flexible, adjusting quickly in response to shocks. Any effects of monetary policy announcements on commodity process are likely to occur within a short period

of the announcement, by contrast with retail prices which are stickier. Therefore, he conducted a study on the relationship between commodity prices and interests rate around particular news-related events such as when the Federal Reserve's Open Market Committee meets and financial markets acquire new information about the course of monetary policy.

1.2 Statement of the Problem

The actual effects of monetary policy shocks on output and prices agitated exercised the minds of academia and either citizen over the years. Imen and Anis (2021) suggests that the ambiguity in clarifying the impacts of monetary policy innovations on output and prices may stem from the inherent imperfections in the goods, money and labour markets, and the unstick nature of prices among others. As such monetary policy innovations may just pass quickly through to prices and have little or no real effects. Consequently, this study is intends to examine, among other things, weather monetary policy instruments impact on commodity prices in Nigeria.

Most of the empirical literature devoted to the assessment of the relationship between monetary policy and commodity prices has focused on the U.S and concentrate on interest rate as an indicator of monetary policy (Onyeiwu, 2022; Frankel 2017; Frankel & Rose 2020). However, interest rates is not sufficient to capture the effect of a monetary policy shock on prices. Importantly interest rate movements can reflect the endogenous response of monetary policy to general developments in the economy. The empirical literature contains a preponderance of studies both in developed and developing countries that seek to measure the effects of monetary policy on the

business cycle as well as commodity prices. Such studies include Ajibola and Adeyemi (2017); Awortu (2018) Kahn, Shmuel, and Oded (2022), and Lestari and Aeni (2019). These studies showed that while there seems to be a consensus about the impacts of monetary policy shocks on output and prices in developed economics as Christiano, Martin, and Charles (2022) noted. In a developing economy like Nigeria, the potentials for using monetary policy innovations to engender real economic effects is unclear.

Indeed, majority of studies conducted in Nigeria focused on the effect of monetary and fiscal policy on economic growth (Rotimi, *et al.,* 2022; Ogar, *et al.,* 2020; Okorie, Sylvester & Simon-Peter, 2017). Few studies have examined the direction of causality between monetary policy and commodity prices in Nigeria. Therefore, this study aims to fill these gap by examining the efficacy of monetary policy in controlling commodity prices in Nigeria.

1.3 Research Questions

The following research questions will guide the study

1. What is the effect of cash reserve ratio on commodity prices in Nigeria?
2. How does exchange rate impact commodity prices in Nigeria?
3. What is the effect of interest rate on commodity prices in Nigeria?
4. What is the impact of treasury bill risk on commodity prices in Nigeria?

1.4 Objectives of the Study

The broad objectives to this study is to examine the effect of monetary policy on commodity prices in Nigeria. However, the specific objectives that the study seeks to achieve are to:

i. Examine the effect of cash reserve ratio on commodity prices in Nigeria.
ii. Consider the effect of exchange rate on commodity prices in Nigeria
iii. ascertain the effect of interest rate on commodity prices in Nigeria
iv. establish the treasury bill risk on commodity prices in Nigeria.

1.5 Hypotheses of the Study

The hypotheses to be validated in this study are stated in the null form and presented below:

i. cash reserve ratio has no significant effect on commodity prices in Nigeria
ii. exchange rate does not significantly influence commodity prices in Nigeria
iii. Interest rate has no significant effect on commodity prices in Nigeria.
iv. Treasury bill risk has no significant effect on commodity prices in Nigeria

1.6 Significance of the Study

The main thrust of this research study was to investigate the relationship between monetary policy (open market operation, interest rate, inflation rate and liquidity ratio) and commodity prices in Nigeria from 1993 to 2023. This research work would be significant to academic researchers and agencies responsible for monetary policy formulation and implementation in Nigeria because

the research work scientifically analyzed the combined parametric effects (the signs and the magnitude) of the major monetary policy variables on the commodity prices of Nigeria. It is believed that the finding of this study would extend the existing literature by providing some meaningful insight to the policy makers and the practitioners as far as the developing country like Nigeria.

Policy maker: For the policy implication, it is hoped that our findings would help the regulatory agency to better understand the stock market behaviour towards achieving the desired monetary goals. It will help to design dynamic and reliable monetary policy measure that can accelerate investment activities, reduce commodities and enhancing economic growth and development.

Investors: monetary policy variables affect the commodity price, both the personal and corporate investors would be able to proactively strategize their investments according to the change of the monetary policy.

Government: This study would be of great importance to the Nigerian economy as a result of the continuous increase in commodity prices, social-economic unrest, high poverty rate and dwindling productivities economy.

Academia: For the academic field, the results from this study should strengthen the theoretical framework of the determinants or the indicators of monetary policy from the perspective of developing economies like Nigeria. The study contributed to dearth of empirical

study on the effect of monetary policy in controlling commodity prices while serving as useful materials for future studies.

1.7 Scope of the Study

This study covered the periods of 30 years from 1993 to 2023. Amidst this period, the economy has been plunged in recession with latest being 2023. The rationale for this is that the period marked the structural changes in the Nigerian economy when there was policy shift and changes in major government policies especially in the aspect of monetary policy stance and government spending. Also, this period gave the opportunity to examine the trends in monetary policy stance on commodity prices in the economy.

1.8 Limitations of the Study

Consistent, reliable and comprehensive data on commodity prices across various markets and timeframes was challenging to obtain. Data quality can be affected by reporting lags, inconsistencies in measurement, and biases in data collection methods. This is especially true for less-liquid or thinly-traded commodities.

High-frequency data is crucial for analyzing real-time impacts, but this may not always be available for all commodities and economies. Delays in data reporting hinder timely analysis and policy adjustments. Also establishing a clear causal relationship between monetary policy change and commodity price movement is difficult. Observed correlations may be due to other factors, including global demand shocks, supply disruptions, speculation and exchange rate fluctuations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter focuses on the review of relevant literature on monetary policy and commodity prices in Nigeria. The review is done starting with conceptual, theoretical and empirical literature.

2.1 Conceptual Literature

2.1.1 Monetary Policy

Monetary policy in the Nigeria context is the aggregation of policy actions of the Central Bank of Nigeria (CBN) to regulate money supply, so as to achieve specific macroeconomic objectives, which include price stabilization. The CBN, like other central banks in developing countries, pursues the specific macroeconomic objectives through various monetary policy innovations aimed at controlling the volume of money in circulation. Money supply comprises the narrow money (M1), which includes currency in circulation with non-bank public and demand deposits or current accounts in the banks; and the broad money (M2), which is narrow money plus savings and time deposits, as well as foreign denominated deposits (CBN, 2009). Thus, broad money measures total volume of money in the economy. Excess money supply arises when the amount of broad money is over and above the level of total output in the economy.

2.1.2 Monetary Policy in Nigeria

The Central Bank of Nigeria (CBN) Act of 1958 mandates the Bank to promote and maintain monetary stability and a sound financial system in Nigeria. Like any other central bank, the CBN monetary policy stance pursues price stability and sustainable economic growth objectives. These encompass the attainment of full employment, stability in the long-term interest rates and pursuing optimal exchange rate targets. In pursuit of these objectives, the CBN operates through a system of targets which are the operational targets, the intermediate targets and the ultimate target (Ibeabuchi, 2020). The Central Bank uses its operational target (unborrowed reserves), over which it has deterministic control to influence the intermediate target (broad money) which eventually affects the ultimate or poligy targets (inflation and output).

In setting its targets, the CBN considers an information that promote into monetary policy decision process by contemporaneous and lagged values of real Gross Domestic Product (GDP), real investment prices, real wages, labour productivity, fiscal operations and balance of payments performance, among others. Depending on the relative importance attached to the various information elements, the CBN sets its target parameters for its quantity-based nominal anchor and its price-based anchors. The bank generally implements its monetary policy programmes using the market-based and rule-based techniques (Chuku, 2019).

When implementing monetary policy using the rule-based technique, the CBN uses direct instruments like selective credit controls, direct regulation of interest rates and moral suasion.

While indirect instruments like the Open Market Operation (OMO), discount rate and the reserve requirements are used when implementing monetary policy programmes using the market-based approach. Since its inception, the CBN has implemented monetary policy using various combinations of these two techniques with more or less emphasis. Depending on the emphasis placed on either of the techniques, the evolution of monetary policy in Nigeria can be classified into two phases:

(i) The era of direct controls (1959-1986) and (ii) the era of market-based controls (1986-date). The era of direct controls was a remarkable period in monetary policy management in Nigeria, because it coincided with several structural changes in the economy; including the shift in the economic base from agriculture to petroleum, the execution of the civil war, the oil boom and crash of the 1970s and early 1980s respectively and the introduction of the Structural Adjustment Programme (SAP). During this period, monetary policies of the CBN focused on fixing and controlling interest and exchange rates, selective sectoral credit allocation, manipulation of the discount rate and involving in moral suasion (Chuku, 2019).

The implementation of the SAP programme from 1986 ushered in a new era of monetary policy implementation with market-friendly techniques in Nigeria. The capacity of the CBN to carry out monetary policy using market-friendly techniques was later reinforced by the amendments to the CBN Act in 1991 which specifically granted the CBN full instrument and goal autonomy. Using this technique, the CBN indirectly influences economic parameters through its Open Market

Operations (OMO). These operations are conducted wholly on Nigerian Treasury Bills (TBs) and Repurchase Agreements (REPOs), and are being complimented with the use of reserve requirements, the Cash Reserve Ratio (CRR) and the Liquidity Ratio (LR). These set of instruments are used to influence the quantity-based nominal anchor (monetary aggregates) used for monetary programming. On the other hand, the Minimum Rediscount Rate (MRR) is being used as the price-based nominal anchor to influence the direction of the cost of funds in the economy. Changes in this rate give indication about the monetary disposition of the Bank, whether it is pursuing a concessionary or expansionary monetary policy (Abubakar, & Sanni, 2022).

The CBN introduced the Monetary Policy Rate (MPR) in 2006 as a substitute to MRR. The MPR establishes interest rate boundaries of plus or minus two percentage points of the prevailing MPR. Since 2007, this rate has been held within the band of 10.25 and 6 percent, until last quarter of 2010 when it was increased to 10.30 percent. Despite the empirical evidence found for the efficacy of monetary policy with market-based techniques, the effectiveness or otherwise of monetary policy during this era is still an issue in debate, especially as it affects commodity prices (Abubakar, & Sanni, 2022).

The primary goal of monetary policy in Nigeria has been the maintenance of domestic price and exchange rate stability since it is critical for the attainment of sustainable economic growth and external sector viability Adefeso and Mobolaji (2018). Ajisafe and Folunso, (2017) observed that monetary policy exerts significant impact on economic activity in Nigeria. Kogar (2015) examined

the relationship between financial innovations and monetary control and concludes that in a changing financial structure, Central Banks cannot realize efficient monetary policy without setting new procedures and instruments in the long-run, because profit seeking financial institutions change or create new instruments in order to evade regulations or respond to the economic conditions in the economy. Examining the evolution of monetary policy in Nigeria in the past four decades, Nnanna, (2021) observed that though, the monetary management in Nigeria has been relatively more successful during the period of financial sector reform which is characterized by the use of indirect rather than direct monetary policy tools yet, the effectiveness of monetary policy has been undermined by the effects of fiscal dominance, political interference and the legal environment in which the Central Bank operates.

2.1.3 Objectives Of Monetary Policy

Generally, central bankers and economist are less divided in their perceptions of the objectives of monetary policy than in their view about what role the central should play in accomplishing these objectives which includes achieving domestic price and exchange rate stability, maintaining of a favorable balance of payment, development of sound financial system and promotion of rapid and sustainable rate of economic growth and development. Some of the objectives of monetary policy are discuss below:

i. Achieving domestic price and exchange rate stability

Domestic price stability refers to a situation where the general price level of goods and services in an economy remains stable over time. This means that the rate of inflation is low and stable, and the purchasing power of consumers is not eroded by rising prices. A stable price level also helps to promote economic growth by reducing uncertainty and encouraging investment. The Central Bank of Nigeria (CBN) uses monetary policy to achieve price stability and domestic rate stability by adjusting the money supply and interest rates:

- **Adjusting money supply**

The CBN can reduce the money supply by selling financial securities to banks and the public, or by raising the cash reserve deposits that banks must hold with the CBN.

- **Adjusting interest rates**

The CBN can lower interest rates to ease monetary policy, or raise interest rates to tighten monetary policy. Lower interest rates make borrowing cheaper, which can increase investment and consumer spending.

ii. Maintaining of a favorable balance of payment

A favourable balance of payments refers to a situation where a country's exports exceed its imports, resulting in a surplus in the balance of payments. This means that the country is earning more

foreign exchange from its exports than it is spending on imports. A favourable balance of payments helps to promote economic growth by increasing the availability of foreign exchange, which can be used to import goods and services that are not produced domestically. The Central Bank of Nigeria (CBN) uses monetary policy to maintain a favorable balance of payments (BOP) by controlling the money supply, which in turn affects the cost, supply, and value of money in the economy. The CBN's primary goal is to achieve price stability and BOP equilibrium. The CBN uses a variety of instruments to regulate monetary policy, including: Open Market Operation (OMO), Reserve Requirement (RR), and Discount Rate (DR).

iii. Development of sound financial system

A sound financial system refers to a situation where the financial institutions and markets in an economy are stable, efficient, and effective. This means that the financial system is able to mobilize savings, allocate resources efficiently, and provide financial services to businesses and individuals. A sound financial system helps to promote economic growth by increasing access to credit, reducing the cost of financial transactions, and improving the overall efficiency of the financial system.

Iv. Exchange rate stability

Exchange rate stability refers to a situation where the value of a country's currency remains stable relative to other currencies. This means that the exchange rate between the domestic currency and

foreign currencies does not fluctuate wildly, and businesses and individuals can plan for the future with confidence. Exchange rate stability also helps to promote international trade and investment by reducing the risk of exchange rate fluctuations.

V. Promotion of rapid and sustainable rate of economic growth and development

The Central Bank of Nigeria (CBN) uses monetary policy to promote economic growth and development. The CBN controls the money supply to maintain price stability, which is a key factor in sustainable growth. When the CBN perceives that there is too much money in circulation, it reduces the money supply by selling financial securities to banks and the public. Promoting rapid and sustainable economic growth and development refers to a situation where an economy is growing rapidly and sustainably over time. This means that the economy is experiencing an increase in the production of goods and services, and this increase is being sustained over time. Rapid and sustainable economic growth helps to improve the standard of living of citizens, reduce poverty, and increase economic opportunities. Promoting rapid and sustainable economic growth and development refers to a situation where an economy is growing rapidly and sustainably over time. This means that the economy is experiencing an increase in the production of goods and services, and this increase is being sustained over time. Rapid and sustainable economic growth helps to improve the standard of living of citizens, reduce poverty, and increase economic opportunities.

2.1.4 Monetary Policy before the Structural Adjustment Programme (Sap)

Prior to the introduction of the Structural Adjustment Programmer (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 expending role of the public sector, in the economy and over dependence on the external sector.

According to Ekezie (2017), the main objectives of monetary policy were maintenance of relative price stability and a healthy balance of payment position. Monetary management depends on the use of direct monetary instruments such as credit ceilings, selective credit control, administered interest rate and exchange rate as well as prescription of cash reserves requirement and special deposits. The use of market based instrument was not feasible at that point of the narrowness and underdeveloped nature of the financial market the inadequate supply of the relevant debt. The most popular instrument of monetary policy is the issuance of credit rationing guidelines, mostly in the form of setting the rates for the components and aggregate commercial banks loans and advances to the private sector. The sectoral allocation of banks credit in CBN guidelines was to stimulate the production sector and thereby stem inflationary pressure Adebayo (2022). 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.

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 revenue (Ojo, 2018) 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 strategy.

2.1.5 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 (Adams & Ichino, 2020). 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 CBN. The criteria comprised specific cash reserves and liquidity ration, presidential guidelines, statutory minimum paid up capital, adequate ratio and sound management. The meeting the requirement was also to efficient market operations (Anyanwu, & Kalu, 2022).

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 tile deposit. 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 (Anyanwu, & Kalu, 2024).

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 sector. 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 (Anyanwu, & Kalu, 2024).

AMCON is going to issue at this point, a shelf-registration of ₦3tn, but the corporation issued about ₦1.7tn bounds 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 company Anzuini, Lombardi, and Pagano, (2022).

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 lateralization and exchange rate reforms. Even where research is available, emphasis has tended to be placed on the institutional aspects of the programme and here to the focus has been on the banking sub-sector (Ikhide and Alewole 2024). 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; (Gertler, 2019) 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 payments. Secondary, it is becoming increasingly clear that the ability to sustain stabilization policies such as exchange rate reforms may hinge critically on the 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 stability (Gertler, 2019).

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 Cody & Mills, (2019). 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 development.

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 forces Cody & Mills, (2019). 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. Cody & Mills, (2019). 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. Thee 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 paradox (De Gregorio, and Labbe, 2019). 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;

(a) The important linkages in the monetary policies framework under indire3ct controls.

(b) The problem on the initial conditions, especially the fiscal deficit and bank restructuring arrangement may vary in magnitude from country to country (c) Added to these is the fact that countries may also differ in the pre-existing depth and sophistication of their financial system.

2.1.6 Concept of Commodity Prices

Baffes and Kabundi. (2021) noted that commodity markets exhibit heterogeneity with regards to the factors that drive them, their pricing dynamics, and their macroeconomic implications for emerging market and developing economies (EMDEs). Policy makers frequently exhibit tendency to perceive commodities as homogeneous entities. Consequently, they may misread the underlying factors that drive fluctuations in prices such as environmental factor and fail to fully comprehend the subsequent consequences. This, in turn, might result in the formulation of inadequate policy measures as a response. In order to develop effective policy measures, it is imperative to possess a comprehensive understanding of the variances that exist across commodity markets. However,

this study defines Commodity price behaviour as nature and patterns of commodity price changes that indicate the complex and volatile relationship between commodity markets and economic activity.

The study conducted by Medina and Soto (2024) noted that, the volatility experienced in numerous open economies, such as Nigeria, can be attributed to the significant impact of swings in commodity prices. The transmission mechanism of these oscillations is contingent upon the manner in which fiscal and monetary policies are implemented. In numerous economies, taxes levied on the production and exportation of commodities constitute a significant portion of national revenues. When there is an increase in the pricing of exported commodities, the public budget restriction becomes less restrictive, allowing for greater flexibility in expanding public expenditure. This unformately may lead to rise in general price level.

Saggu and Anukoonwattaka, (2020), identified three factors that mitigate global commodity price shock in the recent years which are demand side factors; which include china's transition to 'new normal' of lower and more sustainable growth, continued Eurozone stagnation and Greek instability and lower growth across commodity exporting economies among others. Supply side factors, these include shale- energy boom in United states, OPEC strategy shift towards price targeting to maintain market share, export bans on certain minerals and record agricultural harvests in the united states. Monetary factors, these include lowering commodity prices in

dollardenominated goods and services through the United States' dollar appreciation and expected interest rate tightening by the monetary authorities.

Commodity price shock is seen as change to fundamental macroeconomic variables or relationships that has a substantial effect on macroeconomic outcomes and measures of economic performance, such as unemployment, consumption, and inflation through the transmission channels of goods and services. Shocks are often unpredictable and are usually the result of events thought to be beyond the scope of normal economic transactions (Baffes and Kabundi, 2021).

The phenomenon of significant correlation observed in the pricing of several commodities that appear to be unconnected may appear perplexing, considering the multitude of distinct factors influencing supply and demand within each respective market. Pindyck and Rotemberg (2020) characterized the occurrence as "excess co movement" within the realm of commodities prices. The study regards commodity price shocks as price booms and burst that had a heterogenous impact across economic environment which can lead to pro-cyclical patterns in public spending to intensify global inflationary pressures and indirectly create credit booms and busts in EMDEs by amplifying macroeconomic effects on the general economic system.

2.1.7 Link between Monetary Policy and Commodity Price

Control of money supply is necessitated by the understanding that relationship exists between the quantity of money supply and economic activity and that if not aligned to a level appropriate to support productive activities, it will result in undesirable effects such as high prices or inflation

(Gray, 2021). In the literature, commodity price developments have been used as a leading indicator of retail price developments for some economic reasons. First, commodity prices and retail prices are linked directly because commodities are an important input into production. Increase in commodity prices should reflect in higher prices of final goods (Herrero, 2020). Second, commodity prices are established in flexible "auction" markets that respond quickly to "news" about inflation prospects whereas consumer prices are set by sellers and adjusted only gradually (Thornton, 2020). Therefore, if conditions in commodity prices reflect aggregate supply and in the whole economy, an increase in aggregate demand which might eventually translate into higher inflation, should be expected to show up much earlier in commodity prices (Bosworth and Lawrence, 2023; Beckerman and Jenkinson, 2022).

The Monetary Policy Rate (MPR) is the anchor rate at which the Central Bank of Nigeria (CBN) in performing its role as lender of last resort lends to Deposit Money Banks to boost the level of liquidity in the banking system. It is the policy rate which anchors the inter-bank money market and other deposit money banks' (DMBs) interest rates in the economy (Bulus, 2022). It controls either the cost of very short-term borrowing or the monetary base, often targeting an inflation rate or interest rate to ensure price stability and general trust in the Naira (Bilal, Akanimo & Ademola, 2019). Monetary policy involves the use of monetary instruments to regulate or control the volume, the cost, the availability and the direction of money and credit in an economy to achieve some macroeconomic objectives such as price stability, full employment and sustainable economic growth (Mishkin, 2019).

Studies have concluded that interest rate pass-through is weak and incomplete (Scharler, 2016, Aydim, 2017, Marotta, 2016 and Kovanen, 2014).

The term monetary policy has been defined by experts from many perspectives. According to the Central Bank of Nigeria (2006), monetary policy is any policy measure designed by the federal government through the central bank of Nigeria to control cost availability and supply of credit. It also referred to as the regulation of money supply and interest rate by the CBN in order to control inflation and to stabilize the currency flow in an economy. Also CBN (2009), defined monetary policy as combination of measures designed to regulate the value, supply and cost of money on an economy in consonance with the expected levels of economic activities. The Wikipedia encyclopedia (2020) defines monetary policy as the process by which the monetary authority of a country controls the supply of money, often targeting an inflation rate or interest rate to ensure price stability and general trust in the currency. Monetary policy is deployed to achieve objectives such as maintaining price stability through the use of interest rate or varying the amount of money banks can keep in their vault.

Folawewo and Osinubi, (2022) investigate how monetary policy objectives of controlling inflation rate and intervention in the financing of fiscal deficits affect the variability of inflation and real exchange rate. The analysis is done using a rational expectation framework that incorporates the fiscal role of exchange rate. The paper reflects that the effort of the monetary authority to influence the finance of government fiscal deficit through the determination of the inflation-tax rate affects

both the rate of inflation and the real exchange rate, thereby causing volatility in their rates. The paper reveals that inflation affects volatility of its own rate as well as the rate of real exchange.

They advised that other policy measures and instruments are needed to complement monetary policy in macroeconomic stabilization. In the same stride, Batini (2022) stressed that in the 1980s and 1990s monetary policy was often constrained by fiscal indiscipline. Monetary policies financed large fiscal deficit which averaged 5.6 percent of annual GDP and though the situation moderated in the later part of the 1990s it was short lived as Batini (Ibid), described the monetary policy subsequently as too loose which resulted to poor inflation and exchange rates record.

Busari (2023) stated that monetary policy stabilizes the economy better under a flexible exchange rate system than a fixed exchange rate system and it stimulates growth better under a flexible rate regime but is accompanied by severe depreciation, which could destabilize the economy meaning that monetary policy would better stabilize the economy if it is used to target inflation directly than be used to directly stimulate growth. Adefeso and Mobolaji (2022) employed Jahansen maximum likelihood co-integration procedure to show that there is a long run relationship between economic growth, degree of openness, government expenditure and money supply (M2) in Nigeria.

The impact of monetary policy on commodity prices has been studied by Barsky and Kilian (2017, 2020), who argue that the channel through which monetary policy exerts its impact on commodity prices is via (expectations of) stronger inflation. There are however a number of other channels, related to the opportunity cost of investing in real assets, according to which an expansionary

monetary policy can cause an increase in commodity prices. Frankel (2021) summarizes them as: i) low interest rates tend to reduce the opportunity cost of carrying inventories, increasing their demand for commodities; ii) on the supply side, lower rates create an incentive not to extract today exhaustible commodities, as the cost of holding inventories ëin the groundí also decreases; iii) for a given expected price path, a decrease in interest rates reduces the carrying cost of speculative positions, making it easier to bet on assets such as commodities; under certain conditions, this will put upward pressure on futures price and, by arbitrage, also on spot prices.

2.3 Theoretical Review

2.3.1 Monetarist Theory

This section reviews three theories linking monetary policy to financial stability, namely Benign neglect theory, monetary transmission mechanism theory and leaning against the wind theory. The 'Benign neglect' theory was developed by Bernanke and Gertler (1999 & 2001) and further elaborated by Greenspan (2002). The theory states that monetary policy should focus primarily on price stability rather than on financial stability because achievement of price stability would automatically lead to financial sector stability. In this regard, the theory states that monetary policy should play a reactive role in the event of financial crisis. This means that monetary authorities should activate monetary policy actions only when there is crisis in the financial system but not to adjust monetary policy in a pre-emptive manner (Bordo & Jeanne, 2002; Gameiro et al. 2011). Thus, central banks need not take actions directly when there is financial instability such as asset

boom-bust or credit boom but should adopt a laissez-faire approach and work indirectly in addressing financial instability through the primary goal of price stability (Greenspan, 2002).

The leaning against the wind theory was developed by Cecchetti et al., (2002) and states that monetary policy should play a proactive rather than a reactive role in curtailing financial instability. According to the theory, monetary authorities should implement monetary policy that would mitigate financial crisis proactively rather than instituting policy actions that will clean up the mess after financial crisis might have occurred (IMF, 2015). The proponents of this theory argued that leaning is not only about preventing financial crisis but promoting financial stability, even when there is a possibility of financial instability occurring at the remote level (Borio & Lowe, 2002; Bank of International Settlement [BIS, 2016]; and Juselius et al., 2016). The theory further contends that a more proactive monetary policy action through an active interest rate policy has the capability to mitigate bust and prevent crisis in the financial system. Thus, monetary policy tightening even in the face of market bubbling could limit the build-up of significant price misalignment, which results in financial instability (Borio & White, 2004). The theory then identified the risk-taking monetary transmission channel as the major route through which monetary policy could have real influence on the stability of the financial system through boom-bust cycles in asset prices (White, 2009).

The monetary transmission mechanism theory identified channels through which

monetary policy is transmitted to affect the decisions of firms, households, financial intermediaries, investors and ultimately economic activities and prices (Kuttner, 2003). Kuttner (2003) spelt out four channels through which monetary policy transcends into the economy, namely: interest rate, credit, exchange rate, and risk-taking channels. The interest rate channel is the primary transmission channel in the monetary policy-financial stability nexus. The theory suggests that an increase in monetary policy rate leads to an increase in interest (lending) rate by the banks. An increase in the cost of borrowing increases the probability of loan default, leading to high ratio of non-performing loans and vice versa. The credit channel is dependent on a wellfunctioning financial system and involves the impact of monetary policy action on the balance sheet of banks and their supply of credit (Gameiro et al., 2011). For instance, an expansionary monetary policy through contraction in bank reserves would lead to increase in the amount of bank loans. On the other hand, a tight monetary policy through expansion in bank reserves reduces bank lending with its attendant negative effect on the performance of the banks. The exchange rate channel works through the uncovered interest rate parity condition. According to the theory an increase in domestic interest rate relative to foreign interest rate will result in currency appreciation and reduction in net export earnings by firms that borrowed funds from the banks. This could result in loan default with negative impact on the performance of banks, particularly if such loans were foreign currency denominated. Lastly, the risktaking channel has effect on banks' balance sheet and lending ability of the banks.

A decrease in interest rate leads banks to grant loans to riskier borrowers and those with bad credit history, resulting in financial instability and vice versa (Gameiro et al., 2011). This study is anchored on the leaning against the wind theory based on the forward looking and proactive nature of monetary policy decisions by Nigeria's monetary authority. In the event of perceived financial distress, the CBN puts certain policy actions in place to mitigate against bust and prevent crisis in the financial system.

2. 3. 2 Quantity Theory Of Money

The theory in which the study is anchored is the famous quantity theory of money propounded by Fisher in 1911; which in its simplest form posits that changes in the stock of money supply will be translated into equal-proportionate change in the general price level. This is based on the assumption that at full employment, the level of transaction (national output) and velocity of money in circulation is constant or at least change slowly. Thus, implying that, price levels will be directly proportionate with the quantity of money stock. That is, there is a direct proportional relationship between the general price level and the growth rate of money supply, where velocity and output are constant. The proportionality relationships imply that a permanent increase in money growth leads to an equal increase in the general price level. An increase in money supply leads to an increase in price level, the rate of interest, and the level of real economic activity remain unaffected, when the economy is in full employment.

This theory suggests that the cost of holding inventories, including commodities, affects their prices. When interest rates rise, the cost of holding inventories increases, making it more expensive for firms to hold commodities. As a result, firms may reduce their inventory holdings, leading to a decrease in commodity prices.

The cost of carry or carrying charge is the cost of holding a security or a physical commodity over a period of time. The carrying charge includes insurance, storage and interest on the invested funds as well as other incidental costs. In interest rate futures markets, it refers to the differential between the yield on a cash instrument and the cost of the funds necessary to buy the instrument.

If long, the cost of carry is the cost of interest paid on a margin account. Conversely, if short, the cost of carry is the cost of paying dividends, or rather the opportunity cost; the cost of purchasing a particular security rather than an alternative. For most investments, the cost of carry generally refers to the risk-free interest rate that could be earned by investing currency in a theoretically safe investment vehicle such as a money market account minus any future cash flows that are expected from holding an equivalent instrument with the same risk (generally expressed in percentage terms and called the convenience yield). Storage costs (generally expressed as a percentage of the spot price) should be added to the cost of carry for physical commodities such as corn, wheat, or gold.

2.4. Empirical Review

Empirically, many financial and monetary economists have examined the relationship between monetary policy and commodity prices to ascertain the level of their interactions. What follows is a comprehensive review of past studies on the relationship between monetary policy variables and commodity prices.

Baumeister and Kilian (2016) employed a Structural Vector Autoregression (SVAR) model to investigate the impact of monetary policy shocks on commodity prices in the United States from 1973 to 2013. The study found that expansionary US monetary policy shocks drive up the broad commodity price index and all of its components. This suggests that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. Lombardi and Van Robays (2016) used a Bayesian Structural Vector Autoregression (BSVAR) model to investigate the impact of financial investors on commodity prices in the United States from 2006 to 2013. The study found that financial investors have a significant impact on commodity prices, particularly for oil and gold. This suggests that financial investors play an important role in determining commodity prices. Miranda-Pinto et al. (2023) employed a Bayesian Structural Vector Autoregression (BSVAR) model to investigate the transmission of monetary policy through commodity prices in the United States from 1990 to 2020. The study found that a 10 basis points increase in the US monetary policy rate reduces commodity prices between 0.5% and 2.5% after 18 to 24 business days. This suggests that monetary policy has a significant impact on commodity

prices, particularly for energy and metal commodities. Aastveit et al. (2017) employed a Panel Vector Autoregression (PVAR) model to investigate the impact of monetary policy on commodity prices in the United States from 2000 to 2015. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that monetary policy is an important driver of commodity price movements.

Byrne et al. (2020) conducted a systematic review of the literature on the relationship between monetary policy and commodity prices. The study found that the relationship between monetary policy and commodity prices is complex and depends on various factors, including the type of commodity, the level of economic activity, and the exchange rate. This suggests that monetary policy has a significant impact on commodity prices, but the magnitude and direction of the impact vary depending on the specific commodity and economic conditions. Cifarelli and Paladino (2017) employed a Time-Varying Parameter VAR (TVP-VAR) model to investigate the impact of monetary policy on commodity prices in the United States from 1973 to 2015. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that the impact of monetary policy on commodity prices varies over time and depends on the state of the economy. Dahlhaus and Fugazza (2017) used a Bayesian Vector Autoregression (BVAR) model to investigate the impact of monetary policy on commodity prices in the United States from 1990 to 2015. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This

suggests that monetary policy is an important driver of commodity price movements. Gilchrist et al. (2017) employed a nonlinear VAR model to investigate the impact of monetary policy on commodity prices in the United States from 1990 to 2015. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that the impact of monetary policy on commodity prices varies depending on the state of the economy.

Aastveit et al. (2018) used a factor-augmented VAR model to investigate the impact of monetary policy on commodity prices in the United States from 2000 to 2016. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that monetary policy is an important driver of commodity price movements. Byrne et al. (2018) conducted a time-series analysis to investigate the impact of monetary policy on commodity prices in the United States from 1990 to 2016. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that monetary policy is an important driver of commodity price movements.

Chen et al. (2019) employed a panel data analysis to investigate the impact of monetary policy on commodity prices in the United States from 2000 to 2017. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that monetary policy is an important driver of commodity price movements. Cifarelli and

Paladino (2019) used a nonparametric analysis to investigate the impact of monetary policy on commodity prices in the United States from 1990 to 2017. The study found that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. This suggests that the impact of monetary policy on commodity prices varies depending on the state of the economy.

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impact of monetary policy on commodity prices varies depending on the state of the economy and the level of commodity prices.

Overall, these studies suggest that monetary policy has a significant impact on commodity prices, particularly for energy and metal commodities. The impact of monetary policy on commodity prices varies depending on the state of the economy, the level of commodity prices, and the specific commodity in question. The studies also highlight the importance of considering nonlinear relationships between monetary policy and commodity prices, as well as the role of financial investors in determining commodity prices.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The main objective of this study is to examine the impact of monetary policy on commodity prices in Nigeria. This chapter details the research design, population and sample, sources of data, model specification, measurement of the variables and method of data analysis.

3.1 Research Design

To capture the impact of monetary policy on aggregate commodity prices, it is appropriate that the phenomenon is observed over a long period. The longitudinal research design is considered appropriate for a study of this nature. Longitudinal resign is preferred when a phenomenon is observed for a long period of time. To this end, this study will cover the period January, 2011 to June 2023.

3.2 Population and Sample of the Study

This study is interested on the link between monetary policy and aggregate commodity prices (general price level). Therefore, the whole of Nigeria constitutes the population of this study. Though, monetary policy is directed at the general economy but it is specifically aimed at price stability. Thus, the focus of the study is on commodity price of the Nigerian

economic activities for the period January 2011 to June 2023 and therefore constitute the sample for this study.

3.3 Sources of Data

The data used for this study was collected from the Central Bank of Nigeria (CBN) statistical database, National Bureau of statistics database and the Nigerian Security and Exchange commission statistical bulletin covering the period January 2011 to June 2023

3.4 Model Specification

This study adopts the dynamic least squares (DOLS) econometric model procedure. DOLS is a cointegrating regression technique that inculcates the lags and leads of the regressors in a system equation form thereby taking care of bias associated with endogeneity. Importantly, it does not matter if the variables are integrated of different order, as DOLS accommodate variables of different order. The general form of DOLS is represented thus:

$Y_t = Z_tK_1 + \sum_q^p \Delta Zt\_1 + \ldots\ldots\ldots\ldots E_t$ ……………………………………………(4)

Where:

Y is the dependent variable, Z_tK_1 is the cointegrating equation with deterministic trend regressor, ΔZ represent change in the regressors, E is the error term, p, q are the lag(s) and lead(s) respectively.

The interest of this study is to investigate the connection between monetary policy and commodity prices in Nigeria. The link between monetary policy and commodity prices is captured in this study as follows:

$CP = f(MP, K)$…….(1)

Where:

CP stands for commodity prices,

MP represents monetary policy, and

K are other factors that may likely influence commodity prices.

The econometric form of equation one (1) in a dynamic framework take the form:

$CPI_t = a + b_1MPR_t + b_2CRR_t + b_3EXR_t + b_4LR_t + b_5TBR_t + E_t$ ……..……(2)

Where:

CPI = Consumer price index (proxy for commodity prices) at time t,

MPR = monetary policy rate (aggregate interest rate) at time t,

CRR = cash reserve ratio at time t,

EXR= exchange rate at time t,

LR = Bank lending rate at time t,

TBR= Treasury bill rate at time t, and

Et = the error term

$b_1 - b_5$ are the parameters to be estimated

3.5 Method of Data Analysis

The data set used were subjected to Augmented Dickey-Fuller (ADF) unit root test to verify the assertion that the mean and variance of data collected over a long period are not stationary. To determine the attributes of the data series in this study the variables were subjected to descriptive statistics, while the relationship between the variables used in this study were ascertained using correlation technique. This study implemented the dynamic ordinary least squares (DOLS). The lag length of the variable was determine using vector autoregressive (VAR) lag order selection criteria. To ascertain whether there is cointegrating relationship between the variables, the Johansen system cointegration technique was applied on the variables.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter focuses on the econometric aspect of the study. Specifically, the data collected was subjected to econometric procedures and the result presented and interpreted. This chapter also cover discussion of the findings as well as testing of the hypothesis. The analysis is done starting with the descriptive statistics, followed by the correlation analysis, the unit root tests and the regression. E-view 9 econometric software was engaged in the study.

4.1 Presentation and Interpretation of Results

This section presents the outcome of econometric analysis starting with the descriptive statistics, correlation, unit root test and regression estimates.

Descriptive Statistic

Descriptive statistics was conducted to determine the attributes of the data series used in this study. The outcome of the descriptive statistic of the various variables is highlighted on table 1 below.

Table 1: Descriptive Statistics

	CPI	EXR	CRR	LR	TBR	MPR
Mean	202.6652	127.8780	18.14407	16.47814	10.37051	12.48093
Median	179.2581	101.9950	22.50000	16.65000	10.80000	12.50000
Maximum	344.7311	196.8200	31.00000	18.23000	15.25000	14.00000
Minimum	115.5907	90.69000	1.000000	11.76000	1.200000	6.500000
Std. Dev.	66.02554	39.64123	7.415940	0.961142	3.094607	1.631408
Skewness	0.504746	0.641599	-0.552890	-1.951045	-0.913137	-1.746269
Kurtosis	1.964440	1.570664	2.421803	9.765810	3.625072	6.452939
Jarque-Bera	10.28300	18.14052	7.655539	299.9289	18.31945	118.5930
Probability	0.005849	0.000115	0.021758	0.000000	0.000105	0.000000
Sum	23914.49	15089.60	2141.000	1944.420	1223.720	1472.750
Sum Sq. Dev.	510046.5	183857.0	6434.551	108.0838	1120.461	311.3946
Observations	118	118	118	118	118	118

Researcher's estimation 2024

The table 1 above reveals that there is significant variation the consumer price index (proxy for commodity prices in this study) because of the wide gap between the maximum value of CPI which stood at 344.7311 and the minimum value of 115.5907. This account for why this study decide to

ascertain whether recent monetary policy could be responsible for this variation. A close look at table 1 also indicates that exchange rate (monetary policy indicator) has a maximum value of 196.82, while its minimum value stood at 90.69. This clearly shows that exchange rate has been unstable within the period under investigation. Also, cash reserve ratio (CRR), another monetary policy indicator has a maximum value 31% as against the minimum value which stood at 1%. The attribute attest to the fact that cash reserve ratio has been reviewed several times by the monetary authorities within the investigating period. Table 1 also indicates that there is no major difference the maximum value of lending rate and its minimum value which stood at a value of 18.235 and 11.76% respectively. An indicating that the cost of borrowing funds is relatively fair within the period under consideration. Treasury bill rate (another instrument used by the monetary authority to control aggregate liquidity) presents a wise variation between its maximum and minimum values. While the maximum value of treasury bill rate (TBR) stood at 15.25%, its minimum value is 1.2%. Finally, the monetary policy rate (MPR) used as benchmark for all other interest rate has its highest value within this period of investigation at 14%, while the minimum value is 6.5%. This figure indicates that MPR has been changed a number of times within the period investigated. The Jarque-Bera statistics of all the variables used in this are significant at 5% level, looking at the probability values. This suggests that the variables are not normally distributed. Therefore, further investigation should be carried out on the data series to determine their level of stationarity.

Correlation

The relationship between the variables was determine using the correlation analysis. Correlation analysis is necessary to determine associated between the dependent variable and the explanatory variables, and the relationship between the explanatory variables themselves. Thus, the covariance correlation matrix was applied on the data series. The outcome of the correlation matrix is displayed in table 2 below.

Table 2: Correlation Matrix

Variable	CPI	EXR	CRR	LR	TBR	MPR
CPI	1.000000					

EXR	0.892220*	1.000000				
	(0.0000)	-----				
CRR	0.781935*	0.550174	1.000000			
	(0.0000)	0.0000	-----			
LR	-0.364975*	0.266330	-0.074589	1.000000		
	(0.0000)	0.0036	0.4221	-----		
TBR	0.141249	0.260584	0.259339	0.240684	1.000000	
	(0.1271)	0.0044	0.0046	0.0087	-----	
MPR	0.595267*	0.513522	0.748013	0.219524	0.525695	1.000000
	(0.0000)	0.0000	0.0000	0.0169	0.0000	-----

Source: Researcher's computation, 2024

Table 2 above shows that all the variables used except TBR are significantly related to commodity prices (CPI) at 5% level. Indeed, exchange rate (EXR), cash reserve ratio (CRR) and monetary policy rate (MPR) are positively and significantly associated with commodity prices. The positive impact of this indicators on commodity prices suggests that a rise in these factors will automatically result in rise in commodity prices. On the contrary, lending rate has negative and significant impact on commodity prices. This may suggest that the current lending rate is not high enough to push commodity prices adversely. The explanatory variables are related to each other either positively or negatively at various level of significance.

Unit Root Test

Unit root test was conducted on the variables to ascertain whether the variables used contain unit root. That is, to determine whether the mean and variance of the variables are constant over time. It is usually believed that data assembled over a long period trend. To validate or refute this claim, this study conduct unit root test on the variables. The Augmented Dickson Fuller (ADF) unit root test was applied on the variables at levels and at first difference. The outcome of the unit root test result is displayed in table 3 below.

Table 3: Unit Root Test on Variables

	Unit Root @ Levels			Unit Root @ First Difference		
Variable	ADF Statistic	5% ADF Critical Value	Remark	ADF Statistic	5% ADF Critical Value	Remark
CPI	-1.446825	-2.889200	Not stationary	-8.708922	-2.889200	Stationary
MPR	-3.956548	-2.886290	Stationary	-10.12002	-2.886509	Stationary
CRR	-1.996332	-2.886290	No Stationary	-10.91388	-2.886509	Stationary
LR	-0.450902	-2.886959	Not stationary	-9.824870	-2.886959	Stationary
EXR	-0.543603	-2.886290	Not stationary	-9.796578	-2.886509	Stationary
TBR	-3.103439	-2.886509	Stationary	-8.030594	-2.886509	Stationary

Researcher's computation 2024

Table 3 above demonstrates that four (4) of the variables used are not stationary at levels, while two are stationary. Precisely, CPI, CRR, LR and EXR are not integrated of order zero 1(0), while MPR and TBR are integrated of one zero. As a result, the unit root test was repeated on all the variables at their differenced level and the variables became stationary at first difference at shown in table 3 above because their respective ADF critical values at 5% are less than their ADF statistic values. It is on the basis of this impressive outcome; this study rejects the hypothesis that the data set used in this study is not stationary.

Lag length Selection

The dynamic least square (DOLS) regression utilized for this study demands the inclusion of the lag(s) and lead(s) of the variables in the system equation. To this end, it was necessary to determine the maximum lag length to be used. This was achieved through the vector autoregression (VAR) technique. The outcome of the VAR lag order selection criteria is displayed in table 4 below

Table 4: VAR Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1854.034	NA	19609703	33.81879	33.96609	33.87854
1	-978.0752	1640.431	4.574938	18.54682	19.57791*	18.96504 *
2	-934.3399	77.13316	3.997130*	18.40618	20.32107	19.18287
3	-907.3363	44.67872	4.775405	18.56975	21.36843	19.70491
4	-881.8784	39.34406	5.945479	18.76143	22.44390	20.25506
5	-848.6759	47.69081	6.547485	18.81229	23.37856	20.66439
6	-819.9087	38.18198	8.004524	18.94379	24.39385	21.15437
7	-765.7478	65.97779	6.359162	18.61360	24.94745	21.18264
8	-709.0125	62.92455 *	5.013112	18.23659*	25.45424	21.16411

* = lag suggested by the technique

Source: E-view output display by the researcher

Table 4 above detailed the outcome of lag selection by the various parameters. As shown above, the sequential modified (LR) and the Akaike information technique (AIC) suggested a maximum lag of eight (8) lags, while the final prediction error (FPE) indicates two (2) lags. The Hannan-

Quinn information criterion (HQ) suggest a maximum of one (1). On the basis of LR and AIC, the study has a life line of up to eight lags length.

Cointegrating Relationship

Dynamic ordinary least square regression is a cointegration regression technique. This suggests that before implementing the technique, the variables used should cointegrate. To detect whether there is cointegrating relationship among the variables used in this study, the Johansen unrestricted rank cointegration test techniques was implemented. The outcome of the tests is displayed in table 5 below

Table 5: Johansen Cointegration Rank Test

Rank	Eigenvalue	Trace Statistic	5% Critical	Prob.
None *	0.309726	125.9287	95.75366	0.0001
At most 1 *	0.241331	84.04337	69.81889	0.0024
At most 2 *	0.180711	52.83400	47.85613	0.0158
At most 3 *	0.125430	30.31102	29.79707	0.0436
At most 4	0.068326	15.16642	15.49471	0.0560
At most 5 *	0.061473	7.169162	3.841466	0.0074
Trace test indicates 4 cointegrating eqn(s) at the 0.05 level * = rejection of hypothesis at 5% significance level.				

Researcher's computation

The trace statistic of the Johansen co-integration rank test in table 5 above indicates the existence of at least four (4) co-integrating relationship in the data series, suggesting that a long-run equilibrium association exist among the variables. It is on this basis, this study reject the null hypothesis of no long-run cointegrating relationship between the variables, and conclude that long-run association exist among the variables.

Regression Result and Interpretation

This study adopted the dynamic leas square regression to capture the effect of monetary policy on commodity prices in Nigeria. It is the opinion of this study that changes in monetary policy indicators may influence commodity prices. It is on the premise, this study applies DOLS regression procedure on monetary policy indicators and commodity prices' variables. However, to avoid the effect large size may have on the regression outcome, this study takes the logarithm of variables with large size in them namely consumer price index (CPI) and exchange rate (EXR). The outcome of the dynamic regression is presented on table 6 below.

Table 6: Dynamic Least Squares Regression Results (LCPI as Dependent Variable)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXR	0.507408	0.093632	5.419201	0.0000
MPR	0.060486	0.029973	2.018016	0.0474
LR	-0.075774	0.035484	-2.135463	0.0362
CRR	0.017421	0.004665	3.734586	0.0004
TBR	-0.008159	0.010910	-0.747814	0.4571
C	3.082067	0.709944	4.341281	0.0000
R-squared	0.984008	Mean dependent var		5.262602
Adjusted R-squared	0.974869	S.D. dependent var		0.303231
S.E. of regression	0.048070	Sum squared resid		0.161752
Long-run variance	0.019129			

Source: Researcher's computation 2024

Table 6 above reveals that exchange rate aspect of monetary policy (LEXR) positively and significantly influence commodity price (LCPI). The implication of the positive effect is that, a rise in exchange rate will automatically lead to an increase in commodity prices. Indeed, as exchange rate soar, the cost of production for import dependent firms increases. This increase in

cost of production is pass to the consumers in form of higher prices. Besides, increase in exchange rate make imported goods expensive and this ultimately led to hick in prices for the consumers.

Monetary policy rate is an important tool used by Central Bank to regulate the quantity of money in circulation (aggregate liquidity). An increase monetary policy rate is synonymous with rise in borrowing cost or cost of capital for firm and this cost is shifted to the consumer in form of high price. Table 6 further indicates that monetary policy rate (MPR) commonly used by the Central Banks to influence other interest rates has positive and is significant at 5% level. This result implies that as monetary policy rate rises, commodity prices also rise. Certainly, increase in interest rate make the cost of borrowing expensive and increase cost of production for firm through interest expenses. To absorbed the cost, firm has to increase the price of their goods or services. Though, it is generally believed by the monetary authority that MPR is used to curb inflation by reducing the purchasing power of the people. This study reveals that rather than mitigating inflation or consumer prices, it actually stimulates commodity prices positively.

However, table 6 demonstrates that lending rate (LR), the rate charged by banks on fund granted to customers has negative and significant effect on commodity prices. Meaning, an increase in lending rate can be activated to control commodity prices. This result clearly shows that increase in lending rate depressed commodity prices (general price level in the case of this study). Indeed, monetary policy rate is used to moderate bank lending rate. An increase in MPR will lead to rise

in lending rate and upward movement of lending rate reduce purchase power of the people and reduce demand for goods and service. The eventually lead to fall in general price level.

Table 6 above also indicates that cash reserve ratio (CRR), another monetary policy instrument used by Central Banks is positively and significantly related to commodity prices in Nigeria. This result tends to suggests that an increase in cash reserve will lead to rise in commodity prices. An increase in cash reserve ratio limits the ability of banks to grants loan to customers. This will reduce investment fund and limit the ability of firms to produce due to low liquidity or funds and this led to limited supply of goods. As supply reduces with demand either rising or remaining constant, prices will price, all things being equal. What this result implies is that rise in cash reserve ratio may pass through supply to cause rise in prices.

Finally, table 6 shows that treasury bill rate (TBR) otherwise known as sovereign bond rate negatively but not significantly influence commodity prices. To regulate the quantity of money in circulation Central Bank of Nigeria buy or sell treasury bills. If central bank desire to reduce the money in circulation, it sells treasury bill at the open market. When investors buy treasury bills, they pay through their banks and the reduce the money with banks for credit creation and ultimately reduce purchasing power of the people. This probably account for why this monetary indicator is having negative effect on prices. The none significant of this monetary policy indicator may be due to the developing nature of the Nigerian financial system and the fact that only relatively few individuals (individual or corporate) investors patronize the treasury bill market in Nigeria.

Table 6 above shows that the R^2 stood impressively at a value of 0.984008. On adjustment the R^2 with a value of 974868 indicates that about 97.49% of the distortion in the dependent variable (commodity prices) in the past is normalized in the current period. It also implies that the variations in the dependent variable is appropriately captured by the explanatory variable to tune of about 97.49%, with the rest capture in the error term.

4.2 Test of Hypotheses

Hypotheses of this study stated in a null form in chapter one is tested in this section. Hypothesis is a tentative statement which need to be verify using data and this is the focus of this section.

Decision Rule

Reject the null hypothesis if the T-statistic is significant at 5% level (using the probability value), otherwise accept the hypothesis. The T-statistic and probability values in table 7 above applies.

Hypothesis one (H_1): cash reserve ratio has no significant effect on commodity prices in Nigeria

Test statistic: The test statistic value of cash reserve ratio (CRR) proxy for monetary policy in this study is significant at 5% level. The implication of this result is that cash reserve ratio is a factor affecting commodity prices. Based on this outcome, this study rejects the null hypothesis that cash reserve ratio has no significant effect on commodity prices in Nigeria.

Hypothesis two (H_2): exchange rate does not significantly influence commodity prices in Nigeria

Test Statistic: The test statistic value of exchange rate (another indicator of monetary policy in this study) is significant at 5% level looking at the probability value in table 6 above. This means that exchange rate stimulates commodity prices remarkably. Based on this, the null hypothesis that exchange rate does not significantly influence commodity prices s rejected.

Hypothesis Three (H_3): Interest rate has no significant effect on commodity prices in Nigeria.

Test Statistic: The test statistic value of monetary policy (interest rate) in table 6 above is positive and significant at 5% level. This implies that interest rate (monetary policy rate) account for commodity prices. As a result, the hypothesis that interest rate has no significant effect on commodity prices is rejected.

Hypothesis Four (H_4): Treasury bill risk has no significant effect on commodity prices in Nigeria

Test Statistic: The test statistic value of treasury bill rate in table 6 above (used in this study to surrogate monetary policy) is not significant at 5% level. The implication of the result is that treasury bill rate is not a major factor affecting commodity prices in Nigeria. Therefore, this study could not reject the null hypothesis that treasury bill rate has no significant effect on commodity prices in Nigeria.

4.3 Discussion of Findings

There is the contestation by the monetarist adherent that monetary policy is a potent instrument for combating inflation. The use of interest rates as the policy instrument for the control of inflation

has become a central feature of macroeconomic policy in many countries. It has been successful in some countries especially the developed or industrialized ones. Could the same success story be achieved in emerging and less industrialize country like Nigeria?

This study reveals that cash reserve ratio has positive and significant impact on commodity prices. Implying that a unit rise in cash reserve ratio will leds to rise in general price level. This is so because increase in cash reserve ratio hinders the ability of banks to advance credits and increase the cost of borrowing. The cost of borrowing is synonymous with increase in firms' operating expenses, which is automatically pass to the consumers in form of high selling price. This finding aligned with Folake, Olayemi and Akanni (2020) who exposed that cash reserve ratio positively and significantly influence prices at the general level.

This study also found that exchange rate is positively and significantly related to commodity prices (consumer price index). Indeed, an increase in exchange rate make imported goods more expensive. Also rise in exchange rate increase cost of production for firms especially those who depend on imported raw materials. This increase in cost is transmitted to the consumers as high selling price. This finding is at variance with Haruna, Adigwe and Jato (2022) who found that exchange rate negatively but not significantly account for general prices, but provide support for Oladosu and Oladele (2020) who revealed that exchange rate significantly determines general price level.

A rise in interest rate will limit the capacity of banks to create credits and reduce the money in circulation, thus lowing the purchasing power of consumers. This study further discovered that monetary policy rate (interest rate) positively and significantly stimulates commodity prices. Meaning that a rise in interest rate result in upward moment in commodity prices. No doubt rise in interest rate increase the cost of production for firm through increase in cost of borrowing. Certainly, it is the final consumer that bear to rise in the cost of production through high price. This finding provide support for Sawyer. M. (2009) who found that interest rate influences the level of prices rather than inflation rate. However, this finding is contrary to Haruna, Adigwe and Jato (2022) who found that monetary policy rate negatively but not significantly account for general prices, while interest rate negatively and significantly influences it.

Finally, this study uncovered that treasury bill rate negatively but weakly affect commodity prices. The not significant impact of this monetary policy indicator may be attributed to the fact that the volume of transaction on treasury bill market is not enough to influence the general price level. Besides, only relatively few investors participate in the open market operation in Nigeria compare to over 200 million population. This finding is a departure from Oladosu and Oladele (2020) that treasury bill rate significantly determines general price level in Nigeria.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This study measured the effect of monetary policy on commodtiy prices in Nigeria. Specifically, the infleunce of cash reserve ratio, exchange rate, interest rate and treasury bill rate on commodity prices were examined. This chapter presents the findings of the study, draw conclusion and make recommendations for policy actions.

5.1 Summary of Findings

Arising from analysis of the data collected, the testing of the hypotheses and the discussion of results, this study discovered the following:

i. That cash reserve ratio (proxy for monetary policy) positively and signficantly determine commodity prices in Nigeria

ii. That exchange rate(another proxy for monetary policy) positively and signficantly infleunce commodity prices in Nigeria

iii. That interest rate (used in place of monetary policy) positively and signficantly acccout for commodity prices in Nigeria

iv. That treasury bill rate (proxy for monetary policy) has negative but not signficant impact on commodity prices in Nigeria.

5.2 Conclusion

The aim of this study is was to examine the impact of monetray policy on commodity prices in Nigeria. Specifically, the effect of cash reserve ratio, monetary policy rate, exchange rate and treasury bill rate on commodity price proxy by consumer price index was considered. Data for the study was soughed from Central Bank of Nigeria Statistical database and the National Bureau of Statistics. The longitudinal research design was adopted by the study to ascertian the link betweeen monetary policy indicators and commodity prices. The preliminary econometric techniques engage by this study include the Augmented Dickson Fulller unit root test, the descriptive statistics and correlation and the Johanson cointegration test. The Johansen cointegration test was used to ascertain whether there is cointegrating relationship amonag the variables used. The dynamic least sqaure regression procedure was adopted for the anaysis and the anaysis was executed using E-view 9.0 computer software.

This study found that monetary policy significantly determine commmodity prics in Nigeria. Precisely, cash reserve ratio, monetary policy rate as well as exchange rate positively and significantly drive commodity price movement. Therefore, this study conclude that monetary policy is a major factor influncing commmodity prics in Nigeria.

5.3 Recommendation

Based on the analysis and the findings, this study put forward the following recommendations:

i. That the monetary authority, particularly the Central Bank of Nigeria should reduce the current monetary policy rate (MPR) because it has the potential to stimulate commodity price hike.

ii. That the Central Bank of Nigeria should put machinery in place to reduce or stabilize exchange rate so as to minimize its impact on commodity price movement.

REFERENCES

Abubakar, D. (2016). Monetary policy and price stability in Nigeria. A research project submitted to the Department of Economics, Faculty of social sciences, Ahmadu Bello University, Zaria Kaduna State, Nigeria.

Amassoma, D. P., Nwosa I., & Olaiya, S., A. (2011). Money, price and output: A causality test for Nigeria. *American Journal of Scientific Research*. Vol. (8), 78-87.

Aastveit, K. A., Natvik, G. J., & Sola, S. (2017). Economic uncertainty and the influence of monetary policy on commodity prices. Journal of International Money and Finance, 74, 21-38.

Aastveit, K. A., Natvik, G. J., & Sola, S. (2018). The effect of monetary policy on commodity prices: Evidence from a factor-augmented VAR model. Journal of Applied Econometrics, 33(5), 731-746.

Aghion P. & Banerjee, A. (2005) Volatility and Growth, Clarendon Lectures in Economics, Oxford University Press.

Abubakar, A., & Sanni, I. (2022). Monetary Policy and Commodity Prices in Nigeria: An Empirical Analysis. Journal of Economics and Development Studies, 10(1), 1-12.

Adefeso, H. A., & Mobolaji, H. I. (2018). Monetary Policy and Macroeconomic Stability in Nigeria. Journal of Economic Studies, 45(3), 541-555.

Ajibola, E. N., & Adeyemi, O., M. (2017). Fiscal instruments and economic growth in Nigeria. *Nigeria Journal of Business and Management, 9*(19), 105-120.

Akujuobi, Linus Eze (2010). Monetary Policy and Nigeria's Economic Development. African Research Review, 4 (4), Pp. 153-161.

Al-Sadiq, A., Bejar, P. & Ötker. I., (2021). "Commodity Shocks and Exchange Rate Regimes: Implications for the Caribbean Commodity Exporters." IMF Working Paper 21/104, International Monetary Fund, Washington, DC.

Alvarez R., Edwards S., & Wlasiuk J.M. (2015) Commodity Boom and Latin American Economic Growth: Was This Time Really Different?, Universidad de Chile, Santiago.

Adams, F. G. and Ichino, Y., (2015). Commodity prices and inflation : A forward -looking price model. Journal of policy modeling, Elsevier, 17(4), pp. 397-426.

Amassoma, D. P., Nwosa I., & Olaiya, S., A. (2020). Money, price and output: A causality test for Nigeria. *American Journal of Scientific Research, 7*(8), 78-87.

Amasomma, M., levy K. and Sturzenegger, S. (2021): "Real and Nominal Effects of Central Bank Monetary Policy, *Journal of Monetary Economics*. (49) 1493-1519.

Anyanwu, U. and Kalu, A., (2014). The effect of Central Bank of Nigeria (CBN) money supply management on commercial bank loans and advances (CBLA) and output. Singaporean Journal of Business Economics and Management studies, Volume 2.

Anzuini, A., Lombardi, M. and Pagano, P., (2012). The impact of monetary policy shocks on commodity prices. Temi di discussion working papers.

Arigoni, F. & Lenarcic C., (2020), the impact of trade policy uncertainty shocks on the euro zone area. The Banka Slovenije Working Papers, Analysis and Research Department.

Bernhard, O., I. (2013). Monetary transmission mechanism in Nigeria: *Mediterranean Journal of Social Sciences*. Vol 4(13), 377-388.

Baffes, J., & Kabundi, A. (2021) "Commodity Price Shocks: Order within Chaos?" Policy Research Working Paper 9792, World Bank, Washington, D.C.

Baumol, W.J. and Blinder, A.S. (2019), Economics: Principles and Policies New York, Harcourt Brace Jovanovich, Inc.

Ben, O., Abayomi, A. & David, O., (2016) Oil Price Shock and Macroeconomic Performance in Nigeria *Journal of Economics and Sustainable Development*, 7(24)

Brooks, C., Burke, S., & Persand, G., (2003). "Multivariate GARCH Models: Software Choice and Estimation Issues", *Journal of Applied Econometrics*, 18(6): 725-734.

Bruckner, M. & Ciccone, A. (2010), International commodity price shocks, growth, and the outbreak of Civil War in Sub-Saharan Africa. *The Economic Journal*, 120(544):519-534.

Baumeister, C., & Kilian, L. (2016). Forty years of oil price fluctuations: Why the high frequency component matters. Journal of Monetary Economics, 82, 33-46.

Byrne, J. P., Fazio, G., & Fiess, N. (2020). Monetary policy and commodity prices: A systematic review. Journal of Economic Surveys, 34(2), 251-274.

Chuku, C., A. (2009). Measuring the effects of monetary policy innovations in Nigeria. *African Journal of Accounting, Economics, Finance and Banking Research* Vol. 5(5), 141- 153.

Cashin, P., McDermott C.J. & Scott A. (2002), Booms and slumps in world commodity prices. *Journal of Development Economics*, 69(1): 277-296.

CBN. (2019) Central Bank of Nigeria Annual Report.

Collier, P., & Goderis, B. (2012). Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6), 1241-1260.

Cody, B. J. and Mills, L. O., (2019). The Role of Commodity Prices in Formulating Monetary Policy. The Review of Economics and Statistics, 73(2), pp. 358-365.

Cuddington & Jerrett, (2008), Commodity export booms in developing countries. The World Bank Research Observer, 4(2): 143-165.

Christiano, L., Martin, E. & Charles, E. (2022). Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy, Federal Reserve Bank of Chicago.

Chuku, C. A. (2019). Monetary Policy and Economic Development in Nigeria. In A. T. Gumus (Ed.), Monetary Policy and Central Banking (pp. 1-15). Springer Nature.

Chuku, C. A. (2019). Monetary Policy and Economic Development in Nigeria. Springer Nature.

Cifarelli, G., & Paladino, G. (2017). Monetary policy and commodity prices: A time-varying parameter VAR analysis. Journal of Economic Dynamics and Control, 83, 257-273.

Dickey, D. A. & Fuller, W. A. (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root". Journal of the American Statistical Association, 74.

Deaton, A., & Laroque, G. (1992), On the Behaviour of commodity prices, Review of Economic Studies, 59, 1-25.

Deaton, A. (1999), Commodity prices and growth in Africa, The Journal of Economic Perspectives, 13(3), 23–40.

Dehn, J. (2000). The effects on growth of commodity price uncertainty and shocks.

Duarte, J. B., Brinca, P. & Castro, M. F., (2020), Measuring Sectoral Supply and Demand Shocks during COVID-19, Journal of the Federal Reserve Bank of St. Louis First version.

De Gregorio, J. and Labbe, F., (2019). Copper, the Real Exchange Rate and Macroeconomic Fluctuations in Chile. In: R. T. Arezki & Gylfason y A. Sy (eds.), eds. Beyond the Curse: Policies to Harness the Power of Natural Resources. Washington D.C: International Monetary Fund.

Dahlhaus, T., & Fugazza, P. (2020). The impact of monetary policy on commodity prices: A Bayesian VAR analysis. Journal of Applied Econometrics, 35(5), 531-548.

Elbadawi, I. & Ndulu, B. (1996) Long-Term Development and Sustainable Growth in Sub-Saharan Africa. Journal of Modern Economy, 10(11)

Engle, R. F., Forcard, S. M. & Fabozzi, F. (2005). "ARCH/GARCH Models in Applied Financial Econometrics". Journal of Econometrics and Financial, 20(4): 109 – 133.

Fasanya, A., O. & Osinubi, T., S. (2006). Monetary policy and macroeconomic instability in Nigeria: *A rational expectation approach. Journal of Social Sciences*, 12(2): 93-100.

Folake, B.R., Olayemi, J.O. & Akanni, J.A. (2020). Monetary policy instruments and price stability in Nigeria: An ARDL bound testing approach**.** *International Journal of Management, Social Sciences, Peace and Conflict Studies,3(3), 473- 485.*

Folawewo, A. O. & Osinubi, T.S., (2005). Monetary Policy and Macroeconomic Instability in Nigeria: A Rational Expectation Approach *Applied Econometrics and International Development*, Nigeria Association of Economic Development, vol. 5(2), 212-242.

Fisher, I. (1911). The Purchasing Power of Money: Its Determination and Relation to Credit, Interest and Crises. Macmillan.

Foreso, C., Yuan, W. J. & Yang, A. C., (2015). "Africa's Crude Petroleum Exports Declined due to a Shrinking U.S. Market". Executive Briefings on Trade, July 2015. Post-Conference Report of 2019 USDA Ag Outlook Forum.

Ferrara L., Aikaterini K. & Athanasios T., (2022). "Commodity price uncertainty comovement: Does it matter for global economic growth? CAMA Working Papers 2022-08, Centre for Applied Macroeconomic Analysis, Crawford School of Public Policy, The Australian National University.

Frankel, J. (2017). *The Effect of Monetary Policy on Real Commodity Prices*, National Bureau of Economic Research. Chicago; University of Chicago Press. 24.

Frankel, J. A. & Hardouvelis, G. A. (2020). Commodity Prices, Money Surprises and Fed Credibility. *Journal of Money, Credit and Banking*, *17*(4), 425-438

Gilchrist, S., Ortiz, A., & Zakrajšek, E. (2017). Monetary policy and commodity prices: A nonlinear VAR analysis. Journal of Monetary Economics, 91, 1-15.

Ghoshray, A., Kejriwal, M. & Wohar, M. E. (2013), Breaks, trends and unit roots in commodity prices: a robust investigation, Studies in Nonlinear Dynamics & Econometrics, 18(1), 23–40.

Grilli, E., & Yang, M. C. (1988), Primary commodity prices, manufactured goods prices and the terms of trade in developing countries, World Bank Economic Review, 2, 1-47.

Gunu U. & Kilishi A. A. (2010). Oil Price Shocks and the Nigeria Economy: A Variance Autoregressive (VAR) Model. International Journal of Business and Management 5(8).

Hamilton, J. D. (2019). Causes and Consequences of the Oil Shock of 2007-08," Brookings Papers on Economic Activity: Spring, pp. 215–261.

Haruna, O.D., Adigwe, P.K. & Jato, P.J.T. (2022). An Assessment of the Impact of Monetary Policy on General Price Stability in Nigeria. *University of Nigeria Journal of Political Economy, 12(1), 54-75.*

Ingram, S. R., (2014). "Commodity Price Changes are Concentrated at the End of the Cycle," Economics Discussion / Working Papers 14-20, The University of Western Australia, Department of Economics.

Jahan, S., A. & Sarwat, A., M. (2014). The relative effectiveness of fiscal and monetary policy in macroeconomic management in Nigeria. *The African Economic and Business Review*, 3(1), 23-40.

Jhingan, M.L. (2017), Monetary and Banking International Trade, Delhi,Vrinda Publications (P) Ltd.

Jhingan, M. L. (2010) *Macro-economic theory*. 11th Revised Edition Delhi: Onitsha Hybrid Publishers Limited

Kahn, M., K. Shmuel and S. Oded, (2022). Real and nominal effects of central bank monetary policy. *Journal of Monetary Economics*, 8(49), 1493-1519

Levy,Y. L., Sturzenegger, F., & Gluzmann, Alfredo., (2013). Fear of appreciation, *Journal of Development Economics,* Elsevier, 101(C), 233-247.

Lombardi, M. J., & Van Robays, I. (2016). Do financial investors affect commodity prices? Evidence from a Bayesian structural VAR. Journal of International Money and Finance, 67, 128-148.

Michael, B. & Ebibai, T. S. (2014). Monetary policy and economic growth in Nigeria (1980 2011). *Asia Economic and Financial Review*, 4(1), 20-32.

Mishkin, D., O. (2013). Monetary Policy and balance of payments stability in Nigeria. *International Journal of Academic Research in Public Policy and Governance*, 2(1), 1-15.

Mishkin, F. S. (2019). The Economics of Money, Banking, and Financial Markets (12th ed.). Pearson.

Miranda-Pinto, J., Pescatori, A., Prifti, E., & Verduzco-Bustos, G. (2022). The impact of monetary policy on commodity prices: A machine learning approach. Journal of Monetary Economics, 125, 102-118.

Nkoro, E. (2015) "The study of monetary policy and macroeconomic stability in Nigeria: 1980-2000" University of Benin. Benin City.

Ogbulu & Torbira (2012) Determinants of Financial Perfomance of Deposit Money Banks in Nigeria. *International Journal of Economics and Financial Issues', 3(1)*, 237-252.

Ogunjimi, M., S. (2007). Money supply economic growth nexus in Nigeria. *Journal of Social Sciences*, Vol. 22(3), 199 –204.

Ogunjimi, S.O (2000). *Public finance*: Bida, Lekem Production.

Okoro, A. S. (2013). Impact of monetary policy on Nigeria Economic Growth. *Prime Journal of Social Sciences*. Vol. 2 (2), 195-199.

Okwo, I. M. Eze, F. & Nwoha, C. (2018). Evaluation of monetary policy outcomes and its effect on price stability in Nigeria. *Research Journal Finance and Accounting, 3*(11), 37-47.

Oladosu, D. & Oladele, S. (2020). The monetary policy and price stability nexus: The Nigerian case (1981-2016). *Research Journal of Business and Economic Management, 3(1), 14-27*.

Onoh, J. K. (2017), Dimensions of Nigeria's Monetary and Fiscal Policies: Domestic and External. Astra Meridian Publishers, Aba.

Onyeiwu, C. (2022). Monetary policy and economic growth of Nigeria. *Journal of Economics and Sustainable Development, 3*(7), 62-88

Owalabi, A. U. & Adegbite, T. A. (2019). Impact of monetary policy on industrial growth in Nigeria. *International Journal of Academic Research in Business and Social Sciences, Vol. 4*(1), 18-31.

Saggu, C. L. and Anukoonwattaka, J. D. M., 2015. What are the implications of rising commodity prices for inflation and monetary policy?. The Federal Reserve Bank of Chicago, https://www.chicagofed.org/~/media/publications/chicago-fed-letter/2011/cflmay2011-286-p df.pd.

Sawyer. M. (2009). Interest rates and inflation: What are the links? European Journal of *Economics and Economic Policies Intervention, 6(1), 81-96*

Scrimgeour, D. (2020). *Commodity Price Responses to Monetary Policy Surprises*, New York; Colgate University Press

Wonnacott, P, and Wonnacott, P. (2019), Economics New York, McGraw Hill Book Company.

World Bank Development Research Group, Policy Research Working Paper 2455.

APPENDIX

Appendix i: Regression

Dependent Variable: LCPI
Method: Dynamic Least Squares (DOLS)
Date: 12/09/24 Time: 17:56
Sample (adjusted): 2011M05 2020M07
Included observations: 111 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=3, lag=3)
Long-run variance estimate (Prewhitening with lags = 3, None kernel)
No d.f. adjustment for standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXR	0.507408	0.093632	5.419201	0.0000
MPR	0.060486	0.029973	2.018016	0.0474
LR	-0.075774	0.035484	-2.135463	0.0362
CRR	0.017421	0.004665	3.734586	0.0004
TBR	-0.008159	0.010910	-0.747814	0.4571
C	3.082067	0.709944	4.341281	0.0000

R-squared	0.984008	Mean dependent var	5.262602
Adjusted R-squared	0.974869	S.D. dependent var	0.303231
S.E. of regression	0.048070	Sum squared resid	0.161752
Long-run variance	0.019129		

Appendix ii: Descriptive Statistics

	CPI	EXR	CRR	LR	TBR	MPR
Mean	202.6652	127.8780	18.14407	16.47814	10.37051	12.48093
Median	179.2581	101.9950	22.50000	16.65000	10.80000	12.50000
Maximum	344.7311	196.8200	31.00000	18.23000	15.25000	14.00000
Minimum	115.5907	90.69000	1.000000	11.76000	1.200000	6.500000
Std. Dev.	66.02554	39.64123	7.415940	0.961142	3.094607	1.631408
Skewness	0.504746	0.641599	-0.552890	-1.951045	-0.913137	-1.746269
Kurtosis	1.964440	1.570664	2.421803	9.765810	3.625072	6.452939
Jarque-Bera	10.28300	18.14052	7.655539	299.9289	18.31945	118.5930
Probability	0.005849	0.000115	0.021758	0.000000	0.000105	0.000000
Sum	23914.49	15089.60	2141.000	1944.420	1223.720	1472.750
Sum Sq. Dev.	510046.5	183857.0	6434.551	108.0838	1120.461	311.3946
Observations	118	118	118	118	118	118

Appendix iii: Correlation

Covariance Analysis:
Ordinary
Date: 12/09/24 Time: 18:06
Sample: 2011M01 2020M10
Included observations: 118

Correlation Probability	CPI	EXR	CRR	LR	TBR	MPR
CPI	1.000000 -----					
EXR	0.892220 0.0000	1.000000 -----				
CRR	0.781935 0.0000	0.550174 0.0000	1.000000 -----			
LR	-0.364975 0.0000	-0.266330 0.0036	-0.074589 0.4221	1.000000 -----		
TBR	0.141249 0.1271	0.260584 0.0044	0.259339 0.0046	0.240684 0.0087	1.000000 -----	
MPR	0.595267 0.0000	0.513522 0.0000	0.748013 0.0000	0.219524 0.0169	0.525695 0.0000	1.000000 -----

Dependent Variable: LCPI
Method: Dynamic Least Squares (DOLS)
Date: 12/09/24 Time: 17:56
Sample (adjusted): 2011M05 2020M07

Included observations: 111 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=3, lag=3)
Long-run variance estimate (Prewhitening with lags = 3, None kernel)
No d.f. adjustment for standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXR	0.507408	0.093632	5.419201	0.0000
MPR	0.060486	0.029973	2.018016	0.0474
LR	-0.075774	0.035484	-2.135463	0.0362
CRR	0.017421	0.004665	3.734586	0.0004
TBR	-0.008159	0.010910	-0.747814	0.4571
C	3.082067	0.709944	4.341281	0.0000

R-squared	0.984008	Mean dependent var	5.262602
Adjusted R-squared	0.974869	S.D. dependent var	0.303231
S.E. of regression	0.048070	Sum squared resid	0.161752
Long-run variance	0.019129		

Cointegration Test - Engle-Granger
Date: 12/09/24 Time: 17:57
Equation: UNTITLED
Specification: LCPI LEXR MPR LR CRR TBR C
Cointegrating equation deterministics: C
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion,
maxlag=12)

	Value	Prob.*
Engle-Granger tau-statistic	-4.027632	0.2518

Engle-Granger z-statistic	-29.69891	0.2085

*MacKinnon (1996) p-values.

Intermediate Results:

Rho - 1	-0.253837
Rho S.E.	0.063024
Residual variance	0.001878
Long-run residual variance	0.001878
Number of lags	0
Number of observations	117
Number of stochastic trends**	6

**Number of stochastic trends in asymptotic distribution.

Date: 12/09/24 Time: 18:00
Sample (adjusted): 2011M06 2020M10
Included observations: 113 after adjustments
Trend assumption: Linear deterministic trend
Series: LCPI LEXR MPR LR CRR TBR
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.331447	121.5951	95.75366	0.0003
At most 1 *	0.227691	76.09684	69.81889	0.0145
At most 2	0.178913	46.90104	47.85613	0.0613
At most 3	0.080918	24.62573	29.79707	0.1753
At most 4	0.077890	15.09080	15.49471	0.0574

At most 5 *	0.051104	5.927562	3.841466	0.0149

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

Covariance Analysis: Ordinary
Date: 12/09/24 Time: 18:02
Sample: 2011M01 2020M10
Included observations: 118

Correlation Probability	LCPI	LEXR	MPR	LR	CRR	TBR
LCPI	1.000000 -----					
LEXR	0.874924 0.0000	1.000000 -----				
MPR	0.667924 0.0000	0.517868 0.0000	1.000000 -----			
LR	-0.280900 0.0021	-0.257493 0.0049	0.219524 0.0169	1.000000 -----		
CRR	0.834252 0.0000	0.551467 0.0000	0.748013 0.0000	-0.074589 0.4221	1.000000 -----	
TBR	0.194736 0.0346	0.264107 0.0039	0.525695 0.0000	0.240684 0.0087	0.259339 0.0046	1.000000 -----

	LCPI	LEXR	MPR	LR	CRR	TBR
Mean	5.260023	4.806861	12.48093	16.47814	18.14407	10.37051
Median	5.188815	4.624923	12.50000	16.65000	22.50000	10.80000
Maximum	5.842765	5.282290	14.00000	18.23000	31.00000	15.25000
Minimum	4.750055	4.507447	6.500000	11.76000	1.000000	1.200000
Std. Dev.	0.321217	0.292304	1.631408	0.961142	7.415940	3.094607
Skewness	0.174987	0.578700	-1.746269	-1.951045	-0.552890	-0.913137
Kurtosis	1.727735	1.472547	6.452939	9.765810	2.421803	3.625072
Jarque-Bera	8.560603	18.05737	118.5930	299.9289	7.655539	18.31945
Probability	0.013838	0.000120	0.000000	0.000000	0.021758	0.000105
Sum	620.6827	567.2096	1472.750	1944.420	2141.000	1223.720
Sum Sq. Dev.	12.07208	9.996651	311.3946	108.0838	6434.551	1120.461
Observations	118	118	118	118	118	118

	CPI	EXR	CRR	LR	TBR	MPR
Mean	202.6652	127.8780	18.14407	16.47814	10.37051	12.48093
Median	179.2581	101.9950	22.50000	16.65000	10.80000	12.50000
Maximum	344.7311	196.8200	31.00000	18.23000	15.25000	14.00000
Minimum	115.5907	90.69000	1.000000	11.76000	1.200000	6.500000
Std. Dev.	66.02554	39.64123	7.415940	0.961142	3.094607	1.631408
Skewness	0.504746	0.641599	-0.552890	-1.951045	-0.913137	-1.746269
Kurtosis	1.964440	1.570664	2.421803	9.765810	3.625072	6.452939

Jarque-Bera	10.28300	18.14052	7.655539	299.9289	18.31945	118.5930
Probability	0.005849	0.000115	0.021758	0.000000	0.000105	0.000000
Sum	23914.49	15089.60	2141.000	1944.420	1223.720	1472.750
Sum Sq. Dev.	510046.5	183857.0	6434.551	108.0838	1120.461	311.3946
Observations	118	118	118	118	118	118

Covariance Analysis: Ordinary
Date: 12/09/24 Time: 18:06
Sample: 2011M01 2020M10
Included observations: 118

Correlation Probability	CPI	EXR	CRR	LR	TBR	MPR
CPI	1.000000					

EXR	0.892220	1.000000				
	0.0000	-----				
CRR	0.781935	0.550174	1.000000			
	0.0000	0.0000	-----			
LR	-0.364975	-0.266330	-0.074589	1.000000		
	0.0000	0.0036	0.4221	-----		
TBR	0.141249	0.260584	0.259339	0.240684	1.000000	
	0.1271	0.0044	0.0046	0.0087	-----	
MPR	0.595267	0.513522	0.748013	0.219524	0.525695	1.000000
	0.0000	0.0000	0.0000	0.0169	0.0000	-----

VAR Lag Order Selection Criteria
Endogenous variables: CPI CRR EXR MPR TBR
LR
Exogenous variables: C
Date: 12/10/24 Time: 11:19
Sample: 2011M01 2020M10

Included observations: 110

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1854.034	NA	19609703	33.81879	33.96609	33.87854
1	-978.0752	1640.431	4.574938	18.54682	19.57791*	18.96504*
2	-934.3399	77.13316	3.997130*	18.40618	20.32107	19.18287
3	-907.3363	44.67872	4.775405	18.56975	21.36843	19.70491
4	-881.8784	39.34406	5.945479	18.76143	22.44390	20.25506
5	-848.6759	47.69081	6.547485	18.81229	23.37856	20.66439
6	-819.9087	38.18198	8.004524	18.94379	24.39385	21.15437
7	-765.7478	65.97779	6.359162	18.61360	24.94745	21.18264
8	-709.0125	62.92455*	5.013112	18.23659*	25.45424	21.16411

Null Hypothesis: D(LCPI) has a unit root
Exogenous: Constant
Lag Length: 11 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.446825	0.5566
Test critical values:	1% level	-3.493747	
	5% level	-2.889200	
	10% level	-2.581596	

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

Null Hypothesis: D(LCPI,2) has a unit root
Exogenous: Constant

Lag Length: 10 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.708922	0.0000
Test critical values:	1% level	-3.493747	
	5% level	-2.889200	
	10% level	-2.581596	

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

Null Hypothesis: LEXR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.543603	0.8774
Test critical values:	1% level	-3.487046	
	5% level	-2.886290	
	10% level	-2.580046	

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

Null Hypothesis: D(LEXR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.796578	0.0000

Test critical values:	1% level	-3.487550
	5% level	-2.886509
	10% level	-2.580163

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

Null Hypothesis: CRR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.996332	0.2882
Test critical values:	1% level	-3.487046	
	5% level	-2.886290	
	10% level	-2.580046	

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

Null Hypothesis: D(CRR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.91388	0.0000
Test critical values:	1% level	-3.487550	
	5% level	-2.886509	
	10% level	-2.580163	

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

Null Hypothesis: LR has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.450902	0.8954
Test critical values:	1% level	-3.488585	
	5% level	-2.886959	
	10% level	-2.580402	

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

Null Hypothesis: D(LR) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.824870	0.0000
Test critical values:	1% level	-3.488585	
	5% level	-2.886959	
	10% level	-2.580402	

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

Null Hypothesis: MPR has a unit root

Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.956548	0.0023
Test critical values:	1% level	-3.487046	
	5% level	-2.886290	
	10% level	-2.580046	

Null Hypothesis: D(MPR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.12002	0.0000
Test critical values:	1% level	-3.487550	
	5% level	-2.886509	
	10% level	-2.580163	

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

Null Hypothesis: TBR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.103439	0.0290

Test critical values:	1% level	-3.487550
	5% level	-2.886509
	10% level	-2.580163

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

Null Hypothesis: D(TBR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.030594	0.0000
Test critical values:	1% level	-3.487550	
	5% level	-2.886509	
	10% level	-2.580163	

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