

Money Supply and Price Stability: A Disaggregated Effect from Nigeria

¹Dr Ezeunwo NYECHE, ²Dr Kingsley Nnana ODUNGWERU
and ³Dr Elvis Ozulem WOKEKORO

^{1,2*3}Department of Economics, Faculty of Social Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria.

Corresponding author: nyeche.ezeunwo1@ust.edu.ng

DOI: 10.56201/ijefm.v10.no1.2025.pg129.148

Abstract

The objective of this study was to examine the impact of money supply on price stability in Nigeria between the periods of 1990 and 2023. This study collected time series data from Central Bank of Nigeria statistical bulletin (2023). Price stability was modeled as the function of narrow money supply (M1), broad money supply (M2), broad money supply (M3) and quasi money. Auto-regressive distributed lag was used to analyze the time series data collected. Findings revealed that both quasi money supply and price stability are moving in the same direction. that holding other independent variables constant, a one percent decrease in money supply (M3) and M3(-2) at current level and period of lag 1 leads to 0.05 and -0.15 percent respectively increase in consumers price index a proxy for price stability and that holding other independent variables constant, a one percent decrease in money supply (M1) at current level and period of lag 1 leads to 0.1 percent decrease in consumer's price index a proxy for price stability and 50.2% of the changes in consumer price index a proxy for price stability were explained by the changes in disaggregated money supply. From the findings we conclude that money supply affects price stability in Nigeria. The study recommends that there should be further reforms in the financial market that can help reduce the influence of the informal financial sector, be implemented. This would enhance the influence of the central monetary authority in the financial sector, and by implication, enhance the role of monetary policy in macroeconomic management in Nigeria. The need for diversification of the economy so as to channel excessive money supply resulting from deficit financing from different economic yielding vestures and the need for identifying immediate and remote causes of instability in Nigerian economy so as to select the appropriate monetary policy instrument capable of controlling instability in the economy.

Keywords: Money Supply, Price Stability, Narrow Money Supply, Broad Money Supply, Quasi Money

1. INTRODUCTION

The opinion that the quantity of money supplied matters to the economy can be traced to the Monetarists. They believe that increasing the money supply will boost nominal demand, and that increasing output will increase where there is excess capacity. The monetarist believes that an increase in money supply will be inflationary in the long run, with no impact on investment, employment, or aggregate demand (Abiodun & Ogun, 2019). The Central Bank of Nigeria (CBN) has continued to play the conventional role of an apex authority, which is to regulate the stock of money to promote social welfare, since its inception in 1959. This position is based on the application of monetary policy, which is often aimed at achieving full employment, rapid economic growth, price stability, and external balance.

According to CBN (2021) money supply comprises narrow and broad money. Narrow money (M1) is defined as currency in circulation with non-bank public and demand deposits or current accounts in the banks. The broad money (M2) includes narrow money plus savings and time deposits, as well as foreign currency denominated deposits. Broad money measures the total volume of money supply in the economy. In the same vein, Cash Reserve Ratio also refers to required reserve ratio, is the percentage of deposits which commercial banks are required to keep as cash according to the directions of the central bank (The Economic Time online.com, 2022). Furthermore, price stability in an economy connotes constant price level over a period of time. In other words, there is no significant level of inflation or deflation as prices are relatively stable (Bank-Ola, Jemiluyi & Johnson, 2020). It is a situation where prices in an economy change slowly, or do not change at all. It also connotes avoiding a prolonged inflation or deflation (Chukwuemeka, 2018). According to European Statistical System (2021) consumer price index (CPI) is used to estimate the average variation between two given periods in the prices of products consumed by households. It is a composite measurement of trends in the prices of products, at constant quality. The Consumer Price Index measures the overall change in consumer prices based on a representative basket of goods and services over time (Fernando, 2022).

Price stability is an essential economic objective of government (Irungu et al., 2019) attempted to be managed by its regulatory bodies (CBN). Ikehukwu et al. (2016) defined price stability as achieving a single-digit annual inflation rate. Price stability prevails when inflation ceases to be a factor (Cecchetti et al., 2003). Price stability in the economy regardless of its directional movements can cause either capital flights or disincentive to potential investors, both impacting on employment and the gross national products (Ezekiel, 2013). The Nigerian economy has been plagued with several challenges over the years. In spite of many, and frequently changing, fiscal, monetary and other macroeconomic policies, Nigeria has not been able to harness her economic potentials for rapid economic development (Oladosu & Oladele, 2020). In response to the changing macroeconomic conditions, the CBN has adopted a number of monetary policy frameworks over the years. Due to monetary policy lags (time of policy initiation, time of policy implementation and the eventual outcome), the CBN has moved from a short-term monetary policy framework (annual) to medium-term monetary policy framework (biennial).

Despite these controversies, the Nigerian government, in partnership with its monetary authority, continues to regulate the economy through monetary policy. The Central Bank of Nigeria (CBN) uses monetary policy to manipulate the economy's currency fluctuations. It employs both contractionary and expansionary measures. Monetary policy has been successfully adopted and implemented in developing economies, this move is warranted. The Nigerian economic environment is experiencing its own unfortunate share of uncontrollable price fluctuations. Till date, inflation continues to be one of the most challenging of all the numerous economic problems faced by the Nigeria economy. Kumapayi et al. (2012) attributed Nigeria's inflation problem to the oil boom of 1970s, and the rise in government expenditure in the wake of the government's determination to enhance post-civil war reconstruction and development. The implication was a rise in domestic money supply without a corresponding increase in domestic production of goods and services. This adversely affects funds mobilization and disbursement for investment, thereby adversely affecting output and employment. This result is an uncontrollable rise in domestic prices of goods and services. Current available economic indicators, which present her as a poverty engulfed country and an unfavourable business environment, point to this fact. Policy implementations which seek to address Nigeria's inflation problem, by successive governments, can be grouped under fiscal and monetary policy. There are many studies on the effect of money supply. However, most studies focused money supply and economic growth while few studies on money supply and price stability value of money supply and other monetary policy variables. This study disaggregated money supply to study its effect on price stability in Nigeria.

2. LITERATURE REVIEW

Money Supply

Money supply refers to the total quantity of money in circulation in an economy. It comprises of narrow and broad money. Narrow money (M1) is defined as currency in circulation with non-bank public and demand deposits or current accounts in the banks. The broad money (M2) includes narrow money plus savings and time deposits, as well as foreign currency denominated deposits. Broad money measures the total volume of money supply in the economy. Thus, excess money supply (or liquidity) may arise when the amount of broad money is higher than the level required to sustain noninflationary output growth in the economy (CBN, 2011). Various definitions of money supply keep on changing. With the emergence of new systems of payment, the components of money supply increase. Following the new forms of electronic payment systems, the advanced countries have figured the new payment systems into their definitions of money supply for monetary and economic analyses.

Narrow Money (M1) + Quasi-Money (QM) = Broad Money (M2)

Narrow money is made up of currencies, (that is paper notes and coins in circulation) plus demand deposits. It is normally denoted by M1 and regarded as liquid component of money supply. M1 and M2 are derived from the liabilities column of the monetary system's Balance Sheet only. M1 cannot easily be derived from the assets column only. M2 can be derived from the asset column of the Balance Sheet (23).

Narrow Money (M1) and Broad Money (M2) can be derived from the liability column of the monetary system's Balance Sheet. Only M2 for practical purposes can be easily derived from the Asset column of the monetary system's Balance Sheet. Narrow Money (M1) is not easily derivable from the Asset column of the Balance Sheet without some margin of errors.

M1 and M2 can be written as follows:

$M1 = C + DD$ (derived from the liabilities column of the monetary system's Balance Sheet).

$M2 = C + DD + SD + TD + FCD$ (derived from the liabilities column of the monetary system's Balance Sheet) or

$M3 = C + DD + QM$

$M4 = NFA + NDA + OAN$ (derived from the Assets column of the monetary system's Balance Sheet)

Where

C = Currency Outside Bank

DD = Demand Deposit

SD = Savings Deposit

TD = Time Deposit

FCD = Foreign Currency Deposit

QM = Quasi money

$QM = SD + TD + FCD$

NFA = Net Foreign Assets

NDA = Net Domestic Assets

OAN = Other Assets Net

Net foreign assets constitute the foreign exchange holdings of the CBN and the deposit money banks, after netting out the claims of foreigners.

Net domestic assets are made up of net domestic credit and other assets (net) of the banking system. Other Asset Net is made up of residual item equal to the difference between miscellaneous assets and miscellaneous liabilities.

This study relies on the Broad Money Supply (M2) determined from the liabilities column.

Currency outside bank is highly significant in the economic process. In developing countries, C component of broad money supply is normally high. It is an indication of the undeveloped nature of the financial system and the payment system. It is also an indication of a consumption, level, low savings, low investment, low level of employment, and low output level (GDP) and high inflation rate. Demand deposit, on the other hand, is the platform upon which the deposit money banks stand to create bank credit money many folds in excess of the demand deposits available to the banking system. The size of the credit multiplier determines the level of bank credit money the banking system creates from the demand deposit available to the banking system. *Quasi* or near money made up of Savings, time and foreign currency deposits constitute very important components of money supply as they determine the level of investment in the economy. A rise in *quasi* money leads to an increase in the level of investment GDP (income) and employment.

In taking money supply decisions, monetary authorities are usually guided by the prevailing economic conditions such as public debt, inflation rate, balance of payment position, output growth, growth of credit to the economy and foreign reserves position (23). On which of the concepts of money supply to adopt in monetary policy, (94) opined that broad money is deemed

to be most appropriate for inflation-prone economies or economies prone to cyclical disturbances associated with general unemployment, divestment, contracting gross national product and low savings.

Traditional Approach

Under this theory, money supply is defined as a medium of exchange which consists of currency in the hands of the public plus demand deposits in commercial banks [65]. To them what constitute the money stock of any country would be those mediums that facilitate readily the exchange mechanism and command general acceptability. It is also called narrow money (M1). Hence, $M1=C+DD$, where C is currency outside the bank, DD is demand deposit.

The Chicago School

The Chicago economists led by Professor Milton Friedman adopted a broader definition of money and symbolized as M2 and they define money supply as a temporary store of value. Their argument is that since in the economy, money income and spending flow streams are not completely harmonized in time so as to make transaction, money should be temporarily stored as a general purchasing power (Akani & Lucky, 2014). Thus, money not only functions as a medium of exchange, but also as a temporary store of purchasing power. By implication, the total money stock must not be restricted to M1 but must include any other asset that command liquidity or near to currency. Money stock or $M2=M1+Savings\ deposits + Time\ deposit$.

Gurley and Shaw Approach

Introducing another dimension to the definition of money and money supply, Professor John G. Gurley and Edwards Shaw defined currency (C) and demand deposits (DD) as claims against financial intermediaries (central bank and commercial banks. According to these economists, there exists a fairly large spectrum of financial assets which are close substitutes for money and symbolized as M3. Therefore, they define. money supply as M2 plus the deposits of all other non-bank financial institutions like savings banks, building societies, loan associations and others expressed as $M3 = C + DD + SD + TD + DNBF$ (Keith Band and Peter Howells,2003).

Price stability

Price is stable in an economy when money retains its value over time. Prices are said to be neither stable if, on average, they neither increase (as in periods of inflation) nor decrease (as in periods of deflation) over time. With inflation (or deflation) the prices of all goods change significantly and frequently and in an unpredictable manner. As a result, it is difficult to judge whether the change in the price of a product makes it cheaper or more expensive in relation to other products. Consequently, companies and consumers may misinterpret price changes and make mistakes in their purchasing decisions. This then leads to an unproductive use of resources. The benefits of price stability, or the costs associated with inflation or deflation, are closely linked to money and its functions.

Price stability has become one of the most desirable objectives of macroeconomic management. Economists all over the world are unanimous in their affirmation of this position. This is because, frequent price fluctuation, whether persistent increase (inflation) or decrease (deflation), create risks and uncertainties in an economic environment. Fielding (2008) reveals that price instability creates uncertainties about future prices, increases business risks and unanticipated changes in the distribution of wealth. It is important to know that, risks and uncertainties make planning by both consumers and producers difficult, by implication, lead to a fall in the efficiency of the free market in allocating scarce resources and solving other societal and/or economic problems. Whenever prices rise above interest rate of savings, savings is discouraged.

This however led to a fall in loanable funds for investment, and consequently, a fall in potential output and employment. Interestingly, steady and gradual changes in the price level also come with some desired implications. Chiefly among these is its ability to serve as impetus for growth if properly controlled. There is a general believe that at least 3 percent steady growth in the price level in an economy would help boost economic growth. This position is based on the premise that investors are motivated to commit their scarce resources into production of goods and services when they expect a steady rise in the prices of these goods and services. On the other hand, deflation benefits the consumers. It increases their level of demand and consumption and, as a result, increases their standard of living. However, as rightly opined by Berlemann and Nelson (2002), the negative distributional and allocative effects of price instability are typically supposed to dominate the positive ones. There is therefore a need to stabilize prices in such a way that it retains its powers to boost economic growth and employment while ensuring it does not create market risks uncertainties. This has been the target of fiscal and monetary policy instruments which have been jointly administered by most economies today in promoting the macroeconomic goal of price stability

Theoretical Framework

The theoretical basis of this study was the quantity theory of money propounded by Irvin Fisher. The quantity theory of money (QTM) asserts that aggregate prices (P) and total money supply (M) are related according to the equation $P = VM/Y$, where Y is real output and V is velocity of money. With lower-case letters denoting percentage changes (growth rates), the QTM can be expressed as; $p = v + m - y$, with p as the rate of inflation and y, v, and m as growth rates of output, velocity, and money stock, respectively. A central implication of the QTM is that a given change in the rate of money growth induces an equal change in the inflation rate, prompting Milton Friedman to claim that “inflation is always and everywhere a monetary phenomenon” (Yi Wen, 2006).

Irving Fisher and John Maynard Keynes are considered the founders of modern monetary policy as opined in their quantity theory of money. Keynes for instance argued that money has indirect effect on other economic variables by influencing the interest rate which affects investment and cash holding of economic agents (Keynes, 1930). Irving Fisher, in his quantity theory of money on the other hand gave the proposition that money has no effect on economic aggregates but price (Diamond, 2003). These two propositions provided the foundation of monetary policy (Onyeiwu, 2012). Irving Fisher’s research on the quantity theory of money gave rise to not only monetary

policy but inaugurated the school of macroeconomic thought popularly known as “monetarism”. These two genitors of modern monetary policy (i.e Keynesians and Monetarists), disagreed on the role of monetary policy, but agreed on the existence and relevance of monetary policy making. Keynesians recognized what monetary policy could do.

Monetarists emphasized what it could not. The reign of Keynesianism was undisputed until it began to give way under the blows of monetarist critique and a rampant stagflation. During the 1970s, modern theory identified a contradiction between a central bank’s capacity to boost the economy transitorily and its inability to achieve this on a permanent basis. This contradiction (known as the time inconsistency problem) arises because monetary policy can do something about output over the short run, but nothing over the long run, the temptation to actually try and promote employment will prove both irresistible and dangerous, for once they have recognized it, agents adjust the price and wage setting process so that the economy ends up with higher inflation. This eventually wipes out the central bank’s ability to achieve anything useful, and leaves the economy worse off (Flandreau, 2006).

Empirical Review

Onehi, Patrick, Terungwa (2022) examined the effect of monetary policy on price stability in Nigeria using a data-rich framework spanning from 1986-2020 with the interest in exploring which of monetary policy has been effective in propelling price stability and how inflation responds to the monetary policy implementation. The main problem with the macro-economic policies that prompted this study was the fact that despite the series of the CBN Monetary Policy Committee decisions there is apparently no useful effect on inflation (price stability). The study employed Auto-regression Distributed Lag (ARDL) Bound Test for Co-integration of data analysis and Error Correction Model (ECM) estimation. The ADF test revealed that, inflation (INF), exchange rate (EXR) and broad money supply (M2) were stationary at first difference 1(1); while monetary policy rate (MPR) and real interest rate (RIR) were stationary at level 1(0). The results of the ARDL bounds revealed that the null hypothesis of no long run relationship were all rejected implying that a long-run effect exists among monetary policy variables and price stability. ECM coefficient of -0.0151 conforms to expectation. Durbin-Watson statistic of 2.2381 revealed that the model seems not to have any case of autocorrelation. The result of our analysis shows that EXR, M2, and MPR have negative and insignificant on price stability, while RIR has negative and significant on price stability. The study concluded that monetary policy in Nigeria is does have insignificant impact on general piece stability. We, therefore, recommended that, for monetary policy to be more effective in ensuring price stability in Nigeria, the Central Bank of Nigeria should promote policies for greater financial inclusion.

Ogbonnaya, Otta. Chibuzo, Durueke and Okoro (2022) investigated empirically the price stability and monetary policy framework in Nigeria using annual time series data spanning from 1970 to 2019. The main trust of the paper is to ascertain whether exchange rate, inflation rate and interest rate have stabilized the monetary policy outcomes in Nigeria. The data set for the paper were checked using Augmented Dickey Fuller (ADF) and Philips Perron unit root tests, which found that all series were stationary at I(1). In the unrestricted VAR model, only exchange rate was found

to be statistically significant having a t-statistic of over 4.05. This showed that even in the short-run, it is only the first lagged predetermined exchange rate can influence the price stability in designing the monetary policy framework in Nigeria. In the impulse response function, the result indicated that there is a positive and significant impact of exchange rate to interest rate but insignificant to inflation rate resulting in an unparallel shock in the stability of monetary policy. Further, the result of the variance decomposition test revealed that the own shock impact on exchange rate, inflation rate and interest rate accounted for about 88 percent, 83 percent and 83 percent respectively, in their total variations across the 10 point time horizon. Therefore, to ensure price stability in the monetary policy framework in Nigeria, the CBN should adopt an improved credit allocation, strict management of expected inflation, plodding and synchronization of exchange rate and creation of enabling environment for a rapid and sustainable growth in Nigeria.

Timothy (2022) examined the effectiveness of monetary policy in stimulating economic growth in Nigeria between 1990 and 2019. Secondary data were sourced mainly from CBN publications. The theoretical framework was based on the Keynesian transmission mechanism. In the cause of empirical investigation, various advanced econometric techniques like Augmented Dickey Fuller Unit Root Test, ARDL Bounds Test and Error Correction Mechanism (ECM) were employed and the result revealed that all the variables were stationary at first difference except monetary policy rate that was stationary at level, meaning that the variables were integrated of different order justifying ARDL Bounds Test and error correction mechanism test. The ARDL Bounds Test result indicated that there is long run relationship among the variables with the lower bound and upper bound less than the calculated at 5% level of significant. The result of the error correction mechanism (ECM) test indicates an 88% adjustment back to equilibrium. It is therefore recommended that since economic growth in Nigeria is greatly influenced in the long-run by interest rate and reserve requirement making monetary policy an effective tool in stimulating economic growth. Nigerian government through its monetary authorities should unveil other policies that will stimulate economic growth not only in the long run but also, in the short run period

Adeneye (2022) examined the impact of monetary policy on price stability in Nigeria between the periods of 1999 and 2021. This study collected time series data from Central Bank of Nigeria statistical bulletin (2021) and World Development Indicators (2021) on interest rate, money supply and cash reserve ratio as well as consumer price index that cover twenty two (23) years. Thereafter, auto-regressive distributed lag was used to analyse the time series data collected. Finding of this study reveals that interest rate has positive and statistically insignificant impact while money supply at different lag has both positive and negative insignificant impact on price stability. Moreover, cash reserve ratio has negative and significant impact on price stability. Lastly, finding of the study reveals that MS2 Granger Cause CPI and CPI does not Granger Cause MS2. Therefore, the following recommendations are suggested: that monetary policy authority should effectively and continuously apply interest rate (INR) to achieve price stability. More so, monetary policy authority should be caution in applying money supply and cash reserve to achieve price stability. That is to say, that increase or decrease in money supply should base solely on expansionary and contractionary policy targeting at price stability.

Oladosu and Oladele (2020) evaluated the effects of monetary policy on price stability in Nigeria for the period 1981-2016. The consumer price index was used as the dependent variable while money supply, interest rate, exchange rate, Gross Domestic Product (GDP) and Treasury bill rates were the independent variables. The research made use of secondary data obtained from Central Bank of Nigeria Statistical Bulletin and World Bank Development Indicators. The study employed Auto Regressive Distributive Lag (ARDL). The unit root test showed that all the time series data were not stationary series. The result showed in the short-run and long-run, exchange rate, money supply, GDP and open market operations have significant effects on price stability in Nigeria while interest rate is significant only in the short-run. Based on the findings, the study recommended among others, that Central Bank of Nigeria increase interest rates during inflation in order to control money supply and consequently inflation. Government should take policy actions swiftly so as to reduce lag problems. Also, monetary policy alone cannot be used to maintain price stability. It should, therefore, be supplemented by fiscal measures, non-monetary and non-fiscal measures. Henry and Sabo (2020) examined the impact of monetary policy management on inflation in Nigeria between the periods of 1985- 2019. Autoregressive distributed lag analysis was employed on time series data covering the period. It was found that while monetary policy rate and foreign exchange rate impacted negatively on inflation; broad money supply impact positively on it.

Kayode, Isreal and onyuka (2020) examined the impact of money supply on savings and investment in developing countries between the sampled years ranges from 1999-2016. The study employed multiple regression technique. Finding of the study revealed that money supply have significant impact on savings and investment. Babatunde and Kehinde (2016) assessed the impact monetary policy has on price stability in Nigeria using a period from 1970 to 2014 as reference. Secondary data analysis was done using ordinary least square regression (OLS) model, unit root test and Johansen co-integration test. The proxy of price stability was the Consumer Price Index (CPI) while exchange rate and money supply were used as explanatory variables. Their findings showed that exchange rate and money supply influenced price stability in Nigeria both in the short-run and long-run.

Akinbobola (2012) provided quantitative analysis of the dynamics of money supply, exchange rate and inflation in Nigeria. The study used secondary data that were obtained from the International Financial Statistics (IFS). The scope of the study was 1986Q1 to 2008Q4. Estimation was done using Vector Error Correction Mechanism (VECM). The empirical showed that money supply and exchange rate have negative significant effects on inflationary pressure in the long-run, while foreign price and real output growth have direct effects on inflationary pressure. There was also empirical evidence of significant feedback from the long-run to short-run disequilibrium. However, there exists a causal linkage between money supply, exchange rate and inflation in Nigeria. Chimobi and Uche (2010) examined the correlation between money, inflation and output in Nigeria. It was shown that a strong causal association exists among the variables. Particularly, inflation and output was granger caused by the money supply. They established the fact that money supply is essential to price stability in Nigeria. Hence, a move to stabilize money supply by the monetary authority is a good attempt to price stability.

Onayemi (2013) investigated the growth in output, monetary policy and stability price. The result of the estimation showed that positive effects on inflationary pressures were influenced by first lag of money supply, current money supply gap, first lag of price, current real output gap and first lag of real output gap while there was a negative effect on inflationary pressure by the second lag of price lag between 1950 and 2011. The result also showed that there was a significant long-run relationship. Oseni (2013) examined the effects of monetary policy and foreign exchange rate on price stability in Nigeria, discovering that foreign exchange rate had a better impact on price stability than on monetary policy rate. The study hence recommended that sound and efficient foreign exchange policies be put in place to realize price stability objective. In Nigeria, most studies related to monetary policy focused its effects on overall growth and development of the economy. Studies that have addressed the effectiveness of monetary policy on price stability have not offered substantial evidence to show that monetary authorities have made policy decisions that ensured price stability.

Literature Gap

Although there is a lot of empirical literature on money supply and price stability, their limitations prompted this research. Most research on money supply and price stability did not demonstrate how money supply has aided in encouraging price stability. More specifically, the findings of the studies so far indicate that there is some agreement that money supply and price stability are linked. While the robustness of most of the works evaluated has been extensively praised, it is worth noting that some of them have faults that could compromise the robustness of their conclusions, which this study aims to remedy.

3. METHODOLOGY

The study adopted the quasi-experimental research design to examine the effect of disaggregated money supply on price stability in Nigeria. Data were sourced from Central Bank of Nigeria Statistical Bulletin from 1990-2023.

Model Specification

The model specification provides an overview of the econometric models and specifications that was employed to analyze the data and address the research objectives. This section outlines the specific equations, variables, and assumptions used in the models, as well as the rationale behind their selection. By defining the model specifications, this study ensures a systematic and rigorous analysis of the relationships between disaggregated effects of money supply on price stability. The model specification for analyzing the implications of disaggregated effects of money supply on price stability in Nigeria can be represented as follows:

$$PRS = f (M1, M2, M3, QM) \quad (1)$$

Transforming equation 1 to econometrics forms

$$PRS = \alpha_0 + \beta_1 M1 + \beta_2 M2 + \beta_3 M3 + \beta_4 QM + \varepsilon_i \quad (2)$$

Where:

PRS: Price stability measured by consumer price index

MI: Narrow money supply as percentage of gross domestic product

M2= Broad money supply as percentage of gross domestic product

M3= Broad money supply as percentage of gross domestic product

QM= Quasi money as percentage of money supply

$\beta 0$, $\beta 1$, $\beta 2$, $\beta 3$, and $\beta 4$: are the coefficients to be estimated, representing the relationships between the variables.

ϵ : is the error term, capturing unobserved factors and random disturbances.

A Priori Expectation

$\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4 > 0$ and $\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4 < 0$; it is expected that money supply component will have either positive or negative impact on price stability which have been proxy by consumer price index (CPI) at a given period

Auto Regression Distributive Lag (ARDL)

To estimate the specified econometric models, the study will employ the Auto Regression Distributive Lag (ARDL) approach. The ARDL model, developed by Pesaran, Shin, & Smith (2001), is a widely used technique in econometrics for analyzing the long-run and short-run relationships between variables. It has gained popularity in applied research due to its flexibility in accommodating mixed data types and addressing endogeneity concerns. The ARDL model is particularly suitable for analyzing the impact of infrastructure gaps on foreign investment, as it allows for the examination of both the immediate and delayed effects of infrastructural variables on investment. By incorporating lagged values of the dependent and independent variables, the ARDL model captures the dynamic nature of these relationships over time. Moreover, the ARDL approach provides a framework for estimating the long-run equilibrium relationship between foreign investment and infrastructure gaps, as well as the short-run dynamics of adjustment towards this equilibrium. It offers valuable insights into the speed and magnitude of the response of foreign investment to changes in infrastructure, thereby informing policy analysis and decision-making.

The use of the ARDL approach in this study aligns with the objectives of examining the effect of macroeconomic variables on foreign investment in Nigeria and Ghana. It allows for robust statistical inference and facilitates the identification of causal relationships between the variables of interest. The ARDL approach is appropriate when the variables in the model are integrated of different orders, that is, they may be stationary or non-stationary. The key condition for employing the ARDL approach is that at least one variable should be integrated of order one (I (1)), while all other variables can be either stationary (I (0)) or integrated of order one (I (1)). This condition ensures the presence of a long-run equilibrium relationship among the variables. Here are the estimated short-run and long-run ARDL models for the relationship between foreign investment (FI) and the explanatory variables:

Short-Run ARDL Model

In the short-run ARDL model, we examine the immediate effects of changes in the explanatory variables on price stability. The lagged values of price stability (ΔPRS_{t-1}) capture the short-term dynamics and provide insights into the short-run adjustments in price stability. The coefficients ($\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$.) indicate the magnitude and significance of these effects.

Long-Run ARDL Model:

The long-run ARDL model focuses on the equilibrium relationship between price stability and the explanatory variables.

Augmented Dickey-Fuller (ADF) Test

The ADF test is a commonly used test to assess the presence of a unit root in a time series. A unit root indicates that the series is non-stationary and exhibits a random walk pattern. The null hypothesis of the ADF test is that the series has a unit root, while the alternative hypothesis is that the series is stationary. The ADF test is conducted by regressing the differenced series on its lagged values. The general mathematical form of the ADF test equation is as follows:

$$\Delta y_t = \alpha + \beta y_{t-1} + \gamma_1 \Delta y_{t-1} + \gamma_2 \Delta y_{t-2} + \dots + \gamma_p \Delta y_{t-p} + \varepsilon_t \quad (3)$$

Where

Δ : denotes the first difference operator,

y_t : represents the time series variable

ε_t : is the error term.

The coefficient β is estimated and tested to determine if it is significantly different from zero. To interpret the results of the ADF test, the calculated test statistic (ADF statistic) is compared to critical values. These critical values depend on the sample size, level of significance, and the specific version of the test used (e.g., ADF-GLS, ADF-Fisher, etc.). The criteria for decision in the ADF test are as follows:

If the calculated test statistic is less negative than the critical value, we fail to reject the null hypothesis of a unit root, indicating non-stationarity.

- i. If the calculated test statistic is more negative than the critical value, we reject the null hypothesis and conclude that the series is stationary.

ARDL Bounds Cointegration Test

ARDL (Autoregressive Distributed Lag) Bounds Cointegration is a method used to test for the existence of a long-run relationship or cointegration between variables in a time series setting. The ARDL bounds test allows for the analysis of cointegration even when the variables may be integrated at different orders (i.e., some variables may be stationary, while others may be integrated of order 1 or higher). The ARDL bounds co-integration model can be represented as:

$$Y_t = \alpha + \beta_1 X_t + \beta_2 Z_t + \varepsilon_t \quad (4)$$

Where

Y_t : represents the dependent variable,

X_t :

Z_t : are the independent variables,
 α : is the intercept,
 ε_t : is the error term.

To conduct the ARDL bounds test, the following steps are typically followed:

Determine the lag length: Choose an appropriate lag length for the model, usually based on information criteria such as the Akaike Information Criterion (AIC) or the Schwarz Information Criterion (SIC).

- i. Estimate the ARDL model: Use ordinary least squares (OLS) regression to estimate the coefficients of the ARDL model.
- ii. Conduct the bounds test: Calculate the F-statistic for the joint significance of the lagged variables in the model. Compare the calculated F-statistic with the critical values from the bound tables provided by Pesaran, Shin, and Smith (2001) or Narayan (2005).
- iii. At a significance level of 0.05, the decision criteria for the ARDL bounds co-integration test are as follows:
- iv. If the calculated F-statistic is greater than the upper critical value, the null hypothesis of no co-integration is rejected, indicating the presence of a long-run relationship between the variables.
- v. If the calculated F-statistic is lower than the lower critical value, the null hypothesis of no co-integration cannot be rejected, suggesting the absence of a long-run relationship.
- vi. If the calculated F-statistic falls between the upper and lower critical values, no conclusive decision can be made, and further investigation is needed. The critical values for the ARDL bounds test are available in the works of Pesaran, Shin, and Smith (2001) and Narayan (2005) and depend on factors such as the lag length, sample size, and the type of test (e.g., level or first-difference).

4. ANALYSIS AND DISCUSSION OF FINDINGS

Table 1: Unit Root test

Variable	ADF Stat	MacKinnon @ 1%	MacKinnon @ 5%	MacKinnon @ 10%	Order of integration
PRS	-3.761500	-3.752946	-2.998064	-2.638752	1(1)
QM	-3.084955	-3.752946	-2.998064	-2.638752	1(1)
M3	-2.166954	-3.752946	-2.998064	-2.638752	1(0)
M2	-2.045429	-3.769597	-3.004861	-2.642242	1(0)
M1	-0.910354	-3.752946	-2.998064	-2.638752	1(0)

Source: Source: E-View Output

The result of the ADF root test on fiscal policies and tax regulation is presented in table 4.2. The result shows that were stationary at order one I (1) while M3, M2 and M1 are in 1(0). The implication is that the variables are integrated at mixed order and none was integrated at order two, which informed the use of Autoregressive Distributed Lag (ARDL) to estimate the parameters of the model.

Table 2: Table 4: ARDL Long Run Form and Bounds Test

Test Statistic	Value	Signif.	I(0) Asymptotic: n=1000	I(1)
F-statistic	12.620420	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
		Finite Sample: n=35		
Actual Sample Size	22	10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
		Finite Sample: n=30		
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Source: E-View Output

Next is the autoregressive distributed lag (ARDL) long-run model estimation. The procedure starts by conducting the bounds test for the null hypothesis of no co-integration (table 2). The asymptotic critical values bounds, which were tabulated in Pesaran, Shin, and Smith, (2001), provide a test for cointegration with the lower values assuming the regressors are I(0), and upper values assuming I(1) regressors. If the calculated F-statistics exceeds the upper critical value, the null hypothesis is rejected, implying that there is cointegration. However, if it is below the lower critical value, the null hypothesis cannot be rejected, indicating lack of cointegration. If the calculated F-statistics falls between the lower and upper critical values, the result is inconclusive. Once cointegration is established, the conditional ARDL long-run model can be estimated.

Table 3: ARDL Short Run

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PRS(-1)	-0.131405	0.191445	-0.686387	0.5045
QM(-1)	-0.024270	0.011062	-2.193970	0.0470
M3	0.070449	0.042411	1.661114	0.1206
M3(-1)	0.058907	0.045060	1.307291	0.2138
M3(-2)	-0.156240	0.043206	-3.616154	0.0031
M2 (-1)	-0.058881	0.032807	-1.794730	0.0960
M1	0.058102	0.067422	0.861764	0.4044
M1(-1)	-0.108850	0.071307	-1.526499	0.1508
C	11.77050	2.135376	5.512144	0.0001
R-squared	0.692219	Mean dependent var		7.418591
Adjusted R-squared	0.502816	S.D. dependent var		0.899645
S.E. of regression	0.634352	Akaike info criterion		2.219662
Sum squared resid	5.231224	Schwarz criterion		2.665997
Log likelihood	-15.41628	Hannan-Quinn criter.		2.324805

F-statistic	3.654731	Durbin-Watson stat	2.077288
Prob(F-statistic)	0.018905		

Source: Source: E-View Output

Table 3 presents, ARDL short run regression estimation, the first part of the output gives a summary of the settings used during estimation. The result shows that automatic selection (using the Akaike Information Criterion) was used with a maximum of 1 lags of both the dependent variable and the regressor. Out of the 54 models evaluated, the procedure has selected an ARDL (2, 0, 2, 0) including observation of 20 after adjustment.

However, the coefficient of consumer price index PRS (-1) at period of lag 1 -0.131405 a proxy for price stability is very relatively low. However, with probability of 0.5045 PRS is statistically insignificant at period of lag 1 because the probability value is greater than 0.05 levels of significance. This implies that holding other independent variables constant, a one percent increase in consumer price index CPI(-1) period of lagged 1 translate to approximately -0.1% decline in its present value. However, with negative sign associated with the coefficient of consumer price index PRS (-1) at period of lagged 1 implies that consumer price index PRS (-1) at period of lagged 1 is moving in opposite direction with its present value. Also, the coefficient of the quasi money supply at current level period is -0.024270 with the probability value of 0.0470 which is less than 0.05 levels of significance indicates that at current level period quasi money supply has negative and statistically significant impact on consumer price index (CPI) a proxy for price stability under the period sampled. This result suggests that one percent increase in quasi money supply causes about 0.2% increase in consumer price index a proxy for price stability. Furthermore, the result indicates that both quasi money supply and price stability are moving in the same direction. That is an increase in one lead to increase in other vice-verser.

The coefficients of the money supply (M3) at current level, period of lag 1 and 2 are -5.39, -0.058907 and -0.156240 with probability values of 0.2138 and 0.0031 indicate that money supply (M3) at current level period is statistical insignificant with probability value greater than 0.05 levels of significance while, money supply M3 (-2) at period of lag 2 is statistical significant with probability values less than 0.05 levels of significance. This suggests that holding other independent variables constant, a one percent decrease in money supply (M3) and M3(-2) at current level and period of lag 1 leads to 0.05 and -0.15 percent respectively increase in consumers price index a proxy for price stability. The coefficients of the money supply (M2) at current level, period of lag 1 is -0.058881 with probability values of 0.0960 indicate that money supply (M2) at current level period is statistical insignificant with probability value greater than 0.05 levels of significance. This suggests that holding other independent variables constant, a one percent decrease in money supply (M2) at current level and period of lag 1 leads to 0.05 percent decrease in consumer's price index a proxy for price stability. Furthermore, the coefficients of the narrow money supply (M1) at current level, period of lag 1 is -0.108850 with probability values of 0.1508 indicate that narrow money supply (M1) at current level period is statistical insignificant with probability value greater than 0.05 levels of significance. This suggests that holding other independent variables constant, a one percent decrease in money supply (M1) at current level and period of lag 1 leads to 0.1 percent decrease in consumer's price index a proxy for price stability.

The Coefficient of fixed variable, that is, constant (C) also known as the intercept, is the value of (CPI) a proxy for price stability when other independent variables have a value of zero is 11.77050 with probability value of 0.0001 less than 0.05 level of significance is statistically significant. This result simply suggests that increase in CPI in Nigeria within the sampled period is associated with other factors which are not explained by any of the explanatory variables stated in the model. More so, the R-Square often refers as the coefficient of determination also known as a measures of the goodness-of-fit, is 0.502816, approximately 50.2%. This means that 50.2% of the changes in (CPI) a proxy for price stability at time t, are explained by the changes in the explanatory variables while, the remaining 49.8% could be explained by factors outside this model represented by error term. More so, Durbin-Watson statistic (DW) is 2.077288 approximately 2 shows there is no serial autocorrelation. Furthermore, the F-statistic coefficient which measure the overall goodness fit of the study model is 3.654731 with probability value of 0.018905 indicates that the model is statistically significant and competent to estimate the impact of independent variables on the dependent variable. Table 4 below presented ARDL Long Run Form and Bounds Test on which decision to conduct ARDL Error Correction Regression is based

Table 5: ARDL Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M3)	0.070449	0.029428	2.393929	0.0325
D(M3(-1))	0.156240	0.031007	5.038876	0.0002
D(M1)	0.058102	0.051852	1.120542	0.2828
CointEq(-1)*	-1.131405	0.152558	-7.416226	0.0000
R-squared	0.807879	Mean dependent var		0.002636
Adjusted R-squared	0.775858	S.D. dependent var		1.138687
S.E. of regression	0.539095	Akaike info criterion		1.765116
Sum squared resid	5.231224	Schwarz criterion		1.963488
Log likelihood	-15.41628	Hannan-Quinn criter.		1.811847
Durbin-Watson stat	2.077288			

Source: Source: E-View Output

Furthermore, error correction model mechanism regression in table 5 presents the speed of error adjustment. ECM is a category of multiple time series model that directly estimates the speed at which a dependent variable returns to equilibrium after a change in an independent variable. ECM incorporates the long-run equilibrium in the dynamic adjustment (that is the short-run model). The ECM is also closely bound up with the concept of co-integration.

Table 5 present, ARDL ECM regression estimation, in this context the estimated parameters were subjected to test based on economic theory so as to ascertain whether they agree with expected sign. In other words, the model sought to relate the changes in consumer price index a proxy for price stability in Nigeria to its explanatory variables which disaggregated money supply to ascertain the conformation with 'a priori' expectation underlying each variable. The result shows that, the CointEq(-1) coefficient of the error correction term which measures the speed of adjustment towards long-run equilibrium is negative and statistically significant at 5% level. The ECM has the expected negative sign which stands at -1.131405. This implies that the rate at which

changes in CPI at time t , adjusts to the single long-run co-integrating relationship is different from zero. In other words, the equation of CPI at time t , contains information about the long run relationship, the reason why co-integrating equation enter the model automatically. The coefficient of the ECM revealed that the speed with which changes in CPI at time t , adjusts respond to regressors is about -113% in the short-run. This is in conformity with this study a-priori expectation. Furthermore, the R-Square often refers as the coefficient of determination also known as a measures of the goodness-of-fit, is 0.775858, approximately 77.5%. This means that 77.5% of the changes in CPI at time t , are explained by the changes in the explanatory variables while, the remaining 22.5% could be explained by factors outside this model represented by error term. More so, Durbin-Watson statistic (DW) is 2 shows there is no serial autocorrelation.

Table 6: ARDL Long Run Form and Bounds Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.77050	2.135376	5.512144	0.0001
PRS(-1)*	1.131405	0.191445	5.909821	0.0001
QM**	-0.024270	0.011062	-2.193970	0.0470
M3(-1)	0.026884	0.060130	0.447093	0.6622
M2**	0.058881	0.032807	1.794730	0.0960
M1(-1)	-0.050748	0.052408	-0.968330	0.3506
D(M3)	0.070449	0.042411	1.661114	0.1206
D(M3(-1))	0.156240	0.043206	3.616154	0.0031
D(M1)	0.058102	0.067422	0.861764	0.4044

Source: Source: E-View Output

From the long-run results reported above, it was shown that all the variables except narrow money supply (M1) and Quasi money supply have negative relationships with consumer price index. As M3 increases by 1%, CPI increases significantly by 0.026884% while 0.058881% increase in CPI is caused by a 1% increase in M2, both at 5% level of significance. Also, a 1% increase in quasi money results in -0.024270% decrease in CPI. A 1% change in narrow money supply has negative significant effect on CPI by decreasing price instability by -0.050748%. The findings of the study in long run is in line with the opinions of the classical economist such as Milton Fridman

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

This paper investigated the effect of money supply on price stability in Nigeria between 1990 and 2023 by measuring the relationship between the price level in Nigeria (captured by the Consumer Price Index) and narrow money supply (M1), Broad money supply (M2), broad money supply (M3) and Quasi money. In order to achieve this set objective, the study applied the methodology of Autoregressive Distribution Lag (ARDL) Model with in-built differencing to take care of unit root in these time series data. The results of the empirical estimates revealed that disaggregated money supply affects price stability in Nigeria. This position was further strengthened by the result of the ARDL Bound test which found long run relationship between the price level and money supply. On the whole, the role of monetary policy in promoting price stability still leaves a gap to be bridged. This may be due to the high influence of ‘Outside bank money’ and the high level of

participation in the informal financial sector in Nigeria and also high level uncontrollable money in the economy due to quick profit financial instruments such as Ponzi scheme and forex trading. This has significantly reduced the influence of monetary policy instruments targeted at influencing money supply, in keeping with the macroeconomic objective of price stability.

Recommendations

- i. There should be further reforms in the financial market that can help reduce the influence of the informal financial sector, be implemented. This would enhance the influence of the central monetary authority in the financial sector, and by implication, enhance the role of monetary policy in macroeconomic management in Nigeria.
- ii. To maintain a relatively stable economy, there is the need for diversification of the economy so as to channel excessive money supply resulting from deficit financing to different economic yielding vestures.
- iii. There is the need for identifying immediate and remote causes of instability in Nigerian economy so as to select the appropriate monetary policy instrument capable of controlling instability in the economy and government should adequately control deficit spending in order to benefit from effective implementation of the monetary policy measures by the CBN.

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