

Monetary Uncertainty and Estimating the Demand for Money Function in Nigeria: An Empirical Investigation with Quarterly Data, January 2000Q1 to December 2019Q4

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Abstract

The increasing globalization in banking and financial services along with use of cryptocurrencies as a medium of exchange and means of payments, is creating monetary policy uncertainty and concerns in the monetary policy process of central banks, especially difficulty in knowing exactly how much money people are willing to hold at any given point in time, how best to correctly measure the assets that constitutes money and determines the demand for money in the economy. Classical economic theory tells us that, there is a direct relationship between the quantity of money in an economy and the general level of domestic prices. This has made many central banks to adopt monetary aggregates as intermediate targets, in their quest to maintain price stability and achieve sustainable economic growth and development. This study seek to estimate the demand for money function in Nigeria during the period 1980 to 2019 with a view to ascertaining whether monetary policy uncertainty is an important deterrent of money demand in Nigeria or not. We employed the autoregressive distributed lag (ARDL) to model the relationship between money demand and its determinants using times series data from 1980 to 2019. The results indicated that monetary policy uncertainty (MUC) appear to have little or no influence on the demand for money in Nigeria, compared to real income, the nominal exchange rate and domestic inflation. The results confirm that Monetary policy uncertainty (MUC) was not an important determinant of the demand for money in Nigeria during the period 1980 to 2019. It agrees with the findings of El-Rasheed *et al.*, (2017) but disagrees with those of Iyke and Sin-YU Ho (2017) who in a similar study on Ghana, found monetary policy uncertainty to be insignificant in determining the demand for money in Ghana. We therefore bring into focus the need for policy makers in Nigeria and other developing economies to consider monetary policy uncertainty in their monetary policy formulation process because of its positive relationship with how much money Nigerians demand or hold at any given point in time. In addition, this study also found a link between money demand and changes in rate of inflation, nominal and real effective exchange rates and rate of growth in real GDP or real income. The sign and size of the estimated parameter coefficients had the correct a priori expectations, with inflation, monetary policy uncertainty and real GDP growth rates having a positive relationship with money demand, while the exchange rate responding negatively. There is need for more studies using other methods to further confirm this result, especially with respect to its application to other developing economies that may not be an oil exporting, import dependent economy like Nigeria.

Keywords: Demand for money, Central banks, Monetary policy, Nigeria, Times series models.

Jel Classification: E41, E43, E52, C22.

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1.0 INTRODUCTION

The increasing globalization in banking and financial services along with use of cryptocurrencies as a medium of exchange and means of payments, is creating monetary uncertainty and concerns in the monetary policy process of central banks, especially difficulty in knowing exactly how much money people are willing to hold at any given point in time, how best to correctly measure the assets that constitutes money and determinants of the demand for money in the

economy. These concerns are growing everyday as the citizens of countries increasingly embrace new payment modes like the bitcoin and other cryptocurrencies for the settlement of debts and medium of exchange. Classical economic theory tells us that, there is a direct relationship between the quantity of money in an economy and the general level of domestic prices. This has made many central banks to adopt monetary aggregates as intermediate targets, in their quest to

maintain price stability and achieve sustainable economic growth and development.

For these central banks, how to capture and correctly measure what constitutes money in their respective countries and knowing how much people hold them, has become not only important but also critical to the success or failure of the monetary policy process. It is based on these premises, that a good understanding of what constitutes money supply and how best to measure the demand for money has become crucial not only for central bankers and policy makers, but also for academicians, researchers and economic agents involved in the global financial marketplace. It is not surprising therefore, that in many emerging and developing countries, the central banks have as part of their monetary policy objectives, the achievement of some monetary aggregate as an intermediate target to the goal of price stability and sustainable economic growth and development. The thrust of monetary policy are embedded in Government's macroeconomic policy goals of price stability, balance of payments equilibrium, full employment and sustainable economic growth and development. At any given point in time, monetary policy outcomes reflect the outcome of interactions among competing economic forces, operating from both the domestic and international policy arena. A major challenge for many central banks in the emerging and developing economies, therefore, is that of how best to operate within monetary uncertainty to achieve an optimal policy mix that will deliver on price stability and sustainable economic growth.

The need to regulate money supply by the central bank is anchored on the premise that there is an optimal quantity of money supply that is conducive for economic growth. That required optimal quantity of money supplied or demanded is anchored on the classical economists' tenet of a stable relationship between money supply and economic activity and the belief that, supplying more or less of that amount, would produce undesirable effects such as inflation, unemployment, and other macroeconomic imbalances in the economy. Successfully achieving that, would require not only understanding what constitutes money supply but also, why people hold some assets as money and what determines how much they hold at any given point in time.

This study will help provide a better understanding of the nature of the demand for money function and how central banks could accommodate those policy uncertainties arising from the effects of increasing financial globalization and securitizations of financial markets so as to improve on the efficacy of the monetary policy process.

In Nigeria, monetary policy is conducted by the Central Bank of Nigeria (CBN). The framework for the conduct of monetary policy is contained in the CBN

Act (1958) and its subsequent amendments (1997, 1998, 2007); from where the Bank derived its core functions. For example, section two of the CBN Act of 2007, states the principal objects of the Bank as, namely ensure monetary and price stability; issue legal tender currency in Nigeria; maintain external reserves to safeguard the international value of the legal tender currency; promote a sound financial system in Nigeria; and act as banker and provide economic and financial advice to the Federal Government. These objects define the monetary policy objectives and operations of the CBN., which have over the years, have gradually narrowed from multiple to two or three main objectives, but with increasing emphasis on price and exchange rate stability.

Similarly, as the choice of monetary policy instrument in Nigeria has shifted from direct instrument and selective credit controls in the early 1960s through the 1970s to, indirect policy instruments since the late 1980s. The main indirect monetary policy instrument is the Open Market Operations (OMO), which is complemented among others by reserve requirements, cash reserve ratio, the monetary policy rate, discount window operations and unconventional, tools like quantitative easing and development financing to strengthen the weak transmission mechanism. The used of indirect monetary policy instruments was popularized since the adoption of the Structural Adjustment Programme (SAP) in 1986, The SAP, was a market-based programme that promotes the process of financial intermediation and help in building a sound and efficient financial system. The adoption of market-based instruments after the SAP led to substantial reduction in the then, complex price and administrative controls and rent-seeking activities by economic agents. It has, however, left unaddressed, challenges from monetary uncertainties emerging from Nigeria's increasing interaction with the global community and its repercussions on the efficacy of monetary policy.

The focus of this paper is to examine the effect of monetary uncertainty on the demand for money in Nigeria and to ascertain whether the inclusion of the bitcoin currency as a measure of policy uncertainty in the demand for money function, would improve the outcomes of monetary policy decisions in Nigeria, thus assist the CBN deliver on its core mandate of price stability and sustainable economic growth.

1.2 Objectives of the Study

Accordingly, the objectives of the paper shall be to:

- i. Review the literature on the demand for money, identify gaps in the literature and suggest ways on how best to handle them,
- ii. Specify a behavioral demand for money model that will better explain the relationship between assets demanded as money and what determines how much they hold as money, under monetary uncertainty policy.

- iii. Re-estimate and test the significance of the parameter coefficients as well as compare the theoretical and behavioral analyses to, ascertain their validity in terms of model fit, establish stability in the short and long run and verify relevance of the results in an import-dependent oil-exporting emerging and developing economy like Nigeria.

1.3 Research Questions

The following questions shall serve as guide towards achieving the research objectives.

- i. What are the assets held as money and how much of each would consumers hold at any given point in time? In other words, what are the determinants of the demand for money in an import-dependent, oil-exporting emerging and developing economy like Nigeria?
- ii. Are these determinants different from those in emerging and developing economies such as Ghana, South Africa or The Gambia?
- iii. Is the demand for money function in Nigeria stable overtime and it be used in forecasting for policy?

The study shall employ the mixed research method of analysis to achieve the above stated objectives. A modified autoregressive distributed lagged (ARDL) model based on Pesaran *et al.*, (2001), Bahmani-Oskooee, Moshen and Sahar Bahmani (2014) and El-Rasheed Shehu, Hussin Abdullah and Jauhari Dahalan (2017), that combines short-run and long-run effects of policy uncertainty on the economy, will be specified and tested with data on Nigeria. The combined mixed research approach has been found provide a richer and better context for explaining and confirming research outcomes (Ahmed, Munir and Mohammed M. Alshomrani 2014).

1.4 Data Type and Sources

The study will use quarterly secondary times series data for the period January 2000 to December 2019 sourced from the Central Bank of Nigeria, National Bureau of Statistics, International Financial Statistics, World Development Indicators and Kneoma.com website.

1.5 Hypothesis for the Study

The null hypothesis, (H_0), to be tested shall be: The demand for money in influenced by monetary and policy uncertainty and the (H_a) Hypothesis shall be: - The demand for money in Nigeria is not influenced by monetary and policy uncertainty.

1.6 Expected Contribution

The expected contribution of this study is addition to the existing body of knowledge on the demand for money function. It is the first study on Nigeria to include a measure of monetary policy uncertainty. Second, it will present evidence with data

not presented in previous studies. Third, it updates the literature on the money demand in Nigeria.

Following the introduction, the rest of the paper is divided into four. Section two review the literature on the demand for money, with focus on studies on Nigeria and monetary uncertainty and the demand for money, while section three present the method of research. In section four, we present and discuss the results of the analysis of the effect of monetary uncertainty on the demand for money function in Nigeria and whether or not, the demand for money is stable both in the short and long run.

2.0 LITERATURE REVIEW

2.1 Review of Studies on the demand for money in Nigeria

Since the 1960s to early 1970s, there has been an increasing volume of literature on the demand for money in general and on the demand for money function in Nigeria in particular. The globalization in banking and financial services is pushing central banks to re-examine their definition of money and how best to estimate the demand for money function. The development has cut across both developed and developing countries, including Nigeria. The review of literature will identify the type of data used, method of analysis, results and gaps in the literature with a view to using them to better refocus the study.

According to Tule *et al.*, (2018) the decades of the 1970s witnessed early studies on the demand in Nigeria, which included those of Tomori (1972), Ajayi (1974), Teriba (1974) Ojo (1974) and Odama (1974) which come to be referred to as the "TATOO debate" In an initial paper, Tamoro (1972) examined the demand for money in Nigeria as function of income and interest rates and on estimation using regression analysis, concluded that real income was a major determinant of money demand in Nigeria. In a review of Tomori's paper, Ajayi (1974), Teriba (1974), Ojo (1974) and Odama (1974) reacted to different aspects of the study, thus bringing into prominence Tumori's paper and thus, initiating the TATOO debate. The issues of the debate focused on were on, the significance of income in the money demand, the role of interest rate, stability of the demand for money function and the choice of an appropriate definition of money in Nigeria. On income, the others agreed with Tomori, while on interest rates, Teriba agreed with Tomori's view that long term interest rate was significant but disagreed that, short term interest rates were insignificant in the demand for money in Nigeria.

Iyoha, M (1976) used times series data for the period 1955 to 1965, and the linear and log-linear specification to establish that the demand for money in Nigeria was stable in the economy following the world war 2 and that current income was a better explanatory variable for changes in the demand for real money

balances than permanent income and that interest rates have no little or no influence on the demand for money in Nigeria. Ajayi (1977) used data for 1960 to 1970 and regression analysis to show that the demand for both narrow and broad money aggregates were stable functions in income and the savings and lending interest rates. Similarly, Moser *et al.*, (1997) used the cointegration and error correction methods of analysis on annual times series data for the period 1970 to 1994, to establish the existence of a stable demand for both narrow and broad money functions in Nigeria over the short and long run, the study concluded that, the demand for money in Nigeria was a stable function in real income, exchange rate, and nominal domestic interest rates.

Arize (1985) used annual data for 1952 to 1982 and four different statistical tests to establish whether the demand for money function in Nigeria was stable during the period 1962 to 1982 and what role past inflation variability play in the monetary demand function. The results indicated that although the demand for money was stable for most of the period 1962 to 1982, it was unstable for the period 1970 to 1971 and that past inflation variability was an important determinant in the demand for money in Nigeria. Arize and Lott (1985) re-examined the demand for money during the period 1960 to 1977 and confirmed that real income and the expected rate inflation explains variations in real cash balances and that with growth targets for money supply, inflation can be regulated.

Ajewole (1989) used Nigerian data for the period 1973 to 1976 to test the McKinnon's model of the demand for money. The results indicated that while the Mackinnon Model of money demand is suitable and workable in Nigeria, the neoclassical reformulation of the model did not and thus, required further investigation.

Oresotu and Mordi (1992) used annual data for 1960 to 1991 and logarithmic linear relationship to estimate the demand for base money narrow money and broad money in Nigeria. They tried to show that the demand for money is influenced by both domestic (interest rates, inflationary expectations), an adjustment process and external factors (foreign interest rates and exchange rates). Hassan *et al.*, (1995) used monthly and quarterly data for the period 1976 to 1988 to estimate the money demand for Nigeria, for which he found to be real income, expected inflation and expected depreciations in the black-market exchange rates. Moser *et al.*, (1997) found that the demand for real money balances in Nigeria was stable in the long run and largely determined by real income, the real exchange rate and nominal domestic interest rates during the period 1970 to 1994.

Anoruo (2002) and Nwaobi (2002) individually examined the stability of the money

demand function in Nigeria after 1986 and confirmed that the broad money demand function in Nigeria is stable for the study period. Also, Akinlo (2006) used an autoregressive distributed lag (ARDL) method and found that, broad money was cointegrated with income, interest rate and exchange rate and that the demand for money in Nigeria was weakly stable. Similarly, Owoye and Onafowora (2007) used quarterly data for 1986:1 to 2001:4 and cointegration plus error correction model to estimate the demand for broad money in Nigeria. The results revealed that real income, inflation rate, interest rate, and expected exchange rate determined the demand for money in Nigeria, for which they indicated was stable in both the short- and long run. Kumar, Saten, Don Webber and Scott Fargher (2010) investigated the stability of narrow money between 1960 and 2008 and found that, since 1986, there was a change in regime for narrow money and that the demand for money was stable and that money supply could be used as a tool for monetary policy in Nigeria.

Omotor (2011) tested annual data from Nigeria for the period 1970 to 2006 and used cointegration and ARDL to estimate the demand for money that included a foreign exchange rate variable. The study found that the demand for money to be stable in the long run, that it was cointegrated with real income, exchange rate variability, interest rates and inflation rate and that, the central bank of Nigeria can use money supply to control inflation. Bitrus (2011) used annual data for 1985 to 2009 and confirmed that, the demand for money and that the stock market, inflation and exchange rate determined the demand for money in Nigeria

Iyoboyi and Pedro (2013) estimated the narrow demand for money function in Nigeria based on annual times series data for 1970 to 2010 and tested it with an autoregressive distributed lag bounds cointegration approach. Study found cointegration among narrow money demand (M1), real income (RGDP), short term interest rate (STIR), real expected exchange rate (REER), expected inflation rate (EIR) and foreign real interest rates (FRIR). The results also shown that only real income and short-term interest rates were significant in narrow money (M1) demand and that Nigeria was not immune to external shocks from capital flights due to changes in real expected exchange rate (REER) and foreign real interest rates (FRIR).

Also, Nduka, Chukwu and Nwakaire (2013) used annual data covering 1986 to 2001 and the Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) tests to establish whether the demand for money in Nigeria was stable over time or not. The results confirmed the existence of a stable and long run relationship between the real variables of broad money (M2) with income, domestic interest rate, expected rate of inflation, expected exchange rate, and foreign interest rates. The authors recommended that the

monetary authorities should continue targeting broad money (M2) in their quest to achieve price stability. for money function in Nigeria's monetary policy formulation processes.

In a related study on the stability of money demand in Nigeria during the period 1986 Q1 to 2010 Q4 and using ARDL bound procedure, Imimole and Uniamikogbo (2014) confirmed a long run relationship between broad M_2 and its determinants and that both CUSUM and CUSUMSQ results produced a robust short and long run estimates of the parameter coefficient for the broad money demand function. They also recommended that the monetary authority should target broad money aggregates to regulate and control domestic prices as well stimulate economic activity in Nigeria. Focusing on the period before and after the global financial crisis, Doguwa, Olowofeso, Uyaabo, Adamu and Bada (2014) used quarterly data for the period 1991 to 2013 to investigate what happened to the demand for money in Nigeria before and after the global financial crises and the demand for money function was still stable with and or, without structural breaks overall. The results affirmed stability in the demand for money function in Nigeria, both before and after the global financial crisis. Study inferred a long run relationship between demand for money and its determinants and thus recommended the use of monetary aggregates in monetary policy.

Père and Karimo (2014) used annual data for the period 1971 to 2012 and the partial adjustment model to Keynesian approach to demand for money. Their results revealed that the demand for money in Nigeria was stable in the short run but without structural breaks. They also confirmed that real income and interest rates does not determine the demand for real money balances in Nigeria and recommended that the monetary authorities should always distinguish between their short run and long run monetary policy objectives and targets.

Bassey, N. E, Solomon U. U. and Okon U. E, (2017) analyzed annual data from 1986 to 2013 using cointegration the maximum likelihood method and confirmed stability of the demand for money in Nigeria the existence of a long run relationship between the money demand real income, interest rate, and expected inflation rate. In addition, the study also found that increase in returns on other money assets like savings deposits, equity and treasury bills reduces people's holdings of money. They suggested the use of interest rate as a tool of monetary policy in Nigeria.

On the stability of the demand for money in Nigeria between 1970 to 2016, Nwandike, G.C and Emerenini F. M. (2018) used the ordinary least squares and cointegration techniques to investigate whether the decision by the Central Bank of Nigeria to choose broad money with e-money development as an intermediate

target for testing the stability of the demand for money in Nigeria was appropriate or not. The results showed, the demand for money was stable in the short run only and therefore suggested a discontinuation of broad money as an intermediate target for monetary policy in Nigeria. Nwude *et al.*, (2018) used quarterly data for the period 1991Q1 to 2014Q4 and the ARDL method to confirm the existence of a cointegrating relationship between broad money demand and real income, domestic interest rate, inflation rate, exchange rate and foreign interest rate. Both eh CUSUM and CUSUMSQ test results affirmed the stability of the demand for money function in the long run and recommended for the continued use of broad money as an intermediate target for monetary policy.

Tule et al (2018) re-examined the demand for broad money and its stability in Nigeria during the period 1985-2016 by on quarterly data and the ARDL technique. The results showed that broad money had a stable long run relationship with GDP, stock prices, foreign interest rates and the real exchange rate. They also found evidence of increased financialization and increasing integration of the Nigerian financial system into the global financial system. Again, their results supported the use of broad money aggregates as benchmark for monetary policy implementation in Nigeria.

Fasipe and Yusuf (2020), used the autoregressive distributed lagged model (ARDL) to analyze quarterly data for the period 2006 q1 to 2018Q2 to establish whether there is stability in the demand for narrow money function in Nigeria. The logarithmic form of real money balances was regressed against real growth, exchange rate, inflation, treasury bill rate, monetary policy rate, savings deposit rate and the interbank offer rate. The result showed that, movements in the prior lagged values of real growth, exchange rate, inflation and saving deposits rate explain the changes in narrow money. In other words, the demand for narrow money was not influenced by changes in the monetary policy rate, the savings deposits rate and interbank offer rate. The issue that was not analyzed in this recent study, is the effect of monetary policy uncertainty on the demand for money in Nigeria. This is what we hope to provide an answer through this study.

2.2 Review of Demand for Money Studies with Monetary Uncertainty

In one of the earliest studies on monetary uncertainty and the demand for money, Bahmani-Oskooee, Mohsen and Sahar Bahmani (2014) drew from studies by Choi and Oh (2002), Bruggemann and Nautz (1997), Bahmani-Oskooee and Xi (2011) and Bahmani-Oskooee (2012) to specify two models that would help them test Friedman's (1984) hypothesis that, in both the short run and long run, "increased volatility in money supply can increase the demand for money". They used annual data on Korea for the period 1971 to

2010 and the error correction method. The variables used were real GDP (Y_t), Interest rate (rt), nominal exchange rate (NEX), measure of volatility of nominal money stock (V), monetary uncertainty (μ_t). and a measure of policy uncertainty. The logarithmic form of money demand function was used in the analysis. The results showed that, the demand for money in Korea was stable and that it supported Freidman's volatility hypothesis in both the short and long run. That including monetary uncertainty in the demand for money function improved the performance of broad money (M_t). Overall, all variables, except income, carried at least one significant short run coefficient. In the long run, all the variables carried their expected signs and were all significant, except income. They concluded that, including measure of monetary uncertainty in the demand for money in Korea yielded stability in the demand for money function. That it made the public more conscious by increasing their cash holding and thus, reducing the velocity of money. This agrees with Freidman's hypothesis in both the short and long run. This study will serve as background material for this paper.

In Nigeria, a pioneer study on "Monetary uncertainty and the demand for money stability in Nigeria: An Autoregressive Distributed Lag Approach" by El-Rasheed, S et al (2017) used annual data from 1980 to 2014 to ascertain the effect of monetary uncertainty (MUC^1), income, domestic interest rates, inflation, and nominal exchange on the demand for money in Nigeria. The results indicated that, monetary uncertainty along with income, domestic interest rates, inflation and the exchange rate were cointegrated with broad money demand, that Monetary uncertainty had a significant effect on the demand for money in Nigeria and that the demand for money was stable overall and that using monetary aggregates as intermediate targets was still an effective policy tool for monetary management in Nigeria.

Similarly, Iyke, B. N and Sin. Yu Ho (2017) used a more higher frequency data that El-Rasheed *et al.*, (2017) quarterly data from Ghana for the period 1990Q1 to 2016Q3 and the ARDL bound test approach to test Friedman's hypothesis on how monetary uncertainty has influenced the demand for money in Ghana and whether the demand was stable in the long tun. The authors found that MUC has a significant and negative short run effect on the demand for money in Ghana, which is passed through, to the long run, thus reputing Friedman's (1984) hypothesis. The findings

¹The idea of monetary uncertainty or the velocity of money is associated with Milton Freidman's hypothesis that increased velocity of money supply can lower the velocity of money or increase the demand for money, which has received little or no concern application to developing countries and majority of the few studies are on the advanced countries.

also indicated that, due to the negative impact of monetary uncertainty on the demand for money, Ghanaians prefer to hold more of safe assets compared to their demand for cash, during periods of monetary uncertainty. The demand for money in Ghana was found to be stable in both the short and long run.

Some of other demand for money studies that included monetary or policy uncertainty are Bahmani-Oskooee, Mohsen and Majid Maki Nayeri (2020) on Japan, Bahmani-Oskooee *et al.*, (2019) on evidence from emerging economies, Oskooee, Mohsen and Majid Maki Nayeri (2018) on the United States of America and Oskooee, Mohsen and Majid Maki Nayeri (2017) on Australia.

From our review of these studies, it is clear that, there has been a continued search for a stable demand for money function since the 1960s to date. That most of these agreed that domestic interest rates, income, inflation exchange rate and foreign interest rates were significant in the demand for money in Nigeria, that monetary uncertainty has not been confirmed. That the only study on Nigeria that included monetary uncertainty had varying results with a similar study on Ghana. In addition, none of these studies has considered including the bitcoin currency as asset in the demand for money function. These are some of the issues this study is focused to address, in view of the increasing challenges of globalization in financial and banking services and the growing number of Nigerians embracing the use of the bitcoin currency as a medium of exchange and means of settlements of their debts.

2.4 Theoretical framework

The theoretical underpinning for the demand for money function is largely related to the schools of economic thoughts. Some of the major schools on the demand for money are, classical, monetarist and Keynesian schools. The classical school under the quantity theory, posited that, given that the stock of money (M) is exogenously determined and velocity of demand (V) stable, the volume of total purchase (MV) in the economy, is always equal to the total volume of sales (PT). In other words, the demand for money can be expressed as an identity:

$$MV=PY \dots\dots\dots (1)$$

Where,

M is the stock of money, V is its velocity or the number of times money changes hands during a period of time), P is the price level and Y is real income. That since the velocity of money is constant overtime, the demand for money (M^d) can be expressed as demand for real balances, prices (P)and income(Y) or $M^d/P = Y/V \dots\dots(2)$

Where: M^d represents money demand

On the other hand, the monetarist under Milton Friedman, explain the demand for money like the

demand for any other asset such as wealth or future income (Yf), opportunity cost of holding money like expected returns on bonds (erb), expected returns on money (erm) and expected returns on stocks (ers), expected inflation rate(π), among others. According to Milton Friedman the demand for money demand function can be expressed as follows:

$$\left[\frac{M^d}{p}\right] = f(Y_f, erb - erm, ers - erm, \pi - erm) \dots\dots\dots (3)$$

Where:

- Y_f = current and future income,
- erb = expected return on bonds
- erm = expected return on money
- ers = expected return on stocks and
- π = expected inflation rate

Another major School on the demand for money is represented by Keynesian economics, whose key ideas are enunciated in John Maynard Keynes epoch breaking book, The General Theory of 1936. According to Keynes, people hold money for reasons of transaction, precaution and speculation. That the demand for money can be linked to each of these reasons. For example, that the transactions demand for money is a function of income (Y), while the precautionary demand is a function of interest rate (r), and the speculative demand for money is a function of income and interest rate (Y, r). The speculative demand function is given as:

$$M^d = L_1(Y) + L_2(r) \dots\dots\dots (4)$$

Where: M^d represents money demand

$L_1(Y)$ is the transitional and precautionary demand and $L_2(r)$ is the speculative demand for money. Most empirical studies on the demand for money are largely linked to one or a combination of these theoretical explanations of the demand for money in the economy.

It Is important to observe that, in Nigeria, the Central Bank of Nigeria has adopted a modified version of the quantity theory of money in its monetary policy strategy. The Bank had abandoned exchange rate targeting in the 1960s and moved to monetary targeting in the late 1970s and has been practicing several variants of monetary target. The strategy is based a simple monetary rule that says, the rate of growth in money supply equals the growth in real Gross domestic product or income (δy^*) minus the growth in velocity of money plus the growth in the rate of inflation (π). Simply expressed that:

$$\delta M = \delta y^* - \delta v^* + \pi \dots\dots\dots (5)$$

Where:

- π = desired rate of inflation provided by National Planning Commission, through the National Economic Management Team.
- δv^* = velocity of money or the multiplier
- δy^* = desired rate of GDP Growth, also given by the Government, and

δM = rate at which money supply must grow, so to achieve the inflation and GDP Growth targets.

Nigeria’s preference under monetary targeting has left much to be desired, because although there has been some noticeable improvements in terms of meeting monetary aggregate targets, challenges have prevailed over unmet targets.

3. METHODOLOGY

3.1 Model Specification

In this study, the demand for broad money in Nigeria (M^d_3) is a function of rate of growth in real GDP (RGDP), inflation rate (INFLA), nominal exchange rate(NER), a measure of monetary policy uncertainty or money volatility proxied by the rate of growth in broad money (MUC) and lending domestic interest rate (LR). In other words,

$$(M^d_3) = F(RGDP, INFLA, NER, LR, Mvol) \dots\dots\dots (6)$$

Taking the logarithmic transformation so as to obtain elasticities, we have

$$\text{Log}(M^d_{3t}) = \beta_0 + \beta_1 \text{Log}(RGDP_t) + \beta_2 \text{log}(INFLA_t) + \beta_3 \text{log}(LR_t) + \beta_4 \text{log}(NER_t) + \beta_5 \text{log}(MUC_t) + U_t \dots\dots (7)$$

Where:

- $\text{Log}(M^d_3)$ = Log of demand for money (broad money)
- RGDP = Real GDP Growth rate
- INFLA= rate of Inflation
- LR = Lending domestic Interest rate
- NER = Nominal exchange rate
- MUC = Monetary policy uncertainty
- U_t = error term

And the betas are parameter coefficients of the estimated variables and each of them has the following apriori expectation. $\beta_0 > 0$, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 < 0$, and $\beta_5 > 0$

3.2 Data Source and Description

The data for the study was sourced mainly from the Central Bank of Nigeria Statistical Bulletin and complemented by downloads from websites of Central Bank of Nigeria, Kneoma.com and World Data. The period covered under the study is from 1980 to 2019 and annual times series data was used.

3.3 Estimation Procedure

The study used both statistical and econometric techniques to analyze the data. The descriptive statistics of the data was used to look at the nature of the data in terms of the description of one variable in relation with other variables in the model. Then we carried the Augmented Dickey-Fuller Unit Root test on all the variables to establish their stationarity or otherwise. We then estimated the model specified in equation (7) above first, using the ordinary least squares regression, before we applied the Autoregressive distributed lag (ARDL) technique and tested for stability of the dependent variable - broad

money supply (M_3) to ascertain the usefulness of our model results to policy. The EViews 11 software was used to carry out the estimation and tests.

4.0 RESULTS AND DISCUSSIONS

The results of the analysis on the determinants of the demand for money in Nigeria during the period 1980 to 2019 using the Autoregressive Distributed lag technique is presented and discussed in the preceding sections.

4.1 Descriptive Statistics

The descriptive statistics for our return series are shown in Table 1 below. The mean, which represents the average market return, is negative for the All-Share Index (ASI) which is a diversified portfolio with only systematic risk. The negative average return implies that, over time, the volatility of earnings in the stock market may be high on both sides of the mean. In the foreign exchange market, the average return is positive in the Bureau de Change (BDC) segment of the market, giving an indication of active trading in this market. Income variability (Maximum minus Minimum) confirms the volatility of returns in both the stock and foreign exchange markets. In the stock market, the variability of returns is spread across a very broad range compared with the foreign exchange market, which covers a narrower range. The standard deviation further echoes the above results, with a higher standard deviation in the stock market than in the foreign exchange market. Skewness for both series is less than zero while kurtosis is more than three. This implies that both series are normally distributed with a tendency to be peaked, thus providing justification for the use of a GARCH model in our analysis. Pre-tests for conditional heteroscedasticity and serial correlation were satisfactory for both return series (Table 1). From the asymmetry and constant conditional correlation (CCC) test shown in Table 1c below, the joint bias test indicates that the RASI series and RBDCUSD series are both symmetric. The negative size bias test however shows some asymmetry in the RBDCUSD series at a 5% level of significance. In order to address this asymmetry in the RBDCUSD series, we adopted an AGARCH variant of the model for our estimation. The Engle-Sheppard CCC test further indicates that the constant conditional correlation (CCC) variant was more appropriate as the P-value was not significant.

4.2 Unit Root Test

The result of the Augmented Dickey-Fuller (ADF) test to establish the stationarity status of the series, as shown in Table 1 indicates that all the variables are I(0).

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Tests

Test Statistics		
Variables	Intercept	Trend & Intercept
At Level		
LM2	-1.5547 (0)	-1.9349 (1)
RGDPG	-2.9615 (0)	-2.9517 (0)
INFR	-1.7399(0)	-10.7996 (3) **
INTR	-3.5254 (0) **	-3.2983 (0)
First Difference		
Δ LM2	-3.002 (0)**	-3.0671 (0)**
Δ RGDPG	-4.426 (2) **	-4.7714 (2) **
Δ INFR	-4.5262 (0) **	-4.5578 (0) **
Δ INTR	-6.4408 (0) **	-4.9270 (1) **

Key: *** Stationary @ 1%; ** Stationary @ 5%; * Stationary @ 10%

Source: Computed by the Authors

From Table 1 above some of the variables are stationary at level I(0) and the rest at first difference I(1) i.e. the variables are integrated in the same order. Having established the stationarity property of the series, equation (6) then qualifies for estimation using the Ordinary Least Squares technique.

4.2 Estimation Results

The results are presented in two parts. These are the estimated model, and the stability test results.

4.2.1 Estimated Model

The estimated ARDL model is given in equation (8):

$$LM_2 = -0.03 - 0.01RGDPG - 0.003INFR - 0.01INTR \dots (8)$$

(-0.05) (-0.01) (-0.004) (-0.01)

$$R^2 = 0.661 \quad \bar{R}^2 = 0.436 \quad SE = 0.7126$$

The estimation results of the study shows that the regressors provides explanations for about 44 percent ($\bar{R}^2 = 0.44$) of the broad money supply. Indeed, the elasticity of money with respect to income is not in line with the economic theory for broad money, because according to Keynes (1936), there exists a positive relationship between the demand for money and income. The results obtained suggest that income is not a significant determinant of money demand in Nigeria.

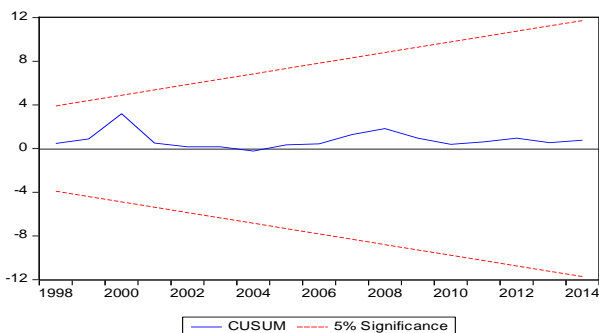
Furthermore, the result shows that the demand for money elasticity with respect to inflation is negatively signed this implies that inflationary tendencies deplete the value of money thereby reducing the desire to hold money (cash). And thus the coefficient of elasticity for broad money is insignificant. This is due to the fact that incomes are at subsistence level hence individuals need to hold cash to finance daily transactions even when inflation expectations are high.

Interest rate came out with the expected sign even though statistically insignificant. This may be as a result of the fact that interest rate works through the financial system and with the underdeveloped nature of Nigeria's financial system, the effectiveness of interest rate as a monetary policy instrument is challenged.

4.2.2 Stability Test Result

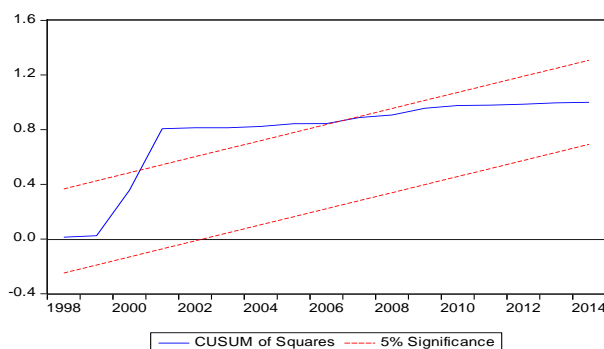
In order to test the stability of the dependent variable - broad money supply (M_2) in Nigeria the use of cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residual (CUSUM of squares) are employed. When the recursive residual of the estimated money demand function goes outside the boundaries of the critical 5% significant lines, then there is presence of parameter instability in that period. The result of the test is presented below:

The CUSUM test shows that the money demand function (M_2) is stable for the period of study since it is within the boundaries of the two critical lines i.e. the critical 5% significant lines.



Source: Authors' computation using E-views

While the CUSUMSQ test indicates instability of the parameters for M_2 between 2000 and 2005, and the parameters are stable after the periods. This is in line with the findings of Bahamani-Oskooee and Barry (2000).



Source: Authors' computation using E-views

5. CONCLUSIONS

This study has empirically examined the stability of money demand using stationarity and stability test to analyze money demand function in Nigeria. M_2 was used as dependent variable and

RGDPG, INFR and INTR as the independent variables. Data used covered the sample period of 23 years (1992-2014).

The results obtained were satisfactory to some extent in the sense that most of the variables are in line with the apriori expectation. Income (RGDPG) turned out to be negative and insignificant while interest rate came out with the right sign (negative) but not statistically significant. Inflation was also negative.

However, the implications of the empirical evidence found in this study are quite expected but not in all cases. Because according to Keynes income is the most significant determinant of the demand for money. Therefore, any policy aimed at changing the level of income will influence the demand for money in the same direction. If policy makers aimed at moping liquidity, the authorities should implement policies that will reduce disposable income in the economy.

The CUSUMSQ stability test provides evidence of a stable money demand function. Because CUSUM test shows that the money demand function (M_2) is stable for the period of study since it is within the boundaries of the two critical lines i.e. the critical 5% significant lines. The paper infers that the estimated money demand model provides important foundations for monetary policy setting in Nigeria.

The empirical finding with respect to income suggest that monetary authorities should implement policies that will reduce disposable income in the economy, that is if they aimed at moping liquidity. However, for inflation monetary authorities can use more effective policies such as monetary targeting as a tool for the control of inflation. Monetary targeting which was among the complementary policies will be an effective tool for the control of inflationary pressures in Nigeria. More so, the empirical finding with respect to the interest rate, monetary authorities should try as much as possible to introduce policies aimed at developing the financial system of the country.

Innovations from the monetary policy rate and exchange rate do not significantly explain the variations in output. The study therefore recommends that the monetary authority should provide some measure of support for specific sectors adversely affected by unanticipated monetary policy shocks.

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