THE IMPLICATIONS OF FINANCIAL INNOVATIONS ON MONEY DEMAND IN NIGERIA

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Abstract- The demand for money is found to be a major determinant of liquidity preference. This study empirically investigated financial innovations as it relates to money demand in Nigeria over the period 1981 – 2016. With data sourced from the Central Bank of Nigeria Statistical Bulletin. The study estimated a VAR model and showed that long-run demand for real balances in Nigeria depends upon real income on its own interest rate. Also, the empirical analysis showed that income and interest rate exert influence on money demand, while financial innovations in Nigeria has but little influence on the demand for money. The result implies that financial innovation is not only an important variable in determining money demand but that as financial innovation increases it affects the demand for money negatively as individuals gradually move away from more liquid assets to less liquid assets with growth in new as such decrease in the demand for money. The result implies that income and interest rate exert influence on money demand, while financial innovations in Nigeria has but little influence on the demand for money. This study therefore recommends that Government and policy makers should be thorough in formulating and implementing unpredictable changes in the money demand due to financial innovation which could lead to misspecification of the money demand; unstable money demand despite its immense benefits to the economy such as efficiency and low transaction costs.

Keywords- Financial Innovations, Money Demand, Money Stocks, Monetary Policy

I. INTRODUCTION

Financial innovations have evolved over time and have moved away from individuals holding cash to assets and the use of Automated Teller Machines, Debit cards, Electronic banking among others. This is prompted as the search for a stable demand for money has been a very contentious issue since the great intellectual debates between Keynesians and Monetarists of the 1960s and 1970s, as no demand for money model set forth by any of these two schools as well as their contemporaries has withstood the test of time. The instability of the demand for money in the 1970s and in the 1980s has been attributed primarily to changes in the performance of financial markets in the area of new financial products arising out of financial innovations. In the 21st century, financial innovation is becoming increasingly important as it poses a serious problem for monetary policy, as with new financial products the ability of monetary policy to be effective diminishes, as it changes one variable vital for effective monetary policy; the demand for money. Financial innovation refers both to technological advances which facilitate access to information, trading and means of payment, and to the emergence of new financial instruments and services, new forms of organization and more developed and complete financial markets (Solans, 2003).

The level and stability of the demand for money has recently received enormous attention in the literature because an understanding of its causes and consequences can usefully inform the setting of monetary policy. The demand for money is found to be a major determinant of liquidity preference. When money demand (which is the people preference for cash instead of assets) is stable, the central bank can reasonably predict the level of money supply in the economy. Poole, (1970) argued that the rate of interest should be targeted if liquidity preference is unstable while the money supply should be targeted if the investment-savings relationship is unstable and the demand for money is stable. It is therefore, necessary to select the correct monetary policy instruments since selecting the wrong instruments may result in large fluctuations in output.

Since the 1980s countless deregulation and liberalization policies, Central Banks in many advanced economies switched between instruments of monetary policy by moving away from policies that influence the money supply towards those which influence the bank rate. A large number of developed country case studies show that the demand for money has become unstable due to financial reforms and hence support the targeting of the rate of interest by central banks (Maki and Kitasaka, 2006; Caporale and Gil-Alana, 2005). The Central banks in many developing economies have followed suit and switched towards monetary policies directed at the bank rate. A major part of this policy switching is grounded on the view that their own financial market reforms and liberalizations might have contributed to the instability in their own money demand functions. However, recent studies have raised doubts about the validity and strength of Central Bank interest rate targeting in developing economies (Bahmani-Oskooee and Rehman, 2005; Rao, Tamazian, and Singh, 2009). It is argued that the choice of bank rate as an instrument of monetary policy may result to stable money demand as against financial markets.
liberalization perceived by industrial economies before the recent financial meltdown. If that is the case then it would be proper to test the stability of money demand in the developing economies like Nigeria. Few studies in Nigeria have been conducted on the stability of money demand function in Nigeria particularly since the 1986 structural policy shift (Owoye and Onafowora, 2007).

Since the SAP in 1986, the Nigerian economy has undergone a number of important structural and institutional changes which included: the liberalization of the external trade and payment systems; substantial degree of financial deepening and innovations in the banking sector; the adoption of a managed float exchange rate system; the dismantling of price and interest rate controls; changes in monetary policy, and the reliance on market determined indirect instruments of monetary policy (Owoye and Onafowora, 2007). These developments may have altered the relationship between money, income, prices and other key economic variables, and may have caused the money demand function to become structurally unstable. Consequently, determining whether the financial reforms undertaken under the SAP have impacted the money demand relationship is important to the effective formation and implementation of monetary policy in Nigeria. Issues related to the behavior and stability of the money demand relationship have assumed greater urgency since the broad monetary aggregate officially became the intermediate target for policy with the CBN (Amendment) Decree Number 37 of 1998 (CBN Briefs, 1998).

There are various reasons that could lead to the instability of money demand such as changes in regulations, financial and monetary reforms or developments in financial innovation. Financial innovation could lead to instability of money demand and unpredictable velocity. Andersen (1985) highlights three sources of instability. These are, first a change in income velocity as a result of fluctuations in interest rates and other factors not related to income. Second, money stocks that may not correspond to desired money balances in the short run which could lead to unexpected changes in the velocity of money. Third, a shift in the money demand function implying unstable parameters or new developments such as financial innovation. Instability of money demand may also be due to the inadequacy of the partial adjustment modeling technique or perhaps new financial innovation (Sriram, 1999).

Financial innovation can lead to an increase in interest rate. Although some studies such as Hafer and Hein(1984), Lippi, and Secchi, (2009) find that financial innovation leads to lower interest rate elasticity. What is clear however is that financial innovation is one of the main reasons for instability of the money demand. As a result of the growth in financial innovation over the last few years, several empirical studies have started including financial innovation in the money demand specification. Exclusion of financial innovation in the money demand function could lead to misspecification of the money demand through over estimation, commonly referred to as “missing money” (Arrau and De Gregorio, 1991).

Although panel and time series data estimation techniques have been used widely to analyze money demand particularly in OECD and EU studies, few studies have been done in Africa with exception of Hamori (2008) and Salisu, Ademuyiwa, and Fatai. (2013) amongst others. They investigate the money demand equation with exclusion of financial innovation and yet there has been growth in financial innovations in the last decade that could have an impact on money demand, macroeconomic stability and thus monetary policy. Further investigation is needed to capture the recent financial innovations in Sub-Saharan Africa specifically in Nigeria with relevant statistical method capable of capturing monetary shocks; given that majority of literatures either employs ordinary least square or causality technique with little emphases on vector autoregressive technique. This study is therefore distinct from some other studies in terms of its analytical techniques.

**Financial Innovations in Nigeria Payment System and Customer Service Delivery**

If the eras of traditional banking are compared to the present financial technology eras, the results show that financial innovation has contributed positively and proliferated the profits of banks (Ngumi, 2013). Banks are gradually transitioning from manual means to the electronic means. Hence the need to entice, retain and win more customers and secure their loyalty. This is the essence of the need for various modes of incentives to encourage loyalty, entice and stimulate customers’ interest, via steady and improved adoption by customers (Mbutor and Uba, 2013).

According to Abubakar and Tasmin (2012), owing to issues of increasing demand to meet customers’ expectation for customer service delivery, trustworthiness of the information system and competition in financial services, it is quite evident from their study that enhancing innovation for qualitative prompt service delivery in the banking industry is a must in a rapidly changing market place. ICT revolution has set the stage for exceptional increase in financial activity across the globe. The global use of cash payment is still endemic, especially for low-value retail transactions. But while cash may be convenient, it makes taxation less
transient, and it is costly to distribute, manage, handle and process. It therefore follows that; cash as a mode of payment is an expensive proposition for any government.

Nyangosi and Arora (2011) argue that financial institutions adopted different electronic distribution channels to meet the demands of customers. In their study to examine the adoption of information technology in Kenyan banks, focusing on services provided through internet and mobile banking, they found out that inclusion of information technology in banking business was necessary to achieve excellence goal. The study further revealed that ATM technology is the most available technology while SMS banking was also found useful.

Mohammed, Siba, and Sreekumar, (2009) assert that financial innovative banking uses the internet as the delivery channel by which to conduct banking activity, for example, transferring funds, paying bills, viewing checking and savings account balances, paying mortgages and purchasing financial instruments and certificates of deposits. Customers prefer to deposit money into a system in which they can obtain a timely information and payment service (Kemppainen, 2003 & 2008). Nigeria’s cash based economy is characterized by the psychology to physically hold and touch a payment medium like cash; a culture informed largely by ignorance, illiteracy and lack of appreciation of the merits of digital payments system like Smart Card, Debit Card or electronic funds transfer (Nigeria-South Africa Chamber of Commerce (NSACC), 2017).

Despite the overwhelming superiority of electronic payment systems, business-to-business transactions are still predominantly consummated in Nigeria with the use of cash and to limited extent bankers’ cheques or certified cheques. The time lag between cheque lodgments and receipt of value as well as the high risk of fraud associated with such payment medium makes e-payment system a preferred alternative. However, the Nigeria Automated Clearing System (NACS) which has been in operation for about some years were set up with the objective to significantly reduce clearing days and mitigate against fraudulent transactions (NSACC, 2017). Effective payment system is a vital part of financial infrastructure of any economy. By enabling commercial transactions to be completed faster, safer and cheaper, it would have positive impact on economic growth and global competitiveness. He mentioned the following payment instruments in Nigeria’s financial sector which he said have started to attract a great deal of attention: such as cards, NFC-Contactless, mobile app, cheque, cash, RTGS/NEFT and mobile:

Internet Banking: Given the overwhelming success of on-line banking, banks in Nigeria are gradually embracing Internet banking and radical changes are beginning to take place in the Nigerian financial landscape. Customers are increasingly raising the stakes of expectations for quality customer services.

GSM/Mobile: Banking (M-Payments). M-payments could be deployed either through the short messages service (SMS) or phone calls. With the roll-out of GSM in Nigeria in August 2001, customers are beginning to savor this service delivery channel. Electronic Money: A generic name for plastic money and other forms of e-payments such as:

Smart Card/Value cards:Smartcard is already operational in Nigeria under the brand name of Value card. The company (Smartcard Nigeria Plc) acts as settlement agent as well as Coordinate hardware and software supply, while participating banks serve as card issuers. Its transactions are however not yet online. Nigeria could easily replicate the South African success story where tremendous progress has been made in the use of Smart Cards. This is very impressive and worthy of emulation. In South Africa, smart cards are being put to use in various areas: salaries, pensions, car parks, post offices, cinemas and stadia (NSACC, 2017).

Credit Cards: The revolving credit on the card allows repayment installmentally. The credit that is granted is either settled in full by the end of a specified period or settled in part, with the remaining balance extended as credit. International credit cards such as Visa and Master cards are known to customers and accepted by merchants. Credit cards are also easy to use on the internet, as only the credit card details need to be sent to the beneficiary in order to effect payment. Debit Cards: This is directly linked to savings or current accounts. The use of debit cards for purchases on the Internet is still limited.

Automated Teller Machine (ATM): A complex self service station for cash withdrawal, account information, credit transfers and cash deposits. ATM and credit card networks are linked in such a way to enable credit card holders of any bank that operates with similar protocol to use it in any machine. One of the ways to grow and encourage the use of Automated Teller Machine (ATM) cards is for banks to form partnerships and jointly own a switch network which will electronically link all the banks’ various ATMs. This has seriously influenced the recent establishment of inter-switch network by some Nigerian banks in collaboration with Accenture and Telnet (NSACC, 2017).

II. LITERATURE REVIEW

By definition, demand for money is a situation in which the citizens prefer to hold their cash balances instead of assets. This is referred to as the liquidity preference. A stable money demand allows for better
predictions of the effects of monetary policy on interest rates, output, and inflation, and therefore reduces the possibility of an inflation bias (Cziraky and Gillman, 2006). Stable money demand is a precondition for an effective monetary policy, especially for countries pursuing a monetary targeting framework.

What then is the demand for money? The demand for money can be defined as the desire to hold money in liquid form rather than other forms of wealth such as stocks, bonds, etc. It often stems from three main motives, which are; transactionary, precautionary and speculative which are influenced by several factors; levels of income and wealth, rates of interest, expectations of economic agents and institutional features of an economy (Bannock and Davis, 1998). Financial innovation is often difficult to measure and there are several definitions that capture this in the literature. Financial innovations have evolved over time for example individuals moved away from holding cash to assets and the use of ATMS, Debit cards, electronic banking among others.

In theory, the growth in financial innovation can improve efficiency in the banking sector through the reduction in transaction costs. However, it can also complicate the way monetary policy is conducted due to the instability of the money demand. To achieve the ultimate goal of price stability, Central Banks particularly those that target monetary aggregates require a stable money demand function. The stability of money demand plays a crucial role in the conduct of monetary policy especially in terms of the appropriate monetary policy actions (Sriram, 2000).

Monetary policy is the process by which the central bank or monetary authority of a country controls the supply of money, availability of money, and cost of money or rate of interest to attain a set of objectives oriented towards the growth and stability of the economy (Nelson, 2008). It is the specific actions taken by the Central Bank to regulate the value, supply and cost of money in the economy with a view to achieving Government’s macroeconomic objectives. For many countries, the objectives of monetary policy are explicitly stated in the laws establishing the Central Bank, while for others they are not (CBN, 2006). Monetary policy focuses on the relationship between the rates of interest in an economy, that is the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of instruments to control one or both of these, to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment. Where currency is under a monopoly of issuance, or where there is a regulated system of issuing currency through banks which are tied to a Central Bank, the monetary authority has the ability to alter the money supply and thus influence the interest rate to achieve policy goals.

2.1 Theoretical Framework
It is imperative to first comprehend related theory of the demand for money so as to understand the implications of financial innovation on money demand.

2.1.1 Classical Theories
To the classical economists, money acts as a numeral. In other words, it is a commodity whose unit is used in order to express prices and values, but whose own value remains unaffected by this role (Sriram, 1999). However, money is deemed neutral with no real economic consequences since its role as a store of value, is limited under the classical assumption of perfect information and negligible transaction costs (Sriram, 1999). The roots of modern theory of money demand began from the early contributions of Mill (1848), Walras (1900) and Wicketsell (1906). The concept of money demand took formal shape through the quantity theory developed in the classical equilibrium framework by two different but equivalent expressions. Fisher (1911) provided the famous equation of exchange (MsVt =PtT, where Ms is quantity of money, Vt is the transactions velocity of circulation, Pt is prices and T the volume of transactions) where money is held simply to facilitate transactions and has no intrinsic value. The alternative paradigm, the so-called Cambridge approach, was primarily associated with the neo-classical economists Pigou (1917) and Marshall (1923). This approach stressed the demand for money as public demand for money holdings, especially the demand for real balances, which was an important factor in determining the equilibrium price level consistent with a given quantity of money (Sriram, 1999).

2.1.2 Keynesian Theory
Keynes (1930, 1936) built upon the Cambridge approach to provide a more rigorous analysis of money demand, focusing on the motives of holding money. Keynes postulated three motives for holding money: transactions, precautionary and speculative purposes. He also formally introduced the interest rate as another explanatory variable in influencing the demand for real balances. The money demand function was then represented as, (iy f(md)) where the demand for real balances (md) is a function of real income (y) and nominal interest rates (i). The main proposition of the Keynesian analysis is that when interest rates are low, economic agents will expect a future increase in interest rates; thus, preferring to hold whatever amount of money is supplied. Older theories that are based on the quantity theory of money such as the classical economists, assume that the velocity of money is stable and that the primary determinant of money demand is income. This theory has advanced over time with the modification by the Keynesians who incorporate...
interest rate and refer to money demand theory as the liquidity preference theory. This includes three motives of holding money, namely, the transaction/business motive, the precautionary motive and the speculative motive (Serletis, 2007). The transaction demand for money is associated with the level of income and money serves as a medium of exchange. Similarly, the precautionary demand for money is dependent on the level of income but it is associated with the level of uncertainty. However, the speculative demand for money mainly focuses on the level of interest rates. Money is considered a store of value and individuals could choose to hold either money or bonds. Therefore, bond prices are highly dependent upon the interest rate (Serletis, 2007 and Siriram, 1999). Interest rates are negatively associated with money demand according to Keynesians and as a result a rise in interest rates is not only associated with a reduction in money demand but a rise in velocity. Put differently, an increase in money demand could lead to a decline in velocity while a decrease in money demand could lead to an increase in velocity. In other words, unlike the classical economists, the Keynesians argued that the velocity of money is not constant (Serletis, 2007). Therefore, the aggregate demand for money becomes perfectly elastic with respect to the interest rate (liquidity trap).

### 2.1.2 New Money Demand Theory
Following Keynes, a number of models were developed to confirm the relationship between the demand for real money and, income and interest rates. These models can be classified into three separate frameworks, namely transactions, asset and consumer demand theories of money.

Under the transactions theory of money demand framework, the inventory-theoretic approach (see Baumol, 1952 and Tobin, 1956) and the precautionary demand for money (see inter alia Cuthbertson and Barlow, 1991) models were introduced. These models were derived from the medium-of-exchange function of money. The asset function of money led to the asset or portfolio approach where major emphasis is placed on risk and expected returns of assets (see Tobin, 1958). Alternatively, the consumer demand theory approach (see Friedman, 1956 and Barnett, 1980) considers the demand for money as a direct extension of the traditional theory of demand for any durable goods (Feige and Pearce, 1977). The resulting implication of all the models discussed in the previous sections is that the optimal stock of real money balances is positively related to real income and inversely related to the nominal rate of return. Ultimately, the difference lies in the selection of variables that will enter the model.

Post-Keynes (New money demand theories) were also developed; for instance, the transactions and portfolio theories (Sriram, 1999). The transactions theories such as the Baumol-Tobin model, the shopping time model and cash in advance model assume that money serves as a medium of exchange while the portfolio theories such as Tobin’s theory of liquidity preference and money and overlapping generations assume the role of money as a store of value (Serletis, 2007). Although Keynesians found that velocity is non-constant, Friedman argues that velocity is rather constant and predictable. Furthermore, the demand for money only depends on permanent income therefore; it is insensitive to interest rates, stable and accurately predictable (Serletis 2007).

### 2.2 Empirical Review
Ditimi, Wosa, and Olaiya, (2011) appraised monetary policy development in Nigeria and also examined the effect of monetary policy on macroeconomic variables for the period 1986 to 2009. The study adopted a simplified Ordinary Least Squared technique and the findings of the study showed that monetary policy had a significant effect on exchange rate and money supply and an insignificant influence on price instability. Nwaobi (2002) examined the stability of money demand for Nigeria using vector auto regression approach. His results confirmed a stable money demand function for Nigeria.

Owoye and Onafowora (2007), employed cointegration and vector error correction analysis to test the stability of the demand for real broad money (M2) in Nigeria over the quarterly period 1986:1 to 2001:4. Their empirical results indicated that there exists a long-run relationship between the real broad money aggregate, real income, inflation rate, domestic interest rate, foreign interest rate, and expected exchange rate. Furthermore, both the CUSUM and CUSUMSQ tests confirmed the stability of the short- and long run parameters of the real money demand function in Nigeria.

Akinlo (2006), using an autoregressive distributed lag (ARDL) technique combined with CUSUM and CUSUMSQ tests, examined the cointegrating property and stability of broad (M2) money demand in Nigeria. The results showed M2 to be cointegrated with income, interest rate and exchange rate. The CUSUM test weakly reported a stable money demand for Nigeria.

Emmanuel, (2002) examined the stability of the M2 money demand function in Nigeria in the Structural Adjustment Program (SAP) period. The result from the Johansen and Juselius cointegration test suggests that real discount rate, economic activity and real m2, were cointegrated.

Ghadepo and Adebapo, (2008) examined the impact of financial innovation on the stability of Nigeria money demand function using Johansen ECM and they found that financial innovation has impact but not a significant impact.

Al-Samara (2011), in his study in the analysis of money demand function in Syria found that real money demand M2 and its economics determinants are weakly cointegrated. On the other hand, stability
test and error correction model have provided a support that money demand function is unstable in the Syrian economy, and this instability could be due to structural changes in the function. These findings support the choice of exchange rate as a nominal anchor for Syrian monetary policy to tie down the price level and achieve its stability.

Adebiyi (2006) examined broad money demand, financial liberalization and currency substitution in Nigeria using Error Correction Model (ECM). His results showed that long-run demand for real balances in Nigeria depends upon real income on its own interest rate, interest rates on government securities, inflation and expected exchange rates. He finally concludes that money demand function in Nigeria was stable despite the economic reforms and financial crises.

Busari, (2004) using cointegration and error correction approach on annual data for the period 1970-2002 to examine Nigerian money demand function. In this study, he observed that demand for money in Nigeria this period was stable and that reforms measures introduced in the mid 1980s seems not to have significantly altered the demand function for money in Nigeria.

III. METHODOLOGY

The main aim of this study is to model the impact of financial innovation and money demand stability in Nigeria. This research used time series technique of econometric simulations for its analysis and employed the VAR method of estimation. Vector Autoregressive Model was developed by Sims (1980) in response to the problem of simultaneity among variables in a system. According to Sims, if there is true simultaneity among variables, they should be treated on an equal footing; there should be no apriority distinction between endogenous and exogenous variables. The term autoregressive is due to appearance of the lagged value of the dependent variable on the right-hand side, and the term, vector, is due to the fact that we are dealing two or more variables.

3.1 Data and Source

This study employed annual data from 1981 to 2016 in this study. The data shall be obtained mainly from secondary sources such as; Central Bank of Nigeria Statistical Bulletin and National Bureau of statistics. Data collected are:Yd: Income as captured by Gross Domestic Product RGDP which seems to be most appropriate proxy variable for capturing the level of transaction. Nominal Rate of interest on time deposits kept in commercial banks. Interest rate measures the opportunity cost of holding money that is, the reward for parting with liquidity. It reflects the degree of substitutability between money and bonds or other forms of financial assets. This is appropriate for our use of M2. The 4-6 month Commercial Paper rate is often used as an indicator for financial innovation, due to difficulty in accessing it and that it’s a relevant proxy (see Goldfeld, 1973). MD: a money demand (in the case of this study M2). In West Germany, real M1 and M2 were not cointegrated rather M3 was more appropriate. However in Nigeria, as M2 is more in line with official monetary conduct, it has been adopted as my monetary aggregate, (Anoruo 2002).

3.2 Model specification

This research follows suit by employing the VAR model to examine the short and long-run impact of financial innovate on money demand in Nigeria. The VAR approach is founded on Granger’s (1969) specification of causality. Causality in Granger’s sense is inferred when values of variables say (Xt), has explanatory power in a regression of Yt on lagged values of Xi and Yt. Following, we consider ageneralized VAR model of order K, as

\[ Y_t = \beta Y_{t-1} + \cdots + \beta Y_{t-k} + \epsilon_t \]

Where the \( \epsilon_t \) form a sequence of independently identically distributed random K-vector with zero mean vector.

Where Yt = (MA, Yd, FI, INRTD) is a k x 1 vector of fourvariables. While Yt - 1 is the corresponding lag term of order i. \( \Phi_k \) is the n x n matrix of autoregressive coefficient vector Y_{t-1} for I = (1, 2… k). \( \Phi = (\phi_1, \phi_2, \cdots, \phi_n) \) is the intercept vector of the VAR model. \( \epsilon_t = (\epsilon_{1t}, \epsilon_{2t}, \cdots, \epsilon_{nt}) \) the (kx1) vector of white noise process. K is the number of lagged terms. VAR estimation is very sensitive to lag structure variables.

In adopting the VAR methodology one could ignore the non-stationarity of included variable altogether and simply estimate the VAR in levels, relying on standard T- and F- distribution for testing any hypothesis (Hamilton, 1994). Although the study used the Granger Causality test to establish instantaneous (short-run) relationship between the variables the study identified shocks that affect demand for money through the use of the impulse response function and the forecast error variance decomposition. Also other tests carried were necessary for robust empirical evaluation.

IV. RESULT AND DISCUSSION

The optimum lag length was determined using lag order selection criteria for which results are present on table 1. Since most of the criteria – LR, FPE and AIC showed lag five (5) to be the optimum lag length. For the purpose of policy formulation, the VAR model has to be dynamically stable. For stability the Roots of Characteristic Polynomial was examined and the results presented on fig1indicates that no root lies outside the unit circle as all modulus were less than unity; as such we affirm that the VAR model is dynamically stable. The VAR LM test for serial correlation as presented in table 2which is necessary to make valid inferences after estimation showed that
the model does not suffer serial correlation up to the twelfth (12th) lag.

The granger causality test results as presented in table 3 showed a bi-directional causality between demand for money and income; unidirectional causality between money demand and financial innovation proxy by treasury bill rate which is 4-6 month commercial paper as an indicator for financial innovation; and a unidirectional causality between demand for money and interest rate on deposit. The implication of the granger causality test results is that transaction demand for money is associated with the level of income and money serves as a medium of exchange. Similarly, the precautionary demand for money is dependent on the level of income but it is associated with the level of uncertainty. His results also showed that long-run demand for real balances in Nigeria depends upon real income on its own interest rate.

The impulse response graphs as presented in figure 2 revealed that the impact of money demand shocks on its own innovations is positive. While response of money demand to innovation in income was also positive through the forecast periods. The impact of financial innovation shocks to variations in the demand for money is positive though little extending along the zero horizontal. The response of money demand to innovations in interest rate of deposit is positive from the first period through the tenth period. The Forecast Error Variance Decomposition result in table 4 shows that in the first forecast horizon 100 percent of the forecast variance is explained by its own innovation in the first period, while 93.81 and 92.52 percent variation in demand for money is explained by its own innovations in the fifth and tenth period respectively. Also, in the first forecasting period changes in income had no impact on money demand, but in the fifth and tenth period 4.12 and 4.89 percent variations in the demand for money are explained by innovation in income and did not decline. In the first forecast horizon no variation is explained by innovation in financial innovation proxy by treasury bill rate, which is 4-6 month commercial paper as an indicator for financial innovation, while 0.016 and 0.020 percent variation in demand for money is explained by innovations financial innovation proxy by treasury bill rate which is 4-6 month commercial paper as an indicator for financial innovation in the fifth and tenth period respectively.

And in the first forecasting period changes in income had no impact on money demand, but in the fifth and tenth period 2.04 and 2.55 percent variations in the demand for money are explained by innovation in interest rate on time deposits. This result implies that income and interest rate exert influence on money demand, while financial innovations in Nigeria has but little influence on the demand for money. The demand for real balances is a function of real income and nominal interest rates and a rise in interest rates is associated with a reduction in money demand.

**CONCLUSION AND RECOMMENDATIONS**

This paper investigated the relation between financial innovation and money demand in Nigeria over the period 1981-2016; using vector autoregressive (VAR) model. The implication of the granger causality test results is that demand for money is associated with the level of income and money serves as a medium of exchange. Also, demand for money is dependent on the level of income but it is associated with the level of uncertainty. The results also suggest that long-run demand for real balances in Nigeria depends upon real income on its own interest rate. Also, the empirical analysis showed that income and interest rate exert influence on money demand, while financial innovations in Nigeria has but little influence on the demand for money. The result implies that financial innovation is not only an important variable in determining demand but that as financial innovation increases it affects the demand for money negatively as individuals gradually move away from more liquid assets to less liquid assets. Therefore it implies that income and interest rate exert influence on money demand, while financial innovations in Nigeria has but little influence on the demand for money. This study therefore recommends that Government and policy makers should be thorough in formulating and implementing unpredictable changes in the money demand due to financial innovation which could lead to misspecification of the money demand; unstable money demand despite its immense benefits to the economy such as efficiency and low transaction costs.

**REFERENCES**

The Implications of Financial Innovations on Money Demand in Nigeria


Table 1: VAR Lag Order Selection Criteria

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<tr>
<th>Lags</th>
<th>LM-Stat</th>
<th>Prob</th>
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<tr>
<td>1</td>
<td>39.5074</td>
<td>0.1046</td>
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<tr>
<td>2</td>
<td>12.78961</td>
<td>0.4677</td>
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<td>3</td>
<td>15.72377</td>
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<td>4</td>
<td>18.91829</td>
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<td>17.33412</td>
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<td>6</td>
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<td>7</td>
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<td>12</td>
<td>7.600978</td>
<td>0.9559</td>
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</table>

Table 2: VAR Residual Serial Correlation LM Tests

Source: Author’s computation
Table 3: VAR Granger Causality/Block Exogeneity Wald Test

<table>
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<th>Null Hypothesis</th>
<th>Wald Statistic</th>
<th>Decision</th>
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<tr>
<td>LOG(MAG) does not Granger Cause LOG(Y)</td>
<td>38.74784***</td>
<td>Reject</td>
</tr>
<tr>
<td>LOG(Y) does not Granger Cause LOG(MAG)</td>
<td>0.565714*</td>
<td>Reject</td>
</tr>
<tr>
<td>LOG(MAG) does not Granger Cause LOG(FT)</td>
<td>17.69710***</td>
<td>Reject</td>
</tr>
<tr>
<td>LOG(FT) does not Granger Cause LOG(MAG)</td>
<td>4.10205 D not Reject</td>
<td></td>
</tr>
<tr>
<td>LOG(TM) does not Granger Cause LOG(INRTD)</td>
<td>6.00875***</td>
<td>Reject</td>
</tr>
<tr>
<td>LOG(INRTD) does not Granger Cause LOG(MAG)</td>
<td>4.47569 D not Reject</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's computation

Table 4: Forecast Error Variance Decomposition of LOG(MAG)

<table>
<thead>
<tr>
<th>Period</th>
<th>S.E.</th>
<th>LOG(MAG)</th>
<th>LOG(Y)</th>
<th>LOG(FT)</th>
<th>LOG(INRTD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.085598</td>
<td>100.0000</td>
<td>0.00000</td>
<td>0.00000</td>
<td>0.00000</td>
</tr>
<tr>
<td>2</td>
<td>0.135543</td>
<td>98.16227</td>
<td>0.812367</td>
<td>0.008553</td>
<td>1.016814</td>
</tr>
<tr>
<td>3</td>
<td>0.178923</td>
<td>95.95920</td>
<td>2.579480</td>
<td>0.011070</td>
<td>1.430252</td>
</tr>
<tr>
<td>4</td>
<td>0.218931</td>
<td>94.50478</td>
<td>3.684678</td>
<td>0.014310</td>
<td>1.796233</td>
</tr>
<tr>
<td>5</td>
<td>0.253401</td>
<td>93.81954</td>
<td>4.120993</td>
<td>0.016238</td>
<td>2.043224</td>
</tr>
<tr>
<td>6</td>
<td>0.282949</td>
<td>93.39269</td>
<td>4.364788</td>
<td>0.017378</td>
<td>2.225149</td>
</tr>
<tr>
<td>7</td>
<td>0.309024</td>
<td>93.07302</td>
<td>4.560443</td>
<td>0.018296</td>
<td>2.348244</td>
</tr>
<tr>
<td>8</td>
<td>0.332541</td>
<td>92.83430</td>
<td>4.710390</td>
<td>0.019041</td>
<td>2.468272</td>
</tr>
<tr>
<td>9</td>
<td>0.353925</td>
<td>92.66066</td>
<td>4.817423</td>
<td>0.019621</td>
<td>2.502898</td>
</tr>
<tr>
<td>10</td>
<td>0.373494</td>
<td>92.52790</td>
<td>4.897723</td>
<td>0.020067</td>
<td>2.535157</td>
</tr>
</tbody>
</table>

Cholesky Ordering: LOG(MAG) LOG(Y) LOG(FT) LOG(INRTD)

Source: Author’s computation

Figure 1

Figure 2