

# **MOBILE MONEY AND MONETARY POLICY IN NIGERIA.**

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## **1.0 INTRODUCTION**

The use of mobile payment technology is becoming increasingly significant in the modern world. In an attempt to explain this financial innovation, Jenkins (2008) broadly classified it into three categories viz: *mobile transfer* (also referred to as person to person transfer, is the transfer of money from one user to another usually without any value added), *mobile payment* (the transfer of money between users accompanied by value added services) and *mobile financial transaction* (this includes accessing financial related services like insurance and macro-finance among others). However, mobile money, as it is often referred to globally, is simply a regulated payment service that can be performed via any mobile device such that, even without a bank account, users can have access to their money anywhere and at any time. It accord subscribers the privilege of converting real money into electronic money (e-money) and credited into mobile devices so that financial transactions can be conducted through a mobile phone. This reduces dependency on cash and commutes a much broader range of financial services to the unbanked population. (Phillips Consulting, 2013).

The advent of mobile money has been applauded to have brought with it a lot of benefits in terms of facilitating transactions and motivating financial inclusion. Munyegera and Matsumoto (2014) considered mobile banking as a recent innovation in the financial sector that is expected to bridge the financial service access gap, thus allowing for socio-economic improvement especially among the financially excluded rural communities in many developing countries. They advocated that it allows users to make deposits, transfer fund as well as purchase a wide range of goods and services using their mobile phones. In supporting this, Jack and Suri (2014) pointed out that mobile money can facilitate quicker recovery from economic shocks such as job loss or illness to the primary wage earner. That is, it could facilitate easy access to grants or any other intervention from governments or corporate bodies. Aker, et al (2011) is of the opinion that mobile money can enable more efficient receipt of monetary transfer from non-government organizations (NGOs) after disasters while Mas (2010) identified it as a veritable potential to lay foundation for access to formal savings, credits and insurance opportunities to those who currently lack access.

Masha (2016) reported that the number of registered mobile account grew to reach 279 million globally at the end of December 2014 and in three-quarters of the markets where mobile money is available, agents outlets outnumbered bank branches. As at December 2014, Sub-Saharan Africa recorded the highest level of mobile money penetration above any region with 23 per cent of mobile connections in the sub-region linked with a mobile money account while Africa as a region accounted for 53 per cent of global mobile money services (Mansa, 2016). In Nigeria, the total transaction value of mobile money has been

growing from 159 billion naira in 2015 to 527 billion naira and 555 billion naira in 2016 and 2017 respectively (NIBSS, 2015, 2016 and 2017). This indicates the level of growth and acceptance of mobile money technology in Nigeria.

Despite being identified to possess some benefits, a few questions still trails the advent of mobile money. Some of which are: does the increasing use of mobile money impact the conduct of monetary policy?, does it weaken the effectiveness of monetary policy?, does the innovation inhibit the attainment of monetary target? In the wake of answering these questions, there have been some arguments. Kamukama and Tumwine (2012) presented that the adoption and increasing use of mobile payments may disadvantaged commercial banks by weakening their liquidity positions and was supported by the assertion of the Governor of the Bank of Uganda at a conference in 2015. In the Governor's opinion, *"if more radical mobile banking business models are eventually developed in which mobile money becomes a substitute for demand deposits in banks, the ability of central banks to control interest rate could be undermined. This is because central banks control short-term interest rates by varying the liquidity available for commercial banks to meet their reserve requirements. But if mobile money eventually leads to a diminution of the role which commercial banks play in the financial system, the interest rate transmission mechanism, which relies on movements in short term inter-bank rate being transmitted along the yield curve to all other interest rates in the economy will be weakened, which in turn will weaken the transmission mechanism of monetary policy"* (Tumusiime-Mutebile, 2015).

In contrast to this, the empirical works of Mbutor and Uba (2013) and Balasuhramanian and Drake (2015) suggest that mobile money contributes to growth and improves the conduct of monetary policy. This conflicting and inconclusive argument calls for more empirical investigation particularly in Nigeria where little or no empirical work has been conducted despite the fact that mobile money transaction is fast gaining ground in the country. It is against this backdrop that this study seeks to empirically examine the effectiveness of monetary policy in the advent of mobile money transaction in Nigeria.

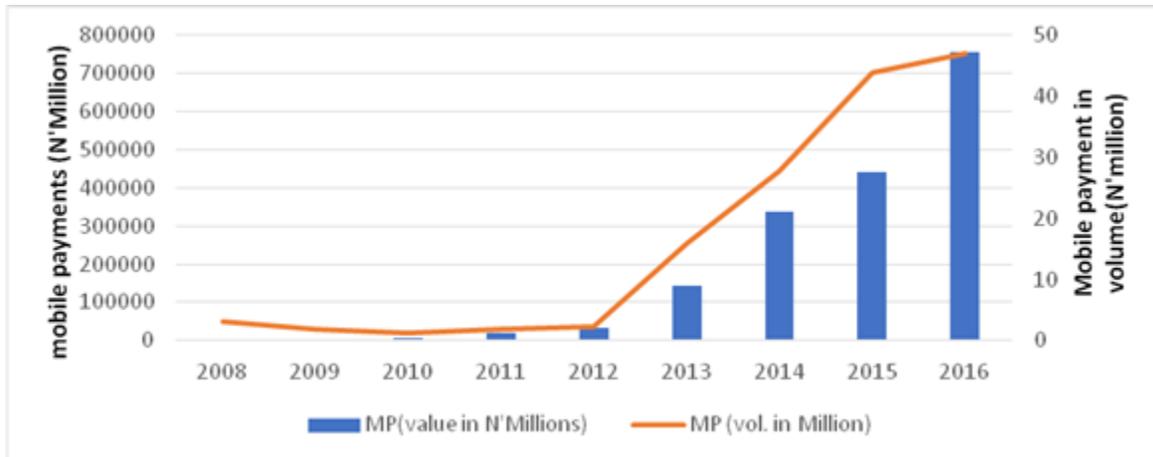
Following the brief introduction above, Section 2 provides the trends and regulations of mobile money in Nigeria while Section 3 reviews theoretical and empirical literature on financial innovation and development. Section 4 provides the methodology for the study while data sources and description are presented in Section 6. Empirical results occupy Section 5 with the study's conclusion and recommendation in Section 7.

## **2.0 TRENDS AND REGULATIONS OF MOBILE MONEY IN NIGERIA**

### **2.1 Trends of mobile money in Nigeria**

The Mobile Money Transfer programme was jointly launched by the GSM Association (GSMA) and Western Union in October 2007. There are now more than 120 mobile money projects being undertaken in about 70 emerging economy (Yakub, et al, 2013). Since then, mobile money transaction has been on the rise particularly in Nigeria. In 2008, the country recorded a volume of 3.2 million of mobile payment with a corresponding value

of 700 million Naira which rose in volume to 15.8 million by 2013 with a corresponding value of 142.8 billion in Naira. Recently in 2016, a total volume of 47 million with a corresponding value of 756.89 billion naira was recorded corresponding to a 108, 127 per cent increase from 2008 (CBN, 2017 and NBS, 2016). This trend is demonstrated in Figure 1.



Source: Authors computation from CBN (2017) and NBS (2016)

## 2.2 Regulations of Mobile Money in Nigeria

In 2011, the Central Bank of Nigeria (CBN) granted operating licenses to twenty one (21) mobile money operators (MMOs) to provide mobile money services in the country. Out of these, six (6) are bank-led {Guaranty Trust Bank (GTBank), Stanbic IBTC, Ecobank, Fortis MFB, Zenith Bank (eazymoney) and Firstmonie} while fifteen (15) others are non-bank-led {Pagatech, Paycom, eTranzact, Afripay, FETS (Funds and Electronic Transfer Solutions), Eartholeum, M-Kudi, Virtual Terminal Network (VTN), Parkway Projects, Teasymobile, Interswitch, Monitize, Pay with capture, Zoto app and CeLLulant}. Though the modes of operation and specific services vary among the different MMOs, there some functions generally performed by all of them. These include: receipt and transfer of money, cash deposits and withdrawals, balance enquiries, purchase of airtimes and payment of bills among others.

In accordance with the powers conferred on the Central Bank of Nigeria (CBN) in Section 47(2) of the CBN Act 2007, "to promote and facilitate the development of efficient and effective system for the settlement of transactions, including the development of electronic payment systems" and pursuant to its mandate of promoting a sound financial system in Nigeria, the CBN issued the guidelines for Mobile Money Services in Nigeria in April 2015 (CBN, 2016). The guidelines cover: the models of operation, agency networks, business rules, roles and responsibilities of participants, nominee/settlement account, transaction security standard, infrastructures, risk managements, technologies, know your customer and customer due diligence requirements, certainty of mobile transaction, customers protection measures, cessation of mobile payments service, statutory returns, remedial measures and sanctions.

As identified in the Act, the objectives of the rules are to ensure a structured and orderly development of mobile money services in Nigeria, with clear definition of various participants and their expected roles and responsibilities, specification of the minimum technical and business requirements for the various participants. This is to promote safety and effectiveness of mobile money services and thereby enhance user confidence in the services.

To further bolster the confidence reposed in mobile payment system by the customers and ensure its continuity, the agency responsible for insuring depositors fund (Nigerian Deposit Insurance Corporation, NDIC) has provided a guarantee to subscribers' for funds deposited with mobile money operators up to the maximum coverage level of ₦500,000. Vide the NDIC's guidelines on mobile payment system released by the corporation, it defines the pass-through deposit insurance scheme as "the protection provided by the NDIC to mobile money subscribers, where the corporation insures funds that are deposited by a mobile money operator in the deposit money banks" (NDIC, 2016). In this sense, mobile money operators are assumed to be acting as custodian of funds on behalf of their subscribers who are the actual owners of funds deposited in the deposit money banks. Insuring subscribers' funds with mobile money operators in Nigeria will not only engender financial system's stability but also promote financial inclusion.

### **3.0 LITERATURE REVIEW**

#### **3.1 The financial development theory**

The theory of financial development centres on cost minimization in the financial system and improvements in the degree and quality of financial intermediation in the system and its role in the development of an economy. This theory can be particularly traced to Bagehot (1873) who asserted that a large and well organized capital markets in England facilitates resources allocation towards a more productive investment. Scholars like Schumpeter (1911); Hicks (1969) and Goldsmith (1969) among others have all critically examined the role of financial development in an economy. Schumpeter (1911) earlier examined the role of a country's banking system for economic development in mobilizing savings and encouraging productive investment, and later in 1939 establishes that the relationship between credit creation by banks and innovation is fundamental to the understanding of the capitalist engine. In identifying the importance of financial market in the process of industrial revolution, Hicks (1969) observed that the development of financial system facilitates the application of new technologies and innovations, while Goldsmith (1969) found evidence of a positive link between financial development and economic growth using data from 35 countries for a comparative study over the periods of 1860-1963. This aligns with the report of Levine (2005) and Pasali (2013) that the degree of financial intermediation is not only positively correlated with growth and developments, it is believed to causally impact growth. Although, traditional growth model of Solow and Swan (1956) did not factor in the role of finance in their models, evidences have shown that financial development is an important factor to the growth of a nation.

## **3.2 Analytical Framework**

### **3.2.1 Mobile money and demand for money**

The demand for money explains the desire to hold money in liquid form instead of holding it in some other forms of investment. While there have been arguments about factors that influences the demand for money, the classical holds out that money is held only for transactionary motive, and thus, income is the only determinant of money demand. The Keynesian notes that money is held not only for transactionary motive, but also for speculative motive and precautionary motives, therefore, money demand is determined not only by income but also interest rate. The monetarist on the counter-revolution asserts that it is only permanent income that determines the demand for money in the long run as interest rate have little and insignificant impact. But what then is the impact of mobile money on money demand? Perhaps, this could best be answered if we know the impact of mobile money on income and interest rate since these are empirically proven determinant of money demand and their direction of influence have already been established in the literatures. Mawejeje and Lakuma (2017) are of the opinion that there are two competing views of the likely impact of mobile money and money demand. The first view is that the financially excluded may accumulate their savings in the form of non-financial assets such as land, livestock, and jewelry (Mehrotra and Yetman, 2015). This may present the household the opportunity to substitute non-financial assets with mobile money, thus increasing the demand for money. That is, with mobile money which facilitates financial inclusion, household might choose to converts their assets or keep their future savings in liquid form with the bank since it is easily accessible and can easily make transactions with it. On the other hand, Ndiranju and Nyamongo (2015) contend that financial innovations may reduce the demand for money due to improvement in transaction efficiency. That is, the desire to hold money in liquid form may decline if such innovation is proven efficient, because it will reduce transaction cost, the stress and risk of moving around with heavy cash among others. This is supported by Mawejeje and Lakuma (2017) findings that mobile money reduces money supply by 1% in their empirical investigation for Kenya. From this view, it can be concluded that whether mobile money reduces or increases money demand depends on its level of efficiency and the trust of the people in the system.

### **3.2.2 Mobile money and money supply**

Money supply is identified to be the total money stock in circulation plus demand deposit in the narrow version of it. Mobile money on the other hand facilitates transaction through mobile payment and banking without necessarily involving the use of cash. This indicates that mobile money could be a substitute for cash because it facilitates transactions as cash would. The implication is that, if mobile money is proven more efficient than cash transaction and acceptable by the people, then most transactions are likely to be consummated through this means. This would increase the velocity of money because transactions can be conducted without delay, at reduced cost and low risk relatively to cash transaction. That is, with the same quantity of money in the system, more transactions can be conducted with it and therefore, more volume money in circulation.

### 3.2.3 Mobile money and velocity of money

The velocity of money measures the number of times a unit of currency circulates around the economy. As presented in the equation of exchange by Fisher (1912);

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

where M = Money supply, V= Velocity of money, P= Price level and T= level of transactions.

PT can be taken as the total nominal national income and MV the total volume of money in circulation, thus, Velocity is given as;

$$V = \frac{P \times T}{M} \dots\dots\dots (2)$$

From equation (2), velocity is determined by the level of money supply and the volume of transaction. Reduction in money supply increases velocity of money from equation 2 above, if and only if, the volume of transaction is constant or increases and vice versa, while increase in national income increases velocity of money if and only if money supply is constant or reduces. Therefore, if mobile money reduces money supply and improves economic transactions, then, it improves the velocity of money and vice versa if otherwise. Batista and Vicenta (2013) noted that the velocity of money is limited by how fast cash can be physically transported, by foot or by bus in most circumstances.

### 3.2.4 Mobile money, price level and economic growth

The influence of mobile money on economic growth and price level depends on whether or not money is neutral. Mobile money will improve velocity of money if it facilitates more transactions, and increase in velocity of money would improve the volume of money in circulation (MV). Looking at this from the theoretical angle, the classical believes that money is neutral and its increase in the economy will result to a proportional increase in price level without any effect on economic activities. The Keynesian argued that there are slacks in the economy in the short-run (i.e. the economy operates below full-employment or potential capacity, leading to a perfectly elastic aggregate supply curve). Therefore, increase in money supply will account for increase in national productivity with no effect on price. However, the monetarist are of the opinion that in the short run, increase in money supply will lead to both increase in price and output while in the long run, increase in money supply have no influence on output. With this, the effect of mobile money on price and output depends on whether the economy is in the short or long run or the economy is at full employment or there are slacks in the economy. If there are slacks in the economy, then mobile money would facilitate growth in national output but will be inflationary if otherwise.

### 3.3 Empirical Reviews

There are growing bodies of literature centred on financial innovation and its possible effect on the conduct of monetary policy. Mobile money is one of the strategies for financial innovation and inclusion. Although, not much of empirical works have been

conducted on mobile money and the conduct of monetary policy, below are the related studies and findings.

Mbiti and Weil (2011) investigated the impact of M-Pesa (mobile money) in Kenya by analyzing data from two waves of individual data on financial access using Fixed Effects Instrumental Variable (FE-IV). The study found increase in the use of M-Pesa to lower the tendency of people to use informal savings mechanism but raised the probability of their being banked. It also found the velocity M-Pesa to be high. They therefore suggested that mobile money improves individual well-being by promoting banking and increasing transfers. Using Dynamic Stochastic General Equilibrium (DSGE) framework with two sectors (the rural and the urban producer household) to investigate Mobile money and monetary policy in East African countries, Adam and walker (2015) reported that mobile money should increase macroeconomic stability and help to minimize the incompleteness of the market. Flowing from their findings, they advocated for policy support to encourage the use of mobile money in East African countries and even beyond.

Mbutor and Uba (2013) while investigating the impact of financial inclusion on monetary policy in Nigeria between 1980 and 2012, adopted unrestricted cointegration and Ordinary Least Square (OLS) techniques reported that growing financial inclusion would improve the effectiveness of monetary policy and that country with higher degree of financial inclusion tends to achieve higher economic growth. Recent empirical work by Mawejje and Lakuma (2017) to examine the macroeconomic effects of mobile money in Uganda using both vector error correction mechanism (VECM) (to examine the effect of mobile money on money demand) and Structural Vector Autoregressive Model (SVAR) (to examine the effectiveness of monetary policy on mobile money) reported that mobile money reduces demand for money in the long run. They also reported that mobile money balances are sensitive to monetary policy shocks and thus have the potential to improve the conduct of monetary policy.

However, contrary to previous findings, Kamukama and Tumwine's (2012) who adopted correlation matrix and multiple regression model to unravel the liquidity threat of mobile money to commercial banks in Uganda showed that mobile money was negatively related to the liquidity position of commercial banks. The study also reported that mobile money service accounts for 36.7% of liquidity variance in Ugandan commercial banks and that this may present a serious problem to the effectiveness of monetary policy in the country. Given the unclear impact of mobile money on monetary policy and the inconclusive debate of its effect on the conduct of monetary policy, this study therefore seeks to fill the gap by empirically examining the influence of mobile money on the conduct of monetary policy in Nigeria.

#### **4.0 METHODOLOGY**

To investigate the impact of financial innovation (mobile money) on the conduct of monetary policy in Nigeria, the study adopts the Structural Vector Autoregressive (SVAR)

Model because of its theoretical underpinning and ability to account for contemporaneous effect in the model.

Kim and Roubini (2000) identified that SVAR approach allows for contemporaneous feedback between variables while imposing the minimal structural restriction on the model. The generalized structural VAR model is represented in equation (3);

$$AY_t = \sum_{i=1}^p B_i Y_{t-1} + \varepsilon_t \dots\dots\dots (3)$$

where Y represents the vector containing the seven endogenous variables, A represents a square matrix of coefficients to be estimated,  $\varepsilon$  represents a vector of serially uncorrelated, and mutually orthogonal structural disturbances, p represents the number of lags.

The structural equation represented by the above system must be identified for the purpose of policy analysis and must be given economic interpretation. The fundamental problem is that the model is not directly observable therefore cannot be directly estimated to derive the true values of the coefficient vector (Bongani, 2014). The reduced form of the model, which is obtained by multiplying both sides by,  $A^{-1}$  is specified as follows in equation (4);

$$Y_t = A^{-1} \sum_{i=1}^p B_i Y_{t-1} + e_t \dots\dots\dots (4)$$

where  $e_t$  is a vector of serially uncorrelated, but not necessarily orthogonal, reduced form disturbances. In this regard, the relationship between the reduced form VAR residuals ( $e_t$ ) and structural shocks ( $\varepsilon_t$ ) is as expressed in equation (5) :

$$e_t = A_0 \varepsilon_t \dots\dots\dots (5)$$

Based on the Cholesky decomposition of the reduced form VAR, for this study, we impose  $n(n-1)/2$  constraints that defines matrix  $A_0$  as a lower triangular matrix. The lower triangularity of  $A_0$  implies a recursive scheme (because structural shocks are identified through reduced form VAR residuals) among variables (the Wald chain scheme) that has clear economic implications and has to be empirically tested as any other relationship. Identification scheme of the matrix  $A_0$  implies that particular contemporaneous interactions between some exogenous shocks and some endogenous variables are restricted reflecting causal chain of interaction transmission. Therefore the Wald causal chain is incorporated via a strategic ordering of the variables in a way that mirrors economic theory. Thus, the variables are ordered as follows on the assumption that: mobile money (MM) balances are affected by own innovations; money supply (proxy with broad money, M2) is affected by mobile money, price level (consumer price index, CPI) is influenced by mobile money and money supply, Treasury bill rates (TBR) are influenced by the price level, money supply and mobile money, Private sector credit (PSC) is affected by TB rates, price level, money supply and mobile money while aggregate output (real gross domestic product, RGDP) is influenced by all the endogenous variables in the model. The matrix form of the SVAR model is expressed in equation (6);

$$\begin{bmatrix} e^{MM_t} \\ e^{M2_t} \\ e^{CPI_t} \\ e^{TBR_t} \\ e^{PSC_t} \\ e^{RGDP_t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix} * \begin{pmatrix} \varepsilon^{MM_t} \\ \varepsilon^{M2_t} \\ \varepsilon^{CPI_t} \\ \varepsilon^{TBR_t} \\ \varepsilon^{PSC_t} \\ \varepsilon^{RGDP_t} \end{pmatrix} \dots\dots\dots (6)$$

The left hand side of the equation consists of the vector of residuals in the reduced form, and the right hand side is the squared matrix ( $A_0$ ) of coefficients associated with lagged variables and structural shocks through column vector ( $\varepsilon$ ).

## 5.0 DATA SOURCES AND DESCRIPTION

The study used monthly data spanning from 2008M1 to 2016M12. The start-off date marks the era when mobile money was introduced in Nigeria while the cut-off period correspond to when data are available on all variables of interest. The data used were collected from National Bureau of Statistics (NBS, 2016) publications and the Central bank of Nigeria (CBN, 2017) annual publications and bulletin. Aside from Treasury bill rate (TBR), the study used the natural logarithm of mobile money payments (LMM), Money supply (LM2), Consumer price index (LCPI), Private sector credit (LPSC) and Real Gross domestic product (RGDP). Monthly data on mobile money between 2015 and 2016 were obtained from CBN while the rest from 2008 to 2014 (annual) and the RGDP data (quarterly) were interpolated to monthly data using E-views.

Both Treasury bill rates (TBR) and broad money supply (M2), which measures the volume of money in circulation, enters the model as monetary policy control instruments. Mobile payment (LMP) which proxy mobile money is the amount of transactions conducted via mobile technology. Private sector credit (PSC) represents banks loans and advances to the private sector and it comes into the model as an intermediate target of monetary policy. Both the consumer price index (CPI), which is the average price level per basket of consumer goods and the real gross domestic product (RGDP), which aggregates the economic activities, enters the model as a monetary policy goal.

## 6.0 EMPIRICAL RESULTS

### 6.1 Stationarity Test

Using both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests for stationarity test, all the variables, except M2, are found stationary at first difference. Given the observed nature of the series with some variables stationary at levels I(0) and others at first difference I(1), as seen in Table 1, the study adopts the Toda and Yamamoto (1995) estimation approach which is adjudged suitable for VAR estimation (Amiri and Ventelou, 2012).

Table 1: Stationarity Test

Variable	ADF			PP		
	Levels	1 <sup>st</sup> difference	2 <sup>nd</sup> difference	levels	1 <sup>st</sup> difference	Decision
LCPI	-2.029	-7.827***		2.249***	-7.869***	I(1)
LM2	4.088***			4.196***		I(0)
LMM	-2.932	-2.669	-10.572***	-2.91779	-13.917***	I(1)
LPSC	-2.051	11.575***		-2.09527	-11.573***	I(1)
LRGDP	-1.616	-9.791***		-1.66014	-9.793***	I(1)
TBR	-2.862	-8.096***		-2.0685	-7.987***	I(1)

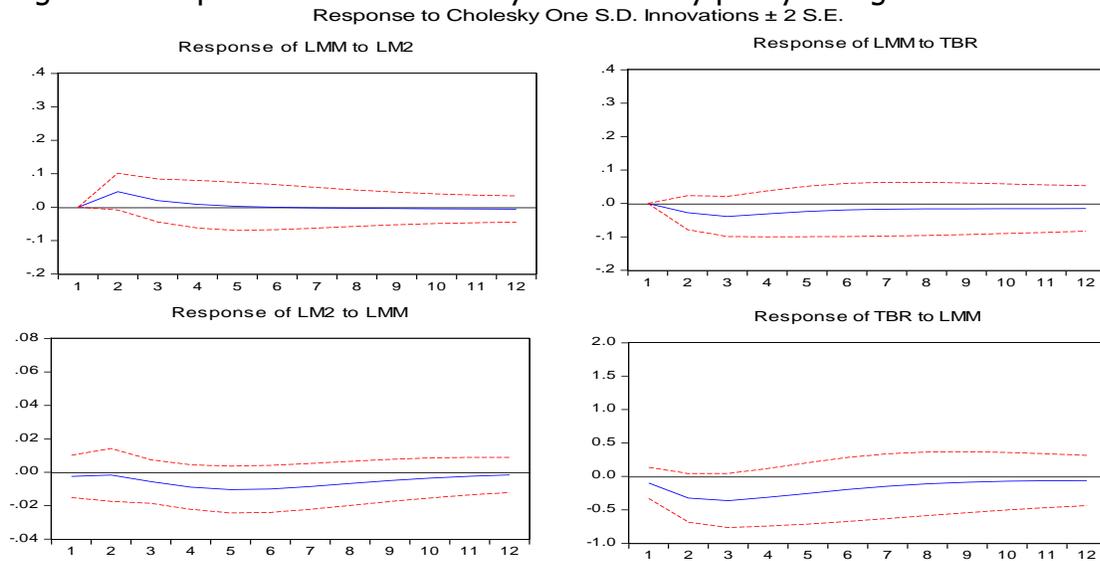
\*\*\*, \*\*, \* represent 1%, 5% and 10% significance level.

## 6.2 Impulse Response

To test the impact of mobile money technology on the conduct of monetary policy in the country, the study evaluates the impulse response of mobile money to shocks emanating from money supply and 364days Treasury bill rate both being monetary instruments.

Figure 2 shows that mobile money is responsive to monetary policy in Nigeria. It responds positively to positive shock in money supply until the second and third months declining thereafter and remaining insignificant throughout the rest of the period. Mobile money responds negatively to shocks in Treasury bills. It reveals that a shock in Treasury bill rate results to a decrease in mobile money. Money supply also respond to mobile money but negatively just like Treasury bill.

Figure 2: Response of mobile money to monetary policy in Nigeria



### 6.3 Variance Decomposition

The forecast error variance decomposition (FEVD) explains the percentage of variance in the equation that is captured by the explanatory variables and its determinants. It shows the impact of shocks in the endogenous variables on the exogenous variable. Table 2 presents the first month in each quarter of the 12-month horizon into the future.

Table 2: Variance Decomposition<sup>1</sup>

<b>DEPENDENT VARIABLES</b>	<b>Month</b>	<b>LMM</b>	<b>LM2</b>	<b>LCPI</b>	<b>TBR</b>	<b>LPSC</b>	<b>LRGDP</b>
Mobile Money	1	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	4	93.4453	1.3849	1.2346	1.7794	1.8369	0.3190
	7	88.9129	1.1148	4.6029	1.9802	2.1963	1.1929
	10	83.2702	1.0212	9.3314	2.0790	2.4049	1.8933
Money Supply	1	0.1477	99.8523	0.0000	0.0000	0.0000	0.0000
	4	1.5766	88.1758	0.4126	6.9110	1.5361	1.3878
	7	4.2214	70.9839	2.8432	17.8598	2.2747	1.8170
	10	4.7412	66.4676	5.8383	18.8895	2.1629	1.9004
Treasury Bill Rates	1	0.6728	0.2123	0.0000	99.1150	0.0000	0.0000
	4	5.5019	0.1846	1.8273	91.5713	0.7923	0.1226
	7	6.0422	0.5219	4.0270	87.7594	0.9865	0.6630
	10	5.9854	0.5444	5.5685	84.4404	1.8270	1.6343

Own shock wholly accounts for variation in mobile money in the first month as shown in Table 2. Own shock decrease further from 93.45% to 88.91% between the fourth and seventh month with other variables each marginally accounting for less than 2% in the fourth month. Only price level innovation provides an appreciable explanation (4.50%) in the fourth month for shocks to money supply while other variables accounts for an average of 2% each during the same period. While explanation from own shock decreased further in the tenth month to 83.27%, only price level (9.33%) offers significant explanation to innovations in mobile money. The two instruments of monetary policy, broad money and TB rates, provide no significant explanation for variation in mobile money. Though this finding shows that mobile money have no significant effect on monetary policy, same cannot be inferred for price level and private sector credit.

From the money supply section in Table 2, money supply responds largely to own shocks with all other variables accounting for less than 1% of the innovation. TB rates account for almost 7% variations in the fourth month aside own shock of (88.17%). However, from the seventh month, TB rates explanation of 17.86% is only second to own shock (70.98%) with mobile money marginally accounting for 4.22% and all others accounting

<sup>1</sup> Exchange rate was among the initial variables considered but was dropped because it was found to be statistically insignificant here.

for about 2% each. In the tenth month when own shock decreased further to 66.47% and TB rates account for 18.89%, price level explains 5.84% of the innovations in money supply confirming that inflation is linked to money supply. Mobile money accounts for 4.74% while private sector credit (2.16%) and output (1.9%) offers little explanation. Thus, innovations in money supply appear not to significantly impact mobile money technology.

Table 2 shows that variations in TB rates are not significantly affected by other macroeconomic variables in the first month as own innovation accounts for 99.85% in the variation. However, in the fourth month when own shock accounts for 91.57%, mobile money explains 5.50% of innovation while the remaining variables accounted for 3% of variations in TB rates. Between the seventh and tenth month, while own shock explanations decreased from 87.76% to 84.44% and mobile money explanation from 6.04% to 5.99% in the same period, price level explanation for the innovation rose from 4.02% to 5.57% for the same period. This implies that mobile money, and even price level, responds more to shocks from TB rates than from money supply.

## **7.0 SUMMARY, CONCLUSION AND RECOMMENDATION**

Mobile money is a financial innovation that poses numerous benefits to the society. Despite these perceived benefits, skeptics are concerned whether these innovations will weaken the operation and effectiveness of monetary policy consequently the stability of financial sector as well as other macroeconomic variables. This paper examines the effect of mobile money on the conduct of monetary policy in Nigeria from 2008M1 to 2016M12. Specifically, it examines the responsiveness of mobile money and some macroeconomic variables to shocks from monetary instruments proxy with moneys supply and 364days Treasury bill rates.

Structural vector autoregressive model (SVAR) was adopted to test for the short term responses of mobile money to shocks from monetary policy. Though mobile money has no significant effect on monetary policy, the result shows that same cannot be said on price level. This implies that financial innovations such as mobile money technology impacts on the economy's price level. The study also found that monetary policy shocks emanating from TB rates impacts more on mobile money than from money supply. The implication is that economic agents consider the yields/returns on risk-free investment such as Treasury bill when making their consumption and investment decisions.

From these findings, the study recommends further enlightenment and education for the use of mobile money by the monetary authority in Nigeria as it could be a veritable tool to deepen financial inclusion especially to those excluded in the rural area and towards achieving a desired expansionary monetary policy. Given its marginal impacts on price level, the study also recommends the sustenance of the existing daily transaction limits by the monetary authority both for security and stability purposes. Also, stakeholders such as the Nigerian Communications Commission and other operators have vital role to play in the propagation of mobile money in Nigeria.

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