
Monetary policy transmission mechanism, innovative banking system and economic growth dynamics in Nigeria

Amechi Endurance Igharo

Department of Economics,
Usmanu Danfodiyo University,
Sokoto, Nigeria
Email: amechidiamond@gmail.com

Romanus Osabohien*

Department of Economics and Development Studies,
Covenant University,
Ota, Nigeria
Email: romik247@gmail.com
Email: romanus.osabohien@covenantuniversity.edu.ng
*Corresponding author

Glorial Okoh Onyemariechi

Department of English,
College of Science and Technology,
Waziri Umaru Federal Polytechnic,
Birnin Kebbi, Nigeria
Email: amechigloria@gmail.com

David Timilehin Ibidapo

Department of Banking and Finance,
Covenant University,
Ota, Nigeria
Email: ibidapodavid38@gmail.com
Email: david.ibidapo@stu.cu.edu.ng

Abstract: Due to mismanagement alongside poor formulation and implementation of monetary and fiscal policies, level of economic development in Africa remains low. This study argued that African countries have great potentials to accelerate and sustain economic growth through effective monetary policies due to huge market potentials, growing population, and availability of manpower, untapped natural resources and other growth advantages provided effective policies are enacted. Against this backdrop, this study investigated the effect of monetary policy transmission mechanism and innovation in the banking system on economic growth in Nigeria. Data sourced from the Nigerian Central Bank Statistical Bulletin and World Development Indicators between 1981–2015 was engaged. The study adopted a vector

auto-regression and auto-regressive distribution lag approaches for its analysis. The study revealed that, due to the large informal banking sector, monetary policies have not been effective and also supervisory and intermediary financial institutions lack dependence due to frequent government interventions.

Keywords: fiscal policy; monetary policy; transition mechanism; innovation, banking system; economic growth; Nigeria.

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Biographical notes: Amechi Endurance Igharo is a postgraduate student of the Department of Economics, Usmanu Danfodiyo University, Sokoto, Nigeria.

Romanus Osabohien is an Assistant Lecturer and a postgraduate student in the Department of Economics and Development Studies, Covenant University, Ota, Nigeria.

Glorial Okoh Onyemariechi is a Lecturer in the Department of English, College of Science and Technology, Waziri Umaru Federal Polytechnic, Birnin Kebbi, Kebbi, Nigeria.

David Timilehin Ibadapo is a postgraduate student of the Department of Banking and Finance, Covenant University, Ota, Nigeria.

1 Introduction

Investigating the relationship between monetary policy and the growth of an economy is one of the oldest areas in the history of macroeconomic theory (De Luigi and Huber, 2018; Bernanke and Gertler, 1995). This area has attracted the interest of many academicians, economists as well as policy makers even though it is one of those areas where extensive theoretical and empirical researches have been carried out. The study of Bernanke and Gertler (1995) pointed out that "the impact of monetary policy on the real economic variables has been a contentious area of debate in macroeconomics. The main reason for this is that; there is a serious dispute among majority of economists and even among the theoretical thinkers about the actual and magnitude of monetary policy impact on real economic activities and how it is transmitted" (De Luigi and Huber, 2018; Elbourne, 2008). Some believe that money does not matter and monetary policy is ineffective in influencing real economic variables such as employment, and real output, while others claim that money matters, and monetary policy can influence real economic activities at least in the short run and again there are those in between these two opponents who believe that the link between money and output is actually reverse causation not the other way around (Chukwu et al., 2009).

The question of if the transmission mechanism of monetary policy is really an implication for economic growth and the place for innovation, research and development in the banking sector has drawn attention of many scholars. Various scholars like De Luigi and Huber (2018), Huber and Fischer (2018) and De Paoli and Zabczy (2013)

have argued on the efficient transmission mechanism of monetary policy in enhancing aggregate output and inflation in a suitable environment. The rationale behind this is that the banking industry experience less uncertainty with respect to future macroeconomic development and perhaps constitutes efficient expectations about the rate of interest in the future.

Various studies has emerged in trying to investigate the reactions of macroeconomic quantities to monetary shocks which controls for the movement in dept-to-GDP ratio (Nickel and Tudyka, 2014; Auerbach and Gorodnichenko, 2012). In opposition, the relationship between monetary policy transmission mechanism (MPTM) and economic growth has relatively received little attention in literature. However, in the period of deficit-increase across the world and exceptional monetary policy strategies engaged by some Central banks, this study appears very relevant for Nigeria, especially, in present situation in which coordination between the central bank and the government is needed to push the economy away from recession, and policy makers are increasing their reliability on the case study which systematically examine this issue (Huber and Feldkircher, 2017).

Bank is a system of market, which referred to as the new age market and the modern age marketplace exists in a global village which has no boundaries, this characteristic makes the banking system not only special, but at the same time volatile in nature (Sondhi et al., 2017). Efficient transmission of monetary policy in the country and good innovative system are required for banks to compete and strive in such an environment, marketers adopt new paradigms and models for their respective business. Sashi (2012) takes a similar view and sees business as a cycle, which proposes and is of the opinion that there is a sequential path to the state of involvement to the striving of business. The government engagement in making business strive ranges from connection to interaction, satisfaction, retention of customers through effective policies, commitment to the satisfying customers (Sashi, 2012). In line with Sashi (2012) and Al-Zu'bi (2018) brings to bear the effect of mindfulness in business strategic creativity through innovation, based on this, development monetary policies and banks innovative system should be strengthened to passively reflect on financial sector development and development of mobile cell phones application which enhance quality service delivery (Hotniar and Heidy, 2018).

The transmission mechanism of monetary policy is a process whereby the action of central banks in terms of manipulation of money supply and interest rates are transmitted to the economy via several channels (Chukwu et al., 2009). Various schools of economic thoughts identified a number of different channels of transmission mechanism of monetary policy (Elbourne, 2008; Chukwu et al., 2009). However, for developing countries, the empirical evidences are mixed and full of contradictions (De Luigi and Huber, 2018; Osabohien and Osuagwu, 2017; Aleem, 2010; Disyatat and Vongsinsirikul, 2003; Pushparaj et al., 2007; Mugume, 2011; Mengesha and Holmes, 2013; Davoodi et al., 2013; Abradu-otoo et al., 2013; Chileshe et al., 2014; Ghazanchyan, 2014). Moreover, from Nigeria, there have been a very limited number of well-known scholarly researches that investigate the MPTM of the Central Bank of Nigeria (CBN).

This study is structured into five sections, following this introductory is Section 2 which comprises of the theoretical framework and the review of empirical literature; Research methodology is discussed in Section 3; findings or results from the research methodology are presented and discussed in Section 4, while Section 5 which is brings to bear the summary and conclusion of the study.

2 Theoretical framework and empirical review of literature

Existing literature and theoretical framework of transmission mechanism of the monetary policies solely depends on linear modelling which assumes the effect of monetary policy on the broader economy to be time invariant and structurally constant (Rüth, 2017; Smets and Wouters, 2007). Irrespective of this, a small portion of empirical studies has been carried out to examine the effects of monetary policy by conditioning it on the business dimension, especially the banking industry. However, these empirical studies seem not to be focused on the coherent aspect of whether monetary policy is more efficient in periods of expansion or recession. The different point of views by researchers among others may be due to the rationale that business shocks result from weak monetary policy transmission. This argument is a long standing debate on the relative significant of monetary policy in explaining cyclical upswings and downswings in macroeconomics that has been a relevant topic since the Great Depression of 1930s (Mishkin, 2009).

2.1 *The nature of the transmission mechanisms of monetary policy*

The monetary transmission mechanism describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact real variables such as aggregate output and employment (Rüth, 2017; McCallum, 2002). For the monetary authorities to be very successful in the conduct and implementation of their monetary policies, they must know the actual impact and timing of their policies as well as the channels through which they are transmitted to the economy and thus requires a proper understanding of the transmission mechanism of monetary policies (Rüth, 2017; Mishkin, 1995; Osabuohien et al., 2018; Osuma et al., 2018).

MPTM is the process whereby monetary policy of central bank of a country is transmitted to the various macroeconomic variables and sectors of the economy (CBN, 2011). CBN (2011), in its first series, Understanding Monetary Policy Series No. 1, defines MPTMs as “the various ways whereby deliberate actions of monetary authority in forms of changes in the stock of nominal money supply or nominal interest rate affect general price level and domestic output in the economy.”

Figure 1 depicts a framework that can help in understanding the concept and the forces at play in the conduct and design of monetary policy by central banks around the world.

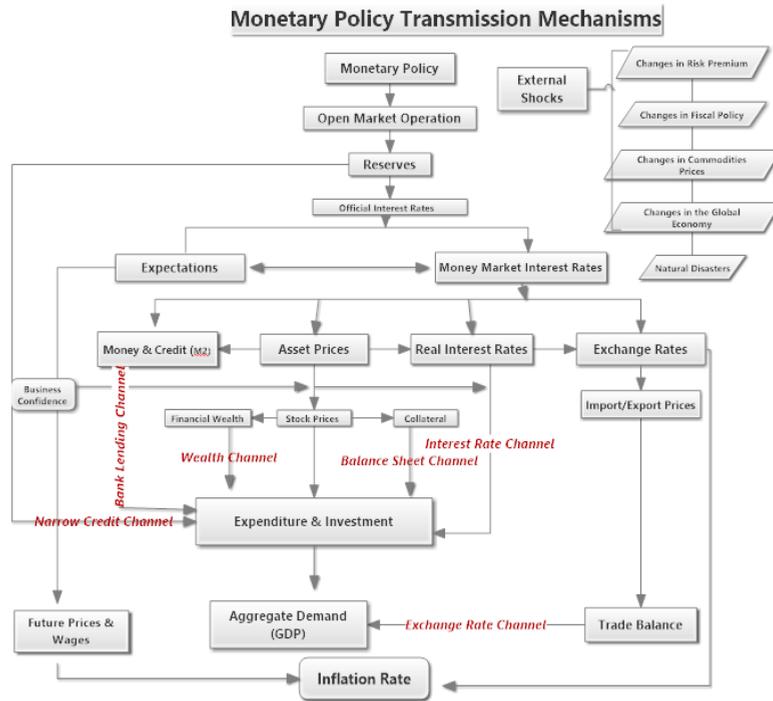
According to the traditional Keynesian *interest rate channel*, a policy-induced increase in the short-term nominal interest rate leads first to an increase in longer-term nominal interest rates, as investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities, as described by the expectations hypothesis of the term structure. When nominal prices are slow to adjust, these movements in nominal interest rates translate into movements in real interest rates as well (Galí, 2008; Ojo, 2001). When firms notice that real cost of borrowing over all horizons has increased, tends to cut down investment expenditures. Likewise, households facing higher real borrowing costs scale back on their purchases of homes, automobiles, and other durable goods. Aggregate output and employment fall. This interest rate channel lies at the heart of the traditional Keynesian textbook IS-LM model (Hicks, 1937).

According to Ojo (2001), asset price movements beyond those reflected in interest rates alone also play a central role in monetarist descriptions of the transmission

mechanism. Indeed, monetarist critiques of the traditional Keynesian model often start by questioning the view that the full thrust of monetary policy actions is completely summarised by movements in the short-term nominal interest rate. Monetarists are of the argument that monetary policy actions impact prices simultaneously across a wide variety of markets for financial assets and durable goods, but especially in the markets for equities and real estate, and that those asset price movements are all capable of generating important wealth effects that impact, through spending, output and employment.

Therefore, various channels, theories or models examined in this study are presented in this subsection.

Figure 1 The transmission mechanism of monetary policy (see online version for colours)



Source: Adopted from Chukwu et al. (2009) and modified by authors (2018)

2.2 Theories of monetary policy transmission mechanism

2.2.1 Traditional interest rate theory

This theory is one of the primary traditional theory of MPTM that works through the cost of borrowing and lending which in turn affects saving and investment decisions as well as

the aggregate demand (AD) and supply in the economy (Horvath, 2006). The interest rate channel can be represented in the form of the following schematic follow chart:

$$M \uparrow \rightarrow r \downarrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

The schematic chart describes the impact of an expansionary monetary policy and how it is transmitted to the economy. It starts from an increase in money supply (M) which in turn leads to a decrease in interest rate (r) and investment spending rises due to the fall in the interest rate and eventually the AD expand in the economy.

2.2.2 Bank lending theory

The bank lending theory examines the potential impact of monetary policy of a central bank on the supply of loans and credits by financial institutions, and on firms' balance sheets and their ability to borrow. According to Bernanke and Gertler (1995), the bank lending theory arises from market frictions in financial markets due to asymmetric information. Asymmetric information is a situation in which one participant in a market transaction is better informed than the other party. For instance, when a central bank implement a concretionary monetary policy by selling bonds in the open market, bank deposits will contract and this will lead to a decrease in bank loans, then investment will shrink and consequently the AD will decrease in the economy. Schematically speaking:

$$M \downarrow \rightarrow BDs \downarrow \rightarrow BLs \downarrow \rightarrow I \downarrow \rightarrow Y \downarrow$$

The empirical evidences from the advanced and some fastest growing economies indicate that the bank lending channel is the most effective medium through which monetary policy is transmitted to the economy (Galí, 2008; Eichenbaum, 1992).

2.2.3 Narrow credit theory

The narrow credit theory is one of the traditional theories of MPTM which also relies on credit market imperfection, just like bank lending channel, but in the narrow credit theory, the banks play special role by holding assets which have no close substitutes. The basic notion of this is that is based on the premise that monetary policy can influence the supply of intermediate credit through its impacts on loan able funds (Bernanke and Blinder, 1988). The credit theory emphasises the influence of quantity of credit on AD rather than its price. In low income countries where the credit markets are highly underdeveloped and government frequently interfere with the free operations of these markets, monetary policy is more likely to be very effective on AD through alteration in the availability of credit rather than through changes in the price of credit. The schematic follow chart of this channel takes the following form:

$$M \uparrow \rightarrow PS \uparrow \rightarrow q \uparrow \rightarrow AS \uparrow \rightarrow MH \downarrow \rightarrow BL \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

With an expansionary monetary policy, the equity prices of firms (Ps) will rise which in turn raises the profit outlook of firms (q) but due to decrease in adverse selection (AS) and moral hazard (MH), bank lending (BL) increases and consequently investment spending (I) rises and AD follows suit (Chileshe et al., 2014).

2.2.4 Exchange rate theory

This theory operates through the foreign exchange markets via the effect of interest rate differential on the net exports. Changes in the monetary policy can affect exchange rate via interest rate which in turn alters exchange rate expectations and eventually affects the relative prices of imports and exports as well as the AD and supply in the economy. For instance, when an expansionary monetary policy is pursued, an increase in money supply (M) will cause the domestic interest rate to fall and this make assets dominated in local currency to be less attractive compared to ones dominated in the foreign currency and consequently the domestic currency will depreciate in value. And due to the depreciation of the domestic currency, domestic goods and services become cheaper relative to the foreign goods and services, thereby leading to a rise in net exports and AD.

Schematically speaking:

$$M \uparrow \rightarrow r \downarrow \rightarrow ERD \rightarrow NX \uparrow \rightarrow Y \uparrow$$

In the literature of the MPTM, exchange rate is mostly effective in countries that adopt flexible exchange rate system, and these include even the low-income countries (Abradu-otoo et al., 2003; Al-Mashat and Billmeier, 2008).

2.2.5 The Keynesian theory

The early Keynesians of the 1950s had the belief that money is insignificant and it does not matter at all to the movement in output and prices and hence economic fluctuations (Mishkin, 2009). This notion of the ineffectiveness of money in influencing economic variables is based on three empirical evidences of indirect link between monetary aggregates and real economic activities. First, during the Great Depression of 1930s, interest rate was low that the monetary policy pursued as at that time failed to stimulate investment spending (McCallum, 2002). Secondly, Keynesians thought that there is a strong link between changes in interest rate and investment activities, but empirical evidence revealed otherwise that there is in fact weak linkage between the two. Thirdly, business decisions concerning investment in new physical capitals are not necessarily sensitive to low interest rates. In fact, some case studies of businessmen showed that their decision makings on what and how much to invest in physical capital were not related to the prevailing interest rates in the market (Mishkin, 2009).

As argued by Mishkin (1995, 2009), the monetarism argument against Keynesians is built on the rationale that the monetarism involves the control of money in the economy, while Keynesian economics involves government expenditures. Monetarists believe in controlling the supply of money that flows into the economy, while allowing the rest of the market to fix itself. In contrast, Keynesian economists believe that a troubled economy continues in a downward spiral unless an intervention drives consumers to buy more goods and services.

2.3 Empirical review of literature

Through the review of both theoretical and empirical studies on the transmission mechanisms of monetary policy, it is clear that, this area has been extensively studied in both developed and developing countries of the world. Although, it appears that there

seems to be at least general consensus about the functioning of the bank lending channel in most of the developed countries, there is no clear picture of which channels are more effective in the developing countries (Elbourne, 2008). According to Padmavathy and Sivakumar (2017) on the empirical study adopting analytic hierarchy process to prioritise banks on CRM effectiveness based on descriptive method, argued that Banks are known to be the engine-growth of any given economy.

The recent economic reform, which is mainly to be liberalisation, privatisation, and globalisation, has allowed many private owners of business to venture into the Indian banking industry (Deol, 2009). As its stance, as a result of this ownership, banks in India are broadly classified as public-sector banks (PSBs), private sector banks, and foreign banks. Akin to Padmavathy and Sivakumar (2017) and Roy (2008) also carried out a study on the implementation of CRM in ICICI bank. In their study, it was explored that ICICI bank has integrated business focus, Organisational structure, business metrics, marketing focus, and technology. Such integration provides the banks with a number of benefits including single view of the customer, better prediction of profit and customised services, and not only in the banking sector, innovative system is useful in all forms of business even in the health care industry as noted by Mothersell and Motwani (2017).

In online banking context, Padmavathy and Sivakumar (2017), Sondhi et al. (2017) and Riivari (2005) explored that the adoption of mobile banking as a powerful CRM tool which helps in acquiring and retaining customers. Of no doubt, ICT usage has the potential of enhancing industrial performance (Ejemeyovwi et al., 2018). Khare (2010) studied the usage of online banking and its role in the development of customer relationships. It was also noted that banks have introduced new technologies for banking practices like web-based trading and call centre operations; alternative delivery channels including ATM facilities, banking through internet, mobile banking and SMS banking; broad product mix with innovative products and services; flexibility in product and service offerings; and focus on retail-banking services (De Luigi and Huber, 2018; Padmavathy and Sivakumar, 2017; Sondhi et al., 2017; Khare, 2010; Riivari, 2005).

In developing countries, there is insufficient empirical evidence that points to the active role of most of the conventional channels, particularly the bank lending channel as the most effective medium through which monetary policy is communicated to real sectors of the economy (Eichenbaum, 1992; Elbourne, 2008; Kashyap and Stein, 2000; Olaloye and Ikhide, 1995). Given the above, Ippolitnd et al. (2018) noted that the firm's balance sheet is one of the best channels or mechanisms for the interaction of monetary policy with markets.

Kashyap and Stein (2000) opt for two-step flexible specification procedures and run a cross sectional regression at the first stage and bivariate regression in the second stage, based on quarterly time series data running from 1976Q1 to 1993Q4. The study found that bank lending channel is stronger for banks with less liquid assets. The findings lend empirical support for the presence of the bank lending channel in USA. Also in Japan, Olaloye and Ikhide (1995) found both monetary policy and bank lending playing an important role in transmitting monetary shocks to economic activities.

Elbourne (2008) estimated eight variables using SVAR model when investigating the role of housing price in the MPTM in UK. The results of the study revealed that housing price does not play a significant role in the transmissions of the bank of England monetary policy. The implication of this finding is that credit and wealth channels do not account for a significant variation of output in response to monetary policy innovations in UK.

Aleem (2010) employs VAR approach in investigating the transmission mechanisms of monetary policy in India. The study estimates different number of VAR models that help in examining the effect of contractionary monetary policy on various sectors of the Indian economy. The results of the study reveals that the bank lending channel is initially increasing in importance in response to monetary squeeze and bank lending channel is very important as it plays a very vital role in transmitting the innovations of the monetary policy to the economy. Similarly, in Turkey, Pushparaj et al. (2007), found the same results that were obtained from India by Aleem (2010) that interest rate and credit channels are becoming increasingly important in influencing economic activities in Turkey.

On the contrary, Mengesha and Holmes (2013) used VAR method and found both interest rate and exchange rate channels inoperative in Eretria. However, the study found reserve requirement ratio to be of significant and playing a vital role in transmitting innovations in monetary policy to the various sectors of the Eretrian Economy. In Thailand, using basic VAR methodology, Disyatat and Vongsinsirikul (2003) examined MPTM over the period of 1993Q1-2001Q4. It was found that bank lending channel playing the important role in the conduct of monetary policy and the way it is propagated to the real sectors of the Thailand economy.

Empirical evidences from Africa suggests that, in most part of the developing countries, the traditional channels which include the interest rate, credit and asset price are generally weak, while the exchange rate and credit channels are more significant even though not very robust (Chileshe et al., 2014). For instance, Mishra (2011), found that the three traditional channels mentioned above are generally weak and statistically insignificant in low income countries. Davoodi et al. (2013), exploring the relative importance of interest rate channel in East-African Countries, using VAR model found that absence of the long run relationship among all the endogenous variables in the model and that the traditional interest rate channel is not strong as it is very insignificant for the region as a whole. Ghazanchyan (2014), examines three conventional monetary transmission channels in Sri Lanka using VAR model and found some results contrary to the ones obtained from other African countries; that is interest rate has the strongest causal effect on output, followed by bank lending rate which is statistically significant but the optimal lag 5 in the case of output and a much longer lag for prices; while the exchange rate does not have any significant causal effect on either the price or output.

In contrast, Abradu-otoo et al. (2003), employs the use of structural VECM using a seven variables system in analysing the transmission mechanisms of monetary policy in Ghana. The author found strong evidence which suggests that there is a long run relationship between the monetary policy and the real economic variables very effective in influencing output and prices in the long run and that exchange rate channel is the most effective conduit through which the Central bank of Ghana transmits its policy to the economy.

Similar results obtained from Egypt by Al-Mashat and Billmeier (2008), who employ the VAR approach and finds the exchange rate as the most effective channel in propagating monetary innovations to output and prices. However, the author found other traditional channels, particularly the bank lending and asset price to be less effective and weaker channels just like they were found to be so in other African countries. But the interest rate channel has been gaining momentum since 2005 when the interest corridor was introduced. While in Uganda, Mugume (2011), apply SVAR methodology and found

that innovations in monetary policy influence inflation and economic activity but still the influence is limited, as most of the important conventional channels are not functioning fully. In particular, the author found interest rate channel to be very weak and the exchange rate as well as the credit channels are also not fully functioning in the case of Uganda economy. Treasury bill rate remains the only effective channel that is partially operative but still indirectly through the lending rates.

To the knowledge of the authors, there is limited number of available empirical works conducted concerning the transmission mechanism of monetary policy in the case of Nigeria with respect to the innovation in the banking system. For example, Chukwu et al. (2009), carried out such kind of study in Nigeria, but excluded bank innovation, thus, this study tends to fill this gap. Chukwu et al. (2009), uses quarterly data from 1986Q1-2008Q4 and applies SVAR model in measuring the impact of monetary policy innovations in the country. The study reveals that money supply (M2) as a quantity anchor has a moderate effect on both output and prices, while the monetary policy rate (MPR) and real effective exchange rate (REER) have neutral effect on output.

Examining the interactions between money and real economic variables (prices and output) in Nigeria, Chimobi (2010), use cointegration technique and causality test for 12 years. The study reveals that no long run relationship exist between money and the two real economic variables. However, money supply was found to have a causal effect on both output and prices. In contrast, Harcourt (2011), adopting the techniques of vector error correction model (VECM) and cointegration test found that there is long run relationship among money supply, minimum rediscount rate and treasury bill rate in Nigeria during the of 1988–2010. The study also reveals that while minimum rediscount rate have impact on inflation at lag 2, money supply does not have impact on inflation. Tuncer and Turaboglu (2014), using the same techniques of cointegration and VECM during the period of 1975–2010, also found cointegrating relationship exists between the monetary policy variables and the real economic variable (RGDP) in Nigeria. The core findings of the study shows that inflation, exchange rate and external reserves constitutes the most effective tools of monetary policy in the country (Tuncer and Turaboglu, 2014).

Aikman et al. (2017) studied the effect of financial conditions and monetary policies on the US economic performance. Result shows the importance of credit being a conditioning variable on macroeconomics performance. Credit facilities below its usual trend instigate an improved economic performance and it also ensures the smooth positive effect of monetary policies intended by monetary authorities. Lee and Werner (2018), investigated the resultant effect of interest rate being a key monetary policy tool in driving the economy; under a condition of disequilibrium arguing quantity constraints are more important than prices in determining market outcomes. Result reveals that interest rate is positively related to GDP growth and also revealed a positive correlation with growth. Therefore, higher interest rate explained higher growth in the US, UK, Germany and Japan.

3 Research methodology

This section presents the methods used in analysing the data collected to achieve the objectives of this study. The study engages two methods of analyses (The auto-regressive distribution lag – ARDL approach to cointegration and the vector auto regression – VAR approach) to achieve its objectives. The ARDL was engaged to test for the long run

relationship existing between MPTM, innovation in the bank industry and economic growth and draws insight from Matthew et al. (2018) and Osabohien et al. (2018). While the VAR method is engaged to control for the shocks in the monetary policy and draws insight from the empirical work of Stock and Watson (2001), Chukwu et al. (2009) and Mengesha and Holmes (2013). According to Mengesha and Holmes (2013), Chukwu et al. (2009) and Stock and Watson (2001), VAR a powerful tool for analysing and describing data as well as for generating multivariate benchmark forecasts and control of shocks in the model.

3.1 Data presentation

To achieve the stated objectives of this study, time series data for the period 1990–2015 was engaged. The data was sourced from the Central Bank of Nigeria Statistical Bulletin, and the World Development Indicators.

Table 1 Data presentation and source

<i>Variable name</i>	<i>Identifier</i>	<i>Source of data</i>	<i>Definition and measurement</i>
Real gross domestic product	RGDP	CBN (2017)	Real gross domestic product is an inflation-adjusted measure that reflects the value of all goods and services produced by an economy in a given year, expressed in base-year prices.
Innovation	INOV	WDI (2017)	Innovative banking system (innovation) was proxied by Mobile account which represents proportion of the bank customers that uses mobile phone to pay bills or to send or receive money through a GSM association (GSMA) mobile money for the unbanked (MMU) service; or receiving wages, government transfers, or any other payments through the mobile phone.
Broad money supply	M2	CBN (2017)	The supply of money takes into account the amount of monetary assets available in an economy [as used in Chukwu et al. (2009)].
Consumer price index	CPI	CBN (2017)	The consumer price index examines the variations in market price level basket of consumer goods and services purchased by individuals. The CPI measures the average changes over time in prices of goods and services consumed by households for day-to-day living. This measures; consumer price index (2010 = 100).
Inflation	INFL	WDI (2017)	Inflation, consumer prices (annual %)
Interest rate	INTR	WDI (2017)	The sustained increase in the general price level of goods and services in an economy over a period of time. This measures Inflation, consumer prices (annual %).
Monetary policy rate	MPR	WDI (2017)	Monetary policy comprises actions of a central bank, currency board or other regulatory committee that determine the size and rate of growth of the money supply, which in turn affects interest rates [as used in Chukwu et al. (2009)].

Notes: CBN means Central Bank of Nigeria; WDI means World Development Indicators.

Source: Authors

This section presents the descriptive and inferential analyses. The descriptive analysis presents simple statistical measures of the variables under investigations, such as the mean, minimum, maximum and standard deviations, while the inferential analysis presents the major techniques to be used in investigating the significant relationship or otherwise among the variables under investigation.

3.2 Model specification

This section outlines the specification of the model to be used in achieving the objectives of the study.

The model specification starts with the functional relationship between the variables, and continues with the ARLD approach which involves unit root test, cointegration test (short and long run), VAR approach. The model is specified as follows:

$$RGDP = f(INOV, M2, CPI, INFL, INTR, MPR) \quad (1)$$

where $RGDP$ is the real gross domestic product, $INNOV$ is innovation, CPI is the consumer price index (CPI), $INFL$ inflation, INT is the InterestRates; $M2$ is the broad money supply, and MPR is monetary policy rates.

The explicit relationship can be presented in econometric form as:

$$RGDP_t = \beta_0 + \beta_1 INOV_t + \beta_2 M2_t + \beta_3 CPI_t + \beta_4 INFL_t + \beta_5 INTR_t + \beta_6 MPR_t + u_t \quad (2)$$

where the variables remain as defined; β_0 is the constant, while $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are the parameters with respect to the explanatory variables as specified in the model. The apriori expectation of the model is that the constant term is expected to be $\beta_0 > 0$, while the parameters: $\beta_1 > 0$ while $\beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are expected to be < 0 indicating a negative relationship between $RGDP$ and the exogenous variables.

Unit root test is conducted on each of the variables under investigation before the ARDL test is carried out. The test will involve several processes such as the determination of whether constant and trend should be part of the model, and the choice of optimal lag, as outlined above (Matthew et al., 2018; Osabohien et al., 2018).

Since the ADF unit root test confirms breakpoints with non-stationarity of a variable, the Clemente et al. (1998) unit root test will be used to assess the impact of breaks on the series variables under investigation. For the VAR model, variables which are stationary at levels (CPI and interest rate) were dropped and it is assumed that for the VAR model all the variables are exogenously determined. Thus, equation (3) presents the VAR model.

$$\Delta RGDP_t = \beta_0 \sum \beta_1 \Delta RGDP_{t-i} + \alpha_i \Delta INOV_{t-i} \sum \alpha_i \Delta m2_{t-i} + \sum \alpha_i \Delta inf_{t-i} + \sum \rho_i \Delta mpr_{t-i} + \mu_{t1} \quad (3)$$

$$\Delta INOV_t = \alpha_0 + \sum \Delta INOV_{t-i} + \sum \beta_1 \Delta RGDP_{t-i} + \sum \alpha_i \Delta m2_{t-i} + \sum \alpha_i \Delta inf_{t-i} + \sum \delta_i + \mu_{t2} \quad (4)$$

$$\Delta m2_t = \alpha_0 + \sum \alpha_i \Delta m2_{t-i} + \sum \beta_1 \Delta RGDP_{t-i} + \sum \Delta INOV_{t-i} + \sum \alpha_i \Delta inf_{t-i} + \sum \delta_i \Delta MPR_{t-i} + \mu_{t2} \quad (5)$$

$$\Delta MPR_t = \delta_0 + \sum \Delta INOV_{t-i} + \sum \delta_i \Delta MPR_{t-i} + \sum \beta_i \Delta RGDP_{t-i} + \sum \rho_i \Delta inf_{t-i} + \sum \rho_i \Delta M2_{t-i} + \mu_{i3} \quad (6)$$

$$\Delta inf_t = \delta_0 + \sum \delta_i \Delta inf_{t-i} + \sum \beta_i \Delta rgdp_{t-i} + \sum \Delta INOV_t + \sum \rho_i \Delta mpr_{t-i} + \sum \rho_i \Delta M2_{t-i} + \mu_{i5} \quad (7)$$

Depending on whether the variables trend or not, the model specification for the ADF is as shown below with the inclusion of consumers price index and interest rates, this is because ARDL is applicable irrespective of the trend of the series

$$\Delta rgdp_t = \beta_0 + \sum_{i=1}^n \beta_1 \Delta INOV_{t-i} + \sum_{i=1}^n \beta_1 \Delta m2_{t-i} + \sum_{i=0}^n \beta_2 \Delta cpi_{t-i} + \sum_{i=0}^n \beta_3 \Delta inf_{t-i} + \sum_{i=0}^n \beta_4 \Delta intr_{t-i} + \sum_{i=0}^n \beta_5 \Delta mpr_{t-i} + \gamma ECM_{t-1} + e_t \quad (8)$$

where Δ means the change operator and the ECM_{t-1} represents error correction term. γ demostns the rate of adjustment from the short-run to the long-run.

$$\Delta rgdp_t = \beta_0 + \beta_1 inov + \beta_2 m2_{t-1} + \beta_3 \Delta cpi_{t-1} + \beta_4 \Delta inf_{t-1} + \sum_{i=1}^n \beta_5 \Delta intr_{t-i} + \sum_{i=0}^n \beta_6 \Delta mpr_{t-i} + e \quad (9)$$

The hypothesis is that; $H_0: \delta = 0$: variable is not stationary; $H_1: \delta < 0$: variable is stationary.

4 Results and discussion

This subsection presents the results that were obtained from analysis as seen Table 2.

Table 2 Summary statistics of variables

Variable	Mean	Standard deviation	Minimum	Maximum
<i>Rgdp</i>	3.6859	7.5619	-13.12788	33.7358
<i>Inov</i>	2.9550	0.01266	2.9022	2.95858
<i>m2</i>	24.303	6.6016	13.2307	43.2661
<i>Cpi</i>	41.568	47.5511	0.4087	158.9435
<i>Infl</i>	19.4440	17.7521	5.3822	72.8355
<i>Intr</i>	-0.3906	16.5614	-43.5726	25.2823
<i>Mpr</i>	12.8194	4.3220	6	26

Source: Compiled by Authors' using Stata 13

The summary statistics presents the nature of data that was engaged for the study. seven variables were engaged: *rgdp*, innovation in banking system (*inov*) proxied mobile account users (% of total bank account), broad money supply (*M2*), consumers price

index (*cpi*), inflation (*infl*), interest rate (*intr*) and *mpr*, with 36 observation (1981–2015), the mean, standard deviation, minimum and maximum are as presented in table 2, to bring to bear the information needed for the study (Osabohien et al., 2018). To fully determine the nature of the variables, Table 3 presents the ADF unit root test for stationarity.

Table 3 Augmented Dickey Fuller unit root test for stationarity

<i>Variables</i>	<i>ADF t-stat</i>	<i>1% Cv</i>	<i>5% Cv</i>	<i>10% Cv</i>	<i>Integration order</i>	<i>Remarks</i>
<i>Rgdp</i>	-4.51	-3.68	-2.97	-2.62	<i>I</i> (1)	Stationary
<i>inov</i>	-5.655	-3.689	-2.975	-2.619	<i>I</i> (1)	Stationary
<i>m2</i>	-5.34	-3.69	-2.98	-2.62	<i>I</i> (1)	Stationary
<i>Cpi</i>	12.26	-3.68	-2.97	-2.62	<i>I</i> (0)	Stationary
<i>infl</i>	-5.52	-3.69	-2.98	-2.62	<i>I</i> (1)	Stationary
<i>Intr</i>	-5.88	-3.68	-2.97	-2.62	<i>I</i> (0)	Stationary
<i>Mpr</i>	-8.12	-3.69	-2.98	-2.62	<i>I</i> (1)	Stationary

Notes: Cv means critical values; ADF means augmented Dickey Fuller.

Source: Authors' computation using Stata 13

It could be observed from Table 3 that the variables trend differently; *cpi* and *intr* are stationary at levels [*I*(0)], this means the variables has no unit root at levels, while *rgdp*, *inov*, *m2*, *infl* and *mpr* are stationary at first difference [*I*(1)]. The decision rule of stationarity is that ADF trace statistic should be greater than the corresponding critical value for a variable to be considered stationary variable. At levels, ADF trace statistics of *rgdp*, *cpi*, and *intr* (-4.51, 12.26 and -5.88) are greater than the corresponding critical values at 1%, 5% and 10%, therefore, they are considered to be stationary at levels. But, *inov*, *m2*, *infl* and *mpr* where not stationary at levels, therefore, these variables were differenced to bring them into stationarity as seen in Table 3. In this case, since the variables are stationary at different levels, the traditional cointegration may not be applicable; therefore, the ARDL cointegration approached is applied as presented in Table 4.

Table 4 Bound test to co-integration results

<i>Asymptotic critical value for rejecting null hypothesis</i>		
<i>Critical value</i>	<i>@ 5%</i>	<i>@ 10%</i>
Lower bound	3.38	2.97
Upper bound	4.23	3.74

Note: F-statistics: 7.18%.

Source: Authors

From Table 4, it can be said that there is a strong co-integration among the captured variables. This is owing to the fact that at 10% level of significance, the F-statistics of 7.18 is greater than the upper bound critical value of 3.74.

ARDL cointegration has three major advantage over the traditional approach to cointegration; first is that all the variables under survey need not to be stationary at the same order, and secondly the ARDL model is applicable when the underlying variable are integrated of order 1 [*I*(1)], order, 0[*I*(0)] or fractionally cointegrated, this can be

found in Table 4, and three The ARDL obtains more efficient estimate of the long-run model (Richard and Sollis, 2003; Pesaran et al., 2001; Osabohien et al., 2018). Table 5 presents the long run and short run ARDL equation.

Table 5 Long-run relationship using the ARDL approach

<i>Independent variables</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>Probability</i>
inov	0.0345	0.2164	0.0003*
M2	0.2401	0.01245	0.0053*
cpi	0.0519	0.84361	0.0008*
infl	0.0412	0.003823	0.0000*
intr	0.0007	0.000274	0.0202*
mpr	0.0442	0.010006	0.0001*

Notes: *means statistically significant at 1% and selection are based on Akaike information criterion at lag 4, 4, 4, 3.

Source: Authors computation

Having established the existence of co-integration among the variables, the long run relationship between RGDP and the explanatory variables has also been estimated using the ARDL approach with ARDL (4, 4, 4, 3) specification selected based on Akaike Information Criterion as represented in Table 5. The result indicates that there exist positive and significant long run relationships between RGDP and the explanatory variables. More specifically, the result reveals a significant and positive long run relationship between CPI and RGDP with a value of 0.0519 meaning that the null hypothesis which states that there is no long run relationship between the above variables is hereby rejected giving the probability value of 0.0008. Furthermore, the result reveals a positive and significant long run relationship between RGDP and interest rate with a coefficient value of 0.0007 giving the probability of 0.0202 indicating that a unit change in interest rate causes a 7% increase in RGDP. On RGDP and money supply, the long run result shows a positive relationship. This point to the fact that any change in money supply has an increasing effect on the economy in line with Chukwu et al. (2009).

Table 6 Short run relationship between RGDP and the explanatory variables

<i>Independent variables</i>	<i>Coefficients</i>	<i>Standard error</i>	<i>P-value</i>
Δ INOV	0.0024136	0.002353	0.0032
Δ M2	0.006644	0.003214	0.3097
Δ CPI	0.014136	0.008383	0.1176
Δ INFL	0.005136	0.006263	0.00123
Δ INTR	-0.000143	5.6005	0.0252
Δ MPR	0.007113	0.00233	0.0001

Source: Authors computation

Table 5 presents the estimated results of the short run relationship RGDP and the explanatory variables. It can be seen from the result that a positive but insignificant short run relationship exist between RGDP and CPI giving the probability value of 0.1176 meaning that the null hypothesis which states that there is no short run relationship between RGDP and CPI cannot be rejected. On interest rate and RGDP, the result shows

a negative and significant short run relationship between the variables giving the probability value of 0.0202. This implies that interest rate has an adversarial effect on RGDP. And innovation, inflation and MPRs are significant with respect to economic growth. In another dimension, the estimated short run coefficient reveals a positive but insignificant relationship between real exchange rate and money supply giving the probability value of 0.3097. It means that in the short run, the volume of money supply in the economy has no effect on RGDP in Nigeria.

Before the long-term, there could be occurrence of errors in the short run, thus the vector error correction (VEC) mechanism as seen in Table 6.

The error correction technique/mechanism) shows that before the long, errors which may result have been corrected. Before the conduct of VAR, variables (CPI and INFL).

Table 7 Estimates from vector error correction technique

Regressand ➔ Regressors ⇓	<i>D_rgdp</i>	<i>D_m2</i>	<i>D_cpi</i>	<i>D_infl</i>	<i>D_intr</i>	<i>D_mpr</i>	<i>D_inov</i>
ECTerm	0.8317 (0.253)	-0.0578* (0.000)	-0.0009 (0.878)	-0.1024 (0.032)	-0.2031* (0.000)	1.0725* (0.002)	-0.3065* (0.097)
<i>rgd(LD)</i>	-0.387** (0.028)	0.1320 (0.128)	0.0723 (0.059)	0.3674 (0.234)	0.4421 (0.192)	0.04780 (0.424)	168.4543 (0.203)
<i>inov(LD)</i>	0.00006 (0.780)	0.00020 (0.708)	-0.0001 (0.774)	0.00017 (0.575)	-0.00001 (0.904)	-0.00003 (0.960)	0.08554 (0.653)
<i>M2(LD)</i>	0.0267 (0.948)	0.7250* (0.000)	0.1399 (0.117)	-1.901* (0.008)	-0.1424 (0.857)	-0.0669 (0.631)	-1.3659** (0.02)
<i>cpi (LD)</i>	-0.3569 (0.253)	-0.2307 (0.212)	0.9791* (0.000)	-0.6767 (0.304)	-0.4680 (0.517)	-0.2615** (0.040)	0.35421 (0.001)
<i>infl(LD)</i>	0.1843 (0.104)	-0.0259 (0.642)	0.0185 (0.452)	0.1712 (0.388)	0.1505 (0.489)	0.1263* (0.001)	-26.60154 (0.11)
<i>intr(LD)</i>	0.0706 (0.517)	-0.0152 (0.777)	-0.0038 (0.873)	-0.0079 (0.967)	-0.03929 (0.851)	0.0641 (0.083)	195.6506 (0.000)
<i>mpr(LD)</i>	-0.0283 (0.950)	0.5001 (0.024)*	-0.1229 (0.210)	-1.022 (0.195)	1.0725 (0.215)	-0.5112 (0.001)	25.022 (0.001)
<i>R-sq</i>	0.616719	0.57291	0.9349	0.5175	0.6452	0.5220	0.9349
<i>AIC</i>	38.36155						
<i>HQIC</i>	39.1729						
<i>SBIC</i>	740.74087						

Notes: *, **, ** means significant at 1, 5 and 10%, respectively. LD signifies that they were lagged and differenced. The probability values are in parenthesis. Constants and a number of other statistics are not reported due to space.

Source: Authors' computation using Stata 13

Table 8 Estimate from VAR analysis

	<i>RGDP</i>	<i>INOV</i>	<i>M2</i>	<i>INFL</i>	<i>MPR</i>
RGDP(-1)	0.153371 (0.24262) [0.63215]	0.270360 (0.10512) [2.57195]	0.074870 (0.04664) [1.60530]	-0.123050 (0.36350) [-0.33852]	0.025698 (0.08511) [0.30194]
RGDP(-2)	-0.014915 (0.24706) [-0.06037]	0.007990 (0.10705) [0.07464]	0.008374 (0.04749) [0.17633]	-0.429384 (0.37016) [-1.16001]	-0.036932 (0.08667) [-0.42614]
INOV(-1)	-0.023445 (0.2313) [0.3282]	0.04870 (0.2343) [0.597]	0.595823 (0.24262) [-0.33852]	-0.4439 (0.37016) [-0.320]	-0.45321 (0.0534) [-0.42614]
INOV(-2)	-0.061388 (0.0453) [-0.1413]	1.53500 (0.34445) [6.70182]	0.34031 (0.8441) [1.0634]	0.90064 (0.54534) [1.05124]	-0.4534 (0.3538) [-2.3004]
M2(-1)	-0.061388 (0.49558) [-0.12387]	1.439005 (0.21472) [6.70182]	0.103186 (0.09527) [1.08313]	0.809401 (0.74249) [1.09012]	-0.355341 (0.17384) [-2.04404]
M2(-2)	-0.015512 (0.54093) [-0.02868]	-1.092912 (0.23437) [-4.66325]	0.062172 (0.10398) [0.59790]	-0.120541 (0.81043) [-0.14874]	0.144539 (0.18975) [0.76173]
CPI(-1)	0.381473 (1.10662) [0.34472]	-0.620104 (0.47947) [-1.29332]	1.344357 (0.21273) [6.31957]	-0.034520 (1.65797) [-0.02082]	-0.467931 (0.38819) [-1.20542]
CPI(-2)	-0.367998 (1.21276) [-0.30344]	0.655983 (0.52545) [1.24842]	-0.272250 (0.23313) [-1.16779]	0.041465 (1.81699) [0.02282]	0.488483 (0.42542) [1.14823]
	(0.12201) [-0.86247]	(0.05286) [0.94561]	(0.02345) [-0.94800]	(0.18279) [-2.30961]	(0.04280) [-2.97834]
INTR(-1)	-0.091975 (0.17841) [-0.51552]	-0.358665 (0.07730) [-4.63991]	-0.014213 (0.03430) [-0.41442]	-0.347019 (0.26730) [-1.29824]	-0.020521 (0.06258) [-0.32790]
INTR(-2)	-0.070497 (0.12575) [-0.56063]	0.066542 (0.05448) [1.22135]	-0.034595 (0.02417) [-1.43114]	-0.277608 (0.18840) [-1.47352]	-0.038025 (0.04411) [-0.86203]
MPR(-1)	0.157158 (0.49541) [0.31723]	0.306884 (0.21465) [1.42972]	-0.036450 (0.09523) [-0.38274]	0.106334 (0.74224) [0.14326]	0.293652 (0.17378) [1.68974]

Notes: Standard errors are in (), t-statistics are [], while the coefficients are not enclosed.

Source: Authors using e-views 9

Table 8 Estimate from VAR analysis (continued)

	<i>RGDP</i>	<i>INOV</i>	<i>M2</i>	<i>INFL</i>	<i>MPR</i>
MPR(-2)	0.335077 (0.51824) [0.64657]	-0.796177 (0.22454) [-3.54585]	0.252925 (0.09962) [2.53882]	2.630700 (0.77644) [3.38816]	0.339547 (0.18179) [1.86778]
C	-1.098857 (12.9777) [-0.08467]	23.70661 (5.62284) [4.21612]	-6.369672 (2.49474) [-2.55324]	-30.67456 (19.4435) [-1.57762]	12.63519 (4.55243) [2.77549]
R-squared	0.905	0.828278	0.999339	0.722603	0.707724
Adj. R-squared	0.579	0.730151	0.998961	0.564090	0.540708
Sum sq. resids	1,351.516	253.7103	49.94334	3,033.718	166.3074
S.E. equation	8.022339	3.475837	1.542159	12.01927	2.814143
Determinant residcov (dofadj)	1.0508	Log likelihood	-554.216	Schwarz criterion	40.69085
Determinant resid covariance	5,801,942	Akaike information criterion	37.18920		

Notes: Standard errors are in (), t-statistics are [], while the coefficients are not enclosed.

Source: Authors using e-views 9

Table 8 presents results obtained from a standard VAR model. Before the conduct of VAR, its stationarity was tested and satisfied. VAR was conducted to capture shocks that may result from monetary policy among others, and it helps in generating impulse response function that can help track the impact of monetary innovations on output and prices. It is observed that increase in inflation rates, MPRs, interest rates and broad money supply impact negatively on RGDP.

This study agrees with Ojo (2001) that asset price movements reflect in interest rates alone play a very crucial role in descriptions of the transmission mechanism as seen in the results as interest rate pose a negative effect on RGDP. Again, in line with Chimobi (2010) argues that there is no long runs relationship between money and the two real economic variables. However, money supply was found to have a causal effect on both output and prices.

In contrast, Harcourt (2011) from VAR model found that there is long run relationship among money supply, minimum rediscount rate and treasury bill rate in Nigeria during the of 1988–2010. This study disagrees and reveals that while minimum rediscount rate impacts on inflation at lag 2, money supply does not. Tuncer and Turaboglu (2014) also found cointegrating relationship exists between the monetary policy variables and the RGDP in Nigeria. This shows that inflation, exchange rate and external reserves constitutes the most effective tools of monetary policy in the country (Osabuohien et al., 2018).

5 Summary and conclusions

5.1 Summary and recommendations

Monetary policy has impact on countries' economies and the level of commodity prices through various means of monetary transmission mechanisms. The ultimate goal of monetary policy is to help in the achievement of its maximum economic growth, help in keeping low the inflation rate among others.

It was found in this study that African countries have the well withal to achieve and sustain economy; this is due to market potentialities and growing population other growth advantages the continent has. Unfortunately, mismanagement and weak institutional framework, the continent finds itself in its present state. The informal banking sector is very huge constraining the proper working of the monetary policy, the supervisory and intermediary financial institutions lack independence due to frequent government interventions.

5.2 Limitations and directions for further studies

It is important to understand the channels through which monetary policies are transmitted to the economy in formulating and implementing a broad range of macroeconomic policies. Thus, further studies should investigate the broad ranges of policy questions in developing countries. This will go a long way in creating a conducive atmosphere for the smooth execution of monetary policy and thereby ensuring maximum outcomes and reducing uncertainty surrounding the formulations and implementations of monetary policies in developing countries.

From the forgoing, some relevant policy recommendations can be made from empirical findings of this study. First, the prevalence of weak traditional channels of MPTM in Nigeria can be reverted and make them stronger by making interest rate attractive for both borrowers and investors in the country through implementation of more business oriented policies that would encourage entrepreneurship and profitable business ventures in the country; there is also the need to develop the stock exchange market so that not only private sector participants, but also the household sector can harness this opportunity and participate in the stock exchange trading activities. Secondly, the bank lending channel is known to be the most important and effective channel of MPTM in most advanced countries of the world, Nigeria can also make its bank channels strong by attracting huge unserviceable non-banking population into the mainstream conventional banking sector and reducing the size its informal sector. Policies such as cashless policies, public awareness and enlighten programs about doing business with banks can help make the bank lending channel operative and strong. Thirdly, embarrassing more flexible exchange rate regimes and reducing CBN interventions in the foreign exchange markets, as well as making the export sector more vibrant can further strengthen the prevailing effective exchange rate channel in Nigeria.

References

- Abradu-otoo, P., Amoah, B. and Bawumia, M. (2003) *An Investigation of the Transmission Mechanisms of Monetary Policy in Ghana: A Structural Vector Error Correction Analysis*, Bank of Ghana, Working Paper, pp.1–37.
- Aikman, D., Lehnert, A., Liang, N. and Modugno, M. (2017) *Credit, Financial Conditions and Monetary Policy Transmission*, pp.1–41, Hutchings Center Working Paper #39.
- Aleem, A. (2010) ‘Transmission mechanism of monetary policy in India’, *Journal of Asian Economics*, Vol. 21, No. 2, pp.186–197.
- Al-Mashat, R. and Billmeier, A. (2008) ‘The monetary transmission mechanism in Egypt’, *Review of Middle East Economics and Finance*, Vol. 4, No. 3, pp.32–82.
- Al-Zu’bi, H.A. (2018) ‘The role of mindfulness in strategic creativity: an empirical investigation’, *International Journal of Business Innovation and Research*, Vol. 15, No. 3, pp.269–276.
- Auerbach, A.J. and Gorodnichenko, Y. (2012) ‘Measuring the output responses to fiscal policy’, *American Economic Journal: Economic Policy*, Vol. 4, No. 2, pp.1–27.
- Bernanke, B. and Gertler, M. (1995) *Inside the Black Box: The Credit Channel of Monetary Policy Transmission*, No. w5146, National Bureau of Economic Research.
- Bernanke, B.S. and Blinder, A.S. (1988) *Credit, Money, and Aggregate Demand*, No. 2534, National Bureau of Economic Research.
- Central Bank of Nigeria (CBN) (2011) *Understanding Monetary Policy Series*, Working Paper, Abuja, Nigeria.
- Chileshe, P., Mbao, F.Z., Mwanza, B., Mwansa, L., Rasmussen, T. and Zgambo, P. (2014) *Monetary Policy Transmission Mechanism in Zambia*, Bank of Zambia Working Paper, pp.1–49.
- Chimobi, O.P. (2010) ‘The estimation of long-run relationship between economic growth, investment and export in Nigeria’, *International Journal of Business and Management*, Vol. 5, No. 4, p.215.
- Chukwu, J., Agu, C. and Onah, F. (2009) ‘Cointegration and structural breaks in Nigerian long-run money demand’, *International Research Journal of Finance and Economics*, Vol. 38, pp.48–58.
- Davoodi, H.R., Dixit, S.V.S. and Pinter, G. (2013) *Monetary Transmission Mechanism in the East African communities: An Empirical Investigation*, Vol. 13, No. 39, pp.1–15, IMF Working Papers.
- De Luigi, C. and Huber, F. (2018) ‘Debt regimes and the effectiveness of monetary policy’, *Journal of Economic Dynamics and Control*, Vol. 19, No. 3, pp.1–21.
- De Paoli, B. and Zabczyk, P. (2013) ‘Cyclical risk aversion, precautionary saving, and monetary policy’, *Journal of Money, Credit and Banking*, Vol. 45, No. 1, pp.1–36.
- Deol, H.S. (2009) ‘Strategic environment and intellectual capital of Indian banks’, *Journal of Intellectual Capital*, Vol. 10, No. 1, pp.109–120.
- Disyatat, P. and Vongsinsirikul, P. (2003) ‘Monetary policy and the transmission mechanism in Thailand’, *Journal of Asian Economics*, Vol. 14, No. 3, pp.389–418.
- Eichenbaum, M. (1992) ‘Interpreting the macroeconomic time series facts: the effects of monetary policy’, *European Economic Review*, Vol. 35, No. 5, pp.1001–1011.
- Ejemeyovwi, J., Osabuohien, E. and Osabuohien, R. (2018) ‘ICT investments, human capital development and institutions in ECOWAS’, *International Journal of Economics and Business Research*, Vol. 15, No. 4, pp.463–474.
- Elbourne, A. (2008) ‘The UK housing market and the monetary policy transmission mechanism: an SVAR approach’, *Journal of Housing Economics*, Vol. 17, No. 1, pp.65–87.
- Galí, J. (2008) *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*, Shock 95, Princeton University Press, Princeton, USA.

- Gertler, M. and Gilchrist, S. (1993) 'The role of credit market imperfection in the monetary transmission: arguments and evidence', *Scandinavian Journal of Economics*, Vol. 95, No. 1, pp.43–64.
- Ghazanchyan, M.M. (2014) *Unravelling the Monetary Policy Transmission Mechanism in Sri Lanka*, Nos. 14–190, International Monetary Fund.
- Harcourt, B.E. (2011) *The Illusion of Free Markets*, Harvard University Press.
- Hicks, J. (1937) 'Mr. Keynes and the 'classics'; a suggested interpretation', *Econometrica*, Vol. 5, No. 2, pp.147–159.
- Hotniar, S. and Heidy, O.T. (2018) 'Perceived quality of mobile cell phones: an initiative to develop local product', *International Journal of Business Innovation and Research*, Vol. 15, No. 3, pp.320–339.
- Huber, F. and Feldkircher, M. (2017) 'Adaptive shrinkage in Bayesian vector autoregressive models', *Journal of Business and Economic Statistics*, pp.1–13, DOI: 10.1080/07350015.2016.1256217.
- Huber, F. and Fischer, M.M. (2018) 'A Markov switching factor-augmented VAR model for analyzing US business cycles and monetary policy', *Oxford Bulletin of Economic Statistics*.
- Ippolitnd, F., Ozdagi, A.K. and Perz, A. (2018) 'Transmission mechanism of monetary policy through bank lending: the floating rate channel', *Journal of Monetary Economics*, Vol. 14, No. 6, pp.1–23.
- Kashyap, A.K. and Stein, J.C. (2000) 'What do a million observations on banks say about the transmission of monetary policy?', *American Economic Review*, Vol. 90, No. 3, pp.407–428.
- Khare, A. (2010) 'Online banking in India: an approach to establish CRM', *Journal of Financial Services Marketing*, Vol. 15, No. 2, pp.176–188.
- Lee, K-S. and Werner, R. (2018) 'Reconsidering monetary policy: an empirical examination of the relationship between interest rates and nominal GDP growth in the U.S., U.K., Germany and Japan', *Ecological Economics*, Vol. 1, No. 46, pp.26–34.
- Matthew, O., Osabohien, R., Fagbeminiyi, F. and Fasina, A. (2018) 'Greenhouse gas emissions and health outcomes in Nigeria: empirical insight from auto-regressive distribution lag technique', *International Journal of Energy Economics and Policy*, Vol. 8, No. 3, pp.43–50.
- McCallum, B.T. (2002) *The Use of Policy Rules in Monetary Policy Analysis*, p.309, Tepper School of Business, Forbes Avenue, Pittsburgh, PA 15213, USA.
- Mengesha, L.G. and Holmes, M.J. (2013) 'Monetary policy and its transmission mechanisms in Eritrea', *Journal of Policy Modelling*, Vol. 35, No. 5, pp.766–780.
- Mishkin, F.S. (1995) 'Symposium on the monetary transmission mechanism', *Journal of Economic Perspectives*, Vol. 9, No. 4, pp.3–10.
- Mishkin, F.S. (2009) 'Is monetary policy effective during financial crises?', *American Economic Review*, Vol. 99, No. 2, pp.573–577.
- Mishra, P., Montiel, P. and Spilimbergo, A. (2011) *How Effective is Monetary Transmission in Developing Countries? A Survey of the Empirical Evidence*, CEPR Discussion Paper, No. 8577.
- Mothersell, W.M. and Motwani, J. (2017) 'Knowledge driven lean in healthcare: a necessity', *International Journal Business Innovation and Research*, Vol. 12, No. 1, pp.120–135.
- Mugume, A. (2011) 'Monetary transmission mechanisms in Uganda', *The Bank of Uganda*, Vol. 4, No. 1, pp.3–52.
- Nickel, C. and Tudyka, A. (2014) 'Fiscal stimulus in times of high debt: reconsidering multipliers and twin deficits', *Journal of Money, Credit and Banking*, Vol. 46, No. 7, pp.1313–1344.
- Ojo, M.O. (2001) 'Principles and practice of monetary management of Central Bank of Nigeria, Lagos', *Economic and Financial Review*, Vol. 44, No. 4, pp.39–67.
- Olaloye, A.O. and Ikhide, S.I. (1995) 'Economic sustainability and the role of fiscal and monetary policies in a depressed economy: the case study of Nigeria', *Journal of Sustainable Development*, Vol. 3, No. 2, pp.89–100.

- Omoke, P.C. and Ugwuanyi, C.U. (2010) 'Money price and output: causality test for Nigeria', *American Journal of Scientific Research*, Vol. 8, pp.78–87.
- Osabohien, R. and Osuagwu, E. (2017) 'Social protection policies and agricultural output in Nigeria: empirical investigation using household survey data', A research paper presented at the 4th international Conference on E-governance in Nigeria, Covenant University, Nigeria, 7–9 May.
- Osabohien, R., Osabuohien, E., and Urhie, E. (2018) 'Food security, institutional framework, and technology: examining the Nexus in Nigeria using ARDL approach', *Current Nutrition and Food Science*, Vol. 14, No. 2, pp.154–163.
- Osabuohien, E., Obiekwe, E., Urhie, E. and Osabohien, R. (2018) 'Inflation rate, exchange rate volatility and exchange rate pass-through Nexus: the Nigerian experience', *Journal of Applied Economic Sciences*, Spring 2, Vol. 13, No. 56, pp.574–585.
- Osuma G., Ikpefan A., Osabohien, R., Ndigwe, C. and Nkwodimmah, P. (2018) 'Working capital management and bank performance: empirical research of ten deposit money banks in Nigeria', *Banks and Bank Systems*, Vol. 13, No. 2, pp.49–61.
- Padmavathy, C. and Sivakumar, V.J. (2017) 'Adopting analytic hierarchy process to prioritise banks based on CRM effectiveness – the customers perspective', *International Journal of Business Innovation and Research*, Vol. 12, No. 1, pp.80–93, IGI Global, Hershey, PA.
- Pesaran, M.H., Shin, Y. and Smith, R.J. (2001) 'Bounds testing approaches to the analysis of level relationships', *Journal of Applied Econometrics*, Vol. 16, No. 3, pp.289–326.
- Pushparaj, V.L., Shaijumon, M.M., Kumar, A., Murugesan, S., Ci, L., Vajtai, R. and Ajayan, P.M. (2007) 'Flexible energy storage devices based on nanocomposite paper', *Proceedings of the National Academy of Sciences*, Vol. 104, No. 34, pp.13574–13577.
- Richard, H. and Sollis, R. (2003) 'Applied time series modelling and forecasting', *International Journal of Forecasting*, Vol. 20, No. 1, pp.137–139.
- Riivari, J. (2005) 'Mobile banking: a powerful new marketing and CRM tool for financial services companies all over Europe', *Journal of Financial Services Marketing*, Vol. 10, No. 1, pp.11–20.
- Roy, S.K. (2008) 'CRM implementation in banks', *The ICFAIAN Journal of Management Research*, Vol. 7, No. 7, p.55–72.
- Rüth, S.K. (2017) 'State-dependent monetary policy transmission and financial market tensions', *Economics Letters*, Vol. 157, pp.56–61 [online] <https://doi.org/10.1016/j.econlet.2017.05.008>.
- Sashi, C. (2012) *Customer Engagement, Buyer-Seller Relationships and Social Media*, pp.1–20, Emerald Insight.
- Smets, F. and Wouters, R. (2007) 'Shocks and frictions in US business cycles: a Bayesian DSGE approach', *American Economic Review*, Vol. 97, No. 3, pp.586–606.
- Sondhi, N., Sharma, B.R. and Kalla, S.M. (2017) 'Customer engagement in the Indian retail banking sector: an exploratory study', *International Journal of Business Innovation and Research*, Vol. 12, No. 1, pp.41–61.
- Stock, J.H. and Watson, M.W. (2001) 'Vector auto-regressions', *Journal of Economic Perspectives*, Vol. 15, No. 4, pp.101–115.
- Tuncer, I. and Turaboglu, T.T. (2014) 'Relationship between stock prices and economic activity in Turkish economy', *Aktual'ni Problemy Ekonomiky, Actual Problems in Economics*, No. 152, p.111.