check for updates

How Effective is Monetary Policy in the Presence of High Informality in Nigeria

Peters Idowu[1]
Yaaba N. Baba[2]
Adetoba O. Olufunso[3]
Tomologu-Okunomo E. Aduni[4]
Tonuchi E. Joseph[5]♣

[1,2,3,5]*Department of Statistics, Central Bank of Nigeria, Abuja, Nigeria.*
[5]*Email: tonuchijoseph@gmail.com*
[4]*Department of Trade and Exchange, Central Bank of Nigeria.*

Abstract

This study investigates whether the existence of high informality in Nigeria dampens effective transmission of monetary policy variation to retail rates. Using time series data from 1981-2018, the study adopts ARDL model to estimate both the long and short-run impacts of a high informal economy on the effectiveness of monetary policy. Findings reveal that changes in monetary policy rate has a significant positive impact on retail rates and that, without accounting for informality in the long-run, the transmission of monetary policy to commercial banks' average lending rate is about 95 percent. In addition, the study finds that, in the long-run, informality dampens the effectiveness of monetary policy in Nigeria through the interest rate channel by at least 72 percentage points. The authors, therefore, conclude that high presence of informality in Nigeria dampens the effectiveness of the monetary policy and that the size of the informal economy and commercial bank lending rate are positively related.

1. Introduction

A great deal of literature has investigated monetary policy transmission mechanisms and its impact on domestic rates/variables. At the macroeconomic level, studies have investigated the impact of monetary policy shocks on output, prices and employment level among others (Gertler & Karadi, 2014; Koshy, 2020; Twinoburyo & Odhiambo, 2018). At the microeconomic level, researchers have employed longitudinal data to investigate the effect of monetary policy on the performance of banks and their stocks (Altunbas, Gambacorta, & Arquez-Ibanez, 2014; Gali & Gambetti, 2014) and on firms (Mizen & Yalcin, 2006). A common consensus is that monetary policy impacts both real and financial variables. However, the relationship between monetary policy and informality is one area that does not largely attract the attention of researchers. One possible explanation is the unavailability of data on informality.

Tonuchi, Peters, Adetoba, and Mimiko (2020) have estimated the size of the Nigerian informality from 1970 to 2018. This study utilizes the data computed by Tonuchi et al. (2020) to investigate whether the existence of high informality dampens the effective transmission of monetary policy to retail rates in Nigeria. Monetary policy is the adjustment of credit availability (changes in money stock) and the cost of the credit

(interest and exchange rate), including expectations, to achieve the desired macroeconomic objectives, particularly price stability (Uchendu, 1996). For monetary policy to be effective, there is a transmission mechanism through which the policy actions impact the target variable(s). In literature, there are three well-known channels through which monetary policy transmits to the economy: the interest rate channel, the credit channel, and the exchange rate channel (Chileshe & Olusegun, 2017; Tahir, 2012; Uchendu, 1996).

Monetary policy is said to be effective if the variation in monetary policy rate is actively transmitted to retail rates and facilitates the achievement of the target objectives (Chileshe & Olusegun, 2017; Mishra, Montiel, & Spilimbergo, 2012). Rasche and Williams (2007) noted that monetary policy is said to be effective when central bank policies tend to stabilise the economy. This means that the effectiveness of any central bank policy − whether changes in the cost of credit (interest rate), changes in credit availability (money stock), variation in the exchange rate or implementation of the unconventional monetary policies − is judged by the ability of the policy to stabilise the economy via a pass-through.

In economic theory, a decrease in interest rate is expected to increase investment and consumption, boosting aggregate demand, while an increase in interest rate is envisaged to reduce the rate of investment and consumption in the economy − negatively affecting aggregate demand. However, empirical evidence reveals that monetary policy transmission to the intermediate targets in developing economies is weak because of several institutional and structural rigidities (Chileshe & Olusegun, 2017; Tahir, 2012). Top among these hindrances include high informality, underdeveloped money markets, inefficient capital markets, and weak institutions (Mishra et al., 2012; Ngalawa & Viegi, 2013).

Monetary policy also transmits through the informal credit market − the unregulated financial market (Duo, Xu, & Zhang, 2014). In Nigeria for instance, the informal financial market includes, but not limited to, credit associations, contributory associations, money lenders, market association, employee association, rotary clubs, among others. During a period of tight monetary policy, borrowers often turn to the informal credit market for loans when the formal financial market tightens the credit requirement or increases loan rationing in response to central bank contractionary monetary policy (Ngalawa & Viegi, 2013). The effectiveness of monetary policy therefore also hinges on the nature, operation and size and response of the informal economy and informal credit market.

Again, the extent to which monetary policy impacts the economy does not depend only on the borrower's willingness to borrow but also the lender's willingness to lend to the would-be borrowers on the ground that they are not qualified. For instance, monetary expansion aimed at inducing banks to relax credit rationing and increase lending to firms can hardly succeed if the bulk of the economic activities take place within the informal economies. The borrowers will naturally be unable to access the loan because of their inability to satisfy the requirements, thereby neutralizing the policy. It is argued that the higher the level of informality in a country, the higher the number of the informal credit market in such an economy (Duo et al., 2014; Ngalawa & Viegi, 2013). Data from Hassan and Schnider (2016) on the size of the informal economy as a percentage of GDP ranked Nigeria third behind Zimbabwe and Tanzania. The estimated size of the informal economy of Nigeria as of 2018 is 67 percent of the GDP (Tonuchi et al., 2020).

The key question then becomes, does this high presence of informality in Nigeria dampens the effectiveness of monetary policy in the country? This question is critical considering, for instance, the postulate of the two-sector Monetary Business Cycle Model (2S-MBCM) of Kolev, Jesus, and Morales (2005) which suggests that formal and informal financial markets act as substitutes to each other. A rise in the cost of capital in the formal credit market due to central bank contractionary policy will result in firms shifting to the informal financial market for capital, thereby thwarting the policy. Although some economists are opposed to the 2S-MBCM (Acharya & Madhur, 1983; Khoi, Gan, Nartea, & Cohen, 2013; Ngalawa & Viegi, 2013) contending that formal and informal credit markets are rather complementary to each other and that the extent to which informal credit market impacts or impedes effective monetary policy transmission depends on whether informal financial markets are autonomous or reactive to activities in the formal financial markets.

It is, however, important to note that the ability of the informal financial market to aid or impede the effectiveness of monetary policy depends not only on the size of the markets, but also on the competitive or complementary nature of the markets. If the markets conform to the 2S-MBCM, they will most likely be close substitutes and this hampers monetary policy efficiency especially in the presence of high informality. If the informality, however, follows the complementarity view of Ngalawa and Viegi (2013) and Khoi et al. (2013) then monetary policy potency is likely to be enhanced as the informal markets grow in size.

The rest of the study is organized as follows: Section II provides detailed empirical review, while section III discusses the methodology. Section IV is on analysis and discussion of findings, and section V concludes the study.

2. Review of Related Literature

The first significant effort to investigate how high informality impacts monetary policy effectiveness is the work of Sundaram and Pandit (1976) on black money in India. The authors note that black money in the informal economy is a threat to price stability. Using tax-based aggregate demand function, their findings reveal that high informality in India encourages high informal or black savings in the form of cash which, the authors argue, are immune to monetary policy. The authors argue that contractionary monetary policy that

induces credit rationing and raise cost of capital, aimed at inducing holders of a liquid asset like cash to switch to a financial asset like bank deposit or government bond, will fail. This is particularly prominent in countries with a high level of money laundering and corruption. The authors are also of the opinion that a tight monetary policy regime is particularly not significant in countries with high informality, mostly because of switching effect and large liquid black money. These findings are not without criticism. One of the critics of the study is the work of Acharya and Madhur (1983) on whether informal credit, black money, and informality frustrate monetary policy in India.

Acharya and Madhur (1983) developed a financial market model comprising both the formal credit market and the informal credit market. The authors argued that contrary to Sundaram and Pandit (1976) previous view, the two markets have strong linkages and do not frustrate monetary policy. They noted that contractionary monetary policy measures by the central bank raise the cost of capital in both formal and informal financial markets, thereby affecting credit rationing which lowers aggregate demand in the country. They found that reduction in deposit money banks' credit to the private sector leads to rise in deposit money banks' credit, which further spills into the informal credit market, raising interest rates in the informal economy. They concluded that there are only three conditions in which monetary policy will be ineffective with high informality: 1. when there is perfectly elastic informal credit supply to formal interest rate; 2. Unitary and negative informal credit supply to the formal credit market; and 3. A complete dichotomy between the two markets. Later studies (Castillo & Montoro, 2012; Chileshe & Olusegun, 2017; Duo et al., 2014; Enrique & Carlos, 2019) as will be discussed shortly, refute their conclusion.

A similar study was conducted by Carpenter (1999) on the informal credit market and monetary policy transmission mechanism in South Korea. The author developed an IS-LM augmented model that incorporates both the formal and informal credit market and showed how monetary policy transmits to both markets. The author argued that the liquidity condition in the informal credit market influences the extent to which contractionary policy measure can induce an increase in the cost of credit in the informal credit market. Particularly, tight liquidity in the informal credit market is the only condition that will induce an increase in the interest rate in both formal and informal markets when central banks adopt contractionary policy measures. Using Structural Vector Auto-Regression (SVAR), they discovered that positive credit shocks increase output in two quarters while output remains the same with shocks in money supply. Contrary to theoretical expectation of negative sign, monetary expansion in the form of increase in money supply and subsequent rise in the formal credit to the private sector increases interest rate in the informal credit market. Their findings are contrary to the work of Acharya and Madhur (1983) that posited that the existence of a high informal credit market does not hamper monetary policy in India.

However, given that, contrary to expectation, Carpenter (1999) found that expansionary monetary policy increases interest rate and credit demand in the informal credit market in South Korea, one would argue that informal credit market and formal credit market are not truly complementary but substitutes as asserted by Acharya and Madhur (1983). If these findings – Carpenter (1999) – are anything to go by, monetary policy in countries with high informality will not be effective. Jeromi (2007) employed a survey methodology of a sample of 5700 informal money lenders in Karala, and argued that the existence of formal and informal financial markets side-by-side in the provision of financial credit to the public would hamper monetary policy if there is high informality in the economy. The findings reveal a linkage between formal and some big informal financial market lenders. They concluded that the unregulated nature of the informal financial market increases the sector liquidity which, as suggested by Carpenter (1999) makes it difficult for monetary policy to reflect in the sector.

Ghosh and Kumar (2015) used decadal data on 14 major cities in India obtained from All India Debt and Investment Surveys (AIDIS) to investigate the transmission effect of monetary policy on informal sector finances. The study employed simple OLS to regress monetary policy variables and state-specific variables like sectoral share of unregistered manufacturing (proxy for broad credit), financial penetration, financial inclusion variable, literacy on household demand for informal credit. They opined that the majority of those operating in the informal economy meets their credit needs from the informal credit market, and that there is a positive relationship between monetary policy shocks and the informal economy – an indication that monetary policy is not effective with high informality. Their findings are consistent with those of Jeromi (2007) and Kolev et al. (2005) who noted that informality and formal economy have a negative relationship and, as such, policy aimed at reducing demand shock pressure on the formal economy often ends up increasing demand in the informal economy. They concluded that if a greater percentage of the country's economic activities is in the informal economy, then such policy may be counter productive.

Particularly interesting and consoling to monetary policy practitioners in countries with high informality are the findings of Duo et al. (2014) on the relationship between monetary policy and informal credit market. Using monthly survey data from Wenzhou in China between 2003 to 2011, the authors employed ordinary least square and instrumental variables (IV) to see the extent to which monetary policy reflects on the informal credit market. They found that Wenzhou's informal credit market lending rates significantly respond to monetary policy measures, and argued that monetary policy, aimed at reducing demand shock pressure on the formal economy, may be counter-productive to the activities of the informal economy in the short run, but will realign in the long run. Specifically, they argued that the informal financial market lending rate responds

to the formal credit market positively in the short-run – suggesting they are substitutes to each other in the short-run – but negatively in the long-run.

On the extent to which monetary policy influences informal economic activities or size, Kolev et al. (2005) argued that contractionary monetary policy leads to a rise in informality in an economy. The study employed a Recursive Vector Auto-Regressive (VAR) Model, using quarterly time-series data from 1971 to 2004 for the United Kingdom. A six-VAR model was developed, comprising the following variables: bank rate, M2, consumer price index, real GDP, and informal economy size. They found that a positive monetary policy shock attracts a positive response from the informal sector activities. The argument is that a positive monetary policy rate shock increases the cost of borrowing in the formal financial market and subsequently reduces investment and consumption in the formal economy. The fall in economic activities in the formal economy, which will immediately lead to a fall in aggregate demand, will lead to an expansion in the informal economy – as unemployment increases in the formal economy. This is found to be true especially during the period of economic recession. For instance, during the period of economic downturn, the central bank can embark on several unconventional policies of injecting liquidity into the economy to spur economic activities (Tonuchi & Onyebuchi, 2019). Such activities often target more of those operating within the informal economies, which invariably expand informality in the country.

Using a Dynamic Stochastic General Equilibrium (DSGE) of the new Keynesian macro model, Castillo and Montoro (2010) investigated informal labour markets, inflation dynamics, and the transmission of demand and supply shocks in Peru. They argued that the informal sector acts as a complement to the formal economy. In order words, the informal labour markets provide a buffer to the formal labour market, such that flexibility in the informal labour market transmits the shocks to the formal economy. The study concluded that countries with large informal labour markets (informal economies) have a lower correlation between inflation and output gap conditional on demand shock. Duo et al. (2014) noted that the extent to which monetary policy becomes ineffective because of informal economies depends on the size of informal economies as a percentage of GDP.

Castillo and Montoro (2012) using a New Keynesian Model with labour market frictions, as in the Diamond-Mortensen-Pissarides model, noted that the new studies are consistent with the earlier findings in Castillo and Montoro (2010) – that large presence of informality generates buffers that reduce the pressure of aggregate demand shocks on inflation. However, the new findings reveal that the interest rate transmission channel is more effective in achieving full employment and stimulating output than achieving price stability. Contrary to theory, however, they also found that inflation in most economies dominated by informality does not respond to demand shocks.

Ngalawa and Viegi (2013) examined the interaction of both formal and informal financial markets and how they impact economic activities in quasi-emerging markets. The study employed the New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model in a small economy. The result shows that formal and informal financial markets do not respond to monetary policy in the same direction. They argued that in most cases, the informal credit market interest rate moves in the opposite direction with monetary policy rate, which ultimately frustrates monetary policy to the degree of the size of the informal economy. Their findings imply that the higher the presence of informality, the less effective the monetary policy.

Mahama (2016) investigated the extent to which informality in a country influences monetary and fiscal policy effectiveness and the desire to join a currency union. The author employed a New Keynesian, small open economy model where informality is accounted for in both goods and labour markets. Using VAR methods to test their model, they concluded that informality promotes volatility in macroeconomic variables and makes it more difficult to understand the pattern of economic activities, which explains why regular monetary policy tools do not yield effective results in developing countries.

Similarly, Chileshe and Olusegun (2017) investigated the role of the informal sector in the interest rate pass-through. Using monthly data from 1998 to 2015 on monetary policy rate, average lending rate, and informal economy size, the authors estimated the relationship using the ARDL approach. The result shows that the monetary policy rate has a positive impact on average lending rate and that the presence of high informality further pushes the average lending rate upward – the effect being much stronger in the long run than the short-run. Consistent with the findings of Kolev et al. (2005) their findings reveal that high informality reduces the effectiveness of monetary policy transmission to the retail prices both in the short-run and long-run. Their findings are contrary to the findings of Carpenter (1999) and Acharya and Madhur (1983) who argued that the existence of high informality does not hamper monetary policy in any way. However, Carpenter (1999) argued that such a relationship could only exist where there is tight liquidity in the informal credit market, which is usually not the case.

A similar stance was shared by Enrique and Carlos (2019) who investigated the extent to which informality impedes the achievement of inflation stability. Using a New Keynesian DSGE model in a closed economy, they discovered that, like every other study, demand and supply shocks on retail prices exacerbate the activities in the formal financial market without affecting the informal financial market. They further argued that informality dampens the effect of demand and financial shock on wages and inflation and increases the sacrifice ratio of monetary policy and makes monetary policy less effective. None of the studies reviewed investigated the effectiveness of monetary policy in the presence of high informality in the context of Nigeria.

3. Methodology

3.1. Model Specification

To determine if high informality dampens the effective transmission of monetary policy variation to retail rates, the study model commercial bank retail rates (average lending rate, savings rate, and deposit rates - '3-month, 6-month, and 12-month') as a function of Monetary Policy Rate (MPR), treasury bill rate (TBR), and broad money supply (M2). The relationship is expressed in Equation 1 as:

$$lnr_{Lt} = \alpha_0 + \beta_1 lnMPR_t + \beta_2 lnTBR_t + \beta_3 lnM2_t + \varepsilon_t \quad (1)$$

Where; r_{Lt} is the average commercial banks' lending rate, MPR_t is the monetary policy rate (the basic rate at which other rates revolves around or the rate central bank lends to the commercial banks), TBR_t is the treasury bill rate and the M2 is the broad money supply at time 't' while $ln.$ represents natural log of the variable. It is expected that $\beta_1 > 0, \beta_2 > 0$ and $\beta_3 < 0$. This implies that a rise in policy rate will induce commercial banks to raise their average lending rate but rise in money supply through expansionary monetary policy should reduce the commercial banks' lending rate. If we believe that high informality in the country (high presence of informal credit market) has the capability of distorting the interest rate pass-through, we can modify Equation 1 as in Equation 2. This is achieved by adding and interacting informality term (*Infg*) with the monetary policy rate.

$$lnr_{Lt} = \alpha_0 + \beta_1 lnMPR_t + \beta_2 lnTBR_t + \beta_3 lnM2_t + \beta_4 lnInfg_t + \beta_5 lnMPRI_t + \varepsilon_t \quad (2)$$

Where MPRI is the interaction of informality with policy rate (that is MPR*Infg). It is equally expected that $\beta_4 > 0$ and $\beta_5 < 0$. The high activities of the informal economy dampen the monetary policy effectiveness such that the coefficient of the interactive term becomes negative. Given that most data are not usually stationary at level and economic model is built on the assumption that the time series is stationary at level, Equation 2 can be differenced to achieve stationarity and avoid spurious results as given in Equation 3:

$$\Delta lnr_{Lt} = \alpha_0 + \beta_1 \Delta lnMPR_t + \beta_2 \Delta lnTBR_t + \beta_3 \Delta lnM2_t + \beta_4 \Delta lnInfg_t + \beta_5 \Delta lnMPRI_t + \varepsilon_t \quad (3)$$

It is safer to avoid the incidence of spurious regression by estimating the model in their difference form, but the long-run information of the model is lost in the process (Enders, 2010). To avoid such incidence, Onougbo (2012) recommended the estimation of a dynamic error correction model (ECM). One major assumption of using ECM is that all the series must be integrated of same order, mainly, order one (Enders, 2010). Studies have shown that the application of ARDL is one way to overcome both challenges (Chileshe & Olusegun, 2017; Enders, 2010). Thus, the study applies dynamic ARDL bounds testing to estimate both the short-run and long-run effects (Pesaran, Shin, & Smith, 2001). Equation 3 can be expressed in the ARDL form as given in Equation 4:

$$\Delta lnr_{Lt} = \alpha_0 + \sum_{i=1}^{\rho} \beta_1 \Delta lnr_{Lt-i} + \sum_{i=0}^{\rho} \beta_2 \Delta lnMPR_{t-i} + \sum_{i=0}^{\rho} \beta_3 \Delta lnTBR_{t-i} + \sum_{i=0}^{\rho} \beta_4 \Delta lnM2_{t-i}$$
$$+ \sum_{i=0}^{\rho} \beta_5 \Delta lnInfg_{t-i} + \sum_{i=0}^{\rho} \beta_6 \Delta lnMPRI_{t-i} + \varphi_1 lnr_{Lt-1} + \varphi_2 lnMPR_{t-1} + \varphi_3 lnTBR_{t-1}$$
$$+ \varphi_4 lnM2_{t-1} + \varphi_5 lnInfg_{t-1} + \varphi_6 lnMPRI_{t-1} + \varepsilon_t \quad (4)$$

Where *ln* is logarithm function, Δ is a first difference operator, ρ denotes optimal lag, and α_0 is the drift component. The expression with summation sign $(\beta_1 - \beta_6)$ represents the short-run dynamics of the model, while the coefficients $(\varphi_1 - \varphi_6)$ represents the long-run relationship and ε_t is the serially uncorrelated disturbance with zero mean and constant variance. Once it is established that there exists long-run relationship through the application of bounds cointegration test. The long-run relationship of the ARDL model can be estimated as given in Equation 5.

$$lnr_{Lt} = \varphi_1 lnr_{Lt-1} + \varphi_2 lnMPR_{t-1} + \varphi_3 lnTBR_{t-1} + \varphi_4 lnM2_{t-1} + \varphi_5 lnInfg_{t-1} + \varphi_6 lnMPRI_{t-1}$$
$$+ \varepsilon_t \quad (5)$$

While the short-run model can be estimated as given in Equation 6 below:

$$\Delta lnr_{Lt} = \alpha_0 + \sum_{i=1}^{\rho} \beta_1 \Delta lnr_{Lt-i} + \sum_{i=0}^{\rho} \beta_2 \Delta lnMPR_{t-i} + \sum_{i=0}^{\rho} \beta_3 \Delta lnTBR_{t-i} + \sum_{i=0}^{\rho} \beta_4 \Delta lnM2_{t-i}$$
$$+ \sum_{i=0}^{\rho} \beta_5 \Delta lnInfg_{t-i} + \sum_{i=0}^{\rho} \beta_6 \Delta lnMPRI_{t-i} + \varphi_1 ECM_{t-1} + \varepsilon_t \quad (6)$$

Equations 4 to 6 is estimated six times with different objective functions. The first estimation uses average commercial banks' lending rate (r_{Lt}) as the objective function while the second accounted for informality and the third uses 3-months deposit rate (*ln_3m_t*). The fourth, fifth and sixth bestimations uses 6-month deposit rate (*ln_6m_t*), 12-month deposit rate (*ln_12m_t*) and saving rate (*ln_savings_t*), respectively. It is however, important to note that the first estimation is carried out without accounting for informality (*Infg*) and the interaction between informality and the anchor rate (*MPR*). This facilitates comparison across all the models.

The advantage of ARDL lies, not only in its ability to be applied for series with fractional integration, but also in its ability to solve endogeneity issues of omitted variables or simultaneity bias resulting from correlation between an omitted variable and the explanatory variables. Wooldridge (2013) noted that the dynamic nature of ARDL solves the problem of endogeneity issues common among time series.

3.2. Data and Sources

All the data are sourced from Central Bank of Nigeria database[1] and CBN Bulletin 2018. Since there is no official data on the size of the informal economy in Nigeria, the study relies on the estimate of the size of the informal economy from the work of Tonuchi et al. (2020) generated using the MIMIC approach.

4. Result and Discussion

This section presents and discusses the result from the empirical analysis. The time series was first subjected to unit root test, as presented in Table 1, using both Augmented Dickey Fuller and Phillip Perron (PP) tests the presence of unit root in the series. The result reveals that average commercial banks' lending rate, 3-month deposit rate, 12-month deposit rate, and size of the informal economy percent of GDP are stationary at level. The other variables are stationary at first difference. The finding is consistent with the work of Onougbo (2012) and Chileshe and Olusegun (2017) who reported that commercial banks' lending rates are level stationary while most deposit and savings rates are often stationary after differencing.

Table-1. Augmented Dickey-Fuller and Philip Perron Test (trends and intercept).

Variable	ADF At Level / 1st Difference		I(d)	Philip Perron At Level / 1st difference		I(d)	REMARKS
Prime(r)	–5.068748***	–	I(0)	–3.311800*	–9.978748***	I(1)	Stationary
MPR	–3.196615*	8.388052***	I(1)	–3.119838	–8.512880***	I(1)	Stationary
3-month	–3.637534***	–	I(0)	–2.921415	–7.109086***	I(1)	Stationary
6-month	–3.425966*	5.815166***	I(1)	–2.946146	–7.564073***	I(1)	Stationary
12-month	–3.751079**	–	I(0)	–2.747256	–7.006623***	I(1)	Stationary
Savings rate	–2.222031	6.146022***	I(1)	–2.335426	–6.189396***	I(1)	Stationary
TBR	–2.921619	6.607517***	I(1)	–2.933891	–6.764539***	I(1)	Stationary
LnM2	–0.488600	3.712966**	I(1)	–1.295592	–3.712966***	I(1)	Stationary
Infg	–3.834692**	–	I(0)	–3.720572**	–	I(0)	Stationary
MPRI	–3.293077*	8.934895***	I(1)	–3.230159*	–8.934895***	I(1)	Stationary

Note: Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively. All variables are logged.

Given that the series is fractionally integrated of order zero and one, the application of ARDL to estimate the dynamic long-run and short-run relationship is further justified. To determine the optimal lag length, a VAR model was first specified for each of the models in Table 2. The optimal lag length was selected using a combination of AIC, FPE, SC, and HQ information criteria and, where there is a conflict between the various criteria, AIC overrides others. Following the suggestion of Enders (2010) and Pesaran et al. (2001) the study conducted three basic check tests; the bounds cointegration test to validate the existence of long-run relationship, the Breusch-Godfrey Serial Correlation test, and CUSUM square test to check stability of the model.

The basic check of long-run relationship and stability of the models reveal that all the models have long-run relationship at 1% level of significance, given that the F-statistics of the bounds test is greater than the 1% critical value for each of the models as seen in the second raw of Table 2.

Similarly, the serial correlation test also validates the absence of serial correlation in each of the models either in the long-run or short-run. Also, the study used HAC-Newman robust estimate in each case to avoid serial and heteroscedasticity issues in each of the model. The CUSUM stability test, which is presented in Figure 1, reveals that all the models are stable and consistent for estimation since the blue line in each case is bounded by the two red line (see Pesaran et al. (2001)).

---

[1] See http://statistics.cbn.gov.ng/cbn-onlinestats/.

Table-2. ARDL models for monetary policy transmission in Nigeria

Variable	Lending rate	Lending rate + informality	3-month	6-month	12-month	Savings rate
Bounds F-Statistics	6.601***	6.675***	3.755**	6.363***	6.240***	6.24***
LONG RUN MODEL						
LnMPR	0.954 (0.001)***	0.221 (0.0112)***	0.396 (0.000)***	0.037 (0.017)***	0.037 (0.019)**	–0.066 (0.063)*
LnTBR	0.348 (0.004)***	–0.014 (0.048)**	0.118 (0.325)	–0.402 (0.017)***	–0.409 (0.050)**	0.229 (0.126)
LnM2	0.1712 (0.521)	–0.0003 (0.989)	–0.278 (0.363)	–0.022 (0.430)	–0.037 (0.270)	–0.110 (0.000)***
LnInfg	-	0.046 (0.029)**	1.165 (0.005)***	1.038 (0.090)*	–0.985 (0.185)**	1.505 (0.000)***
LnMPRI	-	–0.003 (0.025)**	–0.1077 (0.000)***	–0.979 (0.025)**	0.991 (0.021)**	–0.1004 (0.000)***
C	0.423 (0.000)***	–0.918 (0.369)	–60.178 (0.005)***	0.5468 (0.861)	0.323 (0.935)	-2.037 (0.561)
R^2	0.4565	0.5691	0.8271	0.7507	0.7606	0.9272
F*(p-value)	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.000***
Breusch-g	0.2755	0.3628	0.4601	0.5853	0.6413	0.4672
Short Run Model						
d(LnMPR)	0.555 (0.000)**	0.816 (0.000)***	1.065 (0.038)**	0.085 (0.0301)**	0.091 (0.037)**	0.088 (0.002)***
d(LnTBR)	–0.244 (0.000)***	0.529 (0.000)***	2.049 (0.548)	–0.563 (0.013)***	0.557 (0.034)**	–0.295 (0.037)**
d(Ln(M2))	–0.129 (0.009)***	0.215 (0.005)***	–1.240 (0.651)	–0.298 (0.258)	–0.337 (0.308)	–0.662 (0.008)***
d(LnInfg)	-	7.314 (0.038)***	26.96 (0.002)***	2.294 (0.001)***	2.366 (0.029)**	–1.483 (0.06)*
d(LnMPRI)	-	–6.938 (0.000)***	–8.638 (0.000)***	0.930 (0.000)	–1.001 (0.000)***	–0.884 (0.001)***
C	5.450 (0.000)***	–5.797 (0.473)	0.488 (0.345)	0.096 (0.096)*	0.1050 (0.142)	0.144 (0.038)**
ECM(-1)	–17.45 (0.000)***	–1.005 (0.000)***	–7.043 (0.001)***	–0.746 (0.000)***	–0.608 (0.010)***	–0.7806 (0.007)
R^2	0.9666	0.9771	0.6754	0.6864	0.6212	0.4644
F*(p-value)	0.0000	0.0000***	0.0003***	0.0000***	0.0000***	0.0000***
Breusch-g	0.6489	0.1344	0.1644	0.7332	0.4083	0.5690

Note: Significance is indicated as follows: ***, ** and * for 1%, 5% and 10% respectively, p-value in parenthesis. MPRI =(MPR*Infg), Breusch-G = Breusch-Godfrey Serial Correlation f-test p-value.

This study argues that the effectiveness of monetary policy transmission in Nigeria is largely dampened by the presence of high informality particularly through the traditional interest rate channel which is the focus of the study. The first model considers the case of the interest rate channel without accounting for the presence of informality. As revealed in Table 2, monetary policy rate and treasury bill rate both have a positive significant impact on commercial banks' average lending rate both in the short-run and long-run. Particularly, monetary policy pass-through to commercial bank average lending rate is 95 percent in the long-run, while pass-through in the short-run is 55 percent. When informality is accounted for in the interest rate channels as reported in the third column of Table 2, the pass-through from monetary policy rate to lending rate reduces drastically to 22 percent in the long-run but increases to 81 percent in the short-run. In other words, A contractionary monetary policy, for instance, leads to near perfect rise in interest rate but with informality, although interest rate still adjusts upward but not as much as the case without informality, implying that informality dampens the efficacy of monetary policy.

In the same vein, the treasury bill rate pass through which was initially significant and positive (34.8 per cent) in line with *apriori* expectation, did not only turns negative when informality was considered but also reduces significantly to 1.4 percent in the long run further corroborating the adverse influence of informality on the transmission of monetary policy.
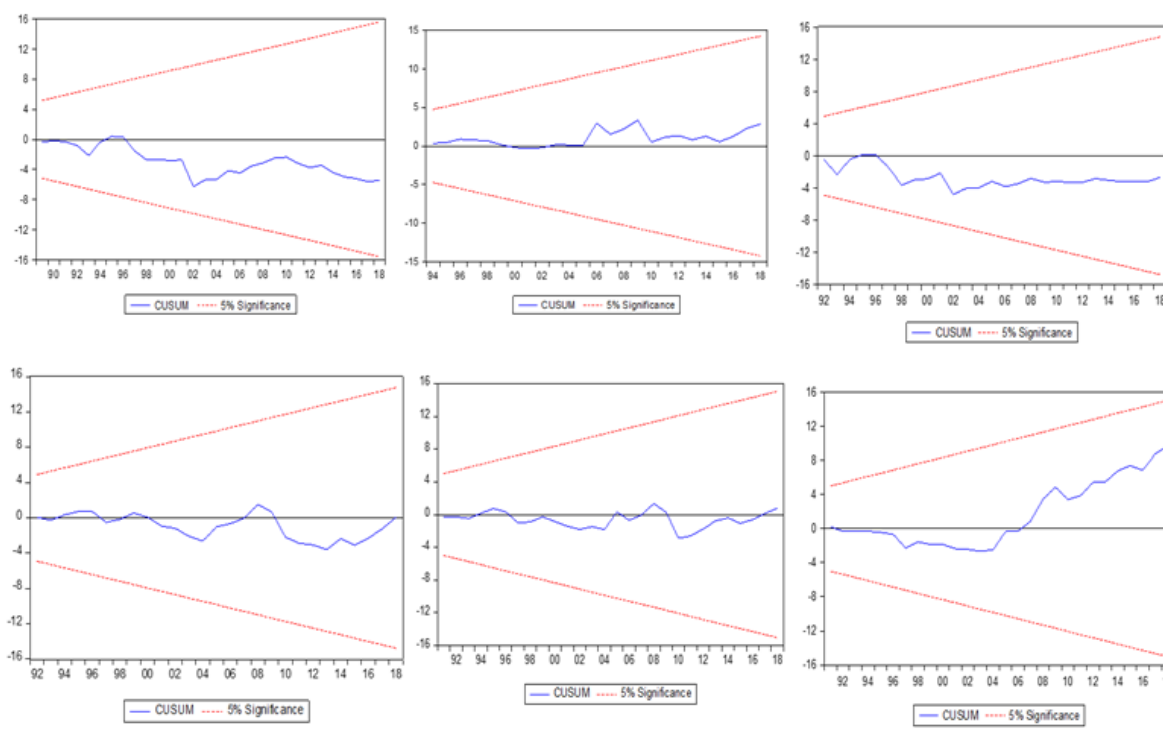
Figure-1. Cusum stability test for the six models.

Also evident is the positive relationship between the informality (*Infg*) and lending rate across all models except for 12-months deposit rate in the long-run and savings rate in the short-run. This near consensus indicates that higher the size of the informal economy, the more the lending rate positively responds to variations in the anchor rate both in the long-run and short-run. This provides further evidence in support of the dampening effect of informality on monetary policy.

The interaction of monetary policy rate and informal economy size (*MPRI*) has a significant negative impact across all models except for 12-months deposit rate in the long-run and 6-months deposit rate in the short-run. This is largely in line with previous studies (Carpenter, 1999; Castillo & Montoro, 2012; Chileshe & Olusegun, 2017; Kolev et al., 2005). This is against the *apriori* expectation and provides additional evidence in support of the dampening effect of informality on the effectiveness of monetary policy transmission mechanism in Nigeria.

From the foregoing, it can be inferred that formal and informal financial markets in Nigeria are far more like substitutes than complementary – an indication that rising informality negatively impedes the effective transmission of monetary policy transmission to the economy. The post estimation diagnostics tests provide evidence in favour of the stability of the estimated models and parameters. For instance, the serial correlation and Breusch-Pagan Godfrey Heteroskedasticity tests show no evidence of serial correlation and Heteroskedasticity. The CUSUM tests demonstrate that the estimated equations and parameters were all stable.

5. Conclusion and Policy Implication

The effectiveness of monetary policy in both developed and developing countries is no more in doubt. However, some analysts are of the view that the efficacy of monetary policy transmission mechanism can be hampered by the presence of informality particularly as present in the Emerging Markets and Developing Economies (EMDEs). This study joins others to confirm the validity of this view.

The study concludes that informality indeed dampens the effectiveness of monetary policy transmission mechanisms. This conclusion stems from the fact that the transmission of monetary policy to domestic rates is as high as 95.4 percent in the long run without informality but drops to as low as 22.1 percent when informality is accounted for. This implies that informality reduces the effectiveness of monetary policy transmission by about 73.3 percentage points. Worse still, in the case of the interaction of the policy rate and size of informality, the relationship yields negative results further revealing that the size of informality also hampers the effectiveness of monetary policy in Nigeria.

The policy implication of this study is that high presence of informality – such as a large informal credit market – is one the leading inhibitors of monetary policy effectiveness in Nigeria. The finding is expected, given that Nigeria has one of the largest informal economies in the world, which currently stood at about 67 percent of the GDP as at 2018 (Tonuchi et al., 2020). It is, therefore, essential that policy makers consider the

existence of an informal economy in policy making and develop policies and programs that will reduce the growth of the informal economy in Nigeria. The starting point may be to commence the collection of data on basic informality (the size of informal economy, informal employment, informal credit market, informal interest rate, and informal exchange rate). This, if done, will give relevant authorities insight into the dynamics of informality in Nigeria as well as enable the Central Bank of Nigeria to determine appropriate policy mix that is required to achieve the desired objective at least in the short run while making frantic effort to formalize the sector.

It is important to add that formalizing the sector is not a too difficult task, as the informal economy is not as hidden as often assumed by some policy makers; it is part of the economy that is un-accounted for through the formal data generating process which can be unveiled. Informal economy employments, size, and credit market can be incorporated in some of the existing surveys conducted in the country as practiced by some other African countries.

References

Acharya, S., & Madhur, S. (1983). Informal credit markets and black money: Do they frustrate monetary policy? *Economic and Political Weekly, 18*(41), 1751-1756.

Altunbas, Y., Gambacorta, L., & Arquez-Ibanez, D. (2014). Does monetary policy affect bank risk? *International Journal of Central Banking, 10*(1), 95-136.

Carpenter, S. B. (1999). Informal credit markets and the transmission of monetary policy: Evidence from South Korea. *Review of Development Economics, 3*(3), 323-335.Available at: https://doi.org/10.1111/1467-9361.00071.

Castillo, P., & Montoro, C. (2010). Monetary policy in the presence of informal labour market. Central Bank of Peru Working Paper No: 2010/009.

Castillo, P., & Montoro, C. (2012). Inflation dynamics in the presence of informal labour markets (pp. 1-23). BIS Working Papers No. 372.

Chileshe, P. M., & Olusegun, A. A. (2017). The impact of informal economy on the interest rate pass-through: Evidence from an ARDL model. *African Journal of Economic Review, 5*(2), 130-148.Available at: https://doi.org/10.5897/jeif2013.0483.

Duo, Q., Xu, Z., & Zhang, X. (2014). How much informal credit lending responded to monetary policy in China? The case of Wenzhou. *Journal of Asian Economics, 31*, 22-31.Available at: https://doi.org/10.1016/j.asieco.2014.03.001.

Enders, W. (2010). *Applied econometric time series* (3rd ed.). New Jersey: John Wiley & Sons.

Enrique, A., & Carlos, U. (2019). Does informality facilitate inflation stability? (pp. 1-40). BIS Working Papers No 778.

Gali, J., & Gambetti, L. (2014). The effects of monetary policy on stock market bubbles: Some evidence. NBER Working Paper No.19981. MA: Cambridge.

Gertler, M., & Karadi, P. (2014). Monetary policy surprises, credit costs and economic activity. NBER Working Paper No. 20224. Cambridge: MA.

Ghosh, S., & Kumar, R. (2015). Monetary policy and informal finance: Is there a pecking order? Reserve bank of India: Munich Personal RePEc Archive. Retrieved from https://mpra.ub.uni-muenchen.de/65243/1/MPRA_paper_65243.pdf.

Hassan, M., & Schnider, F. (2016). Size and development of the shadow economies of 157 countries worldwide: updated and new measures from 1999 to 2013. IZA DP No. 10281.

Jeromi, P. D. (2007). Regulation of informal financial institutions: A study of money lenders in Kerala. *Reserve Bank of India Occasional Papers, 28*(1), 1-32.

Khoi, P., Gan, C., Nartea, G., & Cohen, D. (2013). Formal and informal rural credit in the Mekong River Delta of Vietnam: Interaction and accessibility. *Journal of Asian Economies, 26*, 1–13. Available at: https://doi.org/10.1016/j.asieco.2013.02.003.

Kolev, A., Jesus, E., & Morales, P. (2005). Monetary policy and the informal sector. Department of Economic History working Paper No. 75/2005.

Koshy, M. (2020). Monetary policy: Stabilizing prices and output. Retrieved from https://www.imf.org/external/pubs/ft/fandd/basics/monpol.htm.

Mahama, S. B. (2016). Fiscal and monetary policy in the presence of informality and the incentive to join a currency union. Washinton Education. Retrieved from https://econ.washington.edu/sites/econ/files/documents/job-papers/bandaogo_jmpaper.pdf.

Mishra, P., Montiel, P. J., & Spilimbergo, A. (2012). Monetary transmission in low-income countries: Effectiveness and policy implications. *IMF Economic Review, 60*(2), 270-302.Available at: https://doi.org/10.1057/imfer.2012.7.

Mizen, P., & Yalcin, C. (2006). Access to external finance: Theory and evidence on the impact of monetary policy and firm-specific characteristics. *Journal of Banking and Finance, 30*, 199-227.Available at: https://doi.org/10.1016/j.jbankfin.2005.01.002.

Ngalawa, H., & Viegi, N. (2013). Interaction of formal and informal financial markets in quasi-emerging market economies. *Economic Modelling, 31*, 614-624.Available at: https://doi.org/10.1016/j.econmod.2013.01.005.

Onougbo, C. M. (2012). *Monetary policy in developing countries: The case of Nigeria*. Unpublished PhD Dissertation: Leeds University Business School.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.Available at: https://doi.org/10.1002/jae.616.

Rasche, R. H., & Williams, M. M. (2007). The effectiveness of monetary policy. *Federal Reserve Bank of St. Louis Review, 89*(5), 447–489.

Sundaram, K., & Pandit, V. (1976). On black money. *Indian Economic Review, New Series, 11*(2), 121-132.Available at: https://www.jstor.org/stable/42657322.

Tahir, M. N. (2012). Relative importance of monetary transmission channels: A structural investigation; A case of Brazil, Chile, and Korea University of Lyon Working Paper Series. Retrieved from http://ecomod.net/.

Tonuchi, E., Idowu, P., Adetoba, O., & Mimiko, D. (2020). How large is the size of Nigeria's informal economy? A MIMIC approach. *International Journal of Economics, Commerce, and management, 8*(7), 204-227.

Tonuchi, J. E., & Onyebuchi, N. A. (2019). Economic diversification in Nigeria: The role of agriculture and manufacturing sector. *International Journal of Research in Electronics and Computer Engineering, 7*(3), 916-919.

Twinoburyo, E. N., & Odhiambo, N. M. (2018). Monetary policy and economic growth: A review of international literature. *Journal of Central Banking Theory and Practice, 7*(2), 123-137.

Uchendu, O. A. (1996). The transmission of monetary policy in Nigeria. *CBN Economic & Financial Review, 34*(2), 606-625.

Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach* (5th ed.). Mason, OH: South-Western: Cengage Learning.