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Monetary policy impact on the informal economy and response to shocks in the formal economy

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In developing countries, there has been a surge in the size of the informal economy in recent years. However, the effect of monetary policy on the informal economy and informal economy responses to shocks from the formal economy is yet to receive empirical attention. Our study aims to explore monetary policy effect on the informal economy and response to shocks in the formal economy in Nigeria for 48 years (1970–2018). Using Autoregressive Distributed Lag and Impulse Response Function, we examined empirically how various monetary policy instruments affect the informal economy and responses to shocks in the formal economy. Our result indicates that credit to the private sector along with the exchange rate had a positive and significant effect on the informal economy both in the long run and short run. The estimate further indicates bank lending rate had a positive and insignificant effect on the informal economy. Our research reveals that in the short run, the informal economy responds positively to shocks in the formal economy while the reserve is the case in the long run. These results underscore the importance of factoring the informal economy in monetary policy decisions.

1 | INTRODUCTION

Several studies have provided convincing evidence on the positive effect of monetary policy on economic growth and development. Among others are Chandranath (2008), Sulaiman and Migiro (2014), Ulaiman and Migiro (2014), Central Bank of Nigeria (2014); Nwoko, Ihemeje, and Anumadu (2016), Nkosinathi (2019). Most recently, however, discussions have shifted to the effect of monetary policy on the informal economy. This is occasioned by the surge in the size of informal economy which constitutes over 65% of the economy size in some countries, yet the transmission of monetary policy which makes up a sizable proportion of the informal economy is yet to receive attention (Medina, Jonelis, & Cangul, 2017). In influencing the informal economy, various monetary policy instruments can be adopted. But the most frequently used is the interest rate, which is often adopted to control the general price level and thus, inflation. These instruments are often introduced by the monetary authorities and the effects trickled down to the informal sector of the economy.

A perusal of extant literature depicts that studies on the effect of monetary policy shocks on the informal economy can be categorized into two groups. The first category adopts restricted 2-Sector IS-LM framework (henceforth: 2-SFM) and the second category which is depended on the 2-Sector Monetary Business Cycle framework (henceforth: 2-MBC). Several studies that employed the 2-SFM hold the view that credits from monetary authorities affect the cost of borrowing which is often transmitted to the informal economy. On their part, a stronghold of the 2-SFM posits that the positive shock emanating from the cost of borrowing will contrast formal economy performance through its influence on high-powered money. But Ononugbo (2012) held a contrary view that such a policy tends to bustle the informal economy. As been the experience of most developing economies, an increase in the cost of borrowing has resulted in the creation

of alternative or black markets by the private sector, which constitutes part of the informal economy.

In Nigeria, several policies have been introduced by Central Bank to streamline monetary policy effect on the formal economy and its transmission to the formal economy. Such efforts are however are constrained by several factors, including the large size of the informal economy (Abata, Kehinde, & Bolarinwa, 2012). Nnanna (2001) further notes that the informal economy is driven mostly by cash transactions which tend to truncate monetary policy transmission channels. The channels of transmitting monetary policy to the formal economy include interest rate, exchange rate and credits. When they are applied, real sector activities are affected and they are transmitted to the informal economy. The concern is that the formal economy in response to shock from interest and exchange rate invariably affects the informal economy. Similarly, the monetary policy rate (MPR) can also affect the capacity of money deposit banks and other financial institutions to offer credit to the formal economy which invariably affects the informal economy. Yet, there is a lack of studies on monetary policy effect on informal economy and response to shocks in the formal economy.

Existing studies focus on the effect of monetary policy instruments on the formal economy. Given the desire of formulating monetary policy that would boost activities in both formal and informal economy, it is instructive to conduct an empirical investigation on monetary policy effect on informal economy and response to shocks in the formal economy. The study focuses on Nigeria with data for 48 years, 1970–2018. Given that there is a continuous expansion in the informal economy in Nigeria, the basic question is whether the monetary policy of the formal economy can affect the informal economy significantly. Apart from the fact that empirical results are inconclusive, this research adds to the array of existing studies by exposing the extent informal economy is affected by monetary policy and ascertain informal economy responses to shocks in the formal economy. Our result indicates that credit to the private sector along with the exchange rate had a positive and significant effect on the informal economy both in the long run and short run. The estimate further indicates a positive and insignificant bank lending rate effect on the informal economy. Our research reveals that in the short run, the informal economy responds positively to shocks in the formal economy while the reserve is the case in the long run.

The remaining aspect of this research proceeds in the following order: Section 2 is on review of previous related studies. This is closely followed by the methodology in Section 3. In Section 4, we present empirical results with the conclusion in Section 5.

2 | REVIEW OF PREVIOUS STUDIES

Monetary policy is a tool or instrument used by Central Banks to control economic activities. In essence, it is used to control the total volume of money in circulation and regulate price level. In recent years, monetary policy has been seen as a veritable instrument that can be employed to regulate economic activities through the money supply

and interest rate (Edeme, Erobu, & Aduku, 2019). Apart from these instruments, other strategies that can be adopted by the Central Bank include the discount rate, reserve requirements, discount rates, open market operations and moral suasion (Hamilton, 2019). These policies when in place are made manifest in economic activities through monetary policy transmission (sometimes referred to monetary policy transmission mechanism). Although they can be used interchangeably, Ireland (2005) provides a distinction when monetary policy transmission was conceived as a set of coordinated activities that are designed to control financial stocks. Providing further categorization, Abdullahi (2014) sees monetary policy transmission as a chain of network designed to connect changes in monetary policy with changes in price and economic activities while monetary policy transmission mechanism is designed to rack ex-ante effect of monetary policy and its link with economic activities. In the formal economy, monetary policy is transmitted basically through interest rate while in the informal economy, the channels of transmission are but not limited to interest rate, informal exchange rate, stock prices, unorganized money markets, anticipated inflation. Empirical evidence in this regard has been provided by studies such as Luca and Francesco (2005) for OECD countries, Aslanidi (2007) in the case of Georgia, Ishioro (2013), Ndekwu (2013) and Bature (2014) in the case of developing countries of Africa and Brinkmeyer (2015).

Since the seminal work of Taylor (1995), a significant volume of studies have linked monetary policy and the formal economy, to examine how monetary policy exerts influence on the formal economy. A notable feature inherent in these studies is the adoption Vector Autoregressive (VAR) methodology (*see for instance* Atabaev & Ganiyev, 2013). This approach has been criticized due to its failure to account for the stochastic errors across times due to changes in policy regimes. As a way out, several studies that followed adopted the Structurally Restricted version of the Vector Autoregressive Structural Victor Autoregression (SVAR) Methodology. Evidence also exists in studies that compared the suitability of VAR and SVAR. The SAVR approach was adopted by Elbourne and De-Haan (2009) to determine channels of monetary policy for five new European Union member countries in Central and Eastern Europe. It was observed that SVAR yields more robust result. Through the approach, it was possible to account for the heterogeneity across countries, which eluded previous studies. The same model was also employed by Raghavan and Silvapulle (2006) in the case of Malaysia, Chuku (2009) in the case of Nigeria, Tahir (2012) in a study involving Brazil, Chile and Korea, Chile & Kamati (2012), Vinayagathasan (2013) for Sri Lanka. The usefulness of SVAR was further validated by Magadmi and Chrigui (2015) in a study on monetary policy transmission channels in Tunisia, Adebayo and Harold (2016) for South Africa.

Patrick and Akanbi (2017) observe that bloating informal economy increases the lending rate in the formal economy. In a study on the effect of interest rate on a specific sector of the informal economy in Malawi, Ngalawa (2018) found that the effect of monetary policy (proxied by interest rate) in the formal and informal economy is only felt in some periods. However, such phenomenon tends to be accompanied by inflation. Similar to the finding of Ganley and Salmon (1997),

Carpenter (1999), Kolev, Jesus, and Morales (2005) affirm that when there are shocks in the monetary policy, the informal economy would be affected negatively. The research work by Shaheen (2020) examines the impact of monetary policy tools on macroeconomic variables in Pakistan through a nonlinear specification of threshold structural vector autoregression (TVAR) approach. The study analyzed the generalized impulse response functions (IRFs) for each variable to specify the effects of monetary policy shocks. It was found that in the short run, an increase in broad money had a positive effect on output growth. The study identifies changes in broad money as a veritable instrument to spur output growth.

Gbosh and Rakesk (2014) employed decadal data on major Indian states from 1961 to 2011 to examine the impact of monetary policy on informal finance. Agglomerating data on households accessing finance from various non-institutional sources with indicators on economic, financial and social variables, finding suggests that monetary policy had a significant impact on the informal financial sector. Ogbuabor, Mba, and Orji (2014) examine the effect of monetary policy on Nigeria's informal economy. It was found that monetary policy (represented by money supply) has a positive and significant effect on the informal economy. This finding was upheld by Mohammed (2018) who observes that monetary policy is a veritable tool that plays significantly accentuates informal economy activities.

The effect of monetary on output has also been emphasized by some studies. Notably, Chuku (2009) examine the effects of different monetary policy instruments on output and prices. Findings suggest that the money supply had relatively insignificant effects on output and prices with minimum rediscount rate and exchange rate have real effects on output. Adebayo and Harold (2016) found that monetary policy had a positive and significant effect on output. In a study on the effectiveness of the monetary policy on the development process in Nigeria, Akinjare, Babajide, Isibor, and Okafor (2016) found that exchange rate, interest rate and money supply is significant in impacting on the economy. Other studies, Mansor and Ruzita (2005), Maturu and Ndirangu (2014), Kamati (2014), Imoughele and Ismaila (2014) also found that monetary policy reduces the general price level which invariably promotes output.

Apparently, from the literature, there is no study on monetary policy impact on the informal economy and response to shocks in the informal economy. This knowledge gap is covered by this present study.

3 | METHODOLOGY

Theoretically, assessment of the monetary policy transmission channels on the economy is anchored on the LM framework. The LM framework maintains that the equilibrium level that regulates both investment and growth is established through the interaction of money supply and money demand. Bernanke and Blinder (1992), Bernanke and Gertler (1995) emphasize that both sides are influenced greatly by interest rate. The equilibrium interest rate that achieves the targeted output growth rate is achieved where the money supply is equal to money demand. Such a relationship is represented as:

$$HMS = L(r, Q) = eQ - kr \qquad (1)$$

where HMS = exogenous money supply, e = change in money demand due to rise in income, k = fall in demand for due to increase in interest rate, r denotes real interest rate (MPR), Q = real output in the economy. Monetarist maintained that income positively relates to money demand while interest rate negatively relates to money demand and investment. To determine the equilibrium (where the economy will attain substantive growth), interest rate (r) and (Y) will be solved by making interest rate the subject of the formula as indicated in Equations (2) and (3) respectively.

$$r = \left[\frac{e}{k}\right]Q - \left[\frac{1}{e}\right]HMS \qquad (2)$$

$$Q = \left[\frac{k}{e}\right]r - \left[\frac{1}{k}\right]HMS \qquad (3)$$

3.1 | Empirical model specification

In line with the literature and following the works of Ogbuabor et al. (2014) with variation, the relationship relating the dependent and explanatory variables are specified as:

$$IFE = f(MPR, CRP, EXR, LRR) \qquad (4)$$

Linearly, Equation (4) is specified as:

$$IFE = \phi_0 + \phi_1 MPR + \phi_2 CRP + \phi_3 EXR + \phi_4 LRR + U_t \qquad (5)$$

where IFE = informal economy (captured in this study by informal economy size), CPS = credit to the credit sector, EXR = exchange rate (captured by the official exchange rate, Local Currency Unit per US$, period average), LRR = lending rate (proxied by interest rate). In this regard, the MPR is denoted as MPR/ Minimum Rediscount Rate (MRR), $\phi_1, \phi_2, \phi_3, \phi_4$ = estimated parameters or coefficients, U_t = error term, with its usual properties.

The first objective of this study is to estimate the monetary policy impact on the informal economy. To effectively achieve this, we adopt the Autoregressive Distributed Lag (ARDL) Bound testing methodology. The ARDL is adopted because it is more efficient in estimating short-term and long-term impacts simultaneously, even though some variables are endogenously determined. More importantly, the application ARDL is possible even when the variables under consideration are integrated on different order (I(0); I(1) (Pesaran, Shin, & Smith, 2001). Accordingly, Equation (5) is re-specified in line with ARDL method as stated below.

$$\partial l\_IFE_t = \eta_0 + \sum_{i=1}^{n-1} \varnothing_1 \partial l\_IFE_{t-i} + \sum_{i=0}^{m-1} \varnothing_2 \partial l\_MPR_{t-i} + \sum_{i=0}^{m-1} \varnothing_3 \Delta l_{CRP\,t-1}$$
$$+ \sum_{i=0}^{m-1} \varnothing_4 \partial l_{EXR_{t-i}} + \sum_{i=0}^{m-1} \varnothing_5 l\_LRR_{t-i} + \zeta_1 l_{IFE\,t-1} + \zeta_2 l\_MPR_{t-1}$$
$$+ \zeta_3 l\_CRP_{t-1} + \zeta_4 l\_EXR_{t-1} + \zeta_5 l\_BLR_{t-1} + U_t \tag{6}$$

∂ represents first difference operator, $\phi_1 + \phi_2 + \ldots + \phi_5$ is the coefficient of short-run effect, $\zeta_1 + \zeta_2 + \zeta_3 + \ldots + \zeta_5$ coefficient of long-term effect.

To further determine informal response to shocks in the formal economy, we adopt the IRF analysis. The IRF can measure the effect of change in the dependent variable generated by the explanatory variables. Such a relationship is represented algebraically as:

$$\begin{bmatrix} IFE_t \\ EXR_t \\ CRP_t \\ LRR_t \end{bmatrix} = \lambda_1 \begin{bmatrix} IFE_{t-1} \\ EXR_{t-1} \\ CRP_{t-1} \\ LRR_{t-1} \end{bmatrix} + \ldots + \lambda_2 \begin{bmatrix} IFE_{t-p} \\ EXR_{t-p} \\ CRP_{t-p} \\ LRR_{t-p} \end{bmatrix} \begin{bmatrix} U_{1t} \\ U_{2t} \\ U_{3t} \\ U_{4t} \end{bmatrix} \tag{7}$$

where U = error term error, λ_1 = coefficient of the first lagged variables, λ_2 = coefficient of all the lagged variables, $I - p$.

This study employs time series and covers 1970–2018. They were extracted from the Annual Statistical Bulletin published by Central Bank of Nigeria, World Development Indicator published by World Bank and Business Insight Global published by Gale.

TABLE 3 Result of the bound test for the long-run relationship in the ARDL model

Test statistic	Value	K
F-statistic	13.2588	4
Critical value bounds		
Significance	10 bound	11 bound
10%	2.56	3.45
5%	2.79	3.99
2.5%	3.01	4.58
1%	3.57	5.12

Source: Authors' computations.

TABLE 1 Descriptive summary statistics of the variables used for empirical analysis

	IFE	MPR/MRR	CRP	EXR	LLR
Mean	4,747,893	10.9	1,860,889	49.07	14.9
Maximum	31,406,191	26.00	15,751,838	157.49	29.80
Minimum	4,152.890	3.50	358.4500	0.55	6.00
Std. Dev.	8,818,894	5.19	3,992,677	61.03	6.36
Observations	48	48	48	48	48

Source: Authors' computations.

TABLE 2 Unit root test results

Augmented dickey-fuller (ADF) test					
	Level		First difference		
Variable	5%		5%		Order of integration
	Value	Critical value	Value	Critical value	
IFE	0.5499	3.5181	4.6105	3.5208	I(1)
MPR	2.3934	3.5181	7.0377	3.5236	1(1)
CRP	0.8086	3.5403	4.5927	3.5208	1(1)
EXR	1.7282	3.5181	6.1859	3.5208	I(1)
LLR	10.2858	3.5208			I(0)
Philip-Peron (P–P) test					
	Level		First difference		
Variable	5%		5%		Order of integration
	Value	Critical value	Value	Critical value	
IFE	0.7277	1.9487	2.9109	1.9489	I(1)
MPR	2.3385	3.5181	8.4776	3.5208	I(1)
CRP	3.0936	3.5181	4.5708	3.5208	I(1)
EXR	1.7447	3.5181	6.1858	3.5208	I(1)
LLR	10.5114	3.5208			I(0)

Source: Authors' computations.

TABLE 4 Result of the long-run effect

Variable	Coefficient	SE	*t*-Statistic	Probability
Constant	1.7301	8.5871	0.2015	0.8416
MPR	−7.1289	3.3154	−2.1502	0.0395
CRP	2.3738	0.2575	9.2207	0.0000
EXR	5.6991	1.4595	3.9048	0.0005
LLR	5.2224	2.6168	0.2015	0.8416

Source: Authors' computations.

TABLE 5 Result of the sort run

| Variable	Coefficient	SE	*t*-Statistic	Probability
Constant	47,856.8	52,390.9	0.9134	0.3670
MPR	−19.9380	5.1359	−3.8821	0.0006
CRP	1.7465	0.0817	7.3890	0.0000
EXR	34.3952	5.5158	6.2358	0.0000
LLR	−1.1668	6.3821	−0.1828	0.8550
ECM(−1)	−0.4158	0.1671	−2.4885	0.0175
R^2 0.7217				

Source: Authors' computations.

TABLE 6 Result of the response of the Informal economy to shocks in the formal economy

The response of informal economy:				
Period	IFE	CRP	EXR	LLR
1	1,134,333	0.000000	0.000000	0.000000
2	1,539,497	594.3407	321,298.1	105,786.8
3	1,734,535	−73,180.43	458,242.4	121,646.9
4	1,799,314	−31,453.10	714,205.1	145,117.9
5	1,696,830	68,005.36	944,774.1	177,971.3
6	1,449,659	243,441.4	1,180,143	200,907.2
7	1,090,908	465,441.9	1,388,634	230,165.5
8	669,933.4	720,862.9	1,563,621	258,118.7
9	237,389.9	987,375.5	1,699,652	290,854.9
10	−156,261.2	1,245,437	1,795,750	327,280.8

Source: Authors' computations.

FIGURE 1 The response of the informal sector economy to shocks from the formal economy

Response of IES to Cholesky
One S.D. Innovations
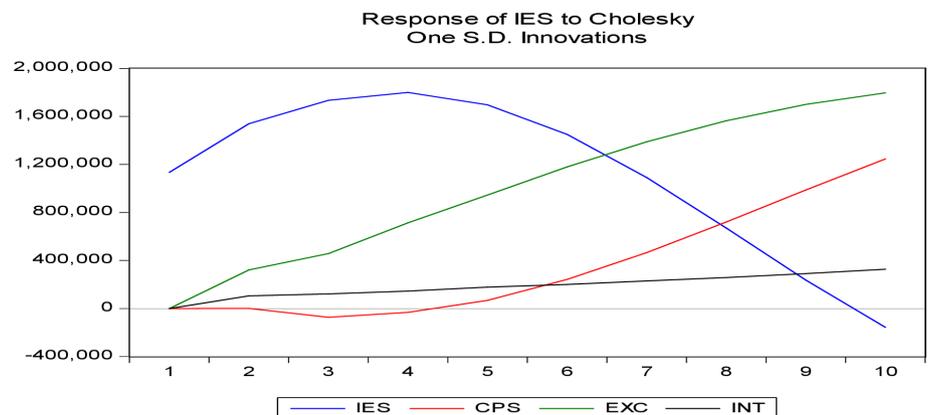
4 | EMPIRICAL RESULTS

For a pep on the behavior of the variables, we present the descriptive summary statistics which is contained in Table 1.

As indicated in Table 1, the informal economy had a mean value of ₦4,747,893 million while the average MPR stood at 10.9%. Credit to private sector averaged ₦1,860,889, the average official exchange rate was pegged at ₦490 while average bank lending rate was 14.9%.

Since the study employs the ARDL methodology, it is necessary to ascertain the stationarity of the various variables to know if some are I(0) and others I(1). Consequently, the unit root test was conducted. For robustness of results, both the Augmented Dickey-Fuller (ADF) and Philip-Perron (P–P) tests were employed. The respective result is presented in Table 2.

The result presented in Table 2 portrays that the variables exhibit mixed stationarity. In the ADF test, bank lending rate was stationary at level I(0), informal economy, monetary policy, credit to the private sector and exchange rate became stationary after first difference, I(1). This was collaborated by the Philip-Perron test results. When this is the case, it is apparent to conduct ARDL bound test to determine the long-run relationship in the model and the result is contained in Table 3.

As indicated in Table 3, *F*-statistic is higher at both lower and upper bounds. Thus, the null hypothesis is rejected and concluded that long term relationship exists among the variables. On this basis, we preceded to conduct the ARDL bound test to determine long-run and short-run effects.

Result in Table 4 suggests that monetary policy is negatively related to the informal economy. Evidence indicates that percentage increase in monetary shrinks the economy by about 7.13%. The coefficient is statistically significant at 5%. This an indication that increases in MPR has that tendency of reducing activities on the informal economy. Moreso, credit to the private sector has a positive and significant effect on the informal economy in the long-run. Increase in credit to private sector enhances the informal sector by 2.3%. Surprisingly, the exchange rate and lending rate has a positive and significant effect on the informal economy. Evidence provided indicates that an increase in exchange rate and bank lending rate increases informal economy by 5.7% and 5.22% respectively. This could be attributable to the fact

that the increase in exchange rate and bank lending rate will create room for the emergency of unrecognized money markets in the economy. This aligns with the finding of Patrick and Akanbi (2017) that increase in monetary and lending rate has the potency of spurring activities in the informal economy.

In Table 5, estimated coefficients provide evidence monetary policy and lending rate is negatively related to the informal economy while credit to the private sector is positively reacted with the informal economy. Going by the specific coefficient, an increase in monetary policy and the lending rate reduces the informal economy by 19.9% and 1.2% respectively. Again, the exchange rate had a positive and significant effect on the informal economy. Meanwhile, the coefficient of Error Correction Model (ECM) (−1) of −0.41 indicates that the error correction model was able to adjust equilibrium with 41% adjustment speed.

From the result presented in Table 6, it is observed that the effect of the shock took proper effect from period 2. In period 3, both positive and negative shocks were observed. In period 10, which is a longer period, the result shows that shocks in the formal sector were negatively responded to by the informal sector. Figure 1 further illustrates the shocks.

The implication emanating from the results is that there was a positive response by the informal economy to shocks in the formal economy in the short run while informal economy responded negatively to the shocks in the formal economy in the long run.

5 | CONCLUSION

The study sought to examine monetary policy impact and repose to shocks in the formal economy in Nigeria employing both ARDL and IRF methods, with data from 1970 to 2018. The variables used for the analysis are: informal economy, monetary policy, credit to the private sector, exchange rate and lending rate. Our main finding is that monetary policy (−19.94) had a negative and significant effect on the informal economy both short-run and the long-run. Again, credit to the private sector had a positive and significant effect on the informal economy both in the short run and long-run, with a respective coefficient of 1.75 and 2.37. Our finding is in tandem with previous studies such as Chileshe and Ayodele (2017) that MPR is positively related to the informal economy. Also, the exchange rate was found to have a positive and significant effect on the informal sector both in the long run and short run. The further result that emanates from the study is that informal sector responded positively to shocks in the formal economy in the short run while informal sector responded negatively to the shocks in the formal sector in the long run.

From the findings, the monetary authority must ensure that policy made is geared toward exposing the informal economy to access to more credit. This understands the importance of factoring the informal economy when deciding on the monetary policy is considered.

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