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The effect of the size of the informal sector on inflation rate

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Abstract

Traditional monetary policy methods have been criticized for their efficacy in reducing inflationary pressures throughout the years. Inflation has recently become a hot topic, owing to the impact of government-led efforts to alleviate the influences of the COVID-19 epidemic as well as the supply train disruptions caused by the conflict in Russia and Ukraine. As a result, the purpose of this study is to find out how Nigeria's informal economy has changed over time and how this has affected inflation from 1980 to 2021. Estimation using OLS-based ARDL with EViews software. The estimated model was reviewed using some diagnostic tests (serial correlation test, normality test, and stability test). Only interest rate had a noteworthy positive influence on inflation in the long run in Nigeria. As opposed to that, exchange rate and the informal sector impacted Nigeria's inflation significantly. It is crucial that the apex bank adopts a more practical approach to root out inflation, such as bolstering the value of the Naira, minimizing supply bottlenecks, and striving for financial inclusion, in order to effectively deploy monetary policy tools in attaining a single figure inflation.

Keywords: *Inflation, Informal Sector, Auto-Regressive Distributed-Lag (ARDL), Economic growth.*

1. Introduction

Inflation has emerged as a topic of intense interest in recent times, particularly due to the impact of government-led efforts to minimise the consequences of the COVID-19 epidemic as well as the supply train interruptions created by the conflict in Russia and Ukraine. In this context, a great deal of scepticism has been placed on traditional monetary policy tools and their effectiveness in controlling inflationary pressures. After the COVID-19 pandemic hit in Nigeria on the 27th of February 2020 (Federal Ministry of Health, 2020), the Central Bank of Nigeria's response was to reduce its monetary policy interest rate, from 13.5 percent to 12.5 percent and in the next quarter, the apex bank maintained its dovish stance reducing the MPR to 11.5 percent (Okorafor et al., 2020).

The Central Bank of Nigeria kept the monetary policy rate relatively steady at 11.5 percent during the pandemic while ignoring the rising inflation with hopes that it would be transitory and economic normalcy would step in once the pandemic fades away. However, inflation which began at 11.25 percent in February 2019 surged to 18.17 in February 2021. It then transited down to 15.2 percent in June 2021 briefly, then began its bullish pace to hit 18.6 in June 2022. This acceleration in the erosion of purchasing power occurred despite the increment in CBN's from 11.5 percent to 13 percent, the monetary policy rate on May 24, 2022.

Hence, many scholars have argued that the hawkish monetary policy stance in an economy like Nigeria, which has a large base of informal sector would be ineffective in addressing inflationary pressures.

The informal sector in Nigeria makes a substantial contribution to the reduction of poverty, the creation of employment, the stimulation of the mainstream economy, and performing as a "last resort" in times of financial crisis and economic downturn (Nguyem, 2019). However, by undermining the trustworthiness of the scale of the formal market, the informal sector may make economic policy ineffectual. In Nigeria, the informal sector accounts for more than 65% of the GDP. There is still a problem with how monetary policy is transmitted, which has an impact on a sizable section of the unorganised sector. (Medina, Jonelis, &Cangul, 2017).

Furthermore, the hawkish stance undertaken by the Central Bank of Nigeria on May 24, 2022, proves that an increase in interest rate will have a moderating effect on prices. An exploration of existing literature shows that there is a contentious debate surrounding this subject, particularly regarding Nigeria's high informal sector, which contributes almost 90 percent of Nigeria's GDP and its import-driven consumer economy.

2. Literature Review

Financial institutions have greatly influenced education, business, and industrial development. However, official banking sector collateral deters the poor (Kinyondo&Kagaruki, 2019). Thus, "social collateral" informal financial groups (IFGs) are replacing the impoverished. Informal financial systems include social clubs that allow community members save and withdraw money (Osuagwu, 2021). Remarkably, conventional financial institutions served and still serve Nigerian communities well before and after the pre-banking era Uruakpa (2018) and promote grass-roots banking for quick integrated rural and enterprise development (Obadeyi, 2015).

However, informal financing channels include ASCAs, informal moneylending, ROSCAs, loan brokers, and others (ILO, 2015). These systems, however old, cover the fundamental to the complex. They smooth consumption, stimulate savings, finance businesses, and connect savers and borrowers (ILO, 2015). The concept promoted human relationships rather than faceless customer-business interactions. Thus, this part evaluates research on the informal finance sector's influence in Nigeria's economic growth.

According to Enrique and Carlos (2019), using a basic closed market general equilibrium model with economic rigidities, labour frictions, and monetary frictions an important effect that informality has on the spread of price changes is that it amplifies the impact of supply and demand shocks in the official sector, while leaving it largely untouched in the informal one. Informality reduces the effect on wages and inflation of financial shocks and demand butincreases the influence of technological up heaval. Monetary policy activities suffer from a higher sacrifice ratio when they are conducted in an informal manner. In the eyes of the Central Bank, the data show that although the existence of the informal sector reduces inflation instability for specific shock types, it reduces the effectiveness of monetary policy.

Although informality is common in developing nations, it is surprising how little research has been done on the limits it places on monetary policy because of these high levels of informality. However, Castillo and Montoro (2010) utilise a New Keynesian DSGE model that allows enterprises to choose the combination of formal and informal labour in manufacturing. Companies have greater freedom to increase production without having to raise prices via the informality option, which serves as a brake on price increases. Despite this, their research neglects a key component: the fragmentation of the financial markets. Not only do the formal and informal economies vary in terms of production and short-term job flexibility, but they also differ significantly in terms of financial system accessibility. According to Levine et al., (2010), more businesses that are informal are unable to access traditional sources of capital since they are not part of the formal economy.

Elgin and Uras (2013), in more recent research, utilised a cash-in-advance limitation is placed on the informal economy together with build-up of physical capital and consumption in an endogenous growth model to investigate the connection between the informal sector and several measures of financial development to see how these relationships may be assessed. They find that the nexusbetween the extent of the informal sector

and financial development has the shape of an inverted U. This means that financial development grows with lower levels of informality but declines with larger levels of informal economy. This conclusion is connected to our model since financial development is among the primary factors that determine economic growth; nevertheless, these scholars did not analyse the connection amongst the informal sector and growth via inflation. This is a limitation of their study.

Salimifar and Keivanfar (2011) in their research on informal sector and its effect on inflation, state that inflation or an improvement in the overall level of the price of goods in the official sector will result to an increase in the cost of household income in such cases since it is not possible to attend two official jobs at the same time they choose the informal sector to cover their expenses and enter this sector, the OLS technique was used in this study to investigate whether the inflation rate has an effect on the informal sector. The findings indicate that growth will occur in the urban informal sector even if just the inflation rate in the products group rises.

Paul and Carlos (2012) established a model thatincorporates the informal sector into Diamond-Mortensen-Pissarides model and a modified New Keynesian model with labour market friction, the informal sector creates a "cushion" effect that lessens the impact of shocks to demand and inflation, according to our major findings. This result is in line with empirical research on the role of the informal labour markets on changes in the business cycle. This conclusion suggests that changes in interest rates are more efficient at spurring full production and have less of an impact on inflation in countries with significant informal labour markets. Inflation affects unemployment and informality by taxing money holdings agents carry from one period to the next. Compared to the formal sector, informal businesses and jobs are more susceptible to inflation due to the higher cash intensity of informal transactions, and an increase in inflation diminishes the trade surplus for both formal and informal businesses.

Musa and Odiba(2021) conducted researchon the effects of Monetary Policy on Inflation in Nigeria. A higher interest rate will, per the research, cause inflation in the Nigerian economy, making the circumstance worse. The Autoregressive Distributed Lag (ARDL) model was used for the study's analysis. The findings showed that interest rates and exchange rates had a significant and positive influence on Nigeria's inflation both in the short and long run. Nonetheless, according to the research, the monetary policy rate has a positive impact on inflation rates in the short term but not in the long run.

Based on the study, MPR proved ineffective in dealing with inflation. It was thus determined that, although interest rates and exchange rates are powerful weapons for regulating inflation, the monetary policy rate in Nigeria is not very successful in limiting inflationary pressure."

Iya and Aminu's 2014 analysis, that have received about 33 citations, adds to this narrative. The research, titled "An Empirical Analysis of the Determinants of Inflation in Nigeria," boosting interest rates had no effect on lowering inflation. The analysis found that increases in both the interest rate and money supply helped reduce inflation, whereas increases in spendings by the government and the rate of exchange influence negatively.

According to the study, "a solid performance of the economy on the basis of price stability may thus be acquired by lowering the money supply and interest rate, as well as raising government expenditure and the country's exchange rate." In place of hiking interest rates to conflict inflation, the research recommends that the central bank reduce the benchmark rate and money supply. The study's major policy implication is that policymakers could perhaps make a concerted effort to normalize prices (to reduce inflation) by plummeting the interest rateand money supply, alongside boosting the spendings of the government and the rate of exchange; principally, broadening the rate of exchange and lowering interest rates.

Methodology

In this study, the Autoregressive Distributed Lag (ARDL) estimation techniqueproposed by Pesaran, Shin, and Smith (2010) was used to analyse the effectiveness of monetary policy in combatting inflation in Nigeria. Inflation, interest, monetary policy rate, currency rate, and government spending are the explanatory

variables that were employed on an annual basis for this research. Statistical information for the variables comes from the 2019 edition of the Central Bank of Nigeria's Bulletin of Economic Statistics.

Model Specification

The study's model was adopted from the research Musa and Odiba (2021), but with modifications in terms of variables considered used like the incorporation of the informal sector. The ARDL model is viewed as a more precise econometric strategy because the variables under study are either stationary at I(0) or only integrated to order I(1).According to the aims of the study and the findings of the stationarity tests of the variables, It will be a more accurate model than alternatives for identifying the intermediate and final results of exogenous influences on the dependent variable, INFL.

The functional form of the model is specified as

INFL = ƒ(INTR, EXR, IFS,) [3.1]

Where the inflation rate (INFL)is utilised as the dependent variable in this study, whereas the explanatory factors are interest rate (INTR), exchange rate (EXR), and informal sector (IFS).

In explicit form, the model is written as

$INFL = \beta_0 + \beta_1 INTR + \beta_2 EXR + \beta_3 IFS + e$ [3.2]

Where β_0 is the intercept and $\beta_1 - \beta_3$ are the slopes/parameters of the explanatory variables.

ESTIMATION TECHNIQUE

The ARDL model specification of the above functional form is specified as

$$\Delta lnINFLt = \alpha 0 + \sum \alpha 1\ pj{=}1\ \Delta lnINTRt{-}j + \sum \alpha 2\ pj{=}1\ \Delta lnEXRt{-}j + \sum \alpha 3\ pj{=}1\ \Delta ln\ \text{IFS}\ t{-}j + ut \quad [3.3]$$

where: INFL is inflation rate, INTR represents interest rate, EXR denotes exchange rate, and IFS stands for informal sector. α0 is the intercept term, α1 –α4 are the parameters to be estimated and Ui represents the stochastic error term. All the variables in Equation [3.2] are estimated in their natural log denoted by l_n in the model

Results and Discussion

Unit Root Test

Table 4.1 Unit Root Test

Variable	Level				First difference				
	Test Statistics	Critical Values	Prob*	Remark	Test Statistics	Critical Value	Prob *	Remark	Order of Integration
INFL	-3.0941	-2.9350	0.0348	Stationary	-5.9855	-2.9369	0.0000	Stationary	I(0)
INTR	-2.2692	-2.9350	0.1864	Non-Stat.	-5.3534	-2.9389	0.0001	Stationary	I(1)
ISEC	-3.9186	-2.9981	0.0069	Stationary	-1.7601	-3.0049	0.3891	Non-Stat.	I(0)
EXR	2.3822	-2.9350	0.9999	Non-Stat.	-4.5364	-2.9369	0.0008	Stationary	I(1)

Source: Authors' computation, 2022

The unit root test determines whether a series' mean, and covariance are stationary. Economic models based on time series analysis must meet the stationary unit root condition, according to earlier research. This first analysis is focused on determining the integration order for all variables utilising the Augmented Dickey-Fuller (ADF) test (1981) to examine and prevents pecious regression results. Table 4.1 shows that INTR, and

EXR all have unit roots at level I (1), meaning they are non-stationary in their level but stationary after first differencing. INFL and ISEC appear stationary at 5% significance. This fulfils the criteria for utilising Auto regressive Distributed Lag (ARDL).

Auto Regressive Distributed LAG (ARDL) Analysis

Table 4.2: ARDL Short-run Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF(-1)	0.508701	0.16669	3.051771	0.0066
INF(-2)	-0.777271	0.19498	-3.98641	0.0008
INTR	-0.493194	0.826917	-0.59643	0.5579
INTR(-1)	0.745423	0.958459	0.777731	0.4463
INTR(-2)	2.423218	0.779964	3.106833	0.0058
ISEC	-0.000179	0.000184	-0.96926	0.0334
ISEC(-1)	0.000366	0.000303	1.208483	0.0242
EXR	-0.356823	0.149122	-2.39283	0.0272
C	-5.145267	9.103923	-0.56517	0.5786

Source: Authors' Computation, 2022

Table 4.2 shows that INF in its first and second lag periods has a significant relationship, with a positive relationship in the first lag period and a negative relationship in the second lag period. INTR on the other hand is statistically significant at a 5% level in its second lag period and is positively related to INF. ISEC also is statistically significant in its first and second lag period also but has a low magnitude impact on inflation. In the first lag period, the informal sector is positive meaning it increases GDP by 0.0004 when there's a unit change in the previous lag period. EXR exhibits a negative but meaningful relationship with INF in the first period, as a unit increase in EXR will decrease inflation by 0.3568. The constant term however shows that when all explanatory variables are zero, INF decreases by -5.145.

Table 4.3: ARDL Short-run Diagnostic Result

Statistic	Value
R-squared	0.729659
Adjusted R-squared	0.615831
F-statistic	6.410199
Prob(F-statistic)	0.000436
Durbin-Watson stat	2.350213

Source: Authors' Computation, 2022

Table 4.3 shows ARDL's short-run diagnostic. The findings specify that the coefficient of determination (R2) of the model is 0.7297. This implies that extra variables not included in the model explained 28% of the change in the dependent variable, whereas independent or exogenous factors explained 72% of the change in the dependent variable. Adjusted R2, which accounts for degree of freedom, shows that independent variables explain 62% of INFL changes. The model fits the data well.

Even though our model was well-fitted based on the F-statistic, the Durbin-Watson statistic of 2.350213 in Table 4.3 is within the allowable range, demonstrating no relationship between the variables and a negative autocorrelation.

Bounds Test

Table 4.4: Bounds test

Test Statistic	**Value**	**K**
F-statistic	4.393487	3
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.72	3.77
5%	3.23	4.35
2.50%	3.69	4.89
1%	4.29	5.61

Source: Authors' computation, 2022

Table 4.4 shows that the null hypothesis has no co-integrating connection is easily debunked at the 5% level. The F-statistic of 3.8891 which is greater than the lower and upper critical limit values of 5% and 10%, respectively indicates that inflation (INFL) and all explanatory variables have a long-run relationship.

Auto Regressive Distributed Lag (ARDL) Co-integration and long-run Analysis

Table 4.5: ARDL Co-integrating Result

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INF)	0.777271	0.19498	3.986405	0.0008
D(INTR)	-0.493194	0.826917	-0.59643	0.5579
D(INTR(-1))	-2.423218	0.779964	-3.10683	0.0058
D(ISEC)	-0.000179	0.000184	-0.96926	0.0345
D(EXR)	-0.356823	0.149122	-2.39283	0.0272
CointEq(-1)	-1.26857	0.210905	-6.01489	0

Source: Authors' Computation, 2022

The computed coefficients in Table 4.5 show that Interest rate (INTR) in its first lag period has a negative and meaningful connection with INF. Furthermore, the Informal Sector (ISEC), has a negative and significant relationship with inflatinsuggesting that a unit increase in the informal sector will lead to a 0.0002 decrease in inflation. A rise in exchange rate (EXR) reduces INF by about 0.35682 units per unit over time. This is true even when all other explanatory variables are held constant. As a result, the interest rate (INTR) and (EXR) have a negative and meaningful impact on inflation, as an increase in both lead to a significant reduction in inflation (INFL). The error correction model (ECM) (1) coefficient, which is around 1.269, demonstrates that the error correction model was capable of changing equilibrium at 126 percent of the average adjustment speed.2

ARDL Long-run Coefficients Results

Table 4.6 ARDL Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INTR	2.109027	0.401025	5.259086	0
ISEC	-0.000147	0.000215	0.684152	0.0502
EXR	-0.28128	0.102272	-2.75032	0.0127
C	-4.05596	7.156409	-0.56676	0.5775

Source: Authors' Compilation, 2022

The ARDL long-run coefficients reflect the nature of the variables' long-term relationship. Table 4.6 shows that interest rate (INTR) and EXR are statistically significant in impacting inflation, also they have positive and negative relationships with inflation respectively. For ISEC on the other hand, evidence reveals that it is statistically significant at 5%, which matches the a priori assumption. This means that the magnitude of the informal sector or activities in this sector has a significant influence on the rate of inflation in the economy. Meanwhile, a unit increase in interest rates would increase inflation by 2.109 and a unit increase in EXR will decrease inflation rate by 0.281 which indicates a small magnitude of change.

Trend Analysis

Post Estimation Test

Stability Test

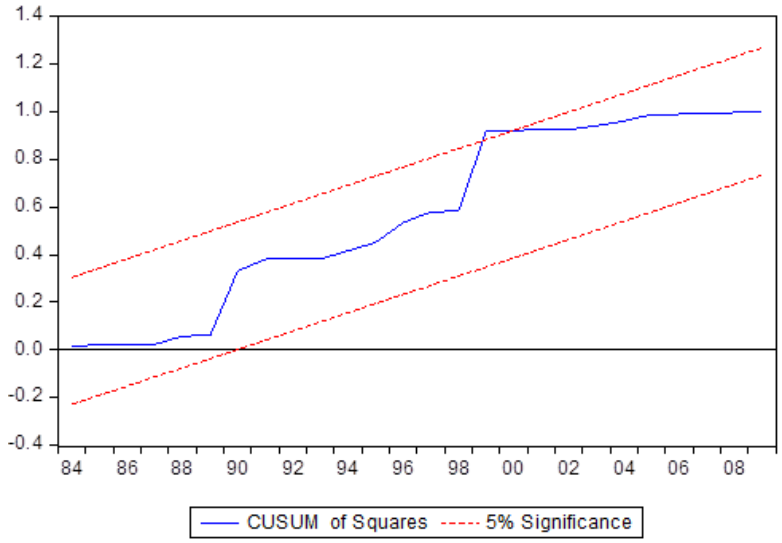

Figure 4.1: Cumulative Sum of Squares (CUSUMSQ)
Source: Authors' computation, 2022

As illustrated in figure 4.7, a stability test was performed using the cumulative sum (CUSUM) of recursive residuals. The cumulative sums of the residuals are scaled down (or normalised) to give the foundation for the CUSUM statistic, according to Brooks (2008). Despite the presence of several residuals in the sum, the CUSUM statistic is 0 under the null hypothesis of total parameter stability (since a disturbance's predicted value is always zero). The occurrence of any statistic outside of the bands is seen as an indication of parameter instability. The conventional error bars are often shown near zero. For better understanding,

consider the area between the essential (straight-bounded upper and lower) lines. When this area is exceeded, parameter instability occurs. Figure 4.1 shows that it is at a 5% level of significance, and the observed limit does not cross any of the confidence bounds in any one period, indicating that there is no change in the relationship. CUSUM, in other terms, was steady.

Normality Test

Table 4.7: Result for Normality Test

Jarque-Berra Statistic	P-value
3.0430	0. 2184

Source: Authors' computation, 2022

When the residuals are evenly distributed, the Jarque-Berra statistic has a p-value of 0. 2184, the normality test is done. This conclusion implies that the joint probability is insignificant at the 5% level, indicating that the null hypothesis is rejected. As a result, the research model has a normal probability distribution.

Heteroscedasticity Test

Table 4.8: Result for Heteroscedasticity Test

F-statistic	2.347360	**Prob. F**	0.0959
Obs *R-squared	6.393737	**Prob. Chi-Square**	0.0939
Scaled explained SS	7.360227	**Prob. Chi-Square**	0.0613

Source: Authors' computation, 2023

The null hypothesis for the Breusch-Godfrey heteroscedasticity test is the homoscedasticity of the residuals. Since the p-value is greater than 0.05 and the likelihood value of the F-statistic is 2.3474, the findings do not support the null hypothesis.

Table 4.9: Result for Serial Correlation Test

F-statistic	P-value
4.908899	0.0163

Source: Authors' computation, 2022

The serial connection between Breusch and Godfrey the residuals are serially uncorrelated, which is the null hypothesis for the LM test. The null hypothesis is rejected since the p-value of 0.0163 is less than 0.05.

Discussion of Findings

The Effect of Interest Rate on Inflation

The ARDL analysis results indicate that interest rates have a positive significant association with inflation in the subsequent lag period in the short term, implying that a unit rise in interest rate increases inflation by 2.42 units. In the long run, interest rates and inflation have a favourable relationship. This demonstrates that an upsurge in interest rates will lead to higher inflation over the long term.

This is consistent with Musa and Odiba (2021) on the "Effects of Monetary Policy on Inflation in Nigeria," which found that short-term and long-term inflation in Nigeria were both positively impacted by the exchange rate. According to another research, rising interest rates has little effect on lowering inflation (Iya & Aminu, 2014).

The Effect of Informal Sector on Inflation

The findings indicate that the informal sector has no long-run or short-run influence on the rate of inflation; nonetheless, the association between the informal sector and the inflation rate is substantial. This result is congruent with that of Enrique and Carlos (2019), who discovered that the existence of an informal sector decreases the volatility of inflation for particular types of shocks but lessens the applicability of monetary policy.

The Effect of Exchange Rate on Inflation

The exchange rate derived from the ARDL test has a significant negative association with inflation in both the short term and the long term. A unit increase in the rate of exchange reduces inflation by 0.357 in the short term and by 0.281 in the long term. Based on research carried out by Iya and Aminu (2014), which has received about 33 citations."An empirical assessment of the causes of inflation in Nigeria," revealed that exchange rates have a negative impact on inflation. Because of this, the rate of exchange should be raised to prevent inflation.

Conclusion and Recommedation

The results from this study denote that interest rate exerts a beneficial and considerable impact on Nigerian inflation in both the short term and long term. This indicates that boosting interest rates has little effect on lowering inflation. As a result, interest rates are ineffective in addressing inflationary concerns, especially given Nigeria's supply-driven inflation, reliance on imports, and vast informal sector. As a result, the central bank must take a more tailored strategy to controlling inflation, such as bolstering the Naira, alleviating supply constraints, and promoting financial inclusion.

However, the informal sector was significant in influencing inflation rate both in the short and long run. This means the size of the informal sector or informal sector activities aggravate or alleviate inflationary pressure.

Exchange rate on the contrary shows a negative relation with inflation both in the short run and long run therefore exchange rates should be used as a device in curbing inflation. It is thus argued that, while interest rates and currency rates are effective instruments for regulating inflation, the magnitude of the informal sector in Nigeria can be used as a factor in regulating inflationary pressures. Nonetheless, the policymakers should intensify efforts to save the falling Naira particularly due to Nigeria import dependency in Nigeria.

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