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All correspondences and enquiries should be directed to:The Editor-in-Chief
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ASYMMETRIC EFFECT OF CREDIT CHANNEL OF MONETARY TRANSMISSION ON REAL SECTOR OUTPUT IN NIGERIA

Mustapha Musa Kuta, Prof. Mike Duru, Dr. Alfa Yakubu, Dr. Ayodeji Salihu, Dr. Moses Gosele Danpome

Department of Economics, Nigerian Defence Academy, Kaduna, Kaduna State.

Corresponding Author Email Address and Phone Number: Mustaphamkuta@gmail.com; (+234) 08160086429

Abstract

This study investigates the asymmetric effect of Credit channel of monetary transmission on real sector output in Nigeria over a period of 1980 to 2023. Data for the study were obtained from World Bank Development Indicators (WDI). The data were analyzed using the Non-linear Autoregressive Distributed Lag (NARDL) model. Findings revealed that positive changes in credits to the private sector, small and medium enterprises, the government significantly enhance real sector output, while negative changes in these credits have insignificant impact on real sector output in Nigeria. The study concludes that the effectiveness of credit transmission channel of monetary policy is largely asymmetric in Nigeria, with expansionary credit measures exerting stronger influence on real sector output than contractionary credit measures. The study therefore, recommends that the central bank of Nigeria should implement measures to lower borrowing cost and incentivize financial institutions to extend credits to the private, small and medium enterprises and the government, these strategies would enhance real sector output as well as ensure sustainable economic growth in Nigeria.

Keywords: Monetary Policy, Credit Transmission Channel, Real Sector Output

Introduction

Monetary policy is one of the instruments used by the monetary authority to regulate the economy. Its effects on credit, investment, and consumption is well documented in monetary literature especially in the developing economies (Mishkin, 2017; Woodford, 2020). The effectiveness of monetary policy transmission is measured by how well changes in policy rates translate into financial conditions that affect economic agents (households, businesses and government). Among the various transmission mechanisms, the credit channel plays a critical role in shaping economic outcomes by influencing borrowing, lending, and investment decisions (Van & Dang, 2021; Marshal *et al.,* 2021). In both developed and developing countries, access to credit determines the ability of businesses and households to finance productive activities, making the credit channel a vital component of economic growth and stability (Boivin *et al.,* 2021; Taylor, 2018).

In developing countries like Nigeria, the transmission of monetary policy through the credit channel is often affected by structural inefficiencies in the financial system, weak banking sector competition, and high levels of informality in economic transactions (Mordi *et al.,* 2020; Akinbobola & Ibrahim, 2021). The real sector, which comprises the agriculture, manufacturing, and services relies heavily on credit for capital investment and operational expansion. However, fluctuations in interest rates, credit supply constraints, and financial market frictions often distort the intended effects of monetary policy, limiting its impact on

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real sector output (Adegbite & Olayemi, 2018; Chimobi & Uche, 2019). The limited depth of Nigeria's financial markets and the persistence of high lending rates further complicate the effective transmission of credit from financial institutions to productive sectors of the economy (Udegbunam & Obafemi, 2020; Olayemi, 2022).

The relationship between monetary policy, credit supply, and real sector output is particularly important in Nigeria, where credit access remains constrained despite various policy interventions (Eleam *et al.*, 2021; Adegoriola, 2022). Empirical evidence suggests that tight monetary policy, aimed at controlling inflation, often results in reduced credit availability, disproportionately affecting small and medium-sized enterprises (SMEs) and manufacturing firms that rely on bank financing for production and expansion (Ajayi & Atanda, 2021; Olayemi, 2022). Furthermore, financial sector reforms, such as increased bank capital requirements and exchange rate adjustments, have influenced credit flows to key sectors, necessitating a deeper analysis of the effectiveness of monetary policy transmission via the credit channel (Financial Times, 2024; CBN, 2023).

Despite the growing body of literature on monetary policy transmission in Nigeria and other developing economies, there remains a significant gap in understanding how asymmetric credit responses influence a real sector performance in Nigeria. Most existing studies like Akinbobola and Ibrahim (2021), Marshal et al. (2021) and Olayemi (2022) focused on the linear impact of credit on sectoral output, they did not account for asymmetric effects of credit supply shocks. Similarly, Obidike (2021) examined monetary transmission using VAR, but did not disaggregate the impact across different types of credit flows. This leave a gap in understanding the non-linear, asymmetric effects of monetary policy on real sector performance, which this study aims to address using a NARDL approach. Additionally, the extent to which credits to various economic agents such as private sector, SMEs and government responds unequally has not been thoroughly investigated. This gap is particularly crucial given Nigeria's persistent financial market inefficiencies, credit constraints and sector-specific vulnerabilities. Thus, a nuanced examination of the asymmetric effects of the credit transmission channel is essential to determine how positive and negative changes in credit availability shape real sector output. It is against this backdrop that this study seeks to analyze the asymmetric effect of the credit channel in transmitting monetary policy changes (positive and negative) to real sector output in Nigeria. This study is divided into five sections. Section one presents the introduction. Section two reviews of conceptual clarifications on credit transmission channel and real sector output, theoretical framework and empirical reviews. Section three outlines the research methodology, including the model specification, estimation techniques and types and sources of data. Section four focuses on the results and discussion of findings. Finally, section five provides the conclusion and policy recommendations based on the findings.

Literature Review

Conceptual Clarifications

Credit Channel of Monetary Transmission

Adeniyi (2024) emphasizes that credit transmission is the linkage between financial intermediaries and real sector activities, where monetary policy changes affect lending conditions, impacting industrial output, capital investments, and economic expansion. The credit transmission is measured using credit to the private sector, credit to small and medium enterprises and credit to government as proxies for lending conditions. Similarly, Ogunleye (2021) highlights that the credit channel amplifies the effects of monetary policy through variations in loan supply, particularly to the private sector, thereby impacting real economic

activities like production and employment. The loan supply is proxied by credit to the private sector and credit to small and medium scale enterprises and their effects are assessed on real sector output. In addition, Obidike (2021) focuses on how supply of credit to businesses and households affects their spending and investment decisions, which in turn influences aggregate demand and output. Credit availability is captured by total domestic credit disbursed to the private sector and small and medium scale enterprises, while outcomes are proxied by aggregate output or real GDP contribution from key real sectors.

Ndekwu (2013) describes the credit transmission mechanism as a monetary policy pathway through which interest rate changes influence banks' willingness to lend, thereby determining credit availability to the real sectors. Interest rate is used as a policy variable, while changes in credit to private sector and credit to small and medium scale enterprises serves as measures of bank lending behavior. Their combined effects on real sector output reflects the strength of the transmission mechanism.

Real Sector Output

European Central Bank (2024) explains real sector output as the total economic production that directly influences employment, investment, and GDP, differentiating it from the financial sector, which facilitates but does not produce tangible goods and services. In this study, real sector output is operationalized as the real gross domestic product excluding contributions from financial sector. It serves as quantitative measure of the economy's productive performance and its influence on employment and investment. Akinola (2020) also defines real sector output as the total production of goods and services in an economy, excluding financial services, which reflects the actual economic productivity and growth of industries such as agriculture, manufacturing, and construction. This definition is measured using the aggregate value-added output from agriculture, manufacturing and construction sectors. Similarly, Standard and Poor's Global (2023) defines real sector output as the combined output of all productive sectors, including industrial production, construction, and services, which drive economic growth and determine the effectiveness of monetary policy. The real sector output is represented by the composite index of sectoral output including industrial production, construction and services, used to track the impact of monetary policy interventions.

Owolabi and Adegbite (2022) describes real sector output as the measure of economic activities within tangible sectors like agriculture, manufacturing, and services, which contribute directly to GDP and employment generation. Real sector output is measured by the sum of real value-added output from agriculture, manufacturing and services as reported in national accounts, reflecting their combined contribution to GDP and job creation.

Theoretical Framework

Keynesian Theory of Credit Money

This study is anchored on the Keynesian theory of credit Money by John Maynard Keynes from his seminal work published in 1936 which provided a foundational understanding of how credit channels influence real sector output. Keynes challenged the classical dichotomy, which posited a clear separation between real sectors and monetary policy, by asserting that monetary transmission, including credit availability, have profound effects on real economic activities such as production and employment. Keynesians argue that monetary policy, by influencing interest rates and credit availability, directly impacts aggregate demand. For instance, an expansionary monetary policy that lowers interest rates can increase the supply of loanable funds, encouraging businesses to invest in capital goods and consumers to spend on durable

goods. This increase in investment and consumption elevates aggregate demand, leading to higher production and employment in the real sector. Conversely, contractionary monetary policy can restrict credit, dampening aggregate demand and reducing real sector output.

Keynesian theory emphasizes that credit channels through mechanisms like interest rates play a crucial role in determining real sector output. By affecting borrowing costs and investment decisions, credit availability can lead to significant fluctuations in production, employment, and overall economic performance. The Keynesian model suggests that credit availability is a key determinant of investment and aggregate demand. When economic agents (businesses, households and government) have access to affordable credit, they can invest more in capital goods and production, leading to increase in real sector output. Conversely, restrictive monetary policies such as credit rationing reduce investment and slow down economic growth.

Empirical Review

Pejman and Reza (2023) examined the effects of monetary policy on the real sector variables of the Iranian economy through the credit channel and the balance sheet channel from 1990 to 2020, using Dynamic Stochastic General Equilibrium (DSGE) model. The results showed that with the implementation of restrictive monetary policy in the economy, all productive activities of enterprises decreased, and this led to a decrease in household income, which in turn reduced household savings in the form of bank deposits.

Adegoriola and Adeyemi (2023) employed the NARDL model to investigate the asymmetric impact of credit to the private sector on Nigeria's manufacturing output from 1981 to 2021. The study found that positive credit shocks significantly enhanced output, while negative shocks had a weak and insignificant effect, highlighting a strong asymmetry in monetary policy transmission through the credit channel.

Owolabi and Adegbite (2022) assessed the impact of monetary policy instruments on Nigeria's real sector performance from 1980 to 2020, employing Vector Autoregressive (VAR) models to analyze the influence of interest rates, exchange rates, money supply, and inflation on agricultural, manufacturing, and service sectors. Findings revealed that Monetary policy instruments significantly influence real sector performance, with interest and exchange rates playing pivotal roles.

Olayemi (2022) investigated the link between credit supply and sectoral output in Nigeria's manufacturing and agricultural sectors from 1980 to 2008, using VAR model. The findings revealed that monetary policy transmission via credit is weak due to structural bottlenecks such as high collateral requirements, poor credit access for SMEs, and regulatory inconsistencies.
Akinbobola and Ibrahim (2021) examined the impact of monetary policy on credit supply and real sector output in Nigeria from 1981 to 2019, using an ARDL approach. The results showed that while monetary policy instruments (interest rates, money supply) influence credit availability, high lending rates and financial sector inefficiencies reduce the impact of credit on real sector growth.

Marshal *et al.* (2021) ascertained the credit channels of transmitting monetary actions into the economy from 1960 to 2016, using VAR model. The study revealed that there exists a long run equilibrium relationship between credit channels and economic growth in Nigeria. Also, credit to private sector, credit to government have a positive significant impact with economic growth. While, credit to small and medium enterprises has negative relationship with economic growth.

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Obidike (2021) investigated the transmission channels of monetary policy shocks on real per capita output in Nigeria from 1981 to 2017, using Vector Autoregressive (VAR) framework to analyze the responses of macroeconomic variables to monetary policy shocks. Findings from the study revealed that Real per capita output, exchange rate, private sector credit, and inflation respond heterogeneously to monetary policy shocks, indicating varying effectiveness of different transmission channels.

Emeka *et al.,* (2021) examined the transmission channels of monetary policy shocks on real per capita output in Nigeria for the period 1981 to 2021, using vector auto-regressive approach. The results of the impulse response functions showed that private sector credit, real per capita output, exchange rate, and inflation responded heterogeneously to unexpected monetary shock and hence, provide a useful indicator for determining the effectiveness of monetary policy in the domestic economy. In the case of the forecast error variance decomposition the study revealed that shocks to monetary policy rate explained the largest variation in real per capita output followed by private sector credit and exchange rate.

Adegbite and Oloruntoba (2020) evaluated how monetary policy affects real output through the credit and interest rate channels in Nigeria, employing a Nonlinear ARDL approach. The results showed significant asymmetries, with credit expansions having stronger positive effects on output than contractions, particularly in the industrial and SME sectors.

Eze and Okonkwo (2019) assessed the dynamic relationship between credit to the private sector and Nigeria's economic growth using quarterly data from 2000 to 2017, employing a VECM model. Their findings confirmed a long-run relationship, with private sector credit exerting a significant impact on output.

Ismaila and Awoyemi (2018) analyzed the responsiveness of real sector output to changes in credit availability, using data from 1981 to 2016. Using the ARDL model, they found that while private sector credit had a positive and significant impact, credit to government had a crowding-out effect on real sector output.

Ogundipe and Oluwatobi (2017) studied the transmission mechanism of monetary policy in Nigeria by comparing the effectiveness of credit, interest rate, and exchange rate channels from 1980 to 2015 using VAR. The credit channel was found to be the most consistent in explaining real sector movements, especially in the manufacturing sector.

From the reviewed studies, it could be noticed that most previous studies, including Ogunleye (2021), Obidike (2021), Marshal *et al.* (2021), Emeka *et al.* (2021), Akinbobola and Ibrahim (2021) Olayemi (2022) and Owolabi and Adegbite (2022) among other studies relied on ARDL and Vector Autoregression (VAR) models, which assume a linear relationship between monetary policy credit transmission and real sector output. However, economic relationships, particularly in developing economies like Nigeria are often nonlinear due to financial market imperfections and asymmetric policy responses.

Methodology

Model Specification

In order to achieve objective of the study, the study adapted the Non-linear Autoregressive Distributed Lag (NARDL) Model credited to Shin, *et al.* (2014). Based on theoretical review

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and previous empirical work of Marshal *et al.* (2021), the monetary policy credit transmission mechanism was modeled taking into consideration the three credit channels to be parts of the explanatory variables as stated in the work of Marshal *et al.* (2021); credit to private sector, credit to small and medium enterprises and credit to government.

$$RGDP_t = f\,(CPS_t, CSM_t, NDC_t, CGO_t) \quad (1)$$

Economic growth is replaced with real sector output, because this study focused on real sector output. NDC in equation 1 is excluded because it considered as total amount of private sector and government credits. Hence, real sector output effects on three economic agents is targeted in this study. Also, Marshal *et al.* (2021) assumes a linear relationship between these credit transmission channels and real sector output.

Linearly, the model for this study is, thus expressed algebraically as:

$$RSO_t = f\,(CPS_t, CSM_t, CGO_t) \quad (2)$$

Where:

RSO = Real Sector Output, measured as annualized % contribution of the industrial sector to GDP.

CPS = Credit to Private Sector, measured as domestic credit to the private sector as a % of GDP

CSM = Credit to small and medium enterprises, measured as SME loans as a % of total bank credit

CGO = Credit to Government, measured as domestic credit to the government as a % of GDP

Econometrically, equation (2) is rewritten to have the estimable version of equation (3)

$$LRSO_t = \propto_0 + \beta_1 LCPSt + \beta_2 LCSMt + \beta_3 LCGOt + \varepsilon_t \quad (3)$$

Where;

$\propto_0$ = intercept parameter, β_1 to β_3 = are the slope parameters, ε_t = error term

Taking the model non-linearity form of equation (3) adapted from the work of Le *et al.* (2019), but differs from those of the authors in choices and measurements of variables of the model. The NARDL model has the capacity of showing how the positive (POS) and negative (NEG) changes of credit transmission channel impact, simultaneously, on real sector output.

The positive and the negative partial sums for the non-linear ARDL model are defined formally as:

$$LCPS_t^+ = \sum_{j=1}^{t} \Delta CPS_j^+ = \sum_{j=1}^{t} max(\Delta \mathrm{LCPS}_j, 0) \quad (4)$$

$$LCPS_t^- = \sum_{j=1}^{t} \Delta CPS_j^- = \sum_{j=1}^{t} min(\Delta \mathrm{LCPS}_j, 0) \quad (5)$$

$$LCSM_k^+ = \sum_{j=1}^{t} \Delta CSM_k^- = \sum_{j=1}^{t} max(\Delta \mathrm{LCSM}_k, 0) \quad (6)$$

$$LCSM_k^- = \sum_{j=1}^{t} \Delta CPS_k^- = \sum_{j=1}^{t} min(\Delta \mathrm{LCSM}_k, 0) \quad (7)$$

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$$LCGO_l^+ = \sum_{j=1}^{t} \Delta CGO_l^+ = \sum_{j=1}^{t} max(\Delta \mathrm{LCGO}_l, 0) \quad (8)$$

$$LCGO_l^- = \sum_{j=1}^{t} \Delta CGO_l^- = \sum_{j=1}^{t} min(\Delta \mathrm{LCGO}_l, 0) \quad (9)$$

Substituting equation 4 – 9 into the NARDL model adapted from Le *et al.* (2019), provides equations (10):

$$\Delta LRSO_t = \alpha + \sum(\beta_{o,i} . \Delta LRSO_{t-i}) + \sum(\beta_{1,j}^+ . \Delta LCPS_{t-j}^+) + \sum(\beta_{1,j}^- . \Delta LCPS_{t-j}^-) + \sum(\beta_{2,k}^+ . \Delta LCSM_{t-k}^+) + \sum(\beta_{2,j}^- . \Delta LCSM_{t-k}^-) + \sum(\beta_{3,l}^+ . \Delta LCGO_{t-l}^+) + \sum(\beta_{3,l}^- . \Delta LCGO_{t-l}^-) + \gamma_0 . LRSO_{t-1} + \gamma_1^+ . LCPS_{t-1}^+ + \gamma_1^- . LCPS_{t-1}^- + \gamma_2^+ . LCSM_{t-1}^+ + \gamma_2^- . LCSM_{t-1}^- + \gamma_3^+ . LCGO_{t-1}^+ + \gamma_3^- . LCGO_{t-1}^- + \varepsilon_t \quad (10)$$

β_1, to β_3, is the short run parts of the model

γ_1 **to** γ_3 is the long run parts of the model

ε_t is the error term

The {+}and {–} notations denote the partial sums of positive and negative changes of the credit transmission mechanisms.

Types and Sources of data

The study utilized secondary time-series data for the analysis, from 1980 to 2023. The data were obtained from the World Bank Development Indicators (WDI). The variables on which data were collected are the Real sector output (RSO), credit to private sector (CPS), credit to small and medium enterprises (CSM) and credit to government (CGO).

Results and Discussions of Findings

Descriptive Statistic

Table 1
Result of Summary Statistic

Variables	RSO	CPS	CSM	CGO
Mean	3.3808	2.8160	2.1988	4.0498
Median	3.3962	2.6711	2.1212	4.2289
Maximum	3.6698	4.6563	2.9768	4.3838
Minimum	2.8999	2.2042	1.6009	2.4357
Std. Dev.	0.1811	0.4563	0.3527	0.4848
Skewness	0.5775	1.4815	0.2233	2.3513
Kurtosis	2.7628	6.8474	2.1516	7.7361
Jarque-Bera	2.5495	43.235	1.6855	81.669
Probability	0.2794	0.0000	0.4305	0.0000

Source: Researcher's Computation using e-views 12

Table 1 shows the result of summary statistic for RSO, CPS, CSM and CGO. Based on the result, the mean for all the variables are positive and are as small as possible. Also, the standard deviations for all the variables are as small as possible, suggesting that the estimated values for RSO, CPS, CSM and CGO are not significantly different from their true values. Furthermore, the result shows that all the variables are positively skewed to the right while their estimated kurtoses fall within acceptable limit of +3 or -3, except that of CPS and CGO. Again, the probability values of Jarque-Bera for two of the variables, except CPS and CGO, are insignificant at 0.05% level of significance. This suggests that all the variables of the study are normally distributed.

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Lag Selection Criteria

Table 2
Result of Lag Selection for Bound Co-integration Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	18.50	NA	5.79e-06	-0.707	-0.540	-0.646
1	100.8	144.6*	2.29e-07*	-3.943*	-3.107*	-3.639*
2	115.5	23.02	2.49e-07	-3.882	-2.377	-3.334
3	131.2	21.44	2.69e-07	-3.867	-1.694	-3.076

Source: Researcher's Computation using e-views 12

Table 2 above shows the lag length selection criteria. From the table, lag order one was selected for this study as indicated by Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn Information (HQ). Thus, one lag was chosen.

Unit Root Test of Stationarity

Table 3: Results of Kwiatkowski-Phillips-Schmidt-Shin's (KPSS) and the Elliott-Rothenberg-Stock Point (ERS) Unit Root Tests of Stationarity

Variables	**KPSS Level**	**KPSS Difference**	**Remarks**	**ERS Level**	**ERS Difference**	**Remarks**
RSO	0.1137*****	0.3348	I(0)	9.3244*	2.5077	I(0)
CPS	0.2233	0.0773*****	I(1)	2.2069	14.339*	I(1)
CSM	0.1185*	0.1639	I(0)	14.583*	0.8830	I(0)
CGO	0.1822	0.1383*****	I(1)	54.853*	4.0277	I(0)
KPSS critical value at 5% = 0.146000				ERS critical value at 5% = 5.720000		
H_0 KPSS: Variables are stationary				H_0 ERS: Variables are not stationary		

** denote stationary at 5% level of significant*
Source: Researcher's Computation using e-views 12

Table 3 shows the result of KPSS and ERS unit root tests using Newey-West Bandwidth and spectral estimation. The KPSS results, at 5% level of significance indicates that RSO and CSM are stationary at levels. Because their KPSS tests statistic at levels are less than their KPSS critical value at 5% level of significance. This implies that RSO and CSM are integrated of order zero [I (0)] while CPS and CGO are stationary at first difference [I (1)]. For ERS result however, at 5% level of significance indicates that RSO, CSM, CGO are stationary at levels [I (0)]. Because their ERS tests statistic are greater than their ERS p-statistic at levels. While CPS is stationary at first difference [I (1)]. Thus, the results of KPSS and ERS tests suggests that the variables are integrated of different orders.

F-Bound Co-integration Test for NARDL

Table 4
Result of NARDL Bound Co-integration Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significant.	I(0) Bound	I(1) Bound
F-statistic	19.14	10%	2.12	3.23
K	6	5%	2.45	3.61**
		2.5%	2.75	3.99
		1%	3.15	4.43

Source: Researcher's Computation using e-views 12
*** indicate significant at 5% level of significance*

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Table 4 shows the result of F-Bound test conducted to determine the existence of long run relationship among credit transmission channels and real sector output. The result revealed that the F- statistic is 19.14, however, the value is greater than 5% critical values. Therefore, the null hypothesis of no levels relationship is rejected and concluded that the variables of the study have a long run equilibrium relationship. This advanced the finding of Marshal *et al*. (2021).

Long-Run NARDL Model

Table 5
Result of Long-Run NARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPS_POS	0.4563	0.4759	0.9587	0.0345**
LCPS_NEG	-0.3188	0.6761	-0.4715	0.6407
LCSM_POS	0.3510	0.4493	0.7811	0.0409**
LCSM_NEG	-1.1679	0.4544	-2.569	0.1054
LCGO_POS	0.0586	0.2995	0.196	0.0463**
LCGO_NEG	0.9169	0.8105	1.131	0.2669
C	2.2842	0.8830	2.586	0.0148

Source: Researcher's Computation using e-views 12
*** indicate significant at 5%*
POS signifies Positive
NEG signifies Negative

Table 5 presents result of long run NARDL estimated coefficients. The result reveals that POS credit to private sector (CPS) has a positive and significant impact on real sector output in Nigeria. While the NEG credit to private sector has a negative and insignificant impact on real sector output in Nigeria. This means that when credit to private sector increases, it leads to a significant increase in real sector output. The significance suggests that higher credit allocation to the private sector enhances investment, production and overall economic growth. This agrees with the prior expectation that a higher CPS should lead to increase in real sector output and confirmed the empirical findings of Ogunleye (2021) and Marshal *et al*. (2021).

Similarly, POS credit to small and medium enterprises (CSM) has a positive and significant impact on real sector output. While NEG credit to small and medium enterprises has negative and insignificant impact on real sector output in Nigeria. This means that an increase in SME credit leads to a significant boost in real sector output. The significance suggests that more financing for SMEs enhances investment, production, job creation and economic growth in Nigeria. This also agrees with the prior expectation that more SME credit leads to higher real sector output but this contradicts findings of marshal *et al.* (2021).

Moreover, POS and NEG credit to the government have a positive but significant impact for POS CGO on real sector output in Nigeria. This means that an increase in government borrowing leads to a significant increase in real sector output in Nigeria. The significance suggests that government credit is effectively used to boost economic activities, especially in infrastructures, industrial development and public investment projects. The positive effect justified the prior expectation that if government borrowing is productive, it should enhance real sector output. This finding contradicts the finding of Obidike (2021).

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Short-Run NARDL Model

Table 6
Result of Short-Run NARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCPS_POS)	0.0353	0.0716	0.4939	0.0249**
D(LCPS_NEG)	-0.3886	0.2897	-1.341	0.1899
D(LCSM_POS)	0.1301	0.1509	0.8624	0.0353**
D(LCSM_NEG)	-0.4330	0.1611	-2.687	0.1016
D(LCGO_POS)	0.0217	0.1123	0.1932	0.0481**
D(LCGO_NEG)	-0.3399	0.2237	-1.519	0.1391
CointEq(-1)	-0.3707	0.1563	-2.372	0.0243
R^2	0.7998	F-statistic	11.983	
Adjusted R^2	0.7330	D-W stat	1.6917	

Source: Researcher's Computation using e-views 12
*** indicate significant at 5% level*

Table 6 presents result of short run NARDL estimated coefficients. The error correction mechanism happens to be negative and statistically significant at 5% level of significance. The result also reveals that POS credit to private sector (CPS), POS credit to small and medium enterprises (CSM) and credit to the government (CGO) have a positive and significant impact on real sector output in Nigeria in the short run, which happens to be the same with the findings of the long run. While the NEG credit to private sector, NEG credit to small and medium enterprises and NEG credit to government have a negative and insignificant impact on real sector output in Nigeria in the short run. This means that when credit to private sector, credit to SMEs and government increase, it leads to a significant increase in real sector output in Nigeria. The significance suggests that higher credit allocation to the private sector, SMEs and government enhances investment, production and overall economic growth. This agrees with the prior expectation that a higher CPS, CSM and CGO should lead to increase in real sector output. The R-squared of the model shows that about 79% of the variation in real sector output is explained by the combined positive and negative effects of all the determinants of real sector output used in this study, suggesting that about 21% variation in real sector output is accounted for by the other factors not included in the model. Hence, the model has a good fit. The F-statistic is high, which implies that the parameters are significant. The D-W value is close to 2, this implies that there is evidence of negative autocorrelation in the data set used for this study.

Wald Test for NARDL

Table 7
Result of Wald Test for NARDL

Test Statistic	Value	Df	Probability
F-statistic	7.581	(3, 29)	0.7000
Chi-square	22.75	3	0.3256

Source: Researcher's Computation using e-views 12
*** indicate significant at 5% level*

Table 7 shows the results of the joint asymmetries. The null hypothesis of the test is that addition of partial sum of the decomposition of credit channels of monetary transmission into positive (+) and negative (-) changes is not important. Based on the wald test F-Statistic, the P-

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values are positive and statistically significant at 5% level of significance. Hence, the null hypothesis is rejected. This indicates that there exists an asymmetric effect of credit transmission channels on real sector output in Nigeria both in the short run and long run over the period of this study.

Post-Estimation Diagnostic Tests

Table 8
Result of Breusch-Godfrey Serial Correlation LM Test

F-statistic	3.601	Prob. F(2,28)	0.4006
Obs*R-squared	8.389	Prob. Chi-Square(2)	0.1051

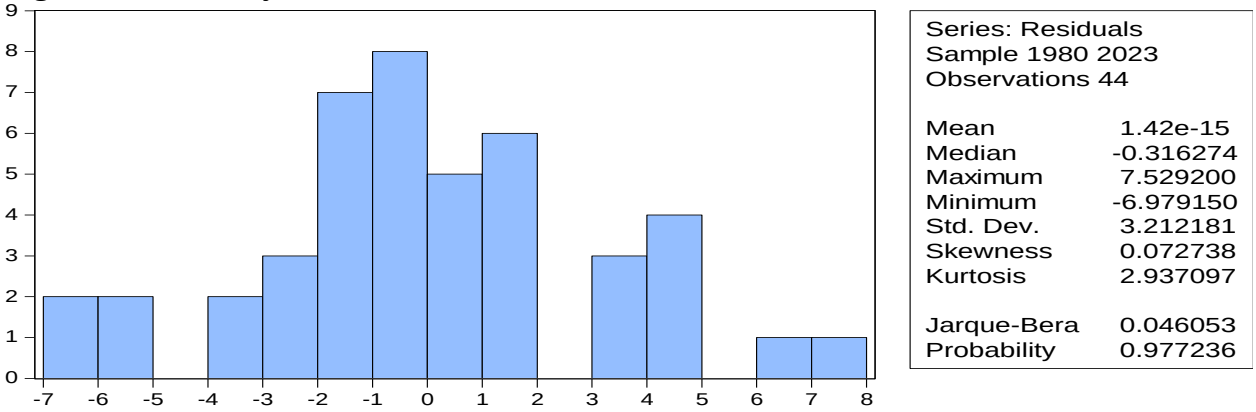
Result of Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.4721	Prob. F(10,30)	0.8948
Obs*R-squared	5.5749	Prob. Chi-Square(10)	0.8496
Scaled explained SS	4.8788	Prob. Chi-Square(10)	0.8991

Source: Researcher's Computation using e-views 12
*** indicate significant at 5% level*

Table 8 shows the post estimations statistic tests for the variables of the study. The serial correlation LM test has a probability values of 0.4006 and 0.1051 which are greater than 0.05%. This suggests that there is absence of autocorrelation in the model. Similarly, the probability values for the test of heteroskedasticity are greater than 0.05%, implying that the series are homoscedastic.

Figure 1: Normality Test



Source: Researcher's Computation using e-views 12

Figure 1 shows that the Jarque-Bera normality probability value is 0.9772, which is greater than 0.05% level of significance. Hence, the null hypothesis that the error terms of the data used in the study are normally distributed cannot be rejected.

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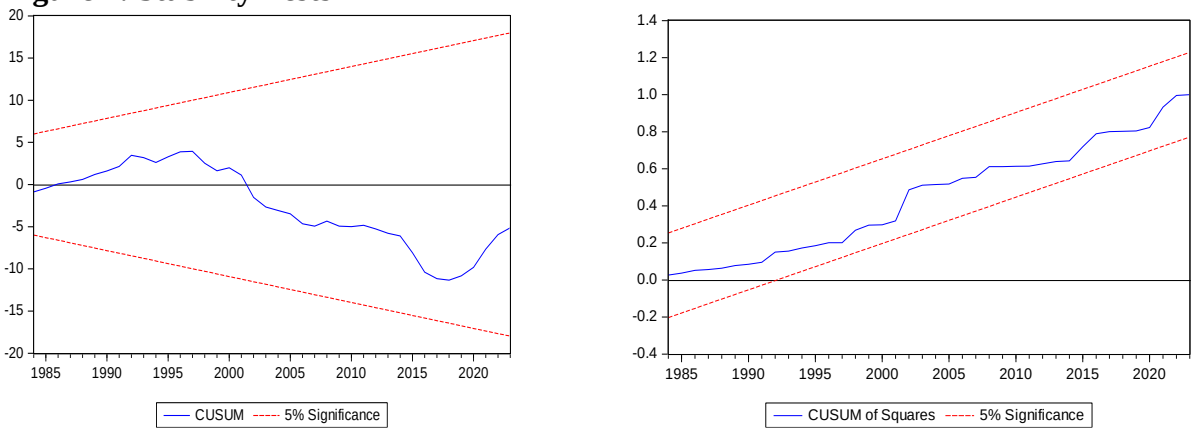
Figure 2: Stability Tests



Source: Researcher's Computation using e-views 12

Figure 2 shows that the result passed stability test. This is because the CUSUM plots does not cross either of the 5% critical lines. Therefore, it could be concluded that the estimated parameters for the study are stable and can be used for policy making.

Conclusion and Recommendations

The study concludes that the effectiveness of monetary policy transmission in Nigeria is largely asymmetric, with expansionary credit interventions yielding more meaningful outcomes than contractionary ones. Specifically, the positive and significant impact of credit expansion whether directed to the private sector, SMEs, or government highlights the real sector's responsiveness to increased liquidity and credit availability. This underscores the critical role of inclusive and well-targeted credit policies in stimulating productive activities and fostering economic growth. Conversely, the insignificance of contractionary credit measures suggests that monetary tightening, especially through credit restrictions, does not produce a proportionate slowdown in real sector performance. This asymmetry implies that policymakers should prioritize and sustain credit enhancing measures over restrictive approaches to effectively drive output growth in Nigeria's real economy.

In line with the findings, it is recommended that:

I. The Central bank of Nigeria (CBN) should implement policies that lower borrowing costs and encourage financial institutions to increase lending to the private sector. This can be achieved by adjusting the monetary policy rate to more favourable levels, thereby reducing interest rates for borrowers.

II. In addition, the Federal Ministry of industry, trade and investment, in collaboration with the bank of industry (BOI) and other development finance institutions, should develop targeted, programs to improve SME's access to credit. This includes creating low interest loan schemes backed by the government, reducing collateral requirements by accepting movable assets and establishing a national SME credit fund through public-private partnerships. Such initiatives can enhance the growth and sustainability of SMEs which are vital to Nigeria's economy.

III. Furthermore, the Federal Ministry of finance, budget and National planning along with the debt management office (DMO), should ensure that government borrowing is allocated to projects that yield economic benefits such as infrastructural development and industrial expansion. Implementing a public investment efficiency framework can help to monitor and evaluate the effectiveness of these investments.

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