Agriculture Financing for Output Growth: A Focus on Livestock Production in Nigeria

Eruba Dimgba[1], Rachael Morris[2] & Adibe A. Okuduwor [3]
[1]Niger Delta Development Commission (NDDC), Port Harcourt – Nigeria
[2&3]Department of Agricultural and Applied Economics, Rivers State University Port Harcourt – Nigeria

ABSTRACT

In this study, the effect of agriculture financing such as the agricultural credit guarantee scheme fund, bank loans and advances to agriculture, and foreign aid to agriculture on livestock production was examined in Nigeria from 1981 to 2021. Annual time series data for each of the variables were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and the Organisation for Economic Cooperation and Development (OECD) Statistics. The method of data analysis includes descriptive statistics, a parsimonious error correction model (ECM), and diagnostic tests. Evidence of the first difference stationary processes was established from the unit root test results. This indicates that the variables are all integrated of order one, I(1). The Johansen cointegration test results show that the variables in the model have a long-run relationship. The parsimonious ECM shows that the agriculture credit guarantee scheme fund has a positive and significant effect on livestock output. The estimated parameters show that a 1% increase in the current value of the agriculture credit guarantee scheme fund leads to a 0.0244% increase in livestock output. Similarly, it was found that livestock output increased by 0.0183% following a 1% increase in the first-lag agriculture credit guarantee scheme fund. The findings highlight the importance of agriculture financing in boosting the growth of livestock production in Nigeria. The results further show that bank loans and advances, as well as foreign aid to agriculture, negatively and significantly affected livestock production. The error correction coefficient (-0.297) is negative and significant at the 5% level. This indicates that about 29.7% of distortions from long-run equilibrium will be adjusted each year. Given the findings, this study recommends that policymakers ensure that agriculture financing prioritises poultry production by allowing for adequate provisions of agriculture credit guarantee scheme funds to poultry farmers.

Keywords: Agriculture financing, livestock production, bank loans, foreign aid and agriculture credits

1. Introduction

Agriculture financing is said to include a development plan aimed at providing farmers with financial resources to encourage investment and increase output over the long run. As an important source of funding, agriculture credits provide the pathway for the transformation of the agriculture sector and promote the participation of farmers in the development process (Adewale *et al.,* 2022). Adesanya and Ajala (2022) posit that credit availability to the agriculture sector improves farmers' productivity, food security and agriculture value added to economic growth. In Nigeria, access to agriculture credits has been a challenge to the majority of farmers in Nigeria because they lack the collateral needed to get credit from formal financial institutions. It is also worrisome that financial institutions tend not to lend to the agricultural sector because they perceive it to be high-risk and associated with low returns. The socioeconomic characteristics of Nigerian farmers have also made it difficult for them to access the credit required to improve agricultural productivity and contribute to economic growth. The poor adherence to sectoral credit allocation guidelines by deposit money banks (DMBs) and the lopsided attitude of the government to agricultural development have continued to impair sustainable investment in agriculture with low poverty reduction outcomes.

Furthermore, credit facilities are not easily accessible to small-scale farmers in Nigeria. According to Nwankwo (2017), the high cost of managing such loans and the alleged high default rates among farmers as the reasons for their limited access to agricultural loans. Although DMBs are expected to play a prominent role in the process of financial intermediation by providing loans to the agricultural sector, it is worrisome that smallholder farmers continue to lack access to adequate financing and the anticipated change for enhanced accessibility to agricultural loans and subsequently increased agricultural productivity for economic growth remains a mirage.

In addition, credit institutions in Nigeria seem not to have consistent credit policies which can assist farmers in accessing credit and enhance the contribution of the agriculture sector to GDP growth. Similar issues, such as late loan release or payment and diversification of funds by financial institutions for non-agricultural uses, equally affect farmers' access to credits in Nigeria. It is also pertinent to note that the informal or non-institutional sources of agricultural credit are insufficient and unreliable in terms of financing agriculture production in Nigeria. The low level of monitoring and evaluation of financial policies, the lack of trained staff to manage financial resources allocated to agricultural investment and policy inconsistency have been identified as barriers to the effectiveness of agricultural credits.

Despite the huge efforts to make agricultural credits available to farmers and other agro-allied businesses, the average farmer in Nigeria still experiences difficulties in accessing agricultural credit which has affected their productivity and subsequent contributions to GDP growth. This has raised concerns about the intended and desired agricultural value added in Nigeria. In view of the growing concerns about the credit-led growth implications of agriculture financing, this study examined how agricultural credits have contributed to the growth of livestock output in Nigeria between 1981 and 2021.

2. Literature Review
2.1 Theoretical Literature

The supply-leading hypothesis, which was first put forth by Schumpeter (1911), provides the theoretical foundation for this study. According to the hypothesis, an increase in financial services is a key factor in both financial intermediation and economic expansion. This hypothesis has been further developed, among others, by Gurley and Shaw (1967) and McKinnon (1973). According to the notion, the financial sector is essential for providing services that have been seen as crucial to the growth of the economy. According to Ohwofasa and Aiyedogbon (2013), the supply-leading hypothesis is based on the assumption that efficiently operating financial institutions have the potential to boost overall economic efficiency, create and increase liquidity, mobilise savings, encourage capital accumulation, and shift resources away from growth-disrupting sectors towards sectors that can bolster it.

In addition, Mckinnon (1973) and Shaw (1973) assert that improved financial intermediation results from an efficient financial sector's tendency to lower transaction and monitoring costs as well as asymmetric knowledge. It is anticipated that this will encourage economic development and present chances for rapid and sustained economic growth. According to the supply-leading hypothesis, financial intermediaries lower costs related to the transfer of wealth or knowledge between individuals and firms by removing market frictions. This is based on the premise that financial intermediaries encourage economic growth and efficiency because they help allocate capital to its best use.

The notable argument of the supply-leading hypothesis is that economic growth and financial development genuinely have a causal relationship that runs from one to the other. As a result, the prerequisite for the optimal financial resource allocation for economic growth is seen as financial deepening that opens up credit. According to proponents of the supply-leading hypothesis, the degree of financial development greatly influences real-sector financing including agriculture. This emphasises how important financial sector is in fostering widespread financial intermediation. Despite the significant contributions of the supple-leading hypothesis to financial literature, it has been criticized for ignoring the role the real sector plays in promoting financial development.

2.3 Empirical Literature

Magaji and Yisa (2023) employed a survey research design anchored on the demand-following theory to empirically examine the impact of agricultural loans by deposit money bank credit on agricultural output in FCT Abuja, Nigeria. The survey covered a sample of 295 farmers selected through a multistage Cluster sampling technique. Data were analysed using descriptive statistics including mean and simple percentages in addition to logit regression analysis for inferential statistics. The results show that access to bank loans for farmers significantly improved the productivity of the farmers in the study area. The recommendation provided based on the findings is that the monetary authorities, especially the CBN ensure that the deposit money banks should provide credits to agricultural loan applicants to increase the level of agriculture funding and encourage more farmers.

Using the employed Fully Modified Ordinary Least Squares (FMOLS) approach, Oyelade (2019) examined the impact of commercial bank credits on agricultural output in Nigeria between 1980 and 2015. Specifically, the study examined how commercial bank credit, deposit money bank

assets and interest rates affected the subsector of agriculture in Nigeria. The datasets for the variables were obtained from the CBN Statistical Bulletin. The long-run results show that commercial banks' credit to agriculture and deposit money bank assets are statistically significant in determining agricultural output. The results also show that the interest rates on commercial bank credit significantly affected the output of fishing in Nigeria. Additionally, the results show that commercial bank loans on agriculture and interest rates on commercial banks' credit to agriculture determine the output of livestock production in Nigeria. To this end, the study recommends that commercial banks in Nigeria should scale up their loan provisions to agriculture to the improve performance of both the subsector and the overall sector of agriculture in Nigeria.

Orok and Ayim (2017) examined the development implications of the Agricultural Credit Guarantee Scheme Fund (ACGSF) in Nigeria. Specifically, the study examined how the ACGSF affected the output of the crop sector, livestock sector and fishery sector in Nigeria which were measured by respective gross domestic product. Secondary data were sourced from the CBN Statistical Bulletin and analysed using the ordinary least square (OLS) model. The results show evidence of a positive and significant relationship between ACGSF and the agricultural sector development. The study also revealed that the scheme had given more funds and impacted the crop sector over the livestock and fishery sectors. Therefore, the study recommends among others that the scheme should be sustained and government should invest more in agricultural development to boost food security.

Using secondary data from the CBN Statistical Bulleting and OLS for data analysis, Okafor (2020) examined the impact of commercial bank credit on agricultural development in Nigeria. Essentially, the study examined the specific impact of bank credit, government expenditure, Agricultural Credit Guarantee Scheme Fund and interest rates on agricultural output in Nigeria. In addition, the study conducted a unit root test on each of the series using the econometric techniques of augmented Dickey-Fuller and Philip-Perron tests. The results show that credit to the agricultural sector, government spending on the agricultural sector and agricultural credit guarantee scheme fund have positive and significant effects on agricultural output while interest rate has negative and insignificant effect on agricultural output. Thus, the study concludes that commercial bank credit has a positive effect has increased agricultural production in Nigeria within the period under review. The study recommends that the government should strengthen the agricultural credit guarantee scheme by meaningful budgetary allocation in order to enhance its capital base significantly.

Reuben, Nyam and Rukwe (2020) examined the effect of the Agricultural Credit Guarantee Scheme Fund (ACGSF) on agricultural GDP growth in Nigeria between 1998 and 2007. Secondary data were sourced from the CBN Statistical Bulletin, National Bureau of Statistics (NBS) and other financial bulletins. The data were analysed using descriptive and inferential statistics. Findings and value-added: The trend revealed that the supply of funds to the agricultural sector from the scheme has always increased in a wobbly pattern. It was found that funds guaranteed to the crop sub-sector increased steadily from 1998 to 2009. The result shows that the coefficients of ACGSF on the crop sector, livestock sector and fishery sector were 0.1607, 0.2320 and 0.2110 respectively. This finding indicates that ACGSF significantly increased the output of livestock, crop and fishery activities in Nigeria during the study period. Thus, the study concludes that ACGSF is important in promoting the growth of agricultural output in Nigeria. To this end,

the study recommends that the government, agricultural agencies and allied bodies should prioritise the ACGSF to create more opportunities for an increase in agricultural production.

3. Methodology

3.1 Data Description

The secondary datasets were used in this study for each of the variables. In essence, livestock production represents the CBN's estimate of the monetary value of livestock output. On the other hand, the Agricultural Credit Guarantee Scheme Fund defines the credit initiative of the Federal Government under the management of the Central Bank of Nigeria intended to ensure that banks increase lending to the agricultural sector by providing guarantees against the inherent risks. While bank loans and advances to agriculture embody the loans provided to the agriculture sector by DMBs in accordance with the sectoral credit allocation, foreign aid to agriculture is measured by the credits provided by foreign institutions to the agriculture sector in accordance with the sector-specific aid. The datasets were obtained from the CBN Statistical Bulletin and OECD) Statistics over the study period (1981-2021).

3.2 Model Specification

The paper closely follows the work of Magaji and Yisa (2023), but with modifications following the expanding the scope of agricultural credits and taking into consideration the foreign aid to agriculture. The model is specified functionally as:

$$LIVS = f (ACSF, BLAA, FAGR) \tag{1}$$

Where: LIVS = Livestock production, ACSF = Agriculture credit guarantee scheme fund, BLAA = bank loans and advances to the agriculture sector and FAGR = foreign aid to agriculture.

The error correction model (ECM) of the deterministic equation is expressed as:

$$\Delta InLIVS = m_0 + \sum_{i=1}^{n} v_1 \Delta InLIVS_{t-i} + \sum_{i=1}^{n} v_2 \Delta InASCF_{t-i} + + \sum_{i=1}^{n} v_3 \Delta BLAA_{t-i} + \sum_{i=1}^{n} v_4 \Delta InFAGR_{t-i} + \varphi ECT_{t-1} + U_t \tag{2}$$

M_0 = constant term, V_1–V_4 = short-run coefficients of the explanatory variables, n = lag selection operator, Δ = first difference operator, ECT = error correction term, φ= Error correction coefficient and U_t = lag length

3.2 Data Analysis Techniques

The econometrics technique of error correction model (ECM) proposed by Engel and Granger (1987) formed the basis for exploring the short-term dynamic effects of agricultural credits on livestock production in Nigeria. The choice of these estimation techniques is necessitated by the evidence of the first difference stationary and cointegrated series. In addition to the ECM, descriptive and diagnostics tests for unit root, cointegration, serial correlation, heteroscedasticity and normal distribution of the residuals among others. Essentially, the descriptive statistics of mean, minimum and maximum values and standard deviation among others. The Phillips-Fuller (PP) test proposed by Phillips and Perron (1988) was utilized to test for unit root in the variables. The general specification of the Phillips and Perron unit root test involving an intercept and linear trend is of the form:

$$\Delta Y_t = \propto_0 + \propto_{1t} + \sum_{i=1}^{K} \beta_i \Delta Y_{t-i} + u_t \tag{3}$$

Where = Y_t = underlying economic time series under investigation, Y_{t-1} = one period lag of the underlying economic variable under investigation, β_i = regression estimate, $\propto_0$ = constant term, $\propto_{1t}$ = deterministic or linear trend, K = maximum lag length and U_t = Random error term.

More so, the Johansen (1988) system of cointegration was applied in carrying out this test. The Max-Eigen statistic and Trace statistic form the basis for rejecting the null hypothesis of no cointegration among the underlying variables.

4. Results and Discussion

4.1 Descriptive Statistics

The descriptive statistics for each of the variables are summarized in Table 1.

Table 1: Summary of descriptive statistics

	LIVS	ACSF	BLAA	FAGR
Mean	710.0477	3220109.	192.6138	37.46263
Median	570.0829	728545.4	48.56150	10.63800
Maximum	1240.215	12456251	1457.822	120.3020
Minimum	341.4115	24654.90	0.590600	4.118000
Std. Dev.	302.9442	3898679.	317.8070	40.33367
Jarque-Bera	4.80102	5.860276	84.00576	6.103234
Probability	0.09067	0.053390	0.000000	0.047282
Observations	41	41	41	41

Source: Researchers' computation from E-views 12

It was observed from the descriptive statistics that livestock production averaged NGN710.0477 billion with minimum and maximum values of NGN 341.4115 billion and NGN1240.215 billion respectively. The findings also revealed that during the study period, bank loans and advances to the agricultural sector and the agriculture credit guarantee scheme fund averaged NGN 192.6138 billion and NGN 3220109 thousand, respectively, while foreign aid to agriculture had a mean value of $37.46263 million. In addition, the standard deviation showed that the observations for livestock production clustered around the mean values given that it is associated with a relatively low standard deviation. The results also showed that livestock production is normally distributed at a 5 per cent significance level based on the fact the probability value of its Jarque-Bera statistic is greater than 0.05. However, the other variables for the investigation were not normally distributed as their Jarque-Bera statistics are associated with probability values which are less than 0.05. This finding could be linked to the outlier in the series distribution.

4.2 Unit Root Test

The unit root test was conducted using the Phillips-Perron method. The results are reported in Table 2.

Table 2: Summary of Phillips-Perron unit root test results

Variable	Adjusted t-stat. at levels	Adjusted t-stat. at 1st difference	Order of integration
LOG(LIVS)	-0.31576 (0.9135)	-3.95355 (0.0040)	I(1)
LOG(ACSF)	-1.0372 (0.7306)	-5.6550 (0.0000)	I(1)
LOG(BLAA)	-0.8624 (0.7897)	-7.1539 (0.0000)	I(1)
LOG(FAGR)	0.0113	-8.2118	I(1)

	(0.9540)	(0.0000)	

Source: Researchers' computation from E-views 12

Note: Figures in parenthesis are the corresponding probability values of the adjusted t-statistics

The results showed that all the variables are not stationary at levels at a 5 per cent significance level. This is because the probability values of the adjusted t-statistics at levels are less than the 5% (0.05) significance level. For this reason, the null hypothesis of a unit root for all the variables cannot be rejected. The variables had to be differentiated due to their nonstationary status, and they were discovered to be stationary at the first difference. In other words, the variables are integrated of order one, I(1). The Johansen (1988) cointegration test was applied to test for long-run relationship among the variables based on evidence first difference stationary in all the variables.

4.3 Cointegration Test
The cointegration test was conducted at the 5 per cent significance level based on the trace and maximum eigenvalue statistics. The results are presented in Table 3.

Table 3: Cointegration test results

Series: LOG(LIVS) LOG(ACSF) LOG(BLAA) LOG(FAGR)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.761357	102.6161	63.87610	0.0000
At most 1 *	0.578169	51.03569	42.91525	0.0064
At most 2	0.290172	19.96230	25.87211	0.2278
At most 3	0.190854	7.623954	12.51798	0.2839
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.761357	51.58037	32.11832	0.0001
At most 1 *	0.578169	31.07338	25.82321	0.0092
At most 2	0.290172	12.33835	19.38704	0.3843
At most 3	0.190854	7.623954	12.51798	0.2839

Source: Researcher's computation from E-views 12

Note: * denotes rejection of the hypothesis at the 0.05 level

The cointegration test results are presented in Table 3. The trace test results show that two cointegrating equations exist in the model. This finding is because of the fact that the computed trace statistics are greater than the corresponding critical values at the 5 per cent significance level. At the same time, the maximum eigenvalue test results show that there are two cointegrating equations in the model. These findings provide significant evidence to reject the null hypothesis of no cointegration. Therefore, it followed from the results that the agriculture credits have a long-run relationship with livestock production. This finding is consistent with the previous results by Uzomba, Nikade and Otokutu (2020), Okafor (2020) and Oyelade (2019) who reported that agriculture financing has a long-run relationship with agricultural output in Nigeria.

4.4 Model Estimation

As previously stated, and given the evidence of the first difference stationary and cointegrated series, this study employed the parsimonious ECM to estimate the effects of agriculture credits on livestock production. The results are presented in Table 4-5.

Table 4: Parsimonious ECM

Dependent Variable: DLOG(LIVS)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(LIVS(-1))	0.280856**	0.119340	2.353423	0.0259
DLOG(ACSF)	0.024463***	0.008545	2.862816	0.0079
DLOG(ACSF(-1))	0.018345**	0.008402	2.183493	0.0375
DLOG(BLAA(-1))	-0.032298**	0.013200	-2.446799	0.0209
DLOG(FAGR(-1))	-0.047433**	0.022785	-2.081768	0.0466
ECT(-1)	-0.29710***	0.080214	-3.703952	0.0009
C	0.027257	0.006998	3.894805	0.0006
R-squared	0.677633	Mean dependent var		0.030234
Adjusted R-squared	0.574015	S.D. dependent var		0.025722
S.E. of regression	0.016788	Akaike info criterion		-5.115334
Sum squared resid	0.007892	Schwarz criterion		-4.684390
Log likelihood	107.1913	Hannan-Quinn criteria.		-4.962007
F-statistic	6.539735	Durbin-Watson stat		1.530409
Prob(F-statistic)	0.000055			

Source: Researcher's computation from E-views 12

Note: * and ** denote significant at 1% and 5% respectively**

The parsimonious ECM presented in Table 4 shows that the first lag of livestock has a positive and significant effect on current livestock production. This finding indicates that livestock output in the previous period can be relied upon to predict future changes in livestock production in Nigeria. The results show that the agriculture credit guarantee scheme fund has a positive and significant effect on livestock output. The estimated parameters show that a 1% increase in the current value of the agriculture credit guarantee scheme fund leads to a 0.0244% increase in livestock output. Similarly, it was found that livestock output increased by 0.0183% following a 1% increase in the first lag of agriculture credit guarantee scheme fund. This finding conforms to the a priori expectation as it highlights the significant positive contribution of the agriculture credit guarantee scheme fund to livestock output growth during the study period. This finding is consistent with the earlier results by Reuben, Nyam and Rukwe (2020); Orok and Ayim (2017) and Abu (2017) who reported that the agriculture credit guarantee scheme fund significantly improved livestock output in Nigeria. The policy implication of this finding is that for Nigeria to increase the livestock production, efforts must be made to increase the availability and access of livestock farmers to the agriculture credit guarantee scheme fund.

The results further show that bank loans and advances to agriculture negatively and significantly affected livestock production. The regression equation shows that livestock output declined by 0.0323% as bank loans and advances to agriculture increased by 1%. Although this finding

deviated from the a priori expectation, it highlights the ineffectiveness of short-term agriculture financing by deposit money banks in promoting livestock production. This finding aligns with the results of Oyelade (2019) who reported that commercial loans to agriculture significantly impacted agriculture sector output in Nigeria. However, this result contradicted the findings of Esan *et al.* (2022) who reported that bank loans and advances do not significantly affect livestock production in Nigeria. Evidence of a negative and significant effect of foreign aid on livestock output was also established from the results. As observed from the estimated parameter, a 1% increase in foreign leads to a 0.0474% decrease in livestock production during the study period. The significant negative effect of foreign aid on livestock production deviated from the findings of Verter (2017) who reported that foreign aid to agriculture significantly improved the growth of agriculture output in Nigeria. The adjusted R-squared (0.5740) shows that 57.40% of the total variations in livestock production are jointly accounted for by changes in the independent variables whereas the probability value (0.0000) of the F-statistic (6.5397) shows that the model is the entire significant at the 5% level. More importantly, the error correction coefficient (-0.297) is negative and significant at the 5% level. This indicates that about 29.7% of distortions from long-run equilibrium will be adjusted each year.

Table 6: Post-estimation test results

Test	Null Hypothesis	Test Type	Test Statistic	Prob
Serial correlation	Serially Independent	Breusch-Godfrey LM test	3.805	0.1492
Heteroscedasticity	Homoscedastic	White's test	11.624	0.2353
Normality	Normally Distributed	Jarque-Bera test	0.852	0.652

Source: Researcher's computation from E-views 12

At the 5% level of significance, the results show that the probability value (0.1492) of the Breusch-Godfrey LM test is greater than 0.05, indicating that the residuals are serially independent. The probability values for the White's and Jarque-Bera test statistics are also more than 0.05, at 0.2353 and 0.652, respectively. This suggests that at the 5 percent level, the residuals are homoscedastic and normally distributed. Overall, the post-estimation test results provide significant evidence for

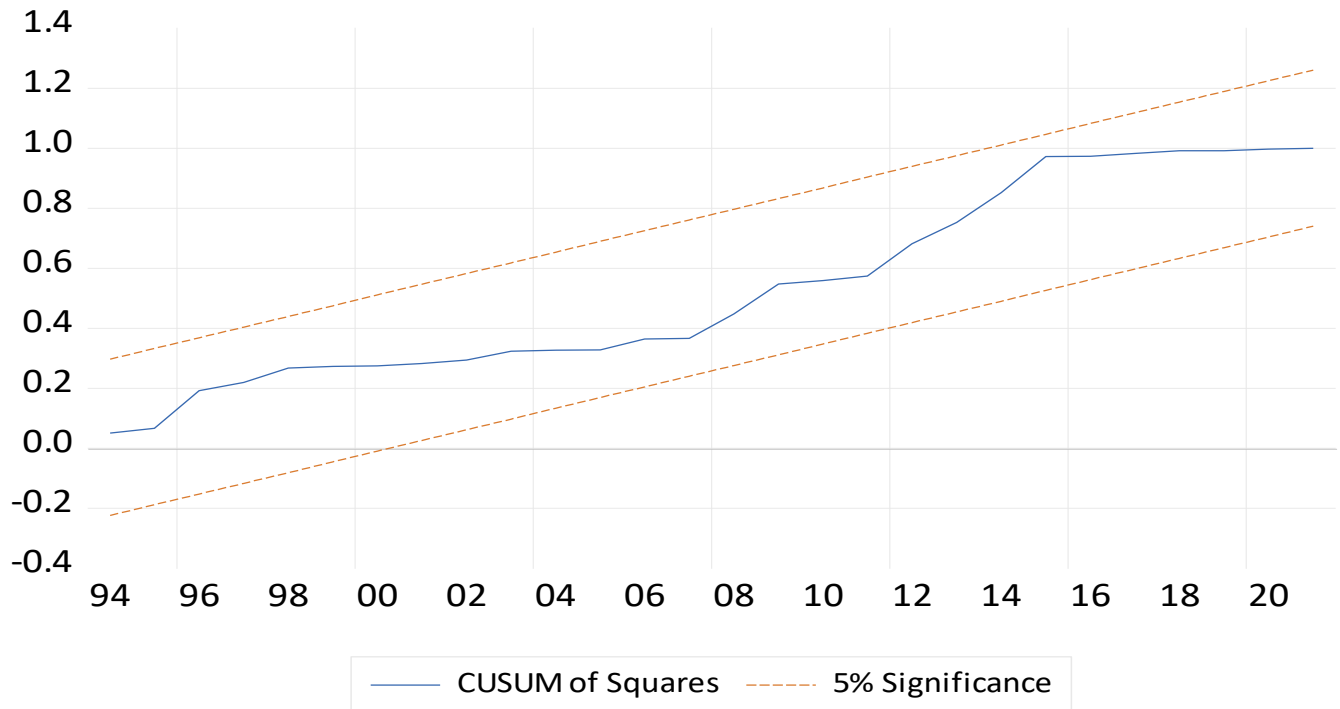the validity of the findings for forecasting and policy purposes.

Figure 1: Cumulative sum (CUSUM) of squares graph

As observed from Figure 1, the CUSUM of squares graph lies within the two critical bounds at the 5% significance level, indicating that the estimated parameters are stable over the study period. This finding authenticates the reliability of the estimated parsimonious ECM.

5. Concluding Remarks

The crux of this study is to deepen the understanding of how agriculture financing schemes contributed to livestock production in Nigeria. This was motivated by the changing dimensions of agriculture financing and the growing importance of livestock in ensuring food security in Nigeria. Thus, this study explored the dynamic effects of agriculture credit guarantee scheme fund, bank loans and advances to agriculture and foreign aid to agriculture on livestock production. The findings show that the agriculture credit guarantee scheme fund significantly increased livestock output during the study period. This finding highlights the importance of agriculture financing in boosting the growth of livestock production in Nigeria. The findings further show that bank loans and advances to agriculture as well as foreign aid to agriculture have adverse effects on poultry production. This explains that poultry farmers in Nigeria have not benefited from bank loans and foreign aid to agriculture. It equally indicates that the growth in bank loans and international aid to agriculture has not translated to output growth in the livestock sub-sector in Nigeria. Given the findings, this study concludes that agriculture financing, especially agriculture credit guarantee scheme fund is imperative for boosting poultry production. It is also concluded from the findings that loans and advances from banks and foreign aid to agriculture are not effective in fostering output growth in the poultry sub-sector. To this end, this study recommends that policymakers

should ensure that agriculture financing prioritises poultry production by allowing for adequate provisions of agriculture credit guarantee scheme funds to poultry farmers.

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