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RESEARCH ARTICLE

COMMERCIAL BANK FINANCING AND DEVELOPMENT OF CROP PRODUCTION IN NIGERIA

Kamilu Adio Saka, Kehinde Banjo Aladelusi

Department of Banking and Finance, The Federal Polytechnic, Ilaro.
**Corresponding Author E-mail: Kamilu.saka@federalpolyilaro.edu.ng*

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ABSTRACT

This study evaluates both short-run and long-run impacts of credit financing facilities provided by commercial banks on crop production development in Nigeria from 1981 to 2020. The study adopts ex post-facto research design and obtains data on the study variables from Central Bank of Nigeria Statistical Bulletin and World Bank Development Indicators. Autoregressive Distributed Lag (ARDL) model approach was employed as an estimation technique. The outcome of the analysis produces significant negative effect of commercial banks loans and advances on crop production development in the short run. In the long run, however, commercial banks loans and advances and labour employment in agriculture sector exert significant positive impact on crop production development in Nigeria. The researchers conclude that commercial banks credit financing significantly increase contribution of agriculture to Nigeria gross domestic product in the long-run while it reduces crop productivity in the short-run.

KEYWORDS

Agriculture, Financing, Economy, Credit, ARDL Model

1. INTRODUCTION

Agriculture plays significant roles in both in developed and developing countries. These roles are more feasible in developing countries through creation of employment, generation of income, and provision of materials. In Nigeria, crop production takes significant proportion of agricultural sector production in the country (Central Bank of Nigeria Statistical Bulletin, 2021). However, Nigeria has been observed as a country in Africa where agricultural sector faces acute shortage of credit financing and funding from commercial banks (Chisasa and Nakina 2015; Guirkinger and Boucher 2008; Osabohien et al., 2020c; World Bank, 2020). Empirical evidence from previous studies suggests that there is a mixed result on the relationship between bank credit financing and performance of agriculture in Nigeria (Osabohien et al., 2020); Abdallah et al., 2018; Osabohien et al., 2019a; Chandio et al., 2019; Osabohien et al., 2018; Osabohien et al., 2020). While some of these studies observed positive relationship others found negative relationship between bank financing and agricultural performance.

Meanwhile, the study linking commercial bank loans and advances to crop productivity in Nigeria is lacking in literature. This situation, therefore, demands a response given the importance of agricultural financing. For instance, just like other developing countries there is surge in the population growth of Nigeria which will require sufficient food production to cope with the increasing population size (World Bank, 2020). Again, the unfavourable climatic change condition to agricultural production in developing countries like Nigeria requires that more finance is needed in agriculture to prevent disruption of agriculture produce from time to time (Manners and Etten, 2018; World Bank, 2020). This is important giving the setbacks that have been caused by global pandemic Covid-19 and recent happenings of over-flooding which has great havoc to crop production in Nigeria.

More importantly, access to improved and better financing is a veritable tool to increase farmers' wealth and motivation for sustainable production which can contribute significantly to extreme poverty eradication in developing countries (World Bank, 2020). Therefore, a study that provides up to date evidence on the relationship between bank financing and crop production is needed for documentation. Against this backdrop, the current study aimed at evaluating both long-run and short-run impacts of credit financing facilities provided by commercial banks on crop production development in Nigeria from 1981 to 2020. This paper is structured as follows. The study starts with the introductory part. Section two focuses on review of related literature. Section three discusses the methodology of the study to achieve the stated objectives and section four present results with interpretation and discussion of results. The study concludes and makes recommendations in the last section.

2. LITERATURE REVIEW

Crop production involves cultivation of land, planting and harvesting of crops. These crops may be food crops or cash crops. Food crops are basic food production while cash crops are crops produced for commercial or exporting purpose. These two components of crop production account for the highest production activities in the agriculture sector in Nigeria (CBN Statistical Bulletin, 2021). Therefore, these two aspects provide large number of incomes and revenues to the government in Nigeria as a developing economy. Meanwhile, achieving high Total Factor Productivity (TFP) in agriculture in term of labour and land productivity requires financial resources as enabling factors. These financial resources such as money can be used to procure seeds and other farm equipments that can be utilized to achieve certain production output. In most cases, these funds through credit facilities can be obtained through formal financial

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institutions such as commercial banks.

Theoretically, this study has its background established by neoclassical endogenous growth model. The reign of endogenous growth model started with publication by Paul Romer in 1986. In this study, this endogenous growth model is adopted on the idea that growth of crop production in Nigeria in the long run is determined by response to financing activities of commercial banks in the country and innovation of labour employment in the agriculture sector economic incentives. This implies that the growth of crop production as agriculture sub-sector in Nigeria is determined by endogenous factors of commercial bank credit financing and labour employment in the agriculture sector. A quite number of empirical studies have been conducted in respect of relationship between commercial bank agricultural financing and agricultural productivity or development particularly with special focus on Nigeria. For instance, employed error correction model (ECM) approach and found significant long-run positive impact of banks credit facilities on agricultural productivity with non-noticeable effect in the short-run (Ogbuabor and Nwosu, 2017).

A similar result was also observed in a study that examined relationship between commercial banks loans and agricultural development in Nigeria through OLS (Okafor, 2020). Also, employed ARDL technique and observed that, in the long-run, bank credit facilities significantly improved the performance of agricultural sector in Nigeria (Osabohien et al., 2020). In term of food security measure, with application of ARDL stressed that increased access to bank credit significantly improve the performance of Nigeria agricultural sector in the long run (Osabohien et al., 2018). From the above reviewed studies, only attempted to have covered food security where crop production but in reality, the measurement of food security cannot be proxy for crop production development (Osabohien et al., 2018). Attempt to provide a more suitable measure to represent crop production which is unprecedented in literature forms the crux of the current study.

3. Material and Methods

This current study adopts ex post-facto research design. Ex-post facto research design examines how an independent variable that has occurred prior to the study affects the dependent variable of interest. Further, the instrument used to obtain secondary data for this study with the extraction of data on commercial banks loans and advances to agricultural sector, Agricultural Credit Guarantee Scheme (ACGS), crop production output and the Nigeria aggregate gross domestic product (GDP) from 1981 to 2020 (CBN Statistical Bulletin, 2021). Also, employment data was obtained on employment in agriculture from between 1991 and 2019. In this study, the ratio of Crop production Gross Domestic Product to GDP (CRGP/GDP) as a variable to proxy crop production development is employed as dependent variable presumably by this study to be determined by the commercial bank loans and advances to agricultural sector (CBLA) and ACGF scheme in Nigeria (World Bank Development Indicators, 2021).

Within the context of this work, the time series model of the study is in line with endogenous growth model as:

$$Crop\ production\ development = f\ (Commercial\ banks'\ financing)$$

$$\frac{CRGP_t}{GDP_t} = \beta_0 + \beta_1 CBLA_t + \beta_2 ACGF_t + \beta_3 AEMP_t + e_t \quad (2)$$

GDP = Aggregate GDP; CRGP = Crop production gross product; CBLA = Commercial banks loans and advances to agricultural sector; ACGF = Agricultural Credit Guarantee Fund; AEMP = Agricultural employment (measured as percentage of total employment based on modeled International Labour Organisation estimate).

Furthermore, all the 2 endogenous growth models of the study were transformed into Autoregressive Distributed Lag (ARDL) models. *Multa pulsis*, the study ARDL model which was later analyzed at 5% level of significance using STATA 12 statistical software is stated as:

$$\begin{aligned}\Delta ln\left(\frac{CRGP_t}{GDP_t}\right) = {} & \beta_4\left\{\ln\left(\frac{CRGP_{t-1}}{GDP_{t-1}}\right) - \beta_5 \ln(CBLA_t) - \beta_6 \ln(ACGF_t)\right. \\ & \left. + \beta_7 \ln(AEMP_t)\right\} \\ & + \sum_{j=1}^{p-1} \delta^1{}_j \Delta\, ln\left(\frac{CRGP_{t-j}}{GDP_{t-j}}\right) \\ & + \sum_{j=0}^{q-1} \theta^2{}_j \Delta \ln(CBLA_{t-j}) + \sum_{j=0}^{q-1} \theta^3{}_j \Delta \ln(ACGF_{t-j}) \\ & + \sum_{j=0}^{q-1} \theta^4{}_j \Delta \ln(AEMP_{t-j}) \\ & + e_t \end{aligned} \quad (3)$$

In ARDL model 7, $\beta_4 - \beta_6$ are long-run impacts while $\theta^2 - \theta^4$ represent short-run impacts.

4. Presentation, Interpretation and Discussion of Results

4.1 Presentation of Results

The results from the analysis of the study data through STATA 12 statistical software are presented in this sub-section in the following Tables.

Table 1: Unit Test Result

Series	Test Statistic	ADF Critical Value @ 5%	Stationary Level	Remark
(CRGP/GDP)	-5.171**	-2.961	I(0)	Stationary
LNCBLA	-7.120**	-2.964	I(1)	Stationary
LNACGF	-5.579**	-2.964	I(1)	Stationary
LNAEMP	3.842ns	-2.992	I(0)	Stationary

** Significance at 5% level of significance; ns (non-significance)

Source: Authors' Computations from STATA 12 Outputs, 2021

Table 2: ARDL Models Estimation Results

Equation	Model	Variables		**Short-run Impact**			**Long-run Impact**	
			Coeff.	Std. Error	Prob.	Coeff.	Std. Err	Prob
3	Crop Production development model	*LNCBLA*	-.2310	.0978	0.029	.1261	.0692	.004
		LNACGF	-.0913	.0765	0.247	-.0024	.0323	0.940
		LNAEMP	1.8580	6.1733	0.767	1.6337	.7487	0.041
		_CONS	-11.020	5.7633	0.070			
		ADJ (ECT)				-1.22		0.000
	Number of Observations		40					

Source: Authors' Computations from STATA 12 Outputs, 2021

Table 3: Diagnostics Results

	Crop Production Development Model			
Model Summary *F-Probability (Short-run Model)*	0.0063			
Peseran/Shin/Smith (2001) Bounds Test	8.912			
Critical values @ 5% (Bounds Test)	3.23 – 4.35			
Lag Selection (AIC)	(1 1 1 1)			

Source: Authors' Computations from STATA 12 Outputs, 2021

4.2 Interpretation of Results

The outcome of Augmented Dickey-Fuller unit root in Table 1 implies that all the study variables reach stationarity either at I(0) (level) or at I(1) (first difference). Lag selection decision was based on Akaike Information Criteria (AIC) to determine appropriate number of lags for both dependent variables and the study predictors. All variables were analysed through ARDL approach at lag 1 which produced lowest AIC values. These values of lag selections are contained in Tables 4 – 7 (Appendix). In Table 2, the results of ARDL indicate that increase in commercial banks loans and advances was also found to have significant negative impact on components of agricultural development in Nigeria (such as Crop Production development, livestock development, fishing development and forestry development) in the short-run. For instance, 1 percentage increase in commercial bank loans and advances distributed to agriculture sector will cause a fall in the contribution of crop production to Nigeria gross domestic product by 0.23%. However, given the outcome of Bounds Test, there is positive long-run relationship between commercial banks credit facilities to agriculture and crop production development in Nigeria. This is confirmed by Bounds test value (8.912) being outside or greater than the critical value (3.23 – 4.35) as revealed in Table 3 and Table 9 (Appendix) (Peseran et al., 2001).

In the long-run, provision of loans and advances by commercial banks to agriculture sector has significant impact on crop production development in Nigeria. That is, one percent increase in commercial banks loans and advances will cause 0.07% increase in the contribution of crop production to Nigeria GDP in the long run. In addition, 1 percent increase in the ratio of labour employment to total employment in Nigeria will lead to 1.63% increase in the contribution of crop production to Nigeria GDP in the long run. Likewise aggregate result, ACGF produces no significant impact on crop production development in Nigeria both in the short-run and long-run. Meanwhile, as shown in Table 1 and Table 8 (Appendix), the long-run disequilibrium position between crop production development in Nigeria and commercial bank credit financing will be significantly restored or adjusted by 122% annually.

4.3 Discussion of Results

The current study analyses the relationship between agricultural-based bank credit financing and crop production development in Nigeria using time series data from 1981 to 2020. The information in Table 3 illuminates that the study ARDL model developed to achieve the study objectives was significantly fit. This implies that data obtained on banks credit financing are best fit to determine crop production development in Nigeria. From the statistics in Table 2 and Table 8 (Appendix), it is discovered that commercial banks loans and advances to agriculture has negative and significant impact on crop production development in the short run. The implication is that, in the short-run period, increase in the provision of loans and advances by commercial banks to agriculture sector or its sub-sectors will significantly produce reduction in the contribution of crop production to Nigeria GDP. Theoretically, the result obtained for short-run effect analysis is inconsistent with the propositions of endogenous growth mode and *a priori* expectations of the study.

On the other hand, the results of Bounds Test indicate long-run relationship between bank credit financing and crop production development in Nigeria. The outcome of ARDL estimation further indicates that there is long-run positive and significant impact of commercial banks loans and advances on crop production development at sub-sectoral level. This is consistent with the study adopted endogenous growth model and previous results (Okafor, 2020; Osabohien et al., 2020; Osabohien et al., 2018; Ogbuabor and Nwosu, 2017). More so, long-run relationship was also observed in this study between labour employment in the agriculture and the crop production development in Nigeria.

5. Conclusion

Based on the findings of the study, the researchers affirm that increase in agricultural-based bank financing significantly reduces crop production development in the short-run. However, in the long-run, commercial banks loans and advances produce positive and significant impact on crop production development. The researchers recommend that there is need for government to develop appropriate specific crop production financing mechanism.

Research Limitations and Direction of Future Research

In the short run, an important part of the current study findings indicates that bank financing produces significant negative effect on development of agricultural crop production in Nigeria. This situation brings about theoretical issue. By implication, the study employed endogenous growth model which illustrates potential positive relationship between finance as capital input and output is non-operational in this context. Therefore, future research is essential to employ a more fitting theory or model that could explain negative relationship between commercial credit financing and agricultural development. In addition, an advanced robust technique can be utilized in future research to provide confirmation or disconfirmation of the current study findings.

References

Adanacioglu, H., 2017. Analysis of Agricultural Credit Performance in Turkey by Multi-Dimensional Scaling Approach. Turkish Journal of Agricultural Economics, 23 (2), Pp. 195-3204.

Bahsi, N., Cetin, E., 2020. Determining of Agricultural Credit Impact on Agricultural Production Value in Turkey. Ciência Rural, Santa Maria, 50 (11).

Central Bank of Nigeria. 2021. Statistical Bulletin, Financial Sector Statistics. Available at http://www.cbn.gov.ng

Chandio, A. Jiang, A.Y., Gessesse, A.T., Dunya, R., 2019. The Nexus of Agricultural Credit, Farm Size and Technical Efficiency in Sindh, Pakistan: A Stochastic Production Frontier Approach. Journal of the Saudi Society of Agricultural Sciences, 18 (3), Pp. 348–354.

Chandio, A., Jiang, A.Y., Wei, F., Guangshun, X., 2018. Effects of Agricultural Credit on Wheat Productivity of Small Farms in Sindh, Pakistan: are Short-Term Loans Better? Agricultural Finance Review, 78 (5), Pp. 592–610.

Chisasa, J., Nakina, D., 2015. Bank Credit and Agricultural Output in South Africa: Cointegration, Short Run Dynamics and Causality. Journal of Applied Business Research (JABR), 31 (2), Pp. 489–500.

Engle, R.F., Granger, W.J.C., 1987. Co-integration and Error Correction: Representation, Estimation, and Testing. Econometrica, 55, Pp. 251–276.

Gould, D., Ruffin, R.J., 1993. Human Capital Externalities, Trade, and Economic Growth. Federal Reserve Bank of Dallas Research Paper no. 9301 (Dallas, January).

Guirkinger, C., Boucher, S.R., 2008. Credit Constraints and Productivity in Peruvian Agriculture. Agricultural Economics, 39 (3), Pp. 295–308.

Gurley, J.G., Shaw, E.S., 1955. Financial Aspects of Economic Development. American Economic Review, XLV (4, September).

Johansen, S., Juselius, K., 1990. Maximum Likelihood Estimation and Inference on Cointegration - With. Oxford Bulletin of Economics and Statistics, 2 (52), Pp. 169 209.

McKinnon, R., 1973. Money and Capital in Economic Development; Brookings Institution: Washington, DC, USA.

Ogbuabor, J.E., Nwosu, C.A., 2017. The Impact of Deposit Money Bank's Agricultural Credit on Agricultural Productivity in Nigeria: Evidence from an Error Correction Model. International Journal of Economics and Financial, 7 (2), Pp. 513-517.

Okafor, C.A., 2020. Commercial Banks Credit and Agricultural Development in Nigeria. International Journal of Business & Law Research, 8 (3), Pp. 89-99.

Osabohien, R., Mordi, A., Ogundipe, A., 2020. Access to Credit and Agricultural Sector Performance in Nigeria. African Journal of Science, Technology, Innovation and Development, DOI: 10.1080/20421338.2020.1799537

Osabohien, R., Ufua, D., Moses, C.L., Osabuohien, E., 2020c. Accountability in Agricultural Governance and Food Security in Nigeria. Brazilian Journal of Food Technology 23, e2019054. https://doi.org/10.1590/1981-6723.08919

Osabohien, R., Osabuohien, E., Urhie, E., 2018. Food Security, Institutional Framework, and Technology: Examining the Nexus in Nigeria Using ARDL Approach. Current Nutrition and Food Science, 14 (2), Pp. 154–163.

Osabohien, R., Osabuohien, E., Ohalete, E., 2019a. Agricultural Sector Performance, Institutional Framework and Food Security in Nigeria. Bio-based and Applied Economics, 8 (2), Pp. 161–178.

Osabohien, R., Afolabi, A., Godwin, A., 2018. An Econometric Analysis of Food Security and Agricultural Credit Facilities in Nigeria. The Open Agriculture Journal, 12 (1), Pp. 227–239 http://doi.org/10.2174/1874331501812 010227.

Osabohien, R., Ufua, D., Moses, C.L., Osabuohien, E., 2020c. Accountability in Agricultural Governance and Food Security in Nigeria. Brazilian Journal of Food Technology 23, Pp. e2019054. https://doi.org/10.1590/1981-6723.08919

Pesaran, M.H., Shin, Y., Smith, R.J., 2001. Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16 (3), 289-326. doi:10.1002/jae.616

Romer, P.M., 1990. Endogenous Technological Change. Journal of Political Economy 98 (October, pt. 2): S71–S102

Shaw, E.S., 1973. Financial Deepening in Economic Development. New York: Oxford University Press.

Sennhauser, E., Jenane, C., 2015. Is Muscle or Machine the Future of Agriculture in Africa? World Bank Blog. http:// blogs.worldbank.org/africacan/is-muscle-or machine-the-future-of-agriculture-in-africa.

Wooldridge, J.M., 2001. Applications of Generalized Method of Moments Estimation Journal of Economic Perspectives—Volume 15, Number 4—Fall 2001—Pages 87–100

World Bank. 2021. World Development Indicators. Available at http://www. worldbank.org

APPENDIX

Table 4: Lag Selection-order criteria for variable *CROGDP*

```
 Sample:  1985 - 2020                  Number of obs     =      36
 +-------------------------------------------------------------------------+
 |lag |   LL     LR     df   p    FPE      AIC     HQIC    SBIC    |
 |----+--------------------------------------------------------------------|
 |  0 |  24.2007                .016135* -1.28893 -1.27358* -1.24494* |
 |  1 |  24.4484  .4954   1  0.482  .016825 -1.24713* -1.21643 -1.15916 |
 |  2 |  24.5002 .10359   1  0.748  .01774 -1.19446 -1.1484  -1.0625  |
 |  3 |  24.5006  .0008   1  0.977  .018763 -1.13892 -1.07751 -.962975 |
 |  4 |  24.5256 .04997   1  0.823  .019825 -1.08475 -1.00799 -.864821 |
 +-------------------------------------------------------------------------+
Endogenous:  crogdp
Exogenous:  _cons
Source: STATA 12 Outputs, 2021
```

Table 5: Lag Selection-order criteria for variable *LNCBLA*

```
 Sample:  1985 - 2020                  Number of obs     =      36
 +-------------------------------------------------------------------------+
 |lag |   LL     LR     df   p    FPE      AIC     HQIC    SBIC    |
 |----+--------------------------------------------------------------------|
 |  0 | -73.6649                3.70688  4.14805  4.16341  4.19204 |
 |  1 | -1.61072  144.11*  1  0.000  .071564* .200596* .231301* .288569*
|
 |  2 | -.987002  1.2474   1  0.264  .073095   .2215   .267558   .35346 |
 |  3 | -.847759  .27849   1  0.598  .076717   .26932   .33073   .445267 |
 |  4 |  .031763  1.759    1  0.185  .0773    .276013  .352776  .495946 |
 +-------------------------------------------------------------------------
Endogenous:  lncbla
Exogenous:  _cons
Source: STATA 12 Outputs, 2021
```

Table 6: Lag Selection-order criteria for variable *LNACGF*

```
 Sample:  1985 - 2020                  Number of obs     =      36
 +-------------------------------------------------------------------------+
 |lag |   LL     LR     df   p    FPE      AIC     HQIC    SBIC    |
 |----+--------------------------------------------------------------------|
 |  0 | -74.9385                3.97866  4.21881  4.23416  4.26279 |
 |  1 | -15.1918  119.49*  1  0.000  .152184*  .9551* .985805* 1.04307*
|
 |  2 | -15.0805  .22265   1  0.637  .15993   1.00447  1.05053  1.13643 |
 |  3 | -14.7215  .71786   1  0.397  .165817  1.04009   1.1015  1.21603 |
 |  4 | -14.2479  .94738   1  0.330  .170888  1.06933  1.14609  1.28926 |
 +-------------------------------------------------------------------------+
Endogenous:  lnacgf
Exogenous:  _cons
Source: STATA 12 Outputs, 2021
```

Table 7: Lag Selection-order criteria for variable *LNCBLA*

```
 Sample:  1995 - 2019                  Number of obs     =      25
 +-------------------------------------------------------------------------+
 |lag |   LL     LR     df   p    FPE      AIC     HQIC    SBIC    |
 |----+--------------------------------------------------------------------|
 |  0 |  17.6044                .015511 -1.32835 -1.31483  -1.2796 |
 |  1 |  92.7436  150.28   1  0.000  .000041 -7.25948* -7.23244 -7.16197
|
 |  2 |  103.229  20.971*  1  0.000  .000019* -8.01832 -7.97775* -7.87205*
|
 |  3 |  103.643  .82775   1  0.363  .00002  -7.97143 -7.91734 -7.77641 |
 |  4 |  103.845  .40337   1  0.525  .000022 -7.90756 -7.83995 -7.66379 |
 +-------------------------------------------------------------------------+
Endogenous:  lnaemp
Exogenous:  _cons
Source: STATA 12 Outputs, 2021
```

Table 8: ARDL (1,1,1,1) Regression

```
Sample:    1992 -    2019                 Number of obs  =      28
                                          R-squared      =  0.6427
                                          Adj R-squared  =  0.5177
Log likelihood =  21.682657               Root MSE       =  0.1320
------------------------------------------------------------------------------
  D.crogdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ADJ          |
    crogdp   |
         L1. |  -1.22284   .2056097    -5.95   0.000    -1.651734   -.7939455
-------------+----------------------------------------------------------------
LR           |
      lncbla |   .1261004   .0692405     1.82   0.004    -.0183327    .2705336
      lnacgf |  -.0024669   .0323062    -0.08   0.940    -.0698564    .0649227
      lnaemp |   1.633793    .748789     2.18   0.041     .0718461    3.195739
-------------+----------------------------------------------------------------
SR           |
      lncbla |
         D1. |  -.2310169   .0978904    -2.36   0.029    -.4352127    -.026821
             |
      lnacgf |
         D1. |  -.0913039   .0765681    -1.19   0.247    -.2510223    .0684144
             |
      lnaemp |
         D1. |   1.858055   6.173312     0.30   0.767    -11.01925    14.73536
             |
       _cons |  -11.02058   5.763345    -1.91   0.070    -23.04271    1.001546
------------------------------------------------------------------------------
Source: STATA 12 Outputs, 2021
```

Table 9: Pesaran/Shin/Smith (2001) ARDL Bounds Test

H0: no levels relationship F = 8.912
t = -5.947

Critical Values (0.1-0.01), F-statistic, Case 3

| [I_0] [I_1] | [I_0] [I_1] | [I_0] [I_1] | [I_0] [I_1]
| L_1 L_1 | L_05 L_05 | L_025 L_025 | L_01 L_01
------+----------+----------+----------+----------
k_3 | 2.72 3.77 | 3.23 4.35 | 3.69 4.89 | 4.29 5.61

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), t-statistic, Case 3

| [I_0] [I_1] | [I_0] [I_1] | [I_0] [I_1] | [I_0] [I_1]
| L_1 L_1 | L_05 L_05 | L_025 L_025 | L_01 L_01
------+----------+----------+----------+----------
k_3 | -2.57 -3.46 | -2.86 -3.78 | -3.13 -4.05 | -3.43 -4.37

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

Source: STATA 12 Outputs, 2021