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EFFECT OF MACROECONOMIC STABILITY AND COMMERCIAL BANKS CREDIT ON AGRICULTURE PERFORMANCE IN RWANDA

1*Nkurunziza Victorien

1School of Economics, University of Kigali
*Email of Corresponding Author: victorienku@gmail.com

Abstract

This research paper intended to examine effect of macroeconomic stability, commercial banks credit on agriculture performance in Rwanda, using data collected from international organisation from 1990-2021. This paper was guided by the following specific objectives which were to examine the effect of aggregate supply and demand on agriculture sector performance in Rwanda, to examine the effect macroeconomic indicators on agriculture sector performance in Rwanda and to examine the effect of commercial bank credit on agriculture sector performance in Rwanda. This research study used theories and models under stated objectives. Diffusion theory was used, Mundell Fleming Model, Keynesian Model was used, and Classical model will be used. The research design was based on quantitative research since it used the econometrics approach such as VECM/ARDL which adjusted to both short run changes in variables and deviation from equilibrium, ARDL model was used to test for both non stationarity time series as well as time series with mixed order of integration, Johansen Cointegration test was done to detect the a long-term, or equilibrium, relationship between variables and therefore the results findings found that there is a long run relationship between macroeconomic stability, bank credit and agriculture performance. For consumption, the result shows that the value of Error Correction Term (ECT) is -0.44 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 44%. The increase of 1 percent in consumption rate will bring about 0.44 percent decrease in agriculture performance and it is significant at 1 percent. For CSP, the result shows that the value of Error Correction Term (ECT) is +0.24 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 24%. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 1.3%. The increase of 1 percent in net export rate will bring about 0.013 percent increase in agriculture performance and it is significant at 1 percent. For GDP, the result shows that the value of Error Correction Term (ECT) is +0.03 which implies that the relationship between the variables met a priori

expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 3%. The increase of 1 percent in GDP rate will bring about 0.03 percent increase in agriculture performance and it is significant at 1 percent. For IR, the results show that the value of the coefficient of the interest rate is 1.18 that the result shows that the value of Error Correction Term (ECT) is +1.18 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 118%. The increase of 1 percent in consumption rate will bring about 1.18 percent increases in agriculture performance and it is significant at 1 percent. A percentage increase in interest rate is associated with 118% increase in Y (agriculture performance) in short run. For the inflation, INF exhibits the positive correlation with Y with the Coefficient value of 0.042 as per VECM estimates. This implies that a percentage change in inflation is associated with 4.2% increase in Y in average ceteris paribus in short run. These results show that macroeconomic indicators through level of inflation leads to agriculture performance, this was explained by a value of 0.042 which implies that it contributes to 4.2%.The same estimates indicated that all variables are positively correlated with agriculture performance in Rwanda, their magnitude decreased over time. These findings are generally consistent with other previous endogenous growth studies in the literature. As policy implications, this study is suggesting focusing on agriculture by supporting the credit facility and export to improve the level of agriculture in Rwanda.

1.1 Introduction

Rwanda enjoys a decade long of macroeconomic stability, with high, on-target rates of growth in economic activity (relative to long run goals), low (single-digit) inflation and international reserves deemed to be at comfortable levels (IMF, 2020). The economy grew by an average of 7% per annum during the year 2000-2019, with a real per capita income growth of more than 4% per annum. The successful implementation of the first Poverty Reduction Strategy (PRSP 1: 2002-2005) and its successor- the Economic Development and Poverty Reduction Strategy (EDPRS: 2008-2012) have contributed for the notable economic and social outcomes. The reduction in growth is attributed to reduced demand in the biggest economies, disruptions of supply chains, and drop in domestic production. According to the World Trade Organization (2020), growth in global trade is estimated to have slowed down by 50% following reduced demand in China, US and EU.

Moreover, an early assessment by the United Nations Economic Commission for Africa shows most businesses are hardly operating at 40% capacity, whereas revenues from services sectors, especially tourism, distribution and transport services have sharply declined in Africa, including the COMESA region (https://comstat.comesa.int/). The overall rate of Inflation increased from 31.6% to 60.4% over the period January-June 2020, with some countries registering double digit month on month inflation. Inflation has largely been driven by drastic changes in consumption of housing, water, electricity, gas and other fuels (89%), health (78.3%) and communication (69.6%) due to supply shortages and confinement measures.

At the same time, large firms have equally borne the brunt of the pandemic, especially air transport and tourism operators, including the hotel industry. In these firms, the concern was largely how to change the business strategies and meet new customers. For instance, some airlines turned passenger planes into cargo transport in a bid to remain in operation albeit under new business lines, whereas some hotels leased out rooms into temporary offices and became quarantine centres. (NISR Reports, 2022)

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Agriculture sector plays a decisive role in economic growth and development of Rwanda. Not only does it provide industrial raw materials; it is also an important source of intermediate and final demand for manufacturing sector. Apart from this the global significance of agriculture products are also increasing day by day. Thus, agriculture in developing nations is an important source of growth and employment multiplier and it has strong forward and backward linkages with manufacturing and rest of the economy. Hence impact of macroeconomic policies has a greater bearing on the performance of agriculture sector. The relationship between agriculture and development, especially in Sub-Sahara Africa, cannot be overemphasized. As a roadmap to attaining development, in year 2000, the Millennium Development Goals (MDGs) was adopted and in Africa, 70% of the development target group live in rural areas and live on agriculture product international food policy research institute (Hazell & Roell, 1983). Every time, reducing poverty, improving nutrition and general well-being of the population would imply improving the living of this majority and this hinges critically on the achievement of the agriculture sector. For example, using World Development Indicator (WDI) data from Rwanda for selected periods, researchers have found a high positive correlation between food production and primary school enrolment ration and gender equality while there is a high negative correlation between food production and child mortality rates. This shows some evidence on the importance of agriculture in economic development (World Bank, 2000). The literature is replete with studies that analyse the agriculture sector of the Rwandan economy. It gives evidence of a positive relation between agriculture sector investment and GDP increment. (Oji-Okoro et al., 2011) found that agricultural output is significantly influenced by government capital expenditure. As identified by scholars (Iyoba & Oriakhi, 2002). The sources of economic growth in developing countries using the growth accounting model and found that agriculture contributes more than expected to the rise of GDP. According to their paper, this indicates a lag in the nation's industrialization process as the case of Rwanda. They also find that agriculture sector performance from 1990 to 2020 is too high and suggest that labour be reallocated to other sectors to accelerate economic development. (FAO, 2017).

By 2050 vision, the estimates say that the global population will have reached 9 billion people, while farmlands decrease and food demand increases (UN, 2017). Smallholder farmers contribute to about 70% of the food produced globally, yet they often remain in poverty and face problems of food insecurity (FAO, 2018). Price fluctuation on agricultural production is not a preserve of one country or a specific economy but rather an occurrence that has engulfed several countries around the globe. Several countries both in the developed and developing world are grappling with agricultural price fluctuations that are caused by factors that are sometimes beyond the control of these countries. World agriculture production continues to face challenges along with other existing forces, pose risks for poor people's livelihoods and food security. Land is now in demand, not only to produce food and to provide shelter and comfort for the world's population, but also in significant quantities for production of energy in various ways. The arguments presented in this study suggest that in response to the lessons learned from the latest period of spectacular price volatility in the world food market, policy initiatives in three areas are justified such as comprehensive and above all sustainable social protection and food and nutrition initiatives to meet the short and medium term needs of the poor and to serve as the basis for emergency response channels in times of food crises. (Barrett & Christopher B.1997).

In United States, its agricultural sector has become, on average, more prosperous relative to the rest of the economy, so that the distributional justification for many agricultural policies in the United States has ceased to exist (Gardner 1992). In Europe, A sharp increase in the price of food affects the poor to a much greater extent than a similar increase in the price of other goods because food forms a much larger share of their total purchases. Faced with an increase in the price of staples, poor households will respond by substituting away from other items in their consumption basket. A common policy response to this situation is to subsidize the price paid by consumers, either through a general subsidy or a more narrowly targeted programme. General subsidies are less efficient than targeted ones and

can also reduce producer incentives by lowering prices. They may also be accompanied by a greater fiscal strain than a targeted programme

In Haiti, agricultural value chains (AVCs) have been a common key strategy to promote economic development and a method to alleviate rural poverty through building market linkages. Urban migration, change in consumer taste, followed by the effects of climate change are pushing some resources to their limit, and thus making production even more critical across Haiti, like other developing countries (Pretty, Toulmin, & Williams, 2011).For Africa, Agricultural performance is prone to several risks which affect both producers and consumers. In poorly integrated markets, production shortages result in higher prices that may compensate producers from production losses but, at the same time, negatively affect consumers (Rashid &Jayne 2010).

Thus, Rwanda's agriculture was expected to be a major beneficiary of the economic policy and structural reforms. The main reason of agriculture performance is the level of supply and demand. The specific focus is to identify the macroeconomic determinants that cause agricultural performance, by using secondary data from different international organisations as well as the ones collected from National Bank of Rwanda, BNR. In broad terms, macroeconomic stability provides a stable economic environment on which the creation of jobs, wealth and improved living standards depend to their policy, and this has a great linkage with agriculture as it is contributing to the economic growth of Rwanda. Food production shrank by 0.5 percent in the fi rst three quarters of 2020. Output of Rwanda's crop exports contracted by 12.7 percent in the first three quarters of 2020, mainly driven by lower coffee production. By contrast, the livestock subsector benefitted from higher fodder production and government efforts to improve animal health and production. (Rohwerder, 2020.). Therefore, it is in this regards that the researcher intends to carry out the research study on macroeconomic policy on agriculture performance in Rwanda using dataset from 1990-2021.

1.2 Problem Statement

Despite the dominant position occupied by the agricultural sector in Rwandan economy, many economic agents to Rwandan society have continuously denied agricultural and rural development adequate attention or investment. This has often led to a motionless agriculture that, in turn, has resulted in large insufficient domestic food production, balance of payment crises, and malnutrition. (FAO, 2008). Macroeconomic policy aims to provide a stable economic environment that is conducive to fostering strong and sustainable economic growth. The key pillars of macroeconomic policy are fiscal policy, monetary policy, and exchange rate policy. Therefore, the stability of all these pillars has a positive influence on agriculture sector in Rwanda. For Rwanda together other developing countries, macroeconomic policy aimed at improved living of the population, and this has a great linkage with agriculture as it is contributing to the economic growth of Rwanda.

Agriculture is critical to Rwanda's economy and a key sector in Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS). Agriculture contributes nearly a third of the national gross domestic product (GDP), employs more than three-fourths of the workforce, and generates more than half of the country's export revenues. Agriculture finance is a national priority to achieve transformation of the agriculture sector and greater financial inclusion. The Financial Sector Development Plan (2013–18), the National Financial Inclusion Strategy (NFIS), and the National Agriculture Policy (NAP) (the latter two under development) include actions to support access to financial services for farmers and agribusinesses. The National Bank of Rwanda (BNR), the central bank, tracks lending to the sector disaggregated by key value chains and value chain stages (BNR, 2017). People engaged in agribusiness are still experiencing challenges caused by the limited depth of the agricultural credit market at the macro level. While the overall credit to national GDP ratio is around 20 percent, credit to farmers and agri-enterprises represented only 4.6 percent of the agricultural GDP in 2016. However, it is growing, having increased from 3.6 percent in 2012.The proportion of

credit to agricultural GDP is also likely to be an underestimate because a nontrivial portion of the noncategorized credit (8 % of total credit) and some credit reported under categories such as construction, trading, and consumer loans, also flow to farmers and Agri-enterprises. (ADB, 2016). Thus, it is this regards that the researcher intends to examine the effect of macroeconomic stability, commercial bank credit on agriculture sector performance in Rwanda using data set from 1990-2021.

1.3 Objectives

The objective of this research paper was to examine the effect of macroeconomic stability, commercial banks credit on agriculture performance in Rwanda. Specifically, this research paper aims at examining the effect of aggregate supply and demand on agriculture sector performance in Rwanda, to examine the effect of macroeconomic indicators on agriculture sector performance in Rwanda and to examine the effect of commercial bank credit on agriculture sector performance in Rwanda

2.1 Literature review

2.1.1 Theory of Diffusion

According to Cardno (2017), this model explains the relationship between agriculture production and technology as factor of production. It is thus the aggregate measure on how technology is spread to the farmers to make the agriculture more productive mostly using different varieties of land and labours in different regions that are more fertile. The more the technology is used, the more production increases which leads to better performance. It provides much more research, and it was developed emphasizing the relationship between diffusion rates and the personality, characteristics, and educational accomplishments of farm operators.

2.1.2 Johnston-Mellor Theory

This theory was echoed by Dercon (2009) who argued that the agricultural sector especially in developing countries has low productivity and therefore expanding this sector cannot be the channel for economic growth. Gollin (2010) also argued that agricultural performance growth is neither a necessary nor sufficient condition for macroeconomic stability. This school of thought therefore, champions for an export-oriented manufacturing sector as a critical channel for agriculture performance. The Johnston-Mellor theory is relevant to this study as it advocates for performance and macroeconomic stability determinant.

2.1.3 The Mundell-Fleming Model

This theory was developed in the early 1960's by Fleming and Mundell. They independently extended the open economy Keynesian model of macroeconomic policy to incorporate systematically the role of capital flows. The Mundell–Fleming model assumes that the price levels at home and abroad are fixed, so the real exchange rate is proportional to the nominal exchange rate in the short-run. That is, when the domestic currency appreciates, foreign goods become cheaper compared to domestic goods, and this causes exports to fall and imports to rise. According to this model, Net exports is negatively affected by nominal exchange rate (Mankiw, 2009). It implies that exchange rate fluctuations affect

agricultural as well. Therefore, policy makers are expected to consider this perspective when exchange rate policy instrument is to be used.

2.2 Empirical Review

Several studies have been carried out on the effects of macroeconomic stability on agriculture performance. Some of them have concluded that the relationship macroeconomic stability and on agriculture performance is positive, others have concluded that the relationship is negative, and few of them found out no relationship. Some of these studies are either foreign or local and are expounded below.

Oztang and Lai (2019) revealed total agriculture export to be a function of foreign income and real exchange rate and results revealed that real exchange rate is a statistically significant determinant of agriculture export performance, in their analysis, they employed bivariate GARCH-M model ton analyse the net effect of real exchange rate changes on agriculture exports for 8 Asian economies (Philippines, Malaysia, Indonesia, Japan, Singapore, Chinese Taipei, Republic of Korea and Thailand) and they found that depreciation alone stimulates agriculture exports for all countries except Singapore.

Oluwatoyese et al (2016) examined the macroeconomic factors affecting the Nigeria's agricultural sector between 1981 and 2013 using multivariate cointegration approach and vector error correction model (VECM), found that the volume of credit to agricultural sector, deficit financing and institutional reform positively and significantly affect agricultural output. However, interest rate spread has negative and insignificant effect on agricultural output in Nigeria.

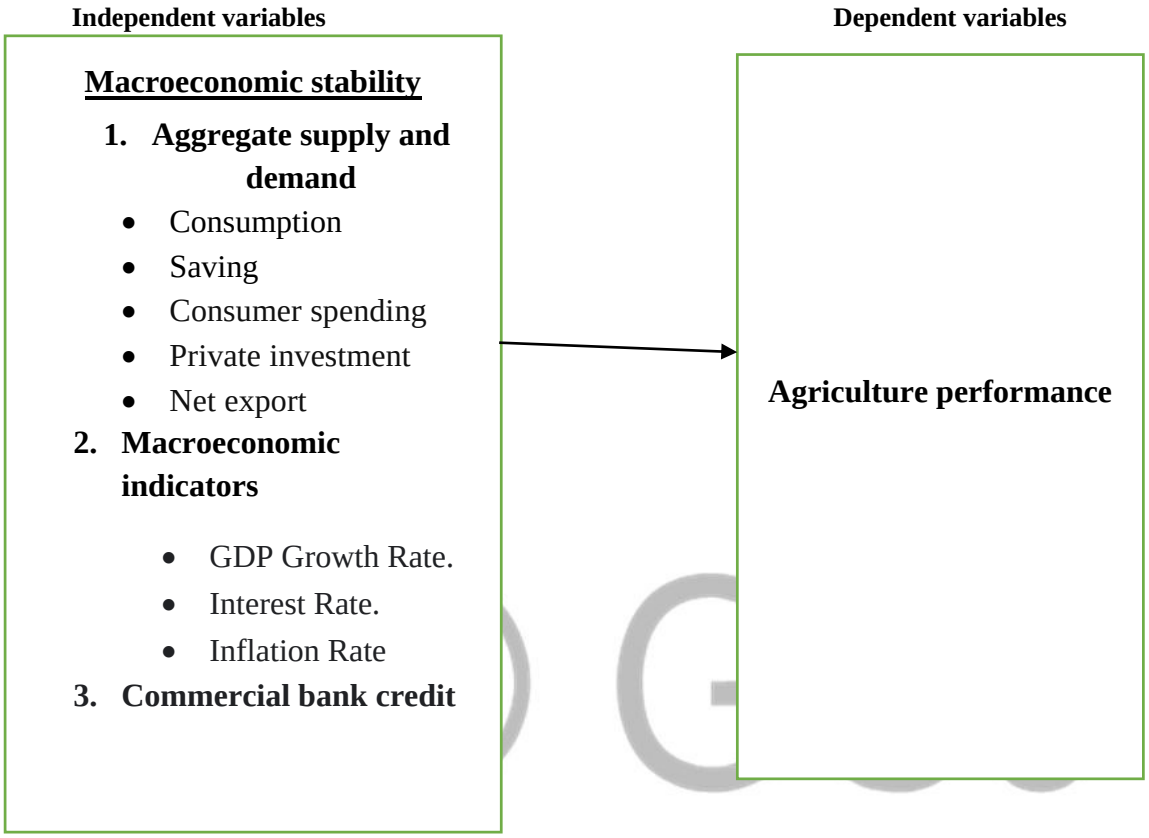
Akpan et al (2015) investigated the effect of macroeconomic variable fluctuation on agricultural productivity in Nigeria over the period of 1970 and 2010 using the techniques of cointegration and error correction model (ECM),on the other hand, Akpan et al (2015) reported that long-run positive drivers of agricultural diversification include inflation, viable manufacturing sector, credit to agricultural sector, external reserves, per capita income, unemployment, and energy consumption, whereas crude oil prices, lending capacity of commercial banks, FDI in agriculture, and non-oil imports constitute negative long-run drivers in the Nigerian economy. In addition, exchange rate fluctuations and agricultural export credit affect cocoa exports positively, whereas relative price of cocoa was negatively and insignificantly related to cocoa exports in the Nigerian economy

In a similar study on Nigeria, Udah and Nwachukwu (2015) investigated the determinants of agricultural output growth between 1960 and 2010 using the technique of ordinary least squares (OLS). Udensi et al (2012) showed that all the determinants of agricultural production index examined in their study were positive and significant, except for world agricultural commodity prices and inflation rate that were negatively related to agricultural production index in Nigeria. In the same vein, agricultural labour, infrastructural development, and total factor productivity (TFP) had positive effect on agricultural GDP, whereas land area harvested, inflation rate and agricultural GDP in the previous were negatively related to agricultural GDP in Nigeria (Udah & Nwachukwu, 2014).

2.3 Conceptual Framework

This section shows the conceptual framework that is having agriculture performance as a dependent variable and aggregate supply and aggregate demand, macroeconomic indicators which are GDP, interest rate and inflation rate, and commercial credit bank. In this study, the researcher analysed the effect of macroeconomic stability and on agricultural performance. This was explained by the diagram that depicts the interrelationship of the stated variables. The dependent variable of this research study was the agricultural performance while the independent variables was macroeconomic stability, determinants of macroeconomic stability were the Aggregate demand and supply explained by

consumption, saving, consumer spending, private saving and net export. Macroeconomic indicators are explained by GDP growth rate, interest rate and inflation and finally the commercial bank credit.



(Source: Researcher: 2022)

Figure 1: schematically diagram shows the relationship among the variables

The diagram shows the relationship between the stated variables. The mentioned variables have appositive or negative relationship. So, all those variables contribute to agriculture performance and thus the results findings allowed the researcher weather there is a negative or positive correlation among them. The agriculture performance which is dependent variable is typically determined by its explanatory variables mentioned above. As with the concepts, aggregate supply-demand, macroeconomic indicators, access to credit.

3.0 Research Methodology

3.1Research Design

A model was then developed for the study. The model conformed to standard econometric technique required for any econometric research work of this nature. Also, it developed an econometric

estimation technique for the causality test as well as the procedure for the evaluation of results from the estimation.

3.2 Model Specification

To find effect of macroeconomic stability on agriculture performance based on data collected from 1990 to 2021 econometrics models were employed in this analysis. The model stated that Agriculture performance depends on macroeconomic stability components which are the aggregate supply, aggregate demand, and exchange rate. Thus, Agriculture performance Y is a function of the above variables. The model is specified as follows

Y= f (AS-AD, MIC, CRED)

This function has been converted into the econometric model; it is derived as:

$Y = \beta0+\beta1CONS+\beta2\ SAV+\beta3\ CSP+\ \beta4PVI+\beta5NX+\ \beta6GDP+\ \beta7IR+\ \beta8INF+ +\ \beta9CRE + \mu t$

3.3Data Analysis

Econometric methods were used in the estimation of the coefficients of the explanatory variables to test the influence of the independent variables on the dependent variable. As the dependent variable (Inflation) has many determinants. It has been necessary to add some control variables. The new model specification has been in the general form as:

Y= f (AS-AD, MIC, CRED)

This function has been converted into the econometric model; it is derived as:

$$\mathbf{Y = \beta_0+\beta_1CONS+\beta_2\ SAV+\beta_3\ CSP+\ \beta_4PVI+\beta_5NX+\ \beta_6GDP+\ \beta_7IR+\ \beta_8INF+\ \beta_9CRE + \mu t}$$

$$\mathbf{Log\ Y=\beta_0+\beta_1logCONS+\beta_2logSAV+\beta_3log\ CSP+\beta_4logPVI+\beta_5logNX+\beta_6logGDP+\ \beta_7logIR+\ \beta_8logINF+\ \beta_9logCRE + \mu t}$$

Where.

Y: Agriculture Performance

CONS: Consumption

SAV: Savings

CSP: Consumer spending

PVI: Private investment

NX: Net export

GDP: Gross domestic product

IR: Interest rate

INF: Inflation rate

CRE: Commercial Banks Credit

4.0 Results Presentation, Analysis, and Discussion

4.1 Descriptive Statistics

Table 1: Descriptive statistics

	AD_AS	CONS	CRE	CSP	GDP	INF	IR	NX	PVI	SAV	Y
Mean	37.2000	30.5218	13.08656	514.159	4.64499	0.01937	22.9927	8.60274	17.2964	0.2216	4.59656
Median	33.8599	24.0939	11.08500	448.806	3.14487	0.64000	16.3697	7.17257	15.3926	0.1758	3.96000
Maximum	71.0956	78.854	20.90000	901.304	10.9100	15.4500	44.3190	51.2665	27.1322	0.4476	6.20000
Minimum	19.684	0.07181	8.760000	2.73890	0.80000	13.20000	1.20515	5.235280	1.97559	0.0902	3.91000
Std. Dev.	12.0077	28.9012	4.181024	213.075	3.24568	6.25115	12.6509	9.85444	5.6964	0.1058	0.91732
Skewness	0.98733	0.56637	0.982791	0.10016	0.61937	0.14359	0.43492	2.54960	0.133355	0.7177	0.75176
Kurtosis	3.45176	1.83677	2.273276	2.59945	1.85703	2.89716	1.71772	12.0454	3.00910	2.3714	1.68105
Jarque-Bera	5.47120	3.51492	5.855519	0.26742	3.78781	0.12407	3.20117	143.762	0.09495	3.2740	5.33361
Probability	0.06485	0.17248	0.053517	0.87484	0.15048	0.93984	0.20177	0.00000	0.9536	0.1945	0.06947
Sum	1190.40	976.700	418.7700	16453.1	148.639	0.62000	735.766	275.28	553.486	7.0918	147.09
Sum Sq. Dev.	4469.79	2589	541.9097	140743 4.	326.567	1211.38	4961.44	3010.41	1005.94	0.3472	26.0861
Observations	32	32	32	32	32	32	32	32	32	32	32

(Source: E-Views-7)

Summary Statistics for Dependent and Independent Variables

The mean for Consumption was 30.5 the max value was 78.9, the max value was 0.07 while the standard deviation was 28.9, thus consumption was closer to mean.For SAV, the mean was 0.221, the max value was 0.4476 while the min was 0.09 and the standard deviation was 0.18077 which was closerto mean.

For CSP , the mean was 514.156, the max value was 901.30 while the minimum was 219.64 , the standard deviation was 2.73.For PVI, the mean was 17.29, max value was 27.1 , the minimum was 9.98 and the satandard deviation was 1.975.For NX, the mean was 8.6, max value was 51.2, the minimum was -5.23 and the standard deviation was158

For GDP, the mean was 4.64, the max value was 10.91, the minimum value was 0.8, and the standard deviation was 5.1.For INF, the mean was 30.72 while the standard deviation was 1.28For IR, the mean was 22.99 while the standard deviation was 9.95.For AS-AD, the mean was 37.2 while the standard deviation was 1.145For CRE, the mean was 13.08 while the standard deviation was 1.56

For a median, CONS has a median of 33.85, for CRE 24.09, CSP median of 11.085 GDDP a median of 448.806, INF a mean of 3.145 IR with 0.64 NX with 16.40 PVI with 7.17 SAV with 15.39 Y with 0.1758 and AS-AD with 3.96

Table 2: Lag Selection Criterion

As an ARDL contains lagged values of both dependent and independent variables, the selection of lag length to include in the model is very crucial. The study used akaike information criterion (AIC) to determine the maximum lag used in the model which is the number of lag correspond to the minimum value of AIC.

Therefore, the following E-views 7 output shows result for lag length selection using four main independent variables namely Aggregate supply and demand (AS-AD),Microeconomic indicators(MIC) and Commercial bank credit (CRED)

Lag	Log	LR	FPE	AIC	SC	HQ
0	-126.2919	NA	0.000305	3.257298	3.376399	3.305049
1	281.5956	764.7891	1.70e-08	-6.539890	-5.944384	-6.301135
2	346.2838	114.8216	5.05e-09	-7.757096	-6.685184*	-7.327336
3	369.9845	39.69857	4.19e-09	-7.949612	-6.401295	-7.328847*
4	386.7631	26.42632*	4.17e-09*	-7.969077*	-5.944355	-7.157308

(Source: E-Views-7)

* Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

The appropriate lag length that was chosen based on the Akaike information criterion (AIC) and the lag of 4 was highlighted by the criteria.

4.2 ADF Unit root results

If the calculated ADF test statistic values in absolute terms are smaller than the ADF critical value in absolute terms, then we accept the null hypothesis that Unit root exists which means that the data is non-stationary. Otherwise, the calculated ADF test statistic value in absolute terms are greater than the ADF critical value in absolute terms, we reject the null hypothesis that the unit root exists which means that the data is stationary.

Before any other estimation was made, the stationarity of the variables in both their level and first difference were conducted using E-views 7 as shown in table 1 and 2 respectively.

Table 3: Unit root test at level

Ho Series has Unit-Root.				
Variables	**Confidence level**	**Critical Values**	**ADF test statistic Value**	**Prob***
Log Y	At 1%	-3.871311	-0.441986	0.8762
	At 5%	-2.768449		
	At 10%	-2.658244		
Log CONS	At 1%	-3.871311	-1.553252	0.497
	At 5%	-2.768449		
	At 10%	-2.658244		
Log SAV	At 1%	-3.871311	-1.182127	0.6821
	At 5%	-2.768449		
	At 10%	-2.658244		
Log CSP	At 1%	-3.871311	-0.821240	0.8052
	At 5%	-2.768449		
	At 10%	-2.658244		
Log PVI	At 1%	-3.871311	-2.563612	0.1232
	At 5%	-2.768449		
	At 10%	-2.658244		
Log PVI	At 1%	-3.871311	-0.362189	0.9056
	At 5%	-2.768449		
	At 10%	-2.658244		
Log NX	At 1%	-3.871311	-1.962549	0.2952
	At 5%	-2.768449		
	At 10%	-2.658244		
Log GDP	At 1%	-3.871311	-1.920895	0.3356
	At 5%	-2.768449		
	At 10%	-2.658244		
Log IR	At 1%	-3.871311	0.1827852	0.9741

	At 5%	-2.768449		
	At 10%	-2.658244		
Log INF	At 1%	-3.871311		
	At 5%	-2.768449	-2.824551	0.0651
	At 10%	-2.658244		
Log CRE	At 1%	-3.871311		
	At 5%	-2.768449	-4.651247	0.0005
	At 10%	-2.658244		
*MacKinnon (1996) one-sided p-values.				

(**(Source: E-Views-7)**

At level, the researcher failed to reject the null hypothesis because test statistics (ADF) are less than (in absolute value) calculated critical values. Therefore, the researcher concluded that all variables in the model are non-stationary at level. Thus, all variables were subjected to first difference.

Table 4: ADF Unit-Root Test Upon First Differencing.

Ho Series has Unit-Root.				
Variables	**Confidence Level**	**Critical Values**	**ADF test statistic Value**	**Prob***
Log Y	At 1%	-3.547767		
	At 5%	-2.93287	-8.538269788	0.0000
	At 10%	-2.552922		
Log CONS	At 1%	-3.547767		
	At 5%	-2.93287	-8.944433	0.00000
	At 10%	-2.552922		
Log SAV	At 1%	-3.547767		
	At 5%	-2.93287	-6.579733	0.0000
	At 10%	-2.552922		
Log CSP	At 1%	-3.547767		
	At 5%	-2.93287	-6.400821	0.0000
	At 10%	-2.552922		
Log PVI	At 1%	-3.547767		
	At 5%	-2.93287	-8.542566	0.0000
	At 10%	-2.552922		

Log PVI	At 1%	-3.547767	-5.665633	0.000
	At 5%	-2.93287		
	At 10%	-2.552922		
Log NX	At 1%	-3.547767	-7.015788	0.0000
	At 5%	-2.93287		
	At 10%	-2.552922		
Log GDP	At 1%	-3.547767	-6.463571	0.000
	At 5%	-2.93287		
	At 10%	-2.552922		
Log IR	At 1%	-3.547767	-7.083948	0.000
	At 5%	-2.93287		
	At 10%	-2.552922		
Log INF	At 1%	-3.547767	-10.7417	0.000
	At 5%	-2.93287		
	At 10%	-2.552922		
Log CRE	At 1%	-3.547767	-8.269826	0.000
	At 5%	-2.93287		
	At 10%	-2.552922		
*MacKinnon (1996) one-sided p-values.				

(Source: E-Views-7)

Upon first differencing, ADF Unit root test results show that all ADF test statistic values in absolute terms for all our variables in the model are greater than any ADF critical values at 1%, 5% and 10% confidential interval respectively in absolute terms. Therefore, the results allow us to reject the null hypothesis indicating that all variables become stationary upon first differencing, Hence, all variables are integrated of order one I (1). Since all the variables are stationary at first difference, the researcher was forced to test whether there is long run relationship by using Cointegration analysis.

The ADF Unit root test results show that time series has stochastic trend and has been made stationary by differencing it one time and became integrated of order one, I (1). This test result in consistent with the literature of Damodar Gujarati in his book (GUJARATI, D., 2012)

4.3: Results for Johansen Co-integration test

Johansen Co-Integration Test Hypothesis follows that: H0 = No Co-integrating equation and H1 = H0 is not true i.e. There is Co-integrating equation.The decision criteria are as follows: Reject the null hypothesis if the value of the Trace and Max statistics exceeds 5 % critical value, otherwise, fail to reject the null hypothesis.

The table and analysis above show the test for the null hypothesis H0 i.e. No Co-integrating equation against the alternative hypothesis i.e. presence of Co-integrating equation. The calculated Trace and Maximum Eigen statistics exceeding the critical values at 5% implies that the null hypothesis that there's no Co-integrating equation in this model has been rejected because the model shows even up to 4 Co-integrating equations confirming the existence of a long-run relationship between variables. Therefore, the researcher proceeds with running the restricted VAR or Vector Error Correction Model in order to examine the short run dynamics and long run relationship among the variables of the study.

4.5 Vector Error Correction Result

The Vector error correction model (VECM) is a system with vector of two or more endogenous and co-integrated variables. It is constructed to examine the long and short run dynamics of the co-integrated series and restricts the long run behavior of endogenous variables to converge to their co-

integrating relationship. The co-integrating term is known as the error correction term (ECT). Below is the error correction and short-run model dynamics as result from VECM estimates:

Table 5: VECM Estimates

Vector Error Correction Estimates	
t-statistics in [ ]	
Cointegrating Eq:	CointEq1
Log_Y(-1)	1.000000
Log CONS(-1)	-0.200014
	[-3.42460]
Log_SAV.(-1)	0.318100
	[16.9616]
Log_CSP(-1)	-0.057633
	[-2.87830]
Log_PVI(-1)	0.031098
	[3.51654]
Log_NX(-1)	-5.227606
	[-9.26812]
Log_GDP (-1)	0.039404
	[6.17435]
Log_INF(-1)	-0.25687
	[-11.5949]
Log_CRE (-1)	-0.782055
	[-12.0370]
C	20.15097
Error Correction:	**D(Log_Y)**
CointEq1 (ECT)	-0.442144
	[-1.45776]
D(Log_Y(-1))	0.333984
	[0.63876]
D(Log_CONS (-1))	0.240607
	[0.53884]
D(Log_SAV (-1))	0.049424
	[1.06838]
D(Log_CSP(-1))	0.013920
	[0.11820]
D(Log_PVI(-1))	0.030564
	[0.79552]
D(Log_NX (-1))	1.189784
	[0.54055]
D(Log_GDP(-1))	0.042000
	[1.23824]
D(Log_INF(-1))	0.201390
	[1.38024]
D(Log_CRE (-1))	0.130163
	[0.68168]
C	-0.018854

	[-0.56906]

(**(Source: E-Views-7)**

$$\Delta \boldsymbol{log\ Y} = -0.44\ \mathrm{CONS}_{t-1} + 0.24\ \Delta \log \mathrm{CSP}_{t-1} + 0.049\Delta \log \mathrm{PVI}_{t-1} + 0.013\Delta \log \mathrm{NX}_{t-1} + 0.03\ \Delta \log \mathrm{GDP}_{t-1} + 1.18\ \Delta \log \mathrm{IR}_{t-1} + 0.042\ \Delta \log \mathrm{INF}_{t-1} + 0.13\ \Delta \log \mathrm{CRE}_{t-1} - 0.018$$

For consumption., the result shows that the value of Error Correction Term (ECT) is -0.44 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 44%. The increase of 1 percent in consumption rate will bring about 0.44 percent decrease in agriculture performance and it is significant at 1 percent.

For CSP, the result shows that the value of Error Correction Term (ECT) is +0.24 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 24%. The increase of 1 percent in CSP rate will bring about 0.24 percent increase in agriculture performance and it is significant at 1 percent.

Thus, these findings are in line with the study objective **(#1)** of examining the effect of Aggregate supply and demand where Brownson et al (2003) showed that in both long run inflation had a significant effects on agricultural productivity, whereas industrial capacity utilization and nominal exchange rate promote agricultural productivity in Nigeria. On the other hand, Akpan et al (2015) reported that long-run positive drivers of agricultural diversification include inflation and energy consumption constitute negative long-run drivers in the Nigerian economy.

For PVI, the result shows that the value of Error Correction Term (ECT) is +0.049 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 4.9%. The increase of 1 percent in PVI rate will bring about 0.049 percent increase in agriculture performance and it is significant at 1 percent.

For NX, the result shows that the value of Error Correction Term (ECT) is +0.013 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 1.3%. The increase of 1 percent in net export rate will bring about 0.013 percent increase in agriculture performance and it is significant at 1 percent.

For GDP, the result shows that the value of Error Correction Term (ECT) is +0.03 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 3%. The increase of 1 percent in GDP rate will bring about 0.03 percent increase in agriculture performance and it is significant at 1 percent.

For IR, the results show that the value of the coefficient of the interest rate is 1.18 that the result shows that the value of Error Correction Term (ECT) is +1.18 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 118%. The increase of 1 percent in consumption rate will bring about 1.18 percent increase in agriculture performance and it is significant at 1 percent. A

percentage increase in interest rate is associated with 118% increase in Y (agriculture performance) in short run.

For the inflation, INF exhibits the positive correlation with Y with the Coefficient value of 0.042 as per VECM estimates. This implies that a percentage change in inflation is associated with 4.2% increase in Y in average ceteris paribus in short run. Using the Error Correction Model, Abla A. H. Bokhari in 2017 found the same results trying to analyse macroeconomic stability and Agriculture performance in Saudi Arabia. The result is also consistent with the findings of Sedat Gumus and Selim Kayhan in 2012 when investigating the relationship between Aggregate Demand and supply and agriculture performance in Turkey.

These results show that macroeconomic indicators through level of inflation leads to agriculture performance, this was explained by a value of 0.042 which implies that it contributes to 4.2%. in Ghana whereby the authors found a positive relationship between Inflation and agriculture production in Sub Saharan Africa. These findings are in line with the study objective **(#2)** of examining the effect of macroeconomic indicators, the results show that the macroeconomic indicators play a significant role in increasing agriculture performance

The coefficient value of CRED is 0.13 and this means that a percentage change in CRED is associated with 13% increase in agriculture performance on average ceteris paribus in the short run. This is consistent with the findings of Ehinomen & Charles (2012) in exploring ways for sustainable ways for growth for Nigeria investigated the agricultural sector in the country and how monetary policy impacted its development when investigating the impact of credit facility on agriculture performance in South Africa countries. They came to similar findings in all South African countries that the credit facility is positively correlated to the agriculture performance. The same findings obtained by Dercon (2009) who argued that the agricultural sector especially in developing countries has low productivity and therefore expanding this sector cannot be the channel for economic growth. Gollin (2010) also argued that agricultural performance growth is neither a necessary nor sufficient condition for macroeconomic stability, thus, trying to assess the relationship credit on agriculture performance. Thus, these findings are in line with the study objective **(#3)** of examining the effect credit on agriculture performance.

4.6 Causality Test

Table 6: Granger Causality Test

Pairwise Granger Causality Tests
Date: 10/12/22 Time: 8:32
Sample: 1 32
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CONS does not Granger Cause AD_AS	30	4.41206	0.0229
AD_AS does not Granger Cause CONS		0.34404	0.7122
CRE does not Granger Cause AD_AS	30	5.98874	0.0075
AD_AS does not Granger Cause CRE		1.86392	0.1760
CSP does not Granger Cause AD_AS	30	6.83177	0.0043
AD_AS does not Granger Cause CSP		2.61285	0.0932
GDP_$BN_ does not Granger Cause AD_AS	30	8.11290	0.0019

AD_AS does not Granger Cause GDP_$BN_		0.92083	0.4113
INF does not Granger Cause AD_AS	30	4.77021	0.0176
AD_AS does not Granger Cause INF		1.00670	0.3798
IR does not Granger Cause AD_AS	30	4.82062	0.0170
AD_AS does not Granger Cause IR		0.48358	0.6222
NX does not Granger Cause AD_AS	30	1.40873	0.2632
AD_AS does not Granger Cause NX		10.5250	0.0005
PVI does not Granger Cause AD_AS	30	6.93078	0.0040
AD_AS does not Granger Cause PVI		1.93169	0.1659
SAV does not Granger Cause AD_AS	30	0.13977	0.8702
AD_AS does not Granger Cause SAV		1.06466	0.3600
Y does not Granger Cause AD_AS	30	3.83673	0.0352
AD_AS does not Granger Cause Y		0.23686	0.7909
CRE does not Granger Cause CONS	30	1.26211	0.3005
CONS does not Granger Cause CRE		1.30103	0.2901
CSP does not Granger Cause CONS	30	2.79205	0.0805
CONS does not Granger Cause CSP		0.30028	0.7432
GDP_$BN_ does not Granger Cause CONS	30	3.77624	0.0369
CONS does not Granger Cause GDP_$BN_		0.53862	0.5902
INF does not Granger Cause CONS	30	0.45988	0.6366
CONS does not Granger Cause INF		0.00820	0.9918
IR does not Granger Cause CONS	30	5.62053	0.0096
CONS does not Granger Cause IR		5.29656	0.0121
NX does not Granger Cause CONS	30	0.17251	0.8425
CONS does not Granger Cause NX		0.40726	0.6698
PVI does not Granger Cause CONS	30	4.25304	0.0257
CONS does not Granger Cause PVI		2.60174	0.0941
SAV does not Granger Cause CONS	30	1.57715	0.2264
CONS does not Granger Cause SAV		2.02961	0.1525
Y does not Granger Cause CONS	30	2.85550	0.0764
CONS does not Granger Cause Y		1.10837	0.3458
CSP does not Granger Cause CRE	30	4.74933	0.0179
CRE does not Granger Cause CSP		0.25148	0.7796
GDP_$BN_ does not Granger Cause CRE	30	7.99823	0.0021
CRE does not Granger Cause GDP_$BN_		0.27837	0.7593

INF does not Granger Cause CRE	30	1.25368	0.3028
CRE does not Granger Cause INF		0.19191	0.8266
IR does not Granger Cause CRE	30	7.81637	0.0023
CRE does not Granger Cause IR		0.22113	0.8032
NX does not Granger Cause CRE	30	1.34390	0.2790
CRE does not Granger Cause NX		0.59845	0.5573
PVI does not Granger Cause CRE	30	2.34701	0.1164
CRE does not Granger Cause PVI		1.00754	0.3795
SAV does not Granger Cause CRE	30	5.82561	0.0084
CRE does not Granger Cause SAV		2.26713	0.1245
Y does not Granger Cause CRE	30	15.3665	4.E-05
CRE does not Granger Cause Y		1.28301	0.2948
GDP_$BN_ does not Granger Cause CSP	30	15.8546	4.E-05
CSP does not Granger Cause GDP_$BN_		0.02766	0.9728
INF does not Granger Cause CSP	30	6.06786	0.0071
CSP does not Granger Cause INF		0.33642	0.7175
IR does not Granger Cause CSP	30	3.45327	0.0474
CSP does not Granger Cause IR		4.80610	0.0171
NX does not Granger Cause CSP	30	0.12351	0.8844
CSP does not Granger Cause NX		3.56686	0.0434
PVI does not Granger Cause CSP	30	1.81824	0.1831
CSP does not Granger Cause PVI		5.19455	0.0130
SAV does not Granger Cause CSP	30	0.18978	0.8283
CSP does not Granger Cause SAV		0.44822	0.6438
Y does not Granger Cause CSP	30	0.28547	0.7541
CSP does not Granger Cause Y		3.04391	0.0656
INF does not Granger Cause GDP_$BN_	30	1.36141	0.2747
GDP_$BN_ does not Granger Cause INF		0.47434	0.6278
IR does not Granger Cause GDP_$BN_	30	0.49243	0.6169
GDP_$BN_ does not Granger Cause IR		7.29910	0.0032
NX does not Granger Cause GDP_$BN_	30	0.04499	0.9561
GDP_$BN_ does not Granger Cause NX		3.27339	0.0546
PVI does not Granger Cause GDP_$BN_	30	0.78669	0.4663
GDP_$BN_ does not Granger Cause PVI		16.0603	3.E-05
SAV does not Granger Cause GDP_$BN_	30	2.63503	0.0915
GDP_$BN_ does not Granger Cause SAV		0.29979	0.7436

Y does not Granger Cause GDP_$BN_	30	0.04870	0.9526
GDP_$BN_ does not Granger Cause Y		6.31210	0.0060
IR does not Granger Cause INF	30	0.13879	0.8711
INF does not Granger Cause IR		1.34343	0.2791
NX does not Granger Cause INF	30	0.29600	0.7464
INF does not Granger Cause NX		0.88029	0.4271
PVI does not Granger Cause INF	30	0.20322	0.8174
INF does not Granger Cause PVI		3.55000	0.0439
SAV does not Granger Cause INF	30	0.44807	0.6439
INF does not Granger Cause SAV		0.05219	0.9493
Y does not Granger Cause INF	30	0.62549	0.5432
INF does not Granger Cause Y		1.90308	0.1701
NX does not Granger Cause IR	30	0.07516	0.9278
IR does not Granger Cause NX		1.24174	0.3061
PVI does not Granger Cause IR	30	3.28742	0.0540
IR does not Granger Cause PVI		11.8486	0.0002
SAV does not Granger Cause IR	30	0.86152	0.4347
IR does not Granger Cause SAV		1.02127	0.3747
Y does not Granger Cause IR	30	3.06346	0.0646
IR does not Granger Cause Y		7.11065	0.0036
PVI does not Granger Cause NX	30	2.01178	0.1548
NX does not Granger Cause PVI		0.14794	0.8632
SAV does not Granger Cause NX	30	0.12207	0.8856
NX does not Granger Cause SAV		0.21663	0.8067
Y does not Granger Cause NX	30	0.97320	0.3917
NX does not Granger Cause Y		0.10608	0.8998
SAV does not Granger Cause PVI	30	1.22154	0.3118
PVI does not Granger Cause SAV		0.82133	0.4514
Y does not Granger Cause PVI	30	1.76392	0.1920
PVI does not Granger Cause Y		4.96614	0.0153
Y does not Granger Cause SAV	30	1.33910	0.2802
SAV does not Granger Cause Y		2.46978	0.1050

(Source: E-Views-7)

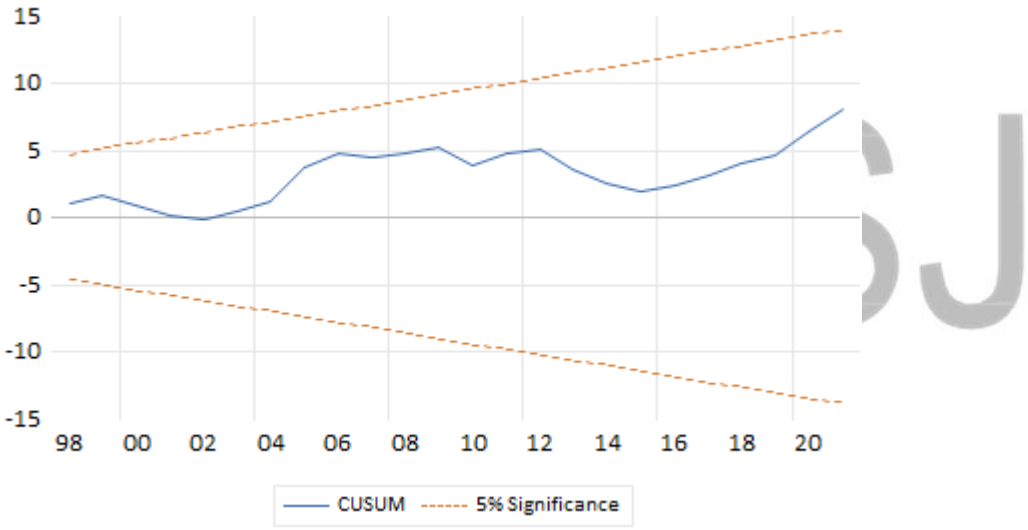
Pair wise Granger Causality Tests was used to determine the direction of causality among variables of interest by using both null and alternative hypothesis. Ho: no Granger causality. H1; the null hypothesis is not true. Reject the null hypothesis if the probability values of the F-statistics are ≤ 0.05

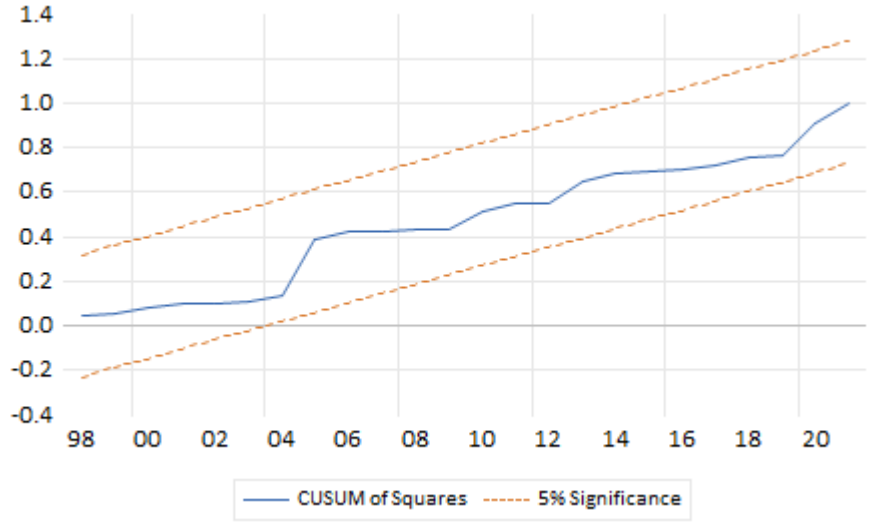
From Table 6, the Pairwise Granger Causality Test showed all independent variables granger their dependent variable Y and independent variables also granger them. Thus, the researcher concluded to reject the null hypothesis for where probability values are less than 0.05, This is the case of causality between SAV to Y, PVI to Y, PVI to NX, cons to AD-AS, CRED to AD-AS

Therefore, it was confirmed that there was unidirectional causality among Aggregate supply and demand, macroeconomic indicators, and commercial bank credit on agriculture performance. In other words, this means that some independent variables contain information that are useful for predicting changes in agriculture performance.

4.7 Stability test

CUSUM &CUSUM SQUARE TESTS (OLS)





(Source: E-Views-7)

The straight lines of the shaded line area are critical bounds at 5% significance level. The results from both the CUSUM show that the plots of the statistics remain within the upper and lower bounds of 5% level of significance. This means that the null hypothesis that all the coefficients obtained from the regression are stable cannot be rejected (Srinivasan, et al., 2012). Thus, the researcher concludes the stability of the model.

4.8Post -Estimation techniques

4.8.1Test for multi-collinearity

The classical linear regression model (CLRM) assumes that there is no exact linear relationship among the regressors. If there are one or more such relationships among the regressors, we call it multicollinearity or collinearity. if two variables are highly collinear it is very difficult to isolate the impact of each variable separately on the regressand (GUJARATI, D., 2012). In this study, it was assessed by both examination of correlation matrix of the regressors and Variance Inflation Factor (VIF) value ((RANJIT. K P , 2014).

(a) Examination of correlation Matrix

A very simple measure of multicollinearity is inspection of the off-diagonal elements r_{ij} in $X'X$. If regressors $X_i$and X_j are nearly linearly dependent, then $[r_{ij}]$will be near unity. The correlation matrix result (appendix 1) indicates that there is high multiclonality between all macroeconomic stability on agriculture performance.

(b) Variance Inflation Factor

The VIF estimates how much the variance of a regression coefficient is inflated due to multicollinearity presence in the model. To interpret VIF, the thumb rule was used. For VIF=1, this indicates not correlated, for VIF between 1 and 5; moderately correlated and if it is greater than 5; highly correlation (Greene, 2012).

Table 7: Variance Inflation Factors Result To Test Multi-Collinearity

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Log_CONS	0.000257	188.2565	6.012790
Log_SAV	0.008937	477.2529	4.646449
Log_CSP	0.000244	7.438809	1.661171
Log_PVI	1.123217	156604.8	4.396654
Log_NX	0.000192	12.25043	3.077984
Log GDP	0.002135	458.0084	12.20419
Log_IR	0.023742	3438.787	21.01790
Log_INF	0.001630	93.51993	4.150494
Log_CRE	0.005053	442.1471	2.559969
C	23.87382	166882.1	NA

(Source: E-Views-7)

The results of VIF and correlation matrix showed that the interest rate IR exhibit a high level of structural multicollinearity which can mislead our regression and interpretation of coefficients.

c) Remedial of multi-collinearity

To come up with remedial measure, the researcher used the standardized variables as one of the techniques to remove the multicollinearity, but this technique was not able to resolve the issue. He also opted the drop out techniques the mentioned variables have been dropped out to remove the multicollinearity. Below is the result after removing the three mentioned variables.

Table 8: Variance Inflation Factors result after remedial of multi-collinearity

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
Log_CSP	0.009258	4.180101	4.180101
Log_PVI	0.002890	1.305041	1.305041
Log_NX	0.005921	2.673422	2.673422
Log_GDP	0.004308	1.945196	1.945196
Log_INF	0.008106	3.660056	3.660056
Log_CRED	0.004945	2.232667	2.232667
Log_SAV	0.011161	5.039304	5.039304
Log_CONS	0.004234	1.911947	1.911947
C	0.002164	1.000000	NA

(Source: E-Views-7)

4.9 Heteroscedasticity Test

Ho: The error variance is Homoscedastic			
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.893063	Prob. F(8,24)	0.5326
Obs*R-squared	7.459052	Prob. Chi-Square(8)	0.488
Scaled explained SS	4.00232	Prob. Chi-Square(8)	0.8569

(Source: E-Views-7)

The result below shown that chi-square has a high p value of 0.8569 suggesting that Ho can be maintained from homoscedasticity and therefore, there is no heteroscedasticity in our regression. This means that the variance of the disturbance term of model is the same overtime and therefore, the researcher can confirm that variables do not exhibit the volatility clustering property. This result is consistent with econometric literature that the heteroscedasticity is generally associated with cross-sectional data (GUJARATI, D., 2012)

5.0 Discussion conclusion and recommendations

5.1 Discussion

5.1.1. Effect of Aggregate Supply And Demand on Agriculture Performance

These findings showed that there was a long run relationship between AD-AS components with agriculture performance, this was explained ECM approach where CSP, the result shows that the value of Error Correction Term (ECT) is +0.24 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 24%. The increase of 1 percent in CSP rate will bring about 0.24 percent increase in agriculture performance and it is significant at 1 percent.

5.1.2. Effect of Macroeconomic Indicators on Agriculture Performance

These results show that macroeconomic indicators through level of inflation leads to agriculture performance, this was explained by a value of 0.042 which implies that it contributes to 4.2%

For GDP, the result shows that the value of Error Correction Term (ECT) is +0.03 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 3%. The increase of 1 percent in GDP rate will bring about 0.03 percent increase in agriculture performance and it is significant at 1 percent.

For PVI, the result shows that the value of Error Correction Term (ECT) is +0.049 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 4.9%. The increase of 1 percent in PVI rate will bring about 0.049 percent increase in agriculture performance and it is significant at 1 percent.

For NX, the result shows that the value of Error Correction Term (ECT) is +0.013 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 1.3%. The increase of 1 percent in net export rate will bring about 0.013 percent increase in agriculture performance and it is significant at 1 percent.

For IR, the results show that the value of the coefficient of the interest rate is 1.18 that the result shows that the value of Error Correction Term (ECT) is +1.18 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 118%. The increase of 1 percent in consumption rate will bring about 1.18 percent increase in agriculture performance and it is significant at 1 percent. A percentage increase in interest rate is associated with 118% increase in Y (agriculture performance) in short run.

5.1.3. Effect of Bank Credit on Agriculture Performance

The coefficient value of CRED is 0.13 and this means that a percentage change in CRED is associated with 13% increase in agriculture performance on average ceteris paribus in the short run.

5.2 Conclusion

This conclusion has been reached by other researchers such as De-Graft Owunu Manu et all, 2019 and Rohit Apurv and Shigufta Hena Uzma, 2020, Eric Mutabazi, 2019 and it undermines the endogenous

growth theories (e.g. Lucas model or Romer's model) that emphasize on credit facility or bank credit as a significant factor for agriculture performance.

In summary, there was a long run relationship between dependent variable and independent variables, the following are the major findings:

For consumption, the result shows that the value of Error Correction Term (ECT) is -0.44 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 44%. The increase of 1 percent in consumption rate will bring about 0.44 percent decrease in agriculture performance and it is significant at 1 percent. For CSP, the result shows that the value of Error Correction Term (ECT) is +0.24 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 24%. The increase of 1 percent in CSP rate will bring about 0.24 percent increase in agriculture performance and it is significant at 1 percent. Thus, these findings are in line with the study objective **(#1)** of examining the effect of Aggregate supply and demand where Brownson et al (2003) showed that in both long run inflation had a significant effect on agricultural productivity, whereas industrial capacity utilization and nominal exchange rate promote agricultural productivity in Nigeria. On the other hand, Akpan et al (2015) reported that long-run positive drivers of agricultural diversification include inflation and energy consumption constitutes negative long-run drivers in the Nigerian economy. For PVI, the result shows that the value of Error Correction Term (ECT) is +0.049 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 4.9%. The increase of 1 percent in PVI rate will bring about 0.049 percent increase in agriculture performance and it is significant at 1 percent. For NX, the result shows that the value of Error Correction Term (ECT) is +0.013 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 1.3%. The increase of 1 percent in net export rate will bring about 0.013 percent increase in agriculture performance and it is significant at 1 percent. For GDP, the result shows that the value of Error Correction Term (ECT) is +0.03 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 3%. The increase of 1 percent in GDP rate will bring about 0.03 percent increase in agriculture performance and it is significant at 1 percent. For IR, the results show that the value of the coefficient of the interest rate is 1.18 that the result shows that the value of Error Correction Term (ECT) is +1.18 which implies that the relationship between the variables met a priori expectation of the study, and that the condition for stability is satisfied. The result indicates that the previous period deviation from the long run equilibrium is corrected in the current period at an adjustment speed of 118%. The increase of 1 percent in consumption rate will bring about 1.18 percent increase in agriculture performance and it is significant at 1 percent. A percentage increase in interest rate is associated with 118% increase in Y (agriculture performance) in short run. For the inflation, INF exhibits the positive correlation with Y with the Coefficient value of 0.042 as per VECM estimates. This implies that a percentage change in inflation is associated with 4.2% increase in Y in average ceteris paribus in short run. Using the Error Correction Model, Abla A. H. Bokhari in 2017 found the same results trying to analyse macroeconomic stability and Agriculture performance in Saudi Arabia. The result is also consistent with the findings of Sedat Gumus and Selim Kayhan in 2012 when investigating the relationship between Aggregate Demand and supply and agriculture performance in Turkey. These results show

that macroeconomic indicators through level of inflation leads to agriculture performance, this was explained by a value of 0.042 which implies that it contributes to 4.2%. in Ghana whereby the authors found a positive relationship between Inflation and agriculture production in Sub Saharan Africa. These findings are in line with the study objective **(#2)** of examining the effect of macroeconomic indicators, the results show that the macroeconomic indicators play a significant role in increasing agriculture performance. The coefficient value of CRED is 0.13 and this means that a percentage change in CRED is associated with 13% increase in agriculture performance on average ceteris paribus in the short run. This is consistent with the findings of Ehinomen & Charles (2012) in exploring ways for sustainable ways for growth for Nigeria investigated the agricultural sector in the country and how monetary policy impacted its development when investigating the impact of credit facility on agriculture performance in South Africa countries. They came to similar findings in all South African countries that the credit facility is positively correlated to the agriculture performance. The same findings obtained by Dercon (2009) who argued that the agricultural sector especially in developing countries has low productivity and therefore expanding this sector cannot be the channel for economic growth. Gollin (2010) also argued that agricultural performance growth is neither a necessary nor sufficient condition for macroeconomic stability, thus, trying to assess the relationship credit on agriculture performance. Thus, these findings are in line with the study objective **(#3)** of examining the effect credit on agriculture performance.

5.3 Recommendations

Since the results confirmed the long run relationship between variables and are consistent with many other previous studies that emphasize the role of efficiency. In same line the results are consistent with previous studies conducted to highlight the effect macroecoenomic stability and credit commercial bank on agriculture performance as services and support that are critical for better functioning and growth of the country. In this line, the study opts to give the following policy recommendations:

The improvement of level of credit facility to be emphasized as it positively relates to agriculture investment in Rwanda. Doing so will contribute to agriculture performance which in turn could promote even economic growth since agriculture occupies a big contribution on GDP in the long run.

Inflation level needs to work on as people need to invest in agriculture sector. The monetary authorities are suggested to keep inflation preferably in a single digit in order to avoid macro-economic fluctuations as they are harmful for the overall economy.

Export promotion needs to be improved as a way of increase the market in agriculture products to be exported outside.

Lastly, the government should put more emphasis in agriculture to allow active people to work and to make agriculture marketed so as to increase the GDP share

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