Effects of Fiscal and Monetary Policies on Agricultural Industry Growth in Tanzania from 1970 to 2022

Vicent Stanslaus[1], Deus D. Ngaruko[2] and Felician Mutasa[2]
[1]Department of Marketing, Entrepreneurship and Management,
The Open University of Tanzania,
[2]Department of Economic Community Development,
The Open University of Tanzania
Corresponding email: stanslausvicent@gmail.com

Abstract
The study examined the effects of macroeconomic policies on agriculture industrial growth in Tanzania from 1970 to 2022. The Keynesian Theory and the Optimal Tax Theory to Tax Policy by Robin Boadway (2012) are used with the Mundell–Fleming model. The ARDL approach supported by Error Correction Model was used to check the long- and short-run nexus between dependent and independent variables. The findings indicated that fiscal policies had a positive and significant effect on agriculture industry growth wile for monetary policies, interest rate and money supply had a significant positive effect. The Autoregressive Distributed Lag and Error Correction Model indicated the presence of a long run relationship between fiscal and monetary policies and agriculture industry growth at large. The speed of long run growth for Monetary and fiscal policies on agriculture industry growth is 38.4%. The study concludes that macroeconomic policies are more effective on the general agriculture industry growth in the long run than in the short run. The key recommendation in this study is that policymakers should adopt expansionary fiscal (in line with the Keynesian theory) and monetary policies which stimulate both short and long run crop production and agricultural productivity growth in Tanzania.

Keywords: *Fiscal policies, Monetary policies, Agricultural industry growth*

INTRODUCTION

The economic overview in Tanzania indicates that the economy registered a growth rate of 4.7% in 2022 compared to 4.9% in 2021 and it country's lowest growth over the last three years. The MoA (2023) reports that the reduction is attributed to the lingering impact of COVID 19 and the effects of the Russian - Ukraine conflict but real GDP is estimated to grow by 5.2% in 2023. It reports further that the reduced growth is not limited to Tanzania but has impacted many countries across the world. Tanzania's growth is however still above the 3.4% and 3.7% growth rate for the global economy and sub-Saharan countries respectively. The agriculture sector grew at 3.9% in 2021 compared to 4.9% in 2020 and the sector contributed 26.1% of GDP, contributed an average of 65.6% of total employment, 65% of industry raw materials and 100% of food crops, MoA (2022 &2023). On the other hand, Kray *et al,* (2020) narrated that agriculture in Tanzania represents almost 30 percent of the country's GDP with three quarter of the country's workforce involved in this sector. Agriculture is undoubtedly the largest and most important sector of the Tanzanian economy, with the country benefitting from a diverse production base that includes livestock, staple food crops and a variety of cash crops.

Agriculture industry growth is initially guaranteed when there is a systematic policy measure to steer resources into the production process, so that eventually the growth of output must be generated through the growth of productivity. For most countries, development and industrialisation are inextricably linked. A classic literature in development argues that, for the poorest countries, improving the productivity of the agricultural sector may provide the initial spur to industrialisation (Rosenstein-Rodan 1943, Schultz 1953, Lewis 1954). This view has been influential with policymakers, according to the World Bank (2007), "there are many success stories of agriculture as an engine of growth early in the development process". Also, the neoclassical conception considers agriculture as an engine for industrialization (Ruan, 2017).

Agriculture has been defined as the production of food crops, cash crops and the purposeful tendering of plants and animals, (Ahmed, 1993). The most common food crops in Tanzania are maize, wheat, rice, sweet potatoes, bananas, beans, sorghum and sugar cane while cash crops include coffee, cotton, cashew nuts, tobacco, tea and sisal. The development of agriculture remains one of the most effective tools to end extreme poverty, boost shared prosperity and feed a projected 9.7 billion people by 2050, (World Bank, 2019). To meet demand, agriculture in 2050 will need to produce almost 50 percent more food, feed and biofuel than it did in 2012 (FAO, 2017). For example, agriculture drives economic change and development in India through its causal links with factor and product markets (Radhakrishna, 2020). It is widely known that agriculture is one of the most effective instruments for achieving growth and reducing poverty, especially in rural economies.

Macroeconomic policy changes have affected the agricultural economy greatly in recent years through their impacts on interest rates and inflation. Changing interest rates influence variable production costs, long-term capital investments, cash flow, land values, and exchange rates, while inflation affects input prices, commodity prices, real interest rates and land prices.

Given the growing integration of the world economy, future domestic and foreign policy changes may play an even greater role in determining the financial performance of the agricultural industry. Therefore, it is becoming increasingly important that farmers and agribusinesses understand the linkages between the macro economy and agriculture in making sound business decisions.

Today, agriculture remains important in Tanzania, employing a large majority of the labour force and accounting for about one-quarter of gross domestic product (Benson *et al*, 2017; Wineman, *et al*, 2020). It is evident that agricultural policy in Tanzania has long been characterized by tension between faith in the market system and in the state, and this endures to this day. The government's major agricultural policy of the 20th century is the Agricultural Sector Development Programme, which has occurred in two phases (Agriculture Sector Development Plan (ASDP)-I, from 2006 to 2013, and ASDP-II, from 2018 to 2025).

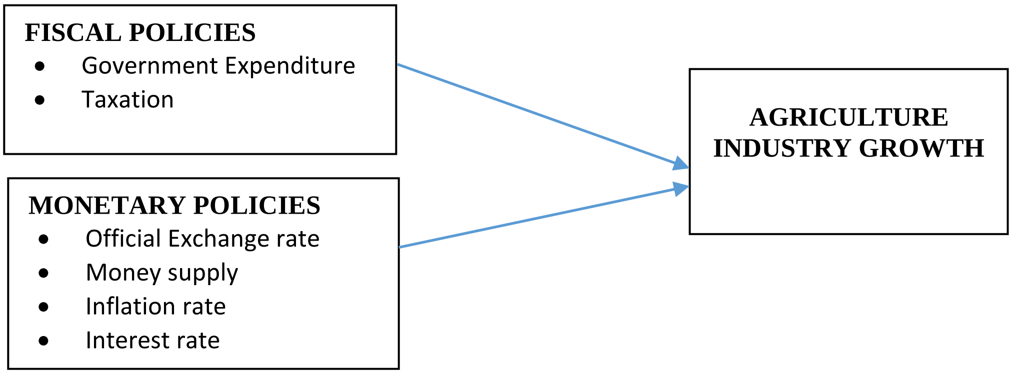
Other policies include the *Kilimo Kwanza* framework for agricultural development which was introduced in 2008 with an emphasis on private sector-driven development in support of commercial farming. The other one wasthe Southern Agricultural Growth Corridor of Tanzania (SAGCOT), which was officially launched in 2010, aiming to attract private investments in agriculture and public investments in infrastructure to specific geographic clusters (United Republic of Tanzania, 2016). The National Agricultural Input Voucher Scheme (NAIVS), consisting of input vouchers for inorganic fertilizer and improved maize and rice seed, was introduced in 2009 and eventually targeted approximately two million farmers (Cooksey, 2012). This was scaled back around 2014 and has been replaced with a Fertilizer Bulk Procurement System (FBPS) aimed at regulating fertilizer prices (Kasumuni, 2018).

The evaluation of these various policies is mixed and their impacts towards agriculture growth are not consistent.

Policymakers are more concerned regarding agriculture growth of cash crops and livestock for economic welfare and development in the near future. Previous research indicates that efforts on macroeconomic policies have been taken to address the problem. A report by CoMPRA, (2022) indicated that different macroeconomic policies have been undertaken such as reduction on borrowing rate, special credits, setting of an exchange rate, government intervention, especially nationalization of the major means of production, privatization, bringing inflation to a single digit and below 7% and government expenditure. Despite all these initiatives on agriculture industrial growth, the country as in many other developing countries has not grown to the desired rate so as to reach a desired level of economic growth and development. For example, the agricultural sector development programme phase II (ASDP II) indicated that the average growth rate for the agriculture sector during the period 2006–2014 was 3.9% per annum. From 2006 to 2012, the share of the agriculture sector in total GDP decreased from 27.7% to 23.2%. The Statista, (2022) report further indicates that in 2020 quarter 3 agriculture grew at 6.4% while in 2021 quarter 3 it decreased to 4.1%. this implies that the agriculture sector continues to fluctuate and grow below the GDP growth rate.

The available similar studies within and across Tanzania and the region that were done on this topic had conflicting conclusions hence one cannot rely on them in explaining how macroeconomic policies affect agriculture industry growth. Studies such as Shobande, *et al*, (2018), Bhat, Kamaiah & Acharya (2020), Ngong, *et al*, (2022), Osabohien *et al*. (2020), Adeleye, Osabuohien, & Asongu. (2020), Pandey. & Kumari, (2021), Peng, Latief & Zhou (2021), Saheed, *et al*, (2018), Kray, *et al*, (2020) had mixed results. Also, no study has combined monetary and fiscal policies to study the effect of these policies on agriculture growth. Therefore, this study addressed this gap by assessing the effects of macroeconomic factors on agriculture industry growth especially their effectiveness on crop production, livestock production and the general agriculture industry growth in Tanzania.

The study used the Keynesian Theory and the Optimal Tax Theory to Tax Policy by Robin Boadway (2012) to establish the effects of fiscal and monetary policies on agricultural industry growth. While Keynesian theory primarily deals with the broader economic management and stabilization policies, optimal tax theory focuses on the design of tax systems for revenue generation with considerations for efficiency and equity. In practice, governments often draw from both theories when formulating economic policies, using Keynesian principles during economic downturns and applying optimal tax considerations for designing tax structures. Further, the study was backed up this conceptual framework shows a relationship between the dependent and independent variables. It simply implies that agriculture industry growth depends on fiscal and monetary policies. Agriculture industrial growth is explained as the share of the agriculture sector to GDP while fiscal policies variables include government expenditure and tax revenues. Monetary policies variables include official exchange rate, money supply, inflation rate and interest rate. Also, it implies that crop and livestock production which are the components of the agriculture sector have a great influence in agriculture growth and this relationship is portrayed in figure 1



Conceptual framework
Source: Researcher, (2023)

2.0 Method

The generic form of the linearregression model was used as presented in equation 1.

$$y = f(x1, x2, \ldots . xK + \varepsilon = x1\beta1 + x2\beta2 + \ldots . + xK\beta K + \varepsilon \ldots \ldots \ldots \ldots \ldots \ldots . .1$$

Where *y* is the dependent or explained variable and *x*1, . . . , *xK* are the independent or explanatory variables. The theory specified that *f* (*x*1, *x*2, . . . , *xK)*. This function is commonly called the population regression equation of *y* on *x*1, . . . , *xK*. In this setting, *y* is the regress andand *xk*, *k*=1, . . . , *K*, are the regressors or covariates.The underlying theory specified the dependent and independent variables in the model.

The model was formulated in three forms; the first model (equation 2) took care of fiscal policy variables while model two (equation 3) took care of the monetary policy variables and model three (equation 4) combined the two models.

$$\text{AIG} = \text{f}\ (\text{TREV}, \text{GE}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . .2$$

Where,
AIG= Agriculture Industrial growth
TREV = Tax revenue
GE = Government Expenditure

$$\text{AIG} = \text{f}(\text{EFX}, \text{M3}, \text{INF}, \text{i}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . .3$$

EFX= Official exchange rate
M_3= Money supply
INF=Inflation Rate and

i= interest rate
The representation of the econometric form of the model is summarized as a functional relationship in equation 4.

$$AIG = f\,(TREV, GE, EFX, M3, INF, i) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 4$$

Stating the relationship of the two models mathematically results to equation 5.

$$AIG = \beta 0 + \beta 1TREV + \beta 2GE + \beta 3EFX + \beta 4M3 + \beta 5INF + \beta 6i > 0 \ldots \ldots \ldots \ldots 5$$

Where; β_0 is the constant intercept which shows the level of AIG.
Agriculture Industrial Growth (AIG) is the dependent variable in this study and is dependent on T, GE, EFX, M_3, INF and *i*.
Stating the relationship in an econometric model, equation 6 is represented as shown in equation 7.

$$AIG = \beta 0 + T + GE + EFX + M3 + INF + i \ldots \ldots \ldots + \varepsilon t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 6$$

Equation 6 can be transformed to form equation 7;

$$AIGt = \beta 0 + \beta 1Tt + \beta 2GEt + \beta 3EFXt + \beta 4M3t + \beta 5INFt + \beta 6it + \varepsilon t \ldots \ldots \ldots \ldots 7$$

These variables have been used in previous studies (Olaniyi, 2017; Omoregie *et al*, 2018; Zakaria *et al*, 2019). In addition, equation (7) can be converted into log form and its final equation for estimation is indicated in equation (8):

$$InAIGt = \beta 0 + \beta 1InTt + \beta 2InGEt + \beta 3InEFXt + \beta 4InM3t + \beta 5InINFt + \beta 6Init + \varepsilon t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 8$$

The data was sourced from the Bank of Tanzania (BOT). This is the main sources for economic and financial data for the country. The BOT collects such data on a periodic regular way, for economic and financial planning purposes of the country. Other sources included National Bureau of Statistics (NBS), International Monetary Fund (IMF), the World Bank (World Development Indicators), Ministry of Finance. (MOF)- and the Ministry of Agriculture, Tanzania. In case of missing data, data interpolation and extrapolation was conducted in order to feel the gaps.

The study used secondary annual time series data for Tanzania mainland covering a period of 52 years from 1970 to 2022. There are nine series namely agriculture industry growth which is the contribution of the agriculture sector to GDP, Gross Domestic Product (GDP), Government

Expenditures (GEXP), tax revenues (TREV), Inflation rate (INF), interest rate (i), Money Supply (M3) and real exchange rate (REX). They originate from two macroeconomic policy category which are fiscal policies and monetary policies. The selection of variable considered the relationships between variables. Identify both correlational and causal relationships. While correlation indicates an association, causation implies a direct influence. Also, the selected variables and their transformations exhibit stationarity, which is essential for many time series models. Stationary time series have constant statistical properties over time. The selected variables are readily available and accessible for the entire time period of interest. Missing data or gaps can impact the analysis. Also, the quality of each variable in terms of accuracy, completeness, and consistency. Poor-quality data can introduce noise and affect model performance. Also, external factors, such as seasonality, external shocks, or policy changes, that may impact the time series. Including these factors can enhance the model's explanatory power were considered.

Data quality was ensured through ensuring that the data is collected from reputable and trustworthy sources. Identifying and handling missing values appropriately, using interpolation or imputation methods. Detecting and addressing outliers, which can distort the analysis. This may involve removing or adjusting extreme values based on statistical techniques. Applying smoothing techniques to reduce noise and highlight underlying trends, use appropriate filtering methods to remove short-term fluctuations and focus on long-term patterns. Transforming data if necessary, such as using logarithmic transformations to stabilize variance or differencing to achieve stationarity. Normalize data if there are different scales across variables. Establishing a secure and organized data storage system and implementation of regular audits of the time series data to identify and address any issues promptly.

FINDINGS AND DISCUSSION

Findings

The Effect of Fiscal and Monetary Policies On Agriculture Industry Growth

The study intended to find out the effects of fiscal and monetary policies on agriculture industry growth in Tanzania in order to determine the existence of a long-run relationship between the variables in the study. The study used Pesaran *et al*. (2001) bound testing approach. The ARDL bounds testing approach allows for a distinction to be made between the dependent variable and the explanatory variables, it allows simultaneous estimation of the short-run and long-run components, eliminating the problems associated with omitted variables and the presence of autocorrelation. The ARDL model also allows variables to have different optimal lags. This avoids some of the frequent difficulties of time series analysis such as the lack of power of unit root tests and doubts about the order of integration of the variables examined. In this study the optimal lag structure was selected by the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) to simultaneously correct for residual serial correlation and the problem of endogenous regressors. If co integration exists an error correction representation exists. The normal regression combining both fiscal and monetary policies is provided in table 1.

Table 1: The effects of fiscal and monetary policies on agriculture industry growth
Dependent Variable: AIG
Method: Least Squares
Date: 06/30/23 Time: 02:39
Sample: 1970 2022
Included observations: 53

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.190030	0.887110	-2.468724	0.0175
CPPI	0.063243	1.182402	0.053487	0.0476
GDP	-0.593605	0.717995	-0.826754	0.0128
GEXP	1.051780	0.689817	1.524723	0.0345
I	0.791262	0.197698	4.002388	0.0002
INF	-0.223320	0.058393	-3.824429	0.0004
M3	0.303641	0.194027	1.564944	0.1248
REX	0.117310	0.155407	0.754857	0.0044
TREV	0.420940	0.210984	1.995129	0.0522

R-squared	0.997350	Mean dependent var	13.38706
Adjusted R-squared	0.996868	S.D. dependent var	3.115763
S.E. of regression	0.174381	Akaike info criterion	-0.501626
Sum squared resid	1.337987	Schwarz criterion	-0.167048
Log likelihood	22.29309	Hannan-Quinn criter.	-0.372964
F-statistic	2069.619	Durbin-Watson stat	2.158789
Prob(F-statistic)	0.000000		

Source: Research findings (2023)

The results of the combined model indicate that CPPI has a coefficient of 0.063, which means that a one-unit increase in CPPI leads to a 0.063-unit increase in AIG and the coefficient is statistically significant as the p-value is 0.0476, which is less than the typical significance level of 0.05. GDP on the other hand has a coefficient of -0.593, indicating that a one-unit increase in GDP leads to a decrease of 0.593 units in AIG and the coefficient is statistically significant (p-value = 0.012).

The coefficient for GEXP is 1.051, suggesting that a one-unit increase in GEXP leads to a 1.051 unit increase in AIG and the coefficient is statistically significant (p-value = 0.034) while the coefficient for i is 0.791, which implies that a one-unit increase in i results in a 0.791 unit increase in AIG and the variable is highly statistically significant with a very low p-value of 0.000. Inflation as in the previous findings has a negative coefficient of -0.223, meaning that a one-unit increase in INF leads to a decrease of 0.223 units in AIG and it is statistically significant with a p-value of 0.000 while M3 has a coefficient of 0.304, indicating that a one-unit increase in M3 leads to a 0.303 unit increase in AIG. However, this variable is not statistically significant (p-value = 0.124). REX has a coefficient of 0.117, suggesting that a one-unit increase in REX leads to a 0.117 unit increase in AIG and the variable is statistically significant (p-value = 0.004). The coefficient for TREV is 0.420, meaning that a one-unit increase in TREV results in a 0.420 unit increase in AIG. This variable is marginally significant, with a p-value of 0.052, which is just above the typical significance level.

Explaining the Model Fit

The R-squared is a measure of how well the independent variables explain the variation in the dependent variable. In this case, R-squared is 0.997, which means that approximately 99.7% of the variation in AIG is explained by the independent variables in the model and the Adjusted R-squared is 0.996, which is slightly lower than the R-squared value.

The F-statistic is used to test the overall significance of the regression model. In this case, the F-statistic is 2069.619, and the probability (p-value) is 0.000, indicating that the overall model is statistically significant. The Durbin-Watson statistic tests for autocorrelation in the residuals of the regression model. A value close to 2 suggests no autocorrelation. In this case, the Durbin-Watson stat is 2.158, indicating that there is no autocorrelation in the residuals.

Selecting the Optimal Number of Lags

Table 2 displays the results of lag order selection criteria for a Vector Autoregression (VAR) model. The purpose of selecting the appropriate lag order is to determine how many past time steps of the variables should be included in the VAR model. This choice is important as it affects the model's performance and its ability to capture the underlying relationships in the data. It is also an important step before performing the ARDL test Using Akaike Information Criterion (AIC) which balances the model's goodness of fit with the complexity of the model, the results reveals that 2 lags are selected since AIC provides the lower values (-10.751*). The '*' symbol indicates the lag order that was selected by each corresponding criterion. The findings are as indicated in Table 2.

Table 2: Var lag order selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: AIG GDP I INF M3 REX
Exogenous variables: C
Date: 07/19/23 Time: 19:56
Sample: 1970 2022
Included observations: 47

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-139.6740	NA	1.98e-05	6.198894	6.435083	6.287774
1	209.2057	593.8378	3.32e-11	-7.115136	-5.461813*	-6.492979
2	474.6713	30.55322	2.39e-11	-10.75197*	-2.012975	-7.463427*
3	257.7278	70.20212	2.10e-11	-7.647989	-4.577532	-6.492556
4	283.9518	31.24564	3.91e-11	-7.231990	-2.744398	-5.543279
5	338.9869	51.52227*	2.69e-11	-8.041997	-2.137271	-5.820009
6	402.8712	43.49568	1.94e-11*	-9.228562	-1.906702	-6.473297

Source: Research findings (2023)
* 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

In practice, it's a good idea to consider multiple lag orders, assess their implications, and possibly use other techniques such as model diagnostics or out-of-sample forecasting performance to make a final decision. Table 3 confirms whether lag 2 provides the best model for ARDL analysis.

Table 3: Regression results for the 2-lag model
Dependent Variable: AIG
Method: ARDL
Date: 07/13/23 Time: 23:23
Sample (adjusted): 1972 2022
Included observations: 51 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): CPPI GDP GEXP I INF M3 REX TREV
Fixed regressors: C
Number of models evalulated: 13122
Selected Model: ARDL(1, 2, 2, 0, 0, 1, 0, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
AIG(-1)	0.856533	0.102864	8.326852	0.0000
CPPI	-0.683196	1.046291	-0.652969	0.5182
CPPI(-1)	0.608060	0.994772	0.611256	0.0451
CPPI(-2)	1.395505	0.958761	1.455529	0.1547
GDP	-0.193638	0.426932	-0.453557	0.6530
GDP(-1)	-1.003853	0.276719	-3.627700	0.0009
GDP(-2)	0.657182	0.201766	3.257143	0.0026
GEXP	0.436804	0.441596	0.989149	0.0296
I	-0.085187	0.177998	-0.478587	0.0353
INF	0.047289	0.053254	0.887987	0.3808
INF(-1)	0.126991	0.046577	2.726461	0.0100
M3	-0.132077	0.137771	-0.958668	0.3445
REX	-0.068559	0.116983	-0.586060	0.5617
REX(-1)	0.132901	0.108585	1.223934	0.2294
TREV	-0.408968	0.185365	-2.206285	0.0342
TREV(-1)	0.633616	0.200269	3.163827	0.0033
C	-0.042202	0.608290	-0.069378	0.9451

R-squared	0.999287	Mean dependent var	13.59275
Adjusted R-squared	0.998951	S.D. dependent var	2.992101
S.E. of regression	0.096921	Akaike info criterion	-1.568644
Sum squared resid	0.319384	Schwarz criterion	-0.924703
Log likelihood	57.00043	Hannan-Quinn criter.	-1.322575
F-statistic	2976.178	Durbin-Watson stat	2.278594
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Research findings (2023)

Table 3confirms that basing on AIC, lag 2 is the best since it provides the lowest values i.e -1.568 hence we can check if lag 2 model has serial correlation, if it is normal, stable, non heterostedastacity, and if it abides to the conditions. All the conditions were met.

Bound Test to Check for Long Run Association

The null hypothesis of the model is given as follows,

H_1: $InAIG_t = InT_t = InGE_t = InEFX_t = InM3_t = InINF_t = In i_t = 0$: There is no longrun effect and

H_0: $InAIG_t \neq InT_t \neq InGE_t \neq InEFX_t \neq InM3_t \neq InINF_t \neq In i_t \neq 0$: There is a longrun effect

This process is termed as cointegration and is according to Brooks (2014) who stated that a long-term or equilibrium relationship as cointegrated variables may deviate from each other in the short-run, but the association among the variables is present in the long-run. Table 4 provides the bound with the F and t statistics.

Table 4: ARDL long run form and bounds test

ARDL Long Run Form and Bounds Test

Levels Equation
Case 3: Unrestricted Constant and No Trend

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.561500	10%	1.95	3.06
K	8	5%	2.22	3.39
		2.5%	2.48	3.7
		1%	2.79	4.1
Actual Sample Size	49		Finite Sample: n=50	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1
			Finite Sample: n=45	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1
t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-3.431414	10%	-2.57	-4.4
		5%	-2.86	-4.72
		2.5%	-3.13	-5.02
		1%	-3.43	-5.37

Source: Research findings (2023)

The model represents the long-run relationship between the dependent variable EC (Error Correction) and the independent variables CPPI, GDP, GEXP, I, INF, M3, REX, and TREV. The F-Bounds test and t-Bounds test are conducted to determine whether there is a long-run relationship between the variables or not.

F-Bounds Test

Null Hypothesis: There is no long-run relationship (I(0)).
Test Statistic is 9.562 and the critical values at different significance levels (10%, 5%, 2.5%, 1%) for asymptotic (n=1000), finite sample (n=50), and finite sample (n=45) are provided. The findings show that the F-statistics is greater than the 5% critical value which is 2.22. For the t-Bounds Test, the null Hypothesis is that there is no long-run relationship I(0). The test Statistic is -3.431 which is greater than the critical values at 5% significance level. For the long run relationship to exist, the rule of thumb is that if the test statistic exceeds the critical value, you can reject the null hypothesis, indicating the presence of a long-run relationship between the variables. If the test statistic does not exceed the critical value, you fail to reject the null hypothesis, suggesting no long-run relationship. Therefore, the results suggest the existence of a long run relationship between monetary and fiscal policies and agriculture industry growth.

In table 4, we compare F statistics with the bound tests-pesaran critical value at 5% level, unresticted intercept at constant and trend. If the F statistics is greater than the critical value (lower and upper), we can reject the null hypothesis. The findings confirm that the F statistics is greater than the critical values at 5% level hence there exists a long run associationship among the variables. Since F-Test>critical F at the 5 per cent level for all the variables, we accept the null hypothesis (i.e. C(1-19)=0). This confirms that there is long-run relationship. Overall the bounds test results support the existence of a mutual relationship among the variables. This confirms the use of ECM model to confirm the long run effects of fiscal and monetary policies on agriculture industry growth. ECM is a type of time-series econometric model used to analyze the long-term and short-term relationships between variables. It is often applied when dealing with cointegrated variables, as they account for both short-term dynamics and long-term equilibrium relationships. Cointegration implies that the variables move together over time, even though they might not have a short-term causal relationship. ECM help to capture this long-term equilibrium relationship and how short-term deviations from this equilibrium are corrected over time. Table 5 provides the findings of the ECM results.

Table 5: Error correction model results
Dependent Variable: D(AIG)
Method: Least Squares
Date: 07/14/23 Time: 00:06
Sample (adjusted): 1976 2022
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.030729	0.076772	0.400271	0.6921
D(AIG(-1))	0.167283	0.192815	0.867581	0.3933
D(AIG(-2))	0.082021	0.203660	0.402737	0.6903
D(CPPI(-1))	1.039218	1.373308	0.756726	0.4558
D(CPPI(-2))	2.417092	1.290567	1.872891	0.0719
D(GDP(-1))	-0.842138	0.530167	-1.588440	0.1238
D(GDP(-2))	-0.605571	0.709328	-0.853724	0.4008
D(GEXP(-1))	0.428560	0.567326	0.755402	0.4565
D(GEXP(-2))	0.789882	0.613684	1.287116	0.2090
D(i(-1))	0.113006	0.294353	0.383912	0.7041
D(i(-2))	-0.035928	0.243679	-0.147439	0.8839
D(INF(-1))	0.095261	0.064045	1.487405	0.1485
D(INF(-2))	-0.030343	0.069094	-0.439155	0.6640
D(M3(-1))	-0.072588	0.295849	-0.245356	0.8080
D(M3(-2))	0.167091	0.317201	0.526767	0.6027
D(REX(-1))	0.015392	0.149611	0.102879	0.9188
D(REX(-2))	0.042063	0.145432	0.289225	0.7746
D(TREV(-1))	0.278130	0.323658	0.859335	0.3977
D(TREV(-2))	0.104448	0.347222	0.300810	0.7659
D(ECT(-1))	-0.384325	0.700786	-0.548420	0.0439
R-squared	0.986305	Mean dependent var		0.186466
Adjusted R-squared	0.924816	S.D. dependent var		0.147188
S.E. of regression	0.137696	Akaike info criterion		-0.830778
Sum squared resid	0.511928	Schwarz criterion		-0.043482
Log likelihood	39.52329	Hannan-Quinn criter.		-0.534513
F-statistic	1.345282	Durbin-Watson stat		2.021374
Prob(F-statistic)	0.235101			

Source: Research findings (2023)

The ECM findings for the fiscal and monetary policies on agriculture industry growth revealed that the ECT is -0.384 and its P-value is 0.044. The Error Correction Term (ECT) is fractional, negative and significant. Thus, the conditions for ECM are met. The speed of adjustment is 38.43%. This implies that the entire system of the model can get back at long-run equilibrium at a speed of 38.43% annually. Thus, there is system correction of disequilibrium to long run equilibrium. Simply said, the speed of adjustment towards long run equilibrium is 38.43%. Therefore, the all system can get back to long run equilibrium at the speed of 38.43%. The ECM term is very useful for many practitioners including policy makers such as the central bank as they can analyze how fast their policies impact the economy. Furthermore, the findings indicate that there is no short run effects running from macroeconomic factors to agriculture industry growth. all the variables are insignificant in the short run as the p-values are above 0.05. The model was checked to ensure that it has no serial correlation and it is stable and the results are in appendix.

These tests of diagnostics of the estimates are used to prove the robustness of the results. The models passed the Breusch–Godfrey LM, Breusch–Pagan–Godfrey, the Ramsey RESET and the Jarque–Bera tests. The results imply the model is specified correctly with no serial correlation and heteroscedasticity, and the residuals are normally distributed. The cumulative sum plots (CUSUM and CUSUMSQ) were performed to verify that the estimated model is stable during the time frame and showed no structural breaks. The plots of CUSUM and CUSUMQ are used to examine the stability of the model. Both plots fall within the 5% significance level critical bound, indicating the stability of the model. Similar findings were obtained by Ntim-Amo *et al* (2022).

DISCUSSION

For monetary policies, the findings indicate that interest rate, inflation and money supply had a significant positive effect on agriculture industry growth. However, ECM indicated that there is no short run relationship running from fiscal and monetary policies to agriculture industry but due to the presence of cointegration, there was a long run relationship between fiscal and monetary policies and agriculture industry growth and the speed of adjustment towards long run equilibrium was 38.43%.

In recent years, a vast literature has appeared on the relationship between fiscal policy and long-run economic growth, Tilahun Mengistu, (2022). Governments use fiscal policies to adjust their level of spending and tax collection, often in a counter-cyclical manner, to affect the broader economy. By raising expenditures on the state, lowering tax income, or a mixture of the two, the administration can utilize stimulus spending to increase economic activity (Zhao et al., 2022). Raising government expenditure generally boosts economic growth, either immediately by buying more products and services from the private industry or indirectly by giving money to individuals who could then spend it. Increasing individuals' expendable cash and spending more on goods and services are the two ways to stimulate economic growth by lowering tax collection, Wang *et al* (2023).

The results of the various regression analyses which were carried out using E-view 8.0 shows that total government expenditure has significantly affected the development of the agricultural sector growth in Tanzania, during the period studied.

The findings indicated that fiscal policies affects agriculture industry growth both in the short and long run. Fiscal policies include taxation and government expenditure. This study used tax revenues to represent taxation where the aim was to confirm whether when tax revenues are invested in agriculture development, they will lead to agriculture industry growth which the findings confirmed the presence of the strong positive and significant relationship among the variables implying that tax revenues affects agriculture industry growth in Tanzania. These findings are related to the theory of taxation which state that the proportion of tax levied on individuals should be based on the benefits derived from government activities. The higher the benefit enjoyed from the government activities, the higher the tax paid by the individuals.

The study also used government expenditure as the percentage of gross domestic product to represent government expenditure and the study findings indicated that government expenditure has a strong positive and significant relationship with agriculture industry growth in Tanzania. The result shows that when government increases their total expenditure, it will have a resultant incremental effect of the agricultural sector development. The relationship between the two variables are positive in nature, in the sense that an increase in one, leads to a corresponding increase in the other. Similar results were obtained by Ezu & Nwobia (2023).

According to Ogbanje & Ihemezie (2021), monetary policies affect agricultural economy in diverse manners. Monetary policies play a significant role in influencing agricultural growth within an economy. Agricultural growth refers to the expansion of the agricultural sector's output, productivity, and overall contribution to the economy. Monetary policies are strategies implemented by a country's central bank to regulate the money supply, interest rates, and credit availability in order to achieve certain economic goals. These policies can have both direct and indirect effects on the agricultural sector and they are interdependence in the sense that they affect each other. An implementation of one policy can lead to the change in another policy. For example, a change in money supply or interest rate can affect inflation rate.

Caldara et al. (2020) for example added that a huge increase in the monetary base could lead to an inflation breakout. Also, large bank reserves might make it difficult to meet funds target when that eventually becomes necessary. Similarly, Dhannur & John (2021) indicated that while a stern monetary policy stance tends to adversely affect investments and subsequently the exports, a growth-oriented monetary policy regime would accelerate investments increase export volumes. In the same lineOkanya & Paseda, (2020) noted that monetary policy focuses on the control of the quantity of money that is available in an economy at a time as well as the channels through which money is supplied. By regulating money supply, a central bank seeks to influence macroeconomic factors such as inflation, the rate of consumption, economic growth, and overall liquidity. In addition to modifying the interest rate, the central bank of a country may buy or sell government bonds, regulate foreign exchange (forex) rates, and revise the amount of cash that the banks are required to maintain as reserves.

Ogbanje & Okpe (2022) states that central banks often use interest rates as a tool to control inflation and stimulate or dampen economic activity. Lower interest rates can encourage borrowing and investment, which can positively affect agriculture. Farmers might be more inclined to borrow for modernizing equipment, expanding operations, or adopting advanced farming techniques. This, in turn, can lead to increased agricultural productivity and growth. High interest rates for example, which invariably leads to high credit costs, have the potential to affect agricultural growth. Hossin (2020) investigated the link between interest rate fluctuations, financial development, and agricultural growth in Bangladesh using an annual time-series dataset from 1980 to 2014 to examine the causal link between financial development and economic growth and it was demonstrated that the link between deposit rates and economic growth is bidirectional. He also indicates that a deregulated deposit rate of interest will raise financial depth and eventually enhance the economic growth of Bangladesh. These findings are backed up by the results of Ochalibe et al. (2019), Kamenya et al. (2022), and Islam (2020), who discovered that interest rates have a considerable impact on an economy's agricultural development.

For inflation, the findings indicate that for a one-unit increase in inflation rate, the estimated average decrease in agriculture industry growth is approximately 0.20 units and it is significant at 0.001 in the short run. Effective monetary policies strive to control inflation. Moderate inflation can be beneficial for agricultural growth, as it provides a price incentive for farmers to produce more. However, excessive inflation can erode purchasing power and disrupt economic stability, potentially affecting the agricultural sector negatively.

Other similar studies like that of Ezu & Nwobia (2023) showed that exchange rate has a strong positive impact on the economy.

CONCLUSION

The study noted and appreciated the importance of the agriculture as the backbone sector of Tanzania and economies of other developing countries and that it continues to assist several African nations in surviving and thriving (Ariom *et al.*, 2022; Gusev & Koshkina, 2022). The agriculture sector employs around 70% of Africa's workforce and despite this, Africa's agricultural development falls behind that of other continents (Bouët *et al.*, 2022; Daum et al., 2022; Suri & Udry, 2022). Concern about sustainable agricultural growth is a pressing issue of development (Serova, 2022). Ngong *et al* (2022) for example researched on the great contribution of the agricultural sector to the economic growth makes agriculture a vital component for countries' growth and development (World Bank, 2020). They concluded that agricultural productivity is still lagging in many African countries with huge proportions of land uncultivated and high unemployment. Africa's value added per worker also lags behind compared to other world regions. This implies that there is a need to raise agricultural productivity to achieve sustainable economic growth.

Basing on the study findings, this study draws the following conclusions, first that fiscal policies are effective to crop production, livestock production and agriculture industry growth both in the short run and in the long run. Second, that a few monetary policies have a significant effect on crop production, livestock production and agriculture industry growth. Thirdly, that a combination of both fiscal and monetary policies has no short run effect on agriculture industry growth but it appears that monetary and fiscal policies can lead to long run agriculture industry growth.

The study recommends that increasing budgetary allocation to agricultural sector in order to enhance the speed at which the sector grows as well as managing the tax system effectively in order to increase tax revenues will go a long way in the development process of a nation. The Government must be keen in the implementation, management and supervision process of her enacted fiscal policies in order to realize short term and long-term crop production and agriculture industry growth. The findings are relevant to stakeholders, and policy makers as they throw more light on the role of fiscal policy on agricultural output over the years for the purpose of providing evidence-based recommendations on how fiscal policy can further be improved to accelerate the growth of agricultural output in Tanzania.

REFERENCES

Abubakar, F., Yusuf, H. A., & Abdulmalik, T. A. (2020). Impact of government expenditure on agricultural growth in Nigeria: Empirical evidence from Kogi State. *International Journal of Intellectual Discourse*, *3*(1). PP?

Adeleye, N., Osabuohien, E., & Asongu, S. (2020). Agro-industrialisation and financial intermediation in Nigeria. *African Journal of Economic and Management Studies*, *11*(3), 443-456.

Bhat, S. A., Kamaiah, B., & Acharya, D. (2020). Examining the differential impact of monetary policy in India: a policy simulation approach. *Journal of Economics, Finance and Administrative Science*.>>> INCOMOLETE

Boadway, R. W. (2012). *From optimal tax theory to tax policy: retrospective and prospective views*. MIT Press.URL??

CoMPRA. (2022). COVID-19 Macroeconomic Policy Responses in Africa

Efendi, B., Arifin, D., & Zebua, A. (2023). Analysis of the Application for Inflation Monetary Variables on the Income of Corn Farmers in Medan Krio Village. *World Journal of Advanced Research and Reviews*, *17*(3), 780-786.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, VOL,251-276.

Epaphra, M., & Kaaya, L. E. (2020). Tax revenue effect of sectoral growth and public expenditure in Tanzania: An application of autoregressive distributed lag model. *Journal of Quantitative Finance and*.

Ezu, G., & Nwobia, C. (2023). Effect of Monetary and Fiscal Policies on Agricultural Growth of Nigerian Economy. *International Journal of Commerce and Management Research*, *9*(3), 98-103.

Gidigbi, Matthew. (2019). Re: How to interpret the speed of adjustment which is positive but significant?

Heinen, S. (2022). Rwanda's Agricultural Transformation Revisited: Stagnating Food Production, Systematic Overestimation, and a Flawed Performance Contract System. *The Journal of Development Studies*, *58*(10), 2044-2064.

Hossin, M. S. (2020). Interest rate deregulation, financial development and economic growth: Evidence from Bangladesh. *Global Business Review*.

Juhro, S. M., Narayan, P. K., & Iyke, B. N. (2022). Understanding monetary and fiscal policy rule interactions in Indonesia. *Applied Economics*, *54*(45), 5190-5208.

Kamenya, M. A., Hendriks, S. L., Gandidzanwa, C., Ulimwengu, J., & Odjo, S. (2022). Public agriculture investment and food security in ECOWAS. *Food Policy*, 113, 102349. https://doi.org/10.1016/j.foodpol.2022.102349

Kimolo, D. W., Naumanga, H., Mhoja, A., Makoye, E., & Salapion, L. (2023). Effectiveness of Monetary Policy Transmission Mechanism Through Interest Rate Channel in Tanzania, Bank of Tanzania.

MoA (2022). Agriculture Statistics Strategic Plan 2022/23 to 2026/27

MoA (2023). Ministry of Agriculture

Msoni, C. (2022). An Analysis of Monetary policy instruments impact on agribusiness in Zambia (Doctoral dissertation, Cavendish University).

Ngobeni, E., & Muchopa, C. L. (2022). The Impact of Government Expenditure in Agriculture and Other Selected Variables on the Value of Agricultural Production in South Africa (1983–2019): Vector Autoregressive Approach. *Economies, 10*(9), 205-??.

Ngong, C. A., Onyejiaku, C., Fonchamnyo, D. C. & Onwumere, J. U. J. (2022). Has bank credit really impacted agricultural productivity in the Central African Economic and Monetary Community? *Asian Journal of Economics and Banking*.

Ngong, C. A., Onyejiaku, C., Fonchamnyo, D. C., & Onwumere, J. U. J. (2022). Has bank credit really impacted agricultural productivity in the Central African Economic and Monetary Community?. *Asian Journal of Economics and Banking*.

Ntim-Amo, G., Qi, Y., Ankrah-Kwarko, E., Ankrah Twumasi, M., Ansah, S., Boateng Kissiwa, L., & Ruiping, R. (2022). Investigating the validity of the agricultural-induced environmental Kuznets curve (EKC) hypothesis for Ghana: Evidence from an autoregressive distributed lag (ARDL) approach with a structural break. *Management of Environmental Quality: An International Journal*, *33*(2), 494-526.

Ogbanje, C. E., & Okpe, C. P. (2022). Monetary policy and agricultural sector performance in Nigeria: A granger causality approach. *International Journal of Economic Policy*, *2*(1), 54-71.

Ogbuabor, J. E., Anthony-Orji, O. I., Manasseh, C. O., & Orji, A. (2020). A disaggregated analysis of monetary policy effects on the agricultural sector in Nigeria. *Applied Studies in Agribusiness and Commerce*, *14*(3-4), 47-58.

Okoh, S. A., Amadi, U., Ojiya, E. A., & Ani, E. C. (2019). Impact of fiscal policy on agricultural productivity in Nigeria: An empirical analysis. *Journal of Business School*, *2*(3), 7-27.

Oloukoi, L. (2021). Comparative effect of short-term credit granted to agriculture on agricultural added value in the West African countries. *Journal of Economics and Development*. >>>

Oluwaseun, O. A., Solomon, O. I., & Yusuf, M. A. (2020). Impact of fiscal policy on agricultural output in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, *10*(8), 224-243.

Onyiriuba, L., Okoro, E. O. & Ibe, G. I. (2020). Strategic government policies on agricultural financing in African emerging markets. *Agricultural Finance Review*.

Orji, A., Ogbuabor, J. E., Anthony-Orji, O. I., & Nkechi Alisigwe, J. (2020). Agricultural financing and agricultural output growth in developing economies: any causal linkage in Nigeria?.

Osuji, E. E., Tim-Ashama, A., Okwara, M. O., Effiong, J. A. L., & Anyanwu, U. G. (2020). Implications of macro-economic variables for National Food Security in Nigeria. *Open Journal of Agricultural Science, 1*(1), 1-11.

Pandey, G. & Kumari, S. (2021). Dynamics of agricultural growth and diversification in Eastern India. *Journal of Agribusiness in Developing and Emerging Economies*.

Peng, Y., Latief R. & Zhou, Y. (2021). The Relationship between Agricultural Credit, Regional Agricultural Growth, and Economic Development: The Role of Rural Commercial Banks in Jiangsu, China, *Emerging Markets Finance and Trade*, 57(7), 1878-1889.

Tilahun Mengistu, S. (2022). Does fiscal policy stimulate economic growth in Ethiopia? ARDL approach. *Cogent Economics & Finance*, *10*(1), INCOMPOLETE

Topics in Applied Macrodynamic Theory. (2008). *Dynamic Modeling and Econometrics in Economics and Finance.*

Wagan, Z. A., Zhang, C. H. E. N., Hakimzadi, S., & Shah, M. S. (2018). Assessing the effect of monetary policy on agricultural growth and food prices. *Agricultural Economics*, *64*(11), 499-507.

Wang, Y., Wang, X., Zhang, Z., Cui, Z., & Zhang, Y. (2023). Role of fiscal and monetary policies for economic recovery in China. *Economic Analysis and Policy*, *77*, 51-63.

Wineman, A., Jayne, T. S., Isinika Modamba, E., & Kray, H. (2020). The changing face of agriculture in Tanzania: Indicators of transformation. *Development Policy Review*, *38*(6), 685-709.

World Bank (2020), World Development Indicators.URL

Yang, J., Wang, Y., Zhang, H., Su, Y., Wu, X., Yan, S., & Yang, S. (2022). Impact of socio-economic and environmental factors on livestock production in Kyrgyzstan. *Frontiers in Environmental Science*, *10*,

Yanushevsky, R., & Yanushevsky, C. (2018). *Applied macroeconomics for public policy*. Academic Press.