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The Empirical Investigation of the Relationship between Banks' Lending Rate and Coffee Export Growth in Tanzania

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

This paper examines the relationship between banks' lending rate and coffee export growth in Tanzania by the help of Johansen Co-integration test and vector error correction (VECM) model. The research results suggested that there is a negative relationship between banks' lending rates and coffee export growth both in the short run and long run. In the long run, the study found that, a unit change in BLR results in a 0.1936 percentage point decrease in the coffee export growth; while, in the short run, the study suggests that, a unit change in banks' lending rate results in a 0.0303 percentage decrease of the coffee export growth, ceteris paribus.

This result supports the argument that, as the cost of loans became cheaper (the low-interest rate charged on loans by commercial banks) will attract farmers to borrow for purchasing farm inputs and expanding agricultural production and hence this will intern enhance export growth, and the high-interest rate correlated with inhibited growth in the coffee exports growth.

Based on the results obtained, this study recommends that, the monetary policy of the country

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periodically has to influences outcomes in the agriculture sector especially exportable crops such as coffee through easier monetary conditions. This will promise the availability of agricultural financing through borrowing from lending institutions at an affordable borrowing rate. Along with this, the availability of farm inputs especially fertilizers, mode seedlings, and pesticides has to be assured to farmers; which will undoubtedly produce the desired impact and lead to optimum productivity and crop quality to enhance exports.

Keywords: Coffee export growth; bank lending rate; inflation rate; discount rate; money supply growth; repurchase agreement.

1. INTRODUCTION

1.1 Background of the Study

The agriculture sector has been considered the backbone of Tanzania's economy since its independence. The sector, which accounts for more than 80% of the country's gross domestic product, serves as a major source of employment, a key source of foreign exchange earnings, and the provider of raw materials to local industries [1]. For a long period, the country has been depending on traditional exports as a source of foreign earnings. Among traditional exports, coffee is one of the major contributors to foreign exchange earnings. The record shows coffee was contributing an estimated 36% as a share to total national foreign exchange earnings in 1986; however, this share has declined over time, reaching less than 5% in 2020 [2].

"The capacity of the sector to fulfil its traditional role in the Tanzanian economy is explained to be constrained by various social economic and structural problems. One of the basic considerable challenges facing the coffee subsector as a whole is inadequate funding, particularly to small-scale farmers from commercial banks and other lending institutions. Several factors can be said to be responsible for inadequate funding among small-scale farmers in Tanzania. Pre-eminent among these factors is the unavailability of credit and high lending rate by commercial banks and other lending institutions" [3].

Practitioners agree that, for the agriculture sector to perform well, the fund is needed to enable farmers to purchase more land, and inputs at the appropriate time including fertilizers, pesticides; and agricultural machinery. Therefore, access to credit with affordable costs of loans from lending institutions will attract small-scale farmers to borrow for improving productivity and crop quality through the purchasing of agricultural inputs. This in turn should contribute to increased output and competitiveness of local products in the international markets and therefore enhance the export growth.

Therefore, this is a problem worth discussing and an important issue for policymakers and all stakeholders involved in the coffee value chain, and this may contribute to increased coffee export growth. Specifically, the study intended to examine whether bank lending rate has a positive or negative relationship with coffee export growth and ascertain the significance of this relationship for policy recommendation.

1.2 Overview of Agricultural Financing in Tanzania

Unfortunately, in most developing countries including Tanzania, credit is not easily available and the interest rates charged are considerable to be higher to small-scale farmers who dominate the sector. The high lending rates by commercial banks have been basically on account of a lack of collateral and other documentation that are usually required by commercial banks and other credit institutions. This situation makes it impossible for small farmers in Tanzania to access the required capital for agricultural investment on a large scale and therefore remains the challenge for enhancing productivity and crop quality to compete in the global market.

By noting that, loans from commercial banks help to facilitate the purchase and usage of new technology in agriculture and promote the lead technology enterprises [4], the important moving stage that has been taken by the government is that of setting up the specialized bank in financing agricultural investment and activities. These banks are Agricultural Development Bank (AgDB) and Tanzania Investment Bank (TIB). With this step, the aim was lending to agricultural endeavors on short, medium, and long–term basis at a reasonable rate. This was to ensure that the mainstream banking industry adequately cater to the urgent need for credit required for

rapid transformation of the agricultural sector of the economy to enhance export growth. At a different time, the Bank of Tanzania has taken some initiatives in discharging its role to ensure adequate liquidity in the banking sector as a new measure to promote lending with affordable charges to productive sectors including agriculture especially for traditional exports such as coffee. Among others was the reduction of Statutory Minimum Reserves (SMR) over time from 10 percent to the currently existing of 6 percent [2]. In line with this, in 2021 the bank provided a credit facility to commercial banks at 3 percent with the condition for benefiting commercial banks to lend to farmers and other companies involved in the agricultural value chain with interest rates not exceeding 10 percent.

However, with all these efforts, the lending rate to smallholder farmers remain considerably higher, averaging 17% (Table 1) to date. Even though the agriculture sector has been playing a vital role in the development of the national economy, the interest rates charged by commercial banks on loans applied equally without any exception. Given the important role the banking sector has in enhancing agricultural export performance, this study aimed at investigating whether banks' lending rate has a positive or negative relationship with coffee export growth in the Tanzania environment and ascertain the significance of this relationship.

To this end, the contribution of this study is in two ways as follows: -First, this will help to fill the vacuum of information on agricultural financing through loans and the way it affects coffee export growth in Tanzania by closing the gap between theory and practice. Second, this study will also help to inform policymakers and small-scale farmers in the coffee sector and other stakeholders involved in the coffee value chain on understanding how monetary policy through the credit transmission channel feed into farm operations. It is expected that results from this study will help to enhance the coffee value chain that enables high crop productivity and quality to compete in the global markets for enhancing export earnings growth.

The rest of the study is as flows; The next chapter (chapter 2) presents the theoretical and literature review of the previous similar studies that have been undertaken; Chapter three presents the methodology of the research; chapter four contains the results of the findings and discussion; while chapter five finalized with conclusion and policy recommendation.

2. REVIEW OF THE LITERATURE

2.1 Theoretical Framework

In general, the most theoretical literature on financial development and economic growth supports the argument that banks' lending rates have a vital influence on agricultural sector growth by enhancing capital accumulation and technological changes. There exists a consensus among economists who suggests that a well-functioning and developed banking system stimulates economic growth through credit provision with affordable costs of lending to productive sectors [5].

Table 1. Trend in commercial bank lending rate in Tanzania

Year	Average lending rate	Year	Average lending rate	Year	Average lending rate
1991	26.0	2002	16.4	2013	15.9
1992	30.0	2003	14.5	2014	16.3
1993	30.0	2004	14.1	2015	16.1
1994	33.4	2005	15.3	2016	16.0
1995	36.0	2006	15.7	2017	17.8
1996	35.3	2007	16.1	2018	17.4
1997	24.5	2008	15.0	2019	17.0
1998	22.5	2009	15.0	2020	16.7
1999	18.7	2010	14.5	2021	16.6
2000	23.1	2011	15.0	2022	16.2
2001	20.1	2012	15.6	2023	

Source: Bank of Tanzania (BOT)

The law of the classical theory of Interest rate provides the linkage between interest rate channels of the monetary policy and agricultural performance. This theory in economic literature explains the interest rate as what equilibrates savings and investment. According to the theory, the interest rate is regarded as the asset's price because firms borrow money for investment, depending on the lending rate level. One of the relationships between lending rate and investment is that, when the lending rate by commercial banks is set low, there is a greater opportunity for more profit and such investors will pounce to borrow at a low-interest rate and invest in the farm activities. This may in turn enhance production levels through enhanced productivity; and improved quality products to compete in the global market which will lead to improving export growth.

Thus, this study is based on these theories underpinning the importance of low lending rates for agricultural export growth.

2.2 Empirical Review

Empirical studies on the relationship between monetary policy effects through credit transmission channels on agriculture exports are replete globally. Among this plethora of research endeavors, many have investigated and tried to establish whether banks' lending rate have any real effect on farm output, farm prices, farm income as well as farm export growth.

Moroyiwa et al., [5], conducted the study in South Africa using annual data from 1970 to 2011. The study investigated the impact of monetary policy on the South African Agricultural sector by employing the VECM model in estimating this impact. The results revealed that changes made by monetary authorities find their way into the agricultural sector through the interest rate channel which affects farmers' borrowing conditions. The study specifically found that an increase in the banks' lending rate, in the long run, leads to low CPI, which in turn affects the agricultural GDP favorably.

Athanasius [6], investigated the relationship between banks' credit and agricultural sector performance in Nigeria using secondary data spanning from 1980 to 2014 using Ordinary Least Square (OLS). The study found that apart from banks' credit to agricultural supply having a positive and significant relationship, the interest rate had a negative and significant relationship with agricultural Gross Domestic Product (AGDP).

Montenegro & Miranda [7], investigated the relationship pattern between agricultural exports (as independent variable) and exchange and interest rates (explanatory variables) for the Mexican economy using multiple regression analysis and the Granger causality test. The results show that the interest rate does not influence agricultural exports; in other words, agricultural exports in Mexico have not been affected by variations in the bank lending rate in Mexico in the period 1993 to 2017.

Ita et al, [8] conducted a study to examine "the effect of commercial banks' lending on the growth of the agricultural sector in Nigeria by using Multiple regression statistical techniques. The study specifically examined the impact of total loans and advances on the agricultural sector output, to examining the impact of lending rate on the agricultural output and to establish the relationship between commercial bank liquidity and the agricultural sector output. The findings revealed that there was negative and a significant relationship between loans and advances, interest rates, liquidity, and bank assets on agricultural output".

Adeola & Ikpesu [9] conducted a study to examine the impact of lending rates on agricultural output using the Vector Autoregressive (VAR) approach over the period 1981 to 2013. The results from the study indicate that commercial bank lending rate has influenced one-way agricultural sector performance, however, the effect was not significant at a 5% level of confidence.

George [10], conducted a study on the export performance of the horticultural sub-sector in Tanzania using the Co-integration technique to examine a long-run relationship among the series. According to the result obtained, the real interest rate was not significantly influenced horticultural export performance in the long run.

Samoei & Kipchoge [11], examined "major drivers behind horticultural exports in Kenya for the period 2005 to 2017 using the co-integration model. The study results explore that; the interest rate has a negative influence on horticulture exports in Kenya".

On the same note, Solanki et al., [12], examined "the relationships between agriculture firms'

financial performance and agricultural exports and macroeconomic indicators in India. The System Generalized Method of Moments (GMM) model was employed to explore the dynamic linkage between exports and firm performance from 2012 to 2019. The results indicate agriculture exports have a significant negative correlation with interest rates, and the value addition of exports to GDP indicates that high-interest rates and more value addition to GDP result in a reduction in agricultural exports".

This review of the related literature supports the inference that, the relationship between bank lending rates and the agriculture sector in terms of output performance and export growth is inconclusive. This is because the related reviewed literature revealed different results; some indicated that the interest rates are significantly responsive to agricultural sector performance, while others found interest rates to have effects however not significant. Moreover, for the case of Tanzania in our review, there are limited studies have been conducted on investigating the way banks' lending rate has been affecting agricultural export growth, particularly for coffee. Thus, the need to further investigate the way the lending rate by commercial banks affects the growth of coffee exports is vital with a reason to enhance the contribution of the banking sector to coffee export growth and the agriculture sector as a whole.

3. METHODOLOGY

3.1 Data Types and Sources

This study employed time series secondary data spanning from 1991 - 2022. The secondary data sources are consisting of already existing data used for some other work but were found to be useful in this study. Based on the objective of the study, data were obtained from reputable sources such as the Tanzania Coffee Board (TCB) and Bank of Tanzania (BOT) reports. The variables used in the study are coffee export growth (*CEG*) referred as the annual total values (in millions USD) as a dependent variable; while banks' lending rate (interest rate) is considered as the cost of loans charged by commercial banks to private sector; *REPO* rate, Inflation (*INF*), discount rate (*DISCR)* and Open market operation (OMO). Data on OMO variable were of 364 yield treasury bill; money supply annual growth rate (*M2*); all of these employed as explanatory variables. In analyzing the data gathered for this work, Vector Error Correction (VECM) was employed. The model was found to be appropriate due to its power in establishing the long-run and short-run relationship between a dependent variable and independent variables.

3.2 Variables and their Features

3.2.1 Coffee Export Growth (*CEG*)

This is the dependent variable as applied in this study. It is defined as the annual value of sold abroad (expressed in million USD). Data and information for this variable were sourced from International Coffee Organization (ICO).

3.2.2 Banks' lending rate

The banks' lending rate is also referring to the interest rate defined as the amount a lender (bank) charges a borrower and is a percentage of the principal (the amount loaned). The interest on a loan is typically noted on an annual basis known as the annual percentage rate. This data and information on this variable were obtained from the BOT reports. The expected sign of coffee export growth is negative.

3.2.3 Discount Rate (DISCR)

The choice of this variable is built on the following explanation. High discount rates tend to affect the rending rate by commercial banks to borrowers since it represents the cost of borrowing money. When it's expensive for commercial banks to borrow money from the Central Bank, they can subsequently charge less interest on their loans, and therefore farmers will be attracted to borrow more for enhancing production and crop quality. This is expected in turn to stimulate export growth as more will be produced and high quality crops to compete in the global market. A negative sign is expected.

3.2.4 Inflation (INF)

Inflating refers to the rise in prices which can be translated as the decline of purchasing power over time. The data was obtained from the Bank of Tanzania website. A negative sign is expected.

3.2.5 Repurchase Agreement (REPO)

The repurchase agreement rate (REPO) impacts the agriculture sector as it is essential to regulate

the cash flow in the market. The Central Bank control and regulate the repo rate depending on the market's liquidity and inflation cash flow. Therefore, the repo rate directly affects the borrowing capacity of banks as the repo rate is higher banks' borrowing capacity decrease and vice versa. Therefore, when the central banks set the repo rate lower, tends to pump more funds influencing the banking system liquidity as a result banks will lend more at a lower lending rate, and this will attract more farmers to borrow for farm investment.

On the other hand, repo may have a negative impact as well. For example, during high inflation, the central bank may increase the repo rate thus resulting in decreased cash flow leading to a decrease in the farm production capacity and thus will lead to a price hike in crop produced.

The repo rates of the central bank and the interest rate of the loans of commercial banks are proportional to each other. If the repo rate decreased, the interest rates on loans gate reduced, and vice versa. As soon as the repo rate fall farmers borrow more from the banks for funding farming activities thus increasing productivity and crop quality to compete in the global market this is expected to stimulate export growth. Therefore, a negative relationship is expected between coffee export growth and the repo rate. (Extend to OMO more than even REPO).

3.2.6 Money supply annual growth rate

This is the independent variable in this study. The money supply growth rate refers to the rate (percentage) of the total amount of money circulating within an economy. Here's how changes in money supply can affect coffee export growth. In this study only broad money supply (M2) has been considered for the analysis by considering as it tends to affect inflation and pricing; inputs imported input costs; agricultural product demand and consumer spending; agricultural investment and infrastructure and trade balance. A positive relationship is expected

3.2.7 Discount rate (DISCR)

This is one of the independent variables used in this study. It is referred to as the "policy rate" or "interest rate," This is the rate at which commercial banks can borrow funds from the central bank. The variable was expressed in terms of percent and the data was obtained from the Bank of Tanzania reports. A negative sign is expected.

3.2.8 OMO

This has been referred to as Treasury Bills (T-Bills) defined as short-term debt securities issued by the government to raise funds in percent. The data on this variable were obtained from the BOT report. A negative sign is expected.

3.3 Model Specification

The response of coffee export growth to changes in macroeconomic variables depends primarily on whether are temporary or permanent. Therefore, it is more important that this composition is performed in the case of standard econometric estimation. Thus, this research study considers the application of an econometric model that ruminates both the trend or short-run components of coffee export growth and its determinants factors under the influence of monetary policy. Predictably, coffee export growth function depends on the output which is depending on inputs, such as land, labor, capital, and other inputs like pesticides, seedlings, fertilizers, etc. However, in this study coffee export growth is the result of output produced, and crop quality is used as the dependent variable, keeping in mind that, the purchase of inputs for enhancing quality and productivity level depends on the lending rate of such credit to purchase the required inputs. But instead of taking output which is influenced by the availability of inputs, the banks' lending rate was taken as a main driver in obtaining credit to purchase such input for production. Taking into consideration of other monetary variables that might influence agricultural sector performance; repo rate, Inflation, discount rate, open market operations represented by annual yield treasury bill (T-Bill) and money supply growth rate have been added into the model. Consequently, in contrast to approaches followed by other empirical works on agricultural export growth responses to banks' lending rate, in this research paper, the researcher regresses coffee export growth to other explanatory variables under the influence of monetary policy of the country in particular through the credit monetary transmission channel. The empirical formula of the model to be used in this study is given by the following function: -

$$CEG = f(BLR, REPO, INF, DISCR, OMO, M2) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where CEG= stands for coffee export growth; *BLR* = Banks' lending rate; *INF* = Inflation rate; *DISCR* = Discount rate; *M2*= Money supply annual growth rate and OMO stands for open market operations represented by 364 yield treasury bills.

Further, the function relationship is linearized into the VECM model as below: -

$CEGt = \beta o + \beta 1\ BLRt + \beta 2\ REPOt + \beta 3\ INFt + \beta 4\ DISCRt + \beta 5OMOt + \beta 6M2t$ 2

To examine the relationship between coffee export growth and other explanatory variables under the study, a log-linear form coffee export growth model is employed by incorporating variables under the influence. In measuring the variables, log normalization has been applied, and hence the natural logarithm forms have been taken for each variable. Therefore, the regression equation can be expressed in the mathematical form in a log-linear model as follows: -

$LnCEG_t = \beta o + \beta_1\ Ln\ BLR_t + \beta_2\ ln\ REPO_t + \beta_3 LnINF_t + \beta_4\ Ln\ DISCR_t + \beta 5LnOMOt + \beta 6LnM2t + \mu_t$ 3

Where

Dependent variable = *CEG*
Independent variables = *BLR, REPO, INF, DISCR, OMO, and M2*
Regression constant = βo
Regression intercept = β_1, $\beta 2$, β3, β4, β5, and β6 which stand for the weight of the unit change of the explanatory variables that is parameter or estimation coefficient of explanatory variables;
Stochastic error terms = μ_t

The Indigenous variable in this study is coffee export growth. Thus, in this study, coffee export growth has been measured by its total annual values sold abroad at a constant price in the form of a natural logarithm.

3.4 Estimation Procedure

The method of data analysis employed in this study is both descriptive and analytical. The descriptive tools include the use of graphs, tables, and percentages. The analytical tool used is the Co-Integration Test, Stationarity (Unit root test), and Error Correction Model (ECM) estimation. ECM is powerful in analyzing dynamics with the long-run equilibrium without losing long-run information. This estimation was conducted in consideration of the time series data behavior analyzed. Estimation was done by using Eviews version 13 statistical software.

3.5 Stationarity (Unit root Test)

According to Newbold & Granger (1974), if time series variables are non-stationary, all regression results with these time series will differ from the conventional theory of regression with stationary series. To avoid this problem, the study tested for the stationarity of the time series data used by Augmented Dickey-Fuller tests (ADF) as explained in the bellow equation. Akaike Information Criterion (AIC) is applied for selecting the number of lags to be used in the model.

$$ADF\ test\ equation\ \Delta Y_t = \delta Y_{t-1} + \sum_{j=1}^{n+1} \varphi_j \Delta Y_{t-j} + \theta_0 + a_t$$

....4

3.6 Determination of Optimum Lag

The optimal lag length was more important in the estimation procedure. To determine the optimal lag length, the information criteria considered were Akaike Information Criteria (AIC), Schwarz's Bayesian information (SIC), and the Hanna-Quinn Information Criteria(HQC). The objective of the information criteria aims to select the number of parameters that minimize the value of the information criteria.

3.7 Bound Test

Then, a bound test for co-integration was conducted to estimate the long-run relationship between the dependent and independent variables. The guided hypothesis for the test was that Ho: $\beta_1 == \beta_2 = \beta_3 = 0$ against the alternative hypothesis $H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$. T-statistics and F-statistics is a criterion for judgment in a way that, for a model to have co-integration the T-statistics and F-statistics has to be greater than the critical values for upper and lower bounds.

3.8 Co-integration Analysis

Johansen's co-integration test was applied to test for a long-run relationship among variables under the study. The maximum eigenvalue and trace statistics were generated to determine the number of co-integrating equations and check for long-run relationships among variables in the model.

3.9 Error Correction Model (ECM)

After performing the co-integration test, it was understood that variables under the study are co-integrated in the long run. We utilized the co-integrating vector to construct the vector error correction model (VECM). The long-run results relationship was obtained after running the error correction term (ECT_{t-1}) which represents a co-integration equation and long-run model.

The equation for the ECT term is given below: -

$ECT_{t-1} = (Y_{t-1} - n_j X_{t-1} - \xi_m R_{t-1})$ ……..…..…….....5

From the model,

Y_{t-1} is the variable of interest (representing the *CEG* in this model);
X_{t-1} and $\xi_m R_{t-1}$ are the order of indigenous variables.

Vector Error Correlation Model, (VECM) was employed to test for the short-run effects of the independent variables on the dependent variable as specified in the bellow equation: -

$$\Delta LnCEG_t = \alpha_t + \sum_{i=1}^{p} \beta_1 LnBLR_{t-1} + \sum_{i=2}^{p} \beta_2 LnREPO_{t-1} + \sum_{i=3}^{p} \beta_3 LnINF_{t-1} + \sum_{i=4}^{p} \beta_4 LnDISCR_{t-1} + \sum_{i=5}^{p} \beta_5 LnOMO_{t-1} + \sum_{i=6}^{p} \beta_6 LnM2_{t-1} + \lambda ECT_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where

ECT = ($\Delta CEG_{t-1} - \emptyset X_t$)

Note that, λ= speed of adjustment with a negative sign,

$\emptyset = \frac{nx}{1!} + \frac{\sum_{i=0}^{p} \beta 1}{\alpha}$ is the long-run parameter; *β1, β2, β3, β4* β5, and *β6* are the coefficients representing short-run dynamics of the model's adjustment in the long run.

3.10 Diagnostic Tests

A diagnostics check was performed for some fundamental aspects of the model to see how seriously our results can be taken in terms of the VEC Residual Serial Correlation LM test, Tests for normality, heteroscedasticity test, and multicollinearity test.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Before the econometric estimation, the statistics characteristics of the variables used in this study were examined. Table 2 shows the summary of statistics of all variables used in this empirical study. Starting with the coffee export value measured in millions of USD from 1991 to 2022 tends to be negatively skewed with a minimum value of 35.22 million USD, and a maximum value of 186.61 million USD.

The average banks' lending interest rate by commercial banks to private sector was 19.83 percent with a minimum average lending rate of 14.14 percent and a maximum of 37.81 percent. The discount rate measured in percent average was 14.33, with a minimum of 3.70 percent and a maximum of 27.0 percent. The money supplies annual growth rate and treasury bill rate (OMO) averaged 17.28 percent and 10.03 with a minimum of 3.76 and 0.00, a maximum of 39.26 percent and 21.11 percent, respectively. The lending interest rate is relatively normally distributed across the period with a kurtosis of 3.70 which is away from zero.

4.2 Unit Root Tests

Before estimation, the unit root test was conducted to determine the order of integration of the series to avoid spurious and nonsensical regression. This was conducted to ensure that, the stationary conditions of the series are sufficient for further analysis.

The results of the Augmented Dickey–Fuller (ADF) unit root tests with a constant are presented in Table 3.

Results in Table 3 show that, all the variables (*LnCEG, LnBLR, LnDISCR LnINF, LnM2, and LnOMO* rate) are integrated in the same order, after first difference except for REPO that became stationary in level; therefore, we can adopt a dynamic time series model, and the appropriate method that was applied is Vector error correction (VECM) model. The main advantage of this approach is that it provides both short-run and long-run dynamics estimated simultaneously.

4.3 Optimum Lag Selection

Literature offers various lag length selection criteria utilized to obtain optimal lag length. To test integration, it is important to specify the number of lags to be included in the model. Table 4 shows the optimum lag structure of which the outcome indicates that majority of the selection criteria select the optimum lag length of 2 at a 5% level of significance. Hence, the lag length of 2 will be used in estimating the ECM and the Johansen co-integration test.

4.4 Co-integration Technique (Johansen-Juselius)

We performed a co-integration analysis to check for any long-run relationship among the variables of interest. Both the Trace test and the Maximum Eigen Value Test by using the Johansen co-integration test were adopted to ascertain if there is a long-term relationship between the dependent variable and independent variables. The results from these tests are shown below as Table 5a & 5b: - The results show that the trace statistics and likelihood function values are greater than the critical value at 5% suggesting that, there is a co-integration with an implication of at least 3 co-integrating equations among the variables which were rejected in favor of the alternative hypothesis at 5% critical level. This implies that a long-run relationship exists among the study variables.

The maximum eigenvalue test in Table 5b confirmed the presence of long-run relationship among the variables under the study with at least 3 co-integrating equations at a 5% confidence interval existing as well.

4.5 Vector Error Correction (VECM) Model (Long-run and Short-run Estimates)

Table 6a and 6b, below presents the results of the VECM in estimating the long-run and short-run relationship between the dependent and independent variables using annual data covering the period 1991 to 2022.

Table 2. Summary statistics using the observations 1991-2022

	CEG	BLR	DISCR	INF	M2	OMO	REPO
Mean	111.86	19.83	14.33	10.23	17.28	10.03	4.43
Median	111.19	16.34	15.99	6.13	15.09	10.92	4.50
Maximum	186.61	37.81	27.00	35.28	39.26	21.11	7.79
Minimum	35.22	14.14	3.70	3.29	3.76	0.00	1.17
Std. Dev.	40.21	6.62	6.65	8.08	8.09	5.41	1.55
Skewness	-0.11	1.38	0.31	1.54	0.76	-0.16	0.07
Kurtosis	2.04	3.70	2.24	4.59	3.26	2.45	2.66
Jarque-Bera	1.25	10.74	1.24	15.46	3.08	0.53	0.18
Probability	0.54	0.00	0.54	0.00	0.21	0.77	0.92
Sum	3467.67	634.68	444.31	317.16	535.54	310.98	137.25
Sum Sq. Dev.	48508.38	1357.82	1326.82	1958.48	1962.94	879.14	72.19
Observations	32	32	32	32	32	32	32

Source: Bank of Tanzania and Eview outputs

Table 3. Augmented dicker - fuller unit root test results

	ADF calculated value		McKinnon 5%	Prob.	Order of
Variable	At level	At 1st difference	Critical value		Integration
LnCEG	-1.5545	-6.2705*	-2.9639	0.0000	1(1)
LnBLR	-1.5142	-4.3248*	-2.9678	0.0020	1(1)
LnDISCR	-1.9302	-5.9476*	-2.9639	0.0001	1(1)
LnINF	-1.7995	-5.6574*	-2.9640	0.0001	1(1)
LnREPO	-4.6553*	-	-2.9640	0.0008	1(0)
LnM2	-2.0334	-10.3894*	-2.9639	0.0000	1(1)
LnOMO	-1.8142*	-4.8967*	-2.9810	0.0006	1(1)
*Siginificant at 5%					

Source: Author's calculation and Eviews output

Table 4. Determination of Optimum Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-50.5363	NA	0.0000	4.4259	4.7646	4.5234
1	70.9763	168.2482*	0.0000	-1.1520	1.557726*	-0.3717
2	145.6370	63.1745	3.21e-10*	-3.125921*	1.9549	-1.662841*

Source: Authors' Computation and EViews 13. Output

Table 5a. Johnsen co-integration trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.9998	419.1824	125.6154	0.0000
At most 1 *	0.9178	164.7039	95.7537	0.0000
At most 2*	0.8474	92.2529	69.8189	0.0003
At most 3	0.4596	37.7310	47.8561	0.3139
At most 4	0.3059	19.8833	29.7971	0.4308
At most 5	0.2345	9.2952	15.4947	0.3388
At most 6	0.0520	1.5474	3.8415	0.2135

Source: Authors' Computation and EViews 13 Output; Trace test indicates 3 cointegrating equation(s) at the 0.05 level*;* * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

Table 5b. Johansen co-integration maximum eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.9998	254.4785	46.2314	0.0000
At most 1 *	0.9178	72.4510	40.0776	0.0000
At most 2 *	0.8474	54.5219	33.8769	0.0001
At most 3	0.4596	17.8478	27.5843	0.5078
At most 4	0.3059	10.5880	21.1316	0.6882
At most 5	0.2345	7.7478	14.2646	0.4049
At most 6	0.0520	1.5474	3.8415	0.2135

*Source: Authors' Computation and EViews 13 Output; Max-eigenvalue test indicates 3 integrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level**MacKinnon-Haug-Michelis (1999) p-values*

Table 6a. Long-run VECM estimation results

Variable	Coefficient	Std. Error	t-Statistic
Constant	1.6756	-	-
D_LNCEG(-1)	1.0000	-	-
D_LNBLR(-1)	-0.1936	-0.0202	7.9650
D_LNDISCR(-1)	-0.1871	-0.0051	-2.7057
D_LNINF(-1)	-0.6817	0.0067	0.0008
D_LNM2(-1)	0.3523	0.0015	-2.9703
D_LNOMO(-1)	-0.9320	-0.0103	1.7142
LNREPO(-1)	-0.1504	0.0040	0.7911

Source: Authors' Computation and EViews 13 Output

4.5.1 Long-Run VECM Estimates

The results of the long-run in terms of the BLR coefficient are consistent with economic theory and have the correct sign. The model above suggests that, in the long-run bank lending rate (BLR) has a negative relationship with coffee export growth. The results suggest that, a unit change in BLR results in a 0.1936 percentage point decrease in the coffee export growth in the long run. The results reflect the fact that, as the cost of loans became cheaper (meaning that the low-interest rate charged on loans by commercial banks) will attract farmers to borrow for purchasing farm inputs and expanding agricultural production. Thus, this will intern

enhance export growth. Therefore, the results from the estimated model confirm that a low lending rate is more favoring the export growth of coffee in Tanzania. These results are the same as the study by George [10] on the impact of banks' lending rates on horticulture exports in Tanzania, which found that banks' lending rates have a negative relationship with horticulture exports in the long run.

$$LnCEG_t = 1.6756 - 0.1936Ln\ BLR_t - 0.1871Ln\ DISCR_t - 0.6817Ln\ INF_t + 0.3523\ Ln\ M2_t - 0.9320\ ln\ OMO_t - 0.1504ln\ REPO_t$$

The other study that revealed the same results was that by Moroyiwa et al., (2014) in South Africa, which revealed that changes made by monetary authorities find their way into the agricultural sector through the interest rate channel which affects farmers' borrowing conditions and in turn will affect the agricultural GDP favorably in the long-run.

In addition to the above, other coefficients of individual variables were examined to determine the nature of their relationship with coffee export growth in Tanzania.

The coefficient of Inflating (INF) was observed to be negative indicating that, a unit change in the inflation rate brings about a 0.6817 percentage point decrease in coffee export growth. This could be caused by the fact that not only inflations lead to an increase in the prices of exported goods which might reduce the competitiveness of coffee exports in the international markets; but also it can impact the cost structure of the coffee industry by raising the prices of inputs such as labor, fertilizer, machinery and transportation. High input costs can tend to reduce profit margins for coffee producers and exporters. Therefore, if the inflation is significant, it might limit the ability of coffee producers to expand production, potentially impacting export growth.

Likewise, a coefficient for Open market operations (OMO) represented by 364 treasury bills was observed to be negative indicating that, there was a negative relationship with coffee export growth in the long run. Again, this agrees with the theory as the relationship between coffee export growth and the Treasury bill (T-Bills) rate is interconnected through its effects on borrowing and currency value. High borrowing costs tend to discourage investment in various sectors including the coffee industry. Increased costs of borrowing might reduce investment in coffee production, processing, and related infrastructure, potentially impacting export growth.

Again, a discount rate (DISCR) and REPO rate were observed to be negative as expected indicating that, there was a negative relationship with coffee export growth in the long run. This is because, on one hand, a high discount rate also tends to increase the cost of borrowing to farmers as borrowing became expensive to commercial banks from the central bank. This situation can lead to high interest rates affecting borrowing costs for businesses including those in the coffee sector. Likewise, changes in the REPO rate can impact borrowing costs investment, consumer spending, and currency value, all of which can have implications for the coffee export growth.

The money supply growth rate (M2) appears to have a positive (0.3523) relationship with coffee export growth as expected. The results suggest that a unit change in the money supply growth rate (M2) results in a 0.3523 percentage point increase in the coffee export growth.

4.5.2 Short-run co-integration equation

The short-run model shows that only OMO (treasury bill) tends to have a positive impact on coffee export in the short-run, however, not statistically significant at the 5 percent level in the first lag. The estimation results in equation 5b. bellow, banks' lending rate (BLR) has a negative (-0.0303) but no statistical significance effect on coffee export growth at a 5% percent level of significance.

Other variables (DISCR, INFL, M2, and REPO tend also to have a negative and significant impact (at 5 percent) on coffee export growth in the short run as can be seen in the table below.

The error correction term is negative and significant thereby affirming the existence of co-integration among the variables. The coefficient of the error correction term implies that 62.7 percent of the disequilibrium is corrected within a year, as the frequency of the data is annual. Given that, the error correction term is significant and large, it is indicating that the speed of adjustment toward the long-run equilibrium is therefore high. The reported R-square is 0.3729 showing that the explanatory variables in the estimated model explained 30.7 percent of

changes in the dependent variables in the short run. It, however, remained stronger after adjusting for the degree of freedom to 35.1 percent (Adjusted R-square). This reveals the high goodness of the feat meaning that, the variable chosen is strong in explaining their contribution to the growth of coffee export in Tanzania.

4.6 Diagnostic Tests

We then conducted some diagnostic checks for some fundamental aspects of the model in terms of the VEC Residual Serial Correlation LM test, Tests for normality, Heteroscedasticity Test, and Multicollinearity test. The diagnostic tests were performed to see how seriously our results can be taken. The results have been given in Table 7a, 7b, and Fig. 1.

4.6.1 VEC Residual Serial Correlation LM test

The auto-correlation tests were done using Breusch-Godfrey (BG). The result of the BG shows that, Obs*R-squared of 4.0594 and Prob. Chi-Square (2) 0.1314 which is greater than 5 percent. This can be concluded that, from the research model, there is no auto-correlation shown.

4.6.2 Tests for normality

The normality test was performed using the Jarque-Bera test obtaining the result of 1.0035 (Fig. 1), with a probability value of 0.6055 which is greater than 5 percent (Fig. 1). This suggests that the above research model used is normally distributed.

Table 6b. Short-run co-integration equation

	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ1	-0.62726	1.1121	1.1444	0.0273
D(D_LNCEG(-1))	-1.9878	1.2950	-1.5350	0.1488
D(D_LNCEG(-2))	-1.7382	1.3774	-1.2620	0.2291
D(D_LNBLR(-1))	-0.0303	2.8790	-1.1472	0.0522
D(D_LNBLR(-2))	-0.0494	3.3895	0.8997	0.3847
D(D_LNDISCR(-1))	-0.6513	0.8115	-0.8025	0.0437
D(D_LNDISCR(-2))	-0.0562	1.2264	-1.2735	0.0723
D(D_LNINF(-1))	-0.09055	0.9397	0.9637	0.0052
D(D_LNINF(-2))	-0.0822	0.7949	-1.0343	0.0432
D(D_LNM2(-1))	-0.0019	0.5054	0.3735	0.0715
D(D_LNM2(-2))	-0.0034	0.4903	-0.6839	0.0051
D(D_LNOMO(-1))	0.0026	0.4956	0.5161	0.0614
D(D_LNOMO(-2))	0.0037	0.4431	0.8281	0.0423
D(LNREPO(-1))	-0.6809	0.9610	0.7085	0.0949
D(LNREPO(-2))	-0.3302	0.6324	-0.5222	0.0610
C	-0.1574	0.2228	-0.7066	0.4923
R-squared	0.3729	Mean dependent var.		-0.1561
Adjusted R-squared	0.3507	S.D. dependent var.		1.0272
S.E. of regression	1.1938	Akaike info criterion		3.4933
Sum squared resid	18.5280	Schwarz criterion		4.2477
Log likelihood	-34.6530	Hannan-Quinn criter.		3.7296
F-statistic	0.5153	Durbin-Watson stat		1.0097
Prob(F-statistic)	0.0890			

Source: Authors' Computation and EViews 13 Output

Table 7a. VEC residual serial correlation LM test results

F-statistic	1.6575	Prob. F(2,22)	0.2135
Obs*R-squared	4.0594	Prob. Chi-Square(2)	0.1314

Source: Author's computations and Eviews 13. output

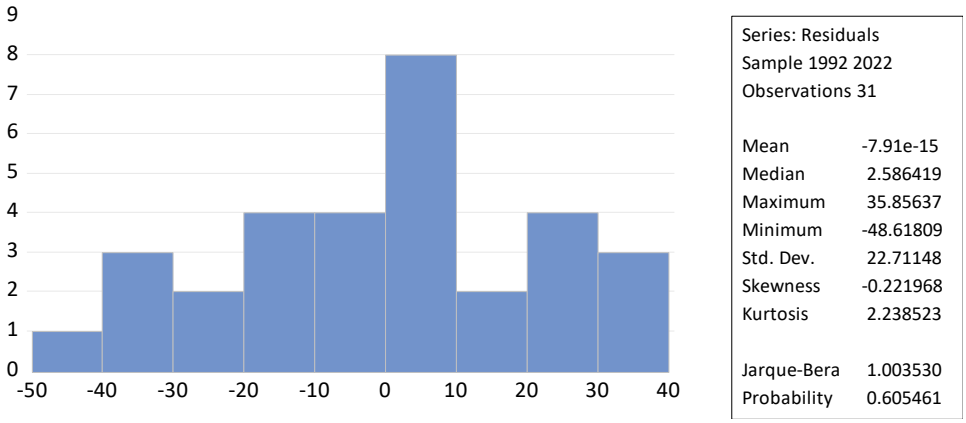

Fig. 1. Normality test results
Source: Author's computations and Eviews output

Table 7b. Heteroscedasticity test results

Heteroskedasticity Test: Breusch-Pagan-Godfrey **Null hypothesis: Homoskedasticity**			
F-statistic	2.5325	Prob. F (6,24)	0.0483
Obs*R-squared	12.0180	Prob. Chi-Square(6)	0.0616
Scaled explained SS	4.4607	Prob. Chi-Square(6)	0.6146

Source: Authors' Computation and EViews 13. Output

Table 7c. Multicollinearity test results

	Coefficient Variance	**Uncentered VIF**	**Centered VIF**
D_LNCRAGR	1056.0500	458.5300	4.0200
D_LNDISCR	0.9900	21.1800	7.2223
D_LNM2	25.4213	85.8432	2.7204
D_LNINF	129.9800	33.0114	3.0751
D_LNOMO	0.0075	1.0590	1.1152
L_inf	129.982	33.0162	3.0728
LNREPO	0.0365	12.7321	2.2810
C	0.0522	16.0645	NA

Source: Authors' Computation and EViews 13. Output

4.6.3 Heteroscedasticity test

From the results when conducting the heteroskedasticity tests using Breusch-Pagan-Godfrey, the Obs * R-squared is 12.018, and the Pro. Chi-Square (6) 0.0616 greater than 5%, indicating that there was no heteroscedasticity from the study research model.

4.6.4 Multicollinearity test

From the results in Table 7c, it can be seen that the Cantered VIF value is below 10, therefore the conclusion made is that in the study model, there is no multicollinearity and the study model is viable to use.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The main purpose of this study was to examine whether the banks' lending rate by commercial banks has a positive or negative relationship with coffee export growth in Tanzania using time series data spanning from 1991 to 2022 and ascertain the significance of this relationship. Data was collected from the Bank of Tanzania (BOT) various reports and Tanzania Coffee Board (TCB). Augmented Dickey-Fuller (ADF) tests were applied for checking the stationarity of the data used. To analyze the data, the method

of error correction (VECM) model was conducted to examine the existing short-run and long-run relationship between the dependent and independent variables under the study. From the fact and figures, it was revealed that the effect of lending rates by commercial banks on coffee export growth was negative but not statistically significant at a 5% level in the short run. The coefficient of lending rate in the long run was -0.0303; signifying a 1 percent decrease of the lending rate on the issued loans by commercial banks associated with a 3.0 percent increase in coffee export growth in the long run, ceteris paribus. This might be associated with the fact that there is a great influence of the cost of loans on agriculture financing through banks' credit which may impact production level and ultimately export growth. This means that, as the cost of loans became cheaper, bowers will be attracted to borrow more for financing agriculture activities and expanding production. This will result in more output and crop quality to compete in the global market. The negative relationship was also observed in the short run and appears to be significant at a 5 percent level. Therefore, from the result it was revealed that credit has been an important component that is used for enhancing their agricultural investment and farm operations including the coffee sector; and ultimately will lead to an increase in export growth particularly of which more than 90% of the national output are exported.

5.2 Recommendation

Analysis of this study revealed that coffee export growth has been associated with banks' lending rate having a negative relationship both in the short-run and long-run however not statistically significant.

In line with the theoretical framework and the finding obtained above, it can be concluded that the lending rate is vital as influences the behaviour of farmers to borrow for agricultural development as it is used to purchase modern inputs for enhancing productivity and crop quality to compete in the global markets and for expansion of new investment.

The negative relationship obtained by testing between banks' lending rate and coffee export growth confirms that lower interest rates on issued loans by commercial banks to farmers encourage improvement in this sector, and the high-interest rate correlated with inhibited growth in the coffee exports performance. Currently for most developing countries including Tanzania, lending rate by commercial banks and the monetary policy in general isn't being pursued as means of trembling productivity in the agricultural sector and the interest rate remain relatively higher about au to about 17 % on average with hard condition to obtain it.

Therefore, given the enormous evidence from the literature and the results of this study on the interdependence between banks' lending rate (BLR) and coffee export growth, the government through the Bank of Tanzania (BOT) is recommended periodically influence outcomes in the agriculture sector especially for exportable crops such coffee through easier monetary condition. This will promise the availability of agricultural financing through borrowing from lending institutions at an affordable borrowing rate. Along with this, the assurance of availability of farm inputs to small-scale farmers especially fertilizers, mode seedlings, and pesticides will undoubtedly produce the desired impact and lead to optimum productivity and crop quality to enhance exports.

COMPETING INTERESTS

Author declared that no competing interests exist.

REFERENCES

1. Tanzania Coffee Board, Annual Report obtained from Tanzania Coffee Board website; 2020.
2. BOT, Annual Report obtained from the Bank of Tanzania website; 2020.
3. Marwa N. Unlocking Coffee Production in Tanzania: What Does the Future Holds. Policy Brief. 2019;7.
4. World Bank, Breaking Down the Barriers to Regional Agricultural Trade in Central Africa; 2018.
5. Muroyiwa B, Sitima I, Sibanda K, Mushunje A. Monetary policy actions and agricultural sector outcomes: Empirical evidence from South Africa; 2014.
6. Athanasius N. An analysis of banks' credit and agricultural output in Nigeria: 1980-2014. International Journal of Innovative Finance and Economic Research. 2017;5(1):54-66.
7. Lechuga Montenegro J, Vega Miranda F. The Impact of Interest and Exchange Rates on Mexican Agricultural Exports: A Study for the Period 1993-2017. Textual:

Análisis Del Medio Rural Latinoamericano. 2018; 72:125-149.
8. Ita AJ, Owui HO, Dunsin OM, Ita RI. Commercial Banks' Lending and The Growth of Agricultural Sector in Nigeria. Iiard International Journal of Banking and Finance Research. 2020;6(3).
9. Adeola O, Ikpesu F. An Empirical Investigation of the Impact of Bank Lending On Agricultural Output in Nigeria: A Vector Autoregressive (VAR) Approach. The Journal of Developing Areas. 2016;50(6):89-103.
10. George W. Export performance of the horticultural sub-sector in Tanzania. In Trade and Investment in East Africa. Springer, Singapore. 2022;293-313.
11. Samoei SK, Kipchoge EK. Drivers of Horticultural Exports in Kenya. Journal of Economics and Financial Analysis. 2021;4(2):27-44.
12. Solanki S, Singh S, Murthy IK. Agricultural Exports and Performance of Agricultural Firms in India: An Empirical Analysis using System GMM. Asian Economic and Financial Review. 2022;12(2):121-131.

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