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

Abstract

This study looks at the examining the relationship between bank lending rate and coffee export growth in Tanzania. Utilizing yearly data from 1991-2022, empirically examined the long-run and short-run relationship in Tanzania by employing Johansen Co-integration test and vector error correction (VECM) model. The study finds a negative relationship between banks' lending rate and coffee export growth both in the both 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 BLR results 0.0303 percentage decrease the coffee export growth, ceteris paribus. This results supports the argument that, as cost of loans became cheaper (low interest rate charged on loans by commercial banks) will attract farmers to borrow for purchasing farm inputs and expanding the agricultural production and hence this will intern enhance export growth, and the high interest rate correlated with inhibited growth in the coffee exports growth.

The study recommends that, the bank of Tanzania (BOT) has periodically to influence outcomes in the agriculture sector especially 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 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.

1. INTRODUCTION

1.1 Background

Agriculture sector has been mainstay for Tanzania's economy since her independence. The sector, 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 (URT, 2020). For a long period, the country has been depending on traditional exports as a source of foreign earnings. Among the traditional exports, coffee is one of the major contributors in the foreign exchange earnings. The record shows, coffee was contributing to an estimated of 36% as a share to total national foreign exchange earnings in 1986; however, this share has declined overtime, reaching to less than 5% in 2020 (BOT, 2021).

The capacity of the sector to fulfil its traditional role in Tanzanian economy is explained to be constrained by various social economic and structural problems. One of the basic considerable challenges facing coffee subsector as a whole is inadequate funding particularly to small scale farmers form commercial banks and other lending institutions. Several factors can be said to be responsible for inadequate funding among the small scale farmers in Tanzania. Pre-eminent among these factors is the unavailability of credits and high lending rate by commercial banks and other lending institutions (Marwa, 2019).

Practitioners agree that, for agriculture sector to perform well, fund is needed to enable farmers to purchase more land, inputs at the appropriate time including fertilizers, pesticide; and agricultural machineries. 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 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 the problem worth discussing and important issue for policy makers and all stakeholders involving in the coffee value chain, and this may contribute to increased coffee export growth. Specifically, the study intended to examine whether bank lending 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 of developing countries including Tanzania, credit is not easily available and the interest rates charged are considerable to be higher to small scale farmers who dominating the sector. The high lending rates by commercial banks has been basically on account of lack of collaterals 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 in large scale and therefore remain 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 promotes the lead technology enterprises (World Bank, 2018), the important moving stage that has been taken by the government is that of setting up of 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 for the urgent need of credit required for rapid transformation of agricultural sector of the

economy in order to enhance the export growth. In different time, the Bank of Tanzania has been 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 including traditional exports such as coffee. Among others were the reduction of Statutory Minimum Reserves (SMR) over time from 10 percent to the currently existing of 6 percent (BOT, 2020). 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 involving in the agricultural value chain with interest rate not exceeding 10 percent.

However, with all these efforts, the lending rates to small holder's farmers remain considerable as higher, averaging 17% (**Table 1**) to date. Regardless of the how the importance of the agriculture sector is, the interest rates charged for loans by banks applied equally to the agriculture sector without any exceptional. This has been among of the constranst

Table 1: Trend in Commercial Bank Lending Rate in Tanzania

Year	Average Lending Rate	Year	Average Lending Rate	Year	Average Lending Rate
1991	26.3	2001	20.1	2011	15.0
1992	27.4	2002	16.4	2012	15.6
1993	27.4	2003	14.5	2013	15.9
1994	34.4	2004	14.1	2014	16.3
1995	37.8	2005	15.2	2015	16.1
1996	34.0	2006	15.7	2016	16.0
1997	26.3	2007	16.1	2017	17.8
1998	22.9	2008	15.0	2018	17.4
1999	21.9	2009	15.0	2019	17.0
2000	21.6	2010	14.5	2020	16.7

Source: Bank of Tanzania (BOT)

1.3 Objective of the study

The general objective of the study is to contributes towards enhancing coffee sector in terms of production, productivity and profitability through availability of affordable loans for agricultural financing.

Specifically, this study aimed at investigate whether bank lending rate has a positive or negative relationship with coffee export growth in Tanzania environment and ascertain the significance of this relationship.

1.4 Significant of the study

To this end, the contribution of this study is in two ways as follow: -

First, this will help to fill the vacuum of information on the 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 involving 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 coffee value chain that enables high crop productivity and quality to compete in the global markets for enhancing export earnings growth.

1.5 Scope of the Study

This study applies time series secondary data spanning from 1991 to 2022 in analyzing the existing relationship between banks' lending rate and coffee export growth.

1.6 Organization of the study

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

Review of the Literature

1.1 Theoretical Framework

In general, most theoretical literature on financial development and economic growth supports the argument that banks' lending rates has a vital influence on agricultural sector growth by enhancing capital accumulation and technological changes. There existing a general 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 (Muroyiwaet al., 2014)

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 this 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 set at 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 level 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.

1.2 Empirical Review

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

Moroyiwa et al., (2014), 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 favourably.

Athanasius (2017), 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, interest rate had a negative and significant relationship with agricultural Gross Domestic Product (AGDP).

Montenegro & Miranda (2018), 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 word 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., (2020) conducted the study to examine the effect of commercial banks' lending on the growth of the agricultural sector in Nigeria by using Multiple regression statistical technique. 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, bank assets on agricultural output.

Adeola & Ikpesu (2016) conducted the study to examine the impact of lending rate on agricultural output using the Vector Autoregressive (VAR) approach over the period 1981 to 2013. The results from the study indicates that, commercial bank lending rate has influenced in one-way agricultural sector performance, however, the effect was not significant at 5% level of confidence.

George (2022), conducted a study on export performance of the horticultural sub-sector in Tanzania using 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 (2021), examined major drivers behind horticultural exports in Kenya for the period 2005 to 2017 using co-integration model. The study results explore that; the interest rate has negative influence on horticulture exports in Kenya.

On the same note, Solanki et al., (2022), examined the relationships between agriculture firms' financial performance and agricultural exports and macroeconomic indicators in India. The System Generalized Method of Moments (GMM) models 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 results in a reduction in agricultural exports.

This review of the related literature supports the inference that, the relationship between bank lending rate and agriculture sector in terms of output performance and export growth is inconclusive. This is due to the fact that, from the related reviewed literature revealed different results; some indicating that, the interest rates are significantly responsive for agricultural sector performance, others found interest rate 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 lending rate by commercial banks affects the growth of coffee exports is vital with a reason to enhance the contribution of the banking sector on coffee export growth and for agriculture sector as a whole.

2. Research Methodology

2.1 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 Tanzania Coffee Board (TCB) and Bank of Tanzania (BOT) reports. The variables used in study are coffee exports growth (*CEG*) measured by percentage of annual growth rate of export values as a dependent variable; while banks' lending rate (interest rate) as 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 this variable were of 364 yield treasury bill; money supply annual growth rate (*M2*) were employed as explanatory variables. In analyzing the data gathered for this work, Vector Error Correction (VECM) was employed. The model was employed due to its powerfully in establishing the long-run and short-run relationship between dependent variable and independent variables.

2.2 Variables and their Features

3.2.1 Coffee Export Growth (*CEG*)

This is the dependent variable as applied in this study. It defined as percentage annual change in coffee export value (expressed in million USD). Data and information for this variable was sourced from International Coffee Organization (ICO). The formula used to calculate the coffee annual growth percentage change for the value of coffee sold abroad is explained bellow: -

$$\text{YEP} = \frac{YEPt - YEPt - 1}{YEPt - 1} * 100\% \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .1$$

3.2.2 Banks' Lending rate

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

3.2.3 Discount Rate (DISCR)

The choice of this variable is built on the following explanation. High discount rate tend to affect 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 the own loans, and therefore farmers will be attracted to borrow more for enhancing production and crop quality. This is expected in turn to stimulate the export growth as more will be produced and quality crop to compete in the global market. A negative sign is expected.

3.2.4 Inflation (INF)

Inflating refers to 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) impact on the agriculture sector as it 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 influence the banking system liquidity as the result banks will lend more at lower lending rate, and this will attract more farmers to borrow for farm investment.

On the other hand, repo may have negative impact as well. For example, during the high inflation, the central bank may increase 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 the productivity and crop quality to compete in the global market this is expected to stimulate the export growth. Therefore, a negative relationship is expected between coffee export growth and repo rate. (Extend to OMO more that even REPO).

3.2.6 Money Supply Annual Growth rate

This is the independent variable in this study. 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 an only broad money supply (M2) has been considered in 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 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 as the 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 as Treasury Bills (T-Bills) defined as a short-term debt securities issued by the government to raise funds in percent. The data on this variable were obtained from BOT report. A negative sign is expected.

2.3 Model Specification

The focus of this study has been to examine whether bank lending (interest rate) has a positive or negative relationship with coffee export growth and ascertain the significance of this relationship. Predictably, coffee export growth function depends on output which is obviously depending on inputs, such as land, labor, capital and other inputs like pesticides, seedlings, fertilizers etc. However, in this study coffee exports growth which is the results of output produced and crop quality is used as dependent variable, keeping in mind that, the purchase of inputs for enhancing quality and productivity level depends on the lending rate of the such credit to purchase the required inputs. But instead of taking output which is influenced by availability of inputs, the banks' lending rate was taken as a main driver in obtaining credit to purchase the such input for production. Taking into consideration of other monetary variables that might have influence in agricultural sector performance; REPO, 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.

Based on this explanation, the model below has been adopted for this study: -

$CEG = f(BLR, REPO, INF, DISCR, OMO, M2)$ ……1

Where, CEG= stands for coffee export growth; *BLR* = Bank 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 bill.

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

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

We further re-write the above equation 2 in the mathematical form in log linear model as: -

$LnCEG_t = \beta o + \beta_1\ Ln\ BLR_t + \beta_2\ ln\ REPO_t + \beta_3\ Ln\ INF_t + \beta_4\ Ln\ DISCR_t + \beta 5LnOMOt + \beta 6LnM2t + \mu_t$ ……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 weight of the unit change of the explanatory variables that is parameter or estimation coefficient of explanatory variables;

Stochastic error terms = μ_t

2.4 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 powerfully on analyzing dynamics with the long-run equilibrium without losing long-run information. These estimation was conducted in considerations of time series data behavior analyzed. Estimation was done by using Eviews version 13 statistical software.

2.5 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

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

…… ……..4

Akaike Information criterion (AIC) is applied for selecting the number of lags to be used in the model.

2.6 Determination of Optimum Lag

Optimal lag length was more important in the estimation procedure. To determine the optimal lag length, 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 value of the information criteria.

2.7 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.

2.8 Co-integration Analysis

Johansen 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 checking for long-run relationship among variables in the model.

2.9 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 thee error correction term (ECT_{t-1}) which represent a co-integration equation and long-run model.

The equation for ECT term is as 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 the interest (representing the *CEG* in this model);

X_{t-1} and $\xi_m R_{t-1}$ are 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: -

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

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.

2.10 Diagnostic Tests

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

3. Results and Discussion

3.1 Descriptive Statistics

Prior to the econometric estimation, 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 USD from 1991 to 2022, tends to be negatively skewed with a minimum value of 35.22 million USD, and the maximum value of 186.61 million USD.

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 maximum of 37.81 percent. Discount rate measured in percent average was 14.33, with a minimum of 3.70 percent and maximum of 27.00 percent. Money supply annual growth rate and treasury bill rate (OMO) averaged 17.28 percent and 10.03 with a minimum of 3.76 and 0.00, maximum of 39.26 percent and 21.11 percent, respectively. Lending interest rate is relative normally distributed across the period with a kurtosis of 3.7 which is away from zero.

Table 2: Summary Statistics Using the Observations 1991-2022

	CEG	CE-VALUE	BLR	DISCR	M2	OMO	REPO
Mean	4.75	111.86	19.83	14.33	17.28	10.03	4.43
Median	3.82	111.19	16.34	15.99	15.09	10.92	4.50
Maximum	59.62	186.61	37.81	27.00	39.26	21.11	7.79
Minimum	-42.67	35.22	14.14	3.70	3.76	0.00	1.17
Std. Dev.	25.36	40.21	6.62	6.65	8.09	5.41	1.55
Skewness	0.13	-0.11	1.38	0.31	0.76	-0.16	0.07
Kurtosis	2.55	2.04	3.70	2.24	3.26	2.45	2.66
Jarque-Bera	0.35	1.25	10.74	1.24	3.08	0.53	0.18
Probability	0.84	0.54	0.00	0.54	0.21	0.77	0.92
Sum	147.37	3467.67	634.68	444.31	535.54	310.98	137.25
Sum Sq. Dev.	19289.34	48508.38	1357.82	1326.82	1962.94	879.14	72.19
Observations	32	32	32	32	32	32	32

Source: Bank of Tanzania and Eview outputs

3.2 Unit Root Tests

Prior to 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 constant are as presented in the Table 3 bellow.

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		Intergration
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)

Source: Author's calculation and Eviews output

Results in table 3 above show that, all the variables (*LnCEG, LnBLR, LnDISCR LnINF, LnM2 and LnOMO* rate) are integrated in same order except for REPO that is stationary in level; therefore, we are able to 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. In order 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, all of the selection criteria select the optimum lag length of 2 at 5% level of significance. Hence, the lag length of 2 will be used in estimating the ECM and the Johansen co-integration test.

Table: 4 Determination of Optimum Lag

VAR Lag Order Selection Criteria
Endogenous variables: D_LNCEG D_LNBRL D_LNDISCR D_LNINF D_LNM2 D_LNOMO
Exogenous variables: C

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.

4.4 Co integration technique (Johansen-Juselius).

We performed co-integration analysis to check for any long-run relationship among the variables of interest. Both Trace test and the Maximum Eigen Value Test by using the Johansen co-integration test were adopted in order to ascertain if there is a long term relationship among 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 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 existing 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 equation at 5% confidence interval exist as well.

Table 5a: Johansen 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

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

Source: Authors' Computation and EViews 13 Output.

Table 5b: Johansen Co-Integration Maximum Eigen value 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

Max-eigenvalue 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

Source: Authors' Computation and EViews 13 Output.

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

Table 6a and 6b, bellow 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.

4.5.1 Long-Run VECM Estimates

The results of the long-run in terms of BLR coefficient are consistency 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 cost of loans became cheaper (meaning that as low interest rate charged on loans by commercial banks) will attract farmers to borrow for purchasing farm inputs and expanding the agricultural production. Thus, this will intern enhance export growth. Therefore, the results from the estimated model confirm that, low lending rate is more favouring the export growth of coffee in Tanzania. This results are the same as the study by George (2022) on the impact of banks' lending rate on horticulture exports in Tanzania, whose found that, banks' lending rate to have a negative relationship with horticulture exports in the long run.

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.

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

The other study that was revealed the same results was that by Moroyiwa et al., (2014) in South Africa, whose 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 favourably 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 inflation rate bring about 0.6817 percentage point decrease in coffee export growth. This could be caused with 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 on the cost structure of 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 significantly, it might limit the ability of coffee producers to expand production, potentially impacting export growth.

Likewise, a coefficient for Open market operations (OMO) represent by 364 treasury bill was observed to be negative indicating that, there were a negative relationship with coffee export growth in the long-run. Again, this agree with the theory as the relationship between coffee export growth and Treasury bill (T-Bills) rate is interconnected through its effects on borrowing and currency value. High borrowing costs tend to discourage investment in various sector 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 were 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 rate affecting borrowing costs for business including those in the coffee sector. Likewise, changing in REPO rate can impact borrowing costs investment, consumer spending, currency value, all of which can have implications for the coffee export growth.

Money supply growth rate (M2) appear to have a positive (0.3523) relationship with coffee export growth as expected. The results suggest that, a unit change in 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) tend to have positive impact on coffee export in the short-run, however, not statistical significant at 5 percent level in the first lag. The estimation results in equation 5b. bellow, banks' lending rate (BLR) has a negative (-0.0303) but not statistical significance effect on coffee export growth at 5% percent level of significance.

Other variables (DISCR, INFL, M2 and REPO tend also to have negative and significant impact (at 5 percent) on coffee export growth in the short-run as it 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 towards 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 degree of freedom to 35.1 percent (Adjusted R-square). This reveals high goodness of feat meaning that, the variable chosen are strong in explaining their contribution on the growth of coffee export in Tanzania.

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.

4.6 Diagnostic Tests

We then conducted some diagnostic checks for some fundamental aspects of the model in terms of VEC Residual Serial Correlation LM test, Tests for normality, Heteroscedasticity

Test and Multicollinearity test. The diagnostic tests were performed to see how serious be our results can be taken. The results have been given in table 7a, 7b, Figure 1 below:

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.

Table 7a: VEC Residual Serial Correlation LM Test Results

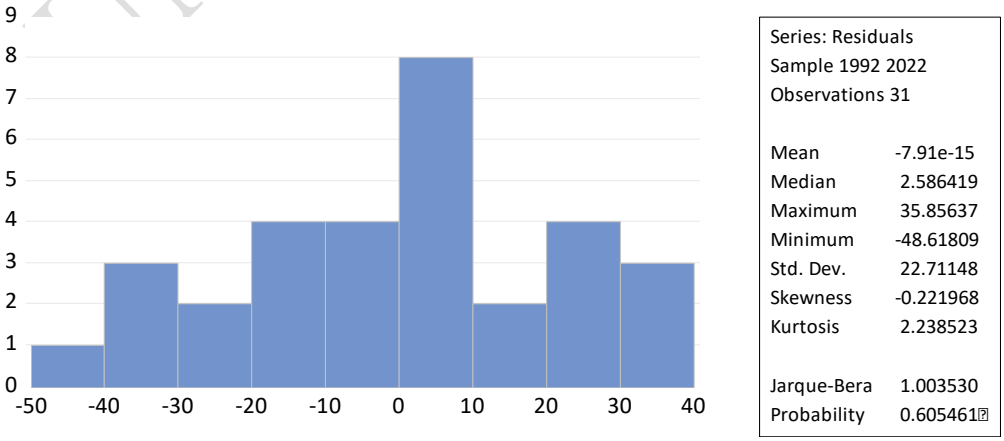
Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.6575	Prob. F(2,22)	0.2135
Obs*R-squared	4.0594	Prob. Chi-Square(2)	0.1314

Source: Author's computations and Eviews 13. output

4.6.2 Tests for Normality

The normality test was performed using the Jarque-Bera test obtaining the result of 1.0035 (bellow 4), with the probability value of 0.0.6055 which is greater than 5 percent (Figure **1**). This suggest that, the above research model used is normally distributed.

Figure 1: Normality Test results



Source: Author's computations and Eviews output

4.6.3 Heteroscedasticity Test

From the results when conducted the heteroskedascity 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.

Table 7b: Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity			
F-statistic	2.532516	Prob. F(6,24)	0.0483
Obs*R-squared	12.01803	Prob. Chi-Square(6)	0.0616
Scaled explained SS	4.460735	Prob. Chi-Square(6)	0.6146

Source: Authors' Computation and EViews 13. Output

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.

Table 7c: Multicollinearity Test Results

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
L_BLR	1056.05	458.53	4.02
DISCR	0.99	21.18	7.22
L_DISCR	331.38	120.48	6.12
L_INF	129.98	33.01	3.07
L_M2	25.42	85.84	2.70
C	15941.01	796.98	NA

Source: Authors' Computation and EViews 13. Output

4. Conclusion and Recommendations

5.1 Conclusion

The main purposes 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 Bank of Tanzania (BOT) various reports and Tanzania Coffee Board (TCB). Augmented Dickey Fuller (ADF) tests was applied for checking the stationarity of data used. In order to analyse 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 rate by commercial banks on coffee export growth was negatively however not statistically significant at 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 cost of loans on agriculture financing through banks credit which may impact on 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 into more output and crop quality to compete in the global market. The negative relationship was also observed in the short-run and appear to be significant at 5 percent level. Therefore, from the result it was revealed that, credit has been an important component which is used for enhancing their agricultural investment and farm operations including coffee sector; and ultimately will lead to 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 concluding that lending rate is vital as influences the behaviour of farmers to borrow for agricultural development as it used to purchase of 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 confirm that lower interest rate 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 of 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 17 % in average with hard condition to obtain it.

Therefore, given the enormous evidence from the literature and the results of this study with 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.

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