



Inflation and Commercial Banks Operation in Tanzania

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Authors' contributions

This work was carried out in collaboration between both authors. Author ZMA designed the study, managed the analyses of the study, managed the literature review, wrote the protocol and wrote the first draft of the manuscript. Author SYS collected and wrote the literature review and performed the statistical analysis. Both authors read and approved the final manuscript.

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ABSTRACT

This paper addresses connection of inflation and commercial banks operation by using quarterly time series data from 2008 to 2017. The study precisely shows relationship of inflation and customer savings in the commercial banks; and bank lending to customers using Vector Error Correction Model. The study reveals that there is existence of long run relationship among customer saving and inflation; and bank lending and inflation. The study reveals positive impact of customer saving and bank lending on inflation. The government of Tanzania should increase expenditure to necessary activities so as to expand banks operations because it is a crucial sector in the financial sector. However, the government should have continuous monitoring and control of the inflation to prevent financial sector shakiness. Additionally, Commercial banks should put much control on lending by increasing interest rates and choosing borrower with good character.

Keywords: Inflation; commercial banks; VECM; customer savings; bank lending.

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1. INTRODUCTION

In Developing countries such as Tanzania, banks play a major role in financial development. The Banking sector to play its role must be profitable. Profitability of the commercial banks depends on deposit of and lending to their customers through lending and deposit interests.

In Tanzania the average lending grew by 7.2 percent in 2016, from TZS 15,491.70 billion in December 2015 to TZS 16,609.00 billion in December 2016. Average deposit rates increased from 8.89 percent in December 2015 to 9.19 per cent in 2016 [1]. Commercial banks operation depends on several factors such as inflation.

Generally, Inflation is the persistent increase of price level of goods and services in an economy over a period. Inflation results into a reduction in the purchasing power per unit of money, a loss of real value in the medium of exchange and unit of account within the economy [2]. Tanzania headline unchanged inflation rate of 3.8% in 2019 which is the highest level since April 2018 that impact economic activities.

Despite many initiatives taken by government on controlling the banking sector in Tanzania, this sector faces inflation rate problem. In theoretical viewpoint, Fisher in 1911 explains the relationship between inflation, interest rate and exchange rates on landing. The theory expression is that, the smaller the real interest rate, the longer it will take for savings deposits to grow substantially. Many empirical studies have been conducted across the countries such as study of [3,4,5] to examine the impact of inflation on banking performance, lending rate and saving in general, but they put less effort to examine the specific effect of inflation on banking customer savings and lending. Therefore, this study fills the gap by providing empirical evidence on the impact of inflation on banking operation specifically on customer saving and lending to customers.

2. LITERATURE REVIEW

Several studies have been conducted on the impact of inflation on commercial banks performance, lending and saving interest rates in general. [6] on the impact of inflation on bank lending rates in Bangladesh for 10 years from 2002 to 2011, observed that there is no significant relationship between the lending rates

and inflation. Additionally, [7] on the effect of inflation and interest rate on Turkish Banking System's incomes, found an increase of interest rate hasn't any statistically meaningful effect on rate of equity (ROE) and inflation doesn't affect to ROA statistically.

Moreover, the study conducted by [3] on the inter-relationship between economic growths, savings and inflation in Asia, observed inflation has a highly significant positive effect on saving rate. [8] conducted his study on the effects of inflation on commercial banks' lending in Kenya, on his study observed there is positive relationship between inflation rate and the base lending rate charged by the bank, as inflation levels rises, inflation has a significant effect on Kenya Commercial Bank (KCB) base lending rate. [5] examined the effect of commercial bank lending on inflation in Nepal, the study has conducted regression analysis using panel data of twenty four commercial banks during the period of 1996 -2015. The empirical results show that bank lending has positive effect on the inflation in Nepal. [9] on investigation of causality between interest rate and deposit investor's behavior, found there is causality between interest rates and deposit volume.

On the other hand, [10] on the effects of chronic inflation on resource allocation: Towards understanding non-neutrality of monetary inflation found that monetary inflation is non-neutral on resource allocation as it erodes the real value of money and monetary assets. In this study resource allocation can be related with banks' lending. Additionally, [7] found an increase of interest rate has negative effect on return on assets (ROA) and affect ROE statistically. [4] in their study on the impact of inflation expectations on Polish consumers' spending and saving tried to linking inflation expectations with the buying attitude and with the saving attitude. They conclude that there is negative relationship between inflation expectations and the saving attitude. [11] Conducted the study on the relationship between saving, inflation and economic growth in Ethiopia; found that inflation has negative relation with domestic saving.

The study concludes that monetary inflation is non-neutral on resource allocation as it erodes the real value of money and monetary assets.

From the above literatures no one concentrate on impact of inflation on the commercial banks'

corporate and individual saving and lending's amount. Most of them concentrate on inflation on country savings, deposits invested, resources allocation, banks profitability and economic growth. Therefore this research shows relationship between inflation and commercial banks operation specifically on Savings deposits and lending's.

3. METHODOLOGY

On examining the effect of inflation on the commercial bank operations on customer saving and bank lending, the study employs time series model that is Vector Error Correction Models (VECM) in order to meet the objective of this study. The study uses quarterly data from 2008 to 2017. The data obtained from Bank of Tanzania and World Bank data base. The original equation of the model is shown below:

$$CS_t = \beta_0 + \beta_1 (INF)_t + \varepsilon_t \quad (1)$$

The first model is used to analyze the relationship between customers saving in the commercial bank and inflation. Hence inflation is taken as independent variable and customers saving are the dependent variable. The study applies the same model used by [12] that developed their model to check the effect of inflation on national saving but in our model, we are using customer savings and we have added some variables such as GDP and Interest rate of saving as the control variable so as to have more meaningful results. Logarithm is applied to help regression estimates. Therefore, regression equation is as follows;

$$\ln CS_t = \beta_0 + \beta_1 \ln (INF)_t + \beta_2 \ln (GDP)_t + \beta_3 \ln (IRS)_t + \varepsilon_t \quad (2)$$

Where:

CS = Customers saving to commercial banks, in this case it includes both corporate and individual customers

INFR = Inflation rate which measured by consumer price indexes

GDP = Gross Domestic Product. It is an income per capital of the country

IRS = Interest rate on saving

ε_t = stochastic error term at time t which assumed to be white noise

t = the symbol which shows the period for each observation at time t

β_0 = intercept of the model which shows the average rate of CS when other things remain constant.

$\beta_1... \beta_3$ = the variability of CS due to the change of respective variables

Moreover, the research estimates another equation to analyze the relationship between bank lending to customers and inflation. Hence bank lending is taken as the dependent variable and inflation is the independent variable. The study includes other two factors that affect bank lending such as GDP per capital and exchange rates as control variables. The GDP per capital is included as a measure of the country economic activity because the country with more GDP per capital tends to have more banks' lending to customers. Therefore, the regression equation is as follow;

$$\ln (BL)_t = \beta_0 + \beta_1 \ln (INFR)_t + \beta_3 \ln (GDP)_t + \beta_4 \ln (EXCH)_t + \varepsilon_t \quad (3)$$

Where:

BL= Bank lending to customers which includes both corporate and individual customer

INFR = Inflation rate which measured by consumer price indexes

GDP = Growth Domestic Product per capital as a measure of economic activity of the country

EXCH = represent the exchange rate

ε_t = stochastic error term at time t which assumed to be white noise

t = the symbol which shows the period for each observation at time t

β_0 = intercept of the model which shows the average rate of BL when other things remain constant.

$\beta_1... \beta_4$ = show the variability of BL due to the change of respective variables

3.1 Variable Summary

Each variable is expected to be significant in examining the impact of inflation on commercial bank operation. The variables applied in this study are summarized in the Table 1.

Stationarity and co-integration tests are done to confirm uses of VECM.

Table 1. Variables summary

SN	Variable name	Definition	Expected sign
1	CS	Customer saving is the total amount of corporate and individual customer savings	+/-
2	BL	Bank lending to customers is the total amount of lending to corporate and individual customers	+/-
3	INF	Inflation rate is a measure of consumer price index	+
4	IRS	Interest rate is a proportion of the amount deposited.	+
5	EXCH	Exchange rate is the ratio of national currency to the foreign currency. In this study the exchange rate is taken Tanzania shillings against US Dollar.	+
6	GDP	Gross Domestic Product is a measure of economic activity of the country. This is an average income earned per person in the country. It is calculated by dividing the total income by its total population.	+

4. RESULTS AND DISCUSSION

This part presents interpretation and discussion of the results of the VECM. Before main results Stationerity and co-integration tests are presented.

Augmented Dickey-Fuller (ADF) test applied testing Stationery to avoid the problems of spurious [13]. The results are presented in appendices A and B.¹ All variables are not stationary at 0 lags (At level) but after first difference all variables become stationary. The results provide the indication of the existence of possible long run relationship in the model. The results provide the lead for proceeding procedures to test co-integration to check whether the model has long run relationship or not.

After analyzing stationary at the first difference, the study applied the Johansens likelihood estimation to test for co-integration to investigate whether the stochastic trends in the examined variable, which is supposed to contain unit roots, have a long term relationship. Johansen test usually involves two results namely "Trace statistics" and "Maximum eigen value". From the results of co-integration both Max Eigen and Trace test indicate that there is long run relationship between variables includes the customer saving and their determinants as well as bank lending with their determinants. The result of co-integration gives direction of the reasoning applying vector error correction model. This is shown in Appendices C and D.

¹ The critical value statistics are given in response of MacKinnon (1999) values.

4.1 Vector Error Correction Model Results

Since all variables are found to be co-integrated at most 1 and none of all the two models, there is a long run dynamic relationship between the variables. VECM is considered appropriate for the analysis of the study using two different equations. This study presents and discusses the estimated results of customer saving and inflation rate and; bank lending and inflation.

4.2 Results of the Relationship between Inflation and Customer Saving

Results presented in Table 2 shows that Inflation and interest rate on saving have positive significance influence on customer saving but GDP has negative significance influence on customer saving.

An increase in inflation increases amount of saving in nominal value in the long-run. An increase in inflation leads to an increase in customer saving by 0.14%. This means that INF impulse customer saving because inflation rate leads to increase price of product that discourage consumption. The result is consistent with the results of [3] and it is inconsistent with the findings of [4] and [11].

For the case of interest rate, it increases customer saving by 0.82%. This means that interest rate of saving push customer savings because the high interest rate leads customer to generate more return.

The GDP has negative relation with customer saving. Similarly, increasing in GDP by one unit leads customer saving to be reduce by 1.400136.

Table 2. VECM results of the relationship between inflation and customer saving

	<i>lirs</i>	<i>lgdp</i>	<i>linf</i>
constant	2.341719		
Coefficients	0.828451	- 1.400136	0.144166
Std. Error	(0.34299)	(0.35774)	(0.16359)
T-statistics	(-2.41535)	(3.91382)	(-0.88127)

Table 3. Relationships between inflation and the bank lending

	<i>lexch</i>	<i>lgdp</i>	<i>linf</i>
Coefficients	0.828362	1.515340	0.447337
Std. Error	(0.24050)	(0.30078)	(0.12900)
T-statistics	(-3.44438)	(-5.03804)	(-3.46767)

4.3 Results of the Relationship between Inflation and Bank Lending

The result in Table 3 shows the relationship between inflation and bank lending. The result shows all variables such as inflation, exchange rate and GDP growth rate have significant positive long-run relationship with bank lending. These results are consistent with the results of [5] and [8].

The result shows one unit change in the inflation rate leads to an increase in the banking lending by 0.45. The result indicates when inflation is high, cost of living and businesses increase that influence people to find more fund to cover their life. Therefore, people and businesses borrow money from banks that increase banking lending.

The study revealed that there is positive relationship between GDP and banking lending. One unit increase in GDP leads to increase banking lending by 1.515340. When GDP increase, economic activities of the country improve that encourage investors to find more fund by borrowing so as to expand business to increase profitability.

The regression result also shows there is positive relationship between exchange rate and banking lending. The result shows that one unit change in the exchange rate leads to an increase the bank lending in Tanzania by 0.83. When value of United State Dola (USD) per Tanzania shillings (Tshs) increase bank lending increase because many customers especially businessmen find more money to cover their international transactions.

5. CONCLUSION

The study analyzed the relationship of inflation on commercial banks operation in Tanzania. This

study examines the impact of inflation on customer savings and lending to customers of the commercial banks in Tanzania. The study applied VECM time series method.

The results revealed that there is long-run relationship between the Customer saving and inflation; and bank lending and inflation in Tanzania. It implies that when the inflation increase, it influence the bank lending as well as customer saving.

Therefore, the Government of Tanzania should increase necessary expenditure to increase inflation rates. This will improve banking operations which is the crucial sector in the financial sector. However, Central Bank should put much consideration on continuous monitoring and control to control price stability because Price stability is the foundation of financial stability and economic stability. Moreover, Commercial banks should put much control on lending by increasing interest rates and choosing borrower with good character. Increment of lending is influenced by increment of cost of living and business that may cause interest rate risks and credit risk.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDICES

Appendices A. Unit root test (At Level) for customer saving, GDP, IRS and inflation

ADF Unit Root Test						
Constant (Level)						
Variables	T-Statistics	Test critical values			Prob	Results
		1% level	5% level	10% level		
LGDP	-2.790743	-3.610453	-2.938987	-2.607932	0.0688	Not stationary
L IRS	-0.891711	-3.610453	-2.938987	-2.607932	0.7804	Not stationary
L EXCH	0.153173	-3.610453	-2.938987	-2.607932	0.9658	Not stationary
L INFR	-1.367363	-3.610453	-2.938987	-2.607932	0.5882	Not stationary
L CS	-2.36628	-3.610453	-2.938987	2.607932	0.1576	Not stationary
L BL	-1.40053	-3.610453	-2.938987	-2.607932	0.5722	Not stationary

Source: Author computation from collected Data (2018)

Note: If p-value is greater than 0.05, we decide that 'it has a unit root' (non-stationary); otherwise, we decide that 'it does not have a unit root' (stationary). The results are obtained from MacKinnon's table by using Eviews7 packet program

Appendices B. Unit root test (At first difference) for customer saving, GDP, IRS and inflation

ADF Unit Root Test						
Trend and Intercept (First Difference)						
Variables	T-Statistics	Test critical values			Prob	Results
		1% level	5% level	10% level		
D (L GDP)	-5.12901	-3.6329	-2.948404	-2.612874	0.0002	stationary
D (L IRS)	-6.030393	-3.615588	-2.941145	-2.609066	0.0000	stationary
D (L EXCH)	-5.182157	-3.621023	-2.943427	-2.610263	0.0001	stationary
D (L INFR)	-6.012234	-3.615588	-2.941145	-2.609066	0.0000	stationary
D (LCS)	-6.023435	-3.615588	-2.941145	-2.609066	0.0000	stationary
D (L BL)	-6.226804	-3.615588	-2.941145	-2.609066	0.0000	stationary

Source: Author computation from collected Data (2018)

Appendices C. Johansen test for co integration for first model of customer saving

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.915389	127.9680	47.85613	0.0000
At most 1 *	0.490548	39.05924	29.79707	0.0033
At most 2	0.289666	14.78015	15.49471	0.0639
At most 3	0.066244	2.467425	3.841466	0.1162

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized	Max-Eigen		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.915389	88.90873	27.58434	0.0000
At most 1 *	0.490548	24.27909	21.13162	0.0174
At most 2	0.289666	12.31272	14.26460	0.0994
At most 3	0.066244	2.467425	3.841466	0.1162

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Source: Author computation from collected Data (2018)

Appendices D. Johansen Test for Co integration for second model of bank lending

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999999	1056.496	69.81889	0.0001
At most 1 *	0.999999	535.2852	47.85613	0.0001
At most 2 *	0.544437	39.95645	29.79707	0.0024
At most 3	0.223075	11.65247	15.49471	0.1744
At most 4	0.068788	2.565647	3.841466	0.1092

Trace test indicates 3 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized	Max-Eigen		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999999	521.2108	33.87687	0.0001
At most 1 *	0.999999	495.3287	27.58434	0.0001
At most 2 *	0.544437	28.30399	21.13162	0.0041
At most 3	0.223075	9.086820	14.26460	0.2790
At most 4	0.068788	2.565647	3.841466	0.1092

Source: Author computation from collected Data (2018)

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