Effects of Macroeconomic Variables on Banks' Lending in Tanzania

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Abstract

The purpose of this paper is to analyse the effects of macroeconomic variables on banks' lending in Tanzania. The study applies the Autoregressive Distributed Lag Model (ARDL). Time series data were analysed yearly covering the period of 1970 to 2021. The contribution of this particular study is provision of empirical evidence of whether macroeconomic variables affect banks' lending behaviour in Tanzania and provide evidence-based policy implication for the country with regard to the financial sector and banks' lending in Tanzania. The empirical results show that there is a significant short-run negative impact of M3 Money Supply in overall commercial banks' lending rate in Tanzania which ultimately impact positively commercial banks' credit lending behaviour. An increase in money supply would lead to a decrease in interest rate. This would ultimately lead to an increase in banks' lending, which is expected to increase because banks would become more liquid resulting into stimulation of banks' lending behaviour. By implication, a contractionary Monetary Policy in a country would inhibit banks' lending as banks run out of liquidity and therefore lending rate would be high. However, excessive bank lending to unproductive and speculative sectors due to a lower rate of interest would lead to unnecessary increase in money supply and hence inflation. This would necessitate the government and the monetary authority of the country to put in place measures to control the rate of inflation to a desirable level. The changes in money supply have direct impact on prices and economic activities and that the relationship between money supply and inflation is much predictable in the long-run than in the short-run. The study suggests that more economic activities act as stimulators of banks' lending. When more economic activities are in place in an economy then the likelihood of banks to lend to such economic activities is increased. The study thus advises policy makers to put in place conducive environment which could attract more business opportunities to which banks could extend credit.

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1. Background to the Study

Since 1980, Tanzania has undergone a rapidly developing finance sector after embarking on a number of financial sector transformation programmes. These financial sector programme reforms include the 1980 to 1985 epoch when the phase coincided with the end phase of Socialism (Ujamaa). During that period, the main policy agenda was the state controlling the economy and state ownership of all major enterprises. Macroeconomic characteristics such as prices and exchange rates were not based on market economy; devaluation and expansionary fiscal policies were the order of the day. The economy was further characterized by e unfavourable terms of trade (Robinson, Gaerner and Papageorgiou, 2011). The second financial sector liberalization in Tanzania took place in 1986 to 1995. That period was characterized by economic liberalization as well as partial reforms. Liberalization policies concentrated mainly on exchange rates, trade, domestic prices, financial system reforms and parastatal and civil services reforms. All these reforms were directed towards moving the economy to a market-oriented economy where there would be little government interferences whenever necessary. In financial sector reforms during that period, the country witnessed notable changes specifically the adoption of the market-driven monetary policy, adoption of monetary target regime, banking sector liberalization and establishment of government securities (T-bills and T-bonds) in the 1990s (Twinoburyo and Othiambo, 2018). All these reforms witnessed the dominance of public monopolies, insolvency of major state-owned banks and weakness of budgetary management, fiscal deficits, elusive macroeconomic stability and low economic growth (Robinson, Gaerner and Papageorgiou, 2011).

The financial sector in Tanzania went into another reform from 1996 to 2017, whereby during this epoch the reforms were mainly concentrated on market-driven macroeconomic and structural reforms. The government emphasized on such policies like privitazation and reform of parastatatls, finanancial sector liberalization, a market-led regulation framework, trade reforms, regional interagtation and fiscal consolidation to mention but a few. Accordingly, the country, witnessed higher economic growth, a declining inflation rate, strong export growth, increase in international reserves and creation of economic

productive sectors Marobhe (2019). Particularly, "in 2021 the Tanzania banking sector recorded a robust perfomance with operating income increasing by 58.8% to TZS 1.1 trillion, the strongest in decades" (EY Tanzania, 2021). The banking sector assets value increased by 14.6%, the highest record since 2015. Moreover, cutomer deposits increased by 17.1% to TZS 27.5 trillion. The reasons which explain the increase of total customer deposits are associated with deposit mobilization strategies carried out by individual commercial banks in the country as well as growth of agency banking businesses all over the country (EY Tanzania, 2021). Banking sector loan advances in Tanzania as well as overdafts grew by 13.0% from TZS 18.4 trillion in December 2020 to TZS 20.8% trillion in 2021. However, the country's banking sector continues to be dominated by two large banks. These banks continue to implemet their dominance of market shares strategies in terms of loans they advance, customer deposissts, leadership style and strategies and widening total assets ownership

Despite all the evidence pieces about the good perfomance of the financial sector in Tanzania and its effects and expected outcome into the country's economy, the study on which this article is intended to empirically investigate the impact of the coutry's macroeconomics variables' perfomance on general lending behaviour of commecial banks in Tanzania. The sections in this article are organized as follows. Section 2 discusses the literature reviewed; Section 3 presents the methodology and modelling approached used in the study; Section 4 presents results and discussion while Section 5 ends the paper with conclusions.

2. Literature Review

2.1 Theoretical Literature

2.1.1 A Multi Bank System Theory (Post Keynesian Approach)

The Multi-bank System theory is a theory which posits that the individual bank decision of giving loans and hence creating credit expansion does not depend on its own management decision but rather also on competitors output (Dymski, Júnior and Paula, 2008). The theory suggests that banks decide their strategic moves of deciding to expand credit by responding to their rivals' moves and decisions. However, the multi-bank theory opposes what has been put forward by Keynesian Economists and suggests that "bankers would rather hang together than hang separately" (Wallace and Karmel, 1962). To be more specific, banks make their credit expansion decisions while considering average behaviour of other banks (Kregel, 1997). The multi-Bank System approach, however, came to be criticized later on, on the basis that it is a bad option to imitate the average lending behaviour of other banks. In line with credit creation, it is suggested that

banks try to protect themselves against liquidity and credit risks and hence they must choose the best strategy but not to imitate others or not to follow a leading bank (Dymski, Júnior and Paula, 2008). Banks are basically linked with the behaviour of being aggressive or conservative in relation to the direction of rivals' banks. Aggressive banks are likely to extend credit while conservative banks are more likely to limit lending in strategic interaction. Such an opposing move amongst banks is known as competing in strategic substitutes and corresponding to a negative competitive strategic measure (CSM).

2.1.2 Credit Creation of Banking Theory

The banking credit creation theory tries to propose that commercial banks can create money but not lend out all deposits that have been provided to the bank by customers. Normally, commercial banks create series of bank deposits as a consequence of bank lending. This is to say that the amount of money that a bank can create is not constrained by their deposit taking activities but, however, by the act of lending which creates new purchasing power which did not previously exist (Mcleay, Radia and Thomas, 2014). The credit creation theory of banking posits that capital adequacy and reserve requirements are no longer main regulators for bank lending decisions as banks can individually create capital out of thin air hence rendering redundancy of capital adequacy to be a regulating factor (Werner, 2016). Since capital adequacy and reserve requirements are no longer the lending behaviours regulators, it does not mean that banks do not face lending constraints. There will be constrains such as demand for loans, banks regulations (Botos, 2016), bank's desire to make profits and strategic interplay between banks and non-banks (Bundesbank, 2017). The credit creation theory of banking suggests that one has to pay more attention to factors related to willingness of the bank to create credit while also considering interaction between players' strategic interaction between players in the banking industry.

2.1.3 Bank Lending Channel Theory

According to the bank lending channel theory, banks' credit supply is determined by the interplay of monetary policy. Specifically, the expansionary monetary policy will usually stimulate the availability of loans while, in contrary, the contractionary monetary policy will involve decreasing in banks' loans and also hinder borrowers from accessing loanable funds from the bank (Sanfilippo-Azofra, Torre-Olmo, Cantero-Saiz, and Lopez-Gutierrez, 2018). Banks' lending channel in developing countries is quite significant as most developing countries depend on bank financing, and bank lending to a large extent is a function of availability of deposits. When there are such policies which induce high lending

interest rates then bank's lending decreases. However, the more liquid banks are, the more they are likely to insulate their credit supply from monetary policy shocks (Vo and Nguyen, 2014; Altunbas , Gambacorta and Marqu es-Ibanez, 2009b; Kashyap and Stein, 2000; Matousek and Sarantis, 2009; Sanfilipo-Azofra, Torre-Olmo, Cantero-Saiz and Lopez-Gutierrez, 2018).

2.2 Empirical Literature

A study by Ewert, Schenk and Szczesny (2000) tried to analyse what determines banks' lending and performance in Germany for the period of 1992-1998. They used a dataset from credit files of six leading banks in Germany. Results they found were that ratings act as an important factor in the bank's lending policy. According to the study, rating reflects higher risks leading to higher rate premiums, and therefore they concluded that collateralization is less clear and does not fully support the role of collateral in credit contracts.

Another study was carried out in 1991-1995 by Sapienza (2004) who analysed the behaviour of privately owned commercial banks and state-owned banks as regards lending behaviour. The study covered a total of eighty-five banks whereby forty banks were privately owned and forty-three banks were state-owned. In addition, two banks were privatized at the time of conducting the particular study. The study found that the banks under state ownership were charging lower interest rates which were more or less similar or identical to privately owned banks. In addition, the study found that state-owned banks mostly favoured large firms and those located in depressed areas. Furthermore, the lending behaviour of state-owned banks was said to be affected by political decisions and election results of the party more likely to be associated with the bank to the extent that the stronger the political party in an area of the borrowing firm, the lower were the interest rates charged. Moreover, the study found that public banks' lending to some developing countries is likely to be less pro-cyclical than banks located in developed countries. This would mean that, at times of business cycles and economic fluctuations, lending in developing countries has very different responses with respect to monetary policy operations.

Olokoyo (2011) conducted a study of what determines lending behaviour of commercial banks in Nigeria. In doing so, the applied model made use of a number of Nigeria's commercial banks together with some determinants such as deposits, portfolio investments, interest rate on lending, stipulated cash reserve requirement ratio and banks liquidity ratio. Results showed a functional relationship between the commercial bank's lending behaviour in Nigeria and

specified independent variables. The study's conclusion was that commercial banks in Nigeria should focus on mobilizing deposits as they would enhance banks' lending performance. Moreover, banks should formulate critical, comprehensive and realistic financial plans. Djiogap and Ngomsi (2012) conducted another study which aimed at unveiling the factors which determine banks' long-term loans. The study made use of 35 sampled commercial banks in six countries from Africa covering the period 2001-2010, and it was found that the ability of a bank to extend credit depends on its size, market capitalization, GDP growth rate and long-term liability. Furthermore, a multivariate study of cross-country differences in commercial banks' lending decisions was conducted, and the results suggested that smaller banks which are not much capitalized, with low levels of long-term funding sources and with higher non-performing loans which operate on recession economies, are more likely to averse lending long term.

A study by Imran and Nishat (2012) using time series data investigated the determinants of the bank credit in Pakistan from 1971 to 2010 and found that bank credit was significantly impacted by a number of factors such as foreign liabilities, economic growth, monetary conditions, domestic deposits, and economic growth. However, the study found that inflation and money market had no significant impact on private credit and concluded that the lending behaviour varied with respect to the dynamics and the institutional set up of the country. Aikael, Mugizi and Ndanshau (2011) performed a study by using macroeconomics quarterly data and performed a co-integration and error correction model to establish a relative importance of macroeconomic and regulatory factors in explaining persistence of interest rate spread in Tanzania and found that interest rate spread in Tanzania was strongly influenced by a number of factors such as net government borrowing from commercial banks, development of the banking sector, the statutory minimum reserve requirement and the discount rate.

On the other hand, Matemilola, Bany-Ariffin and Muhtar (2015) conducted a time series study by using a method of momentum threshold autoregressive as well as an asymmetric error correction model. They found that the rate at which banks lent tended to adjust in line with a decrease in South African money market rate. On the other hand, it was found that most commercial banks in South Africa normally adjusted lending rates downward, but that the lending rate appeared to be rigid upward, a phenomenon which supports the customer reaction proposition. Manamba (2014) conducted a study focused on co-integration

technique analysis by using macro-level quarterly data covering the period of 1986-2012 and found that the spread of interest rates was significantly determined by lack of stiff competition amongst financial institutions as well as other factors such as existence of diseconomies of scale in the overall financial system and that as the proportion of liquid assets increases the bank liquidity risk decreases, which would result into a lower interest rate spread.

GDP growth is regarded as an important driver of the demand-effect on bank's lending behaviour, and it favours credit expansion (Yang and Shao, 2016; Khatat and Shabsigh, 2016). Evidence shows that, during economic booms, credit demand expands, and this expansion induces commercial banks to expand the amount of cash in form of loans. Conversely, when the economy performs poorly there will always be lower credit demand, and hence the possibility of non-performing loans will always be high, which will constrain credit availability (Jimborean, 2009; Vazakidis and Adamopoulos, 2009; Sanfilippo-Azofra et al., 2018; Vo, 2018; Al-Kilani and Kaddumi, 2015; Khan et al., 2016). On the other hand, the impact of macroeconomic conditions on bank lending behaviour will be omitted by the nature of strategic interaction amongst commercial banks. It is evidenced that, in response to, some banks would accommodate such an aggressive move in lending by "staying put" and hence become more conservative. The motivation of being more conservative reveals how strategic substitutes will attenuate the positive impact of economic growth on bank lending.

This particular study differs from other studies in the sense that it does not incorporate individual bank-level information. However, the study considers factors such as inflation rate, overall lending rate, savings rate, growth rate of Gross Domestic Product and M3 broader measures of money supply. Moreover, this study extends data to 2021, making it relevant in capturing the determinants of overall lending in Tanzania.

3. Methodology and Modelling

3.1 Data and Variables

Data to conduct this study came from the Bank of Tanzania and World Bank Indicators databank and indexes covering the country of Tanzania. The analysis used time series data covering 52 years (1970-2021). Overall, bank lending is the dependent variable, measured by the overall lending rate. The study employed other variables considered to be independent variables, namely M3 money supply, deposit rate of interest, growth rate of GDP and inflation.

3.2 Model Specification

For modelling the effects of macroeconomic variables on banks' lending in Tanzania, the following equation was specified

$$y_t = \mu + \sum_{k=1}^{p} \rho_k y_{t-k} + \sum_{j=0}^{q} \beta_j X_{t-j} + \varepsilon_t$$

Where μ is a set of possible drift, ρ and β are the coefficients, ε_t is the white noise error term and $X's$ are a set of explanatory variables. The study employed the Autoregressive Distributed Lag Model (ARDL) which was proposed by Pesaran et al. (2001). The Autoregressive Distributed Lag Model (ARDL) is based on the Ordinary Least Squares (OLS) estimation technique. The ARDL model is most appropriate for a mixed order of integration [I (0) and or I (1)] (Shrestha and Bhatta, 2018). The ARDL model has a number of advantages, especially when one deals with time series data including the fact that the ARDL model does not impose restrictive assumptions or some order of integration and is suitable for studies involving small samples as well as it produces unbiased estimates of the long run estimates and valid t-statistics regardless of the problem of endogeneity in the time series (Appiah 2018).

3.3 Variables Description

Table 1: Variable Description

Variable	Description of Variable	Type of Variable	Notation
Lending Rate	Indicates access indicates banks overall lending rate	Continuous, Dependent Variable	Lend_rate
Savings Rate	Indicates the interest rate on saving deposits	Continuous, Independent Variable	Saving_rate
Inflation	Indicates the rate of inflation	Contiguous, Independent variable	infl
GDP	Indicates rate of growth of gdp	Continuous, independent Variable	gdp
M3 Money Supply Growth Rate	Indicates the growth rate of broader measure of money supply	Continuous, Independent variable	m3

4. Results and Discussion

4.1 Descriptive Statistics Analysis

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
year	52	1995.5	15.155	1970	2021
infl	52	15.369	11.125	2.4	36.1
lend rate	52	16.575	7.488	7.5	36
saving rate	52	7.503	3.775	1.95	17.12
gdp	52	4.404	2.353	-2.4	7.7
m3	52	21.304	12.356	-9.6	54.9

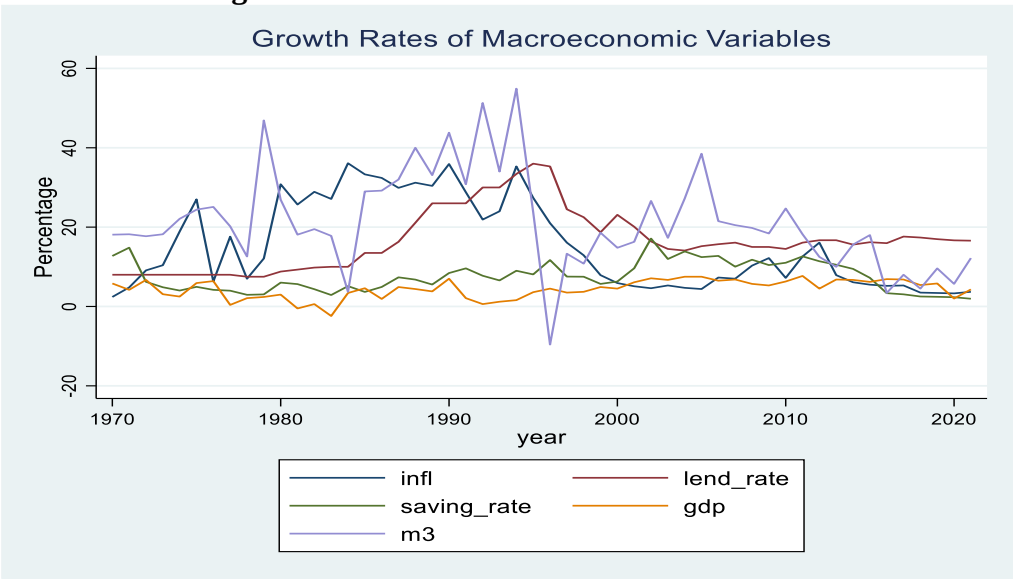
A summary of descriptive statistics has been provided in Table 2. The variables of interest span from the period 1970 to 2021, involving 52 observations for all the variables. Inflation rate ranged from a minimum of 2.4 % to 36.1% with a relatively high deviation from the mean of 11.12% and a mean value of 15.36%. The lending rate had a minimum value of 7.6%, a maximum value of 36% with a mean of 16.57% and a deviation from the mean of 7.48%. On the other hand, savings rate had a minimum value of 1.95% and a maximum value of 17.12%, with a mean value of 7.5 and a deviation from the mean of 3.77. The M3 money supply growth rate had a minimum value of minus 9.6% and a maximum value of 54.9%. In contrast, the GDP growth rate was observed to have a minimum dispersion from the mean of 2.35; moreso, it has been found to have a range of minus 2.4% to 7.7% with a mean value of 4.40.

4.2 Behaviour of Macroeconomic Variables

Trend of macroeconomic variables have been shown in Figure 1 where they portray a relatively narrow fluctuations prior to the year 1990 and after 1995. However, the trend of these variables shows that between the year 1990 and 1995, macroeconomic variables namely inflation, saving rate, lending rate, gross domestic product and M3 money supply were seen to have wider fluctuations with the growth rate of money supply, i.e. M3 portraying a much wider fluctuation, compared to any other macroeconomic variable. Many reasons could, however, be linked to the fluctuation of M3 money supply growth rates in Tanzania in the early 1990s. It is easy to remember that, beginning 1991, financial sector reforms began to be implemented, and hence the Bank of Tanzania started conducting monetary policy in a liberalized market economy, and the financial market was first introduced in the country. This seemed to bring shock to the

monetary component of the country before it later on stabilized in subsequent years.

Figure 1: Trend of macroeconomic variables



4.3 Optimal Lags Selection – AIC

Before conducting our estimation, we subjected the variables to the optimal lag selection by using the Akaike Information Criteria (AIC). Wooldridge (2015) suggests that, with annual data, the number of lags is typically small, 1 or 2 lags. These lags are said to be appropriate in order not to lose degrees of freedom. The maximum number of lags for our data was, therefore, decided. The study did not include too many numbers of lags so as to avoid consuming the degrees of freedom and reducing the degree of multicollinearity to impact our study which would result to less precision of our estimates by inflating the standard errors in relation to estimated coefficients. In the same vein, we avoided including too few lags and hence avoided the specification error which could otherwise happen; hence the variable lag length was selected by the AIC criterion which gives the lowest value as shown in Table 3.

Table 3: Optimal Lag Selection With AIC

Sample: 1974 through 2021
Number of obs = 48

Variable	lag	LL	LR	do	p	FPE	AIC
	0	-163.37				55.1945	6.84873
	1	-110.507	105.73*	1	0.000	6.35954	4.68779
Lend_rate	2	-108.765	3.4835	1	0.062	6.16671*	4.65688*
	3	-108.304	0.92299	1	0.337	6.30806	4.67932
	4	-107.793	1.021	1	0.312	6.44042	4.69971
	0	-183.758				129.071	7.69824
	1	-154.743	58.029*	1	0.000	40.171	6.53097
infl	2	-153.594	2.2995	1	0.129	39.9257*	6.52473*
	3	-153.475	0.23758	1	0.626	41.4282	6.56145
	4	-153.334	0.28207	1	0.595	42.9537	6.59724
	0	-109.854				5.93596	4.6189
	1	-99.0646	21.578*	1	0.000	3.94795*	4.21103*
gdp	2	-98.3931	1.3429	1	0.247	4.00282	4.22471
	3	-97.1136	2.5591	1	0.11	3.95736	4.21307
	4	-97.079	0.06915	1	0.793	4.12132	4.25329
	0	-190.101				168.117	7.96253
	1	-183.891	12.42*	1	0.000	135.316*	7.74544*
m3	2	-183.107	1.5676	1	0.211	136.556	7.75445
	3	-183.027	0.15925	1	0.69	141.926	7.7928
	4	-182.893	0.26814	1	0.605	147.195	7.82888
	0	-130.102				13.8004	5.46257
	1	-103.513	53.176*	1	0.000	4.75198*	4.39639*
saving_rate	2	-103.051	0.92485	1	0.336	4.86017	4.41879
	3	-102.7	0.70122	1	0.402	4.99459	4.44585
	4	-102.513	0.37441	1	0.541	5.16856	4.47971

4.4 Stationarity Test with Optimal Lags

Data analysis related to the model began with a unit root test of the variables used in the model to determine the stationarity of the variables. We employed a number of lags to determine the order of integration, a condition suitable to estimate an Autoregressive Distributed Lag Model. The unit root test using the Augmented Dickey Fuller test was conducted, and the results are presented in Table 4. We began testing for unit root in all the series while utilizing the optimal lags as given by the Akaike Information Criterion. The null hypothesis was specified such that the series of the variables used in the model had a unit root against the alternative hypothesis which posited that the series of variables are stationary. However, we failed to reject the null hypothesis in all the variables, except for m3 (money supply growth) variable where we reject the null hypothesis at the 10% level of significance.

Table 4: Unit Root Test with Optimal Lags

			Dickey-Fuller critical value		
Variable	***Number of lags***	***Test statistics***	***1%***	***5%***	***10%***
lend_rate z(t)	*2*	*-1.86*	*-3.587*	*-2.933*	*-2.601*
infl z(t)	*2*	*-1.28*	*-3.587*	*-2.933*	*-2.601*
gdp z(t)	*1*	*-2.561*	*-3.58*	*-2.93*	*-2.600*
m3 z(t)	*1*	*-2.825*	*-3.58*	*-2.93*	*-2.600*
saving_rate z(t)	*1*	*-2.342*	*-3.58*	*-2.930*	*-2.600*

4.5 First difference Optimal Lags Determination – AIC

We conducted first difference optimal lag selection by employing the Akaike Information Criterion for the variables which were not stationary at level. Again, at this level it is advised that when dealing with annual data, it is preferable to employ a small number of lags, typically 1 or 2, to prevent the loss of degrees of freedom. As a result, when analysing our data at first difference, the maximum number of lags was chosen in accordance with this principle as it can be seen in Table 5. The optimal lag selection criteria with first differenced variables were conducted in such a manner that the degrees of freedom were not compromised, and the issue of multicollinearity would not emerge and bias the coefficient estimates. The study did not include too many lags so as to avoid consuming the degrees of freedom and reducing the degree of multicollinearity to impact our study which would result to less precision of our estimates by inflating the standard errors in relation to estimated coefficients. In the same vein, we avoided including too few lags and hence avoided the specification error which could otherwise happen; hence the variable lag length was selected by the AIC criterion which gave the lowest value as shown in Table 3. The differenced variables seem to have the optimal lag length of 1 with the exception of the variable GDP of which the first difference had that optimal lag of 2.

Table 5: First Difference Optimal Lag Selection with AIC

Sample: 1975 through 2021
Number of obs = 47

Variable	lag	LL	LR	df	p	FPE	AIC
	0	-109.813				6.53762	4.71544
	1	-108.533	2.5605	1	0.110	6.46042*	4.70352*
d.Lend_rate	2	-108.356	0.35267	1	0.553	6.69168	4.73857
	3	-107.467	1.7784	1	0.182	6.72491	4.74328
	4	-105.693	3.5484	1	0.060	6.50955	4.71034

	0	-152.813				40.7455	6.54522
	1	-150.708	4.2092*	1	0.040	38.8763*	6.49821*
d.infl	2	-150.218	0.98041	1	0.322	39.7338	6.51991
	3	-150.213	0.00993	1	0.921	41.4622	6.56225
	4	-149.919	0.58848	1	0.443	42.7432	6.59228
	0	-102.738				4.83799	4.41437
	1	-99.548	6.3793	1	0.012	4.40776	4.32119
d.gdp	2	-97.0848	4.9265*	1	0.026	4.14218*	4.25893*
	3	-97.0249	0.11965	1	0.729	4.31229	4.29893
	4	-96.8179	0.41414	1	0.52	4.46204	4.33267
	0	-103.616				5.02224	4.45175
	1	-102.417	2.3977	1	0.122	4.98014*	4.44328*
d.saving_rate	2	-102.414	0.00644	1	0.936	5.19656	4.4857
	3	-101.812	1.2044	1	0.272	5.28654	4.50263
	4	-101.651	0.32158	1	0.571	5.48091	4.53834

4.6 First Difference Unit Root Test with Optimal Lags

As it was observed in section 4.4 that only one variable i.e. m3 seem to be stationary at 10% level of significance while other variables used in the model had a unit root. Sometimes de-trending a series of a variable is not sufficient to make it stationary, in which case it is necessary to transform it into a series of period-to-period and or season-to-season differences. This is to say that the statistics of the changes in the series between periods or between seasons will be constant, and such a series is termed as a difference-stationary. The Unit root tests were applied to investigate or detect non-stationarity in all the variables which in turn led to spurious estimates. In this test, for variables which were found to be non-stationary, first differencing was applied until the bias was eliminated. One should be able to note that presence of a unit root leads to spurious regression and hence non-sensical regression results. The null hypothesis in this case was that a series of a time series variable has a unit root or it is non-stationary. The results in Table 6 led to rejection of the null hypothesis that the variables had a unit root for all the variables subjected to the Augmented Dickey Fuller Test.

Table 6: First Difference Unit Root Test with Optimal Lags

			Dickey-Fuller critical value		
Variable	**Number of lags**	**Test statistics**	**1%**	**5%**	**10%**
D.lend_rate z(t)	1	-3.856	-3.587	-2.933	-2.601
D.infl z(t)	1	-6.091	-3.587	-2.933	-2.601
D.gdp z(t)	2	-5.211	-3.594	-2.936	-2.602
saving_rate z(t)	1	-5.466	-3.587	-2.933	-2.601

4.7 Serial Correlation Test

In the course of conducting this study, we were worried about the problem of serial correlation as the variables used were the time series in nature. Basically, when a variable and its lagged version of itself as a variable in time T and the same variable in time $T-1$ are observed to be correlated over periods of time, this would lead to bias in the variance of estimated coefficients, leading to unreliable hypothesis testing. However, with the problem of serial correlation, the $t-statistics$ would actually appear to be more significant than they really are. The serial correlation test was therefore conducted using the Breusch-Godfrey test while specifying the null hypothesis that there is no serial correlation. The serial correlation results are presented in Table 7 whereby we failed to reject the null hypothesis that there is no serial correlation.

Table 7: Breusch–Godfrey LM Test for Autocorrelation

lags(p)	chi2	df	Prob > chi2
1	2.586	1	0.1078

H_0: No serial correlation

4.8 Heteroscedasticity Test

Again, we noted that the problem of heteroscedasticity, though not common, could appear with time series data when the variance of a time series data changes over time. We, therefore, decided to conduct a test for heteroscedasticity by applying the Breusch-Pagan test. The null hypothesis was categorically specified as the error variances are all equal and, therefore, they are homoscedastic. The Results regarding heteroscedasticity are presented in Table 8 whereby we failed to reject the null hypothesis that the error variances are all equal at the 5% level of significance.

Table 8: Breusch–Pagan/Cook–Weisberg Test for Heteroskedasticity

H0: Constant variance
chi2(1) = 2.99
Prob > chi2 = 0.0839

4.9 Auto Regression Distributive Lag Model Estimation and Discussion of Results

The estimation of effects of macroeconomic variables on banks' lending in Tanzania was conducted with the help of Auto Regression Distributive Lag Model (ARDL). The model in this study was considered to be the best as the variables were stationary at I (0) or integrated of order I (1). Moreover, the model

was able to capture both short-run and long-run effects of macroeconomic variables on banks' lending in Tanzania. The results of the ARDL model are presented in Table 9. The long-run results of the ARDL model provide a positive relationship between banks' lending and inflation, banks' lending and GDP and banks' lending and $m3$ money supply while savings rate had a negative relationship with banks' lending. However, none of the variables had a significant impact. The Short-Run ADRL model results show that banks' lending had a positive relationship with savings rate while inflation, GDP and m3 money supply had a negative relationship. However, m3 money supply seemed to have a significant impact in affecting banks' lending rate in Tanzania. A unit increase in money supply would cause commercial banks' lending rate to drop by 9.4% in the short-run and hence increase banks' lending. The error-correction term which measures the speed of adjustment was negative and statistically significant at 5% level of significance. The ARDL bound test as presented in Table 10 shows whether the long-run relationship exists between the variables in our time series model. Basically, the bound test assesses whether there exists co-integration between variables in the model. The null hypothesis was such that there is co-integration relationship between variables. Since the critical F test was greater than the calculated F test at the 5% level of significance, then we failed to reject the null hypothesis that the variables are co-integrated in the long-run.

Table 9: Auto Regression Distributive Lag Model Estimation

Sample: 1971 through 2021				Number of obs = 51		
Log likelihood = -103.18619				R-squared = 0.4202 Adj R-squared = 0.2930 Root MSE = 2.0410		
D.lend_rate	**Coefficient**	**Std. err.**	**t**	**P>|t|**	**[95% conf.**	**interval]**
ADJ						
Lend_rate						
L1.	-.084022	.0428824	-1.96	0.057	-.1706248	.0025808
		LR				
infl	.4350596	.5071669	0.86	0.396	-.5891847	1.459304
saving_rate	-2.502789	2.029689	-1.23	0.225	-6.601828	1.596251
gdp	3.512632	3.045808	1.15	0.255	-2.638503	9.663766
m3	1.538431	.8934589	1.72	0.093	-.2659464	3.342807
		SR				
infl		.0516101	-0.53	0.601	-.1313928	.0770646
D1.	-.0271641					
saving_rate	.0752191	.1314104	0.57	0.570	-.1901696	.3406077

D1. gdp	-.0956454	.1717288	-0.56	0.581	-.4424588	.251168
D1. m3	-.0944588	.0303382	-3.11	0.003	-.1557281	-.0331895
D1. _cons	-1.504448	1.343504	-1.12	0.269	-4.217708	1.208813

The short-run results obtained in our regression that when money supply particularly $m3$ component increases, commercial banks' lending rate decreases and hence leading to an increase in banks' lending is consistent with the findings obtained by monetarists. Friedman (1968) explained the role of Monetary Policy in affecting banks' lending and argued that an increase in money supply leads to a decrease in the lending interest rate in the short-run which in turn results in an increase in banks' lending or credit. One can be able to conceptualize that the interest rate acts as the main channel through which lending is affected and at the same time acts as the cost of borrowing. However, excessive bank lending to unproductive and speculative sectors due to a lower rate of interest would lead to unnecessary increase in money supply and hence inflation. This would necessitate the government and the monetary authority of the country to put in place measures to control the rate of inflation to a desirable level. According to monetarists, the changes in money supply have direct impact on prices and economic activities and the relationship between money supply and inflation is much predictable in the long-run than the short-run. The effectiveness of monetary policy transmission on lending depends on whether the policy per se is expansionary or contractionary (Friedman and Schwartz 1963).

Ozekhome (2018) argue further that an increase in money supply or in other words lowering of the monetary policy rate would represent an easing in Monetary Policy engender, a regime of increase of bank's deposits and the volume of money that banks will have to provide as credit contrary to restrictive Monetary Policy. Furthermore, our findings that an increase in money supply leads to reduction in banks' lending rate and hence an increase in banks credit is supported by the Keynesians who argue that a change in monetary supply will impact activities in the financial markets, interest rate, credit, investment, output, and prices. Monetary Policy transmission mechanism affects banks' willingness to lend (Modigliani 1963). Basically, when there is credit squeeze in the country spearheaded by a contractionary monetary policy, credit rationing would automatically happen (Berger and Udell, 1992; Borio, 1995).

Keeton (1979), Stiglitz and Weiss (1981) proposed an additional channel of Monetary Policy which consists mainly of agency problem, asymmetric information and exorbitant contact enforcement in the financial sector. Their main argument which is consistent with our core findings is such that credit channel operates via banks' lending and balance sheet channel (Mishkin, 1995). As regards banks' lending, a decrease in money supply would result in a decrease in bank deposits which would decrease the volume of money banks are willing to loan out. One will note that the bank lending channel operates which disallowing lending rate of interest to enter into operation, implying that interest rate may sometimes not be a sufficient consideration for stimulating investment in an economy.

Table 10: ARDL Bound Test

H_0: No level relationship	F = 5.560
Case 3	t = -1.959

Finite sample (4 variables, 51 observations, 4 short-run coefficients)
Kripfganz and Schneider (2020) critical values and approximate p-values

	10%		**5%**		**1%**		**p-value**	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F	2.576	3.783	3.095	4.442	4.297	5.948	0.002	0.015
t	-2.533	-3.639	-2.872	-4.028	-3.554	-4.799	0.263	0.640

5. Conclusions and Policy Implications

5.1 Conclusions

This paper aimed at examining the effect of macroeconomic variables on banks' lending behaviour in Tanzania using macroeconomic data from 1970 to 2021. The empirical results show a significant short-run negative impact of M3 Money Supply and overall lending rate in Tanzania which ultimately impact positively on commercial banks' credit lending behaviour. However, excessive bank lending to unproductive and speculative sectors due to a lower rate of interest would lead to unnecessary increase in money supply and hence inflation. This would necessitate the government and the monetary authority of the country to put in place measures to control the rate of inflation to a desirable level. The changes in money supply have direct impact on prices and economic activities, and the relationship between money supply and inflation is much predictable in the long-run than in the short-run. The limitation of this study could be linked to

the use of time series data where time series rely on historical data which are prone to the problem of not being able to make generalization. This is so because time series data are only based on a specific time period, and this might lead to failure to make generalization to other contexts of time periods. Lastly, the study was not able to account for exogenous shocks in the sense that time series studies are based on models that assume stable relationship (stationarity) between variables over time. However, the study suggests future studies to be conducted based on panel data estimation techniques so as to be able to capture individual banks' lending time invariant characteristics and dynamic analysis which this particular time series study was not able to account for.

5.2 Policy Implications

Several important policies implication can be inferred based on the above findings. First of all, there is high evidence that an increase in money supply would lead to a decrease in interest rate. This would ultimately lead to an increase in banks' lending. Banks' lending is expected to increase because banks would become more liquid and hence stimulate banks' lending. By implication, a contractionary monetary policy in a country would inhibit banks' lending as banks run out of liquidity and therefore lending rate would be high. However, there are other several factors that could influence banks' lending behaviour in response to an increase in money supply. One of the factors is the state of the economy whereby even if money supply increases, if the economy is in recession or experiences low demand for credit, then banks may become hesitant to lend out money.

Secondly, bank lending rate is a major determinant of investment as it stimulates borrowing from banks. Lending rate represents the cost of borrowing funds mainly for investment purposes. When lending rates are so high, then it becomes expensive for individuals, firms, and governments to borrow money from banks. This will discourage investments in an economy. On the other hand, when lending rates are said to be low, then it becomes even cheaper for individuals, firms and government to access loans from banks. However, the relationship between interest rate on lending and investment does not always hold. There are other factors such as availability of credit itself and perceived riskiness of investment opportunities which might play a significant role.

Lastly, it is worth to infer that whenever there are more economic activities, then the activities act as important stimulators for banks' lending. This is the same as saying that the more economic activities are in place in an economy the higher

the likelihood of banks' lending to such economic activities. The study, thus, advises to the policy makers to put in place such conducive environment which could attract more business opportunities to which banks could extend credit.

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