International Journal of Scientific Research and Management (IJSRM)
||Volume||12||Issue||03||Pages||6220-6237||2024||
Website: https://ijsrm.net ISSN (e): 2321-3418
DOI: 10.18535/ijsrm/v12i03.em22

How Do Commercial and Non-commercial Banks Adjust Capitalization Ratio: Evidence from Tanzania

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Abstract
This study examines the dynamic balanced panel data to explore the level of capitalization adjustment process for commercial and non-commercial banks in Tanzania for a period of 10 years from 2012 to 2021 in a two-step system GMM estimator. The findings of the research reveal that the cost of adjustment towards the required bank capitalization ratio is lower for commercial and non-commercial banks operating in Tanzania. The results are significant to the instantaneous adjustment process of a capitalization ratio measured in terms of the ratio of bank total equity to total assets. This finding is consistent with the dynamic trade-off theory of capitalization ratio using the coefficient value of the lagged response variable. The result reveals further that return on assets reduces the cost of the target bank capitalization ratio which means it eliminates the financial distress because return on assets is easier to be valued by investors. Therefore, it can be used as an indicator of the good performance of banks that can increase the easy availability of external capital from prospective and existing investors. The negative and significant sign of the bank size coefficient (-0.710) implies that the sample of banks in this study in terms of equity to assets ratio causes the capitalization ratio to deviate from the target level. This is consistent with the too-big to fail hypothesis. Abdulhamid et al. (2019) hold that an inverse association between bank size and capitalization ratio would happen because large banks have comparative advantages in non-traditional banking activities (interest) since they can operate with a fixed cost. The findings of this study have significant policy implications for economic and financial sector growth.

Key terms: Tanzania, Target bank capitalization ratio, Dynamic trade off theory, Too-big to fail hypothesis

1.0 Background of The Study

Following the financial crisis facing the world in 2007-2009, financial system and banks regulators suggest significant improvement to the policy and regulation for ensuring stability of the financial institution particularly banks by reforming the current required capitalization ratio and its criteria (Bakkar et al., 2019). The regulators increase the regulation stringent to ensure banks maintain at all time enough capitalization ratio to minimize the risk of closing their operation due to capital deterioration. Over the past few years, literatures have been putting emphasize on the investigating various aspects related to bank capitalization ratio. These literatures including Abdulhamid et al. (2019); Philip et al. (2014); Abbas et al. (2021); Abbas & Masood (2020); Huang & Ritter (2009); Jokipii & Milne (2008); Wang & Luo (2019).

The purpose of this study is to fill up the gaps associated with the previous literatures of the bank capitalization ratio and increasing the scope of the previous literatures. This study addresses some important issues such as variation of the rate in which banks adjust capitalization ratio and the speed of change of the total capitalization ratio after the crisis. The important reason for considering the pace of adjustment is

following the recent reform in Basel III accord concerning the requirement for bank to operate with higher capitalization ratio for the elasticity of the financial sector to meet unanticipated economic shocks. This study use the capitalization ratio measured as total equity to total asset (at book value) as used in the literatures of Poghosyan & Čihak (2011); Abbas et al. (2021); Philip et al. (2014) and Cho et al. (2014). The adjustment process measurement considering in this study is similar to prior literatures of Memmel & Raupach (2010); Philip et al. (2014); Mohanty and Mahakud (2019); DeJonghe & Oztekin's (2015); Bakkar et al. (2019); Abbas et al. (2021).

The study employed a standard method for partial adjustment model to estimate the speed of adjustment as adopted in the study of Abbas & Masood (2020) in USA and Philip et al. (2014) in China. This model consider that every bank has particular need and required capitalization ratio. Though, it is difficult to maintain the needed ratio in whole number, therefore, the ratio are maintained in fraction among various banks because of the cost incurred to raise capital for increasing bank capitalization ratio. Hence, actual and target capitalization ratio varies across banks (Bakkar et al., 2019; Philip et al., 2014). According to De Jonghe & Oztekin's (2015) the actual and book value based capitalization ratio are taken as the average of a lagged value of respective capitalization ratios. Since we employed annual published financial statements data of commercial and non-commercial banks for performing the analysis and estimation of this study, there is greater possibility of manipulating different factors to obtain desired results that is not against the regulatory requirement. Because of this reason, the analysis performed results into average pace of adjustment on yearly bases. To examine the differences in the value of rate of adjustment in capitalization ratio we adopt the method of De Jonghe & Oztekin's (2015); Bakkar et al. (2019) and Abbas et al. (2021).

This study contribute in different ways to the existing similar literature. Firstly, the analysis is based on the developing country with which according to our knowledge no investigation was made on the speed of adjustment process towards target bank capitalization ratio. Secondly, the study investigation focused on the commercial and non-commercial banks, large and small banks. Thirdly, the study is unique because it concentrate on single metric (book value of total equity to total assets) used in determining the influence of the adjustment of capitalization ratio and provide details examination of specific banks and non-banks factors and excludes institutional features. The significance contribution of the study is, it focused in making a comparison of the pace of adjustment for state owned banks and private banks, domestic and foreign banks.

The next sections is structured in the four parts. This includes the study hypothesis and empirical literatures review that relates to the adjustment speed towards bank capitalization ratio following by another section that comprise of adjustment model, data collection, sampling design, definition and measurement of variable used in the study. The other section provide discussion of the empirical findings. The last section gives conclusions of the study.

1.1 Empirical literature Review and hypothesis formulation

This section provides various empirical literatures related to the study of the adjustment speed and cost of bank capitalization ratio. There are numerous study conducted to examine the speed and cost of adjustment process to target bank capitalization ratio in some developed, emerging and few frontier market countries. These study on adjustment process are wide, because the speed of adjustment process can be influenced by numbers of bank characteristics factors, macroeconomic and institutional factors (Jokipii & Milne, 2011; Philip et al., 2014; Memmel & Raupach, 2010). Very early study such as Shrieves and Dahl (1992) evidence that regulatory stringent have greater effects on bank capitalization ratio for commercial banks. Leary and Roberts (2005) empirically concluded that in order for the financial institutions to rebalance their capitalization ratio they have to incur adjustment cost. Though, this cost may vary between one institutions to another. Flannery and Rangan (2006) found that financial institutions operate with 33.33% of deviation between actual and target capitalization ratio each year. They argue that financial institutions have their target capitalization ratio. To achieve that ratio the institutions incurred the low cost of adjustment. Drobetz and Wanzenried (2006) support that there is bank specific factors and macroeconomic factors that influence the capital structure (debt and equity) that have impact on the bank adjustment speed of capitalization ratio. Empirically they found that profitable banks and during poor economic condition in a country banks adjust

their capitalization ratio very quickly. Huang and Ritter (2009) argue that financial institutions use external source of finance to improve capitalization ratio especial when there is low cost of financing. They further found that the institutions use moderate speed to rebalancing their target capitalization ratio. Memmel and Raupach (2010) support that, focusing on the liability side of the balance sheet for the adjustment process of the capitalization ratio is more preferable. Though, the tendency of capitalization adjustment process is higher for the assets side of the balance sheet. They also found that adjustment process of capitalization ratio is faster for the banks than other financial institutions.

Philip et al. (2014) found that banks with different ownership status have insignificant effects on the speed of adjust of non-risk-weighted capitalization ratio towards target level. In addition, they observed that foreign banks adjust slowly the risk-weighted capitalization ratio to targets level when compared to domestic banks. These banks incurred high adjustment cost because they maintained significantly high capitalization buffers and they have very small risk of operating below target capitalization ratio. Philip et al. (2014) further observed that, the adjustment pace of big banks is significant low and incurred higher cost of adjustment than smaller banks, this findings contradicts with the results of De Jonghe and Oztekin's (2015). In addition, they reported that during good time of economic condition banks in China adjust risk-weighted Tier1 ratio and total ratio to required levels at very low speed and high cost. Though, they adjust quickly during poor economic condition. They hold this may be caused by banks not considering the overall risk associated with assets they possess. Therefore, these banks gets difficult time to adjust capitalization ratio at very high speed during time of asset expansion especial when economy of the country is growing very fast. Moreover, profitability detected to have high speed and very low cost of adjustment of the unweighted equity ratio but not for risk-weighted capitalization, this findings is in line with the literature of Fonseca & Gonzalez (2010). However, theoretically less profitable banks have to adjust capitalization ratio quickly to remove the risk of default associated with operating below the required minimum level of capitalization ratio. But Philip et al. (2014) propose opposite that less profitable bank maintained low adjustment speed.

De Jonghe and Oztekin (2015) analysed information of balance sheets and bank income statements obtained from Bankscope in system GMM revealed that adjustment speed of capitalization ratio is not the same across the countries. They observed adjustment process of banks capitalization ratio is faster in high inflation economy and banks use low cost of adjustment process. Memmel and Raupach (2010) reported that banks in Europe maintain high speed and low cost to target capitalization ratio and private commercial banks in German adjust more quickly to target capitalization ratios when compared with state-owned banks. Abbas and Masood (2020) found that there is a low adjustment speed of a total capitalization ratio compared to the ratio of total risk-weighted capitalization for commercial banks in USA using a two-step GMM estimator. In addition, according to Huang and Ritter (2009), bank profitability is a significant factor of high speed of adjustment process towards target bank capitalization ratio. Mohanty and Mahakud (2019) observed that banks owned by public adjust quickly to target capitalization ratio and have low cost of adjustment process compared to the private and foreign banks. The findings also show that bank-specific determinants such as size of banks influencing the target capitalization ratio of the banks in India. Though, scholars propose that adjustment process of capitalization ratios is more beneficial through rebalancing liabilities side of the bank's balance sheet, their results found that banks also rebalancing their capitalization ratios using the assets side of balance sheet. Despite the findings of various literatures as described above, still the results relating to adjustment process including speed and cost of adjustment cannot be generalized. This is because the previous studies report varying speed of adjustment process of capitalization ratio measured in different ways. In addition, most of these studies have been conducted in developed and emerging market countries and some few frontier market countries was involved but excluding Tanzania. On the other hand, the previous studies used various institutional factors and bank-specific determinants that few of them were employed in this study. This enable us to investigate the impact of these variables on the bank adjustment process (speed and cost) to target capitalization ratio in Tanzania.

The study hypotheses can be formulated as follows, this is after considering of various literature reviewed as shown above.

Hypothesis 1: The speed at which the commercial banks adjust their capitalization ratio are higher compared to non-commercial banks

Hypothesis 2: Commercial banks have low cost to adjust their capitalization ratio compared to non-commercial banks

Hypothesis 3: Large banks adjust their capitalization ratio instantly compared to small banks

Hypothesis 4: High profitable banks adjust their capitalization ratio instantly compared to less profitable banks

1.2 Data collection, variable description and model specification

1.2.1 Data collection

The data in this study was collected from a population of 46 banks operated in Tanzania as at June 2022 in which 24 commercial and 4 non-commercial banks. We collected Bank specific data from published annual financial statements (balance sheet and income statements). Data related to economic indicators were collected from the World Bank database. The sample space of the study is balanced panel data. In the published report as at June 2022, there were approximate 28 sample of banks. In addition, the requirements for the inclusion of this sample space of the study is to enable having sufficient and more reliable data. The study involved only active banks based on the date of last published financial reports of December 2021. Another parameter was to ensure there were no too many missing data for the variables used in the study by including banks that have been in operation for at least 6 years. Following this inclusion criterion, Only 28 banks were selected to represent sample size of the study. For a better understanding and improvement of output, the sample space is also categorized in terms of ownership status (private banks and state owned banks), country of originality of banks (domestic banks and foreign banks) according to classification given by regulator of banks. However, definition and measurement of variables given in Table 1.

1.2.2 Variable description

In this study we categorized the variables that influencing the banks speed of adjustment to target capitalization ratio into three major groups namely banks status variables, bank-specific variables, and macroeconomic variables. Bank-specific variables including the size of bank and bank profitability, while macroeconomic variables including GDP growth and inflation. Table 1 provide measurement of variables used and source of the data for the study.

Table 1: Variables measurement and source of data

DEPENDENT VARIABLE		
Variable	**Measurement**	**Source of data**
Bank Capitalization ratio (BCRV)	Ratio of total equity to total assets	Individual bank balance sheets
INDEPENDENT KEY VARIABLES		
Variable	**Measurement**	**Source of data**
Bank-Specific Factors		
-Profitability (ROAV)	Return on asset	Individual bank income statements
-Bank size (BSV)	Natural logarithm of Bank total asset	Individual bank balance sheets
(Macroeconomic)		
-Inflation (INFV)	Annual rate of change of consumer price index	World bank database
-Economic growth rate (EGV)	Annual percentage growth rate of GDP	World bank database

Banks status factors		
- Banks ownership status (DOSV)	Dummy variable (binary number 1 for private banks and 0 for state owned banks)	-
- Country of originality of banks (DCOV)	dummy variable (binary number 1 for domestic banks and 0 for foreign banks)	-

Source: Authors review of related literature

A number of studies have conducted to investigate different factors that influence adjustment process to target capitalization ratio. These studies come up with different findings. Some of these studies investigated variables which are not used in this study, for example De Jonghe and Oztekin (2015) examined how better supervisory activities and adequate developed capital markets influencing the speed of adjustment process of bank capitalization ratio to target level. In addition, Mohanty and Mahakud (2019) examined the effects of non-performing asset, loan to asset ratio, net interest margin and regulatory pressure on the adjustment process to target capitalization ratio. Some literatures have investigated variables that are part of the explanatory variables in this study. Though, these literatures investigated the variables in three capitalization measure namely Equity Capital which is the ratio of equity to unweighted total assets, Tier1 Capital which is the ratio of tier 1 capital to total risk-weighted assets and Total Capital which is the ratio of total bank capital tier 1 and tier 2 to total risk-weighted assets.

Since not all the banks in this study are listed in Dar es Salaam stock exchange which is a precondition for access to market values data, we used plain capitalization ratio in terms of total equity to total unweighted assets (Equity Capital) as used in the study of Vithessonthi and Tongurai (2016); Abbas and Masood (2020); Öztekin and Flannery (2012); Memmel and Raupach (2010); Abbas et al. (2021); Gropp and Heider (2010). The main reasons for choosing this capitalization ratio measure is that, international standards setter (Basel committee) for banks capitalization ratio and other regulation of banks through Basel III accord use the above three capitalization measure as a benchmark. The Table 2 below summarize the adjustment speed to target capitalization ratio base on the three capitalization measure as revealed from various literatures. Furthermore, the Table 2 presents the expectation of adjustment speed to target capitalization ratio of banks in Tanzania and summary of finding from various literatures reviewed concerning adjustment speed.

Table 2: Variables descriptions for adjustment speed to target bank capitalization

Parameters	**Expectations for Equity to unweighted total assets**	**Equity to unweighted total assets**	**Tier1to risk weighted asset**	**Total capital to risk weighted asset**	**Related literatures**
Banks Status Variables					
State Owned Bank-Private Bank	High-Low	Nil			Philip et al., (2014)
		Low-High,			Memmel and Raupach, (2010)
				High-Low	Philip et al., (2014)
		High-Low			Mohanty and Mahakud, (2019)
				High-Low	Abbas et al., (2021).
Foreign Banks-Domestic Bank	Low-High			Low-High	Philip et al., (2014)
		Nil	Nil	Nil	Philip et al., (2014)
				Low-High	Abbas et al., (2021).
Listed Banks-Non Listed Bank	Low-High	Low-High			Philip et al., (2014)

Macroeconomic Variables					
GDP Growth-GDP Decline	High-Low	High-Low	Low-High	Low-High	Philip et al., (2014)
		Nil	Nil	Nil	De Jonghe and Oztekin's, (2013)
High Inflation-Low inflation	High-Low	High-Low	High-Low	High-Low	Philip et al., (2014)
		High-Low			De Jonghe and Oztekin's, (2013)
Bank-Specific Variables					
Large Banks-Smaller Banks	Low-High			Low-High	Philip et al., (2014)
			Low-High		Philip et al., (2014)
			High-Low		De Jonghe and Oztekin's, (2015)
		Low-High			Bakkar et al., (2019)
		Low-High	Low-High	Low-High	Abbas et al., (2021).
		Low-High	Low-High	Low-High	Abbas and Masood, (2020)
High profitability-Low Profitability	High-Low	High-Low		Low-High	Philip et al., 2014
		High-Low			Abbas and Masood, (2020)
		High-Low		Low-High	Flannery and Rangan, (2008); Flannery and Rangan, (2006)
		High-Low			Huang and Ritter, (2009)
		High-Low		Low-High	Fonseca and Gonzalez, (2010)
		High/Low			De Jonghe & Oztekin's, (2013)
1-Nil indicates no significant impact of adjustment speed to desired capitalization ratio. 2-Blank space indicates non-investigated capitalization ratio measure.					

Source: Author's construction 2022

1.2.3 Model specification

Following the presence of stringent regulation in banking supervision, banks succeed to hold their desired capitalization ratio which is above the required ratio set by the regulators. If the banks fails to maintain minimum required capitalization ratio, they exposed to huge risk that may cause to stop their operation. In order for the banks to continue in operation they have to maintain higher capitalization ratio as proposed by regulators. Still there is situation where by the cost of the improving capitalization ratio is higher compared to the cost caused by banks operating below required equity level. Such circumstances involves the trade-off between adjustment cost of capitalization ratio and cost that can be associated with operating below required capitalization ratio (Etudaiye-Muhtar, 2016; Philip et al., 2014 and Abbas et al., 2021). In order to study how do banks adjust capitalization ratio, previous studies employed a partial adjustment process to develop model for capitalization ratio (Flannery and Hankins, 2013; Abbas and Masoud, 2020). In a model of capitalization adjustment process, current capitalization ratio of banks represented by $Y_{i,t}$, is an average of required capitalization ratio $Y^*_{i,t}$, and the last time period's capitalization ratio, $Y_{i,t-1}$, and also a random shock represented by $\varepsilon_{i,t}$ in line with literatures of Bakkar et al. (2019) and Flannery and Hankins (2013). The partial specification model equation is as shown below:

$$Y_{i,t} = \gamma Y^*_{i,t} + (1-\gamma)\, Y_{i,t-1} + \varepsilon_{i,t} \quad \text{(i)}$$

Where "i,t" denotes cross-section (i) , which means a bank in this study and time period (t), which means the year in this case. Generally, for each time period, a bank closes the gap γ which is the difference between actual and target required capitalization ratio. The lower the coefficient value of γ signifying that banks spend longer time to wards rebalancing required capitalization ratio after experiencing financial distress especially when economic shock occurs. Therefore, the parameter γ used as a scale of capitalization

adjustment process which also indicates the pace of adjustment process for banks. The opposite of it (1-γ) represents the cost of adjustment process.

The target capitalization ratio of the banks measured in terms of ratio of total equity to total assets ($Y^*_{i,\ t}$), is unknown and its value varies based on time, this means its value is not constant. The required capitalization ratio according to the nature of linear regression of the lagged capitalization ratio, time fixed effects and banks characteristics (De Jonghe and Oztekin, 2015; Abbas and Masoud, 2020). This can be represented using below equation.

$$Y^*_{i,} = \beta Z_{i,-1} + V_t + \mu_i \quad \text{.....(ii)}$$

To take in to consideration bank characteristics, we adopted the model used by Bakkar et al. (2019); Abbas and Masoud (2020) who used banks data and investigates the pace of adjustment of capitalization ratio of the banks. Using partial adjustment model of capitalization ratio, we consider two important factors of panel fixed effects represented by μ_i and unobserved heterogeneity (V_t). The panel unobserved fixed effects including banks managerial capacity, banks risk tolerance, banks managerial decision making as well as nature of the country in which the banks operate which means Tanzania in this case. The inclusion of bank-fixed effects in the capitalization adjustment model is in line with the literatures of Gropp and Heider (2010); Huang and Ritter (2009); Bakkar et al. (2019); Abbas and Masoud (2020). Substituting equation (ii) in equation (i) results in to the below equation.

$$Y^*_{i,t} = (\beta Z_{i,t-1} + V_t + \mu_i) + (1-\gamma)\, Y_{i,t-1} + \varepsilon_{i,t} \quad \text{.....(iii)}$$

In order to avoid biaseness estimation that associated with the use of lagged dependent variable, the estimation of the coefficient of equation (iii) is performing using Generalized Method of Moments (GMM estimator) as recommended by Blundell and Bond (1998) and as adopted by Abbas and Masoud (2020); Flannery and Hankins (2013). This is due to fact that ordinary least square (OLS) and fixed effects specification model when used would results biased estimate of the coefficient. GMM is preferable for the dynamic panel estimate because also it control for the endogeneity issue of the lagged response variable. Nevertheless, it controls the issue of measurement error, it eliminates omitted bias problem and tackle unobserved heterogeneity issues in panel data. Thus, we employ two-step system GMM estimator because it is more efficient compared to one-step GMM estimator.

It is most likely that the effects of speed and cost of adjustment of capitalization ratio with commercial banks in Tanzania may be relatively different from non-commercial banks. We classified the banks in this study based on commercial and non-commercial banks as categorized by BOT as at June 2021 to find out whether the effects is different or not between the two categories. We conducted a robustness test for regression specifications model in equations (i) to make sure that the interpretations of the findings are robust according to the bank classification. In using this equations (i), commercial and non-commercial banks were merged in a new single regression to find out the effects of the speed and cost of adjustment of bank capitalization ratio. This is done in order to avoid conducting different regression analysis for the two sample classification. A single dummy variable is introduced in a regression where banks in Tanzania classified as commercial banks take the value of 1 and those classified as non-commercial banks take the value of 0. The coefficient value which is significant for the proposed dummy variable (DVCS) signifying that the effects of speed of adjustment towards target bank capitalization ratio is significant different between banks classified as commercial banks and those classified as non-commercial banks in Tanzania. While a non-significant coefficient variable would suggest otherwise.

The regression equation for the robustness tests of the bank's classification are customized versions of the previous equations (i) which take similar form as shown below:

$$Yi,t = \gamma Yi,t-1 + \beta Xi,t + D\text{VCS} + \mu i + \eta t + \varepsilon i,t \quad \text{.....(iv)}$$

The key difference of the equations (i) and (iv) is that commercial and non-commercial banks classification dummy variable (DVCS) is introduced to the independence variables in equation (iv) while bank ownership dummy variable (DOSV) and country of originality of the banks dummy variable (DCOV) are not included in the specification model. All of the remaining variables are the same. The two-step system Generalized Method of Moments technique still employed to perform the regression estimates as in the previous equation. The comparison of the findings obtained in a robustness estimation and those obtained in equations (i) are made and that findings are robust to find if they possess similarity in terms of qualitative characteristics. If the results are similar it implies that the findings obtained in a robustness estimations regression equation and those obtained from the main analysis in equations (i) are consistent.

1.3 Findings and discussion

1.3.1 Descriptive statistics

Table 2 shows the results of the descriptive statistics of the study, which means it provide description on the maximum, minimum, average and standard deviations of variables. Bank capitalization ratio is the key variable of concern. The average value of capitalization ratio is 15.77%, the minimum value is 10.91% and the maximum value is 51.69%. The median amount is 14.25% and the standard deviation is 6.52%. The descriptive statistics of other variables are as shown in table 3 below.

1.3.2 Pairwise correlation analysis matrix

Table 4 shows the signs of the correlations between independent variables and dependent variable and between independent variables themselves. The results depicts that the correlation coefficient are within acceptable range. This indicates that there is no issue of effective multicollinearity problem among the independent variables. The symbol of the relationship indicates that profitability and capitalization ratio are significantly positively correlated, this means that the good performance of the banks in terms of profit-making contributes to the overall increase in the capitalization ratio. This is in line with the pecking order theory that banks use retained earnings to act as an internal source of finance to improve the capitalization ratio. In terms of macroeconomic factors, there are negative link between economic growth and bank capitalization ratio and also between inflation and bank capitalization ratio.

Table 3: Descriptive statistics

Variables	Obs	Mean	Median	Std. Dev	Minim	Maxim
BCRV	280	15.7700	14.2500	6.5200	10.9100	51.6900
BSV	280	12.8400	12.8400	1.3500	9.3100	15.9800
ROAV	280	0.7200	0.6900	0.0200	-2.4100	6.2000
EGV	280	5.5400	5.9800	1.4800	2.0000	6.8700
INFV	280	6.0000	5.2500	3.6200	3.2900	16.0000

Note: BCRV indicates bank capitalization ratio, BSV represents bank size, ROAV represents Return on assets, EGV indicates economic growth and INFV represents inflation. All these variables are as measured in Table 1

Table 4: Pairwise correlation between bank capitalization ratio and regressors

Category 1 Bank capitalization ratio and bank-specific variables			
Variables	BCRV	BSV	ROAV

BCRV	1.000	-0.153**	0.015***
Category 2 Bank capitalization ratio and non-bank-specific variables			
Variables	BCRV	EGV	INFV
BCRV	1.000	-0.036***	-0.008**

*NOTE: *** represents significant level at (p<0.01), ** represents significant level at (p<0.05). BCRV reports bank capitalization ratio, BSV represents bank size, ROAV represents Return on assets, EGV indicates economic growth and INFV represents inflation.*

Table 5: Pairwise correlation between regressors

Variables	BSV	ROAV	EGV	INFV
BSV	1.000			
ROAV	0.171***	1.000		
EGV	-0.049	0.166***	1.000	
INFV	-0.170***	0.114*	0.036	1.000

*NOTE: *** represents significant level at (p<0.01), ** represents significant level at (p<0.05). BCRV indicates bank capitalization ratio, BSV represents bank size, ROAV indicates Return on assets, EGV indicates economic growth and INFV represents inflation*

1.4 Overall study findings

The regression equation number (i) of this study has two important use, Firstly, is used to examine the speed of adjustment process of the banks in Tanzania to the target bank capitalization ratio. Secondly, it is used to investigate adjustment cost of banks in Tanzania to target bank capitalization ratio. They both reflect to the common question that do the Tanzanian's banks exhibit target capitalization ratio adjustment process? If the answer to the question is yes. Therefore, we want to know what is the speed and cost of adjustment process? The investigation is as a results of the finance concept that financial market of any country is imperfect. Though, the perfect market exist theoretically but in real sense do not exist and the degree of imperfection of the financial markets varies from one country to another. Öztekin and Flannery (2012) argued that imperfect competitive markets cause banks to incur high costs of adjustment process when re-balancing the capitalization ratio. This results in to slow pace of adjustment process. The results of the regression model in equation (i) used to test all research hypotheses are reported in Table 6. The findings show that there is significance positive speed of adjustment process to target bank capitalization ratios (BCRV).

Table 6: Two-step system GMM regression estimation for the speed and cost of adjustment to target bank capitalization Ratio

BCRV	Coefi.	St.Er	p-value	Signi
Lagged dependent variable				
LBCRV	0.458	0.065	0.000	***
Bank-specific variables				
BSV	-0.710	0.371	0.066	*

ROAV	0.162	0.050	0.003	***
Macroeconomic variables				
EGV	-0.027	0.066	0.685	
INFV	-0.219	0.098	0.034	**
Dummy variables				
DOSV	-0.007	0.088	0.663	
DCOV	-0.007	0.056	0.725	
Test statistics				
AR(1)	-1.77		0.077	
AR(2)	-1.19		0.236	
Hansen test stati	20.16		0.266	
World Chi^2 test	7.89		0.000	
Number of groups	28			
Number of observations	252			
Number of instruments	24			

*Note: The Table 6 reports the results of equation (i) using the two-step system GMM estimation method employed STATA 15.0, the coefficients and standard errors that are robust to heteroskedasticity in column wise. The dependent variable is BCRV, independent variables are bank size (BSV), Return on assets (ROAV), Economic growth (EGV), inflation (INFV), dummy variable for ownership status (DOSV) and dummy variable for Country of originality (DCOV). All variables are as measured in Table 1. Arellano-Bond (AR1) and (AR2) in addition to Wald chi-square tests statistics and the Hansen test statistics of over-identifying restrictions which test for the overall validity of the instruments are also part of the Table together with the P-values. Parenthesis *, **, *** represent 10%, 5% and 1% significance level respectively. In addition, the Table reports the number of groups, number of instruments and number of observations*.

Recall from the previous paragraph, it was indicated that the equation (i) of regression model for determination of speed and costs of adjustment process enable also examining the dynamic trade-off theory of capitalization ratio using the coefficient of the lagged dependent variable. Therefore, as reported in Table 6, the coefficient value below 1 which is positive and statistically significant at 1% significant level for the lagged response variables (BCRVi,t-1) reveal that banks adjust to target capitalization ratio at very high speed. The cost of adjustment process also known as the parameter of adjustment denoted by β1 is found to be exactly 0.458 for the lagged capitalization ratio of bank (BCRVi,t-1).

Regarding bank size (BSV) and return on assets (ROAV) which represents bank-specific variables of the study, their statistics coefficients value in Table 6 are found to be different but they are statistical significance for the definition given to the bank capitalization ratio in this study which is total bank equity to total bank assets. Hence, based on the previous studies the result of the analyses for bank-specific variables are used in explaining theories related to capitalization ratio of bank specifically on determining if banks in Tanzania have target capitalization ratio behavior.

Generally, research objective of the study aim to test the hypothesis that the speed at which the commercial banks adjust their capitalization ratio are higher compared to non-commercial banks. According to our knowledge, this objective is against the previous studies of bank capitalization ratio in developing countries that most of them investigate the impact of financial development on bank capitalization ratio.

Hence, the previous studies in developing countries don't consider the investigation of the effects of the speed and cost of adjustment process of the banks in an imperfect market on re-balancing of the capitalization ratio. As presented in Table 6, there is an existence of positive coefficient value of the lagged response bank capitalization ratio which lie between 0 and 1. This is (0.458) which is also significant at 1% significant level for the measure used for capitalization ratio in this study. Based on Antoniou et al. (2008), the value specifies that if the bank capitalization ratio deviate from the desired target level an adjustment process used to re-balancing the system. This is consistent with the dynamic trade-off theory of capitalization ratio. The existence of the significant positive coefficient value also signifying that financial system constraints associated with imperfect markets in a country have great effects on the speed at which the banks used to achieve desired capitalization ratio. Even with these constraint in financial market, banks capitalization ratio in Tanzania has low cost of adjustment which is (0.458). The cost of adjustment can be used to find the adjustment pace of the banks towards target bank capitalization ratio. Based on that, the value of the coefficients of the lagged response capitalization ratios shows that bank capitalization ratio has high pace of adjustment (0.542) obtained from (1-0.458).

In order to have precise interpretation of the results of adjustment cost in Table 6, the result is also compared with the costs of adjustment results revealed from prior studies in developed countries. For example, Abbas and Masood (2020) found that large commercial banks in USA have 0.798 adjustment costs. Despite the financial system of USA being adequate developed as shown in World Bank development indicator database but still have higher adjustment costs. The higher the adjustment cost is as a result of the trade-off scenario between tax deduction benefit and costs of debt finance. Banks in USA consider advantage of tax deduction benefit over cost of bankruptcy. Therefore, they issue more debt finance which result in to slow speed of the adjustment process of capitalization ratio. In addition, banks in USA incurred high cost of equity capital as a result make financing through issuing share becomes more challenging to them. This argument is in line with Öztekin and Flannery (2012) who observed that the level of development of financial sector in a country has great impact on the cost of equity financing.

In making another comparison of adjustment costs with that observed in developed countries, Philip et al. (2014) argued that the Chinese banks incur higher cost of adjustment (0.572) for lagged capitalization ratio. Gropp and Heider (2010) conclude that large banks in Europe reported the adjustment costs of (0.530). These results in developed countries shows that they have higher adjustment cost compared in this study (Tanzania). This may be as a results of the higher cost of equity capital as stated in the previous paragraph. Öztekin and Flannery (2012) propose that the higher cost of adjustment is caused by the market imperfections. The lower adjustment cost in Tanzania may be due to fact that banks depending on the issuance of equity as a major source of financing for increasing capitalization ratio. This is because the retained earning is not adequate for increasing capitalization ratio since the banking sector is underdeveloped. According to De Jonghe and Oztekin (2015) equity finance is used by banks for capitalization when the economic effects is higher for equity capital and also when the banking sector in the country is not well developed (i.e when domestic credit provided to private sector is not improved). Since this study involved a large number of banks in the sample space which are not listed in stock market, these banks may depend on founder members or private investors to rise equity capital with lower costs compared with issuing equity capital in public stock market (Barclay et al., 2003). Therefore, the cost of equity capital is probable to be lower for these banks compared if it had been issued from the public stock market. This is not happening for banks in developed countries such as USA, China and Europe where the public stock market are more developed but associated with higher floatation costs. Despite the literatures in developed countries showing large adjustment cost of re-balancing bank capitalization ratio compared to this study, but the difference may be as a result of big sample size used in the study for developed countries compared to this study. In addition, the studies in developed countries including a numbers of the institutional features variables in their investigation.

Another argument that support the Tanzanian's banks to hold low cost of adjustment and high speed of adjustment process is revealed by Faulkender et al. (2012), that banks seeking to increase capitalization ratio when the retained earnings is not sufficient require to maintain low adjustment costs which is necessary for easy access to equity capital. These banks increase speed of adjustment process because of low adjustment cost. Therefore, it indicates that banks used in this study maintain low adjustment cost to allow smooth adjustment of capitalization ratio.

Bank-specific variables as control variable of the study as well are essential factors in determining the cost and speedy of adjustment towards desired bank capitalization ratio. Evidence presented in Table 6 for bank-specific variables that relate to adjustment process towards target bank capitalization ratio is realized when capitalization ratio is measured in terms of total equity to total assets, This is reported by the significant coefficients of bank size (-0.710) and return on asset (0.162). These results were consistent with some previous studies such as Bakkar et al. (2019); Abbas and Masood (2020); Philip et al. (2014); Abbas et al. (2021). The significant positive coefficient value for return on assets (ROAV) means that ROAV eliminates the cost of target bank capitalization ratio and reduce the financial distress because investors are interested in return on assets and they can value it easier for their investment decision making. Therefore, ROAV can be used as good indicator for measuring performance of bank that can be used to expose banks to easy access of external capital from existing and prospective investors. The negative coefficient value for bank size (BSV) supports the concept that bank size cause bank capitalization ratio to decline which increase financial distress (De Jonghe & Oztekin's, 2015). Moreover, bank size confirms the rationality of the too big to fail hypothesis which argue that because larger banks are usual older in operation than smaller banks. Therefore, they can earn more profit to rise retained earnings. For this concept, large banks are in great position to use retain earnings as internal financing for their investment portfolio (Abdulhamid et al., 2019; Baselga-Pascual et al., 2015; Tran & Nguyen, 2020). However, this argument contrast with results of Gropp and Heider (2010); Adrian and Shin (2010); Vithessonthi and Tongurai (2016) who argued that positive and significant value of coefficients for bank size indicating that larger banks maintain higher capitalization ratio compared to smaller banks. They hold larger banks can easily access the stock market for equity capitalization because most of them are listed and the issue of information asymmetry is very low to them. According to these arguments and as found in this study, We may conclude that the adjustment cost towards re-balancing capitalization ratio for sampled banks in this study have great impact when the capitalization ratio is measured in terms of total banks equity to total banks assets and it relate directly to dynamic trade off theory of capitalization ratio.

Even though the main purpose of the study is to examine the adjustment process in terms of the speed and adjustment cost to target bank capitalization ratio, the results from banks equity to banks assets ratio estimation show the presence of pecking order theory and dynamic trade-off theory. However, the presence of pecking order theory identified to provide a precise justification on the causes of low adjustment costs for the lagged ratio of bank capitalization. This is because according to the theory the retained earnings is the first choice for the financing option of the entities. Hence, banks incurred low adjustment costs when using retained earnings to finance investment. Based on the pecking order theory, when retained earnings is not adequate to finance investment project so as to increase capitalization ratio, leverage can be used as a second choice. But the leverage decrease capitalization ratio. Banks considering equity financing as the last option which increase capitalization ratio but it is associated with higher agency cost.

In addition, the significant value of coefficient sign for bank size (BSV) denotes the existence of dynamic trade off theory, which argue that capitalization ratio adjustment process does not happen frequently. This is because the results show the capitalization ratio of the banks deviate from the desired ratio despite the fact that adjustment costs such as flotation costs outweigh the benefits of returning back to the target level. Connecting this reported negative sign to the objective of the study, the sign of the bank size which is also significant at the coefficient value of (-0.710) signifies that banks in this study cause capitalization ratio measured in terms of equity to assets ratio to deviate from the target. Abdulhamid et al.

(2019) argued that a negative relationship between bank size (BSV) and capitalization ratio happen because big banks benefit from comparative advantages in non-traditional banking activities since they are able to operate with a fixed cost. Though, engaging into great number of non-traditional banking activities raise leverage to the banks which may results into increasing the risk of bankruptcy and financial distress. On other hands, too big to fail hypothesis also suggests a negative association between bank size and bank capitalization ratio. This theory describe that large banks are supported by government when they face financial difficulties to avoid disturbance in economy. Therefore, they are considered not to fail. In other words, higher banks total assets hold imply less capitalization ratio retained. The observed sign of the bank size variable (BSV) in this study indicate banks deviate from the target capitalization ratio and also shows banks exhibit adjustment behaviour towards the target ratio. This shows the existence of dynamic trade-off theory.

Further evidence for the presence of the dynamic trade-off theory in the study is observed for inflation in Table 6 for total bank equity to total bank assets ratio. According to the argument of Etudaiye-Muhtar and Abdul-Baki, (2020); Hortlund (2005) who found the same results for inflation like in this study, the negative sign which is also significant (-0.219) signifies that the effects of inflation on bank capitalization ratio may be influenced by tax deduction benefit related with inflation in the economy. The higher the tax deduction benefit suggest the lower the cost of debt financing to the banks compared to equity. This means the debt financing becomes cheaper. This is to say, banks prefer to issue debt instruments for financing purpose over of equity which result into decline of the bank capitalization ratio.

1.5 Post estimation check for validity and suitability of regression model specification

Post-estimation statistics check was performed to confirm the validity, suitability and robustness regression model of the study in equations (i). The test revealed that the results in Tables 6 are valid and the regression models employed are suitable for the estimations, the test for no autocorrelation in AR(2) residuals as shown in Tables 6 indicate that the null hypothesis should not be rejected and the alternative hypothesis should not be accepted because the AR(2) estimates coefficients is insignificance. This means that the second order serial correlation is not existing in the AR(2) residuals. On the other hand, the alternative hypothesis for Hansen statistics used to test whether the instruments used in the regression specification equation (i) are over identified revealed that it cannot be accepted and the null hypothesis cannot be rejected, this indicating that the statistical instruments variables used in the regression model are not over identified. Regarding the joint statistically significance test of the predictor variables and whether these variables are good predictor of the response variable, the Wald chi square statistics test also known as the goodness of fit test indicated non-rejection of the alternative hypothesis and non-acceptance of the null hypothesis. This indicating that the independence variables are good predictor of the dependent variable because of the presence of significance level for the chi-square statistics. According to these results of the post estimation test, we may therefore make conclusion that the regression model and the estimation techniques employed which is two-step system generalized method of moments is appropriate econometric technique for answering the research questions.

1.6 Robustness test for bank classification

The study grouped banks into commercial and non-commercial banks as described in the previous paragraph. A special categorical variable named dummy variable (DVCS) is used that take the binary number 1 for commercial and 0 for non-commercial banks. These dummy variable used in order to investigate statistically whether there is presence or absence of significant difference in the effects of adjustment process in terms of the speed and cost of adjustment on bank capitalization ratio for the group of banks. Another regression model apart from the main model which consist of the dummy variable are employed to investigate the impact as shown in equation (iv). The findings of the analysis are as shown in Table 7.

The findings of the regression model of the main study analysis in Table 6 are compared with the results of robustness test reported in Table 6 for the objective of the study. After the comparison, it is

observed that the findings are similar in terms of qualitative features. Though, there is presence of very small changes on the results. The results shows that the estimates of the coefficients of the analysis reported for the main regression model are robust. The study robustness test for the core analysis is noted after the presence of non-significance coefficients of estimates of the DVCS variable as reported in Tables 7. The presence of non-significance coefficients of the estimates of the DVCS variable signifies that the analysis does not report significant difference in the effects of adjustment process (speed and cost of adjustment) towards target bank capitalization ratio for commercial and non-commercial banks in Tanzania. However, it is noted that the coefficient of the estimates for bank-specific factors and macroeconomic variables varies. The post estimation statistics test for the validity and suitability of the robustness regression model used including Hansen test, AR(2) for identifying whether the instrumental variables used violate over identified restriction or not. Wald Chi- Square check for checking the goodness of fits of study variables used indicates that the regression model is free from spurious findings of the estimation and valid.

Table 7 and Table 6 are then compared. The results of the comparison showed that the signs of the statistics coefficients value and the level of significance of variables are similar concerning the investigation of the adjustment process to target bank capitalization ratio in terms of speed and cost of adjustment. Though, the dummy variable (DVCS) for banks classified in to commercial and non-commercial banks in Table 7 is insignificant which means that bank classification has no specific effects in sampled banks. The results of the robustness checks presented in Table 7 strengthen the findings obtained from the main regression analysis in equation (i).

Table 7: Robustness check for the speed and cost of adjustment to target bank capitalization Ratio

BCRV	Coefi	St.Err	p-value	Signi
Lagged dependent variable				
LBCRV	0.449	0.062	0.000	***
Bank-specific variables				
BSV	-0.700	0.373	0.068	*
ROAV	0.159	0.048	0.001	***
Macroeconomic variables				
EGV	-0.105	0.182	0.710	
INFV	-0.187	0.064	0.040	**
Dummy variable for bank classification				
DVCS	-0.004	0.007	0.784	
Test statistics				
(AR1)	-1.89		0.058	
(AR2)	-1.24		0.219	
Hansen test	22.08		0.244	
World Chi^2	8.02		0.000	
Number of groups	28			
Number of observations	252			

Number of instruments	24

*Note: The Table 7 reports the results of the robustness test equation (iv) for investigating banks speed and cost of adjustment to target bank capitalization ratio using the two-step system GMM estimation method employed STATA 15.0, the coefficients and standard errors that are robust to heteroskedasticity in column wise. The dependent variable is BCRV. All variables are as defined in Table 1. Arellano-Bond (AR1) and (AR2) in addition to Wald chi-square tests statistics and the Hansen test statistics of over-identifying restrictions which test for the overall validity of the instruments are also part of the Table together with the P-values. Parenthesis *, **, *** represent 10%, 5% and 1% significance level respectively. In addition, the Table reports the number of groups, number of instruments and number of observations.*

1.7 Conclution

The objective of the study was to investigate the adjustment process in terms of banks' speed and cost of adjustment to target bank capitalization ratio for the sample of banks in Tanzania. Previous studies in developing countries form the bases of this study because they do not investigated the adjustment process (speed and cost) of adjustment to target bank capitalization ratio. On the other hand, previous studies do not involve market constraints as the main cause of high adjustment costs that resist adjustment process. The results in the investigation of the study objective indicate the existence of high speed of adjustment and also low cost of adjustment process to target bank capitalization ratio in Tanzania. In addition, the study results reveal that the pecking order theory is relevant theory to the banks for the ratio of total banks equity to total banks assets ratio. The impact of the pecking order theory on bank capitalization ratio is consistent with this study and some prior literature such as Flannery and Rangan (2008); De Jonghe and Oztekin (2015); Fonseca and Gonzalez (2010).

Moreover, the costs of adjustment process to target capitalization ratio which is proxies by coefficients of the lagged bank capitalization ratios (LBCRV) for the sample of banks in this study are relatively lower compared to the banks in developed countries such as USA, China and Europe. This means, despite the developed countries to have adequate financial sector development which implies the developed countries have less market constraints and the market are more transparent, but the higher the adjustment costs may be caused by higher floatation cost of equity shares issued in the stock exchange compared to Tanzania market where most banks are not listed in the public stock market and depend much on the founder and private owner for equity capital. Hence, banks in Tanzania incurred low floatation cost. Philip et al. (2014); Flannery and Rangan (2006); Öztekin and Flannery (2012) hold that if floatation costs in the market are not significant banks may adjust to target capitalization ratio at very high speed. Thus, the speed of adjustment process to target bank capitalization ratio in this study are higher, this high speed of adjustment is associated with the above explained argument.

The results of this study also shows that the policies related to banking sector development in Tanzania appeared to be appropriate in increasing bank's use of retained earnings and the equity capital, this indicating the effects of equity capital substitution for debt capital. Therefore, it enhance bank capitalization ratio. In this way, the findings reassure banks and securities regulatory authorities that the major financial sector reforms in Tanzania, that take place many years ago are in the right direction because it leads to the improvement in bank capitalization ratio which help in maintaining stability of banking sector. Specifically, these results provide strong bases for policy makers to constantly improving control, monitoring and supervisory activities. Parallel with this, they should find an alternative measure that will help banks to provide more credit facility to private sector while also removing some market constraints that exist in the market. This removal of market constraints including liberalization of lending interest rate, encouragement of the creation and the use of the credit bureau organization or establishment of other programmes that will remove completely the problem of information asymmetry and increasing information sharing between banks and borrower. This reduce moral hazard problems and adverse selection issues arising from banks lacking necessary customer's information. This is necessary for improving credit to private enterprises and allow banks to maintain adequate capitalization ratio. In addition, the effective establishment and use of credit bureaus probable may improve the lending process of banks because of effective screening and monitoring of customer's loan. This assured banks that the expected required returns will be obtained from

the investment. If liberalization of lending interest rate are in place, banks are likely to improve the credit allocation process to private sector and increase the interest income. This also can reduce bank risk taking for increase bank capitalization ratio using retained earnings. In terms of upgrading knowledge for researchers who are interesting in investigating impact of banking sector development on capitalization ratio of bank specifically in frontier market countries. This study is of a great important because it provides empirical evidence for researchers to rely on the results particularly in the situations of existing few empirical literature from frontier market countries.

This study cannot be normal concluded if it does not state some limitations existing during the study. It is commonly for study like this to have some limitations. This study used published annually accounting data that can be easily manipulated, rather than market based data which were not available during the study because most of the banks licensed to carry banking business in Tanzania as at June 2021 are not listed in stock exchange. The data used in this study were limited to a period of ten years from 2012 to 2021. Due to this limitation, this study could not examine the effect adjustment process of speed and cost of adjustment towards bank capitalization ratio in Tanzania in long-run bases, rather it only investigate the effects in the short-run bases. While country level data including inflation and economic growth (GDP) was available for long time period, bank-level data including bank size, bank profitability (ROA) and bank capitalization ratio still limited to a period of ten years. Therefore, it was difficult to determine the long-term effects using co-integration analysis. Following the above few limitations of the study, future research should take in to consideration these limitations and use them as area for improvement in new studies. Other researchers should consider the market-based data when available to extend this study in the future. This may provide new empirical evidence whether the effects of adjustment process of bank capitalization ratio is the same when market-based data were used, also the future studies should consider the whole banking sector in Tanzania by involving large number of banks and all types of banks in Tanzania. In addition the future study should include institution variables in the investigation such as government's effectiveness and regulatory quality during implementing financial sector regulation and policies. These factors may have great effect on the developmental of financial sector. By considering the above mentioned limitations and take necessary measure to work effectively on the recommendation for improvement of the future study, the knowledge gathered will be improved and extended.

Competing Interests

There is no competing interests that exist between author(s).

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