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Camel Rating System and Financial Performance of Rwandan Commercial Banks

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Abstract
Financial institutions hugely contribute to Rwandan economic development. However, different studies showed that they expose to risks that limit them from attaining their objectives. The banking sector's liquidity, efficiency, and profitability in Rwanda have weakened in the past four years – 2015 to 2018 and its performance indicators collapsed. This study intended to examine the effect of the CAMEL rating model on the financial performance of commercial banks in Rwanda for the period ranging from 2014 to 2018. It was underpinned by four theories namely; cash management theory, agency theory, liability management theory, and market power theory. This paper covered11 commercial banks operating in Rwanda and adopted secondary data published by the Central Bank of Rwanda and the official websites of mentioned the 11 banks.Descriptive research design and panel regression were employed to evaluate the correlation between the predictor and outcome variables. The findings concluded that capital adequacy and asset quality are positively correlated to determine the value of financial performance. Liquidity management, management efficiency, and earnings management have a negative correlation. However, capital adequacy, asset quality, management efficiency are statistically significant to predict the ROA at a 5% level. This paper recommends that both the banks' management and financial regulatory body should work together to formulate policies that would help improving banking sector efficiency without violating the right of their clients. When it comes to the evaluation of financial institutions, all the CAMEL model factors should be considered.

Key words: *Capital Adequacy; Asset Quality; Management Efficiency; Earnings Management; Liquidity Management; and Financial Performance.*

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I. Introduction

The banking sector has been playing a pivotal role in economic growth through the creation of financial inclusion to its valuable customers. It has also been exposing to some critical problems such are liquidity management problems, asset quality problems, capital adequacy problems, and so many more problems that hinder banks from achieving their planned objectives. The CAMEL rating system has been selected as the guidance to evaluate the efficiency of commercial banks in Rwanda as its five components touch on different aspects of banks. According to Dang (2011), The banking sector is considered as the spine of the financial sector, for it supports the proper use of funds in the country. Today, banks operate in an innovative and rapidly changing environment that requires them to create a favorable environment to meet the needs of their customers. This changing environment exposes financial institutions to a variety of risks that make the environment complex.

The banking sector in Africa is at an exciting level of development where opportunities are increasing. Their digitization boosts customers' awareness, attracts overseas investments, contributes to financial inclusion, and better methods of easy access to financial services. Bankshave taken off in the southern and northern regions of Africa. However, the East Africa banking sector is more innovative, where people are being fascinated by mobile banking usage than other technological methods that require routine maintenance and costs of security. East African people prefer transacting money over the telephone network. The recent global financial crunch gripped financial institutions where banks' loans and financial assets worsened. During this period, customers took their deposits away from banks; interest rate degraded the value of securities controlled by commercial banks, which resulted in a peak of liabilities.

Due to the result of the credit disaster, the global economy had been affected where financial firms lost USD 2.8 Trillion. The deficit of liquidity in the financial institutions have become worse in Nigerian banks where the Central Bank decided to lower interest rate to assist financial institutions becoming liquid (Okorie, 2014).In the same period, Kenya's net foreign cash flow activity dropped off from KShs 143billion to negative KShs 879 billion (CMA Kenya, 2008). One of the commercial banks listed at NSE (cooperative bank of Kenya) managed only 81% of its subscription after its target went down from KShs 10 billion to KShs 6.7 billion

(Mwega, 2009). The Rwandan banks were also affected in a way their large customers took their deposits away due to the high inflation rate, and they were wondering about the security of their deposits (Sayinzoga, 2009).Based on the BNR Report (2019), banking efficiency, profitability, and liquidity have weakened over the last four years. Their earning indicators (ROA and ROE) reduced from 2.4% to 1.6% and 13.1 to 9.6% consecutively from June 2015 to 2018. The capital adequacy dropped from 24.3% to 21.4, and liquidity from 57.3 to 32.7%. Banks reserve in Rwanda was exceeding the statutory requirement where it rose from 17 percent in the year between 2003 – 2008, 38% in 2009 – 2012, and 46% percent in 2013 – 2016 (World Bank Report, 2018). According to Sambaza (2016) Banks are always critical due to the way they link borrowers and lenders. The banks need to ensure that there are enough funds to borrowers, attract depositors, and pay them back at a reasonable return for their deposits.

II. Empirical Literature Review

On the link between capital adequacy and financial performance in banks, several studies have been undertaken. For instance, Amin; et al. (2014) investigated the relationship between financial risk on the performance of banks in Tanzania. The prime motive to conduct this study was to review the link between financial performance and financial risks among Tanzanian banks. It concluded that financial risks have an inverse correlation with the profitability of commercial banks in Tanzania. However, capital adequacy itself affected the performance significantly this confirmed by (Al-Tamimi, &Obeidat, 2013).

On the correlation between asset quality and bank performance, a bunch of reviews was conducted. Kimanzi (2015) sought to establish the effect relation between asset quality and the financial performance of commercial banks in Kenya. Findings revealed a negative link between Asset quality and financial performance. The same investigation was conducted on Turkey banks; It employed a panel regression method. This investigation reported a statistically significant negative correlation between the variables. The results contradicted by Aguenaous, et al. (2017); where the study revealed that all the CAMEL factors except management efficiency have a positive correlation on bank efficiency in Moroccan banks.

On the link between management efficiency and financial performance, Itumo (2013) studied the alliance between efficiency and financial performance in Kenyan commercial banks. The review employed a descriptive statistic for a sample period of 5 consecutive years from 2007 - 2012. The study revealed that the efficiency ratio dropped from 2008 to 2012, which means that banks were generating lower-income compare to their operating expenditures. However, the correlation between bank efficiency and financial performance was positive. This got confirmed by Kaneza (2016). The study disclosed that management efficiency is positively associated with performance. It means that one unit increase in management efficiency would lead to an increase in the performance of commercial banks quoted at NSE at a certain point. Karemera (2013) investigated the correlation between the regulation and financial performance of commercial banks in Rwanda. The study chose ten commercial banks in which eight of them were able to participate in this investigation. The findings showed that both management efficiency and liquidity management do not explain the banks' performance.

Earnings and profitability in financial institutions bring the persistency generation of income that keeps the firm continue to raise funds that helps the settlements of obligations. This statement got confirmed by Kumar (2006), where the research revealed that the more the income rise, the more the firm captures a large market share and takes hold of other many opportunities. Mengistu (2015) confirmed this after evaluated the financial performance of the banking sector in Ethiopia: the case study of Zemen bank. The study found a positive association between earning ability and banks' performance in Ethiopian banks. Ongore&Kusa (2013) researched on factors that determine the financial performance of Kenyan commercial banks. The Multiple linear regression and least square method were employed to generate the correlation between the variables. The study adopted CAMEL model factors, GDP Growth rate, and inflation as independent variables to determine banks' performance. The review revealed a significant impact between CAMEL and financial performance. However, earnings management got excluded from the CAMEL model when analyzing the performance.

On the correlation between liquidity management and financial performance, Mucheru et al. (2017) researched on liquidity management and the financial performance in Rwandan commercial banks during the period from 2014 to 2016. The sample population of the research was 14 Commercial banks. A random sampling of 42 respondents was selected. The study adopted the multiple regression techniques to measure the correlation between variables. It concluded that liquidity risk management has a significant negative relation to financial performance. Holding more liquidity would lead to lower returns and the effects were significant at 5%. Muthoga (2019) concluded that keeping a lot of liquidity requires many costs that may cause a fall in the profits of the banks. Sylvain (2013) adopted the CAMEL model while analyzing the financial statement of commercial banks in Rwanda. The study found a decline in liquidity and profitability. However, it never shows clearly the effect of the CAMEL model. Rwemalika (2013) and Harelimana (2017) also analyzed the financial statements of Rwandan commercial banks. These studies were oblivious to the usage of the CAMEL model as

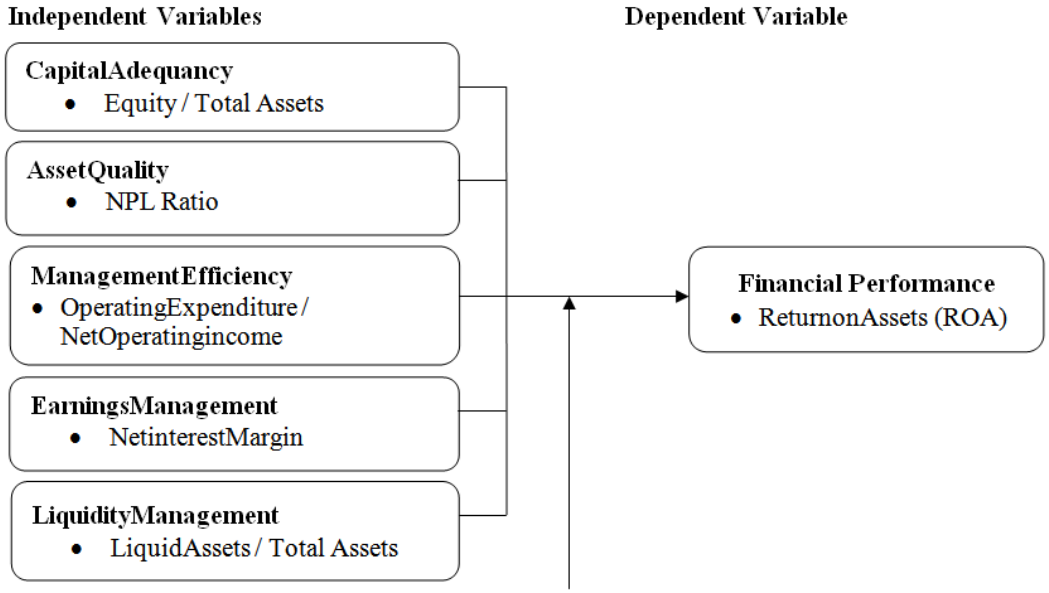
the proposed method to evaluate financial institutions; they all focused on only one commercial bank and ignored the rest of the commercial banks operating in Rwanda.

On the relationship between bank size and financial performance, there are several reviews conducted to examine this effect. These studies have been done globally and have given a unanimous result of how bank size affects profitability. Bank size has been taken to be the key driver in the determination of financial performance in the banking sector. Staikourasand Wood (2004) surveyed the determinants of European bank profitability. The study discovered an inverse correlation effect of bank size on the profitability of large banks and a significant positive impact on small banks. Shahnaz, et al. (2019) conducted research on Liquidity and Bank size and the profitability of Bangladesh commercial Banks for five years from 2011 to 2015. The study revealed an insignificant positive correlation between bank size and profitability. Suleiman (2015) investigated review on bank size and profitability, an empirical study on listed Jordanian commercial banks. The survey disclosed that bank size is statistically inverse significant correlation on the profitability. It means that the higher the asset size, the more the profitability goes down. Nzioka (2013) targeted 43 commercial banks for an era stating from 1998 to 2012. Secondary data published on the Central Bank of Kenya website and the selected commercial banks' websites get used. It concluded that there is a positive significant influence of bank size on financial performance. Also Kamau, Gatauwa&Mwambia (2018) confirmed this after examining the effect of operational risk management on the performance of commercial banks.

2.1 Conceptual Framework

This research is anchored on the CAMEL rating model and the performance of commercial banks in Rwanda. The CAMEL model five components got used as explanatory variables, bank size as a moderating variable and return on assets operationalized to measure the financial performance of the Rwandan commercial banks as the dependent variable.

Figure 1: Conceptual Framework



III. Research Methodology

3.1 Research Design

Research design comprises the pattern in data collection, data measurement, and analysis in research (Cooper & Schindler, 2014). The review employed a descriptive research design. Research design has usually taken as the research plan that guides the overall work as it helps the researcher to find the solution to the research question(Gatauwa&Murungi, 2015; Kamau et al., 2018). A descriptive research design has chosen to figure out the valid and accurate factors that are relevant to the problem. It has also been adopted to guide this study as the study that would comprise of quantitative, time series, and cross-sectional data.

3.2 Target Population

The target population is defined as the group of interest in a study. It shows where research data has obtained from. This paperfocused on 11 commercial banks operating in Rwanda as the target population. Since 11 commercial banks are small, a census was adopted.

3.3 Data Collection

Data collection involves the procedure of accumulating evidence and facts to confirm the reliability of the work done (Mugenda, 2008). The CAMEL rating system has been adopted as the proposed method to judge the soundness of finance in financial institutions. It's a Ratio based model that relies on the financial statements that have already prepared. Its five acronyms touch all aspects of banks to improve their efficiency. For ratio purposes, these financial statements have been obtained from the Central Bank of Rwanda (BNR), Rwanda Stock Exchange, and the official websites of the companies as well. The study covered a period from 2014 to 2018 and followed the secondary data collection schedule as per the appendix.

3.4 Model Specification

This research used a descriptive statistic design and panel regression model to inspect the correlation between the explanatory variables and the outcome variable. Since the data to be collected is a panel data model, the model summarized below:

$Y = \beta 0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \beta_5 X_{5t} + \varepsilon_t$ ……(1)

$Y = \beta 0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \beta_5 X_{5t} + \beta_6 S*X_{1t} + \beta_7 S*X_{2t} + \beta_8 S*X_{3t} + \beta_9 S*X_{4t} + \beta_{10} S*X_{5t} + \varepsilon_t$ …… (2)

Where:
Y = Return on Assets
β0 = Constant
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$= coefficients
β_6 to β_{10} = Moderating variable effect
X_1 = Capital Adequacy X_2 = Asset Quality X_3 = Earnings Management
X_4 = Management Efficiency X_5 = Liquidity Management S = Bank size
ε_t= error termt = time constraint

IV. Data Analysis

4.1 Descriptive Statistics

Descriptive statistics analysis was conducted to depict the feature characteristics of research variables. The table below summarizes the characteristics of the study variable by providing mean, maximum, minimum, standard deviation, and observations.

Table 4.1 Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations		
Return on Assets	overall	0.385	3.574	-13.02	4	N	=	51
	between		4.61	-12.775	3.64	n	=	11
	within		1.283	-6	5.12	T-bar	=	4.636
Capital Adequacy	overall	16.272	8.998	8.08	52.62	N	=	51
	between		9.822	9.952	40.345	n	=	11
	within		4.682	0.344	31.254	T-bar	=	4.636
Asset Quality	overall	8.065	5.67	1.98	32	N	=	51
	between		5.071	2.864	19.85	n	=	11
	within		3.783	-4.085	20.215	T-bar	=	4.636
Management Efficiency	overall	96.322	61.094	49.88	392.7	N	=	51
	between		83.272	53.466	347.2	n	=	11
	within		19.815	40.265	172.785	T-bar	=	4.636
Earnings Management	overall	7.235	1.882	4.61	11.8	N	=	51
	between		1.755	5.296	10.632	n	=	11
	within		0.72	5.192	8.403	T-bar	=	4.636
Liquidity Management	overall	39.445	12.539	17.5	68.1	N	=	51
	between		11.682	25.76	61.7	n	=	11
	within		7.045	21.465	59.465	T-bar	=	4.636
Bank Size	overall	18.698	0.932	16.38	20.59	N	=	51
	between		1.029	16.715	20.282	n	=	11
	within		0.297	17.882	19.822	T-bar	=	4.636

This Table presents a summary of panel data statistics of Rwandan commercial banks for five years from 2014 to 2018. It delineates that there are 51 observations for 11 firms. It shows that a firm with a high ROA had 4%, a firm with lower ROA had -13.02, and the mean value of ROA stood at 0.385 during the period of study. The mean of capital adequacy ratio stood at 16% slightly above the minimum prudential standard of 15% as it has set by the central bank of Rwanda. The mean of asset quality ratio stood at 8.065% and indicates the quality of loan management. The mean of management efficiency ratio stood at 96%, and mean earnings management stood at 7%. The liquidity mean was 39% above the regulatory requirement of 20%, and the bank sizes' stood at 18.7%.

4.2 Diagnostic Test Results

Panelmodel analysis was employed to test the hypothesis. A bunch of diagnostic tests was conducted to see whether the study has not violated the classical linear regression model assumptions (Appendix I). These tests ensure the appropriate model to analyze the selected variables mentioned in the conceptual framework. The multicollinearity rule of thumb proposes that any value above ten would bring multicollinearity problems. Since variance inflation factor results are below ten, the data have no problem with multicollinearity. The skewness and Kurtosis test concluded that; we can reject the null hypothesis that ROA, capital adequacy, assets quality, management efficiency, and earnings management have distributed normally. Alternatively, we may fail to reject the null hypothesis that the liquidity management has a normal distribution at a probability of 0.323. The study employed white's test to discover homoskedasticity problems, and it proposed that there are Homoskedasticity problems. Since the test proposes the heteroskedasticity problem, the Robust error test would be employed. However, the Hausman test was conducted to choose the compatible method between the random and fixed-effect models.

4.3 Regression Analysis

This section presents the results found from the analysis to meet the general objective of the study, which is to establish the relation between the CAMEL rating system and financial performance in Rwandan commercial banks. It presents the results of the pooled regression model, the random effect model, and the fixed effect model.

Table 4.2Pooled Regression Model

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Capital adequacy	0.024	0.017	1.4	0.168	-0.01	0.058	
Asset quality	0.107	0.029	3.76	0	0.05	0.165	***
Management efficiency	-0.064	0.003	-21.01	0	-0.07	-0.058	***
Earnings management	-0.045	0.08	-0.56	0.576	-0.205	0.115	
Liquidity management	-0.004	0.013	-0.32	0.754	-0.03	0.022	
Constant	5.808	0.882	6.58	0	4.031	7.585	***
Mean dependent var.	0.385	SD dependent var.			3.574		
R-squared	0.946	Number of obs.			51		
F-test	158.008	Prob. > F			0		
Akaike crit. (AIC)	136.684	Bayesian crit. (BIC)			148.275		

**** p<0.01, ** p<0.05, * p<0.1*

In the beginning, the pooled regression model has conducted to estimate the predictors. From the results of the pooled regression model in Table 4.2, capital adequacy and asset quality have a positive correlation on the financial performance though only assets quality is statistically significant at a p-value of 5%. Other factors such asmanagement of efficiency, earnings management, and liquidity management have a negative correlation though only management efficiency has a statistically significant at a 5% level.

Table 4.3. Random Effect Model

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Capital adequacy	0.048	0.016	2.98	0.003	0.016	0.079	***
Asset quality	0.105	0.025	4.27	0	0.057	0.153	***
Management efficiency	-0.063	0.003	-19.97	0	-0.069	-0.057	***
Earnings management	-0.098	0.103	-0.96	0.339	-0.3	0.103	
Liquidity management	-0.002	0.011	-0.14	0.886	-0.024	0.02	
Constant	5.605	1.106	5.07	0	3.438	7.772	***

Mean dependent var.	0.385	SD dependent var.	3.574
Overall r-squared	0.942	Number of obs.	51
Chi-square	495.9	Prob. > chi2	0
R-squared within	0.882	R-squared between	0.969

**** p<0.01, ** p<0.05, * p<0.1*

Therefore, based on the random effect estimation on the table above all the results bear a resemblance to the pooled regression model. Both assets quality and management efficiency continued to be significantly at 5% level. However, capital adequacy became statistically significant compared to the pooled regression results where it was insignificant. The R-squared within, between, and overall represent a well fit of this model.

Table 4.4. Fixed Effect Estimation Model

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Capital adequacy	0.07	0.023	3	0.005	0.023	0.117	***
Asset quality	0.076	0.034	2.22	0.033	0.006	0.146	**
Management efficiency	-0.057	0.006	-9.32	0	-0.069	-0.044	***
Earnings management	-0.097	0.128	-0.76	0.455	-0.356	0.163	
Liquidity management	0.005	0.013	0.35	0.725	-0.022	0.031	
Constant	4.63	1.474	3.14	0.003	1.638	7.623	***

Mean dependent var.	0.385	SD dependent var.	3.574
R-squared	0.886	Number of obs.	51
F-test	54.49	Prob. > F	0
Akaike crit. (AIC)	70.357	Bayesian crit. (BIC)	81.948

**** p<0.01, ** p<0.05, * p<0.1*

Based on fixed effect estimation results, the model takes after random effect estimation results where capital adequacy, assets quality, and management efficiency continued to be statistically significant to explain financial performance at a confidence level of 5%. Though capital adequacy and asset quality remained to be positively correlated, management efficiency and earnings management negatively correlated, and liquidity management became positively correlated. To choose a compatible method for our panel data between the Random and the Fixed-effect model, the researcher conducted the Hausman test.

Table 4.5. Hausman Specification Model

	Fixed (b)	Random (B)	Difference (b-B)	sqrt(diag(V_b-V_B))S. E.
Capital adequacy	0.0699307	0.0476463	0.0222844	0.0169818
Assets quality	0.076212	0.105012	-0.0288	0.023949
Management efficiency	-0.0568865	-0.063231	0.0063449	0.0052168
Earnings management	-0.0966407	-0.098449	0.0018078	0.759036
Liquidity management	0.0045667	-0.001604	0.0061704	0.0063041

b = consistent under Ho and Ha; obtained from xtreg
B= inconsistent under Ha, efficient under Ho; obtained from xtreg
Test Ho: difference in coefficients not systematic
chi2(**5**) = (b-B)'[(V_ b-V_ B)^(-1)](b-B)
= 2.22
Prob>chi2 = 0.8182

The Hausman test in table 4.5 presents a chi-square of 2.22 with a probability of 0.8182 higher than 0.05 of significance. Since the Hausman test p-value is higher than 0.05, the random effect is appropriate to analyze the panel data (Schmidheiny, 2019). However, the random effect model robust would be conducted to correct homoskedasticity problems.

Table 4.6. Random EffectModel (Robust)

ROA	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Capital adequacy	0.048	0.016	2.99	0.003	0.016	0.079	***
Assets quality	0.105	0.034	3.08	0.002	0.038	0.172	***
Management efficiency	-0.063	0.004	-14.05	0	-0.072	-0.054	***
Earnings management	-0.098	0.095	-1.03	0.302	-0.285	0.089	

Liquidity management	-0.002	0.012	-0.14	0.892	-0.025	0.022	
Constant	5.605	1.221	4.59	0	3.213	7.998	***
Mean dependent var.	0.385	SD dependent var.			3.574		
Overall r-squared	0.942	Number of obs.			51		
Chi-square	4106.233	Prob. > chi2			0		
R-squared within	0.882	R-squared between			0.969		
*** p<0.01, ** p<0.05, * p<0.1							

From these outcomes in table 4.12, the model below might be formulated.
ROA= 5.605 + 0.048CA + 0.105AQ - 0.063ME - 0.098EM - 0.002LM + E
Where:
CA = Capital Adequacy
AQ = Assets Quality
ME = Management Efficiency
EM = Earnings Management
LM = Liquidity Management
E = Error term

This model Random effect fit the data with R^2 = 94.2 and statistical significant at 5% (p-value = 0.000). It presents that capital adequacy, asset quality, and management efficiency are statistically significant at a 5% level. Any increase of one percentage in capital adequacy, assets quality, and management efficiency, ROA is anticipated to rise by 0.048, 0.105, and drop by 0.063 consecutively. Earnings management and liquidity management have a negative correlation to explain ROA though their correlation is insignificant at a p-value of 5%. It means that an increase of one percent in earnings management and liquidity management will make the financial performance to reduce by 0.098 and 0.002 consecutively. The study findings contrast with Sylvain's study where liquidity management and asset quality were positively correlated.

4.4 Effect of Moderation on Financial Performance

The sixth objective of this study was to examine the effect of bank size on the performance of Rwandan commercial banks. It had been introduced in the study as a third variable to seek the way it impacts the relationship between the predictor and dependent variables.

Table 4.7. Bank Size as an Interaction Term Between Capital Adequacy and ROA

Return on Assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Capital adequacy	0.539	1.121	0.48	0.63	-1.657	2.736	
Bank size	3.097	1.857	1.67	0.095	-0.544	6.737	*
c.Capitaladequacy#c.Bank.Size	-0.026	0.06	-0.43	0.664	-0.143	0.091	
Constant	-58.96	35.372	-1.67	0.096	-128.289	10.369	*
Mean dependent var.	0.385	SD dependent var.			3.574		
Overall r-squared	0.412	Number of obs.			51		
Chi-square	6.958	Prob. > chi2			0.073		
R-squared within	0.107	R-squared between			0.495		
*** p<0.01, ** p<0.05, * p<0.1							

The Table above presents the effect of bank size (moderating variable) between capital adequacy and financial performance that is measured by the return on investment (ROA). The study found that the bank size standard deviation above the mean, below the mean and within have a slightly parallel positive effect. However the effect is insignificant at a 5% level as shown in the Table above. The Table presents that the moderating variable itself has a positive correlation of 3.097 at R-squared of 0.412 it would lower the value of capital adequacy by 0.026. In this case, there is a positive predictive relation between capital adequacy and financial performance.

Table 4.8Bank Size as an Interaction Term Between Asset Quality and ROA

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Asset quality	-1.213	0.463	-2.62	0.009	-2.121	-0.305	
Bank size	1.766	0.86	2.05	0.04	0.08	3.451	
c.Assetquality#c.Bank Size	0.06	0.026	2.36	0.018	0.01	0.11	
Constant	-31.986	16.683	-1.92	0.055	-64.683	0.711	
Mean dependent var.	0.385	SD dependent var.			3.574		
Overall r-squared	0.618	Number of obs.			51		
Chi-square	290.933	Prob. > chi2			0		
R-squared within	0	R-squared between			0.884		
*** *p<0.01, ** p<0.05, * p<0.1*							

The results concluded that a two-way interaction is statistically significant at a p-value of 0.05. Bank size has a positive effect on financial performance at a value of 1.766. The interaction term c.assetquality#c.bank size has a positive relation of 0.060. It means that one unit change in interaction will make the value of asset quality increase to -1.153. The effect of asset quality's on banks' performance is being determined by the plot. It shows a negative correlation as per appendix. The bank size standard deviation above the mean, within and below the mean indicates a negative association between asset quality and financial performance.

Table 4.9BankSize as an Interaction Term between Management Efficiency and ROA

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Management efficiency	0.042	0.12	0.35	0.728	-0.193	0.277	
Bank size	0.731	0.4	1.84	0.066	-0.049	1.512	*
c.Managementefficiency#c.Bank size	-0.006	0.01	-0.78	0.438	-0.02	0.009	
Constant	-7.473	6.6	-1.13	0.257	-20.402	5.455	
Mean dependent var.	0.385	SD dependent var.			3.574		
Overall r-squared	0.941	Number of obs.			51		
Chi-square	199.054	Prob. > chi2			0		
R-squared within	0.719	R-squared between			0.984		
*** *p<0.01, ** p<0.05, * p<0.1*							

From the Tableabove, the results conclude that the interaction term (Bank size) has a negative correlation with an insignificant value of 0.438. The bank size itself has a positive impact on ROA at 0.731. However, the table itself cannot produce a straight interpretation to conclude the effect of management efficiency on financial performance when an interaction term gets introduced. The results have plotted to give the right link between management efficiency and financial performance. The margins plot (appendix) shows a negative correlation when the bank's size standard deviation is above, below, and within the mean. Though, the relation is insignificant at a p-value of 0.438.

Table 4.10Bank Size as an Interaction term Between Earnings Management and ROA

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Earnings management	-10.103	7.76	-1.3	0.193	-25.306	5.099	
Bank size	-2.273	3.5	-0.65	0.516	-9.138	4.592	
c.Earningsmanagement#c.Bank Size	0.518	0.4	1.28	0.2	-0.274	1.31	
Constant	45.07	67.1	0.67	0.502	-86.436	176.577	
Mean dependent var.	0.385	SD dependent var.			3.574		
Overall r-squared	0.457	Number of obs.			51		
Chi-square	19.762	Prob. > chi2			0		
R-squared within	0.179	R-squared between			0.508		
*** *p<0.01, ** p<0.05, * p<0.1*							

The findings show that bank size's standard deviation above the mean is slightly positive. The standard deviation below the mean exhibits a negative link; the standard deviation at the mean is a bit negative (appendix). It means that the standard deviation below the mean, the Earnings management is statistically negative associated with banks' performance. The standard deviation of moderator above the mean produces a

slightly positive effect between our predicting variable and outcome variable, and standard deviation at the mean shows a negative correlation to some degree between predicting variable and financial performance. However, the effect is insignificant at the 0.05 level. The findings in the table above concluded that Bank size has a negative correlation on ROA with a value of 2.273; the interaction variable has a positive connection with Earnings by 0.518.

Table 4.11. Bank Size as an Interaction Term between Liquidity Management and ROA

Return on assets	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
Liquidity management	0.026	1.45	0.02	0.986	-2.82	2.872	
Bank size	2.02	2.83	0.71	0.476	-3.53	7.569	
c.Liquiditymanagement#c.Bank Size	-0.001	0.08	-0.01	0.991	-0.15	0.148	
Constant	-38.181	54.7	-0.7	0.485	-145.435	69.072	

Mean dependent var.	0.385	SD dependent var.	3.574
Overall r-squared	0.509	Number of obs.	51
Chi-square	6.937	Prob. > chi2	0.074
R-squared within	0	R-squared between	0.708

**** p<0.01, ** p<0.05, * p<0.1*

The results in the table above show that each unit increases from bank size will increase the value of ROA by 2.020, Liquidity management would reduce by 0.001, and interaction term will drop to 2.019 (2.020 – 0.001). The overall R-squared is 0.509 at a p-value of 0.074. It finally shows that standard deviation above the mean, below, and at the mean (appendix) liquidity management has a slightly positive link on financial performance in Rwandan Commercial Banks.

4.5 Discussion of Findings

Based on the study findings, capital adequacy has a significant positive statistical impact to ascertain the financial performance of financial institutions. This study shares the same results with research conducted by (Dahiyat, 2012). However, some studies contradict this result Alshatti, (2015). Asset quality and financial performance are positively significant. It means that the lower the NPLs ratio, the higher profit. It unanimously confirms some studies conducted internationally like Ozurumba (2016); Kadioglu et al. (2017). However, there is a mismatch with some studies like Mausya (2009) and Kamanzi (2015). The results from findings continue to indicate that operational expenditure over net operating income has a negative and significant influence on financial performance in commercial banks. It has been confirmed by some other studies conducted at both the national and international levels. The more management efficiency goes up, the more the performance in commercial banks will increase. Earnings management and return on assets have a negative statistical correlation; this is approved by (Aguenaous, et al. 2017), where the effect is not significant. However, this contrasts different studies conducted at the international where other studies found a positive association study (Kumar, 2006) and (Mengistu, 2015). Based on the statistical findings, the study shows unanimous results between the literacy of liquidity management and the financial performance among commercial banks. This paper shows that ROA and liquidity management are negative correlated with -0.002 of the coefficient. However, the effect is not significant. Mwangi (2014), Mucheru et al. (2017), and Muthoga (2019) disclosed that retaining much liquidity requires many costs that may cause a fall in the profits. Finally, the investigation reported that bank size has a direct positive effect on financial performance. However, the impact is statistically significant when bank size has interacted with asset quality. It can be said that more studies are still needed to construct more substantive judgments between the CAMEL rating system and commercial banks' performance.

V. Conclusion

The study concluded that CAMEL factors affect financial performance in Rwandan commercial banks. Capital adequacy, asset quality, and management efficiency have a statistically significant effect at a 5% level to explain ROA. However, earnings management and liquidity management are negative correlations, though their correlation is insignificant at a p-value of 5%. The study also concluded that the moderation variable affects financial performance. However, the effect is statistically significant if it has interacted with asset quality. The study recommends that Rwanda National Bank and banks' management should work together to come up with policies and remedies that would ditch financial risks but improve financial performance in financial institutions. Banks management is recommended to formulate policies and strategies that will boost financial inclusion and make it easier access to a massive of citizens. This would be achieved through an increasing number of agents, ATMs and mobile banking services, and other new technologies that would help banks to get closer to their customers and heighten customers' deposits. In the end, future researchers and academicians are

recommended to consider an improved CAMEL model with sensitivity and refer to this study to enhance vigorous analysis.

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APPENDIX1: DIAGNOSTIC TEST RESULTS

The correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Return on assets	1.000					
(2) Capital adequacy	-0.482	1.000				
(3) Asset quality	-0.511	0.296	1.000			
(4) Management efficiency	-0.963	0.533	0.636	1.000		
(5) Earnings management	0.062	0.118	-0.158	-0.090	1.000	
(6) Liquidity management	-0.405	0.296	0.325	0.432	-0.486	1.000

Variance Inflation Factor for Multicollinearity

	VIF	1/VIF
Management efficiency	2.284	.438
Liquidity management	1.716	.583
Asset quality	1.711	.585
Capital adequacy	1.526	.655
Earnings management	1.465	.683
Mean VIF	1.741	.

The Skewness and Kurtosis Test for Normality

Variable	Obs.	Pr.(skewness)	Pr.(kurtosis)	Adj. Chi2(2)	Prob. >chi2
Return on assets	51	0	0	32.13	0
Capital adequacy	51	0	0	32.66	0
Asset quality	51	0	0	28.39	0
Management efficiency	51	0	0	41.77	0
Earnings management	51	0.008	0.94	6.47	0.039
Liquidity management	51	0.168	0.616	2.26	0.323

IM-Test for Homoskedasticity

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity
chi2(20) = 48.75
Prob.> chi2 = 0.0003

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df.	p
Heteroskedasticity	48.750	20	0.000
Skewness	12.060	5	0.034
Kurtosis	2.340	1	0.126
Total	63.150	26	0.000

Breusch-Godfrey LM Test for Autocorrelation

chi2	df	Prob>Chi2
3.389	5	0.640

H0: no serial correlation

The Phillips-Perron Test for Unit Root (Stationarity Test)

		Critical value			Comment
Variable	Test statistics	1%	5%	10%	
Return on assets	-3.653	-4.15	-3.5	-3.18	Stationary
Capital adequacy	-4.397	-4.15	-3.5	-3.18	Stationary
Asset quality	-4.343	-4.15	-3.5	-3.18	Stationary
Management efficiency	-3.796	-4.15	-3.5	-3.18	Stationary
Earnings management	-2.89	-4.15	-3.5	-3.18	Non-stationary
Liquidity management	-4.602	-4.15	-3.5	-3.18	Stationary

The Hausman Specification Test

	Fixed (b)	Random (B)	Difference (b-B)	sqrt(diag(V_b-V_B))S. E.
Capital adequacy	0.0699307	0.0476463	0.0222844	0.0169818
Assets quality	0.076212	0.105012	-0.0288	0.023949
Management efficiency	-0.0568865	-0.063231	0.0063449	0.0052168
Earnings management	-0.0966407	-0.098449	0.0018078	0.759036
Liquidity management	0.0045667	-0.001604	0.0061704	0.0063041

b = consistent under Ho and Ha; obtained from xtreg

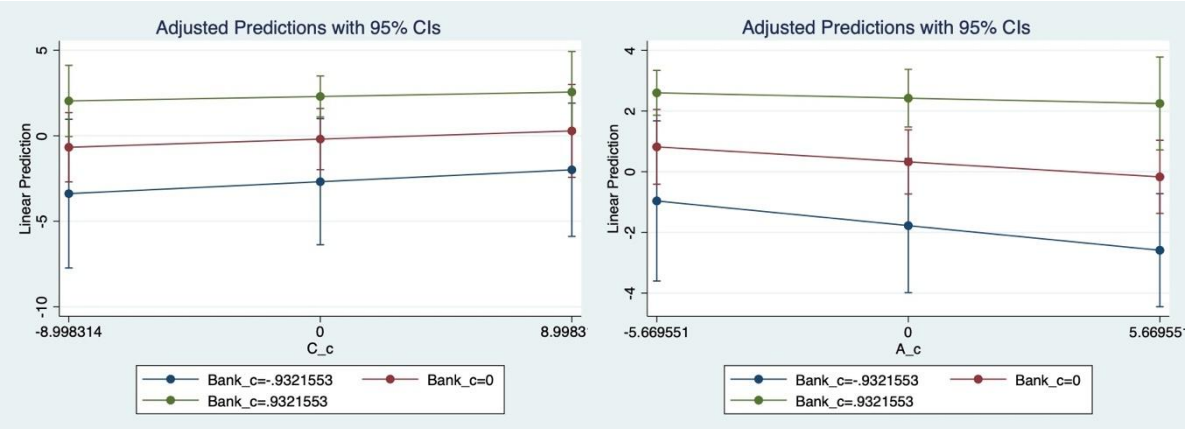
B= inconsistent under Ha, efficient under Ho; obtained from xtreg

Test Ho: difference in coefficients not systematic

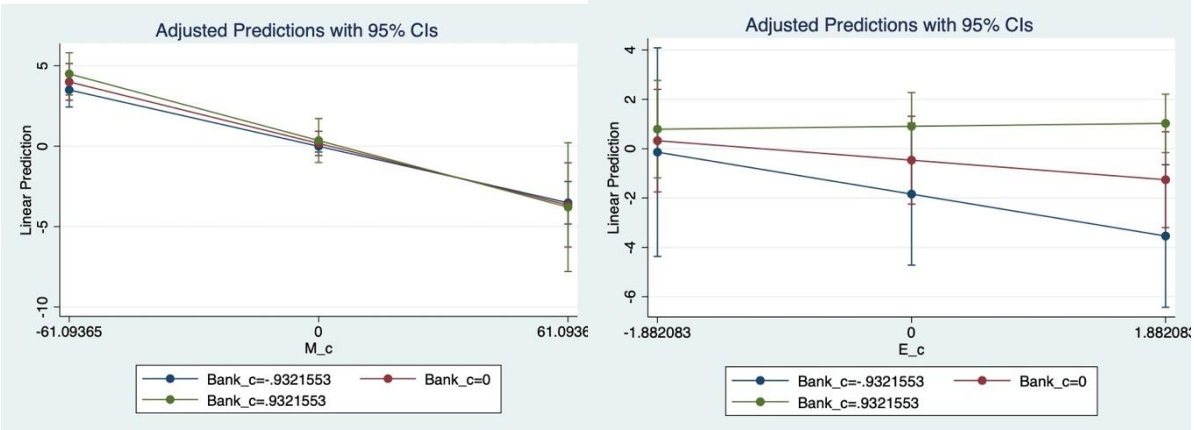
chi2(**5**) = (b-B)'[(V_ b-V_ B)^(-1)](b-B)
= 2.22

Prob>chi2 = 0.8182

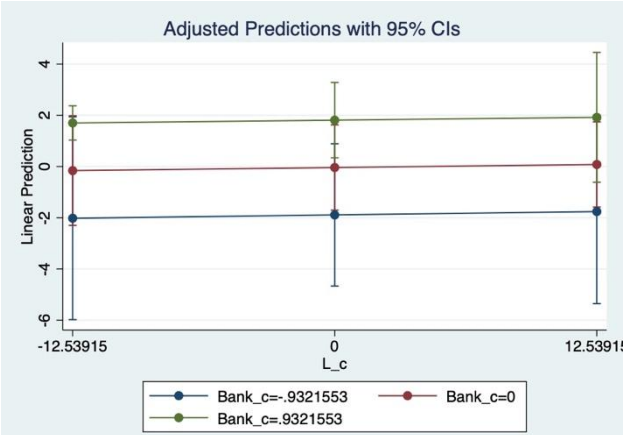
APPENDIX 2: EFFECT OF MODERATION ON FINANCIAL PERFORMANCE



Bank size intermediated between CA and ROA Bank size intermediated between AQ and ROA



Bank size intermediated between ME and ROA Bank size intermediated between EM and ROA



Bank size intermediated between LM and ROA

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