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Effect of Capital Adequacy on Operational Efficiency of Commercial Banks in Kenya

Jedidah Wanjagi
Tabitha Nasieku
Olanrewaju Fatoki
Department of Economics, Accounting and Finance,
School of Business and Entrepreneurship,
Jomo Kenyatta University of Science and Technology, Nairobi, Kenya

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Abstract

This study investigates the impact of capital adequacy on the operational efficiency of Kenyan banks, highlighting its importance for financial stability and risk management using a two-step analytical approach: first, Stochastic Frontier Analysis was used to determine operational efficiency scores for each bank; second, a panel Generalized Method of Moments (GMM) regression model assessed the relationship between these scores and capital adequacy. The study employed a panel GMM Method, accounting for individual and time-specific effects as well as endogeneity and correlation biases. The study concentrated on data from 2008 to 2022, spanning a period of 14 years of data. Data was collected from verified audited financial statements from the Central Bank of Kenya and the respective banks websites. The study revealed a positive relationship between capital adequacy and operational efficiency. Specifically, an increase in capital adequacy was associated with a 10.32% improvement in operational efficiency. The study also found that market structure plays a significant role in this relationship. Based on these findings, policymakers are recommended to adopt comprehensive strategies focusing on stringent capital adequacy regulations to enhance bank performance and stability.

Keywords: Operation Efficiency, Capital adequacy, Stochastic Frontier Analysis

Introduction

Capital adequacy refers to the level of capital that a commercial bank requires to allow them to endure the risks such as operational, credit or market risks that are prone in order to absorb the possible losses and protect firm debtors (Mendoza & Rivera, 2017) Capital is one of the important components that have an influence on operational efficiency of banks. According to Basel II accord indicates that a bank should hold minimum tier I capital of 8% which is the ratio of core capital to risk weighted asset. Moreover, banks should have minimum tier 2 capital of 12% that being the ratio of tier plus asset revaluations and term debt to risk weighted asset and minimum of tier 3 being 12% being ratio of tier 1 plus tier 2 plus short-term debt to risk weighted assets. Tier 1 in banks is known as regulatory capital while tiers 2 and 3 are termed as supplementary capital (Greuning & Bratanovic, 2009).

According to Njeule (2013), the banking sector plays a crucial role in driving economic growth and development in Kenya. Banks provide essential services such as loans, savings, and investment opportunities, which are vital for businesses to expand, individuals to invest, and the government to finance public projects. Like any other sector, the banking industry in Kenya faces various challenges, including regulatory compliance, competition, cybersecurity risks, and economic volatility (Alabi et al.,2023). However, there are also opportunities for innovation, expansion into underserved markets, and leveraging technology to enhance financial inclusion and efficiency.

The banking sector in Kenya is vibrant, competitive, and dynamic and has enjoyed robust and sustained growth over the period 2000 to 2014 (Kamau & Were, 2013). In terms of asset holding, foreign banks were found to account for about 34% of the assets in banks as of 2013 (Wanjagi, 2018). This presence of foreign banks can bring several benefits to the local banking sector, including access to international expertise, technology, and capital, which can contribute to overall growth and innovation (Léon & Zins, 2020). Additionally, competition from foreign banks can drive local banks to improve their services and products, ultimately benefiting customers. However, there may also be challenges associated with the dominance of foreign banks, such as potential risks related to capital flight or a decrease in market share for domestic banks.

The influence of capital adequacy on bank performance is substantial, as it directly impacts the availability of funds for loans, thereby affecting the

level of risk absorption. Capital serves as a protective buffer against losses arising from various uncertainties, acting as a constraint to prevent defaults and safeguard depositors and creditors during operational and liquidation phases (Fekadu, 2015).

In Kenya, recapitalization measures are adopted by regulators during periods of heightened capital adequacy ratios to realign the existing capital structure. Adequate capital supports recapitalization efforts by meeting individual banks' needs, such as increasing minimum paid-up capital, thereby enabling efficient operations and customer service (Obuobi et al, 2019). This corrective measure addresses the widespread distress in the banking sector, driven by concerns about solvency and stability. Studies, such as the one conducted by Nyaundi (2015), highlight the nonlinear impact of capital requirements on bank competition and stability. Increased capital requirements yield competitive advantages once consolidation occurs, with bank structure significantly influencing performance. These findings underscore the role of capital regulation in shaping bank competition, performance, and financial stability in Kenya.

The significance of capital adequacy in enhancing bank efficiency cannot be overstated, as it directly affects loan availability and risk absorption levels. Mandatory capital ratios help establish profit targets for banks, influencing their cost of capital and overall funding costs. However, higher capital adequacy ratios may constrain banks' competitiveness and growth potential, impacting their ability to meet lending obligations and fulfill their primary function of money creation. Despite the rapid growth in literature on banking sectors in developing countries, research on the impact of capital requirements on efficiency remains limited. Given the prominence of the banking sector in these economies, this study aims to address this gap by empirically analyzing the impact of capital adequacy requirements on the operation efficiency of commercial banks in Kenya, and further establish the moderating role of market structure on the relationship between the two variables.

Research hypotheses

The research was guided by the following null hypothesis:

- H_{01}: There is no significant relationship between capital adequacy and operational efficiency of commercial banks in Kenya.
- H_{02}: Market structure does not moderate the relationship between capital adequacy and operational efficiency of commercial banks in Kenya.

Literature review

Theoretical review

In the theory of financial intermediation, the focus squarely rests on the pivotal role played by intermediaries, primarily banks, within the financial system. As delineated by Allen and Santomero (1997), these intermediaries serve as vital conduits, facilitating the movement of funds from savers to borrowers, thereby underpinning economic activity and fostering growth. Central to this theory is the concept of operational efficiency, which denotes the adept management of operations by financial intermediaries to attain their objectives effectively. Operational efficiency assumes paramount importance in the context of financial intermediation due to several interrelated factors. Firstly, intermediaries engage in risk transformation, where they assume certain risks from savers and repackage them into more manageable forms for borrowers. This process necessitates efficient operational management to mitigate risks while keeping costs at bay. Economies of scale and scope further underscore the significance of operational efficiency. By streamlining operations, intermediaries can reduce average costs and broaden their suite of financial offerings, thereby enhancing their competitive edge in the market. Another crucial aspect is the information advantage wielded by financial intermediaries. Armed with more comprehensive borrower information than individual savers, intermediaries can more accurately assess creditworthiness and navigate potential pitfalls like adverse selection and moral hazard. Here, operational efficiency in gathering, analyzing, and leveraging information becomes indispensable for maintaining this informational edge.

Moreover, financial intermediaries act as cost-efficient platforms for fund pooling and capital access. Through operational efficiency, they minimize transaction costs, making it feasible to aggregate funds from multiple savers and provide convenient access to capital for borrowers. This optimization extends to liquidity management as well. Intermediaries' adept at operational efficiency can effectively balance the demands of liquidity withdrawals with profitable lending activities, ensuring sustained financial stability. Furthermore, regulatory compliance constitutes a significant operational challenge for financial intermediaries. Efficient operational frameworks are essential for adhering to regulatory requirements while minimizing associated costs and disruptions to business operations. In summary, operational efficiency lies at the heart of the theory of financial intermediation, enabling intermediaries to fulfill their crucial functions effectively while mitigating risks and minimizing costs. Through efficient operations, intermediaries bolster their competitiveness, attract capital from savers, and allocate resources to productive endeavors, thereby catalyzing overall economic growth and development.

Empirical literature

Capital adequacy and the effect it has on operational efficiency of banks has elucidated serious debate in the banking industry. Adequate capitalization allows banks to absorb losses without jeopardizing their financial stability. This enables them to engage in riskier activities, such as lending, while still maintaining prudent risk management practices. Efficient banks not only maintain sufficient capital but also effectively allocate it to mitigate risks and optimize returns. Well-capitalized banks have a competitive advantage in the market as they can attract deposits, lend more, and expand their operations with confidence (Pradhan et al.,2017). Moreover, efficient banks can achieve economies of scale and scope, reducing their cost of operations and enhancing profitability. This competitive advantage allows them to thrive in a highly competitive banking landscape. Compliance with capital adequacy regulations is essential for banks to operate legally and maintain the trust of depositors and investors (Sentero, 2013).

Odunga, Nyangweso, Carter, and Mwarumba (2013) conducted a study examining the capital adequacy, credit risk, and operational efficiency of banking institutions in Kenya. Their findings revealed a positive relationship between capital adequacy and operational efficiency. The positive relationship they discovered between capital adequacy and operational efficiency suggests that as banks maintain higher levels of capital, they are likely to operate more efficiently. The findings of this study highlight the critical role of capital adequacy in driving operational efficiency within banking institutions, emphasizing the need for both banks and regulators to prioritize capital management strategies to achieve sustainable performance and stability in the financial system.

Pradhan and Shrestha (2017) conducted a study examining how capital adequacy and operational efficiency affect the financial performance of commercial banks in Nepal. Their findings revealed that factors such as loan loss provision to total loan, core capital ratio, risk-weighted ratio, and total capital ratio were associated with a detrimental effect on the financial performance of Nepalese commercial banks. This indicates that higher levels of capital might not necessarily translate into improved financial performance. This finding could prompt banks to reevaluate their capital allocation strategies and consider optimizing capital utilization to enhance profitability.

Hussein et al (2017) conducted a study examining operational efficiency within 17 Islamic banks in Sudan spanning the years 1990 to 2000, employing the Stochastic Frontier Analysis (SFA) methodology. The research outcomes revealed a positive relationship between increased capital adequacy ratio and elevated operational efficiency costs. Moreover, the

findings implied that foreign banks outperformed state-owned banks in terms of efficiency. The study suggests that a higher capital adequacy ratio is associated with increased operational efficiency costs.

Ding and Sickles (2018) conducted research examining the relationship between capital adequacy, portfolio risk, and frontier efficiency in U.S. banks spanning from 2001 to 2016. Their findings indicated that banks with higher efficiency levels are capable of boosting their capital reserves while simultaneously assuming greater credit risk. The study employed Stochastic Frontier Analysis (SFA) to construct a frontier representing the cost of banks' efficiency levels, serving as a proxy for their overall performance. One of the key findings of the study suggests that more efficient banks have the ability to enhance their capital reserves while also taking on increased credit risk. This finding is significant as it challenges conventional notions that increasing capital reserves necessarily comes at the expense of assuming higher levels of risk.

In an empirical analysis utilizing a sample of commercial banks in Kenya, Odunga (2016) undertook an investigation into the determinants of bank operating efficiency. The study discerned bank capital adequacy as a paramount factor significantly impacting operational efficiency. Odunga (2016) asserted that augmenting their capital reserves is imperative for banks in mitigating operational costs effectively.

Siddik and Kabiraj (2019) conducted a study examining the influence of capital adequacy on the operational efficiency of banks in Bangladesh. They utilized panel data from 23 commercial banks in Bangladesh spanning the years 2013 to 2017 for their analysis. The findings revealed a notable and positive relationship between capital adequacy ratios and the operational efficiency of banks. Additionally, the findings suggested that meeting minimum capital requirements prompts banks to reassess their internal operational policies, including aspects such as corporate governance, risk assessment methodologies, credit evaluation procedures, recruitment of skilled personnel, and enhancement of internal control mechanisms.

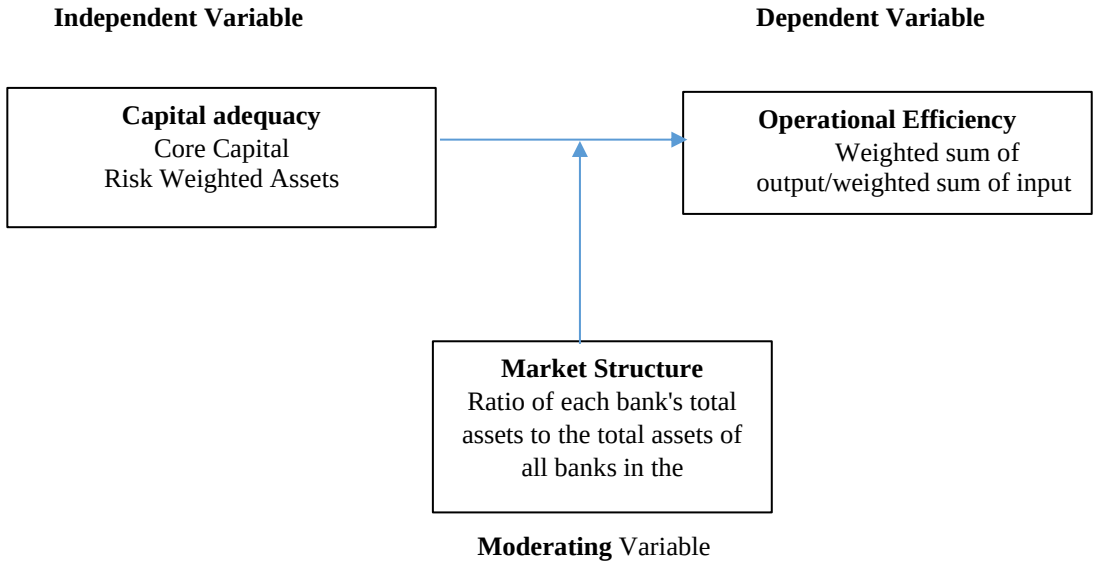
Odekina et al., (2019) conducted a study examining the impact of capital adequacy, credit risk, and operating efficiency on the performance of commercial banks in Nigeria. Secondary panel data from the Central Bank of Nigeria (CBN) and Annual Bank Reports were utilized for the analysis. The study employed the panel random effect regression method to analyze the data. The findings revealed a noteworthy positive relationship between capital adequacy and the financial performance of the banks. The results of the analysis revealed a significant positive effect of capital adequacy on the financial performance of commercial banks in Nigeria. This suggests that maintaining sufficient capital reserves is vital for enhancing the overall performance and stability of banks.

Empirical evidence reveals a disparity between capital adequacy and operational efficiency. While many researchers typically use financial performance as the dependent variable, this study opts for operational efficiency due to its ability to encompass various input and output factors, thus providing impartial findings. Moreover, operational efficiency considers the error term, which is often overlooked when using performance as the dependent variable.

Conceptual framework

The research was guided by the following conceptual framework.

Figure 1: Conceptual framework



Source: Author, 2024

Research methodology

Data collection

The research gathered secondary data spanning 14 years, from 2008 to 2022, sourced from verified audited financial statements acquired from the Central Bank of Kenya and the websites of the respective banks. A structured data collection form was utilized to extract information from these financial statements. This form facilitated efficient extraction, coding, and editing of the data, streamlining the subsequent processing and analysis, as suggested by Saunders (2009). The collected data underwent a comparison process, cross-referencing information from both the audited financial statements and the data sourced from the Central Bank of Kenya to ensure accuracy.

Determination of operational efficiency

The research utilized Stochastic Frontier Analysis (SFA) to assess the operational efficiency of banks in Kenya. The stochastic production function within the translog cost function, following the framework outlined by Coelli et al., (2005) was utilized.

The SFA model utilized input variables such as loans and other assets indicative of earnings quality. Output variables encompass labor, quantified as personnel expenses relative to total assets; capital, calculated by subtracting personnel expenses from operating expenses and then dividing by fixed assets; and deposits, determined by total interest expenses divided by total funding.

Model specification and Estimation technique

Given the potential relationship between the independent variable, the following model was specified:

$$Operational\ Efficiency = \alpha_0 + Capital\ Structure_{it} + \varepsilon_{it} \text{.....1}$$

The Dynamic Panel Models (DPMs) was used for analysis.

Testing for moderation effect of market structure

To assess the moderation effect of market structure on relationship between operational efficiency of banks and capital adequacy, the analysis used the hierarchical regression analysis, where three regression analysis models tested for moderation. The use of hierarchical regression analysis in this study indicates a sophisticated approach to understanding the interplay between market structure, capital adequacy, and operational efficiency within the banking sector. Hierarchical regression allows researchers to examine the incremental contribution of different variables while controlling for the effects of others, which is particularly useful when investigating complex relationships like those in banking.

The following models was used to test for moderation effect of market structure.

$$Y = \alpha_0 + \varepsilon\beta_3 X_1 X_3 + \varepsilon\beta_i X_i + \varepsilon \text{.....(i)}$$

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_3 + \varepsilon \text{.....(ii)}$$

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_3 + \beta_3 X_1 X_3 + \varepsilon \text{..... (iii)}$$

$\beta_3 X_1 X_3$ = Interaction term (Market structure and capital adequacy)

In testing for moderation effect of market structure, the interaction term ($\beta_3 X_1 X_3$) was included in the models. The interaction term of this study was the product market structure and capital adequacy. Moderation occurs when the link between an independent and dependent variable shift in

magnitude or sign when a moderator is introduced, as described by Preacher et al. (2007) and Baron and Kenny (1986). We employed a hierarchical multiple regression strategy in testing for the moderation effect of market structure. The first model(i) examined how changes in capital adequacy affected operational efficiency. The second model(ii) was to test the hypothesis that the independent variables (capital adequacy) and the moderator (market structure) influence the dependent variable (operational efficiency). The third model (iii) required the incorporation of an interaction term, which is the multiplication product of the capital structure and the market structure. Using this step, moderation is presumed to be taking place when the introduction of the interaction term in the model alters the overall effect of the model (R2) and the predictor variables, the moderator, and the interaction between the two are all statistically significant.

Estimation Technique

The data was tested for normality, multicollinearity, heteroscedasticity tests and cointegration test. The study used the panel Generalized Method of Moments (GMM) techniques account for the presence of both individual-specific and time-specific effects and help mitigate potential bias in the estimation due to endogeneity and correlation.

Findings and Discussion

Descriptive Statistics

Table 1: Summary statistics for the input and output variables

Variable	Mean	SD	Min	Max	Skewness	Kurtosis
Total Cost	4.12e+06	6.50e+06	0.0000	4.17e+07	2.8274	11.9786
Total Loans	2.94e+07	4.95e+07	0.0000	3.73e+08	3.1555	15.4550
Earning Assets	1.55e+07	2.29e+07	0.0000	1.35e+08	2.3981	8.9840
Labor	0.0410	0.0394	0.0000	0.6756	8.9566	130.5773
Capital	0.1370	0.1298	-0.4254	1.1218	2.5612	18.6752
Deposits	0.2640	0.3314	0.0000	6.4895	12.3456	222.7268

Source: Author, 2024

The findings presented in Table 1 illustrate that the mean values of the input variables—total loans, earnings from assets, and total costs—were approximately Ksh 29.4 million, Ksh 15.5 million, and Ksh 4.12 million, respectively. These variables also demonstrated standard deviations of approximately Ksh 49.5 million, Ksh 22.9 million, and Ksh 6.5 million, respectively. A higher standard deviation implies greater variability around the mean, with total loans exhibiting the highest deviation, suggesting significant variation around its mean.

Regarding skewness and kurtosis, total costs, total loans, and earnings from assets showed skewness values of 2.82, 3.15, and 2.39,

respectively, and kurtosis values of 11.97, 15.45, and 8.98, respectively. These values indicate a degree of asymmetry and heavier tails in their distributions, suggesting the presence of outliers or extreme values.

Operational Efficiency by Year

Table 2: Summary statistics of Operational Efficiency by Year

Year	Mean	SD	Min	Max	Skewness	Kurtosis
2008	0.7578	0.1263	0.1961	0.8945	-2.9774	13.5947
2009	0.7605	0.0723	0.5705	0.9068	-0.2948	3.4168
2010	0.7843	0.0824	0.4850	0.9052	-1.5619	6.7790
2011	0.7969	0.0594	0.6231	0.9210	-0.8374	4.7352
2012	0.8114	0.0616	0.5944	0.9089	-1.2740	5.9688
2013	0.8268	0.0528	0.6402	0.9158	-1.3658	5.7577
2014	0.8205	0.0526	0.6760	0.9522	-0.8667	4.8199
2015	0.8108	0.0642	0.6399	0.9720	-0.1833	4.3506
2016	0.7872	0.1495	0.0351	0.9041	-3.9560	19.0920
2017	0.8094	0.1707	0.0505	0.9197	-3.3128	13.4737
2018	0.8325	0.0398	0.6397	0.8942	-3.1371	15.5698
2019	0.8286	0.0385	0.6561	0.8994	-2.3394	11.6586
2020	0.8167	0.1597	0.0784	0.9372	-3.8279	16.7701
2021	0.8457	0.0380	0.7408	0.9338	-0.6116	4.1498
2022	0.8337	0.0809	0.3989	0.8900	-4.7545	26.1325
Total	0.8092	0.0965	0.0351	0.9720	-4.3511	29.6293

Source: Author, 2024

The average efficiency score for all banks in table 2 was 0.8092, implying an overall efficiency level of around 80.1 percent. Furthermore, the skewness of -4.3511 indicates that a few banks may have significantly low efficiency scores, skewing the distribution to the left. The kurtosis of 29.6293 suggests that the distribution of efficiency scores has heavy tails, signifying the presence of numerous outliers, both high and low. Understanding the factors behind these efficiency variations could offer insights into improving the overall performance of the banking sector. Addressing inefficiencies in underperforming banks is crucial for bolstering the stability and resilience of the entire banking system.

Dependent, Independent, and Moderating Variables

Table 3: Summary statistics of Dependent, Independent, and Moderating Variables

Variable	**Mean**	**SD**	**Min**	**Max**	**Skewness**	**Kurtosis**
Operation Efficiency	0.8092	0.0965	0.0351	0.9720	-4.3511	29.6293
Market Structure	0.8626	1.0660	0.0000	23.3410	16.9429	349.609
Capital Adequacy	0.2509	0.2017	0.0008	2.7039	5.3061	51.8249

Source: Author, 2024

Based on the descriptive statistics in table 3, banks' capital adequacy exhibited an average value of 0.2509 with a standard deviation of 0.2017. Moreover, the skewness and kurtosis were found to be 5.3061 and 51.82 respectively. The maximum observed capital adequacy value among the banks was 2.7039, while the minimum stood at 0.0008. These descriptive statistics provide valuable insights into the distribution and variability of capital adequacy among the banks. The high skewness suggests that while the average capital adequacy might be moderate, there are several banks with exceptionally high ratios, potentially indicating a subset of well-capitalized banks. The high kurtosis indicates that the distribution has heavier tails and more extreme values, which could be due to factors such as regulatory requirements or differing business models among banks. Understanding these statistics can help stakeholders in assessing the overall health and stability of the banking sector, identifying outliers, and making informed decisions regarding risk management and regulatory policies.

Diagnostic Tests

The Normality Test, which aimed to ascertain whether the dataset adhered to a normal distribution. Utilizing the Shapiro-Wilk test along with graphical representations such as Kernel density and Q-Q plots, it was established that the data did not conform to a normal distribution, necessitating data transformation. Multicollinearity tests were conducted to identify any multicollinearity among the predictor variables in the regression analysis. Based on the assessment of the variance inflation factor (VIF), it was determined that multicollinearity did not pose an issue within the dataset. The researcher employed the Breusch-Pagan test to examine heteroskedasticity, where the dispersion of a dependent variable varies across different levels of an independent variable. Following the analysis, the researcher inferred that the data exhibited homoscedasticity. Additional examinations were conducted, encompassing tests for stationarity, panel autocorrelation, and cointegration. The findings indicated the absence of serial correlation issues and the lack of long-term relationships among variables (cointegration). Moreover, the stationarity test revealed that certain variables initially exhibited non-stationarity at their original levels, prompting the application of differencing once to achieve stationarity. The Hausman test was employed to assess the potential existence of endogeneity and to determine the suitable model selection between random effects and fixed effects. The findings indicated that the fixed effect model was the preferred option. However, the test also uncovered the presence of an endogeneity problem, requiring the estimation of a robust model to address these issues.

Model estimation results

Table 4: Effect of capital adequacy on operational efficiency

	Panel GMM
	Operational efficiency
Capital Adequacy	0.1032***
	(0.0553)
Constant	0.7843***
	(0.0137)
Observations	546
Number of Group	40

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2024

The results of the panel GMM Model in table 4 demonstrate that capital adequacy exerted a beneficial effect on banks' operational efficiency, leading to an approximate increase of 10.32%. Specifically, the panel GMM outcomes highlight that capital, which is a compulsory minimum reserve which banks must have, plays a particularly beneficial role in improving operational efficiency.

The findings concur with research by Odekina (2019), that indicated capital adequacy had a significant positive effect on the bank's financial performance. In contrast, Pradhan and Shrestha (2017) research indicates that loan loss provision to total loan, core capital ratio, risk weighted ratio, total capital ratio has negative impact on financial performance of commercial banks. However, Siddik and Kabiraj (2019), further reinforce this finding, the research indicates a significant positive impact of capital adequacy ratio on operational efficiency of banks. This implies that capital adequacy increases the operational efficiency of banks.

Hypothesis Testing

- H01: There is no significant relationship between capital adequacy and operational efficiency in banking institutions in Kenya.

The results obtained from the panel GMM models reveal a positive relationship between capital adequacy and operational efficiency, with statistical significance detected at the 1%, 5%, and 10% thresholds.

Moderation effect of market structure on relationship between capital Adequacy and Operational Efficiency

Table 5: The Moderating Effect of Market Structure on the Relationship Between Capital Adequacy and Operational Efficiency

	Model One	**Model Two**	**Model Three**
	Operational Efficiency	Operational Efficiency	Operational Efficiency
Capital Adequacy	0.0592	-0.1333***	-0.1676***
	(0.0496)	(0.0403)	(0.0425)
Market Structure		0.5633**	-0.9578
		(0.2304)	(0.6611)
Interaction Term			9.5909**
			(3.9097)
Constant	0.7235***	0.7924***	0.7959***
	(0.0156)	(0.0152)	(0.0152)
Observations	599	571	571
R-squared	0.0024	0.0386	0.0487

Note: Interaction term = (*Capital adequacy * Market Structure)*
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Author, 2024

The findings revealed that upon introducing the moderating variable, there was a notable change in the relationship of the independent variable (capital adequacy). Specifically, it shifted from being positive in model one to negative in model two. Moreover, there was an increase in the R-square value from 0.0024 in model one to 0.0386 in model two, and further to 0.0487 in model three.

The coefficients for both the interaction term and predictor variable became significant in Panel GMM model for all the three. This indicates a clear moderation effect of market structure on the relationship between capital adequacy and the operational efficiency of banks in Kenya. The results are consistent with finding of Chen (2020) that the moderation effect of market structure inform regulatory decisions, such as capital adequacy requirements and antitrust measures, as well as strategic decisions within individual banks regarding resource allocation and competitive positioning, can alter the operation efficiency of banks.

Hypothesis Testing:

- H02: Market structure does not moderate the relationship between capital adequacy and operational efficiency of commercial banks in Kenya.

The results obtained from the panel GMM models reveal a positive relationship between market structure on the association between capital adequacy and operational efficiency, with statistical significance detected at the 1%, 5%, and 10% thresholds.

Conclusion and recommendation

The initial null hypothesis (H_{01}) examined the relationship between capital adequacy and operational efficiency. Here, we conducted an empirical investigation to examine the hypothesis that there exists no significant effect of capital adequacy on operating efficiency.

To achieve this objective, the panel GMM model was estimated. The panel GMM analysis revealed a strong positive link between capital adequacy and operational efficiency, with significance at 1%, 5%, and 10% levels. Specifically, higher financial leverage contributed to a 10.32% increase in operational efficiency of banks in Kenya. The implication drawn from the findings indicates that adequate capitalization enables banks to absorb losses, improve processes, and deliver better services, while managing risks effectively. Well-capitalized banks can expand lending, reduce borrowing costs, and pursue growth opportunities, fostering operational efficiency and long-term sustainability. This underscores the importance of maintaining optimal capital levels for enhancing operational efficiency and overall performance of banks in Kenya. The conclusions drawn and the rationale provided regarding the positive impact of capital adequacy on the operational efficiency of banks in Kenya agree with the research findings of Odekina (2019), Ogboi and Unuafe (2013), Khalifaturofi'ah (2023), and Ayadi et al. (2016). However, these findings diverge from the perspectives put forth by Pradhan and Shrestha (2017), as well as Siddik and Kabiraj (2019), who contend that metrics such as loan loss provision to total loan, core capital ratio, risk-weighted ratio, and total capital ratio exert a negative influence on the financial performance of commercial banks.

Policy Recommendation

In response to these revelations, policymakers are urged to enact a multifaceted approach aimed at nurturing a banking environment conducive to optimal performance and stability. Foremost among these measures is the enhancement of capital adequacy regulations, imposing stringent requirements that mandate banks to uphold optimal capitalization thresholds. This initiative, coupled with periodic assessments and recalibrations of said thresholds, serves to safeguard against systemic vulnerabilities while fostering an ecosystem that incentivizes prudent risk management practices.

Furthermore, policymakers must spearhead initiatives aimed at bolstering financial literacy among consumers. By equipping individuals with the requisite knowledge to make informed financial decisions, they can engender a culture of responsibility and accountability within the banking landscape. Collaborative endeavors with banking institutions and other

stakeholders to disseminate educational resources and conduct outreach programs can prove instrumental in achieving this objective.

This study also makes a valuable contribution to agency theory by highlighting how the selection of financial instruments can effectively instill financial discipline within banks. The inclusion of a significant proportion of debt financing within the capital adequacy necessitates that banks exercise prudence in managing their remuneration and operating expenses in order to mitigate the risk of a hostile takeover. Consequently, the conduct of banks is influenced by their avoidance of engaging in activities that give rise to agency problems.

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