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ABSTRACT

Commercial banks in Kenya acknowledge that optimizing liquid assets is required to increase earnings while adhering to the regulator's minimum liquidity ratio and minimum liquid assets for day-to-day operations. This study examines the relationship between liquidity management and the financial performance of commercial banks in Kenya, focusing on the impacts of capital adequacy, non-performing loans, inflation rates, and interest rates. Financial institutions operate within complex environments characterized by risks such as inadequate capital adequacy, loan defaults, poor cash management, and inflationary pressures. These risks, if not effectively managed, can destabilize a bank's financial performance. Using data from the Central Bank of Kenya and applying a random effects model for panel data analysis, this study investigates how these variables influence the profitability of commercial banks, measured by Return on Assets (ROA). Using data from the Central Bank of Kenya and applying a random effects model for panel data analysis, the study finds that an increase in capital adequacy is associated with 0.130 units increase in Return on Assets (ROA), while a rise in non-performing loans negatively impacts ROA by approximately 0.114 units. The effect of inflation on ROA is found to be marginal, with a decrease of 0.499 units, while interest rates positively influence ROA by 0.875 units. These results underscore the critical role of effective liquidity management in optimizing financial performance, particularly in balancing liquid assets to meet regulatory requirements and operational demands. In this context, it is recommended that commercial banks in Kenya enhance their liquidity management strategies by improving capital adequacy and reducing non-performing loans to better withstand economic fluctuations and improve profitability. Strengthening these areas can help banks maintain financial stability and improve overall performance in a challenging economic environment.

Key Words: Capital Adequacy, Non-Performing Loans, Inflation Rate, Interest Rate

INTRODUCTION

Commercial banks play a crucial role in the Kenyan economy by providing essential financial services, facilitating economic growth, and supporting various sectors through lending and investment. They offer employment opportunities, which helps reduce unemployment, and contribute to government revenue through taxes. These funds are used to provide public services and support research and development, driving innovation. Consequently, the financial performance of commercial banks is vital for ensuring they meet the interests of their stakeholders and maintain their pivotal role in the economy.

The financial performance of commercial banks is a critical measure of their ability to effectively generate and manage resources through their operations over a given period. This performance is pivotal in enhancing shareholder value and profitability, which are key objectives for these institutions (Peiris et al., 2020). To evaluate the impact of various factors on financial performance, financial ratios derived from balance sheets, income statements, and market data are used. These metrics help assess how shareholder wealth evolves, influenced by factors such as deposit growth, profit margins, and strategic capital management (Siddik et al., 2017).

As noted by Murewa, (2015) an efficient banking sector is vital for economic development, it facilitates the accumulation of capital through credit provision. Banks mobilize savings, support sound trade activities, aid in risk diversification, and make credit available to the private sector, all of which are crucial for fostering economic growth. Furthermore, commercial banks play a key role in achieving the monetary policy objectives set by the Central Bank. Their primary function is to channel community savings and investments into productive uses by providing loans to individuals and businesses for various investment opportunities (Van Gestel & Baesens, 2009).

In Kenya, the banking sector plays a crucial role in the nation's economy and is pivotal to achieving the goals set out in Kenya's Vision 2030 (Sile & Bett, 2015). Despite its significance, the sector has faced substantial challenges, particularly amidst increasing regulatory scrutiny and control. This has led to several banks in the lower tiers exiting the market or being placed under receivership. For instance, Chase Bank was put under receivership due to severe liquidity issues. Similarly, Imperial Bank faced closure by the Central Bank of Kenya, attributed to poor portfolio management and insider lending. Dubai Bank of Kenya also fell under statutory management for a year due to liquidity and capital deficiencies, with the Kenya Deposit Insurance Corporation (KDIC) appointed as the receiver manager (KDIC, 2015)

According to the Central Bank of Kenya (2016), liquidity is the capacity of a financial organization to support the growth of its assets while also being able to fulfill its obligations on schedule and without suffering unfavorable losses. Financial institutions are typically judged on their capacity to obtain the necessary cash and loans or on their liquidity without incurring additional costs. Therefore, managing liquidity is a very important factor that bank managers must carefully consider. A bank's ability to fulfill obligations on time and finance asset growth, typically without suffering unconscionable losses, is referred to as liquidity. Since it affects all credit generation and total economic operation, liquidity management is also acknowledged as the principle of actual bills (Hosna, A., Manzura, B., &Juanjuan, 2009)

Bank performance refers to the effectiveness and efficiency with which a bank meets its financial objectives and operational goals. It encompasses various metrics that assess the bank's profitability, asset quality, capital adequacy, and liquidity management. These metrics include Return on Assets (ROA), Return on Equity (ROE), Non-Performing Loans (NPL) ratio, and Capital Adequacy Ratio (CAR). Evaluating bank performance involves

analyzing financial statements to understand how well a bank is utilizing its resources to generate profits, manage risks, and maintain financial stability. This assessment is crucial for stakeholders, including investors and regulators, to ensure the bank's long-term viability and compliance with financial regulations (Mott, 2020)

According to Mwega, (2014), the Central Bank of Kenya, established under Article 231 of the Kenyan Constitution of 2010, regulates and oversees the banking sector in Kenya. According to data from the Central Bank of Kenya (2019), Kenya had 40 commercial banks by the end of 2019. Of these, two were under receivership, and one was under statutory management. The Central Bank categorizes the 37 operational banks into three tiers: large, medium, and small, based on their market share. As of December 2019, the performance ratings for these banks were as follows: 8 banks were rated strong, 20 satisfactory, 7 fair, 2 marginal and 2 unsatisfactory. This compares to December 2018, where 6 banks were rated strong, 20 satisfactory, 10 fair, 3 marginal, and 1 unsatisfactory. Among the 40 privately owned banks, 25 were locally owned. The number of locally owned private banks decreased by 10.71% from 28 in 2008 to 25 in 2017, while the number of foreign-owned banks increased by 20%, rising from 12 in 2008 to 15 in 2017 (Central Bank of Kenya, 2019).

Statement of the Problem

One of the critical challenges within the Kenyan banking sector is effectively managing liquidity amidst varying capital adequacy ratios, increasing non-performing loans, and fluctuating inflation and interest rates. The mismatch between available liquid assets and the liquidity demands of clients presents significant risks, potentially leading to financial instability. Although regulatory frameworks are in place, a number banks encounter difficulties in implementing effective liquidity management strategies, which results in financial outcomes that do not meet expectations (Mwega,

2014; Chen et al., 2014). Previous studies have examined aspects of liquidity management, but there remains a gap in understanding its impact on the financial performance of Kenyan commercial banks, especially in the post-COVID-19 context.

This study seeks to investigate the impact of liquidity management factors, specifically capital adequacy, non-performing loans, inflation rates, and interest rates, on the financial performance of commercial banks in Kenya. By focusing on these critical variables, the research aims to provide a deeper understanding of their interactions and effects on financial performance. The findings will offer valuable insights for enhancing liquidity management strategies, thereby improving financial stability and performance within the Kenyan banking sector. This study will contribute to the literature by addressing specific knowledge gaps related to Kenyan banks and offering practical recommendations for better liquidity management practices.

Objectives of the Study

The study focused on determining the relationship between liquidity management and financial performance of commercial banks in Kenya. The study focused on the following specific objectives:

- To investigate the influence of capital adequacy on the financial performance of commercial banks in Kenya.
- To assess the influence of non-performing loans on the financial performance of commercial banks in Kenya.
- To examine the effect of inflation rate on the financial performance of commercial banks in Kenya.
- To examine the effect of interest rate on the financial performance of commercial banks in Kenya.

LITERATURE REVIEW

Theory of Pecking Order

Myers' (1984) theory suggests that when businesses design their capital structure, they should prioritize using internally generated funds, followed by external debt, and resort to external equity as a last option. Internal funds are preferred because they are inexpensive and free from external influence, while external debt is considered less costly than issuing equity due to its fewer restrictions. The theory assumes that a firm's managers have a deeper understanding of the company's status and will act in the best interest of the existing shareholders (Ahmed Sheikh & Wang, 2011) . Additionally, managers are motivated to maintain the confidentiality of the firm's proprietary information as relying on internal funds allows them to avoid public disclosures about the company's investment opportunities and potential profits (Liesz, 2001).

It is essential to evaluate both debt and equity financing when making financial decisions to propose an optimal capital structure. The pecking order theory suggests that companies should prioritize financing options based on their cost-effectiveness, starting with liquidity, followed by leverage (debt), and lastly equity. These three components of the financial structure are central to the study, warranting an investigation into their impact on financial performance. According to the theory, leverage positively influences financial performance as it is more cost-effective. The firms anticipate that investors will be skeptical of the equity offering. As a result, enterprises choose to finance their investments first with retained earnings, then with debt, and finally with equity if the first two options fail to fulfill the entirely required cash for investments (Calabrese, 2011).

The Loanable Funds Theory

H. & Wicksell, (1936) proposed the loanable funds theory. The theory offers a foundational perspective on how interest rates are determined through the interaction of supply and demand for loanable funds. According to Wicksell, the supply of loanable funds is primarily sourced from savings by households, businesses, and governments. When individuals or entities choose to save rather than spend, they effectively increase the pool of funds available for lending. This supply is influenced by various factors, including income levels and prevailing interest rates. Higher interest rates generally incentivize saving by offering better returns on deposited funds, thereby increasing the supply of loanable funds in the economy.

On the other side of the equation, the demand for loanable funds arises from the need for investment. Businesses and individuals borrow money to finance activities like expanding operations, purchasing capital goods, or undertaking large projects. The demand for these funds is closely tied to the potential returns on investment relative to the cost of borrowing. As interest rates rise, borrowing becomes more expensive, leading to a decrease in the demand for loanable funds. Thus, there is an inverse relationship between interest rates and the demand for these funds.

Liquidity Preference Theory

Keynes' Liquidity Preference Theory, introduced in 1936, posits that individuals' preference for holding liquid assets over illiquid investments determines interest rates. According to Keynes, people have three main motives for holding cash: transactions, precautionary, and speculative. The theory suggests that the demand for liquidity is influenced by economic uncertainty and the opportunity cost of holding cash versus investing in assets. In Keynes' view, the interest rate is the price of liquidity, balancing the supply of money with the public's preference for liquidity Thus, interest rates are influenced by the demand and supply of financial stability. It is believed that people will refuse to earn interest on money kept now and instead keep it as a precaution. An increase in interest rates means more profit and, as a result, a reluctance to keep money now (Reilly and Norton, 2016). Long-

term assets are said to be riskier, forcing investors to demand higher premiums. A slight change in interest rates causes a huge shift in speculative demand for money (Schumpeter, 1936).

According to the notion, consumers will always keep cash on hand for quick consumption. According to Reilly and Norton (2016), people need money because they intend to spend it, speculate on future interest rate fluctuations, or are unsure of what will happen in the future, and thus it is worthwhile to keep some resources in the form of pure purchasing power. These are known as transactional, speculative, and precautionary motivations for requesting money. When an investment in non-liquid assets, such as bonds, is favored, a premium will be requested. This premium rises as the investment time lengthens.

Capital Adequacy and Financial Performance

Torbira & Zaagha, (2016) evaluated the relationship between capital adequacy metrics and bank financial performance in Nigeria from 2008 to 2012. The ratio of Shareholders Fund to total assets was employed as a proxy for capital sufficiency, while net profit margin, earnings per share, and return on assets (ROA) were used to gauge bank financial performance. The findings of the Dickey-Fuller unit root test indicated that the data series reached stationarity after initial differencing at order. The study found a substantial long-run link between bank financial performance characteristics and capital adequacy indicators in the Nigerian banking market. The granger causality test results revealed that the ratio of shareholders' funds to bank total assets has unidirectional causality. These findings imply that capital sufficiency strongly and actively stimulates and improves the financial performance of Nigerian banks.

Pradhan & Shrestha, (2017) used multivariate regression analysis to investigate the impact of capital adequacy on the financial performance of Nepalese commercial banks. The research findings demonstrated that capital adequacy ratio, interest expenditures to total loan, and net interest margin all had a significant impact on return on assets, whereas capital adequacy ratio had a substantial impact on return on equity.

Non-performing loans and financial performance

According to Hossain, (2017) a robust investment flow and a culture of savings are essential for the economic development of any nation. Developing countries often face challenges such as a problematic loan culture and an underdeveloped capital market. These issues largely depend on the ability of commercial banks to mobilize savings and provide credit facilities to investors. The financial sector's performance is closely linked to that of commercial banks. Non-performing loans, in particular, significantly impact bank profitability by not generating interest income and depleting the banks' loanable funds, disrupting the recycling of banking operations. To counterbalance bad debts, banks must set aside substantial reserve funds derived from their income. High levels of non-performing loans necessitate larger provisions, which adversely affect bank profitability and can lead to a weakened capital base, ultimately harming the banking sector's stability.

Inflation rate and financial performance

Economic instability, particularly fluctuations in interest rates and prices, has had a significant impact on financial theory and decision-making practices. These fluctuations are often responses to changes in inflation, which has emerged as a critical macroeconomic issue in recent years. For bank managers, managing inflation is paramount, as macroeconomic instability demands that future inflation rates be factored into strategic decisions concerning bank deposits and loans. This need for vigilance is echoed by Pearce and Robinson (1994), who assert the importance of adjusting prices to mitigate rising costs and sustain cash flow for continued productivity. Inflation, typically measured by the Consumer Price Index (CPI), serves as a crucial benchmark for both business leaders and policymakers at the Central Bank and Treasury.

Ajayi & Atanda, (2012) conducted a study on the impact of monetary policy on banking performance in Nigeria, focusing on the period from 1980 to 2008. Using the Engle-Granger two-step co-integration approach, their research found that inflation had a positive but insignificant effect on the performance of Nigerian banks. However, since their study was centered on Nigerian commercial banks, the findings may not be directly applicable to the Kenyan context. Therefore, this study will specifically focus on Kenyan commercial banks to explore similar effects within the local environment.

Interest rate and financial performance

Monetary policy plays a crucial role in shaping short-term interest rates, which are aligned with the Central Bank's objectives of full employment and price stability. In the short term, the Central Bank sets the benchmark funds rate to meet its growth and employment goals. Over the longer term, the Central Bank adjusts the funds rate to manage inflation expectations and achieve its inflation targets. Longer-term interest rates are influenced by expectations of growth and inflation, the balance of credit demand (including financing federal deficits), and international credit supply. Easy monetary policy, characterized by low interest rates, is used to boost money demand and stimulate economic activity. While the exact relationship between interest rates and profitability

remains complex and inconclusive, evidence shows that interest rate instability impacts the financial performance of commercial banks, with various studies producing mixed results (Bilal et al., 2013).

The Kenyan banking industry is a crucial player in the country's economic development. However, despite its importance, the sector has faced challenges, including the collapse of some commercial banks and others being placed under receivership or statutory management. This situation prompted a study by Onyancha and Muturi (2023), which aimed to investigate the effect of macroeconomic factors on the financial performance of commercial banks in Kenya. The study focused on four key macroeconomic variables: exchange rate, real GDP, inflation rate, and real interest rate, and analyzed data from 35 commercial banks over the period from 2011 to 2019. Using a causal research design and panel regression analysis, the study found that exchange rate and interest rate significantly impacted the financial performance of these banks. In contrast, GDP growth rate and inflation rate did not have a significant effect. The findings suggest that policy formulation in the banking sector should prioritize exchange rate management and recommend moderate interest rate adjustments to enhance profitability (Onyancha & Muturi, 2023).
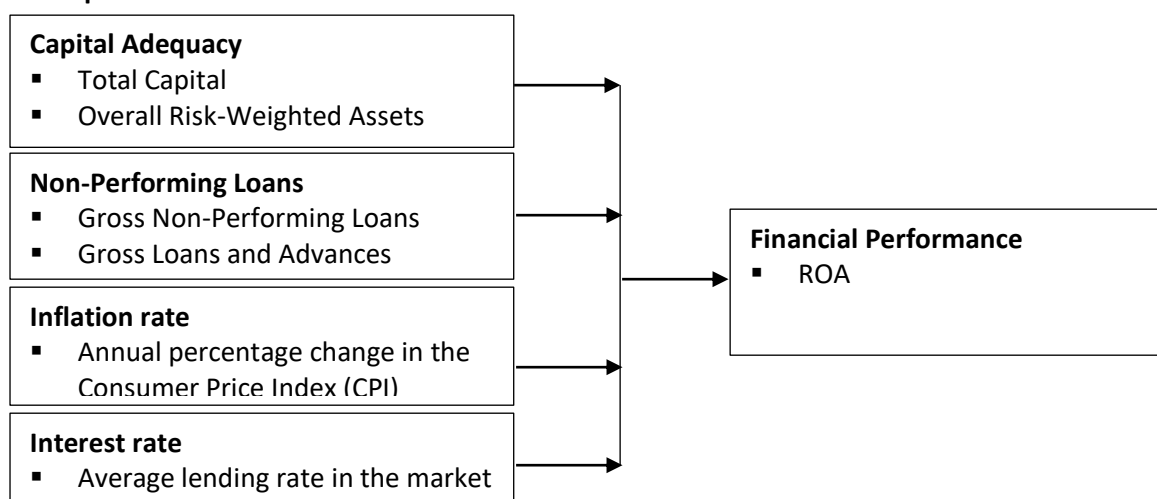
Conceptual Framework

Figure 1: Conceptual Framework

METHODOLOGY

The study employed descriptive research design (Cash, P., Isaksson, Maier, &Summers, 2022). The target population included all 35 commercial banks in Kenya, with complete information on the variables under study, as reported in the Bank Supervision Annual Reports by the Central Bank of Kenya for the period 2018-2022.

The study exclusively utilized secondary data on bank characteristics and performance, drawn from the Bank Supervision Annual Reports for the years 2018-2022.

The study employed a document review guide to collect secondary data on financial performance metrics, including Return on Assets (ROA) and Capital Adequacy, as well as on bank characteristics such as the Non-Performing Loans Ratio.

Descriptive statistics, including means, standard deviations, and variations (overall, within, and between), were employed to analyze the data, alongside correlation analysis and panel multiple linear regression. The study utilized secondary panel data, analyzed with STATA software.

The study utilized a panel regression model to assess the link between liquidity management and the financial performance of commercial banks in Kenya

General empirical model:

$Yit = \beta_0 + \beta_1 X_1 it + \beta 2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon it$

Yit id the Return on Assets (ROA) of bank i at time t.

i denotes the observation (Bank), i = 1, 35.

t is the time period t= 2018.......,2022.

X_{1it} denotes vector for Capital Adequacy of Bank i in period t.

X_{2it} denotes vector for Non-Performing Loans Ratio of Bank i in period t.

X_{3it} denotes vector for Inflation Rate of Bank i in period t.

X_{4it} denotes vector for Interest Rate of Bank i in period t.

εit is the composite error term explaining the variability of financial performance changes as a result of other factors not accounted for.

β1, β2 and β3 are coefficients representing the conditions of the independent variables to the dependent variable.

X2: Cash Management, measured as cash and cash equivalents as a proportion of Total Assets (TA). This variable evaluates the efficiency of cash management practices in meeting short-term obligations.

RESEARCH FINDINGS AND DISCUSSION

Descriptive Analysis

The mean values, standard deviations, minimums, and maximums of these variables are summarized in table 1.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Return On Assets	175	0.7334646	3.888935	-30.24643	7.402102
Capital Adequacy	175	21.06095	12.78978	-60.54422	73.20536
Non-Performing Loans	174	18.70882	13.77276	0.01	75.97651
Inflation Rate	175	5.82	1.044911	4.7	7.7
Interest Rate	175	12.38232	0.3766114	11.9958	13.06

The data set comprises observations from 35 commercial banks over five different time periods, as denoted by the variable time, which ranges from 1 to 5. The mean time value of 3 and a standard deviation of 1.42 indicate that the data is evenly distributed across the years of study. This temporal

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distribution provides a robust framework for analyzing trends and changes in key financial metrics over the study period, facilitating a longitudinal assessment of bank performance.

The financial performance of the banks, measured by the Return on Assets (ROA), shows a mean value of 0.73, with a significant standard deviation of 3.89, and values ranging widely from -30.25 to 7.40. This considerable variability suggests substantial differences in the operational efficiency and financial health of the banks in the sample. Such variations in ROA could be indicative of diverse management strategies, risk appetites, and external economic conditions impacting the banks during the study period.

In terms of financial stability indicators, the Capital Adequacy ratio has a mean of 21.06 with a standard deviation of 12.79, ranging from -60.54 to 73.21, highlighting the diverse capital management strategies and risk profiles across the banks. The Non-Performing Loans (NPL) ratio, with a mean of 18.71 and a standard deviation of 13.77, further reflects this variability, with some banks exhibiting significantly higher credit risk than others. The relatively stable macroeconomic environment, as indicated by the low variability in Inflation Rate (mean 5.82, SD 1.04) and Interest Rate (mean 12.38, SD 0.38), suggests that external economic conditions were moderately stable during the study period, providing a consistent backdrop against which the banks' internal performance metrics can be evaluated.

Descriptive Analysis Output

Table 2: Panel Variables Summary Statistic

Variable	Variation	Mean	Std. Dev.	Min	Max
Return on Assets	Overall	0.73	3.89	-30.25	7.40
	Between		2.81	-11.99	4.41
	Within		2.72	-17.52	14.25
Capital Adequacy	Overall	21.06	12.79	-60.54	73.21
	Between		9.83	-8.16	47.95
	Within		8.32	-31.33	102.42
Non-Performing Loans	Overall	18.71	13.77	0	75.98
	Between		12.60	2.98	61.97
	Within		5.79	-0.24	42.90
Inflation Rate	Overall	5.82	1.04	4.7	7.7
	Between		0	5.82	5.82
	Within		1.04	4.7	7.7
Interest Rate	Overall	12.38	0.38	11.9958	13.06
	Between		0	12.38	12.38
	Within		0.38	11.9958	13.06

The Return on Assets (ROA) ratio demonstrates significant overall variability, with a mean of 0.73 and a high standard deviation of 3.89, ranging from -30.25 to 7.40. This broad range indicates substantial differences in the financial performance of banks within the dataset. The between-bank variation, marked by a mean of 2.81, points to differing average ROA levels across banks,

suggesting that some banks are more profitable than others. The within-bank variation, with a standard deviation of 2.72, reflects notable fluctuations in ROA over time for individual banks, potentially due to varying operational efficiencies, market conditions, and financial management strategies. The Capital Adequacy ratio also shows considerable overall variability, with a mean of

21.06 and a standard deviation of 12.79, ranging from -60.54 to 73.21. This broad range reveals significant differences in capital adequacy across banks. The between-bank variation, with a mean of 9.83, suggests that different banks maintain different levels of capital adequacy, influenced by their risk profiles and capital management practices. The within-bank variation, with a standard deviation of 8.32, indicates that these ratios fluctuate significantly over time, reflecting changing capital management strategies and responses to economic conditions.

The Non-Performing Loans (NPLs) ratio has an overall mean of 18.71 and a standard deviation of 13.77, ranging from 0 to 75.98, indicating substantial variability in the proportion of non-performing loans among banks. The between-bank variation, marked by a mean of 12.60, suggests that different banks experience varying levels of non-performing loans, likely due to differences in credit risk management and loan portfolios. The within-bank variation, with a standard deviation of 5.79, highlights significant changes in the NPL ratio over time for each bank, potentially reflecting shifts in credit quality, economic conditions, and loan management practices. The Inflation Rate variable

shows an overall mean of 5.82 and a standard deviation of 1.04, with values ranging from 4.7 to 7.7. The lack of between-year variation indicates that inflation rates are considered fixed for the study period. However, the within-year variation suggests moderate fluctuations in inflation over time, which could have implications for the broader economic environment affecting banks. The Interest Rate variable, with an overall mean of 12.38 and a standard deviation of 0.38, ranges from 11.9958 to 13.06. The absence of between-year variation suggests that interest rates were relatively stable across the study period. Nonetheless, the within-year variation of 0.38 indicates some level of variability in interest rates over time, which could influence bank performance and key financial metrics.

Diagnostic Tests

These tests are conducted on the data variables to ensure they meet the requirements of the multiple regression technique, thereby enhancing the robustness and validity of the results.

Normality Test

The Shapiro-Wilk test for normality was conducted on the variables to assess the distribution of the data. The results are summarized in table 3.

Table 3: Normality Test

Variable	Obs	W	V	z	Prob> z
Return_On_Assets	175	0.59839	53.360	9.089	0.2323
Capital_Adequacy	175	0.83182	22.346	7.099	0.3413
Non_Performing_Loans	174	0.85175	19.601	6.798	0.4134
Inflation_Rate	175	0.89497	13.955	6.024	0.1665
Interest_Rate	175	0.89073	14.518	6.114	0.2718

Source: Research data, 2024

The Shapiro-Wilk test results indicate that all the variables have W statistics significantly below 1, and the p-values are all less than the 0.05 significance level. This suggests that the null hypothesis of normality is rejected for each variable. Specifically, the W statistics for Return_On_Assets, Capital_Adequacy, Non_Performing_Loans, Inflation_Rate, and Interest_Rate are 0.59839,

0.83182, 0.85175, 0.89497, and 0.89073, respectively, all indicating non-significant departures from normality.

Given these findings, the residuals from our analysis do not conform to a normal distribution. To address this issue and ensure robust and reliable regression results, we employed robust standard errors. This adjustment compensates for any potential

heteroskedasticity and non-normality in the residuals, providing more reliable estimates and hypothesis tests despite deviations from normality.

Multicollinearity Test

The multicollinearity analysis using Variance Inflation Factor (VIF) is as shown in table 4.

Table 4: Multicollinearity Test

Variable	VIF	1/VIF (Tolerance)
Capital Adequacy	1.23	0.8127
Non-Performing Loans Ratio	1.22	0.8183
Inflation Rate	1.20	0.8301
Interest Rate	1.20	0.8311
Mean VIF	1.22	

To evaluate multicollinearity in the panel data regression model, the Variance Inflation Factor (VIF) was used. Multicollinearity refers to the situation where predictor variables are highly correlated, potentially leading to unreliable coefficient estimates. The VIF values for the explanatory variables were as follows: Capital Adequacy (1.23), Non-Performing Loans Ratio (1.22), Inflation Rate (1.20), and Interest Rate (1.20). The mean VIF for the model was 1.22.

These VIF values are well below the common threshold of 10, indicating that multicollinearity is not a significant concern. The low VIF values suggest that the variance of each predictor is not excessively explained by other predictors in the model. Additionally, the tolerance values, which are the reciprocals of the VIF, were all above 0.1, reinforcing the absence of significant multicollinearity. Thus, the results support the conclusion that the predictors—Capital Adequacy, Non-Performing Loans Ratio, Inflation Rate, and Interest Rate—are not highly collinear, ensuring that the regression analysis results are robust and reliable

Heteroscedasticity Test

Table 5: Results of the Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Test	Statistic	Degrees of Freedom	P-value
Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity	203.14	1	0.4441

The Breusch-Pagan / Cook-Weisberg test was employed to assess the presence of heteroskedasticity in the regression model. The test results revealed a chi-squared statistic of 203.14 with 1 degree of freedom and a p-value of 0.4441. This insignificant p-value indicates that the null hypothesis of constant variance is supported. Consequently, the results suggest the absence of heteroskedasticity in the residuals of the model. This finding implies that the variability of the residuals is not constant across all levels of the explanatory variables, necessitating no further adjustments to address the heteroskedasticity issue in the regression analysis.

The Hausman Test for Model Effects Estimation

Table 6 includes the coefficients from both the fixed and random effects models for each variable, along with their differences and standard errors from the Hausman test. The Breusch-Pagan LM test result is also included to compare the random effects model against OLS.

Table 6: Result of the Hausman test and the Breusch-Pagan LM test.

Test	Variable	Coefficient (Fixed Effects)	Coefficient (Random Effects)	Difference (b-B)	Standard Error (S.E.)	Chi-squared Statistic	p-value
Hausman Test	Capital Adequacy	0.1559	0.1300	0.0259	0.0099	6.98	0.1368
	Non-Performing Loans	-0.1534	-0.1139	-0.0395	0.0225		
	Inflation Rate	-0.5375	-0.4993	-0.0382			
	Interest Rate	0.7650	0.8746	-0.1096			
Breusch-Pagan LM Test						44.24	0.0000

The Hausman test compares the coefficients between the fixed effects and random effects models to determine if the random effects model is appropriate. The chi-squared statistic of 6.98 with a p-value of 0.1368 indicates that the differences in coefficients are not statistically significant, supporting the use of the random effects model.

The Breusch-Pagan LM test further validates the choice of the random effects model. With a chibar-squared statistic of 44.24 and a p-value of 0.0000, the test strongly rejects the null hypothesis that the variance of the random effects is zero, meaning the random effects model is appropriate for capturing individual variations in the data.

Correlation Analysis

Table 7: Correlation Matrix

Variable		Return On Assets	Capital Adequacy	Non-Performing Loans	Inflation Rate
ROA	Pearson Correlation	**1.0000**			
	N	175			
Capital Adequacy	Pearson Correlation	0.4869	**1.0000**		
	Sig	0.000			
	N	175	175		
Non-Performing Loans	Pearson Correlation	-0.5097	-0.4260	**1.0000**	
	Sig	0.000	0.000		
	N	175	175	175	
Inflation Rate	Pearson Correlation	-0.1408	0.0554	-0.0073	**1.0000**
	Sig	0.1452	0.4892	0.9886	
	N	175	175	175	175
Interest Rate	Pearson Correlation	0.1634	0.0384	-0.0243	-0.4119
	Sig	0.0968	0.4303	0.4129	0.000
	N	175	175	175	175

The correlation analysis provides significant insights into the relationships between key variables affecting bank performance. The Return on Assets (ROA) is positively correlated with Capital Adequacy (r = 0.4869), suggesting that banks with stronger capital bases tend to exhibit better financial

performance. This positive relationship underscores the importance of maintaining adequate capital buffers to enhance profitability. On the other hand, ROA has a strong negative correlation with Non-Performing Loans (r = -0.5097), indicating that an increase in bad loans directly harms financial performance, likely due to the increased cost of managing non-performing assets and reduced interest income.

The relationship between Non-Performing Loans and Capital Adequacy is also noteworthy, with a moderate negative correlation (r = -0.4260). This implies that as the level of non-performing loans rises, the capital adequacy of banks tends to decline, reflecting the strain that poor asset quality can place on a bank's financial stability. This finding highlights the critical need for effective credit risk management to safeguard capital adequacy.

Macroeconomic factors, such as Inflation Rate and Interest Rate, show weaker correlations with ROA. The Inflation Rate has a weak negative correlation with ROA (r = -0.1408), suggesting that inflation does not have a strong direct impact on bank profitability. Meanwhile, the Interest Rate exhibits a weak positive correlation with ROA (r = 0.1634) and a moderate negative correlation with the Inflation Rate (r = -0.4119), indicating that while interest rates can influence bank performance, their effect is less significant compared to internal bank factors like capital adequacy and non-performing loans. These results emphasize that while macroeconomic conditions are important, internal financial management plays a more critical role in determining bank performance.

Regression Analysis

Model Summary and ANOVA Table

Table 8: Model Summary and ANOVA Table

Source	SS	Df	MS	Number of obs	=	175
				F(4, 170)	=	16.42
Model	66.95288	4	16.73822	Prob > F	=	0
Residual	173.3393	170	1.019643	R-squared	=	0.2786
				Adj R-squared	=	0.2617
Total	240.2922	174	1.38099	Root MSE	=	1.0098

The regression analysis presented evaluates the relationship between liquidity management and the financial performance of commercial banks in Kenya, based on a dataset of 175 observations. The F-statistic of 16.42, with a corresponding p-value of 0, shows that the regression model is statistically significant. This means that liquidity management variables included in the model play a significant role in explaining variations in the financial performance of these banks. A statistically significant F-statistic implies that, collectively, the independent variables related to liquidity management are meaningful predictors of financial performance.

The R-squared value of 0.2786 indicates that approximately 27.86% of the variance in the financial performance of commercial banks is explained by the model. This means that while liquidity management is an important factor in driving performance, other variables outside the model contribute to the remaining 72.14% of unexplained variation. The adjusted R-squared of 0.2617 provides a more accurate measure by adjusting for the number of predictors. This value, slightly lower than the R-squared, indicates that while liquidity management influences financial performance, the predictive power of the model is moderate. This analysis highlights that liquidity management is a statistically significant factor

influencing the financial performance of commercial banks in Kenya, though the relatively low R-squared values suggest that there are additional factors influencing performance that should be explored further.

Key Findings and Discussion

The analysis reveals a significant positive impact of capital adequacy on the financial performance of commercial banks in Kenya, as evidenced by the coefficient of 0.1300. This finding aligns with previous research indicating that higher capital adequacy ratios contribute to better bank performance. Torbira & Zaagha (2016) found a significant long-run link between capital adequacy indicators and financial performance in Nigerian banks, suggesting that well-capitalized banks can better absorb losses and sustain operations, thus enhancing their financial performance. Similarly, Pradhan & Shrestha (2017) reported that capital adequacy ratios significantly impact Return on Assets (ROA) in Nepalese commercial banks. This positive relationship underscores the importance of maintaining adequate capital levels to ensure bank stability and performance.

The negative coefficient for non-performing loans, -0.1139, highlights their detrimental effect on financial performance. This result supports findings from Hossain (2017), who emphasized that non-performing loans significantly impair bank profitability by depleting funds and disrupting operations. Additionally, Gorter & Bloem (2002) noted that non-performing loans often stem from poor economic decisions and unforeseen circumstances, which negatively affect bank stability. This underscores the critical need for effective credit risk management and loan provisioning to mitigate the adverse effects of non-performing loans on financial performance.

The negative effect of the inflation rate on financial performance, with a coefficient of -0.4993, aligns with findings from Otuori (2014), who identified a negative impact of inflation on bank performance in

Kenya. This result also resonates with Rachael & Moses (2017), who found that inflation had a significant negative effect on profitability for listed commercial banks on the Nairobi Securities Exchange (NSE). Despite some studies suggesting positive or insignificant effects (Kiganda, 2014), the general consensus is that high inflation erodes profitability by increasing operational costs and reducing the real value of revenues.

The positive coefficient for interest rates, 0.8746, indicates a potential beneficial effect on financial performance, although it is not statistically significant. This finding contrasts with Mangeli (2012), who found that interest rate spreads positively influence bank performance, and Mutemi & Makori (2019), who observed a positive relationship between interest rates and financial performance. The lack of statistical significance in this study suggests that the impact of interest rates may vary depending on the specific context or other influencing factors. Further research is needed to understand the conditions under which interest rates significantly affect bank performance.

When comparing these results with prior research, it is evident that while some findings corroborate previous studies, others reveal varying outcomes. For instance, the significant positive effect of capital adequacy observed here is consistent with Berger & Bouwman (2013) and Chen et al. (2014), who also highlighted the benefits of higher capital ratios. However, the mixed results on inflation and interest rates reflect the complexity of macroeconomic influences on financial performance, as noted by Ajayi & Atanda (2012) and Almanaseer (2019), who found differing impacts based on the economic context.

CONCLUSION AND RECOMMENDATIONS

The findings underscore the critical role of capital adequacy in enhancing bank performance, affirming that higher capital adequacy ratios are positively associated with improved profitability. This conclusion supports previous research by Torbira &

Zaagha (2016) and Pradhan & Shrestha (2017), which highlighted the benefits of robust capital buffers in stabilizing financial institutions. Effective capital management allows banks to absorb financial shocks better and sustain their operations under varying economic conditions.

The negative relationship between non-performing loans and financial performance observed in this study reinforces the importance of effective credit risk management. As indicated by Hossain (2017) and Gorter & Bloem (2002), high levels of non-performing loans severely impact a bank's profitability by draining resources and increasing operational risks. Banks must prioritize stringent credit assessment processes and proactive management of existing loan portfolios to mitigate these adverse effects. This study's results stress the need for enhanced risk management practices to preserve financial stability and performance.

The study also highlights the significant negative impact of inflation on bank performance, with findings consistent with those of Otuori (2014) and Rachael & Moses (2017). Inflation increases operational costs and erodes the real value of revenues, leading to diminished profitability. Banks operating in high-inflation environments need to adopt strategies to manage inflationary pressures, such as adjusting interest rates and improving operational efficiencies, to protect their financial performance.

While the impact of interest rates on bank performance was found to be positive, it was not statistically significant. This result suggests that the relationship between interest rates and bank profitability may be more complex and context-dependent. Further research is needed to explore how different interest rate environments affect bank performance, considering varying economic conditions and regulatory frameworks. This will help in understanding the nuances of interest rate impacts on financial performance and guide future monetary policy and banking strategies.

To enhance capital adequacy and its positive impact on financial performance, banks should prioritize maintaining strong capital buffers that exceed regulatory requirements. This involves regularly assessing the adequacy of capital levels in relation to both current and projected risks. Banks should implement robust capital planning frameworks, ensuring they have sufficient reserves to absorb shocks and sustain operations during periods of economic uncertainty. Additionally, banks can explore strategic capital raising through equity offerings or subordinated debt to bolster their capital positions. Improving capital adequacy not only supports financial stability but also enhances liquidity management by providing a cushion against unexpected financial strains.

Effective management of non-performing loans is crucial for maintaining liquidity and improving financial performance. Banks should adopt rigorous credit risk assessment procedures to minimize the incidence of non-performing loans. This includes enhancing loan underwriting standards, conducting regular credit reviews, and employing proactive collection strategies. Developing a comprehensive loan provisioning policy that aligns with international accounting standards can help in mitigating the financial impact of NPLs. Banks should also invest in advanced risk analytics and monitoring tools to detect early signs of loan deterioration and take timely corrective actions. By reducing the volume of non-performing loans, banks can improve their liquidity position and overall financial health.

To manage the adverse effects of inflation on financial performance, banks should develop strategies to adjust their interest rate policies in response to inflationary pressures. This may involve increasing the interest rates on loans and deposits to maintain their profit margins. Additionally, banks should focus on improving operational efficiencies and cost management to offset the increased costs associated with inflation. Implementing hedging strategies to protect against inflation risks and

investing in inflation-linked financial instruments can also be beneficial. Effective inflation management helps preserve liquidity and profitability, ensuring that banks remain resilient in fluctuating economic conditions.

Banks should carefully monitor and adjust their interest rate strategies to optimize their financial performance. This involves analyzing the impact of interest rate changes on both their assets and liabilities to ensure that interest rate spreads remain favorable. Implementing dynamic interest rate management techniques, such as interest rate swaps or adjustable-rate loans, can help in mitigating the impact of fluctuating rates. Banks should also consider the impact of interest rate changes on their liquidity position and adjust their funding strategies accordingly. By aligning interest rate policies with market conditions and liquidity needs, banks can enhance their financial performance and stability.

Banks should maintain adequate liquidity reserves to buffer against unexpected cash flow shortages. Implementing a robust liquidity risk management framework, including regular stress testing and scenario analysis, can help in identifying potential liquidity risks and planning appropriate responses. Developing diversified funding sources and optimizing the management of liquid assets are essential for maintaining liquidity stability. By integrating liquidity management practices with their overall financial performance strategies, banks can improve their resilience and operational efficiency.

A holistic approach that integrates capital adequacy, non-performing loans, inflation, and interest rate management is essential for optimizing financial performance and liquidity. Banks should adopt an integrated risk management framework that considers the interplay between these variables and their collective impact on liquidity and profitability. Regularly reviewing and adjusting strategies based on changing economic conditions and regulatory requirements will enhance banks'

ability to manage risks and capitalize on opportunities. This comprehensive approach ensures that banks remain agile and capable of sustaining their financial performance in a dynamic economic environment.

This study significantly enhances the understanding of how capital adequacy, non-performing loans, inflation rates, and interest rates influence the financial performance of commercial banks in Kenya. By confirming the positive impact of capital adequacy on Return on Assets (ROA) and highlighting the negative effects of non-performing loans and inflation, the research provides empirical support to existing theories and extends the knowledge base on these critical financial metrics. The study aligns with prior findings, such as those by Berger and Bouwman (2013) and Gorter & Bloem (2002), reinforcing the importance of robust capital management and effective credit risk strategies for improving bank profitability.

Furthermore, the study's insights into the varying effects of interest rates and inflation offer practical recommendations for Kenyan banks and policymakers. Although the effect of interest rates was not statistically significant, the positive coefficient suggests a potential relationship that warrants further exploration.

Areas for Further Research

The study highlights several research gaps that warrant further investigation. While the impact of capital adequacy and non-performing loans is well-documented, additional research is needed to explore the effects of these factors under varying economic conditions and regulatory environments, as suggested by Pradhan & Shrestha (2017) and Mwega (2014). Similarly, the inconsistent findings regarding inflation and interest rates emphasize the need for more nuanced studies that consider different economic scenarios and their impact on financial performance. Future research should address these gaps to provide a more comprehensive understanding of the factors influencing bank performance in Kenya and beyond.

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