



EFFECT OF MORTGAGE FINANCING ON FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN KENYA

Daniel Odhiambo Dondi¹ⁱ,

Robert K. Mule²,

Benjamin O. Ombok²

¹Department of Accounting & Finance,
Maseno University,
Kenya

²Dr., Department of Accounting & Finance,
Maseno University,
Kenya

Abstract:

The financial performance of commercial banks has been unstable as evidenced in Annual Supervision Report of 2011 to 2020, where the Return on Assets (ROA) rose to 6.2% in 2012 from 3% in 2011; and to below 3% in the years 2016 to 2020. Literature reveals that commercial banks' lending criteria are pro-cyclical, implying a less strict lending criteria during the real estate boom, and very strict during burst; resulting in likely underestimation of the default risk on loans during periods of high demand by the commercial banks. The objective of the study was to establish the effect of mortgage financing on the financial performance of commercial banks in Kenya for the period 2015 to 2022. Using secondary balanced panel data from 27 mortgage-offering banks in Kenya, with 189 data points and employing moderated multiple regression to achieve the study objectives. The regression analysis revealed that the independent variables explained 86.69% ($R^2 = 0.8669$, $p\text{-value} = 0.0004$) of variance in of financial performance of commercial banks in Kenya, the coefficient of mortgage financing is 0.004434, ($p=0.0004$); implying that a unit increase in mortgage loan would result to significant increase in the return on assets by 0.004434 units. Therefore, the null hypothesis was rejected. The study concluded that an increase in the amount of mortgage loans offered as well as other activities that augment the total value of mortgage loans extended by the commercial banks leads to a significant improvement in the financial performance of commercial banks in Kenya. The study recommends that commercial banks in Kenya should target to increase the amount of mortgage offered as well as other activities that augment the total value of mortgage loans extended in order to improve their financial performance.

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ⁱ Correspondence: email odhiambodondi@gmail.com, odhiambodondi@yahoo.com

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1. Introduction

In the recent past, a large number of people have opted to buy or build homes and houses rather than stay in rented ones. This has resulted in an upsurge in mortgage companies that offer financial solutions (Athanasoglous, 2015). Many commercial banks now provide mortgage financing as one of their products to enhance their financial performance, remain competitive and improve their market share. A homebuyer or builder can obtain financing (a loan) either to purchase or secure against the property from a financial institution such as a bank either directly or indirectly through intermediaries (CBK & World Bank, 2016).

In a study done in the USA by Moench, Vickery & Aragon (2010) they analysed recent trends in households' mortgage decisions, focusing in particular on the choice between fixed-rate mortgages (FRM) and adjustable-rate mortgages (ARM). They documented that the market share of ARMs has declined significantly across all segments of the mortgage market in recent years. Using a simple model, they present evidence that this decline in the ARM share can largely be accounted for by factors that explain mortgage choice in earlier periods, in particular, measures of the relative borrowing costs for fixed-rate and adjustable-rate mortgages. Supply-side factors, especially the increasing share of the conforming mortgage market, are also important in accounting for the fall in the ARM share over this period (Moench, Vickery & Aragon, 2010). Rubio (2008) studied how the proportion of fixed and variable-rate mortgages in an economy can affect the way shocks are propagated. Secondly, she analysed optimal implementable simple monetary policy rules and the welfare implications of this proportion. Another study, World Bank Report (2010) on FRM and ARM, says that fixed-rate mortgages are most suitable for low to moderate and stable inflation and interest-rate environments.

Mortgage credit does not necessarily mean improved financial performance and profitability, as mortgage defaults can result in financial crises and bank failures. According to Dirnhorfer (2012), mortgage loans significantly affect banks' performance. The author examines whether mortgage-backed securities affected the performance of banks in the USA during the 2007 financial crisis.

Locally, a study by Ndirangu 2004 investigated the effect of types of Mortgages on the financial performance of Mortgage Institutions in Kenya indicating that falling asset prices have adversely affected mortgage financing. Moreover, Ndururi (2012) evaluated the effects of mortgages on the financial performance of commercial banks in Kenya and established that there is a positive relationship between commercial bank performance with effects of mortgage financing which are core saving, diversification of portfolio, increased income and economic growth.

Macharia (2013) evaluated the effects of the global financial crisis on the financial performance of commercial banks offering mortgage finance in Kenya and concluded that there is a negative relationship between inflation as a result of the global financial crisis and the financial performance of commercial banks offering mortgage finance in

Kenya. Wahome (2010) conducted a study on the effects of mortgage financing on the performance of the firms and concluded that mortgage financing is influenced by market and financial factors. Shikumo, D. H. & Mwangi, Mirie (2016) investigated Determinants of Lending to Small and Medium Enterprises by Commercial Banks in Kenya and found that bank size and liquidity significantly influence (positively and negatively, respectively) lending to SMEs by commercial banks in Kenya while credit risk and interest rates have no significant influence on lending to SMEs by commercial banks in Kenya.

However, from the reviewed literature very little is said about how mortgage lending influences the financial performance of commercial banks. From the aforementioned literature, it is clear that studies on mortgage financing and financial performance give mixed results and conclusions. Despite instability in the performance of commercial banks, there is no study conducted in Kenya to assess the effect of mortgage financing on the financial performance of commercial banks and therefore the effect of mortgage financing on the financial performance of commercial banks is not known.

2. Literature Review

A study in Nepal that sought to explore the impact of nonperforming loans on the profitability of Nepalese commercial banks was conducted by Kumar & Basuku (2017). The main objective of this study was to investigate the impact of nonperforming loans on the profitability of Nepalese commercial banks, Pooled data of fourteen commercial banks with 77 observations for the period of 2010 to 2015 had been analyzed using a regression model. The estimated regression models revealed that NPLR had a negative and statistically significant impact on bank profitability (ROA). This study concluded that the profitability of commercial banks in Nepal is influenced by the non-performing loan ratio and other covariates like: bank size, cost per loan assets and gross domestic product growth rate. A similar study by Viswanadham, & Nahid (2015) using cross-sectional survey design confirmed that macro-factors such as: economic condition and GDP impact negatively on the level of non-performing loans in Dodoma in Tanzania.

Aslam M. (2020) carried out a study in Bangladesh to investigate Bank-specific and Macroeconomic Determinants of Profitability of commercial banks listed on Dhaka Stock Exchange. The study was conducted using panel data set from 18 conventional private commercial banks listed in Dhaka Stock Exchange over a period of 2010 to 2019. Return on Asset (ROA) was used as a dependent variable as a proxy for profitability; nine bank-specific variables and three macroeconomic variables were used as independent variables. The study was conducted using panel data regression model and Hausman test was conducted to choose between fixed effect and random effects model. Empirical results show that Non-performing loan ratio, Equity multiplier, Cost to income ratio, Net interest margin, Non-interest income to total asset ratio among the bank-specific variables and Real rate of interest, Economic growth among the macroeconomic variables have a significant impact on profitability. An interesting finding was that banks'

profitability over this period had a significant negative relationship with economic growth.

Fang (2014) conducted a study on the relationship between home mortgage loans and the real estate market in China and their effect on banks' financial performance, the study sought to analyse the correlation between the development of the real estate market and home finance and their effect on banks financial performance. The study further revealed that both real estate financing and mortgage had positive effects on the bank's profitability. Although residents' sustainable income, macroeconomic factors are all the reasons for the development of China's real estate market.

Duraj (2015) investigated the profitability behaviour of bank-specific, industry-related and macroeconomic determinants from Albania. The primary objective was to investigate the determinants of profitability and to present all the debates through the literature review on the profitability of these important financial institutions, the banks. An important element of the macro-prudential analysis was the evidence of the internal and external factors and their relationship to the profitability of the banking sector and how this relationship is affected by institutional and structural characteristics. On the other hand, internal factors of the banks influencing the profitability were analysed. The estimated results suggest that the profitability of Albanian banks is influenced not only by factors related to their management decisions which are classified as internal factors, but also by changes in the external macroeconomic environment example; GDP, and inflation which resulted as significantly related to the profitability of the banks.

Dirnhofer (2012) examined the impact of Mortgage-Backed Securities on the performance of the Top 375 US banks during the financial crisis. The study used a correlation study design and only secondary data was used. Regression analysis was carried out to examine the relationship between the variables and bank performance. Banks that were highly involved in the securitization process of mortgage loans tended to perform very poorly during the financial turmoil. Furthermore, Mortgage-Backed Securities did not only affect bank performance but also had a positive correlation with the number of impaired loans. Mortgage Backed Securities have proven ones more about how financial instruments can have a large impact on the entire financial market and their effects when being used inappropriately. During the turmoil, hundreds of banks have made use of this financial tool to increase their leverage and diversify the risk in order to enhance their growth. However, in the end, this plan failed as banks began to misuse this tool and third parties were unable to screen and observe relevant information with regard to MBSs. The study concluded that Mortgage Backed Securities had a negative effect on bank performance during the banking turmoil as well as on the number of impaired loans.

Amahalu, N. N. *et al.*, (2017) analysed the relationship between loan management and the financial performance of quoted deposit money banks in Nigeria. The objective of this study was to determine the relationship between loan management and financial performance with a focus on deposit money banks, evaluate on the floor of the Nigerian stock exchange from 2010 – 2015. This study used secondary data obtained from fact books, annual reports and accounts of the listed deposit money banks in Nigeria. The

relevant data obtained were subjected to statistical analysis using STATA 13, Pearson coefficient of correlation and multiple regression analysis were the statistical tools used for this study, the result of this study revealed that there was a positive and statistically significant relationship between loan management and financial performance (ROA, EPS, DPS of quoted deposit money bank in Nigeria).

Ayele (2012) investigated the determinants of private commercial banks' profitability in Ethiopia by using panel data from seven private commercial banks from the year 2002 to 2011. The study used a quantitative research approach and secondary financial data were analysed by using multiple linear regression models for the three bank profitability measures; Return on Asset (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). The fixed effect regression model was applied to investigate the impact of capital adequacy, asset quality, managerial efficiency, liquidity, bank size, and real GDP growth rate on major bank profitability measures i.e., (ROA), (ROE), and (NIM) separately. Besides this, the study used primary data analysis to solicit managers' perceptions towards the determinants of private commercial banks' profitability. The empirical results show that bank-specific factors; capital adequacy, managerial efficiency, bank size and macro-economic factors; level of GDP, and regulation have a strong influence on the profitability of private commercial banks in Ethiopia. Thus, management bodies of private commercial banks should strive to strengthen the identified significant factors and government bodies should also see the adverse effect of tight policies imposed on the existing private banks as well as for the new entrant. However, even though the study reveals that there is a strong influence on profitability, the findings were limited only to private banks in Ethiopia.

Ogboi, C. & Unafe, O. K. (2013) conducted a study in Nigeria on credit risk management and capital adequacy. The study objective was to analyse the impact of credit risk management and capital adequacy on the financial performance of commercial banks in Nigeria. The study used a time series and cross-sectional data from 2004-2009 obtained from selected banks' annual reports and accounts in Nigeria, this is with a view to providing further empirical evidence on how credit risk management strategies and capital requirement variables affect banks' profitability in Nigeria. The panel data model was used to estimate the relationship that exists among loan loss provisions (LLP), loans and advances (LA), non-performing loans (NPL), capital adequacy (CA) and return on asset (ROA). Results showed that sound credit risk management and capital adequacy impacted positively on bank's financial performance with the exception of loans and advances which were found to have a negative impact on banks' profitability in the period under study. A similar study by Kolapo *et al.* (2012) using panel data regression for the period 2000 to 2010 found that the effect of credit risk on a bank's performance measured by the Return on Asset (ROA) of banks is cross-sectionally invariant. They concluded that the nature and managerial pattern of individual firms does not determine the impact. Also, Hosna, Manzura and Juanjuan (2009) reemphasized the effect of credit risk management on the profitability level of banks. They concluded that higher capital requirement contributes positively to a bank's profitability. Muhammed, Shahid, Munir and Ahad (2012) used descriptive, correlation and regression techniques to study

whether credit risk affect banks' performance in Nigeria from 2004 to 2008. They also found that credit risk management has a significant impact on the profitability of Nigerian banks. However, none of these studies focused on the volume of mortgage lending both in developing and developed countries.

Ajang (2018) carried out a study on the effect of loan portfolio management on the profitability of Deposit Taking Microfinance Institutions in Nairobi, Kenya. The study used a descriptive survey design. The population of the study was made up of all the Deposit Taking Microfinance Institutions operating in Nairobi County. A census was used to carry out the study. The study used primary data which was collected using questionnaires. The data collected was then tabulated and analyzed using the Statistical Package for the Social Sciences. Multi-regression was used to determine the effect of the independent variables on the dependent variable. The results were presented in tables and graphs. The study found out that loan portfolio planning, client screening and loan portfolio control had a significant influence on the profitability of Deposit Taking Microfinance Institutions. The study concluded that loan portfolio management has a significant effect on the profitability of the Deposit Taking Microfinance Institutions in Nairobi County at 55.2%. This study focused mainly on deposit-taking microfinance institutions in Nairobi, while the finding is that loan portfolio control had a significant influence on profitability the scope is so limited to enable sound results and therefore little is known as to whether the same findings can be elicited to influence the financial performance of commercial banks.

Karanja (2013) carried out a study on the relationship between mortgage financing and the profitability of commercial banks in Kenya. The study sought to answer the following specific objectives; to determine how mortgage core savings influence the profitability of commercial banks, to establish the relationship between income and profitability of commercial banks, to establish the relationship between economic factors and profitability of commercial banks and to establish how diversification of portfolio influences profitability of commercial banks. The study adopted a descriptive research design for it portrays an accurate profile of situations. The population of this study comprised of financial managers and credit managers from the mortgage financing institutions in Kenya. The target population of this study was 44 commercial banks in Kenya. The study adopted a census survey of all the banks. The study used primary data and secondary data. The study used a survey questionnaire administered to each member of the sample population. The study administered the questionnaire individually to all respondents of the study. Secondary data was obtained from the individual bank reports and from Central Bank of Kenya. Quantitative data collected was analyzed by the use of descriptive statistics using SPSS and presented through percentages, means, standard deviations and frequencies. The information was displayed by use of bar charts, graphs and pie charts and in prose form. The inferential analysis which includes regression and correlation was done to establish the relationship between mortgage financing and the profitability of commercial banks in Kenya. The study established that there is a positive relationship between mortgage financing and the profitability of commercial banks in Kenya. A similar study by Adongo (2010) using cross-sectional data confirmed the results

with the finding that only a few banks, 9 out of the 43 do not offer mortgage financing. However, the studies give a general view of financial performance with finding on how mortgage lending influences the profitability of commercial banks. According to Ndungu (2010), Kenya's mortgage market is growing and the mortgage industry is dominated by the larger commercial banks indicating barriers to entry or high risk for medium and smaller banks. He further stated that the growth rates of small-sized banks have been the fastest, with a growth rate of 38% on average, followed by medium banks which are growing at 25% on average with large banks closely following at 24% on average (Ndungu, 2010). Ndirangu (2014) focused on the effect of adopting different types of mortgages on the financial performance of mortgage institutions in Kenya his study revealed that adopting different types of mortgages positively affect the financial performance of mortgage institutions in Kenya (Ndirangu, 2014) further found that the growth rates of banks ranged between 40-50% in 1990 to 70% in 2004. This was linked to mortgage firm's ability to match services to the need of the customers which generated adequate risk-adjusted returns, besides being influenced by the overall growth in the mortgage finance market (Ndirangu, 2004).

Ndururu (2012) evaluated the effects of mortgages on the financial performance of commercial banks in Kenya. The study sought to answer the following specific objectives; to determine the effects of mortgage saving on financial performance in commercial banks, and to establish the effects of mortgage diversification on the financial performance of commercial banks. This study adopted a descriptive research design for it portrays an accurate profile of situations. The target population of this study was 44 commercial banks in Kenya. The study used primary data and secondary data. The inferential analysis which included regression and correlations was done to establish the effects of mortgage financing on financial performance in commercial banks in Kenya. The study concluded that commercial banks in Kenya emphasises on mortgage financing to improve bank performance. The study concluded that mortgage financing is influenced by market and financial factors which includes increased investment and Improve Profitability of the firm, improvement of risk management, the attraction of more customers, promotion of innovations, Market Penetration, diversification of investment and encountering competition in the market lowering of interest on Treasury bond, Kenya financial laws require the bank to have less cash in reserve and High interest from Mortgage, creating of wealth and Improving savings. The study therefore established that there is a positive relationship between commercial bank performance with effects of mortgage financing which are core saving, diversification of portfolio, increase income and economic growth. Murugu (2013) carried out a study on the perceived quality of service in the mortgage sector. In his study, it was found that Commercial Banks in Kenya offered quality mortgage products as perceived by the customer. Mutero (2007) did a study on access to housing finance in Africa, exploring the issues, he found that Kenya has a well-developed and regulated financial system and, in recent years, the mortgage finance sector has become competitive and innovative, this sector serves only those households at the top of the income pyramid. Mutero (2007) recommended that there was need to assess the effects of mortgage financing on the

financial performance of commercial banks in Kenya. Nkirote (2014) did a study on environmental challenges and the strategic responses in the mortgage industry in Kenya, his study found that there was stiff competition in the industry, the study also found that mortgage firms were responsive to environmental challenges by having produced tailored products to suit their clients.

Despite studies indicating that there is a positive relationship between mortgage financing and financial performance, to the researchers' best knowledge, there is no study conducted in the study area to establish the relationship between outstanding mortgages and the financial performance of commercial banks in Kenya, hence knowledge gap.

3. Material and Methods

This study adopted a correlation research design. A correlation research design is a design that is used when a researcher wants to describe the relationship of two or more variables. The study was conducted in Kenya. The study targeted all the commercial banks in Kenya offering mortgage financing. According to the Central Bank of Kenya (2021) report, there are 39 established Banks in Kenya, 32 of which are offering mortgage financing. The study used a census technique where all 32 commercial banks were surveyed. The panel data set covering a period of 7 years as from 2015 to 2021, giving 189 data points were collected. This period is characterised as a time of significant developments in the country's banking sector (CBK, 2016a). Also, over the same period of time, the capping of the interest rates had been affected, and the country's GDP had stagnated in growth. Data was analysed using inferential statistical techniques. Diagnostic tests were carried out to ensure that the data conformed to the basic assumptions of the classical linear regression model.

3.1 Results on the Unit Root Tests

Table 3.1 shows the results of the unit root tests conducted on the variables using Levin, Lin, Chu (LLC) common root test. From the results, all the variables of the study were found to be stationary at levels.

Table 3.1: Summary of the Levin, Lin, Chu (LLC)
Common Root Test Results on the Study Variables

Study Variable	Statistic	Prob.
Financial Performance (ROAS)	9.38165	0.0000*
Mortgage Financing (MF)	4.86372	0.0000*

* represent significance at the 0.05 level.

Source: Field data, 2023

The detailed E-views results are shown below:

3.1.1 Unit Root Test on Financial Performance-ROAs

Table 3.1.1: Unit Root Test on Financial Performance-ROAs

Null Hypothesis: Unit root (common unit root process)							
Series: ROAS							
Date: 04/29/23 Time: 16:59							
Sample: 2015 2021							
Exogenous variables: Individual effects							
Automatic selection of maximum lags							
Automatic lag length selection based on SIC: 0							
Newey-West automatic bandwidth selection and Bartlett kernel							
Total (balanced) observations: 162							
Cross-sections included: 27							
Method				Statistic		Prob.**	
Levin, Lin & Chu t*				-9.38165		0.0000	
** Probabilities are computed assuming asymptotic normality							
Intermediate results on ROAS							
Cross Section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Bandwidth	Obs
ABSA	-0.66598	2.E-05	6.E-05	0	0	0.0	6
ABC	-0.47065	5.E-07	4.E-06	0	0	1.0	6
BOA	-1.14692	0.0006	0.0003	0	0	5.0	6
BOB	-0.62523	3.E-05	3.E-05	0	0	3.0	6
BOI	-1.23877	1.E-05	2.E-05	0	0	3.0	6
CON	-0.90012	7.E-05	0.0002	0	0	0.0	6
COOP	-1.00151	3.E-05	1.E-05	0	0	5.0	6
DBK	-1.18818	0.0006	0.0003	0	0	5.0	6
DTB	-0.23975	5.E-05	1.E-05	0	0	5.0	6
ECO	-0.86790	0.0006	0.0003	0	0	5.0	6
EQT	-0.72191	0.0002	5.E-05	0	0	5.0	6
FBK	-0.87229	0.0002	0.0003	0	0	3.0	6
FCB	-1.19727	0.0002	9.E-05	0	0	1.0	6
GBL	-0.47000	3.E-05	5.E-06	0	0	5.0	6
GAB	-0.63764	3.E-05	0.0001	0	0	1.0	6
HFC	-0.33468	7.E-05	3.E-05	0	0	3.0	6
I&M	-0.55970	3.E-05	9.E-06	0	0	5.0	6
KCB	-1.00382	6.E-05	2.E-05	0	0	5.0	6
KBL	-1.11209	0.0022	0.0025	0	0	2.0	6
MIB	-0.67529	0.0001	0.0001	0	0	2.0	6
NBK	-0.97474	3.E-05	2.E-05	0	0	5.0	6
PBK	-1.19911	5.E-06	5.E-06	0	0	5.0	6
PBL	-0.46057	2.E-05	3.E-05	0	0	0.0	6
SMB	-0.94573	0.0076	0.0026	0	0	5.0	6
SPIRE	-0.24835	0.0068	0.0024	0	0	5.0	6
SBL	-1.07399	2.E-05	1.E-05	0	0	5.0	6
SCB	-1.19727	8.E-05	2.E-05	0	0	5.0	6
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.63640	-12.400	1.093	-0.554	0.919		162

3.1.2 Unit Root Test on Mortgage Financing-MF

Table 3.12: Unit Root Test on Mortgage Financing-MF

Null Hypothesis: Unit root (common unit root process)							
Series: MF							
Date: 04/29/23 Time: 17:02							
Sample: 2015 2021							
Exogenous variables: Individual effects							
Automatic selection of maximum lags							
Automatic lag length selection based on SIC: 0							
Newey-West automatic bandwidth selection and Bartlett kernel							
Total (balanced) observations: 162							
Cross-sections included: 27							
Method				Statistic		Prob.**	
Levin, Lin & Chu t*				-4.86372		0.0000	
** Probabilities are computed assuming asymptotic normality							
Intermediate results on MF							
Cross Section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Bandwidth	Obs
ABSA	-0.06919	0.0060	0.0011	0	0	5.0	6
ABC	-0.70808	0.0198	0.1191	0	0	0.0	6
BOA	-1.36148	0.1159	0.1429	0	0	1.0	6
BOB	0.05681	0.0111	0.0039	0	0	5.0	6
BOI	-1.15958	0.0706	0.1172	0	0	2.0	6
CON	-1.18525	0.1620	0.5462	0	0	1.0	6
COOP	-0.60847	0.0154	0.0351	0	0	0.0	6
DBK	-0.94761	0.0146	0.0073	0	0	5.0	6
DTB	-0.30354	0.0064	0.0031	0	0	5.0	6
ECO	-0.33700	0.0080	0.0189	0	0	0.0	6
EQT	-0.19290	0.0028	0.0005	0	0	5.0	6
FBK	-0.34802	0.0378	0.0468	0	0	2.0	6
FCB	-0.12076	0.1175	0.0284	0	0	5.0	6
GBL	-0.80048	0.1104	0.1893	0	0	0.0	6
GAB	-1.95573	0.1883	0.5566	0	0	0.0	6
HFC	-0.06261	0.0394	0.0089	0	0	5.0	6
I&M	-0.83911	0.0324	0.0147	0	0	5.0	6
KCB	-0.64860	0.0053	0.0026	0	0	5.0	6
KBL	-0.07243	0.0628	0.0096	0	0	5.0	6
MIB	-0.45790	0.1836	0.1834	0	0	2.0	6
NBK	-0.79774	0.0104	0.0210	0	0	0.0	6
PBK	-0.19248	0.0108	0.0024	0	0	5.0	6
PBL	-0.44991	0.0226	0.0514	0	0	1.0	6
SMB	-0.97277	0.0716	0.1068	0	0	2.0	6
SPIRE	-0.41780	0.3300	0.0992	0	0	5.0	6
SBL	-0.18708	0.0106	0.0090	0	0	2.0	6
SCB	-1.38334	0.0077	0.0184	0	0	2.0	6
	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.39697	-7.837	1.185	-0.554	0.919		162

3.2 Result on Model Specification Test

The Hausman Test was used to select the best model, that is, either the fixed effect (F.E) model or the random effect (R.E) model, to analyse the panel data under the null hypothesis, that the R.E model is preferred to the F.E model. Based on the test results as presented in Table 3.5.2 (see the regression results on the R.E model), the null hypothesis was rejected and hence, the F.E model was used.

Table 3.2: Summary Results on Hausman Test

Test cross-section random effects			
Test summary	Chi-Sq. statistic	Chi-Sq. d.f.	Prob.
Cross-section random	49.539951	6	0.0000*

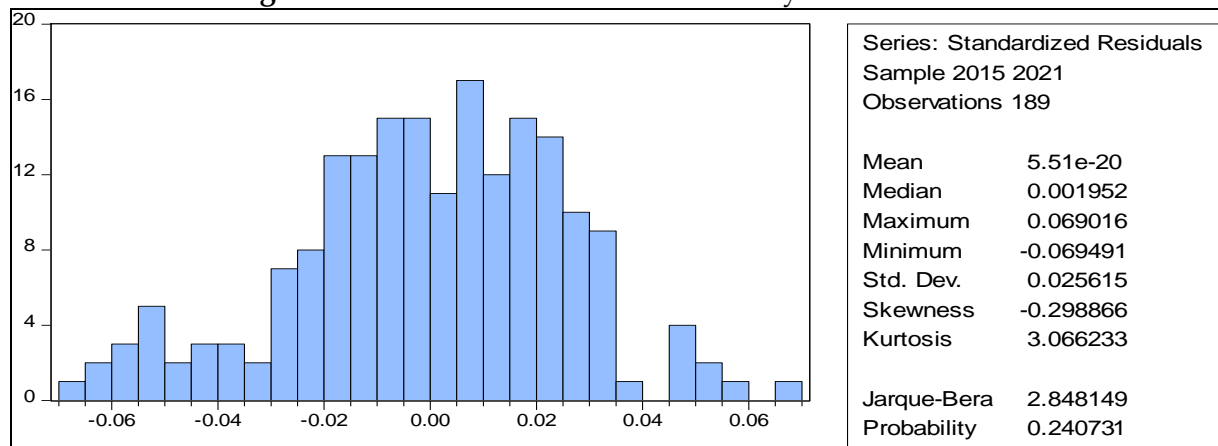
* represent significance at the 0.05 level.

Source: Field data, 2023.

3.3 Results on the Test of Normality of the Residual

Figure 4.3.1.3 shows that the residuals from the regression were normally distributed with the reported probability that the Jarque-Bera statistic exceeds in absolute terms the observed value being 0.240731, higher than the 0.05 level of significance.

Figure 3.1: Results on the Test of Normality of the Residual



Source: Field data, 2023

3.4 Results on Multicollinearity Test

The variance inflation factor (VIF) method was used in examining the inter-correlations among the explanatory variables. As indicated in Table 3.4, the centered VIF value is 9.691289 which is lower than 10. Accordingly, Gujarati (1995) asserts that multicollinearity will only be a problem if and only if one of the VIF values is greater than 10 which was not the case with the presented results.

Table 3.4: Variance Inflation Factors

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
C	1.56E-06	2.214812	NA
MF	6.65E-06	12.16054	9.691289

Key: MF = Mortgage Financing

Source: Field data, 2023

3.5 Model Specification

The researcher used the multiple regression analysis both in the basic and the interactive regression models as follows:

3.5.1 Basic Model

$$ROA_{it} = \alpha_0 + \beta_1 CAR_{it} + \beta_2 CAR_{it} * CAR_{it} + \beta_3 MF_{it} + \beta_4 MF_{it} * MF_{it} + \beta_5 LNRT_{it} + \mu_{it}$$

Where:

ROA_{it} = Return of asset of bank i at time t , CAR_{it} = Capital Adequacy Ratio of bank i at time t , MF_{it} = Mortgage financing of bank i at time t , α_0 = Intercept, $LNRT_{it}$ = Lending Interest rate of bank i at time t , and μ_{it} = Error term where i is cross sectional and t time identifier.

NB: One model that encapsulates the two independent variables that is mortgage financing and lending rates was used in the study which is in line with panel regression

3.5.2. Interactive Model

$$ROA_{it} = \alpha_0 + \beta_1 CAR_{it} + \beta_2 CAR_{it} * CAR_{it} + \beta_3 MF_{it} + \beta_4 MF_{it} * MF_{it} + \beta_5 LNRT_{it} + \beta_6 MF_{it} * LNRT_{it} + \mu_{it}$$

Where:

ROA_{it} = Return of asset of bank i at time t , CAR_{it} = Capital Adequacy Ratio of bank i at time t , MF_{it} = Mortgage financing of bank i at time t , α_0 = Intercept, $LNRT_{it}$ = Lending Interest rate of bank i at time t , $MF * LNRT_{it}$ = interaction term representing the moderator effect of bank i at time t and μ_{it} = Error term where i is cross-sectional and t time identifier.

4. Results and Discussion

4.1 Descriptive Statistics

Table 4.1 presents the descriptive statistics relating to the study variables. From the table, the financial performance of the commercial banks in Kenya as measured by their Return on Assets (ROAs) had a mean of 0.009987 with a standard deviation of 0.046222 during the study period. On the other hand, mortgage financing measured by the volume of mortgage lending (MF) had a mean of 4.11E-14 with a standard deviation of 1.768463.

4.1.1 Relationship between Mortgage Financing and Financial Performance

Table: 4.1.1: Relationship between Mortgage Financing and Financial Performance

	ROAS	MF	LNRT	CAR
Mean	0.009987	4.11E-14	4.27E-16	0.177816
Median	0.014846	0.005886	0.000407	0.147509
Maximum	0.074021	3.559180	0.062593	8.491264
Minimum	-0.302464	-4.639080	-0.031407	-0.504693
Std. Dev.	0.046222	1.768463	0.011805	0.612979
Skewness	-3.649655	-0.032412	1.141766	13.29389
Kurtosis	21.48392	2.685284	9.311741	180.9311
Jarque-Bera	3110.114	0.813078	354.7891	254885.2
Probability	0.000000	0.665951	0.000000	0.000000
Sum	1.887451	7.76E-12	8.05E-14	33.60722
Sum Sq. Dev.	0.401656	587.9630	0.026201	70.63976
Observations	189	189	189	189

Key: ROAs = Financial Performance of Commercial Banks, MF = Mortgage Financing, LNRT = Lending Interest Rate, CAR = Capital Adequacy Ratio

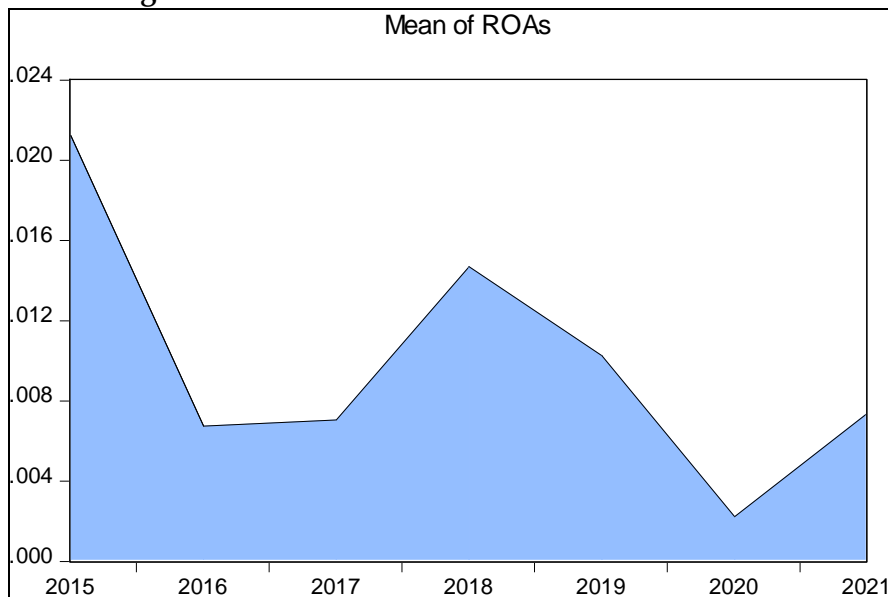
Source: Field data, 2023.

These include trend analysis on financial performance, mortgage financing and lending interest rate as follows:

4.1.2 Trend Analysis on Financial Performance of the Sampled Banks

Figure 4.2.1 below indicates that the mean ROAs for the sampled commercial banks in Kenya had a decreasing trend from 2015 to 2016, stagnated in 2016 and increased gradually from 2017 to 2018 before taking a downward trend again and was minimum in 2020. The minimum returns experienced in 2020 might be attributed much to the negative effects of the covid-19 pandemic that led to slow growth in lending.

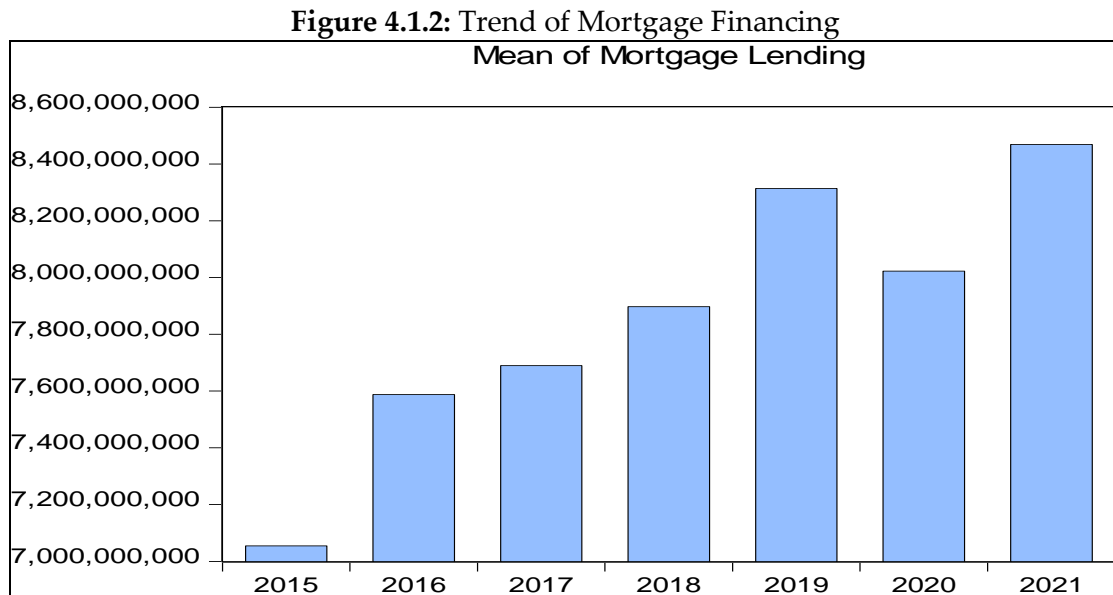
Figure 4.1.1: Trend of Financial Performance- ROAs



Source: Field data, 2023.

4.1.3 Trend Analysis on Mortgage Financing of the Sampled Banks

Figure 4.2.2 shows an upward trend with an annual average mortgage lending increasing from over seven billion in 2015 to approximately 8.4 billion in 2019, then declined a bit to eight billion in 2020 due to the covid-19 pandemic that constrained households and finally increasing to over 8.4 billion in 2021. All in all, there was high uptake of mortgage loans over the study period. This is consistent with the finding of Karanja (2009) who conducted a study and found out that annual average mortgage volume consistently increased over time.



Source: Field data, 2023.

4.2 Inferential Statistics

4.2.1. Results on Correlation Analysis

Table 4.2.1 indicates the correlation matrix. From the table, financial performance measured in terms of ROAs had a weak positive correlation with the volume of mortgage financing for the sampled commercial banks in Kenya ($r=0.298489$) at 5% significant level.

Table 4.2.1: Correlation Matrix

Correlation				
Probability	ROAS	MF	LNRT	CAR
ROAS	1.000000			

MF	0.298489	1.000000		
	(0.0000) *	-----		

Key: ROAs = Financial Performance of Commercial Banks, MF = Mortgage Financing,
Note: p-values in parentheses; *represent significance at the 0.05 level

Source: Field data, 2023.

4.2.2 Regression Results

The results are from the interaction model of moderated multiple regression run to test the research hypotheses. These results include summary statistics of the multivariate regression model and the regression results on the effect of mortgage financing on financial performance of commercial banks in Kenya.

4.2.2.1 Summary Statistics of the Regression Model

Table 4.2.2.1 presents the summary statistics of the interaction regression model. From the statistics, R-Squared is 0.866892. This means the independent variables jointly explain about 86.69% of the variations in the financial performance of commercial banks in Kenya. In addition, the results show that the Adjusted R-Squared is 0.839587, a clear indication that the independent variables collectively, are good explanatory variables of the financial performance of commercial banks in Kenya. Moreover, the probability of the F-statistic (0.000000) was less than the 0.05 level of significance. Hence, the null hypothesis of F-statistic (the overall test of significance) that R-Squared is equal to zero was rejected. Further, the D.W. statistic was about 1.6 implying that serial correlation was not a problem in the regression analysis.

Table 4.2.2.1 Summary Statistics of the Moderated Regression Model

R-Squared	0.866892
Adjusted R-Squared	0.839587
F-statistic	31.74929
Prob (F-statistic)	0.000000
Durbin-Watson stat	1.592612

Source: Field data, 2023.

4.2.2.1 Regression Results on the Effect of Mortgage Financing on the Financial Performance of Commercial Banks in Kenya

Table 4.2.2.1 shows that the coefficient of mortgage financing (MF) is 0.004434, with a p-value=0.0004. This indicates that a unit increase in mortgage financing leads to an increase of 0.004434 in the financial performance of commercial banks in Kenya holding other factors constant. Moreover, the effect is significant since the p-value is less than the 0.05 level of significance leading to the rejection of the null hypothesis that mortgage financing has no significant effect on the financial performance of commercial banks in Kenya. Hence, the alternative hypothesis was instead accepted. However, the square of mortgage financing variable (MF*MF) included in the model to take care of the second-order effects with a coefficient of 0.000703 with a p-value=0.3689 was insignificant. The detailed E-views follow Table 4.2.2.2 regression results.

Table 4.2.2.1: Regression results on the effect of mortgage financing on financial performance of commercial banks in Kenya

Mortgage Financing Variable	Coefficient	Std. Error	t-Statistic	Prob.
MF	0.004434	0.001222	3.629713	0.0004*
MF*MF	0.000703	0.000780	0.901059	0.3689

* represent significance at the 0.05 level.

Source: Field data, 2023

Table 4.2.2.2: Detailed E-views result

Dependent Variable: ROAS				
Method: Panel EGLS (Cross-section weights)				
Date: 05/01/23 Time: 15:26				
Sample: 2015 2021				
Periods included: 7				
Cross-sections included: 27				
Total panel (balanced) observations: 189				
Linear estimation after one-step weighting matrix				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.002127	0.004800	-0.443142	0.6583
CAR	0.073991	0.028182	2.625464	0.0095
CAR*CAR	-0.008675	0.003295	-2.632408	0.0093
MF	0.004434	0.001222	3.629713	0.0004
MF*MF	0.000703	0.000780	0.901059	0.3689
LNRT	-0.158824	0.050408	-3.150767	0.0020
MF*LNRT	-0.057650	0.020935	-2.753725	0.0066
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.866892	Mean dependent var	0.059682	
Adjusted R-squared	0.839587	S.D. dependent var	0.076165	
S.E. of regression	0.028120	Sum squared resid	0.123355	
F-statistic	31.74929	Durbin-Watson stat	1.592612	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.645216	Mean dependent var	0.009987	
Sum squared resid	0.142501	Durbin-Watson stat	1.613486	

5. Conclusions and Recommendations

In view of the study findings, it was concluded that mortgage financing has a significant positive effect on financial performance of commercial banks in Kenya.

In line with the above conclusions, the sector stakeholders should champion for the enactment of favourable regulations that motivates more banks to adopt mortgage financing among their key lending activities as it will boost their revenue streams and hence impacting positively on their financial performance thus guaranteeing their sustainability in the changing competitive landscape.

5.4 Limitation of the Research

The study relied majorly on secondary data from the financial statements of commercial banks and central banks. Such data are quantitative in nature and therefore do not provide an opportunity to fully interrogate the mortgage financing issues of the banks as may have been the case if primary data sources were used.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Authors

Daniel Odhiambo Dondi is a PhD student at Maseno University, Kenya and holds Msc. Finance, Bachelor of Commerce – Finance and Accounting, Certified Public Accountant Kenya (CPA K).

Robert K. Mule (PhD) is a lecturer at Maseno University, Kenya.

Benjamin O. Ombok (PhD) is a lecturer at Maseno University, Kenya.

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