

**EFFECT OF MOBILE LENDING ON NON-PERFORMING
LOANS AMONG COMMERCIAL BANKS IN KENYA**

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DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

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This research project has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

This research project is dedicated to my Mother D. Mwangeli. My Children Denis Mwanzia and TerryAnne Mwangeli, and My brother Kasyoki. To my mother, I saw your struggles to bring us diligently. You instilled in me discipline and inspired me to work hard in school and in life. You have always told me to strive for excellence in all spheres of life and I am forever grateful. To my children, I wish you to grow in wisdom and be trailblazers in your own great ways.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATM	Automated Teller Machine
CBK	Central Bank of Kenya
DLAK	Digital Lenders Association of Kenya
MFI	Micro Finance Institution
MSME	Micro, Small and Medium Enterprises
NPL	Non- Performing Loans
ROA	Return on Assets
SPSS	Statistical Package for Social Sciences
VIF	Variance Inflation Factors

ABSTRACT

Commercial banks have increased their digitization, putting mobile lending at the frontline, in order to enhance their network base, reduce personnel costs, compete favorably with their peers, as well as improve their financial performance. Nevertheless, with all of this increased digitization, some banks have shown a decline in performance, others have been placed under statutory management, and still others have been completely closed. One of the explanations for this trend is the fact that the increase in mobile lending has also been followed by increases in the level of NPLs. This research aimed at finding the effect of mobile lending on the level of NPLs among commercial banks in Kenya. Bank size, capital adequacy and interest rate were used as the control variables in the model. Descriptive research design was used. The 38 commercial banks in Kenya were the target population. Research variables data were derived from CBK and annual financial statements from 2016 to 2020 for all the 38 banks. Regression as well as correlation analysis were utilized to test the research hypotheses by establishing the correlation between mobile lending and NPLs. The study found that mobile lending ($\beta=0.166$, $p=0.192$) and interest rates ($\beta=0.379$, $p=0.162$) had a positive but not significant effect on the level of NPLs among banks in Kenya. The study also found that bank size ($\beta=-0.348$, $p=0.021$) and capital adequacy ($\beta=2.141$, $p=0.028$) had significant effect on the level of NPLs among banks in Kenya. The results also indicated R^2 of 0.299 which implied that the selected independent variables contributed 29.9% to variations in NPLs. The research recommends that managers of commercial banks ought to keep offering mobile loans as this does not increase the risk of delinquent loans. Policy makers such as CBK ought to develop policies and guidelines that would make it easy for banks to offer mobile loans to their clients. Further, the research suggests that banks in Kenya should strive on growing their asset base as bigger banks are able to enjoy economies of scale and have better structures that help them in managing and monitoring NPLs compared to small banks.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The infusion of mobile lending into the banking operations and services have provided a new cost effective alternative to enhancing financial inclusion and promoting access to credit by the poor, the rural population and the middle class (Koki, 2018). This has however come with the risk of rise in the Non-Performing Loans (NPLs) level (Ugoani, 2016). According to Kaaya and Pastory (2013), rise in gross NPLs level pose a great risk to financial institutions including commercial banks and the economy at large. High NPLs levels as a result of the crisis have a detrimental influence on credit availability and demand, decreasing lending to the real economy at a time when it is desperately required.

This research was guided by; financial intermediation theory, information asymmetry theory and Merton's default risk theory. Financial intermediation theory by Diamond (1984) is the anchor theory as it states that through intermediation, financial institutions may create and provide customized financial solutions to meet the needs of each client. By doing so, the financial intermediaries enhance credit reach but this may also contribute to increase in NPLs. The theory links mobile lending and NPLs. The theory of information asymmetry by Akerlof (1970) is fundamental in understanding the need for disclosure in issuing loans. Credit risk is caused by unpredicted factors in the market that influence the level of NPLs. Merton's default risk theory by Merton (1970) is used in determining ability of debtors to repay loans hence is useful to credit analysts in determining a firm's or individuals credit default risk.

The study focused on commercial banks in Kenya; since nearly all commercial banks in Kenya have invested or are seeking to invest in mobile lending. Commercial banks,

like KCB, Equity Bank, NCBA, Cooperative Bank of Kenya and Diamond Trust Bank among others, have launched digital lending to their customers as from 2012, or by forming a partnership with Safaricom (KCB in 2015 and CBA in 2012). ABSA started a virtual mobile network operator which is independent like Equity's Equitel (CNBC AFRICA, 2019). There is therefore need to investigate whether these happening has an effect on the NPLs level amongst these commercial banks as increases in NPL is a risk that can jeopardize their operations.

1.1.1 Mobile Lending

Mobile lending entails the automation of processes and structures that are critical to improving and simplifying the loan process (Kigen, 2010). Revenue creation may be mobilized using mobile lending as a contemporary method in banks. This may improve and expand the income base and banking transaction of services and products (Health Finance and Governance, 2013). Mobile lending entails making investment utilizing cutting-edge technology in order to boost income and increase the system's efficiency and efficacy (Sheleg & Kohali, 2011). According to John, Fredrick and Jagongo (2014), mobile lending refers to new technologies that enable money transfer services and financial transactions that are regulated and carried out by financial institutions through mobile phone rather than conventional over-the-counter trades.

Adoption of mobile lending helps in minimizing the operational costs and in being efficient and effective as service provider. The banks saves the cost of opening new branches because mobile lending enables bank reach customers and penetrate new markets. Mobile lending enables the banks to maximize the income collection that is not supported by any funding (Sheleg & Kohali, 2011). According to research conducted in Kenya, mobile lending has brought about an increment in the quantity of

people signing up for banking services, as well as Additional profit from interest and transaction fees for commercial banks (Koki, 2018).

Previous studies have operationalized mobile lending in terms of either number of mobile loan applicants, value of mobile loans or as a proportion of mobile loans to total loans (John et al., 2014). Others such as Koki (2018) operationalized mobile lending as the availability, cost and amount of mobile loans issued. The current research will operationalize mobile lending as the natural logarithm of the total value of mobile loans in a given period due to its wide applicability in previous literature.

1.1.2 Non-Performing Loans

Fofack (2005) defines NPLs as loans that remain outstanding for long periods of time. According to IMF (2015), loans are considered not active if principal payment together with interest are past due by more than 90 days, or when at the minimum 90 days of payments on late interest have been delayed by agreements, capitalized or payments are overdue by less than 90 days, with clear indications towards doubt in payment made full. Moreover, NPLs are considered as those loans which are rolled over, where the borrower only services the interest rate while the principal amount or a fraction of it remains unpaid for a duration of more than 90 days (Ezeoha, 2011). According to CBK (2019), NPLs are loans that the principal or interest has been due as well as unpaid for 90 days or longer, or payment of interest have been repaid or rolled over into a new loan for 90 days or more.

NPL investments result in the reduction of banks' liquidity and credit expansion. As a result, the slowdown in the growth of the real sector directly affects banks' financial performance, firms in default and economy as a whole (Kithinji & Waweru 2007). Furthermore, NPLs generate difficulty in banking sectors' balance sheet asset side.

NPLs also affect income statements by creating negative impacts due to provisions made for loan losses. High levels of NPLs towards banking systems endanger systemic risks that invite panic within deposits hence restricting financial intermediation, investments, together with growth. NPLs combined with external shocks together with inadequate political or legal support result in phases of greater economic cycles that are exacerbated (Brownbridge, 1998).

Several ratios are utilized in measuring NPLs. The ratios include delinquency rate which is obtained by dividing total loan installments past due divided by total loan advances (Stanga, Vlahu & Haan, 2018). Saba, Kouser and Azeem (2012) operationalized NPLs as the absolute value of NPL in a given period. The most widely used measure is however the non-performing loans to total loans ratio as well as advances in a given period. The higher the ratio, the higher the credit risk. The current study will operationalize the NPL level by the proportion of NPL to total loans and advances.

1.1.3 Mobile Lending and Non-Performing Loans

One major debate in NPLs academic literature is factors affecting NPLs (Skarica, 2014; Louzis et al, 2012; Nkusu, 2011). The main income for banks is in the interests on loans which also increases liquidity position in banks. Hence, management of NPLs in banks serves as an addition in improving financial performance. International analysis shows that if NPLs are not managed properly, they subsequently lead to bank failures in addition to nationwide monetary fragility. NPLs block interest revenues, reduce investment opportunities and create liquidity crisis within a financial system which can have devastating effects such as bankruptcy. Samuel (2011) notes that although banks

have put measures to secure loans, mortgages and other securities, loan defaults has become part of the lending business.

World Bank (2016) has identified that mobile loans and mobile money have had a positive effect on financial inclusion levels. Nevertheless, increase in financial inclusion did not always translate to superior financial performance for commercial Banks. The correlation between mobile lending and financial performance was found to be insignificant. The most likely explanation of the findings is that an increase in mobile lending also comes with increased level of NPLs depleting the gains of increased financial inclusion and loan volumes.

Financial intermediation theory by Diamond (1984) observes that through intermediation, financial institutions may create and provide customized financial solutions to meet the needs of each client. By doing so, the financial intermediaries enhance credit reach but this may also contribute to increase in NPLs. The theory links mobile lending and NPLs. Merton's default risk theory by Merton (1970) also recognize that mobile lending can have an influence on the prevailing levels of NPLs.

1.1.4 Commercial Banks in Kenya

Commercial banks are categorized mainly by ownership, with some belonging to local individuals or firms and others to foreign organizations and individuals. Kwach (2020) in her article in 2020 observed that nature also categorizes banks, that is, microfinance banks as well as commercial banks. Commercial banks are classified into three levels by the Kenyan Central Bank, which oversees them. Tier 1 banks are large financial institutions with assets worth hundreds of billions of dollars that are unlikely to fail. They are Kenya's most important banks. Tier 2 is made up of medium-sized banks, and Tier 3 is made up of small banks. The number had risen to 43 in 2016. Nevertheless,

some banks, like Chase Bank, Dubai Bank as well as Imperial Bank, have had issues that have resulted in bank closures and Central Bank intervention, while others have currently merged, such as Commercial Bank of Africa and NIC Bank merging to form NCBA, and KCB acquisition of National Bank of Kenya, taking the total number of banks to 38 (BankingSurveyLive, 2019). The number of registered Microfinance banks, on the other hand stands at 10 and a group of 11 digital lenders who are self-regulating under Digital Lenders Association of Kenya (DLAK) whose proposal as a means of ethical lending has been rebuffed by CBK Governor, Patrick Njoroge (CBK, 2020).

Equity bank, NCBA, KCB and Co-op bank are the top 4 banks in terms of digital lending. Equity bank leads in digitization strategy through the launch of Equitel and Eazzy banking app, seconded by KCB on KCB M-pesa leading growth in deposits and loans and Co-op bank with a large Sacco banking foundation with growth potential, cost reduction, operational efficiency to boost profitability (Kwach, 2020). There is growth in the Kenyan banking industry on loans advancement with the recent launch of a loan facility by CBK known as 'Stawi' which aims to provide unsecured loans averaging Kshs 30,000 to Kshs 250,000 to MSMEs in 4 commercial banks (NCBA, KCB Group, Diamond Trust Bank Kenya (DTBK) and Co-operative Bank Kenya) with a 1 to 12 months repayment period. The credit product, which is priced at 9.0 percent p.a., will assist MSMEs overcome challenges like access to formal credit due to the informal nature of their businesses, lack of collateral, as well as the low rate of private sector credit growth (Cyttonn, 2019).

1.2 Research Problem

Commercial banks have increased their digitization, putting mobile lending at the frontline, in order to enhance their network base, reduce personnel costs, compete

favorably with their peers, as well as improve their financial performance. Nevertheless, with all of this increased digitization, some banks have shown a decline in performance, others have been placed under statutory management, and still others have been completely closed. One of the explanations for this trend is the fact that the increase in mobile lending has also been followed by increases in the level of NPLs (Koki, 2018). There is therefore need to establish if mobile lending can explain the rise in the level of NPLs.

Banks in Kenya have made significant investments in fintech such as mobile lending to tackle issues about competition, income and cost. At the same time, the number of nonperforming loans (NPLs) held by commercial banks has increased. The critical question is whether the rise in NPL results from mobile lending. Given that mobile lending has already cost Kenya billions of shillings, it is critical to investigate the link between growing NPLs and mobile lending. It is critical to keep NPLs under control so that commercial banks' financial performance is not adversely affected. An increase in NPL among commercial banks if not checked can lead to huge losses in the banking sector and the effect would be felt in the entire economy.

A lot of empirical evidence exists on how mobile lending impacts financial performance of institutions like banks but very few if any have focused on mobile lending and NPLs. The studies have also produced varied results. Francis, Blumenstock and Robbinson (2017) did a study on digital credit in emerging markets. In their study, they concluded that this easy access high interest digital credit are likely to have adverse consequences to borrowers. From 2006 to 2014, Wadhe and Saluja (2015) investigated how electronic banking impacts the profitability of Indian banks. The findings demonstrated that, in both private and public sector banks, electronic banking had a

positive connection with profitability. Ndagijimana (2017) zeroed in on the impact of mobile lending on commercial banks' performance in Rwanda but did not address the level of NPLs. All of these investigations were conducted in a distinct setting, thus their results cannot be applied to the current situation.

Locally, Mugodo (2016) explored how electronic banking affects commercial bank profitability in Kenya and found that it has a beneficial impact on the profitability. This research reveals a conceptual gap as the focus was on profitability. Chirah (2018) investigated how alternative banking channels affect bank operational efficiency in Kenya, concluding that online banking has no substantial impact on bank operational efficiency. The study presents a conceptual gap as it focused on different variables from mobile lending and NPLs. Abdulkadir (2019) studied how commercial banks in Kenya profitability is impacted by fintech and concluded that fintech has a favorable impact on performance. This study finding was also supported by Kemboi (2018). The studies however did not determine the impact of fintech on the level of banks NPL. This study was motivated by the fact that despite the existence of prior studies almost all preceding researches have investigated the effect of fintech on financial performance leaving a gap on NPLs. Further, the studies have also not focused on mobile lending as they have focused on electronic banking as a whole. The current study was based on these gaps and attempts to answer the research question; how does mobile lending influence the level of NPLs among commercial banks in Kenya?

1.3 Research Objective

The objective was determining the effect of mobile lending on non-performing loans of commercial banks in Kenya.

1.4 Value of the Study

This research's results will contribute to the existing theoretical and empirical literature on mobile lending and commercial banks level of NPLs. The findings will also help in theory development as they will offer insights on the shortcomings and relevance of the current theories to the variables of the study. Subsequent studies may also be carried out based on the recommendation and further research suggestions.

The outcomes of the survey may be relevant to the government and the regulator CBK in developing regulations for the population under consideration. The study's findings will help investors who are considering investing in the population under investigation by providing information on the risk-reward tradeoffs that exist in such institutions and their impact on overall performance.

The findings are intended to benefit managers responsible for managing of commercial banks as the study will give important data as well as suggestions that will be valuable in making better decisions that will minimize NPLs. As a result, they will be in a better position to develop suitable plans and practices for their institutions improved non-performing loans management.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter explains the theories on which mobile lending and NPLs is based. It further discusses the previous empirical studies, knowledge gaps identified and summarizes with a conceptual framework and hypotheses showing the expected correlation among the study variables.

2.2 Theoretical Framework

This segment examines the theories that underpin the study of mobile lending and non-performing loans. Theoretical reviews enclosed include financial intermediation theory, information asymmetry theory and Merton's default risk theory.

2.2.1 Financial Intermediation Theory

Diamond's (1984) theory serves a central mandate in the financial intermediation process predominantly among banks to mitigate information asymmetry that lies between borrowers and lenders, hence their constant interaction assists lenders in producing credit worthy information to borrowers. Information that is provided gives creditors and loan officers a strong incentive in assessing and appraising credit to those that require it. Modern theories state that the business of financial intermediation is pegged on economic imperfections from 1970s with limited contributions (Jappelli & Pagano, 2006). The existence of the intermediaries is based on their ability to lower transaction and information costs from asymmetries (Tripe, 2003).

The biggest criticism of the financial intermediation theory is its inability to give recognition to the role of lenders in the process of risk management (Levine et al., 2000). Scholtens and Van Wensveen (2000) stated that they do not recognize credit risk

management as an important financial industry factor and emphasizing the participation costs concept. They suggested future developments in the financial intermediation theory to understand challenges in the financial sector.

The theory is useful in examining the level of NPLs among banks as they take a number of risk measurements using modern technology in credit which involves the efficient collection of private details, treating, screening and monitoring borrowers. Financial intermediaries utilize mobile apps and other digital lending mechanisms that are useful in lowering transactional costs brought about by information asymmetry. They hence play a central role in effective functioning of financial markets. The theory is useful in understanding how mobile lending and NPL relate.

2.2.2 Information Asymmetry Theory

Akerlof (1970) proposed this theory, which states that when borrowers and lenders interact, there is an information asymmetry. The assumption arises from borrowers who request for loans with no information on the possible risks associated with investment options on which the loan will be used. The lender on the other hand has no prior information on the investment by the borrower (Edward & Turnbull, 2013). Because none of them is privy to such information, adverse selection is generated thereby creating moral hazard issues (Horne, 2012).

Horne (2012) criticizes the theory stating two main reasons: signals influence information asymmetry which is not correct and investors that are heavily impacted upon by information asymmetry problems are ambiguously identified or misidentified. Stiglitz (1970) state that financial institutions write loan contractual terms seeking to attract borrowers to agree to their terms and to attract low risk credit borrowers. The effect of this is the setting of rates of interest for which loan demand exceeds loan

supply. The credit amount and the collateral amount also have an impact on credit-seeker character and distribution of the credit issued, and returns to lenders (Moti et al., 2012).

This theory is crucial in creating an understanding on the need to disclose information upon issuing loans in the segment. Increase in credit risk in the market is attributed to undisclosed factors that impact bank NPLs. The study hence seeks to examine how banks can make better appraisals using mobile APPs to lower the amount of losses and improve bank efficiency by maintaining good loans that are not declared delinquent. The theory is useful in explaining competitive market behavior. It has been utilized in many scenarios thereby confirming its credibility.

2.2.3 Merton's Default Risk Theory

The theory was proposed by Merton (1970). It has extensively been applied in assessing defaults among banks and cooperative societies. The model makes the assumption that credit analysts are necessary in appraisal of financial institutions, over the debt period (Jorion, 2014). It has been applied in determining debtors' capability in repaying their obligations and can be useful for credit analysts in establishing an institution's credit risk. The basis of the theory was on the assumption concerning the capital structure of a firm (Merton, 1970). In instances where there is a default and the market value of a firm's assets as compared to its liabilities falls below the standard limit, the firm is considered to be at default. A primary reason for this is credit risk which is common to financial institutions (Jorion, 2014).

Jones (1984) criticized the theory, claiming that the model's default risk is so low that investment pricing is comparable to that of a pure model without default risk. In a study, Afik et al. (2016) discovered that modest applications of the model are far greater as

compared to more complicated and arithmetic intensive models thereby recommended using simpler models.

The pertinence of the theory in this research being that it intends to evaluate mobile lending among financial institutions and its influence on the level of NPLs. The theory remains useful to this study since it confirms the importance of the ability of credit analysts to determine a borrower's capability to settle debts hence establishing the credit risk of an institution.

2.3 Determinants of Non-Performing Loans

There are numerous NPL bank determinants; these factors are found either within or outside the firm. Internal factors are firm-specific and can be manipulated internally. They are mobile lending, asset base, interest rate, capital adequacy, ownership and liquidity. Factors outside a firm that influence NPL includes; inflation, GDP, political stability and unemployment rate (Athanasoglou et al., 2005).

2.3.1 Mobile Lending

Mobile lending entails making investment utilizing cutting-edge technology in order to boost income and increase the system's efficiency and efficacy (Sheleg & Kohali, 2011). According to John, Fredrick and Jagongo (2014), mobile lending refers to new technologies that enable money transfer services and financial transactions that are regulated and carried out by financial institutions through mobile phone rather than conventional over-the-counter trades.

World Bank (2016) has identified that mobile loans and mobile money have had a positive effect on financial inclusion levels. Nevertheless, increase in financial inclusion did not always translate to superior financial performance for commercial Banks. The correlation between mobile lending and financial performance was found

to be insignificant. The most likely explanation of the findings is that an increase in mobile lending also comes with increased level of NPLs depleting the gains of increased financial inclusion and loan volumes.

2.3.2 Bank Size

The bank size usually establishes how much it is affected by financial and legal concerns. High banks are typically able to obtain low-cost capital while also making large profits, implying that bank size is closely related to capital sufficiency. Furthermore, ROA possess a positive relationship with bank size, indicating that large banks are able to achieve economies of scale, lowering operating costs as well as boasting loan volumes (Amato & Burson, 2007). Magweva and Marime (2016) found a positive correlation between the size of the bank and the amount of NPLs, implying that the level of NPLs rises as the bank grows in size.

As per Amato and Burson (2007), the amount of assets owned by an organization determines its size. In comparison to small organizations with less assets, it can be argued that the larger a firm's assets are, the better its capability to undertake a huge projects with higher returns. Furthermore, as compared to small firms, the larger the organization, the greater the security amount that can be pledged in order to acquire credit facilities (Njoroge, 2014). According to Lee (2009), the amount of assets under a company's control has an impact on the company's NPLs from one year to another.

2.3.3 Capital Adequacy

The capital adequacy ratio, often known as the bank capitalization ratio, is the equity-to-total-assets ratio. It assesses a bank's capability to manage risks in terms of solvency. Berger and DeYoung (1997) found a negative association between capital adequacy ratio and nonperforming loans in their research. Louzis et al. (2012) found a negative

correlation between capital adequacy ratio and nonperforming loans. They came to the conclusion that banks with huge capital adequacy ratios can manage to put in place efficient measures to limit default risks, resulting in lower NPL numbers.

A adequately capitalized bank leads gestures to the market that it ought to expect above-average performance. According to Athanasoglou et al., (2005), capital possess a positive impact on the level of NPLs, as evidenced by the Greece banks' strong financial position. Berger et al. (1987) also discovered a link between capital contribution and the amount of NPL in enterprises in both directions.

2.3.4 Interest Rate

The interest rate is regarded as funds outlay and an rise or rise in the rate of interest may affect the financiers' savings decisions (Olweny & Omondi, 2016). Consequently, due to high production cost as well as hazards rate, as per Rehman, Sidek, and Fauziah (2009), the interest cap implementation drives banks to reduce loans and forces several of these basics to abandon rural zones. As a result, the banks' growth will be delayed. To stop the situation from worsening, banks might raise fees and other taxes dramatically. As per Barnor (2014), an unanticipated shift in interest rate increases the default rate.

As per Khan and Sattar (2014), the interest rate possesses a positive or negative effect on NPLs, based on its movement. Savings are discouraged by a decrease in depositor interest rates and a rise in spread. A rise in the depositor's interest rate has a negative impact on the investment. In comparison to other sectors, the banking sector is very vulnerable to interest rate swings because the majority of bank earnings derives from the interest rate differentials that banks charge and repay to savers.

2.4 Empirical Review

Local as well as global researches have determined the correlation between mobile lending and NPLs, the objectives, methodology and conclusions of these prior research have been discussed in this segment.

2.4.1 Global Studies

Dawood et al. (2019) studied the mobile lending influence on alleviation of household poverty in Indonesia. Via the Binary Logistic model and data from 300.000 families from the 2017 Indonesian National Social and Economic Survey, the study found that mobile lending decreases absolute poverty amongst households. Additionally, mobile lending can be a compensation for limited assets, reduced non-agricultural occupations in rural areas, and little education for family heads. Additionally, it will reduce incentives for poor, to reduce rural-urban migration for low-skilled rural people who seek non-agricultural job opportunities.

Le, Ho and Mai (2019) focus on how mobile lending impacts income inequality in transitioning economies. The two-stage least squares model and two mobile lending indices are used in examining the impact that mobile lending has on income inequality in 22 transitioning economies from 2005 to 2015. The study results show that there exists a negative relation between the mobile lending index and the GINI coefficient. Among the suggestions put forward is that policy recommendations are needed to lower income inequality by the development of mobile lending.

Kim et al. (2019) examined fifty four scholarly papers on the relationship among development, integration and mobile service in order to identify the critical questions and gaps in their study. Findings indicate that most of the examined literature addressed three main areas: mobile services, delivery and the environment. In the early phases of

the research, the regions examined shown a prejudice to individual and institutional circumstances in the mobile banking services are being implemented, compared to real users' supply and demand and their social effect. The research techniques were selected additionally showing minimal variety and depth. This analysis enhances the knowledge of current publications on mobile financial service in regards to inclusiveness among emerging regions and identifies needs for further investigations.

Chinoda and Akande (2019) have examined Africa's mobile telephone distribution, economic development and financial inclusion. A Structural Equation Model examined mobile telephone diffusion, economic development and financial inclusion for thirty two countries in Africa between 2004 and 2016. Findings demonstrated inclusion affects economic development through mobile telephones. The implications of the study were in the management of the relevance of deploying mobile handsets for finance and growth in Africa.

From 2001 to 2014, Ghosh (2019) utilized data from key Indian states to evaluate the trinity of Mobile, Inclusion and Aadhaar on economic development. Research demonstrated that mobile proliferation has a statistically substantial effect on economic development via advanced panel data methods. Furthermore, significant complementarities have been identified connecting financial inclusion and mobile telephony. The extent to which financial use is complementary was much greater compared to accessibility. Furthermore, data demonstrated the increasing effect on inclusion of the biometric identification procedure (Aadhaar), mainly via better financial access.

2.4.2 Local Studies

Kamande (2018) investigated how electronic banking impacts Kenyan commercial banks' financial results. He obtained samples from all 42 commercial banks in Kenya. The value of transactions made via mobile banking, internet banking, agency banking, and ATMs was used as the predictor variable for electronic banking. The return on assets, that was selected as the research's response variable, was utilized to analyze financial performance. Over a five-year period, from January 2013 to December 2017, secondary data was collected. According to the findings, agency banking, ATMs, liquidity, capital adequacy, and bank size all had a significant positive impact. Mobile banking and internet banking were also discovered to be statistically insignificant commercial bank financial performance determinants.

Chirah (2018) sought to determine the alternative banking channels impact on commercial banks in Kenya operational efficiency. The population was drawn from a total of Kenyan 42 commercial banks. Alternative banking platforms were the research's independent variable, as evaluated by the value of transactions made by mobile banking, internet banking, ATMs, and banking through agents. Operational efficiency, which was measured as the ratio of operating expenses to total revenue, was the response variable. Starting in January 2013 and ending in December 2017, secondary data was collected annually for a period of five years. In this research, the results show that liquidity has a positive and substantial value. As per the study, ATMs, agency banking, mobile banking, internet banking, company size, and capital structure are statistically negligible drivers of commercial bank operational effectiveness.

The research interests of Wanalo (2018) were focused on investigating whether the use of technical financial technology had a significant impact on financial performance, and

to do so, examined the performance of commercial banks in Kenya. The three theories used in this research were financial intermediation theory, innovation diffusion theory, and Silber's financial technology limitations. To do this project, the methodology involved in a descriptive research was used. This study took into consideration all commercial banks. This research included a total sample size of 15 individuals and included banks from both the commercial and non-commercial sectors. Additional data was sourced from annual reports provided by commercial banks between 2012 and 2016, along with data gathered from the CBK and from the bank's website. The research utilized panel data analysis. The findings were found using the Prais Winstein regression model. Despite the increased use of ATMs and agency banking, they have little impact on a bank's overall financial health.

Ogwen (2019) aimed at finding out how financial innovations influences financial performance of Kenyan licensed MFIs. The population of the research was 13 licensed MFIs as of December 31, 2018. Secondary data was collected for 5 years on a yearly basis (January 2014 to December 2018). A descriptive cross-sectional approach was used in this research, with a multiple linear regression model used to assess the connection between variables. The findings revealed that savings accounts, mortgage accounts, and bank size are all important factors to consider. The research found that agency banking, number of ATMs as well as capital adequacy have a statistically insignificant impact on financial performance of licensed MFIs.

Sindani, Muturi and Ngumi (2019) examined the impact of financial channels of distribution evolution on financial inclusion in in Kenya over a period of six years beginning from 2012 to 2017. The specific objectives guiding this study include; examine how internet banking affects financial inclusion in Kenya and to examine how

ATM banking affect financial inclusion in Kenya. Secondary data was collected for subsequent analysis. For analysis of the data collected, frequency tables, percentages and means were used to demonstrate the findings of this study. Use of descriptive statistics in this study was meant to present the category sets formed by this research. The mean, standard deviation as well as variance on the dependent and independent variables function was to describe the variables used for the study. The research conclusion is that internet banking has had a beneficial effect on Kenya's financial industry in Kenya because it promotes productivity and efficiency. Also, ATM banking has enhanced financial inclusion in Kenya.

2.5 Summary of the Literature Review and Research Gaps

The theoretical reviews showed the predicted relation between mobile lending and the level of NPLs among financial institutions. Major influencers of NPLs have been discussed. From the reviewed studies, there is a knowledge gap that requires fulfilling. From the studies reviewed, there are varied conclusions regarding the relation between mobile lending and performance. The differences from the studies can be explained on the basis of different operationalization of mobile lending by different researchers thereby indicating that findings are dependent on operationalization model. Further, the prior studies have focused on the influence of mobile lending on performance leaving a gap on NPLs which is the focus of the current study.

Additionally, many studies done employed different designs for which some relied on empirical review to conclude while others relied on existing literature in measuring how the variables relate. Researchers showed varied inconclusive findings and failed to indicate the exact relationship that mobile lending has on the level of NPL. This shows

the need for more research in future studies to close the gap by conceptualizing the effect of mobile lending on NPLs.

2.6 Conceptual Framework

Figure 2.1 shows the predicted relation between the variables. The predictor variable was mobile lending given by the natural logarithm of the total value of mobile lending in a given year. The control variables were bank size shown via total assets natural log, capital adequacy by core capital to risk weighted assets and interest rate given by average bank lending rate. Non-performing loan was the response variable given by the NPLs to total loans and advances ratio.

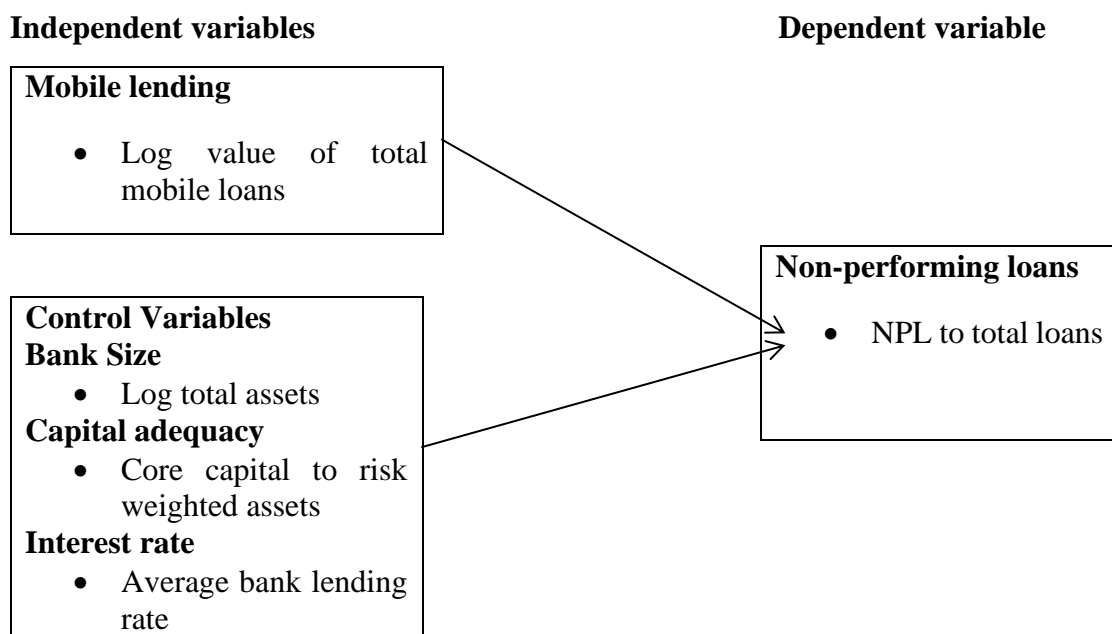


Figure 2.1: The Conceptual Model

Source: Researcher (2021)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes the approaches utilized in accomplishing the research objective which was to determine how mobile lending affects NPLs among commercial banks. In particular, the study highlighted the; the design, data collection, as well as analysis.

3.2 Research Design

A descriptive design was adopted to determine how mobile lending and NPLs amongst commercial banks link. This design was appropriate since the nature of the phenomena was of key interest to the researcher (Khan, 2008). It was also sufficient in defining the interrelationships of the phenomena. This design also validly and accurately represented the variables thereby giving sufficient responses to the study queries (Cooper & Schindler, 2008).

3.3 Population

All observations from a collection of events of interest stated in a study make up a population (Burns & Burns, 2008). The population of this research was made up of Kenya's 38 commercial banks as of December 31, 2020 (see appendix I). Since the population was relatively small, sampling was not carried out.

3.4 Data Collection

Secondary data was made use of on in this investigation which was extracted from annual published financials of the banks from 2016 to 2020 and captured in data collection forms. CBK financial publications of the specific banks provided the data. The precise data gathered comprised total loans and advances, mobile loans, non-performing loans, total assets, core capital, risk weighted assets and average bank

lending rate.

3.5 Data Analysis

The data was analyzed using SPSS software version 24. Tables and graphs offered the conclusions quantitatively. Descriptive statistics were employed in the calculation of central tendency as well as dispersion measures and combined with standard deviation for every variable. Inferential statistics relied on correlation and regression. Correlation established the magnitude of the correlation between the study variables and a regression determined cause and effect among variables. A multivariate regression linearly determined the relation between dependent and independent variables.

3.5.1 Diagnostic Tests

To ascertain viability of the model, a number of diagnostic tests were done, like normality, stationarity, multicollinearity, homogeneity and autocorrelation. The assumption of normality is that the dependent variable's residual was normally distributed and closer to the mean. This was accomplished by use of the Shapiro-wilk test. In the event that one of the variables had no normal distribution it was adjusted using the logarithmic adjustment methodology. Stationarity test was utilized in determining if the statistical properties like mean, variance and autocorrelation changed with the passage of time. This property was ascertained using the augmented Dickey Fuller test. In the event the data does not meet this property, the robust standard errors were utilized (Khan, 2008).

Autocorrelation is a measure of how similar one time series is when compared to its lagged value across successive timings. The measure of this test was done using the Wooldridge test and in the event that the presumption was breached, robust standard errors were used by the model. Multicollinearity exists when a perfect or near perfect

linear relation is made between a number of independent variables. Variance Inflation Factors (VIF) and tolerance levels were utilized. Any multicollinear variable was eliminated and a new measurement used in place of the variable that has co-linearity. Heteroskedasticity confirms if the variance of the errors in a regression lies among the independent variables. This was tested using the Breusch Pagan test and if data did not meet the homogeneity of variances assumption, robust standard errors were employed (Burns & Burns, 2008).

3.5.2 Analytical Model

The following equation was applicable:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Non-performing loans given as the ratio of NPLs to total loans on an annual basis

β_0 = y regression equation intercept.

$\beta_1, \beta_2, \beta_3, \beta_4$ = are coefficient of regression

X_1 = Mobile lending as measured by the natural logarithm of total mobile loans on an annual basis

X_2 = Bank size as assessed via the natural logarithm of total assets on an annual basis

X_3 = Capital adequacy as given by the ratio of total core capital to risk weighted assets

X_4 = Interest rate as measured by annual average bank lending rate

ε = error term

3.5.3 Tests of Significance

Parametric tests determined the general model and individual variable's significance.

The F-test determined the model's relevance and this was achieved using ANOVA while a t-test will determine the significance of every individual variable.

CHAPTER FOUR: DATA ANALYSIS RESULTS AND FINDINGS

4.1 Introduction

This chapter deals with the analysis of data. The research objective was to determine the correlation between mobile lending and NPLs among banks in Kenya. Patterns were studied by descriptive and inferential analysis, that were analyzed and conclusions made on them, in accordance with the specific objectives.

4.2 Descriptive Statistics

The research pursued to describe the data in terms of their mean and standard deviations. The descriptive analysis was necessary as it helps in understanding the characteristics of the collected data before conducting inferential analysis. Table 4.1 summarizes the findings.

Table 4.1: Descriptive Results

	N	Minimum	Maximum	Mean	Std. Deviation
NPLs	185	.0008	38.5539	.355127	2.8284459
Mobile lending	185	8.4730	17.2928	14.329904	1.6056311
Bank size	185	14.7750	20.6163	17.725991	1.3648773
Capital adequacy	185	.0280	2.1258	.237358	.2113328
Interest rate	185	8.5000	10.7500	9.766210	.7611799
Valid N (listwise)	185				

Source: Research Findings (2021)

Table 4.1 depicts the descriptive analysis, with 185 observations for each variable based on the product of the number of cross-sectional units and the number of periods studied. The dependent variable was NPLs while the independent variable being mobile lending. Finally, the control variables were bank size, capital adequacy and interest rate.

4.3 Diagnostic Tests

To ascertain the model viability, a number of diagnostic tests were done, like normality, stationarity, Multicollinearity test, variance homogeneity as well as autocorrelation.

4.3.1 Normality Test

To test whether the collected data assumed a normal distribution, normality test was conducted via the Shapiro-Wilk Test. The threshold was that, if the p value is above 0.05, then the data assumes a normally distribution.

Table 4.2: Test for Normality

	N	W	V	z	Prob>z
NPLs	185	0.983	3.925	3.219	0.061
Mobile lending	185	0.928	16.183	6.555	0.064
Bank size	185	0.445	125.183	11.372	0.082
Capital adequacy	185	0.943	12.835	6.009	0.124
Interest rate	185	0.861	31.396	8.116	0.073

Source: Research Findings (2021)

The normality test results yielded a p- value above 0.05 thus the null hypothesis rejection and acceptance of the alternate hypothesis meaning the normality test revealing normal distribution in the data.

4.3.2 Multicollinearity Test

Multicollinearity exists when a perfect or near perfect linear relation exist between a number of independent variables. Variance Inflation Factors (VIF) as well as tolerance levels were utilized.

Table 4.3: Multicollinearity

Variable	Collinearity Statistics	
	Tolerance	VIF
Mobile lending	0.697	1.434
Bank size	0.703	1.422
Capital adequacy	0.661	1.513
Interest rate	0.634	1.577

Source: Research Findings (2021)

The outcomes in Table 4.3 specify that all the variables had a VIF values <10 and tolerance values >0.2 suggesting that Multicollinearity did not exist.

4.3.3 Heteroskedasticity test

To check for heteroskedasticity, the Breusch-Pagan test is used. The null hypothesis was that the variance of error terms is constant. Heteroskedasticity Test Results are shown in Table 4.4.

Table 4.4: Heteroskedasticity Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity		
Ho: Constant variance		
Variable: fitted values		
chi2(1)	=	0.7217
Prob > chi2	=	0.3602

Source: Research Findings (2021)

The null hypothesis of Homoskedastic error terms is not rejected, as per the results in Table 4.4, which are supported by a 0.3602 p-value

4.3.4 Autocorrelation Test

Autocorrelation is a measure of how similar one time series was when compared to its lagged value across successive timings. The measure of this test was done using the Wooldridge test.

Table 4.5: Test of Autocorrelation

Wooldridge test for autocorrelation			
H0: no first-order autocorrelation			
F(1, 184) =	0.3442		
Prob> F =	0.6684		

Source: Research Findings (2021)

From the results of Table 4.5, the null hypothesis of no serial correlation is not rejected provided the p-value is significant (p-value = 0.6684).

4.3.5 Stationarity Test

Stationarity test was utilized in determining if the statistical characteristics such as variance, mean, as well as autocorrelation change with the passage of time. Table 4.6 shows the Augmented Dickey-Fuller (ADF) unit root test outcomes.

Table 4.6: Stationarity Test

	Critical value at 95%	DFT statistic	P-value
NPLs	-2.661	-3.170	0.000
Mobile lending	-2.661	-3.236	0.000
Bank size	-2.661	-4.647	0.000
Capital adequacy	-2.661	-3.654	0.000
Interest rates	-2.661	-4.725	0.000

Source: Research Findings (2021)

The null hypotheses that: Panels have unit roots were rejected for all variables since the p values were below 0.05, based on the results in Table 4.6. This meant that all of the variables' panel data were stationary.

4.4 Correlation Results

Correlation analysis was performed to establish the association strength and direction between each predictor variable and the response variable. The results in Table 4.7 show the correlation nature between the research variables in terms of magnitude and direction.

Table 4.7: Correlation Results

		NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
NPLs	Pearson Correlation	1				
	Sig. (2-tailed)					
Mobile lending	Pearson Correlation	.096	1			
	Sig. (2-tailed)	.191				
Bank size	Pearson Correlation	-.174*	.043	1		
	Sig. (2-tailed)	.018	.560			
Capital adequacy	Pearson Correlation	.155*	-.003	-.034	1	
	Sig. (2-tailed)	.036	.972	.643		
Interest rate	Pearson Correlation	.102	.095	-.048	-.106	1
	Sig. (2-tailed)	.167	.200	.520	.150	

*. Correlation is significant at the 0.05 level (2-tailed).
b. Listwise N=185

Source: Research Findings (2021)

The results in Table 4.7 reveal that mobile lending and NPLs are positively but not significantly correlated ($r=0.096$) at 5% significance level. This signifies that mobile lending and NPLs variation is in similar direction but the association is not significant statistically. Additionally, the outcomes show that bank size and NPLs are negatively

and significantly correlated ($r=-0.174$) at 5 % significance level. Further, outcomes depict that capital adequacy and NPLs are positively and significantly correlated ($r=0.155$) at 5 % significance level. Finally, interest rate and NPLs displayed a positive link though the correlation was not statistically significant.

4.5 Regression Results

Regression analysis being undertaken to determine the extent to which NPLs is explained by the selected variables. The regression results were presented in Table 4.8 to Table 4.10.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.547 ^a	.299	.280	2.4002534

a. Predictors: (Constant), Interest rate, Bank size, Mobile lending, Capital adequacy

Source: Research Findings (2021)

From the conclusions as represented by the adjusted R^2 , the independent variables which were examined explained 29.9% of the variations in NPLs among commercial banks in Kenya. This therefore means the four variables contributed 29.9% of the variations in NPLs among commercial banks in Kenya whereas other factors not examined in this study contribute 70.1%.

Table 4.9: ANOVA Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	108.318	4	27.080	3.574	.008 ^b
	Residual	1363.701	180	7.576		
	Total	1472.020	184			

a. Dependent Variable: NPLs
b. Predictors: (Constant), Interest rate, Bank size, Mobile lending, Capital adequacy

ANOVA statistics in Table 4.9 depict that the data had a 0.008 level of significance hence this indicates that the data is perfect for making conclusions on the variables.

Table 4.10: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.063	4.110		-.015	.988
1 Mobile lending	.166	.127	.094	1.310	.192
Bank size	-.348	.149	-.168	-2.337	.021
Capital adequacy	2.141	.966	.160	2.215	.028
Interest rate	.379	.270	.102	1.405	.162

a. Dependent Variable: NPLs

Source: Research Findings (2021)

The coefficient of regression model was as below;

$$Y = -0.063 + 0.166X_1 - 0.348X_2 + 2.141X_3 + 0.379X_4$$

Where:

Y = NPLs; X₁ = Mobile lending; X₂ = Bank size; X₃= Capital adequacy; X₄ = Interest rate

4.6 Discussion of Research Findings

The objective of this research was to determine the effect of mobile lending on NPLs. The study utilized a descriptive design while population was the 38 commercial banks in Kenya. The research relied on secondary data which was obtained from CBK and individual banks annual reports. Mobile lending was measured as the natural logarithm of value of total mobile loans in a given year. The control variables were bank size, capital adequacy and interest rates. Data was analyzed via descriptive as well as inferential statistics. This section discusses the findings.

The results of correlation analysis revealed that mobile lending did not have a significant association with NPLs among banks in Kenya. Although the association was

positive, the magnitude was not significant. The results further revealed that bank size had a negative and significant association with NPLs which implies that when the size of a bank is increasing, the level of NPL is usually declining. Capital adequacy demonstrated a positive and significant link with NPLs implying that banks with more capital are likely to possess a higher level of NPLs. The link between interest rate and capital adequacy was discovered to be positive but not statistically significant.

The regression results demonstrated that the four selected predictor variables explain 29.9% of changes in NPLs amongst banks in Kenya. The explanatory power is too significant as the p value was 0.008 that is below 0.05 This implies the model was sufficient in describing the cause and effect among the study variables. Individually, mobile lending does not have a significant impact on NPLs while bank size has a significant negative effect. Capital adequacy was discovered to possess a significant positive impact on the level of NPLs while interest rate was not statistically significant.

These results concur with Kamande (2018) who investigated how electronic banking impacts Kenyan commercial banks' financial results. He obtained samples from all 42 commercial banks in Kenya. The value of transactions made via mobile banking, internet banking, agency banking, and ATMs was used as the predictor variable for electronic banking. The return on assets, that was selected as the research's response variable, was utilized to analyze financial performance. Over a five-year period, from January 2013 to December 2017, secondary data was collected. According to the findings, agency banking, ATMs, liquidity, capital adequacy, and bank size all had a significant positive impact. Mobile banking and internet banking were also discovered to be statistically insignificant commercial bank financial performance determinants.

The results also concur with Chirah (2018) who sought to determine the alternative banking channels impact on commercial banks in Kenya operational efficiency. A total of 42 Kenyan commercial banks were used to serve as the population. Alternative banking platforms were the research's independent variable, as evaluated by the value of transactions made by mobile banking, internet banking, ATMs, and banking through agents. Operational efficiency, which was measured as the ratio of operating expenses to total revenue, was the response variable. Starting in January 2013 and ending in December 2017, secondary data was collected annually for a period of five years. In this research, the results show that liquidity has a positive and substantial value. As per the study, ATMs, agency banking, mobile banking, internet banking, company size, and capital structure are statistically negligible drivers of commercial bank operational effectiveness.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings from the preceding chapter and draws conclusions as well as discuss the study's limitations. It also makes policy recommendations and suggests places where more research should be conducted.

5.2 Summary of Findings

The objective of this research was to assess how mobile lending influences the level NPLs of Kenyan banks. The selected variables for investigation included mobile lending, bank size, capital adequacy and interest rates. To finish the study, a descriptive research design was chosen. CBK provided secondary data, which was obtained and analyzed using SPSS. Annual data for 38 banks was acquired from their financial reports for the five years from 2016 to 2020.

The first objective was to determine mobile lending effect on NPLs amongst banks in Kenya. The correlation results at 5 % significance level show that mobile lending had a positive correlation with NPLs. However, the association was not statistically significant. Regression results ($\beta=0.166$, $p=0.192$) show that there was a positive but not significant effect of mobile lending on the level of NPLs among banks in Kenya.

The second objective was to assess the effect of bank size on NPLs among banks in Kenya. The correlation results at 5 % significance level show that bank size had a negative and significant correlation with NPLs. Regression results ($\beta=-0.348$, $p=0.021$) show that there was a negative and significant effect of bank size on NPLs among banks in Kenya.

The third objective was to examine the effect of capital adequacy on NPLs among banks in Kenya. The correlation results at 5 % significance level show that capital adequacy had a positive correlation with NPLs. Regression results ($\beta=2.141$, $p=0.028$) show that there was a positive and significant effect of capital adequacy on NPLs among banks in Kenya.

The fourth objective was to examine the effect of interest rates on NPLs among banks in Kenya. The correlation results at 5 % significance level show that interest rates had a positive but not significant link with NPLs. Regression results ($\beta=0.379$, $p=0.162$) show that there was a positive but not significant interest rates effect on NPLs amongst banks in Kenya.

5.3 Conclusions

The research intention was to find out the association between mobile lending and NPLs. The findings indicated that mobile lending had a positive but not significant effect on NPLs. This may imply that banks with high levels of mobile loans do not necessarily have high levels of NPLs.

The study results further indicated that bank size had a negative and significant effect on NPLs which might mean that banks with more assets are more likely to manager their NPLs better. This might be clarified by the reality that bigger banks have better structures and therefore more likely to monitor loans better.

The study results showed that capital adequacy had a positive and significant effect on NPLs. This may mean that the higher proportion of core capital to risk weighted assets is likely to lead to higher levels of NPLs. This can be clarified by the reality that banks with more core capital are likely to take higher risks by lending more which can translate to higher levels of NPLs.

Moreover, the conclusions demonstrated that interest rate has no significant impact on NPLs. This implies that banks with higher interest rates do not always report more NPLs compared to banks with low interest rates. This is explainable by the reality that due to the determination of interest rate based on demand and supply, banks charge relatively the same levels of interest rates for loans with the same amount of risk.

5.4 Recommendations for Policy and Practice

The research finding reveals that mobile lending does not contribute to an increase in NPLs. The research thus recommending commercial banks managers ought to keep offering mobile loans as this does not increase the risk of delinquent loans. Policy makers such as CBK ought to develop policies and guidelines which would make it simple for banks to offer mobile loans to their clients.

Further, bank size was discovered to possess a significant and negative effect on the level of NPLs. The research thus recommending banks in Kenya should strive on growing their asset base as bigger banks are able to enjoy economies of scale and have better structures that help them in managing and monitoring NPLs compared to small banks.

From the study findings, capital adequacy demonstrated a significant positive effect on NPLs. Therefore, the research recommending CBK on its mandate of regulating commercial banks should monitor and set standards of the maximum core capital a bank can have and what percentage can be issued as loans as banks with more capital have been found to have higher levels of NPL in this study.

5.5 Limitations of the Study

The focus was on some of the elements that are thought to affect the NPLs of banks in Kenya. The research focus was on four explanatory variables in particular.

Nevertheless, there are other factors likely to impact a bank's NPLs. Some are controlled by the company, such as corporate governance and liquidity while others are outside the control of management such as unemployment rate and political instability.

The research used a scientifically sound analytical technique. The study also ignored qualitative data that might describe other factors influencing the relationship between mobile lending and bank's NPLs. Qualitative methods like focus groups, open-ended surveys, and interviews can aid in the development of more definite outcomes.

The research focus on a five-year duration (2016 to 2020). It's unclear whether the results will last for a longer period of time. It is too uncertain if same results will be achieved after 2020. In order to account for key economic events, the research has been conducted over a long duration of time.

The researchers utilized an OLS regression model to analyze the data. Because of the limitations of employing regression models, such as erroneous as well as misleading outcomes that cause the variable value to change, it was not possible to generalize the conclusions of the research with accurateness. Furthermore, if more data was included in the regression, the outcome could be varied. As a result, the model utilized had additional drawback.

5.6 Suggestions for Further Research

The study findings revealed an R square of 29.9%. This suggests that there are other factors that affect NPLs among the banks in Kenya that were not addressed by the research. Other researches ought thus to focus on other factors for example; corporate governance, liquidity, ownership structure, management efficiency among other factors that affect NPLs among banks.

The study was limited to banks in Kenya. Additional research on other financial institutions such as microfinance banks and SACCOs should be conducted, according to the study's suggestions. Future research should look into how mobile lending affect other factors besides the NPLs, such as company value, efficiency, and growth, to name a few.

Because of the readily available data, the focus of this research was drawn to the last five years. Past studies may span a longer time period, such as ten or twenty years, and might have a significant impact on this study by either complementing or contradicting its conclusions. A longer study has the advantage of allowing the researcher to catch the impact of business cycles like booms as well as recessions.

Lastly, this research relied on a regression model, that has its own set of drawbacks, like errors and deceptive outcomes when a variable is changed. Impending study ought to concentrate on models such as the Vector Error Correction Model (VECM) in order to investigate the numerous relationships between mobile lending and the NPLs level.

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APPENDICES

Appendix I: Commercial Banks in Kenya

1	ABSA Bank Kenya	1916
2	Access Bank Kenya	8th January 1985
3	African Banking Corporation Limited	8th December 1994
4	Bank of Africa Kenya Limited	30th April 2004
5	Bank of Baroda (K) Limited	1st July 1953
6	Bank of India	5th June 1953
7	Citibank N.A Kenya	1st July 1974
8	Consolidated Bank of Kenya Limited	18th December 1989
9	Co-operative Bank of Kenya Limited	1st July 1968
10	Credit Bank Limited	30th November 1994
11	Development Bank of Kenya Limited	20th September 1996
12	Diamond Trust Bank Kenya Limited	15th November 1994
13	DIB Bank Kenya Limited	13th April 2017
14	Ecobank Kenya Limited	16th June 2008
15	Equity Bank Kenya Limited	28th December 2004

16	Family Bank Limited	1st May 2007
17	First Community Bank Limited	29th April 2008
18	Guaranty Trust Bank (K) Ltd	13th January 1995
19	Guardian Bank Limited	20th December 1995
20	Gulf African Bank Limited	1st November 2007
21	Habib Bank A.G Zurich	1st July 1978
22	I&M Bank Limited	27th March 1996
23	Kingdom Bank Limited	2nd March 2010
24	KCB Bank Kenya Limited	1st January 1896
25	Mayfair CIB Bank Limited	20th June 2017
26	Middle East Bank (K) Limited	28th November 1980
27	M-Oriental Bank Limited	8th February 1991
28	National Bank of Kenya Limited	1st January 1968
29	NCBA Bank Kenya PLC	5th November 2019
30	Paramount Bank Limited	5th July 1995
31	Prime Bank Limited	3rd September 1992
32	SBM Bank Kenya Limited	1st April 1996

33	Sidian Bank Limited	23rd March 1999
34	Spire Bank Ltd	23rd June 1995
35	Stanbic Bank Kenya Limited	1st June 2008
36	Standard Chartered Bank Kenya Limited	1910
37	UBA Kenya Bank Limited	25th September 2009
38	Victoria Commercial Bank Limited	11th January 1996

Source: CBK (2020)

Appendix II: Research Data

Bank	Year	NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
1	2016	0.1426	13.4492	16.9342	0.1645	8.5000
	2017	0.1566	14.5950	16.9451	0.1528	10.1250
	2018	0.1829	14.6453	17.0576	0.1560	10.7500
	2019	0.1989	14.8834	17.1451	0.1844	10.0000
	2020	0.1490	15.0790	17.1964	0.1538	9.3333
2	2016	0.2325	14.6052	18.0537	0.1639	8.5000
	2017	0.2606	15.9889	17.8408	0.1616	10.1250
	2018	0.2816	15.9219	17.8080	0.1578	10.7500
	2019	0.3383	15.8584	17.7090	0.1602	10.0000
	2020	0.4139	15.7852	17.5996	0.1083	9.3333
3	2016	0.0754	13.7599	18.0376	1.9617	8.5000
	2017	0.0846	14.5768	18.2332	0.3053	10.1250
	2018	0.0586	14.9398	18.3812	0.3229	10.7500
	2019	0.0882	14.7218	18.6278	0.3466	10.0000
	2020	0.0828	15.1152	18.7805	0.3274	9.3333
4	2016	0.0420	15.3316	19.2998	0.1840	8.5000
	2017	0.0521	13.5734	19.3751	0.1786	10.1250
	2018	0.0556	14.2855	19.4197	0.1803	10.7500
	2019	0.0610	14.4647	19.6003	0.1638	10.0000
	2020	0.0560	14.9982	19.7397	0.1667	9.3333
5	2016	0.0202	11.1449	17.5571	0.4230	8.5000
	2017	0.0139	12.7982	17.6829	0.4574	10.1250
	2018	0.0207	12.5000	17.8521	0.5397	10.7500
	2019	0.0713	12.9661	17.9537	0.4392	10.0000
	2020	0.0936	14.0891	17.9514	0.4842	9.3333
6	2016	0.0580	13.2541	18.2945	0.2832	8.5000
	2017	0.0192	14.2506	18.4534	0.2637	10.1250
	2018	0.0368	13.1748	18.4028	0.2555	10.7500
	2019	0.0162	14.1294	18.2656	0.2764	10.0000
	2020	0.0257	12.9685	18.3858	0.2715	9.3333
7	2016	0.1059	15.6607	19.1891	0.1792	8.5000
	2017	0.0745	16.2099	19.2507	0.1845	10.1250
	2018	0.0831	15.9346	19.3199	0.1732	10.7500
	2019	0.0797	16.0608	19.3172	0.1573	10.0000
8	2020	0.0553	16.0866	16.4642	0.0939	8.5000
	2016	0.1176	13.9119	16.4487	0.0790	10.1250
	2017	0.1527	13.1426	16.4149	0.0509	10.7500
	2018	0.1533	13.8898	16.3718	0.0280	10.0000
	2019	0.2568	14.0673	16.2888	0.1352	9.3333

Bank	Year	NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
9	2020	0.0638	14.0719	16.1464	0.1551	8.5000
	2016	0.0722	13.0293	16.3200	0.2285	10.1250
	2017	0.0754	13.0224	16.4904	0.1477	10.7500
	2018	0.0724	13.2537	16.7006	0.1451	10.0000
	2019	0.0870	13.5020	16.8910	0.1496	9.3333
10	2020	0.0342	13.7576	19.6518	2.1258	8.5000
	2016	0.0390	15.0340	19.6787	0.2277	10.1250
	2017	0.0620	15.0109	19.7736	0.2268	10.7500
	2018	0.1009	15.5781	19.8406	0.1618	10.0000
	2019	0.0979	16.1124	19.9402	0.1505	9.3333
11	2020	0.2601	16.1330	16.6135	0.2508	10.1250
	2016	0.2098	14.3210	16.6072	0.2355	10.7500
	2017	0.2981	14.3780	16.5449	0.2323	10.0000
	2018	0.3695	14.6360	16.5472	0.3147	9.3333
	2019	0.0241	14.4732	19.4199	0.1463	8.5000
12	2020	0.0325	14.2760	19.6087	0.1850	10.1250
	2016	0.0666	14.2875	19.7107	0.1901	10.7500
	2017	0.0629	15.2683	19.7497	0.2111	10.0000
	2018	0.0683	15.6160	19.7719	0.2091	9.3333
	2019	38.5539	16.3843	14.7750	0.7005	10.7500
13	2020	0.0037	16.3125	15.4739	0.2990	10.0000
	2016	0.0095	8.6540	16.0114	0.1486	9.3333
	2017	0.0622	8.4730	17.7749	0.2496	8.5000
	2018	0.1628	8.7650	17.6683	0.1944	10.1250
	2019	0.3770	8.9370	17.7944	0.1599	10.7500
14	2020	0.1735	8.9819	17.8130	0.1659	10.0000
	2016	0.1448	14.5097	18.1380	0.1622	9.3333
	2017	0.0272	14.4261	19.8748	0.2017	8.5000
	2018	0.0628	15.1980	19.9761	0.1966	10.1250
	2019	0.0553	15.6354	20.0779	0.2041	10.7500
15	2020	0.0710	14.6307	20.1671	0.1593	10.0000
	2016	0.0873	15.8102	20.3283	0.1979	9.3333
	2017	0.0367	15.8072	18.2134	0.1441	8.5000
	2018	0.1197	16.6319	18.0567	0.2078	10.1250
	2019	0.1923	16.5526	18.0516	0.1986	10.7500
16	2020	0.1618	16.4875	18.0204	0.1952	10.0000
	2016	0.1409	13.9028	18.1831	0.1869	9.3333
	2017	0.2346	14.1470	16.4941	0.1145	8.5000
	2018	0.3195	15.6077	16.5210	0.1399	10.1250
	2019	0.4078	15.9390	16.6697	0.1534	10.7500

Bank	Year	NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
	2020	0.4882	15.7806	16.6992	0.0911	10.0000
	2016	0.4145	14.2011	16.7474	0.0810	9.3333
18	2017	0.0916	14.7579	17.5282	0.2649	8.5000
	2018	0.1108	15.0670	17.2864	0.2547	10.1250
	2019	0.1088	15.1934	17.2774	0.2387	10.7500
	2020	0.1467	15.2987	17.4516	0.2597	10.0000
	2016	0.1090	14.7349	17.1856	0.2428	9.3333
19	2017	0.0304	14.4013	16.4972	0.1763	8.5000
	2018	0.0169	14.5828	16.5037	0.1904	10.1250
	2019	0.0453	14.6201	16.5757	0.2022	10.7500
	2020	0.0757	14.8757	16.5997	0.2275	10.0000
	2016	0.0689	11.6827	16.6120	0.2220	9.3333
20	2017	0.0842	12.5462	17.0226	0.1577	8.5000
	2018	0.0923	11.9296	17.1171	0.1872	10.1250
	2019	0.0929	12.9837	17.2596	0.1620	10.7500
	2020	0.1064	13.0078	17.3218	0.1866	10.0000
	2016	0.1534	13.7061	17.3744	0.1711	9.3333
21	2017	0.0792	14.0772	16.1408	0.3213	8.5000
	2018	0.1871	14.2170	16.3419	0.3911	10.1250
	2019	0.0745	14.4033	16.8845	0.2463	10.0000
	2020	0.0922	13.6780	17.0273	0.2729	9.3333
22	2016	0.0437	12.4380	18.0874	0.1813	8.5000
	2017	0.0692	12.6520	18.0912	0.1769	10.1250
	2018	0.1081	13.4776	18.0282	0.1700	10.7500
	2019	0.2494	12.3870	17.9190	0.1534	10.0000
	2020	0.2356	13.4740	17.8490	0.1456	9.3333
23	2016	0.0248	14.8357	19.0716	0.2020	8.5000
	2017	0.0289	14.6567	19.1652	0.1815	10.1250
	2018	0.0870	15.1431	19.2966	0.1858	10.7500
	2019	0.1079	15.4955	19.3315	0.1792	10.0000
	2020	0.0979	16.1981	19.4287	0.2156	9.3333
24	2016	0.0517	13.9230	16.6358	0.1625	8.5000
	2017	0.1720	14.9697	16.5742	0.2008	10.1250
	2018	0.1331	15.1743	16.3714	0.1933	10.7500
25	2016	0.0446	16.4039	20.1400	0.1536	8.5000
	2017	0.0705	16.3720	20.2045	0.1801	10.1250
	2018	0.0766	13.1488	20.2873	0.1663	10.7500
	2019	0.0627	13.1722	20.3868	0.1955	10.0000
	2020	0.1016	14.2912	20.6163	0.1903	9.3333
26	2016	0.1590	13.9164	15.4706	0.3933	10.1250
	2017	0.1807	13.7920	15.4489	0.5708	10.7500

Bank	Year	NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
	2018	0.3825	15.9989	15.4946	0.4494	10.0000
	2019	0.1374	16.5515	15.9516	0.3119	9.3333
27	2016	0.0821	17.1188	16.1101	0.3869	10.1250
	2017	0.0718	17.2928	16.1741	0.3316	10.7500
	2018	0.0940	17.1680	16.1683	0.3093	10.0000
	2019	0.1931	13.1120	16.3327	0.3442	9.3333
28	2016	0.1116	13.4730	18.6473	0.1399	8.5000
	2017	0.1749	13.2621	18.5348	0.0715	10.1250
	2018	0.3001	13.1230	18.5148	0.0542	10.7500
	2019	0.3913	13.7946	18.5591	0.0370	10.0000
	2020	0.3564	13.1780	18.5343	0.1150	9.3333
29	2017	0.0912	13.2730	18.9262	0.2059	8.5000
	2018	0.1126	13.2089	18.9481	0.2304	10.1250
	2019	0.1089	13.1657	19.1442	0.2227	10.7500
	2020	0.1224	13.4661	19.1550	0.1869	10.0000
30	2016	0.0519	15.8709	16.1693	0.2412	8.5000
	2017	0.0828	15.8396	16.0592	0.2741	10.1250
	2018	0.1056	16.0799	16.0711	0.2946	10.7500
	2019	0.1318	16.5700	16.1067	0.2853	10.0000
	2020	0.1211	16.7438	16.1615	0.2450	9.3333
31	2016	0.0170	14.1168	17.9899	0.1729	8.5000
	2017	0.0362	16.1623	17.9950	0.2216	10.1250
	2018	0.0486	16.3715	18.1721	0.2248	10.7500
	2019	0.0606	16.3834	18.4220	0.3729	10.0000
	2020	0.1018	16.4759	18.5049	0.4136	9.3333
32	2016	0.1025	12.5908	18.7977	0.1509	8.5000
	2017	0.8832	12.6277	16.0873	0.1281	10.1250
	2018	0.7290	13.0815	16.2608	0.1644	10.7500
	2019	1.2528	13.3428	18.0733	0.2425	10.0000
	2020	0.8521	13.5197	18.0994	0.2312	9.3333
33	2016	0.1284	13.0425	16.7655	0.2468	8.5000
	2017	0.2383	13.4555	16.8541	0.2325	10.1250
	2018	0.2780	14.1686	16.7757	0.1646	10.7500
	2019	0.2035	14.4548	17.0467	0.1440	10.0000
	2020	0.1968	14.6174	17.0908	0.1793	9.3333
34	2016	0.0411	13.5625	19.1552	0.1870	8.5000
	2017	0.0505	14.2903	19.1847	0.1812	10.1250
	2018	0.0666	14.9790	19.3319	0.1684	10.7500
	2019	0.0945	14.9697	19.4537	0.1740	10.0000
	2020	0.0998	14.7987	19.4947	0.1834	9.3333
35	2016	0.1015	14.3780	19.2707	0.2116	8.5000

Ban k	Yea r	NPLs	Mobile lending	Bank size	Capital adequacy	Interest rate
	2017	0.0829	14.7036	19.3389	0.2091	10.1250
	2018	0.0896	14.9574	19.4705	0.1852	10.7500
	2019	0.1169	14.8312	19.4694	0.1947	10.0000
	2020	0.0953	14.5404	19.5264	0.1773	9.3333
36	2016	0.3332	16.0002	16.4876	0.1745	8.5000
	2017	0.1677	16.2735	16.4404	0.1627	10.1250
	2018	0.4271	16.1346	16.2268	0.1265	10.7500
	2019	0.5598	16.2419	16.0372	0.2201	10.0000
	2020	0.7111	16.4453	15.7413	0.2060	9.3333
37	2016	0.1103	14.7419	16.1624	0.2164	8.5000
	2017	0.1156	14.8352	16.1547	0.2230	10.1250
	2018	0.2416	14.0358	16.1419	0.2908	10.7500
	2019	0.2211	14.6208	16.1414	0.2111	10.0000
	2020	0.2857	14.7272	16.0475	0.2015	9.3333
38	2016	0.0180	13.1792	15.8672	0.2379	8.5000
	2017	0.0186	13.5055	15.5385	0.3868	10.1250
	2018	0.0436	13.5092	15.6880	0.3878	10.7500
	2019	0.1276	14.2825	16.5455	0.3316	10.0000
	2020	0.2432	14.3957	16.5936	0.2537	9.3333
39	2016	0.0329	10.7413	16.8122	0.1930	8.5000
	2017	0.0255	10.8024	16.9247	0.2545	10.1250
	2018	0.0008	10.9464	17.0730	0.2274	10.7500
	2019	0.0308	11.8670	17.2917	0.2109	10.0000
	2020	0.0506	12.9946	17.4010	0.2015	9.3333

