THE NEXUS BETWEEN FINANCIAL SOUNDNESS INDICATORS FOR COMMERCIAL BANKS IN KENYA

MUNENE JUDY MUKIRI

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Strathmore Institute of Mathematical Science

Strathmore University

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

Munene Judy Mukiri ..... [*Name of Candidate*]

..... [*Signature*]

12th Feb 2021 ..... [*Date*]

This Research Project has been submitted for examination with my approval as the Supervisor.

GILLIAN KIMUNDI ..... [*Name of Supervisor*]

..... [*Signature*]

12th Feb 2021 ..... [*Date*]

Strathmore Institute of Mathematical Sciences

Strathmore University

Table of Contents

LIST OF FIGURES/TABLES

ABSTRACT

The Banking sector stability and soundness is paramount in the achievement of a sustainable and stable economic growth and is also of prime interest to various investors and policy makers. Therefore, the purpose of this paper is to evaluate the interrelatedness of financial soundness indicators using the CAMEL indicators, across the overall banking sector in Kenya and to compare the interrelatedness of these indicators in a tier analysis using data for the period between 2001 and 2018. The study employed fishers unit root test to first test for the stationarity of the variables, both endogenous variables (bank specific) and exogenous variables (macroeconomic), where some variables were stationary at level and others at first differencing. Panel VAR model was used to test for the interrelatedness between the Financial Stability Indicators. The results suggest that for the overall banking sector and the different tiers, there is a significant interdependence between the indicators.

CHAPTER 1: INTRODUCTION

1.1. Background

Banks are one of the financial institutions that play a vital role in an economy. They serve as financial intermediaries between the surplus and deficit units in the economy to bring about equilibrium therefore playing a big role in deciding the direction of financial markets that sustain the prosperity of economic development. This is important for developing countries that are known for capital deficiencies that hinder investments. Lelissa (2014) concluded that banks play a major role in economic development by acting as intermediaries which helps boosts investment and economic growth. Banks are one of the most leveraged sectors and therefore stability and financial soundness is very key to them. In order to measure financial soundness, banks employ the CAMEL framework. The CAMEL model is an international bank rating system where in a bank's regulations, it assesses an overall performance of the bank to determine their financial viability by measuring efficiency of the use of available financial resources. These five parameters include Capital adequacy, Asset quality, Management efficiency, Earnings and profitability and Liquidity.

Capital adequacy indicates the banks' ability to maintain capital equivalent with the nature and degree of all types of risk. It is the minimum reserves of capital which a bank must hold to handle losses and to have sufficient protection to absorb reasonable losses so that they do not become insolvent. With the occurrence of financial crisis which pose a great risk to stability, financial soundness indicators had to be revised to reflect the new international standards on capital and liquidity that are more risk based and dynamic and that are supplemented with concentration and distribution measures. Capital adequacy is necessary for banks in order to safeguard stakeholder's confidence. Some of the ratios include capital adequacy ratio which is the ratio of banks' capital in relation to the total risk weighted assets. Non-performing loans net of provision to capital, core capital to assets.

Asset quality measures the strength of a bank and is directly connected with the capital sufficiency. Asset quality stipulates the financial wellbeing of banks against devaluation of assets, since weakening of assets risks the solvency of the banks. This deteriorating value of the assets has a rippling effect, as losses are eventually written down against capital, which consecutively influences the earning capability of the bank. It is a measure to represent the degree of Non-performing assets in the portfolio of the banks and the degree of damage this particular asset class have on the financial performance. The following ratios measure asset

quality; Non-performing loans to total loans aids in determining the stress in a portfolio of loans. Total investment to total asset ratio which measures the proportion of total assets locked in investments and provisions to non-performing loans.

Management efficiency indicators show the capability of a bank's management to recognize, measure, track and control risks linked with the operations of the bank. This is of high importance because the management is tasked with making critical decisions. This indicator, although it has a dash of subjectivity, utilizes risk management policies and procedures as an estimator of sound management practices. The ratios that measure management efficiency include: Cost Income Ratio which estimates the cost of running a bank in connection with its operating income. It gives a clear indication on how efficiently a bank is being run.

The fourth parameter is earnings and profitability. Earnings quality is a crucial indicator which determines the capability of a bank to earn consistently, going into the future. The quality of earnings shows the viability and growth in future earnings of a bank and the ability of a bank to maintain this quality and earn continually. The objective of a bank is to bring profit to its stakeholders. The ratios that measure the earnings quality include: Net Interest Margin, Return on Equity, Interest spread and Return on Assets.

Liquidity is a key aspect for all banking institution as it measures the aptness of a bank to meet its financial commitments in a timely manner. Liquidity in banks is measured by a mechanism known as asset and liability management which minimizes maturity mismatch between assets and liabilities in order to maximize returns. Some ratios that measure liquidity include: Quick assets to total liabilities, total investment to total deposits which measures how the bank is meeting its obligation towards the depositors of the bank. Interest expense to Interest earned ratio which measures the capacity of a bank to meet the interest expenditure on deposits from the interest income from loans. Liquidity coverage ratio which enhances banks short term resilience. Net stable funding ratio which aims to promote resilience over a long period of time by coming up with incentives for banks to fund their activities with a more stable source of funding.

This study focuses on the Kenyan banking sector which consist of 42 commercial banks, 1 mortgage financial company and 13 microfinance institutions banks. These commercial banks are categorized in tiers according to their size. Tier 1 includes the big banks that have been in the industry for a long time and have accumulated so much wealth therefore making their chance of falling into a financial crisis very minimal. It consists of 6 commercial banks.

Tier 2 consist of medium-sized banks of 16 commercial banks. Tier 3 consist of small banks and it comprises of 21 banks.

1.2. Financial stability of the Kenyan Banking Sector.

Financial stability of the Kenyan Banking Sector over the years from 2012 to 2019 can be illustrated by graphs which represent each CAMEL indicator showing the trend for tiers I, II, III, IV and the aggregate industry over the period.

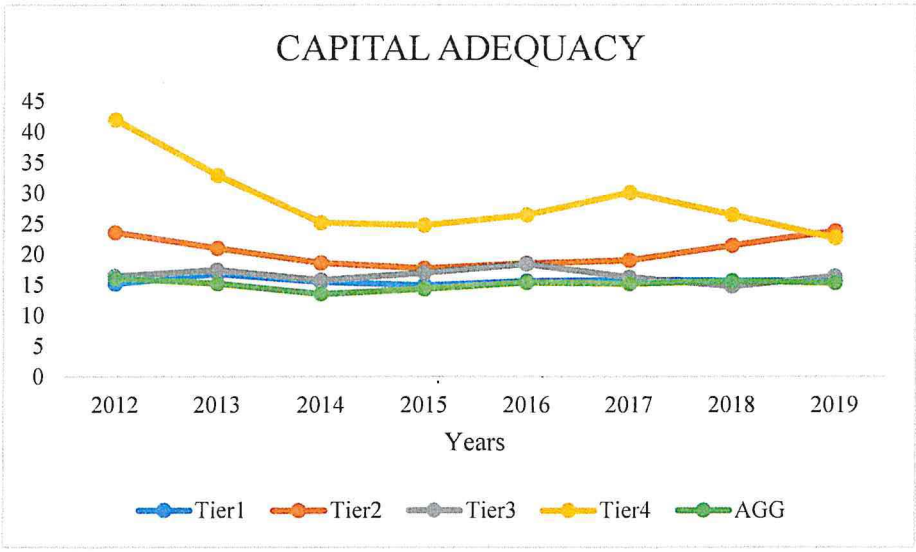

Figure 1: Trend analysis for Capital adequacy

The capital adequacy has significantly declined for tier IV group from 2012 to 2014 followed by a slight rise and a dip from 2017 to 2019. Tier III group had a slight decline but steadily rose over the years. The decline in capital adequacy could be due to a high growth of the total risk weighted assets in comparison to the core capital.

Tier I and II group have significantly small variations over the period and are slightly above the industry average. This indicates that the average capital accumulation for the industry was relatively low compared to the risk weighted assets.

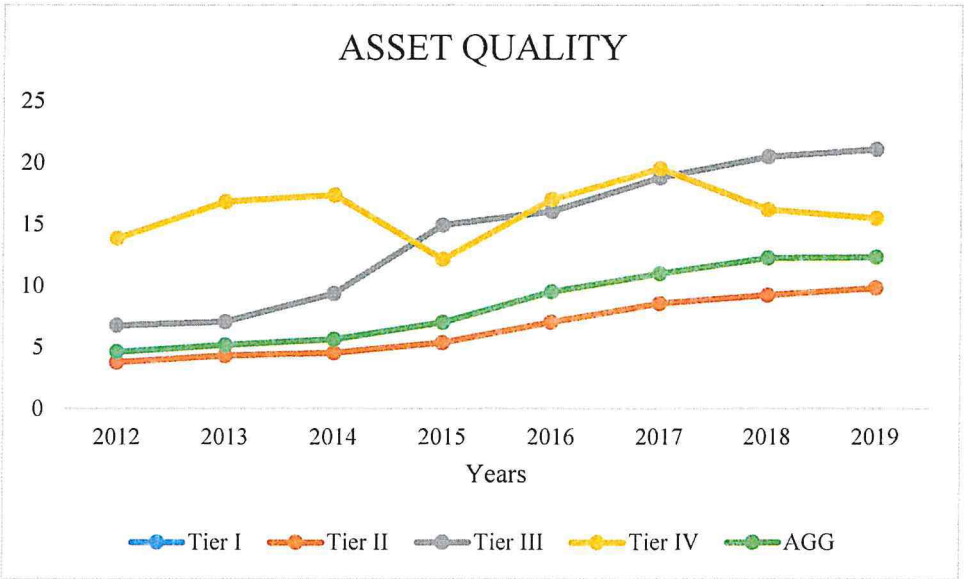

Figure 2: Trend analysis for Asset quality

The quality of assets which is measured by the ratio of non-performing loans to total loans has been deteriorating over the period. This could be an indicator of increasing credit risk due to unfavourable business conditions making it hard for borrowers to service their loans.

Big banks which are represented by tier I and tier II have the lowest non-performing loan to total loan ratio, below the industry average across the period. Small tier groups: tier III and IV have a ratio that is overly above the industry average, with Tier IV which has a slight improvement of their asset quality in 2015 which could be due to reduction in credit risk.

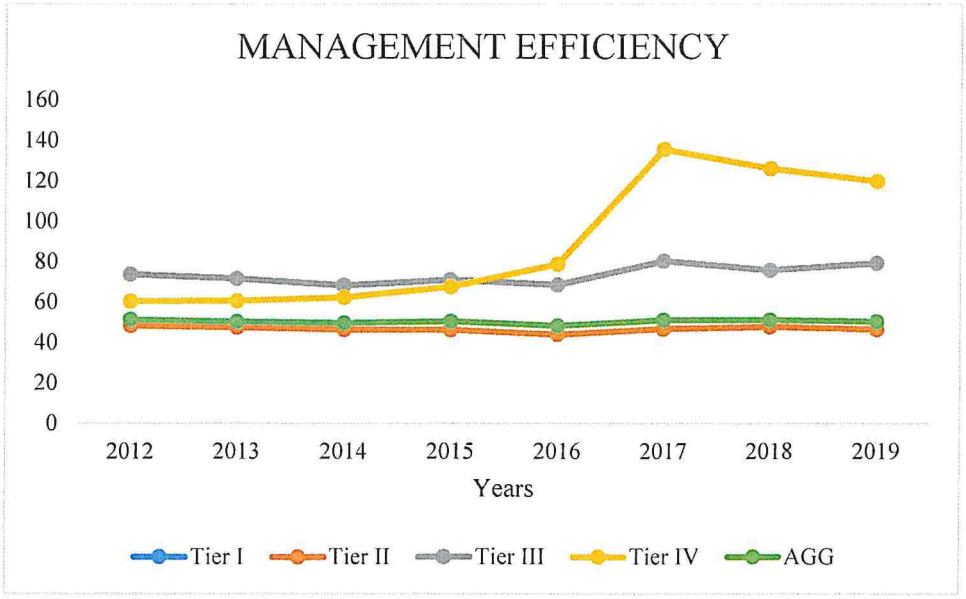

Figure 3: Trend analysis for Management efficiency

The management efficiency which is measured by the cost income ratio indicates a steady trend with minimal variations over the years for tier I, II and III.

Tier IV indicates a steady rise from 2014 to 2017 which is very alarming as it means a high increase in cost in comparison to income. A high cost to income ratio shows the operating expenses are too high. That may strain and negatively impact profitability.

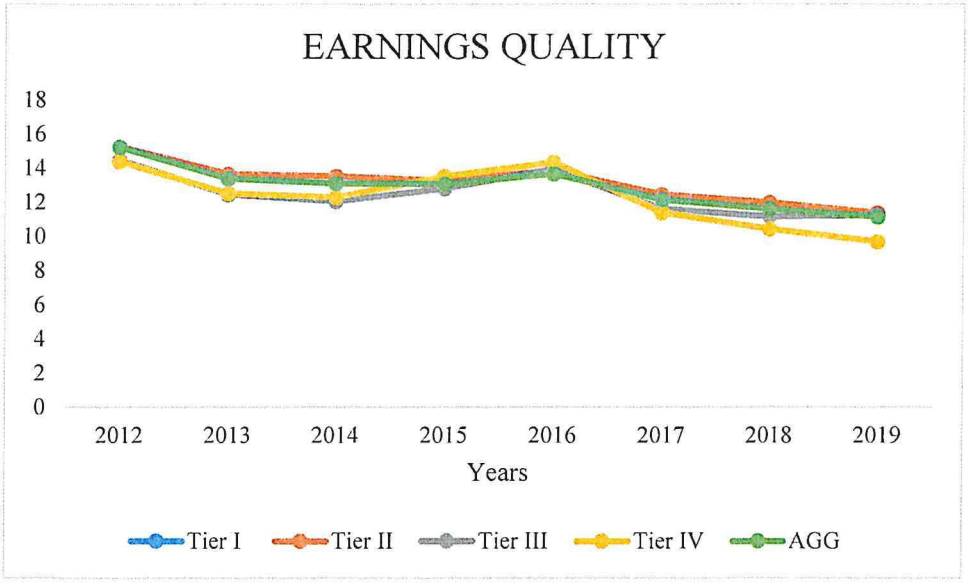

Figure 4: Trend analysis for Earnings quality

The above graph above shows a slight decline of profitability from 2012 which shot up in 2016 and drastically started declining across all tiers and the industry from 2017 and especially for tier IV which indicates a higher decline rate than the rest. This perhaps could be a reflection of the impact of the interest capping law which was introduced in late 2016.

Decline in profitability makes it hard for banks to absorb shocks hence make them highly susceptible to shocks in the economy.

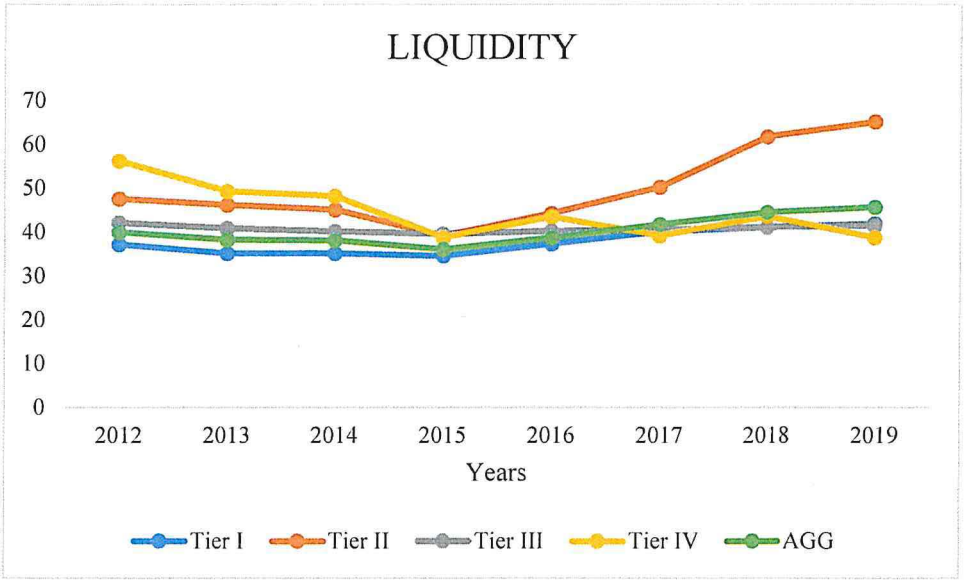

Figure 5: Trend analysis for Liquidity

The trend for tier I, III and IV has been steady over the period with the industry aggregate also indicating a similar trend. The trend for tier II indicates a drastic rising trend from 2015 which might be attributed to a higher growth of quick assets compared to the growth in liabilities.

The steady trend of the industry average indicates the resilience of the banking sector despite the danger of credit risk associated with lending money to risky borrowers and the interest rate cap imposed to them.

1.3. Problem statement

The banking sector revolves around amassing funds from surplus units and directing the funds to deficit units in form of loans and advances. In developing countries, like Kenya, banks play a crucial role in economic development. This is due to the high economic imbalance among the citizens. They impact the economy by promoting trade and industry, promoting capital formation by providing an avenue for people to save and financing agriculture, among others. With the increasing growth of the banking sector, financial stability is very paramount.

Over time, the financial health of banks was determined through its deposit growth rates, the percentage of non-performing loans to total loans and other factors like the risks associated with its operations. These determinants only represent a small section of the CAMEL model which are the universally used financial soundness indicators by most banks. Therefore, in this study, we evaluate the financial performance of banks by looking at the interrelatedness of the financial soundness indicators using the CAMEL model and going further into looking at whether they vary depending on bank tiers.

1.4. Research objective

The specific objectives of this study are:

1. To assess the interrelatedness of the CAMEL indicators on the banking sector.
2. To investigate and compare the interrelatedness of the CAMEL indicators in a tier analysis.

1.5. Significance of the research

This study can be relevant to various decision makers and policy makers in the banking industry because the results of this study could be used to show if there is any significant interrelation between different financial indicators and what effect they have on the general performance of a bank.

CHAPTER 2: LITERATURE REVIEW

2.1. Theoretical review

A financial system that does not portray any financial imbalances which may be brought about by significant adverse and unexpected events is said to be financially stable. Financial stability especially for banks may be characterized by management of financial risk, maintenance of employment levels and efficient allocation of resources. However, various researchers have come up with different definitions to understand financial stability.

According to Allen & Wood (2006), they brought about some suggestions of a number of features which should constitute a good definition stating that the definition of financial stability should be an observable state of affairs which is favourable to the public's interest. It should also be subject to supervision by the authorities and should not be so rigorous that it impedes any change as proof of instability. Therefore, Allen and Wood concluded that financial stability is a disposition whereby interludes of instability are likely to occur.

Houben et al. (2004) tried to define financial stability with regards to its capacity to aid the economic system efficiently dispense resources, assess and manage risks and over a continuum, alterable over time and steady with numerous combinations of its constituent components. Likewise, Swamy (2014) considered an interlinkage between financial stability and banking stability. He described banking stability as a situation in which the financial system can; mitigate financial risks, ensure flexible payments and remittance, ensure efficient allocation of resources, absorb shocks and enhance equilibrium by managing price fluctuations. He concluded that financial stability is a spin-off of the existing conditions of the banking sector and the economy, and due to these conditions that directly affect the stability of banks either positively or negatively, the extent of financial stability can be determined by the ability to mitigate shocks.

Borio (2003) took a macroprudential viewpoint and describes financial stability in terms of limiting risks of significant real output losses associated with episodes of financial system wide distress.

On the other hand, Mishkin (1999) stated that financial instability comes about when there is information asymmetry caused by shocks in the financial system therefore curtailing its task of channelling funds to those with high-yielding investment opportunities.

Financial instability entails increased risk of a financial slump (Davis, 2003). He also identifies three types of financial instability. The first one being centred on bank failures usually brought about by trading losses or loan. The second type involves great market price fluctuations after a change in expectations. The third type involves prolonged collapses of market liquidity and issuance.

In order to ensure financial stability especially for banks, supervisory frameworks have been put in place to ensure banks have enough capital to support all risks and have better risk management techniques. Central banks are tasked with setting out prudential regulations for banks within their jurisdictions. Some central banks conduct stress tests to look at the effect of shocks on certain areas of the economy like the banking sector. Central bank of Malaysia put in place an extension of the Net stable funding ratio which compliments the liquidity coverage ratio by promoting a long-lived resilience of banks liquidity risk profile.

Furthermore, apart from the CAMELS framework that was introduced by the International Monetary Fund to measure bank stability, the Basel Committee on Banking Supervision introduced the three basel accords which are based on three pillars; minimum capital requirement, supervisory review and market discipline.

Pillar one entails minimum capital requirement. This ensures that banks hold the minimum level of required capital in order to absorb any shocks that may arise. From their study on the Egyptian banking sector, Naceur & Kandil (2009), concluded that high capital requirements have a positive impact on the banks profitability. Likewise, Barth et al. (2004) showed that putting in place stringent capital requirements leads to fewer non-performing loans hence banks profitably and stability are improved. According to Lin et al. (2005), there exist a significant positive relation between capital adequacy and a negative relationship between insolvency risk of banks and financial performance hence the need of implementing a minimum capital requirement.

The second pillar fosters supervisory review process and power. It ensures that banks have sufficient capital besides the required minimum requirement and liquidity to cover all the risks and encourage good risk management. Barth et al. (2005) noted that encouraging private monitoring instead of government oversight will improve performance of a bank and in the long term its stability. Barth et al. (2004) suggested that there exists no strong correlation between bank performance and stability and supervisory power. However, they also highlighted that are certain advantages and disadvantage that arise from granting

supervisors too much power. Where powerful supervision would prevent managers from engaging in extremely risky business which is dangerous for the bank therefore the banks performance and stability is enhanced. Also, strong supervision may hinder bank operations.

The third pillar aims to check market discipline. This is achieved through making it a must to provide all relevant information in order to ensure users of the financial information make informed decisions. Through elimination of information asymmetry situations such as insider trading which may impede the banks operations and pose a threat to banks stability are eliminated.

In a bid to establish factors that influence financial stability or rather bank stability, some research has been done to establish the relationships between bank stability and various macroeconomic factors. Soedarmono, Machrouh & Tarazi (2011) investigated the linkage between economic growth and bank stability where they noted that economic growth can mitigate a bank's risk-taking behaviour therefore can lead to a more stable condition for banks.

Volatility of general prices could lead to high interest rates and consequently decreases the stability of various financial sectors especially the banking sector (Akram & Eitrheim, 2008). Similarly, Criste & Lupu (2014) studied that there exists a trade-off between inflation and financial stability. High interest rate on deposits integrated with poor supervision may lead to bank instability (Kraft & Galac, 2007). According to Driffill et al. (2006), central banks' action on smoothing the interest rates can enhance banks stability.

Apart from using FSIs recommended by IMF, Financial stability in the banking industry can also be assessed through various alternative measures. Beck et al. (2005) uses three measure to assess the stability of banks. The Z-score which is a standard measure of the distance from insolvency, distress probabilities and non-performing loans. Merton (1974) in his study on option theoretic framework towards default which has laid a foundation for many studies on modelling credit ratings and quantifying credit risk, concluded that measuring bank stability can be done through employing bank equity prices. Some researchers took approaches that are not based on market indicators. Calomiris & Mason (1997) in their investigation of failing and non-failing banks during the great depression investigated deposit withdrawals as proportion of a bank's solidness. Moreover, Hasan & Dwyer (1994) measured autocorrelation of bank failure after controlling for macroeconomic fundamentals such as unemployment, inflation etc during diverse episodes of US banking history.

Bank size has also been considered as a measure of bank stability by other researchers. This is through evaluating the relationship between bank size and bank stability. De nicolo (2005) observed a negative and significant relationship between bank size and bank stability, while (Boyd & Runkle 1993; Calomiris & Mason 2000) noted the existence of a vague relationship.

Furthermore, high amounts of risky assets are regarded to be likely associated with high bank failure (Boris & Lowe, 2000). Beck et al. (2005) argued that market concentration is linked to more financial stability.

2.2. Empirical review

Berger (1995) investigated the relationship between return on equity and capital to assets for commercial banks in United States by using granger causality model from 1983 to 1992. The conclusion suggested that ROE and capital to assets are positively correlated and each of the variable positively granger caused the other.

In a bid to establish the link between macro-economic and bank specific characteristics, (Gul et al., 2011) used panel data of fifteen Pakistani banks over the period from 2005 to 2009. They applied pooled OLS to examine the impact of economic growth, loans, inflation, deposits, market capitalization and equity on profitability indicators of the banks which are ROE, ROA and NIM. They concluded that, both external and internal factors have a strong effect on profitability of banks.

Jha & Hui (2012) analysed eighteen commercial banks in Nepal over the period 2005 to 2010. This was in an attempt to look at the impact of interest expenses to total loan, capital adequacy ratio, credit to deposit ratio, non-performing loan ratio and net interest margin ratio on the return on assets and return on equity which are indicators of profitability or rather earning quality. Through application of multivariate regression, the analysis revealed that capital adequacy ratio, net interest margin and interest expenses to total loans highly influenced return on assets while return on equity was significantly influenced by the capital adequacy ratio.

Gucci (2012) investigated the factors that affect profitability of commercial banks in Indonesia, using a sample of commercial banks listed on the Indonesia stock exchange during the 2002 to 2011 period. By using fixed effect regression model, he demonstrated that bank profitability is influenced by operational efficiency, equity, loans, inflation rate and total equity.

Moreover, Trujillo-Ponce (2013), by use of generalized method of moments (GMM), on a study on Spanish banks over the period of 1999 to 2009, argued that there existed a direct link and significant influence of asset quality on bank profitability.

To analyse the interrelatedness of financial soundness indicators, Swamy (2014) employed a micro model of vector autoregressive model (VAR) on a panel data derived from 56 commercial banks in India from 1996 to 2009 in trying to analyse the importance of the interrelationship of the bank specific variables and dynamics of bank stability measures. He established that, liquidity is mutually related with capital adequacy, asset quality and profitability.

Furthermore, Gremi (2013) studied how some important internal factors influence banks profitability in Albania. Panel data from twelve banks over the period from 2005 to 2012 was used and fixed effect regression model was applied to test the relationship between dependent variable: ROA and internal factors such as loans, bank size, deposits, among others. It was concluded that few internal variables have significant effect on bank profitability and others have no significant influence on bank profitability.

Abata (2014), with the use of Pearson correlation and regression, analysed asset quality and bank performance of six commercial banks in Nigeria for a period of fifteen years from 1999 to 2013. The analysis showed that that asset quality had a statistically strong and positive relationship and impact on bank performance and that asset quality and profitability have no relationship.

Albulescu (2015), focused on the internal conditions of banks to test the impact of financial soundness indicators on banks profitability which was represented by either ROA or ROE. By using IMF data from the year 2005 to 2013 and a panel data approach, it was concluded that non-performing loans to total loans which represents the asset quality has a negative impact on profitability, liquidity has a mixed effect while capital adequacy and interest rate margins positively affect banks profitability under the fixed effect model.

Mohanty (2017) studied the determinants of banks profitability in Ethiopia using timeseries data of Commercial Bank of Ethiopia from the year 1983 to 2012. The data was evaluated using OLS method to assess the effect of explanatory variables on profitability indicators. i.e. ROA. Regression analysis were carried out to test hypotheses to establish which independent variable(s) can explain the dependent variable. The results indicated that bank specific factors; credit risk, bank size, managerial experience and macroeconomic factors;

inflation rate, and level of GDP have a strong impact on banks profitability. Independent variables have negative impact on profitability.

Ayadurai & Eskandari (2018) investigated the drivers of bank soundness by using Partial Least Squares Structural Equation Modelling (PLS-SEM) on a sample of 1135 listed banks in G7 countries during the period 2003 to 2013. The structural equation model comprised of six exogenous variables; CAMELS, which explained the effects of soundness in the G7 countries. The study concluded that CAMEL indicators could explain 32.5% of the variation in banks soundness.

CHAPTER 3: METHODOLOGY

3.1. Research design

In carrying out this study, descriptive research design was employed. A descriptive research design describes the features of an occurrence or population being studied without trying to alter it in any way. Descriptive research studies are concerned with describing the attributes of a specific individual or of a group. For that reason, descriptive design help to establish the interrelatedness of financial soundness indicators for commercial banks in Kenya.

3.2. Population and Sampling

A research population is a collection of individuals with similar characteristics and constitutes all sets of individuals or items that fit the area of study of a researcher. The population of this study entailed all commercial banks in Kenya registered under the Central Bank of Kenya. As at June 2016, the CBK reported 43 licenced commercial banks. This study was over the period from 2001 to 2019 considering annual data of the commercial banks.

3.3. Data Collection

Data collection involves gathering and measuring information from the selected topics of a study. This study used panel data of 43 commercial banks over the period from 2001 to 2019. Secondary data from financial statements of the commercial banks was used. Financial statements are prepared based on a standardized accounting policy in the banking industry hence they are considered reliable for this study.

In trying to analyse other factors that explain soundness in banks, this study considered some control variables preferably macroeconomic variables as they also significantly impact bank performance. The macroeconomic variables used in this research study include, real interest rates, inflation, exchange rates.

Inflation affects currencies value as it causes instability of currencies and this has a ripple effect on the banking sector. Therefore, this affects the liquidity structure of banks.

Interest rates also affect stability of banks in that, profitability tends to go up when interest rates hike due to the increased spread between saving rates and borrowing rates. This affects banks earnings.

Exchange rates also influence the financial soundness of banks. This is because an increase in exchange rates have a positive impact on borrowers of foreign currency hence leads to the decline of non-performing loans.

Variable	Measurement	Source
Exchange rates	Annual average based on monthly average. (local currency units relative to the US dollar)	International Monetary Fund + International Financial Statistics
Inflation	Laspeyre formula	International Monetary Fund + International Financial Statistics + Data files using World Bank data
Real Interest rates	GDP deflator	International Monetary Fund + Data files using World Bank data
Bank size	Logarithm of the total assets of the bank	Think Business
Capital Adequacy	Core capital over total risk weighted assets	Think Business
Asset Quality	Non-performing loans to total loans and advances	Think Business

Management Efficiency	Cost Income Ratio	Think Business
Earnings Quality	Return on Assets	Think Business
Liquidity	Quick assets over total liabilities	Think Business

Table 1: Variables

3.4. Data Analysis

In its analysis, this study employed panel data methods. The three parameter estimation techniques considered were fixed effect model, random effect model and the Hausman test.

3.4.1. Panel Data Unit Root Test

To test for unit root, we consider the Maddala Wu Fisher type test which is an alternative testing strategy that was developed to cover for the shortcomings of both LLC (Levin, Lin & Chu) and IPS (Im, Pesaran & Shin) framework. It uses non-parametric fisher type test which is based on a combination of the P-values of the test statistic for a unit root in each cross-sectional unit. Some advantages of this test are, it does not require balanced panels, it can be carried out for any unit root test derived and it is possible to use different lag lengths in the individual ADF regression. However, its disadvantage is the P values have to be derived by Monte Carlo simulation.

3.4.2. Panel VAR models

One of the recommended estimators of panel data relationships is the Panel VAR. The Panel VAR is using GMM. It is designed for situations with small time periods and many individuals. GMM controls for endogeneity of the lagged dependent variable, omitted variable bias and unobserved panel heterogeneity hence making it a dynamic model estimator.

The Vector Auto-Regressive model typically uses the lags of the endogenous dependent variables in each equation in the VAR system. When the lags of the dependent variable appear as independent variables, the strict exogeneity of the predictors that is needed for an unbiased estimation of the parameters no longer holds. The estimation of a Fixed Effects model would lead to biased estimates, popularly known as the Nickel Bias (Nickel, 1981).

The estimation of the VAR model using Generalized Method of Moments (GMM) is done to correct for the violation in strict exogeneity. This type of bias is especially present in a small T, large N data set (long data). To start, a first difference transformation is done on the variables to eliminates the unobserved heterogeneity (also known as the fixed effects), before applying the GMM estimation. This is known as the Difference GMM. However, the shortcoming of this first difference transformation is that it magnifies gaps in unbalanced panels.

For this study, we therefore consider an alternative transformation known as the forward orthogonal deviations (FOD) transformation, first suggested by Arellano & Bover, 1995. The transformation subtracts the mean of future observations from the current observation in order to remove the unobserved heterogeneity. This means that the estimation is able to retain more observations per bank (reduce loss of observations due to differencing).

The estimators highlighted above are both instrumental variables methods. Therefore, it is important to evaluate them based on the Hansen/Sargan's J test results after they are estimated. According to Holz-Eakin, Newey and Rosen (1988), the estimation of GMM in a VAR setting where we have a system of equation, not only leads to consistent estimates (as per GMM estimation) but also gains in efficiency.

In addition to this, it is important to highlight that the lags of 6 bank-specific variables will be treated as endogenous in our GMM estimation, and their further lags will therefore use as instruments. The macroeconomic factors considered as control variables will be included as exogenous variables, therefore being used as IV Type of instruments. This rationale follows a similar application by Roodman (2009)

For panel VAR to be efficient, an optimal lag length should be chosen. A widely used method of choosing lags is to use information criteria. The goal is to minimize the value of the information criteria.

Impulse response is an examination of the unit shock to one variable on the other variables in a VAR system. It assumes that the error term of all the other equations in the system are held constant but is unrealistic because the error terms are likely to be more correlated across equations to some extent.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1. Introduction

This chapter discusses the empirical analysis of this research. It looks at the interrelatedness of the CAMEL indicators for commercial banks in Kenya from 2001 to 2018. The descriptive statistics of various CAMEL components was captured and panel VAR was used in the analysis.

4.2. Descriptive Analysis

	GDP	Inflation	Real interest rate	Exchange rate	Bank size	Risk weighted assets
Mean	4.92	9.14	7.98	83.60	4.54	35369.17
Standard deviation	0.46	5.39	2.65	11.23	0.37	28510.97
Kurtosis	0.40	5.36	0.36	-0.75	-1.55	-1.24
Skewness	0.74	1.91	-0.11	0.55	-0.19	0.65
Minimum	0.50	1.96	2.85	67.31	3.99	6890.17
Maximum	8.40	26.23	12.78	103.41	5.01	82159.00

	Loan loss provision/ operating income	Core capital/ RWA	NPL/Total loans	Core capital	Core capital/total deposit liability	Return on average assets
Mean	420.93	21.43	14.27	5732.05	26.02	-0.92
Standard dev	1364.11	2.88	5.77	4820.27	10.92	12.18
Kurtosis	16.53	-0.23	-1.45	-1.39	2.52	17.67
Skewness	4.02	-0.10	0.37	0.58	1.80	-4.19
Minimum	9.05	16.07	7.34	956.22	15.54	-49.55
Maximum	5790.61	26.83	23.61	13541.57	53.66	3.42

	Return on average core capital	Total op expense/ total income	Net loans/ total deposits	Quick assets	Quick assets/ total liabilities	Quick assets/ total deposits
Mean	25.27	1698.32	70.22	15524.27	43.30	51.49
Standard deviation	22.16	5386.76	9.21	11391.58	5.93	16.04
Kurtosis	11.61	15.35	3.26	-0.91	1.12	10.29
Skewness	3.11	3.86	1.55	0.67	1.18	3.00
Minimum	5.78	54.17	57.93	3968.32	37.46	40.58
Maximum	106.40	22577.78	96.65	37751.32	57.96	108.89

The above tables represent a summary statistic of all the variables. From the analysis we obtain the mean which measures the average of the values. The results of the average core capital to risk weighted assets is 21.426, that of Non-performing loans to total loans is 14.2729, net total operating expenses to net total operating income has an average of 1698.3187 and quick assets to total liabilities shows a mean of 43. 3022. Subsequently, return on average assts has a negative mean of -0.9249 which is quite low because it indicates there is negative rate of return for investments in assets which will affect profitability greatly.

Standard deviation measures how close data is to the mean value. Variables with high standard deviation are bank size with 33516.8208, return on average assets with a standard deviation of 12.1822, total net operating expense to total net operating income with 5386.7631 and quick assets to total liabilities with 16.0365. High standard deviation indicates that there are serious deviations from the mean. However, GDP growth, inflation, real interest rate, core capital to risk weighted assets and non-performing loans to total loans have relatively low deviations.

Kurtosis measures the flatness of the distribution. From the summary, some variables have positive kurtosis which indicates a relatively picked distribution, while other variables have a negative kurtosis indicating a relatively flat distribution.

Skewness is a measure of symmetry it indicates how much the underlying distribution deviates from the normal distribution since the normal distribution has a skewness of zero. Variables such as return on average assets, core capital over risk weighted assets and real interest rate are negatively skewed. Which is not favourable especially for return on average assets and the capital adequacy measure as it indicates they are lower than the median. The rest of the variables are positively skewed.

Descriptive Analysis per Tier

TIER 1	MEAN	KURTOSIS	SKEWNESS
Bank Size	5.08	-1.47	-0.19
Core capital/RWA	14.36	1.05	0.79
NPL/Total loans	10.11	-0.83	0.76
Return on average assets	4.00	0.37	-1.15
Total op expense/total op income	59.24	3.22	1.62
Q. Assets/total liabilities	38.71	-0.37	-0.59

TIER 2	MEAN	KURTOSIS	SKEWNESS
Bank Size	4.52	-1.59	-0.20
Core capital/RWA	15.82	-0.49	0.69 .
NPL/Total loans	10.97	-1.15	0.26
Return on average assets	2.95	0.09	-0.51
Total op expense/total op income	52.37	3.45	1.25
Q. Assets/total liabilities	37.19	-0.52	0.32

TIER 3	MEAN	KURTOSIS	SKEWNESS
Bank Size	3.99	-1.64	-0.18
Core capital/RWA	20.47	2.23	1.50
NPL/Total loans	13.88	-1.69	-0.07
Return on average assets	-10.08	17.97	-4.24
Total op expense/total op income	221.23	17.67	4.19
Q. Assets/total liabilities	44.70	14.01	3.57

TIER 4	MEAN	KURTOSIS	SKEWNESS
Bank Size	3.64	-1.77	0.16
Core capital/RWA	32.91	2.64	-1.33
NPL/Total loans	20.88	-1.61	0.32
Return on average assets	0.26	8.31	-2.59
Total op expense/total op income	5879.75	15.35	3.86
Q. Assets/total liabilities	51.62	4.65	1.57

Bank size, non-performing loans to total loans and quick assets to total liabilities have a negative kurtosis of -1.47, -0.83 and -0.37 respectively. This implies thin tails which indicates presence of extreme lower values in the distribution. This shows a not so good performance for liquidity of tier one banks. However, the negative kurtosis for non-performing loans to total loans indicates a good asset quality position for tier one banks. Core capital to risk weighted assets, bank size, non-performing loans to total loans and total net operating expense to total net operating income are positively skewed while return on average assets and quick assets to total liabilities are negatively skewed. This indicates that the earning quality and liquidity of tier one banks is primarily on the left tail of the distribution, slightly under the normal distribution hence not doing well.

From the statistics of tier two banks, bank size, Core capital to risk weighted assets, non-performing loans to total loans, return on average assets and quick assets to total liabilities have a negative excess kurtosis. Subsequently, return on average assets is negatively skewed. This is likely to affect the earnings quality, liquidity, and capital adequacy negatively across tier 2 banks indicating that they are not performing well.

Across tier three banks, non-performing loans to total loans has a negative excess kurtosis and a negative skewness which indicates that the asset quality of tier 3 banks is doing well. However, total net operating expense to total net operating income has an excess positive kurtosis and positive skewness which means that there are more higher values. This is not a good indicator for the management efficiency of tier three banks.

The total net operating expense to total net operating income and quick assets to total liabilities have a positive excess kurtosis and a positive skewness which indicates there are more higher values which is not recommendable for the management efficiency but shows that liquidity for tier 4 banks is doing well. Core capital to risk weighted assets has a negative excess kurtosis and negative skewness which is close to the normal distribution. Return on average assets has an excess positive kurtosis and a skewness which slightly below the normal hence the earning quality for tier 4 banks is relatively good.

4.3. Panel VAR analysis

4.3.1. Overall Banking Sector

lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	1	344.3491	.0396117	-1414.74	-255.6509	-716.9123
2	.9894884	159.5229	.9840336	-1013.203	-240.4771	-547.9848

Test of overidentifying restriction:
Hansen's J chi2(108) = 106.77032 (p = 0.515)

Variables stationary at level	Variables stationary at first differencing
Core capital to risk weighted assets	Bank size
Non-performing loans to total loans	Exchange rate
Total net operating expense to total net operating income	
Return on average assets	
Quick assets to total liabilities	
Real interest rate	
Inflation	
GDP growth	

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
CoreCap_RWA						
CoreCap_RWA						
L1.	.223999	.1016916	2.20	0.028	.024687	.4233109
NPL_TotalLoan						
L1.	.2821423	.1628513	1.73	0.083	-.0370403	.6013249
ROAveAssets						
L1.	-.2545374	.0689554	-3.69	0.000	-.3896874	-.1193873
OpExp_NetOpInc						
L1.	.2129393	.060298	3.53	0.000	.0947573	.3311212
QuickAssets_TotalLibs						
L1.	.660375	.0784368	8.42	0.000	.5066417	.8141084
DBank_Size						
L1.	-10.05417	5.738672	-1.75	0.080	-21.30176	1.193421
GDP_Growth	-107.0138	28.61423	-3.74	0.000	-163.0967	-50.93099
Inflation	-48.19665	11.26356	-4.28	0.000	-70.27282	-26.12048
RealInterestRates	53.69417	31.80069	1.69	0.091	-8.63404	116.0224
DFXRATE	.0426556	.0919848	0.46	0.643	-.1376313	.2229425

The table above indicates there is a significant positive relationship between Capital Adequacy (Core capital to risk weighted assets) and Management Efficiency (total net operating expense to total net operating income), Liquidity (Quick assets to total liabilities). This implies that an increase in Management Efficiency (total net operating expense to total net operating income) will be followed by an increase in Capital Adequacy (Core capital to risk weighted assets). In addition, an increase in Liquidity (Quick assets to total liabilities) will be followed by an increase in Capital Adequacy (Core capital to risk weighted assets) and vice versa.

However, there is a significant negative relationship between Capital Adequacy (Core capital to risk weighted assets) and Earnings quality (Return on average assets), GDP growth, inflation. Implying that an increase in Earnings quality (Return on average assets), increase in GDP growth or an increase in inflation will be followed by a decrease in Capital Adequacy (Core capital to risk weighted assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
NPL_TotalLoan						
NPL_TotalLoan						
L1.	.6792805	.0782202	8.68	0.000	.5259717	.8325892
CoreCap_RWA						
L1.	-.0459251	.0565521	-0.81	0.417	-.1567653	.064915
ROAveAssets						
L1.	.0309977	.0263353	1.18	0.239	-.0206186	.0826139
OpExp_NetOpInc						
L1.	-.1054514	.0300783	-3.51	0.000	-.1644038	-.046499
QuickAssets_TotalLibs						
L1.	-.0133096	.0466622	-0.29	0.775	-.1047659	.0781466
DBank_Size						
L1.	-6.457016	2.33974	-2.76	0.006	-11.04282	-1.871209
GDP_Growth	-4.035149	12.2211	-0.33	0.741	-27.98806	19.91776
Inflation	3.888362	4.484964	0.87	0.386	-4.902005	12.67873
RealInterestRates	3.572926	15.85451	0.23	0.822	-27.50135	34.6472
DFXRATE	-.0260419	.0348144	-0.75	0.454	-.0942769	.0421931

For Asset quality (non-performing loans to total loans), there exist a significant negative relationship between Asset quality (non-performing loans to total loans) and Management Efficiency (total net operating expense to total net operating income), change in bank size. This implies that an increase in Management Efficiency (total net operating expense to total net operating income) will result to a decrease in Asset quality (non-performing loans to total loans. Also, growth in bank size will also lead to a decrease in Asset quality (non-performing loans to total loans) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROAveAssets						
ROAveAssets						
L1.	2.441745	.8812421	2.77	0.006	.7145421	4.168948
CoreCap_RWA						
L1.	4.005629	.72198	5.55	0.000	2.590574	5.420684
NPL_TotalLoan						
L1.	-.7974445	.6499491	-1.23	0.220	-2.071321	.4764323
OpExp_NetOpInc						
L1.	-.5706487	.2863371	-1.99	0.046	-1.131859	-.0094384
QuickAssets_TotalLibs						
L1.	-3.220886	.4166757	-7.73	0.000	-4.037555	-2.404216
DBank_Size						
L1.	55.91354	25.25408	2.21	0.027	6.416456	105.4106
GDP_Growth	121.8088	126.986	0.96	0.337	-127.0791	370.6967
Inflation	-38.53324	40.21488	-0.96	0.338	-117.353	40.28648
RealInterestRates	-482.4669	147.5716	-3.27	0.001	-771.7019	-193.232
DFXRATE	.3015746	.4060462	0.74	0.458	-.4942614	1.097411

From the results, there exist a positive and statistically significant relationship between Earnings quality (Return on average assets) and Capital Adequacy (Core capital to risk weighted assets) and change in bank size. This means that an increase in Capital Adequacy (Core capital to risk weighted assets) or growth in bank size will result to an increase in Earnings quality (Return on average assets) and vice versa.

However, there is a negative significant relationship between Earnings quality (Return on average assets) and Management Efficiency (total net operating expense to total net operating income), Liquidity (Quick assets to total liabilities) and real interest rates. Meaning that, an increase in these variables will be followed by a decrease in Earnings quality (Return on average assets).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
OpExp_NetOpInc						
OpExp_NetOpInc L1.	-.0457022	.1029702	-0.44	0.657	-.2475201	.1561157
CoreCap_RWA L1.	.0224604	.1695238	0.13	0.895	-.3098002	.354721
NPL_TotalLoan L1.	.1809601	.203735	0.89	0.374	-.2183532	.5802735
ROAveAssets L1.	-.278929	.1386735	-2.01	0.044	-.550724	-.0071339
QuickAssets_TotalLibs L1.	.1614627	.1274806	1.27	0.205	-.0883946	.41132
DBank_Size L1.	53.31343	7.464571	7.14	0.000	38.68314	67.94372
GDP_Growth	-159.8309	48.42672	-3.30	0.001	-254.7455	-64.9163
Inflation	-21.29484	15.59291	-1.37	0.172	-51.85638	9.26669
RealInterestRates	200.0103	53.71964	3.72	0.000	94.72177	305.2989
DFXRATE	-.4363859	.1562187	-2.79	0.005	-.7425689	-.1302029

From the table above, there is statistically significant positive relationship between Management Efficiency (total net operating expense to total net operating income) and change in bank size and real interest rate. This means that an increase in real interest rate or growth in bank size will be followed by an increase in Management Efficiency (total net operating expense to total net operating income).

But there is a negative and significant relationship between Management Efficiency (total net operating expense to total net operating income) and Earnings quality (Return on average assets), GDP growth and change in exchange rates. This implies that an increase in any of these variables will be followed by a decrease in Management Efficiency (total net operating expense to total net operating income).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
QuickAssets_TotalLibs						
QuickAssets_TotalLibs L1.	-.1706757	.074684	-2.29	0.022	-.3170537	-.0242977
CoreCap_RWA L1.	.5664561	.0868795	6.52	0.000	.3961754	.7367369
NPL_TotalLoan L1.	.0325752	.1351563	0.24	0.810	-.2323263	.2974766
ROAveAssets L1.	.0179628	.0381198	0.47	0.637	-.0567507	.0926764
OpExp_NetOpInc L1.	.0616622	.050391	1.22	0.221	-.0371023	.1604267
DBank_Size L1.	-15.46782	4.976951	-3.11	0.002	-25.22247	-5.713177
GDP_Growth	-95.14464	27.32706	-3.48	0.000	-148.7047	-41.58458
Inflation	-41.72771	7.472017	-5.58	0.000	-56.3726	-27.08283
RealInterestRates	-65.96762	32.14044	-2.05	0.040	-128.9617	-2.973521
DFXRATE	.0070324	.0852529	0.08	0.934	-.1600603	.1741251

The table above shows there is a positive and significant relationship between Liquidity (Quick assets to total liabilities) and Capital Adequacy (Core capital to risk weighted assets). Implying that and increase in Capital Adequacy (Core capital to risk weighted assets) will be followed by an increase in Liquidity (Quick assets to total liabilities).

On the contrary, there is a negative significant relationship between Liquidity (Quick assets to total liabilities) and change in bank size, GDP growth, inflation, and real interest rates. This means that an increase in GDP growth, increase in inflation or growth in bank size will be followed by a decrease in Liquidity (Quick assets to total liabilities).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DBank_Size						
DBank_Size L1.	-.2064821	.0900015	-2.29	0.022	-.3828818	-.0300824
CoreCap_RWA L1.	.0039675	.0017946	2.21	0.027	.0004502	.0074847
NPL_TotalLoan L1.	-.0017983	.0025946	-0.69	0.488	-.0068835	.003287
ROAveAssets L1.	-.0011963	.0007243	-1.65	0.099	-.0026158	.0002233
OpExp_NetOpInc L1.	.0008673	.0009961	0.87	0.384	-.0010851	.0028197
QuickAssets_TotalLibs L1.	.0004906	.0012808	0.38	0.702	-.0020198	.0030009
GDP_Growth	3.294469	.5043858	6.53	0.000	2.305891	4.283047
Inflation	.5914787	.20766	2.85	0.004	.1844725	.9984849
RealInterestRates	2.590303	.5706892	4.54	0.000	1.471773	3.708834
DFXRATE	-.0078955	.0017103	-4.62	0.000	-.0112477	-.0045433

From the table above, there is a statistically significant positive relationship between change in bank size and Capital Adequacy (Core capital to risk weighted assets), GDP growth, inflation, and real interest rates. This means that an increase in Capital Adequacy (Core capital to risk weighted assets), increase in GDP growth, increase in inflation, or increase in real interest rates will be followed by an increase in change in bank size.

On the other hand, there is a negative significant relationship between change in bank size and change in exchange rates. Implying that when change in exchange rate increases, change in bank size reduces and vice versa.

4.3.2. Tier 1

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Test of overidentifying restriction:
  Hansen's J chi2(36) = 27.459482 (p = 0.846)
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Variables stationary at level	Variables stationary at first differencing
Core capital to risk weighted assets	Bank size
Non-performing loans to total loans	Exchange rate
Total net operating expense to total net operating income	
Return on average assets	
Quick assets to total liabilities	
Real interest rate	
Inflation	
GDP growth	

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
CoreCap_RWA						
CoreCap_RWA						
L1.	.6907458	.2276519	3.03	0.002	.2445563	1.136935
NPL_TotalLoan						
L1.	.0613752	.2212465	0.28	0.781	-.3722599	.4950103
ROAveAssets						
L1.	-.129573	.9799761	-0.13	0.895	-2.050291	1.791145
OpExp_NetOpInc						
L1.	-.0081275	.0080358	-1.01	0.312	-.0238774	.0076224
QuickAssets_TotalLibs						
L1.	.0718921	.0708574	1.01	0.310	-.0669859	.2107701
DBank_Size						
L1.	12.35658	4.062327	3.04	0.002	4.394569	20.3186
GDP_Growth	-89.64646	42.81038	-2.09	0.036	-173.5533	-5.739665
Inflation	-26.006	12.18431	-2.13	0.033	-49.88681	-2.125199
RealInterestRates	-2.957473	35.39665	-0.08	0.933	-72.33363	66.41868
DFXRATE	.0490636	.081322	0.60	0.546	-.1103246	.2084519

From the results on the table above, there is a significant positive relationship between Capital adequacy (core capital to risk weighted assets) and change in bank size. Meaning that a growth in bank size will be followed by an increase in capital adequacy and vice versa.

However, there is a negative significant relationship with GDP growth and inflation. This implies that, when GDP growth increases, or inflation increase it will be followed by a decrease in Capital adequacy (core capital to risk weighted assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
NPL_TotalLoan						
NPL_TotalLoan						
L1.	.5750836	.2718033	2.12	0.034	.0423588	1.107808
CoreCap_RWA						
L1.	.3322786	.2666886	1.25	0.213	-.1904214	.8549786
ROAveAssets						
L1.	-2.130673	1.358613	-1.57	0.117	-4.793506	.5321603
OpExp_NetOpInc						
L1.	-.0176675	.0113491	-1.56	0.120	-.0399112	.0045763
QuickAssets_TotalLibs						
L1.	.0002177	.1071255	0.00	0.998	-.2097445	.21018
DBank_Size						
L1.	17.53057	6.879196	2.55	0.011	4.047593	31.01354
GDP_Growth	-112.391	75.81795	-1.48	0.138	-260.9915	36.20944
Inflation	6.575723	18.12159	0.36	0.717	-28.94195	42.09339
RealInterestRates	3.908386	51.8755	0.08	0.940	-97.76573	105.5825
DFXRATE	-.1013213	.0806517	-1.26	0.209	-.2593956	.0567531

For Asset quality (non-performing loans to total loans), the results above show there is a positive and significant relationship between Asset quality (non-performing loans to total loans) and change in bank size. This means that growth in bank size will be followed by an increase in Asset quality (non-performing loans to total loans) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROAveAssets						
ROAveAssets						
L1.	.4996252	.2745131	1.82	0.069	-.0384107	1.037661
CoreCap_RWA						
L1.	.0449481	.0584106	0.77	0.442	-.0695346	.1594309
NPL_TotalLoan						
L1.	-.0104228	.0698259	-0.15	0.881	-.1472791	.1264336
OpExp_NetOpInc						
L1.	.0000719	.0022836	0.03	0.975	-.0044038	.0045476
QuickAssets_TotalLibs						
L1.	-.0191169	.0217213	-0.88	0.379	-.0616898	.023456
DBank_Size						
L1.	1.32362	1.014952	1.30	0.192	-.6656496	3.312891
GDP_Growth	19.10041	13.9634	1.37	0.171	-8.267353	46.46817
Inflation	-.173846	3.706591	-0.05	0.963	-7.438631	7.090939
RealInterestRates	-7.93215	9.757577	-0.81	0.416	-27.05665	11.19235
DFXRATE	-.0308859	.0188733	-1.64	0.102	-.067877	.0061052

From the results, there is no variable that has a significant effect on Earnings quality (Return on average assets)

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
OpExp_NetOpInc						
OpExp_NetOpInc						
L1.	.1965359	.174109	1.13	0.259	-.1447114	.5377833
CoreCap_RWA						
L1.	-6.458852	3.688603	-1.75	0.080	-13.68838	.7706775
NPL_TotalLoan						
L1.	-.8110577	3.753679	-0.22	0.829	-8.168134	6.546019
ROAveAssets						
L1.	41.28901	18.46954	2.24	0.025	5.089375	77.48865
QuickAssets_TotalLibs						
L1.	-.0794272	1.534057	-0.05	0.959	-3.086124	2.92727
DBank_Size						
L1.	-363.4827	86.33919	-4.21	0.000	-532.7044	-194.261
GDP_Growth	264.5295	961.0036	0.28	0.783	-1619.003	2148.062
Inflation	-491.228	227.2123	-2.16	0.031	-936.556	-45.90002
RealInterestRates	93.49301	742.3358	0.13	0.900	-1361.458	1548.444
DFXRATE	1.388741	1.303464	1.07	0.287	-1.166	3.943483

However, there is a positive significant relationship between Management efficiency (total net operating expense to total net operating income) and Earnings quality (Return on average assets). This means that an increase in Earnings quality (Return on average assets) will be followed by an increase in Management efficiency (total net operating expense to total net operating income) and vice versa.

There is a negative and significant relationship between Management efficiency (total net operating expense to total net operating income) and change in bank size and inflation. That is, a growth in bank size will be followed by a decrease in Management efficiency (total net operating expense to total net operating income). Also, an increase in inflation will be followed by a decrease in Management efficiency (total net operating expense to total net operating income) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
QuickAssets_TotalLibs						
QuickAssets_TotalLibs L1.	.3430091	.3694345	0.93	0.353	-.3810692	1.067088
CoreCap_RWA L1.	-.9415595	.7908555	-1.19	0.234	-2.491608	.6084887
NPL_TotalLoan L1.	.1591009	.7218598	0.22	0.826	-1.255718	1.57392
ROAveAssets L1.	10.63985	3.915304	2.72	0.007	2.965992	18.3137
OpExp_NetOpInc L1.	.0691552	.0378165	1.83	0.067	-.0049638	.1432742
DBank_Size L1.	-54.2414	13.00356	-4.17	0.000	-79.72791	-28.75488
GDP_Growth	-214.6065	187.0641	-1.15	0.251	-581.2454	152.0323
Inflation	-153.6783	45.61751	-3.37	0.001	-243.087	-64.26966
RealInterestRates	84.65945	151.9147	0.56	0.577	-213.0878	382.4067
DFXRATE	.2170308	.2989237	0.73	0.468	-.3688489	.8029105

There is a positive and significant relationship between Liquidity (quick assets to total liabilities) and Earnings quality (Return on average assets). This implies that, an increase in Earnings quality (Return on average assets) will be followed by an increase in Liquidity (quick assets to total liabilities) and vice versa.

However, there is a negative significant relationship between Liquidity (quick assets to total liabilities) and change in bank size and inflation. This means that growth in bank size or an increase in inflation will be followed by a decrease in Liquidity (quick assets to total liabilities) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DBank_Size						
DBank_Size						
L1.	-.3718348	.168962	-2.20	0.028	-.7029941	-.0406754
CoreCap_RWA						
L1.	-.0148411	.0076926	-1.93	0.054	-.0299184	.0002362
NPL_TotalLoan						
L1.	.0023733	.0072524	0.33	0.743	-.0118411	.0165878
ROAveAssets						
L1.	.1016549	.039756	2.56	0.011	.0237346	.1795753
OpExp_NetOpInc						
L1.	.0004731	.000275	1.72	0.085	-.0000659	.0010121
QuickAssets_TotalLibs						
L1.	-.0038146	.0028457	-1.34	0.180	-.009392	.0017629
GDP_Growth	.6429234	1.856156	0.35	0.729	-2.995075	4.280922
Inflation	.3978382	.5563439	0.72	0.475	-.6925757	1.488252
RealInterestRates	-1.304925	1.28612	-1.01	0.310	-3.825674	1.215825
DFXRATE	-.0087528	.0029304	-2.99	0.003	-.0144963	-.0030094

From the results above, there is a positive and significant relationship between change in bank size and Earnings quality (Return on average assets) and a negative significant relation between change in bank size and change in exchange rate. This means that when Earnings quality (Return on average assets) increase, change in bank size will increase. But, when change in exchange rates increase, change in bank size will decrease.

4.3.3. Tier 2

```
Test of overidentifying restriction:
  Hansen's J chi2(36) = 19.627626 (p = 0.988)
```

Variables stationary at level	Variables stationary at first differencing
Core capital to risk weighted assets	Bank size
Quick assets to total liabilities	Return on average assets
GDP growth	Non-performing loans to total loans
Inflation	Exchange rate
Real interest rate	Total net operating expense to total net operating income

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
CoreCap_RWA						
CoreCap_RWA						
L1.	.2594161	.1709324	1.52	0.129	-.0756052	.5944375
DNPL						
L1.	-.0628264	.1330578	-0.47	0.637	-.3236149	.1979622
DROA						
L1.	.3697777	.2370824	1.56	0.119	-.0948953	.8344507
Dopexp_opinc						
L1.	-.0435375	.0397239	-1.10	0.273	-.1213949	.0343198
QuickAssets_TotalLibs						
L1.	.0450695	.0901551	0.50	0.617	-.1316313	.2217703
DBank_Size						
L1.	.896053	9.091311	0.10	0.921	-16.92259	18.7147
GDP_Growth	-72.55725	72.03677	-1.01	0.314	-213.7467	68.63223
Inflation	-9.145434	18.71906	-0.49	0.625	-45.83412	27.54325
RealInterestRates	53.47204	56.09853	0.95	0.340	-56.47906	163.4231
DFXRATE	-.1128137	.1254032	-0.90	0.368	-.3585994	.132972

The table above indicates there is no significant relationship between Capital adequacy (core capital to risk weighted assets) and the rest of the variables.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DNPL						
DNPL						
L1.	.0451365	.2673763	0.17	0.866	-.4789115	.5691845
CoreCap_RWA						
L1.	.162902	.3061928	0.53	0.595	-.4372248	.7630289
DROA						
L1.	-.530045	.3844894	-1.38	0.168	-1.28363	.2235404
Dopexp_opinc						
L1.	-.0165496	.0765513	-0.22	0.829	-.1665874	.1334881
QuickAssets_TotalLibs						
L1.	-.1353857	.1410476	-0.96	0.337	-.4118338	.1410625
DBank_Size						
L1.	2.300846	10.48379	0.22	0.826	-18.24701	22.84871
GDP_Growth	45.39253	80.02169	0.57	0.571	-111.4471	202.2322
Inflation	-21.79222	24.35852	-0.89	0.371	-69.53403	25.94959
RealInterestRates	36.23116	73.09896	0.50	0.620	-107.0402	179.5025
DFXRATE	.1606929	.1829716	0.88	0.380	-.1979248	.5193106

For Asset quality (non-performing loans to total loans), there exists no significant relationship between it and the rest of the variables.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DROA						
DROA						
L1.	.0486845	.214802	0.23	0.821	-.3723197	.4696887
CoreCap_RWA						
L1.	-.1820685	.2239685	-0.81	0.416	-.6210386	.2569016
DNPL						
L1.	.1790751	.1653983	1.08	0.279	-.1450996	.5032497
Dopexp_opinc						
L1.	.0383131	.0427159	0.90	0.370	-.0454086	.1220347
QuickAssets_TotalLibs						
L1.	.0317372	.0971145	0.33	0.744	-.1586038	.2220781
DBank_Size						
L1.	8.370526	7.881589	1.06	0.288	-7.077104	23.81816
GDP_Growth	88.58563	72.46257	1.22	0.222	-53.43841	230.6097
Inflation	9.917044	18.51858	0.54	0.592	-26.37871	46.2128
RealInterestRates	34.91595	44.97654	0.78	0.438	-53.23646	123.0684
DFXRATE	-.1564124	.1125819	-1.39	0.165	-.3770688	.064244

There exists no significant relationship between Earnings quality (Return on average assets) and the rest of the variables.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Dopexp_opinc						
Dopexp_opinc						
L1.	-.3723725	.1234509	-3.02	0.003	-.6143318	-.1304132
CoreCap_RWA						
L1.	.0972411	.5483383	0.18	0.859	-.9774823	1.171964
DNPL						
L1.	-.8853254	.308823	-2.87	0.004	-1.490607	-.2800433
DROA						
L1.	-2.156511	.7712225	-2.80	0.005	-3.668079	-.6449429
QuickAssets_TotalLibs						
L1.	.0859141	.258781	0.33	0.740	-.4212874	.5931156
DBank_Size						
L1.	-59.07886	23.12093	-2.56	0.011	-104.3951	-13.76266
GDP_Growth	-188.8766	211.8051	-0.89	0.373	-604.007	226.2537
Inflation	24.77653	52.49097	0.47	0.637	-78.10387	127.6569
RealInterestRates	69.1354	157.4227	0.44	0.661	-239.4073	377.6781
DFXRATE	.7395401	.3192497	2.32	0.021	.1138221	1.365258

For Management efficiency (total net operating expense to total net operating income), there is a positive significant relationship between Management efficiency (total net operating expense to total net operating income) and change in exchange rate. This means that when change in exchange rate increases, it will be followed by an increase in Management efficiency (total net operating expense to total net operating income) and vice versa.

However, for Management efficiency (total net operating expense to total net operating income), there exists a significant negative relationship between Management efficiency (total net operating expense to total net operating income) and Asset quality (non-performing loans to total loans), Earning quality (Return on average assets) and change in bank size. This means, increase in Asset quality (non-performing loans to total loans), increase in Earning quality (Return on average assets) or growth in bank size will be followed by a decrease in Management efficiency (total net operating expense to total net operating income) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
QuickAssets_TotalLibs						
QuickAssets_TotalLibs L1.	.1661671	.3589836	0.46	0.643	-.5374278	.869762
CoreCap_RWA L1.	-.0758517	.6125657	-0.12	0.901	-1.276458	1.124755
DNPL L1.	-.1320186	.4618468	-0.29	0.775	-1.037222	.7731846
DROA L1.	-.7613116	.9985096	-0.76	0.446	-2.718354	1.195731
Dopexp_opinc L1.	-.1431338	.1846034	-0.78	0.438	-.5049499	.2186822
DBank_Size L1.	-16.20503	26.58203	-0.61	0.542	-68.30485	35.89479
GDP_Growth	-267.6582	263.4309	-1.02	0.310	-783.9732	248.6568
Inflation	-18.14005	64.89969	-0.28	0.780	-145.3411	109.061
RealInterestRates	82.77597	182.691	0.45	0.650	-275.2918	440.8437
DFXRATE	.0880801	.4379607	0.20	0.841	-.7703071	.9464672

There is a no significant relationship between Liquidity (quick assets to total liabilities) and the rest of the variables.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DBank_Size						
DBank_Size						
L1.	.0817327	.1616204	0.51	0.613	-.2350375	.3985029
CoreCap_RWA						
L1.	-.0046681	.0041375	-1.13	0.259	-.0127775	.0034412
DNPL						
L1.	.0004269	.002643	0.16	0.872	-.0047532	.0056071
DROA						
L1.	-.0061747	.0048324	-1.28	0.201	-.015646	.0032966
Dopexp_opinc						
L1.	-.0013024	.0010319	-1.26	0.207	-.0033248	.00072
QuickAssets_TotalLibs						
L1.	-.003829	.0021412	-1.79	0.074	-.0080256	.0003675
GDP_Growth	3.158333	1.252984	2.52	0.012	.7025302	5.614136
Inflation	1.055589	.3384968	3.12	0.002	.3921474	1.719031
RealInterestRates	.0686021	1.234568	0.06	0.956	-2.351106	2.48831
DFXRATE	-.0093809	.0028393	-3.30	0.001	-.0149458	-.003816

From the results above, there is a positive and significant relationship between change in bank size and GDP growth and inflation. This implies that, when GDP growth increases or inflation increases, change in bank size will increase, and vice versa.

But there is a negative significant effect between change in bank size and change in exchange rate. This means, when change in exchange rate increases, change in bank size will decrease and vice versa.

4.3.4. Tier 3

```
Test of overidentifying restriction:
  Hansen's J chi2(36) = 24.144416 (p = 0.934)
```

Variables stationary at level	Variables stationary at first differencing
Return on average assets	Bank size
Quick assets to total liabilities	Core capital to risk weighted assets
GDP growth	Non-performing loans to total loans
Inflation	Exchange rate
Total net operating expense to total net operating income	
Real interest rate	

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Dcore						
Dcore L1.	-.0678618	.1163724	-0.58	0.560	-.2959475	.1602239
DNPL L1.	.2366324	.1744182	1.36	0.175	-.1052209	.5784857
ROAveAssets L1.	.0017105	.000423	4.04	0.000	.0008814	.0025396
OpExp_NetOpInc L1.	-.0884488	.038031	-2.33	0.020	-.1629882	-.0139093
QuickAssets_TotalLibs L1.	-.1976616	.099166	-1.99	0.046	-.3920233	-.0032999
DBank_Size L1.	-17.48309	7.188992	-2.43	0.015	-31.57325	-3.39292
GDP_Growth	37.28113	128.0554	0.29	0.771	-213.7028	288.2651
Inflation	6.241521	31.17894	0.20	0.841	-54.86808	67.35112
RealInterestRates	-38.43568	82.6821	-0.46	0.642	-200.4896	123.6183
DFXRATE	.2748326	.183868	1.49	0.135	-.0855421	.6352073

There is a positive and significant relationship between Capital adequacy (core capital to risk weighted assets) and Earning quality (Return on average assets). This means that an increase in Earning quality (Return on average assets) will be followed by an increase in Capital adequacy (core capital to risk weighted assets) and vice versa.

However, there is a negative and significant effect between Capital adequacy (core capital to risk weighted assets) and Management efficiency (total net operating expense to total net operating income), Liquidity (Quick assets to total liabilities) and change in bank size. This means that an increase in Management efficiency (total net operating expense to total net operating income), Liquidity (Quick assets to total liabilities) or growth in bank size will be followed by a decrease in Capital adequacy (core capital to risk weighted assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DNPL						
DNPL						
L1.	.0913798	.1654986	0.55	0.581	-.2329915	.4157512
Dcore						
L1.	-.0532234	.12313	-0.43	0.666	-.2945538	.1881069
ROAveAssets						
L1.	.0005632	.00053	1.06	0.288	-.0004755	.0016019
OpExp_NetOpInc						
L1.	.1898493	.0541235	3.51	0.000	.0837692	.2959295
QuickAssets_TotalLibs						
L1.	-.2121575	.1268416	-1.67	0.094	-.4607624	.0364474
DBank_Size						
L1.	-10.31951	5.552156	-1.86	0.063	-21.20153	.5625199
GDP_Growth	2.71962	132.4442	0.02	0.984	-256.8663	262.3055
Inflation	21.58341	39.54007	0.55	0.585	-55.91371	99.08053
RealInterestRates	-59.90737	78.11026	-0.77	0.443	-213.0007	93.18593
DFXRATE	.0459244	.2664597	0.17	0.863	-.476327	.5681759

For Asset quality (non-performing loans to total loans), there is a significant positive relationship between Asset quality (non-performing loans to total loans) and Management efficiency (total net operating expense to total net operating income). Implying that an increase in Management efficiency (total net operating expense to total net operating income) will result to an increase in Asset quality (non-performing loans to total loans).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROAveAssets						
ROAveAssets						
L1.	-.0045318	.0057642	-0.79	0.432	-.0158294	.0067659
Dcore						
L1.	-1.521547	1.304282	-1.17	0.243	-4.077894	1.034799
DNPL						
L1.	1.027342	1.22223	0.84	0.401	-1.368184	3.422868
OpExp_NetOpInc						
L1.	-.3901329	.2663309	-1.46	0.143	-.9121318	.131866
QuickAssets_TotalLibs						
L1.	-1.555247	.9293632	-1.67	0.094	-3.376766	.266271
DBank_Size						
L1.	-85.85752	40.41898	-2.12	0.034	-165.0773	-6.637774
GDP_Growth	-555.4105	900.6848	-0.62	0.537	-2320.72	1209.899
Inflation	-83.57645	204.2748	-0.41	0.682	-483.9478	316.7949
RealInterestRates	-704.6039	443.0803	-1.59	0.112	-1573.025	163.8174
DFXRATE	.4475018	1.114517	0.40	0.688	-1.736911	2.631915

There exists a statistically significant negative relationship between Earning quality (Return on average assets) and change in bank size. Meaning that a growth in bank size will be followed by a decrease in Earning quality (Return on average assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
OpExp_NetOpInc						
OpExp_NetOpInc						
L1.	-.1286292	.1639241	-0.78	0.433	-.4499145	.1926561
Dcore						
L1.	-.4291869	.525511	-0.82	0.414	-1.45917	.6007957
DNPL						
L1.	.1829899	.7314751	0.25	0.802	-1.250675	1.616655
ROAveAssets						
L1.	.0030185	.0021082	1.43	0.152	-.0011135	.0071504
QuickAssets_TotalLibs						
L1.	-.6683221	.4252471	-1.57	0.116	-1.501791	.165147
DBank_Size						
L1.	-87.56491	24.94475	-3.51	0.000	-136.4557	-38.67409
GDP_Growth	-128.1374	485.5603	-0.26	0.792	-1079.818	823.5432
Inflation	68.46613	111.0141	0.62	0.537	-149.1175	286.0498
RealInterestRates	.4842766	281.0068	0.00	0.999	-550.2789	551.2474
DFXRATE	1.01022	.7221692	1.40	0.162	-.4052057	2.425646

For Management efficiency (total net operating expense to total net operating income), there exists a significant negative relationship between Management efficiency (total net operating expense to total net operating income) and change in bank size. This implies that growth in bank size will be followed by a decrease in Management efficiency (total net operating expense to total net operating income) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
QuickAssets_TotalLibs						
QuickAssets_TotalLibs L1.	-.2432258	.2140563	-1.14	0.256	-.6627685	.1763168
Dcore L1.	-.1483972	.2910535	-0.51	0.610	-.7188517	.4220573
DNPL L1.	.3302212	.3612676	0.91	0.361	-.3778502	1.038293
ROAveAssets L1.	-.004186	.0010053	-4.16	0.000	-.0061563	-.0022156
OpExp_NetOpInc L1.	-.092477	.0906265	-1.02	0.308	-.2701018	.0851478
DBank_Size L1.	-29.56768	12.29979	-2.40	0.016	-53.67482	-5.460535
GDP_Growth	-313.3896	280.7812	-1.12	0.264	-863.7106	236.9315
Inflation	-91.09445	68.10896	-1.34	0.181	-224.5856	42.39667
RealInterestRates	-406.6815	186.7014	-2.18	0.029	-772.6094	-40.75349
DFXRATE	.1410884	.4680633	0.30	0.763	-.7762988	1.058476

From the results, there is a negative and significant relationship between Liquidity (Quick assets to total liabilities) and Earnings quality (Return on average assets), change in bank size and real interest rate. This implies that an increase in Earnings quality (Return on average assets), increase in real interest rate or growth in bank size will be followed by a decrease in Liquidity (Quick assets to total liabilities) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DBank_Size						
DBank_Size L1.	.0060482	.1166444	0.05	0.959	-.2225706	.2346671
Dcore L1.	-.0031418	.0024794	-1.27	0.205	-.0080015	.0017178
DNPL L1.	-.008238	.0038522	-2.14	0.032	-.0157883	-.0006878
ROAveAssets L1.	-.0000594	9.89e-06	-6.00	0.000	-.0000788	-.00004
OpExp_NetOpInc L1.	.0008209	.0006914	1.19	0.235	-.0005342	.0021759
QuickAssets_TotalLibs L1.	.0025099	.002138	1.17	0.240	-.0016805	.0067002
GDP_Growth	-3.814884	2.481937	-1.54	0.124	-8.679391	1.049623
Inflation	-1.302958	.5597457	-2.33	0.020	-2.400039	-.2058762
RealInterestRates	-2.867405	1.560039	-1.84	0.066	-5.925026	.1902147
DEXRATE	-.0051744	.0040757	-1.27	0.204	-.0131626	.0028138

From the results above, there is a negative and significant relationship between change in bank size and Asset quality (non-performing loans to total loans), Earnings quality (Return on average assets) and inflation. Meaning that when Asset quality (non-performing loans to total loans), Earnings quality (Return on average assets) or inflation increases, change in bank size decreases and vice versa.

4.3.5. Tier 4

```
Test of overidentifying restriction:
  Hansen's J chi2(36) = 25.618745 (p = 0.901)
```

Variables stationary at level	Variables stationary at first differencing
Core capital to risk weighted assets	Bank size
Quick assets to total liabilities	Non-performing loans to total loans
GDP growth	Return on average assets
Inflation	Total net operating expense to total net operating income
Real interest rate	Exchange rate

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
CoreCap_RWA						
CoreCap_RWA						
L1.	-.0734123	.1915363	-0.38	0.702	-.4488165	.301992
DNPL						
L1.	-.0889113	.1918914	-0.46	0.643	-.4650116	.287189
DROA						
L1.	.5371537	.3415218	1.57	0.116	-.1322167	1.206524
Dopexp_opinc						
L1.	-7.44e-07	4.78e-06	-0.16	0.876	-.0000101	8.63e-06
QuickAssets_TotalLibs						
L1.	.1082618	.0433031	2.50	0.012	.0233893	.1931343
DBank_Size						
L1.	-11.03511	10.67474	-1.03	0.301	-31.95722	9.887
GDP_Growth	-112.0028	180.2913	-0.62	0.534	-465.3672	241.3616
Inflation	12.60739	34.12203	0.37	0.712	-54.27055	79.48534
RealInterestRates	46.8085	179.9374	0.26	0.795	-305.8624	399.4794
DFXRATE	-.1366714	.3165156	-0.43	0.666	-.7570306	.4836879

The table above indicates there is significant positive relationship between Capital adequacy (core capital to risk weighted assets) and Liquidity (Quick assets to total liabilities). This means that an increase in liquidity (Quick assets to total liabilities), will be followed by an increase in Capital adequacy (core capital to risk weighted assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DNPL						
DNPL						
L1.	.3734526	.1687054	2.21	0.027	.0427962	.704109
CoreCap_RWA						
L1.	-.0025687	.0989198	-0.03	0.979	-.196448	.1913106
DROA						
L1.	.1854157	.2543188	0.73	0.466	-.3130399	.6838713
Dopexp_opinc						
L1.	-.0000139	3.04e-06	-4.57	0.000	-.0000198	-7.94e-06
QuickAssets_TotalLibs						
L1.	-.2429332	.0458399	-5.30	0.000	-.3327778	-.1530885
DBank_Size						
L1.	16.04821	8.020717	2.00	0.045	.3278921	31.76853
GDP_Growth	-343.5933	146.8787	-2.34	0.019	-631.4703	-55.71626
Inflation	-126.0986	38.90114	-3.24	0.001	-202.3434	-49.85371
RealInterestRates	-336.0759	131.3419	-2.56	0.011	-593.5013	-78.6505
DFXRATE	-.3217267	.3008128	-1.07	0.285	-.9113089	.2678555

From the results on the table above, there exist a significant positive relationship between Asset quality (non-performing loans to total loans) and change in bank size. Meaning that growth in bank size will be followed by an increase in Asset quality (non-performing loans to total loans) and vice versa.

Alternatively, there is a negative significant relationship between Asset quality (non-performing loans to total loans) and Management Efficiency (total net operating expense to total net operating income), Liquidity (Quick assets to total liabilities), GDP growth, inflation, real interest rate. Implying that, an increase in each of these variables will be followed by a decrease in Asset quality (non-performing loans to total loans) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DROA						
DROA						
L1.	-.5461567	.1121581	-4.87	0.000	-.7659825	-.3263308
CoreCap_RWA						
L1.	-.0645622	.038849	-1.66	0.097	-.1407047	.0115804
DNPL						
L1.	-.168822	.0456333	-3.70	0.000	-.2582616	-.0793824
Dopexp_opinc						
L1.	1.07e-06	1.07e-06	1.00	0.317	-1.02e-06	3.16e-06
QuickAssets_TotalLibs						
L1.	.020683	.0112853	1.83	0.067	-.0014358	.0428018
DBank_Size						
L1.	-2.253086	2.321489	-0.97	0.332	-6.80312	2.296948
GDP_Growth	136.596	43.41837	3.15	0.002	51.49761	221.6945
Inflation	36.30283	12.48675	2.91	0.004	11.82925	60.77641
RealInterestRates	53.63408	37.76151	1.42	0.156	-20.37713	127.6453
DFXRATE	-.0145089	.0918697	-0.16	0.875	-.1945702	.1655524

There is a positive and significant relationship between Earnings quality (Return on average assets) and GDP growth and inflation. This implies that an increase in GDP growth will be followed by an increase in Earnings quality (Return on average assets) and so is the same case with an increase in inflation.

However, there exists a significant negative relationship between Earnings quality (Return on average assets) and Asset quality (non-performing loans to total loans). Meaning an increase in asset quality (non-performing loans to total loans) will result to a decrease in Earnings quality (Return on average assets) and vice versa.

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Dopexp_opinc						
Dopexp_opinc						
L1.	-.28313	.0762911	-3.71	0.000	-.4326579	-.1336021
CoreCap_RWA						
L1.	-812.5181	1635.155	-0.50	0.619	-4017.364	2392.328
DNPL						
L1.	-3868.855	2431.295	-1.59	0.112	-8634.105	896.3954
DROA						
L1.	-2157.538	4284.488	-0.50	0.615	-10554.98	6239.904
QuickAssets_TotalLibs						
L1.	-2111.724	663.2214	-3.18	0.001	-3411.614	-811.8337
DBank_Size						
L1.	-156123.4	95503.11	-1.63	0.102	-343306.1	31059.24
GDP_Growth	6839901	2569780	2.66	0.008	1803225	1.19e+07
Inflation	1820150	630986.9	2.88	0.004	583438.9	3056862
RealInterestRates	3625091	2003362	1.81	0.070	-301425.5	7551608
DFXRATE	4145.711	5040.499	0.82	0.411	-5733.486	14024.91

For Management efficiency (total net operating expense to total net operating income), there exists a significant positive relationship with GDP growth and inflation. This means that an increase in GDP growth or an increase in inflation will be followed by an increase in Management efficiency (total net operating expense to total net operating income).

However, there is a negative and significant relationship with Liquidity (Quick assets to total liabilities). Meaning that an increase in Liquidity (Quick assets to total liabilities) will result to a decrease in Management efficiency (total net operating expense to total net operating income).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
QuickAssets_TotalLibs						
QuickAssets_TotalLibs L1.	.1850637	.1040888	1.78	0.075	-.0189466	.389074
CoreCap_RWA L1.	-.1653812	.2346158	-0.70	0.481	-.6252197	.2944572
DNPL L1.	-.1601716	.4089438	-0.39	0.695	-.9616868	.6413435
DROA L1.	-.759407	.8272226	-0.92	0.359	-2.380734	.8619196
Dopexp_opinc L1.	.0000162	9.54e-06	1.70	0.090	-2.52e-06	.0000349
DBank_Size L1.	23.77344	16.02153	1.48	0.138	-7.628177	55.17507
GDP_Growth	57.79219	331.9631	0.17	0.862	-592.8436	708.4279
Inflation	44.35521	85.0665	0.52	0.602	-122.3721	211.0825
RealInterestRates	-101.4732	298.8657	-0.34	0.734	-687.2392	484.2927
DFXRATE	-.2235201	.5330366	-0.42	0.675	-1.268253	.8212126

From the results, there is no variable that has a significant relationship to Liquidity (Quick assets to total liabilities).

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
DBank_Size						
DBank_Size						
L1.	.0448028	.3028418	0.15	0.882	-.5487562	.6383618
CoreCap_RWA						
L1.	.0052589	.0051722	1.02	0.309	-.0048784	.0153961
DNPL						
L1.	.0096324	.0077751	1.24	0.215	-.0056065	.0248712
DROA						
L1.	.0071099	.010928	0.65	0.515	-.0143085	.0285283
Dopexp_opinc						
L1.	-1.55e-07	1.49e-07	-1.04	0.297	-4.47e-07	1.36e-07
QuickAssets_TotalLibs						
L1.	.0065022	.0019524	3.33	0.001	.0026755	.0103289
GDP_Growth	-13.6013	7.361913	-1.85	0.065	-28.03039	.8277854
Inflation	-3.834021	1.895248	-2.02	0.043	-7.548638	-.1194035
RealInterestRates	-8.130918	5.980246	-1.36	0.174	-19.85199	3.590148
DFXRATE	-.0193675	.0140696	-1.38	0.169	-.0469435	.0082084

From the results, there is a significant positive relationship between change in bank size and Liquidity (Quick assets to total liabilities) implying that when Liquidity (Quick assets to total liabilities) increases, change in bank size will increase and vice versa.

However, there is a negative significant relationship between change in bank size and inflation, meaning that, when inflation increases, change in bank size will decrease and vice versa.

CHAPTER 5: CONCLUSION

By employing the bank specific variables of the CAMEL rating system, this study set to investigate the interrelatedness of the indicators on the overall banking sector in Kenya and on each bank tier. This was achieved by employing panel VAR technique where the bank specific variables represented the endogenous variables and the macroeconomic variables; GDP growth, inflation, real interest rate and exchange rate represented the exogenous variables.

From the analysis on the overall sector, capital adequacy interrelates with management efficiency, liquidity, GDP growth and inflation. Asset quality has some relationship with management efficiency and bank size. Moreover, management efficiency interrelates with GDP growth, earnings quality, interest rate, exchange rate and bank size. Earning quality has some interrelation with capital adequacy, bank size, management efficiency liquidity and real interest rates. Lastly, liquidity has some significant relationship with capital adequacy, bank size, GDP growth rate, inflation, and interest rates.

For the tiers, the results indicate that in tier one, capital adequacy has some relationship with GDP growth, inflation, and bank size. Secondly, asset quality is interrelated with bank size. Management efficiency has some relationship with exchange rate, bank size and inflation, while liquidity interrelates with bank size and inflation.

In tier two, management efficiency interrelates with asset quality, earnings quality, bank size and exchange rate.

For tier three, capital adequacy interrelates with earnings quality, management efficiency, liquidity, and bank size. Whereas asset quality has significant relationship with management efficiency. Both Earnings quality and management efficiency have significant relationship with bank size, while liquidity is interrelated with earnings quality, bank size and real interest rates.

Lastly, in tier four, capital adequacy has significant relationship with liquidity. Asset quality is interrelated with management efficiency, liquidity, GDP growth, real interest rate and bank size. Moreover, management efficiency has significant relationship with liquidity, GDP growth and inflation, while liquidity is interrelated with asset quality, GDP growth and Inflation.

In conclusion, one recommendation from this study is that it did not account for sensitivity of markets which is a recent addition to the CAMEL framework. Therefore, it would be prudent for future studies to take that into account and see whether there is any interrelatedness among all the variables.

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