The Effects of Bank Specific and Macroeconomic Factors on Nonperforming Loans in Commercial Banks in Kenya: A Comparative Panel Data Analysis

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Abstract

The main goal of every banking institution is to operate profitably in order to maintain stability and sustainable growth. However, the existence of high levels of non-performing loans (NPLs) in the banking industry negatively affects the level of private investment, impair a bank's ability to settle its liabilities when they fall due and constrain the scope of bank credit to borrowers. External and internal economic environments are viewed as critical drivers for nonperforming loans. In this regard, the main goal of this study was to investigate the link between NPLs and bank-specific and macroeconomic factors, and establish the extent to which these factors affect the occurrence of nonperforming loans in commercial banks in Kenya. The dependent variable under investigation was nonperforming loans while independent variables included macroeconomic and bank specific factors. The macroeconomic factors included; real GDP, GDP per capita, lending interest rates, inflation, government expenditure, export and imports, exchange rate between the Kenya shilling and US dollar and asset value as measured by the Nairobi Securities Exchange (NSE) 20 share Index. Bank specific factors included; credit risk management techniques, bank structures, and quality management factors. The period covered under this study was 1995 to 2009.

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Secondary and primary data was used. A census of 44 commercial banks in kenya was taken.   A causal- compararive research design based on bank structures was adopted. The study used panel econometrics approach employing both pooled (unbalanced) panel and fixed effect panel models. The study found evidence that per capita income was negative and significantly related to NPL levels across bank size categories (large, t-value -6.13, medium, t-value -4.81, small, t-value -4.16). Similarly per capita income was negative and significantly related to NPL levels across bank ownership categories (Foreign; t-value -4.45,   local; t-value -6.53, government; t-value -6.41). Further, return on assets (ROA) was negative and significantly related to NPLs levels in large banks (t- value -8.10) and small banks (t- value -4.73) but insignificant in medium banks. In addition the study found that return on asset (ROA) was negative and significant in local banks (t-value-8.41) and government banks (t-value -3.99) but not in foreign banks. However the study found no evidence that banks asset size was related to NPLs levels across all bank categories in Kenya. In conclusion, the study found evidence that bank specific factors contribute to NPLs performance at higher magnitude (β= 8.361) compared with macroeconomic factors (β= 0.561). These results support Fofack, 2005; Flamini, 2009; Khemraj, 2009; Dinos & Ashta, 2010 findings. The study recommends that commercial banks portfolio management strategies focus more on the bank specific factors which the management has more control over and seek practical and achievable solutions to redress NPLs problems.

1 Introduction

The core business of any bank is to receive deposits from customers and on lend these funds to borrowing customers. To ensure sustainability and profitability, banks procure cheaper loanable funds from customers deposits, and lend these funds to borrowing customers at a relatively higher rate of interest (lending rates) than that paid to the depositors (deposit interest rates). One of the difficulties in lending is to precisely predict whether a loan will be paid in full. This implies that lending involves credit risk especially default risk. Therefore banks use diverse internal techniques such as client screening to minimize loan default rates and consequently minimize levels of nonperforming loans. A loan is nonperforming when payments of interest and principal are past due for over 90 days or more and are other good reasons to doubt that payments will be made in full (CBK, 2008, IMF, 2009). In other words, it is a delinquent loan whose recovery is highly doubtful because loans are not being serviced as required. For this study, NPLs and delinquent loans terms are used interchangeably.

Basel II (2004) requires banks to show categories for nonperforming loans according to days at risk and provisions used in analyzing NPL levels. The loan risk classifications include; Normal: solvent loans with zero to less than 30 days at risk and given 1 percent provision. Watch: loans with principal or interest due and unpaid for 30137 to 90 days and allocated 3 percent provision. Substandard: loans, past due for more than 90 days but less than 180 days given 20 percent provision. Doubtful: loans past due for more than 180 days and allocated 100 percent provision. Loss: loans considered uncollectible and past due for 360 and above days and given 100 percent provision. The risk classification using days at risk is used to calculate nonperforming loan levels.

2 Preliminary Notes

This study is motivated by the chronic existence of nonperforming loan in banking Kenyan banking industry. In addition the motivation is further enhanced by   four major events affecting   kenya financial sector which includes; liberalisation of interest rates in Kenya in July 1991, banking crises of 1985-1986 and 1990-1998 and global financial crises of 2007-2008 (Ngugi & Ndungu, 2000; Ngugi, 2001, Mwega, 2009). Liberalization of interest rates in kenya was effected in July 1991 to harmonized interest rates across financial institutions (Ngugi, 2000). Before then, the economy operated under controlled interest rates regime (Ngugi & Ndungu, 2000) Liberalisation therefore allowed banks greater flexibility in varying rates according to loan maturities. When there is no ceilings on lending rates, it is easier for banks to charge a higher risk premium and therefore give loans to more risky projects. This increases the rate of bank insolvency as nonperforming assets increase (Ngugi, 2001). As a result, banks in the attempt to defend their profit margins charge high interest rates on performing loans.This leads to high borrowing cost for borrowers which may increase NPL levels.

Researchers often associate the occurrence of banking crises with a massive accumulation of nonperforming loans which can account for a sizable share of total assets of insolvent banks and financial institutions, especially during episodes of systemic crises (Fofack, 2005; Kane & Rice,2001; Inaba, 2005). For instance, in Indonesia, over 60 banks collapsed during the 1997 East Asian Financial and Banking crisis where non-performing loans represented about 75 percent at total banks' loan portfolios (Caprio & Klingebiel, 2002). The banking crisis which affected a large number of Sub-Saharan African countries in the 1990s was accompanied by a rapid accumulation of non-performing loans (Miller, 1995, Fofack, 2005, Waweru & Kalani, 2009). The 1985-1986 and 1990-1998 banking crisis culminated in major bank failures (37 failed banks as at 1998) in Kenya (CBK, 2000). The bank failures were attributed to high nonperforming loans, poor lending practices, conflicts of interest between shareholders and banks top

management, slow recovery of NPLs, loans to non-viable projects, insider lending to directors, and undercapitalization (Kamau, 2008; CBK, 1997, 2000, 2003).

Instabilities in global financial systems led to an increase in loan default across many countries globally. Kenyan banks consistently reported increased loan default levels since 1995 (IMF, 2009). The losses in 2007 to 2009 may be associated with the global financial crisis of 2007-2010. The required capital adequacy ratio (CAR), which is a measure of a bank's risk weighted credit exposure in banking industry globally is 8 percent (Base11, 2004) while in Kenya the minimum CAR is 12 percent (CBK, 2007). During the crisis, Kenyan commercial banks holding 13 percent of the total industry depositors were operating in a high risk territory close to minimum CAR of 12 percent (IMF, 2009) which was a major risk if the default situation worsened. According to Institutional investor (2009), Russian banking sector reported that corporate and retail nonperforming loans (NPLs) were on the increase with some banks recording NPLs at over 10 percent of the balance sheet in 2009. In Sweden, Swedbank NPLs have risen from 0.47 percent in 2007 to 5.88 percent 2009. In Hungary, Romania and Ukraine, NPLs have soared forcing the European Bank for Reconstruction and Development (EBRD) to bailout the banks.

Oloo (2001) traced the genesis of NPLs in Kenya to the external environment in which the Kenyan banks operate. He argues that when the government was faced by the clamour for, multiparty, it held an election in 1992 for which it was ill prepared. Out of desperation, the CBK was compelled to imprudently print money to fund the elections. The result was a rapid increase in interest rates as the government thereafter sought to mop up excess liquidity. The domestic debt rose from Kshs. 45 billion in 1992 to Kshs 166 billion, in 1993. Oloo further comments that the interest rates on treasury bills rose from 23 percent in early 1992 to 76 percent in 1993.

The success of individual banks in credit risk management is largely reflected in the proportion of NPL's loans to gross lending (Flamini, 2009). In Kenya, the ratio of NPLs to Total Gross Loans which is proxy for asset quality improved from 7.1 percent in 2005 to 5 percent in 2006. Though it declined to 28.3 percent in August 2003 from 28.9 percent in August 2002, the absolute level of non-performing loans increased to Ksh. 73.3 billion from 72.9 billion over the same period (CBK, 2003). The incidence of nonperforming loans (NPLs) in Kenya varies between different commercial banks (Oloo, 2007) and also changes over time depending on economic environments (CBK, 2007). For instance NPLs in Kenya stood at Kshs. 107.4 billion at the end of 2001. This represented 38 percent of total loan of Kshs. 281.7 billion in the banking sector (Oloo, 2003). Understanding the causes of NPLs can assist the government of Kenya, banks policy designers and all stakeholders to come up with effective control measures to reduce high levels of NPLs.

Unresolved problem of non-performing loans can compound into financial crisis the moment these loans exceed bank capital in a relatively large number of

banks. The Kenya government recognizes the chronic burden of NPLs in the banking industry (CBK, 2003). For instance, in the budget speech of June 2003, the Minister of Finance indicated that, the government was exploring possibilities of setting up a non-performing loan agency with judicial powers to deal with the issue of bad debts (Oloo 2003). In the year 2007, government introduced the "in-duplum rule" which provides that NPLs be stopped from accruing further interest, as soon as the interest already levied equals the principal borrowed (Oloo, 2007). This bill was meant to check further escalation of NPLs. Further, the enactment of the Finance Act 2006 by parliament, made sharing information on non-performing loans compulsory, in an effort to reduce the incidence of non-performance of loans (CBK, 2007). In the year 2010, the government put in place credit bureau referencing agency in a further effort to minimize NPLs in Kenyan banking industry.

During the global financial crisis of 2007 and 2009, just like in the case of other financial crises, it became abundantly clear that macro-economic conditions manifested through economic cycles, could have a significant impact on the banking industry's incidence of non-performing loans. This is because business cycles affect cash flows of various economic units and consequently credit portfolio performance (Yiping, 2008). Effects of business cycle on incidence of non-performing loans came to the fore during the global economic recession. During boom, interest rates tend to be lower as savings tend to be higher and this tends to bring down cost of funds. This could lead to excessive borrowing pushing leverage to unsustainable levels. When the bust period sets in and businesses are not making as much sales as they had hoped for and risk of default starts to go up, lenders raise interest rates to take into account the increased lending risk compounding the borrower's problems. This behavior of banks and investors during boom and bust periods leads to exacerbating the business cycle as their behavior is pro-cyclical (Keeler, 2001, Eichengreen & Mitchener, 2003)

A firm's profitability changes with the business cycles. Apart from the management problems and other firm specific issues that would cause a loss in its profitability, changes in market and economic conditions (such as changes in interest rates, stock market, exchanges rate, unemployment rates, and industry specific shocks and so on) may affect the overall profitability of the firm. Ross's (1976) Arbitrage Pricing Theory (APT) reflected this idea by defining a firm's change in value (or return) as a function of changes in the underlying macroeconomic variables (the systemic component) and the firm specific idiosyncratic shocks. In general, in an expansion, demand is high and business is strong: firms have higher probability to profit and therefore fewer defaults will happen. Therefore the bank's portfolio performance, which is associated with its risk profile, is directly tied to the business cycle and the whole state of macro economy.

Relative causes of NPLs occurrence cited by some researchers includes; legal forms of business and depressed economy (Firdmuc, 2007, Waweru & Kalani, 2009), moral hazard and interest rates (Fofack, 2005), loan asymmetric

information (Wet, 2006), poor credit risk assessment and management, and delays through the judicial systems (CBK, 2000). However, most of these arguments have not been statistically proven particularly in the Kenyan context. As a backdrop to the preceding discourse, this research empirically investigates the extent to which variations in macroeconomic and bank specific risk factors contribute to the occurrence of NPLs, then further examines this extent quantitatively by using the data of post banking crises period (1995-2009) in commercial banks in Kenya.

Non-performing loans have a negative impact on borrowers, the bank and the economy. In the banking industry, lending money is perhaps the most important of all banking activities, for the interest charged on loans is how the banks earn cash flows. A bank lends a certain percentage of the customer deposits at a higher interest rate than it pays on such deposit. Principal repayments and interest rates are agreed at the time of the loan application. Banks' loans department staff are expected to work out the loan best suited to the applicant needs to ensure the beneficiary can afford to pay the loan applied for (CBK 2007). Failure of borrowers to repay their loans on time or at all constrains commercial banks ability to lend to other borrowers. With increasing default rates, most commercial banks' loan programs fail to achieve their objectives and lead to huge monetary losses. In this regard, failure to receive loan repayments on time, results to banks experiencing cash flow problems. Delinquent loans have the potential of creating financial instability which may contribute to failure of projects thus affecting a country's economy adversely.

It is the responsibility of commercial banks to assess and vet effectively credit worthiness of loan applicants and the effectiveness of bank lending policies to minimize loan default risk. In this regard, it is imperative that an efficient financial safety-net in debt recovery mechanism by commercial banks be put in place to reduce NPLs or assess the probability of NPL occurrence at the loan application stage.

2.1 Bank Size Category NPLs Trends

Figure 1 presents NPLs trends for bank size category in kenyan banking industry from 1995 to 2009.

From Figure 1, trend lines for NPL performance in size of banks indicate that, small banks had highest NPLs trend (except between 1997 and 1999) followed by medium size banks while large banks had the lowest levels of NPLs over the years as shown in Figure 1. The period between 1999 and 2001 depict highest NPLs level in all banks sizes. Year 2000 seem to be an outlier in all bank sizes. However, after 2001, the average value for NPL for all banks showed downward trends except in 2005 where a sharp surge in large banks is noted.
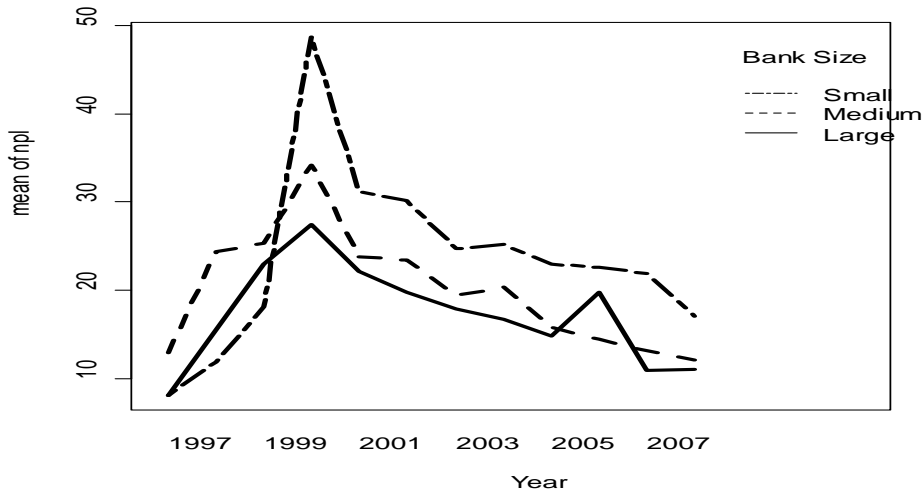
Figure 1: NPLs by bank size category

The periods with highest and sharp increase of NPLs may be attributed to political upheaval due to anticipated national elections. For instance, NPL performance in the period between 1999 and 2001can be seen as readyness for year 2002 elections while another surge between 2005 and 2006 could be for 2007 national elections. There could be a possibility that politicians and investors marshal money from small banks with a promise of better tenders for the small banks if they succeed in acquiring their political positions after elections. Hence highest NPL performamnce trends in small banks.It is worth noting that the greater percentage of large banks composes government owned banks. This may indicate that political upheavals influence NPLs occurrence. The implication may be that national elections provide shocks to NPL performance. The country seem to experience NPL surge when approaching elections. End of one government regime to a new one appear to enhance lenders and borrowers speculations on loans management differently. This can be deduced from the highest NPL trends between 1999 to 2001 when KANU regime anticipated change of the country governance during 2002 national elections , while NARC regime appear to have had significant control of NPL performance between 2005 and 2006 in preparation to 2007 national election. Only government banks appear to have been significantly adversely affected while foreign and local banks NPLs performance were relatively stable.

2.2 Banks Ownership Category NPLs Trends

Figure 2 presents NPLs trends for bank Ownership category in kenyan banking industry from 1995 to 2009.
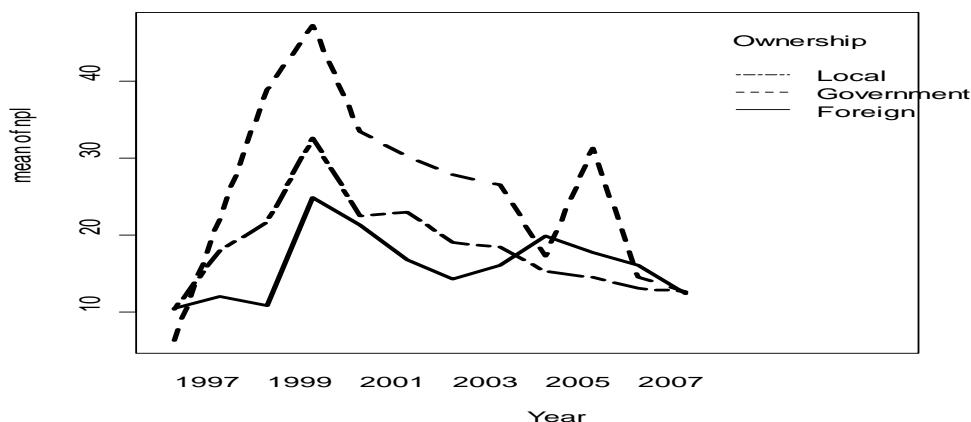

Figure 2: NPLs by bank ownership category

From Figure 2, trend lines for NPL performance in bank ownership categories depicts that government banks had the highest NPLs trend, followed by locally owned banks, while foreign owned banks depicted lowest levels of NPLs over the years. The period between 1999 and 2001 depict highest NPLs level in all banks ownership categories followed by downwards trend to 2005. Government banks showed a sharp increase for NPLs   between 2005 and 2007compared with their foreign banks counterparts, while local banks maintained stedy downwards trend. This scenario is similar to observations made in bank sizes analysis as depicted in Figure 2. This may be a confirmation that political upheavals influence NPLs occurrence.

2.3 Methodology

2.3. 1 Theories underpinning non performing loans

The theories of credit risk highly associate occurrence of nonperforming loans with external and internal factors. Three theories underpinnings have provided insight into how these factors influence nonperforming loans levels. The first is deflation theory (Fisher,1933), which suggests that when the debt bubble bursts the following sequence of events occurs; debt liquidation leading to distress selling and contraction of deposit currency, as bank loans are paid off. This

contraction of deposits cause a fall in the level of prices, which leads to greater fall in the net worth of business, hence precipitating bankruptcies which leads the concerns running at a loss to make a reduction in output, in trade and in employment of labor. These cycles cause complicated disturbances in the rates of interest and a fall in the money value. The complicated disturbances described above can be summed as both external and internal forces (macro and micro factors) influencing state of over-indebtedness existing between, debtors or creditors or both which can compound to loan defaults.

The second theory, "Financial theory" pioneered by Minsky (1974), also known as financial instability hypothesis, and attempted to provide an understanding and explanation of the characteristics of financial crisis. The theory suggests that, in prosperous times, when corporate cash flow rises beyond what is needed to pay off debt, a speculative euphoria develops, and soon thereafter debts exceed what borrowers can pay off from their incoming revenues, which in turn produces a financial crisis. As a result of such speculative borrowing bubbles, banks and lenders tighten credit availability, even to companies that can afford loans and the economy subsequently contracts. The theory identifies three types of borrowers that contribute to the accumulation of insolvent debt: The "hedge borrower" can make debt payments (covering interest and principal) from current cash flows from investments. For the "speculative borrower", the cash flow from investments can service the debt, i.e., cover the interest due, but the borrower must regularly roll over, or re-borrow, the principal. The "Ponzi borrower" borrows based on the belief that the appreciation of the value of the asset will be sufficient to refinance the debt but cannot make sufficient payments on interest or principal with the cash flow from investments; only the appreciating asset value can keep the Ponzi borrower afloat. Financial theory underpin this study in that, a hedge borrower would have a normal loan and is paying back both the principal and interest; the speculative borrower would have a watch loan; meaning loans' principal or interest is due and unpaid for 30 to 90 or have been refinanced, or rolled-over into a new loan; and the Ponzi borrower would have a substandard loan, meaning the payments do not cover the interest amount and the principal is actually increasing. The primary sources of repayment are not sufficient to service the loan. The loan is past due for more than 90 days but less than 180 days. Watch loans and substandard loans are nonperforming loans, hence applicability of financial theory in this study.

The third theory, Ownership structure theory pioneered by Jensen (1976) integrated the elements of theory of property rights (Ronald, 1937), the theory of agency (Ross,1973) and Mitnick, 1974) and the theory of finance (Minsky, 1974). The theory explains why highly regulated industries such as public utilities or banks have higher debt-equity ratios for equivalent levels of risk than the average non-regulated firm. Jensen (1976) argues that, "ownership structure" rather than "capital structure" is the crucial variables to be determined, not just the relative amounts of debt and equity but also the fraction of the equity held by the manager. Relating to this study, the Kenya banking industry is composed of

various categories of banks based on different ownership structure with different percentage in shareholdings. Ownership structure theory is appropriate for this study in that NPLs levels are investigated on basis of bank ownership structure dependence.

2.3.2 The model

To determine the magnitude of macroeconomic and bank specific variables on nonperforming loans the following model was formulated:

$$Y_{it} = \beta_i + \beta_1 BS_{it} + \beta_2 Macro_{it} + \varepsilon_{it}$$

where Y_{it} is composite index of NPLs; BS is vector of bank specific variables; Macro is vector of macroeconomic variables; while β_i is unobserved macro and bank specific time; invariant effect which allows for heterogeneity in the means of the Y_{it} series across banks and ε_t is the error term.

2.3.3 Study variable measurements

A loan is nonperforming when payments of interest and principal are past due for over 90 days (CBK, 2008, IMF, 2009). The balance outstanding as at the time when the account is identified as nonperforming is used in calculating the aggregate amount of nonperforming loan (IMF,2004). NPL level measurement (IMF, 2004; banking Act, 2008) formula is as under:

NPL = <u>Outstanding principal balance of loans past due more than (90) days</u>
                    Outstanding principal balance of all loans

2.3.4 Macroeconomic measurements

It is important to understand macroeconomic factors in an economy to aid effective monitoring and review of credit risk. The performance of an economy is evaluated by measuring the magnitude of its growth and the quality of its growth. The nature and magnitude of performance of an economy is assessed through the analysis of variables such as selected for this study and described in Table 1.

Table 1: Summary of the macroeconomic and bank specific variables

Variable	Description	Measurement	Research support
Real gross domestic product(GDP)	Measure of the size of an economy adjusted for price changes and inflation. It measures in constant prices the output of final goods and services and incomes within an economy	Calculated as prices in the "base year" multiply by quantities in the current year. Base year 1976=100	Hippolyte Fofack(2005) Koopman & Lucas (2005) Yiping Qu (2008) Waweru & Kalani (2009)
The GDP per capita	GDP adjusted for population to measure average productivity per person	Real GDP divided by the size of the population	Wilson (1997, 1998)
Lending interest rate	The cost of capital in an economy/reward for investments.	Measures the price at which borrowers of funds are willing to pay to the owners of capital while at the same time measures the price at which lenders are willing to lend their money to enterprise in exchange for consumption.	Carey (1998) Cipollini & Massaglia (2007) Sorensen & Zicchino (2005), Rose Ngugi(2000, 2001, 2003)
Interest rate spread	The interest rate spread is the difference between the rates banks attach to the lending and the interest they fix to deposits	Lending interest rate minus Deposit interests	
Real interest rate	Difference between lending interest rates and inflation	lending interest rates minus inflation	
Inflation	A general increase in prices of commodities. Measure by how much the value of the currency has been impaired.	Measured using a price index, based on a representative basket of goods and services.	Michael F. Bryan (1997) Joseph T. Salerno (1987)

Source: Literature review

2.3.5 Bank categories and quality management variables

For this study banks are classified (Banking Act, 2008) by size and ownership. Size classification (large, medium, small) was based on asset size of the banks while ownership was classified as foreign, local, and government banks. The NPL category ratio was the base used in this study to measure whether performance of NPLs was dependent on ownership and size of banks. Conversely, quality management to a large extent is reflected by bank performance rating (BPR) indicators. BPR is a simple yet credible measure of how stable a bank is. High NPLs levels affect bank performance. This study adopted 3 internationally (IMF, 2004) accepted rating indicators which includes; ROA, ROCE and NPL to total loans advanced to assess individual banks efficiency in management of NPLs. Description for the variables are indicated in Table 2.

Table 2: Summary of the bank categories and quality manangement variables

Variable	Description	Measurement	Research support
Bank Ownership (categorised by CBK)	As classified by CBK		Flamini (2009) Abdelkader et al (2009) Michael C. Jensen(1976), Altman (2000)
Foreign owned	Foreign owned not locally incorporated, foreign owned but locally incorporated institutions (Partly owned by locals) and Foreign owned but locally incorporated institutions.	The measure is any bank with above 50% holding.	
Banks with Government participation	Banks government had significant shareholding.	CBK categories	
Locally owned	Fully locally owned.	CBK categories	
Bank sizes	As classified by CBK	Bank Size=asset size	
Large banks	As classified by CBK	Based on assets size: with assets above Ksh. 15 billion	

Variable	Description	Measurement	Research support
Medium	As classified by CBK	Assets valued at between Ksh. 5 billion and Ksh. 15 billion	
small banks	As classified by CBK	Assets valued at less than Ksh. 5 billion	
Return on asset	Measure of how well the bank's assets are utilized in realizing profits. That means ROA measures how well a company's management team is doing its job.	The ratio of Profit before Tax (PBT) to total assets	Abdelkader et al (2009) Chang et al (2009) Jayadev (2006)
Return on capital employed	A measure of success of a business in realizing satisfactory return on capital invested The ratio gauges the management efficiency in utilizing both creditors and owner's money.	Measured by net profit before interest and tax to total capital employed	
NPLs to total loan advances	A performance indicator	Weighed against the total portfolio of all loans and advances that the bank has extended	

Source: Literature review

3 Main Results

3. 1 Macro and NPLs variables across bank sizes model

To establish effects of macroeconomic variables on banks NPLs performance, full regression models (pooled and fixed effect) for all banks was run and results shown in Table 3 columns 1 and 4. To check for robustness of the results, pooled and fixed effects panel analysis was run to test effects of macroeconomic variables on NPLs levels across the bank sizes and results shown on Table 3. F-test was run to test the fixed effect model stability and results shown in the same table.

From Table 3 base model column 2 results reveal that only per capita (X1) variable was negative and significantly (t-values 3.5) related to NPL performance

among other macroeconomic variable under study. In addition per capita variable was negative and significantly related to NPL levels across bank size categories, (large, t-value -6.1; medium, t-value 4.8; small, t-value -4.1) under pooled model analysis. Similary   fixed effect model results depicts negative and significant relationship between per capita and NPLs performance across banks (large, t-value -7.0; medium t-value, -7.1) and small t-value, -4.3). These results imply that any negative development in per capita income negatively affects NPLs performance in commercial banks in kenya. This suggests that an increase in per capita empowers borrowers' cash flow hence ability to meet their loan liabilities.

Further Table 3 results depicts that real GDP (X2) was negative and significantly related to NPLs performance across bank size category (large, t-value -3.3; medium, t-value -2.1;   small, t-value -5.0) under pooled model analysis. Similary fixed effect model results depicts negative and significant relationship between per capita and NPLs performance across banks (large, t-value -3.8; medium t-value, -2.2) and small t-value, -5.5). The results suggest that a negative development of real GDP increases NPLs performance levels in commercial banks in Kenya.

From Table 3 lending interest rate was found positive and significantly related to NPLs levels in large banks (t-value 5.8), medium banks (t-value 4.4); and large banks (t-value 7.9), medium banks t-value 7.5) in both pooled and fixed effects models respectively. However in both models lending rates was not significantly related to NPL levels in small banks across bank sizes category. This suggests that NPLs levels in small banks are not responsive to changes in lending interest rates.

Further, real interest rates was found positive and significantly related to NPLs performance across bank size categories in both models (pooled: small, t-value 2.9; medium, t-value 2.7;   large, t-value 3.8 ; fixed effect: small, t-value 3.0; medium, t-value 3.6; large, t-value 3.0). The results suggest that an increase in real interest rates negatively affects NPLs levels across bank sizes in commercial banks in Kenya.

Finally,Table 3 shows inflation was found negatively related to NPLs levels in lagre banks (t-value 2.8) under fixed effect model but not under pooled model. However the study found no evidence that there exists significant realtion between inflation and NPLs performance in small and medium banks in both pooled and fixed effect models. This implies that NPLs performance in small and medium banks are not responsive to changes in inflation. Further majority of large banks in Kenya comprise government banks which appear to be responsive to inflation. This suggests that large banks are more susceptible to manipulation as the regulator take action to put measures in place to manage inflation in the economy.

The F-test results shown in Table 3 confirm the fixed effect model stability and reliability (large banks, F-test, 0.000; Medium banks, F-test, 0.000; Small banks, F-test, 0.000) hence validating robustness of the study findings.

Table 3: Macro and NPLs variables across bank sizes model

Explanatory Variables (macro)	Base (Full) model	Pooled model			Base (Full) model FE	Fixed effects model(FE)		
		Large	Medium	Small		Large	Medium	Small
X1 (per capita)	-0.042 (3.501)***	-0.042 (-6.133)***	-0.035 (-4.810)***	-0.041 (-4.166)***	-0.033 (-3.27)***	-0.042 (-7.094)***	0.039 (-7.152)***	-0.039 (-4.380)***
X2 (Real gdp)	0.661 (-0.985)	-1.810 (-3.388)***	-1.308 (-2.182)*	-3.620 (-5.072)***	-0.338 (-0.605)	-1.829 (-3.82)***	-1.175 (-2.227)**	-3.608 (-5.565)***
X3 (Lending lnterest)	-0.350 (-0.663)	0.834 (5.849)***	0.663 (4.464)***	0.342 (1.683)	-0.248 (-0.564)	0.896 (7.94)***	0.800 (7.528)***	0.337 (1.778)
X4 (real interest)	-0.140 (-0.732)	0.555 (3.247)***	0.505 (2.972)***	0.287 (1.223)	-0.002 (-0.018)	0.620 (4.268)***	0.674 (5.107)***	0.353 (1.629)
X5 (Interest spread)	1.020 (0.949)	1.773 (3.851)***	1.297 (2.710)***	1.836 (2.924)***	0.945 (1.051)	1.978 (5.164)***	1.497 (3.623)***	1.774 (3.045)***
X 6 Inflation	0.347 (0.910)	-0.505 (-1.783)	-0.315 (-1.073)	-0.522 (-1.312)	0.253 (0.798)	-0.684 (-2.832)***	-0.415 (-1.620)	-0.476 (-1.288)
R^2	0.177	0.135	0.143	0.134	0.421	0.353	0.427	0.431
F-test						0.0002	0.0000	0.0000

*** 1 percent level of significance;   ** 5 percent level of significance;
*   10 percent level of significance. T-values in brackets

Table 4: Macro and NPLs variables across bank ownership categories model

Explanatory Variables (macro)	Base (Full) model	Pooled model			Base (Full) model FE	Fixed effects model(FE)		
		Foreign	local	Government		Foreign	local	Government
X1 (per capita)	-0.042 (3.501)***	-0.030 (-4.459)***	-0.037 (-6.531)***	-0.073 (-6.415)***	-0.033 (-3.276)***	-0.032 (-5.540)***	-0.036 (-6.717)***	-0.072 (-6.930)***
X2 (Real gdp)	0.661 (-0.985)	-0.574 (-1.022)	-2.413 (-5.414)***	-5.030 (-5.649)***	-0.338 (-0.605)	-0.398 (-0.803)	-2.386 (-5.546)***	-4.883 (-5.574)***
X3 (Lending lnterest)	-0.350 (-0.663)	0.698 (5.222)***	0.521 (-4.533)***	1.570 (6.266)***	-0.248 (-0.564)	0.788 (7.647)***	0.512 (4.635)***	1.534 (6.351)***
X4 (real interest)	-0.140 (-0.732)	0.592 (3.728)***	0.397 (2.977)***	1.235 (3.808)***	-0.002 (-0.018)	0.699 (5.301)***	0.420 (3.333)***	1.274 (4.204)***
X5 (Interest spread)	1.020 (0.949)	1.167 (2.596)***	1.733 (4.787)***	5.035 (6.782)***	0.945 (1.051)	1.179 (2.994)***	1.678 (4.805)***	5.070 (7.121)***
X6 Inflation	0.347 (0.910)	-0.417 (-1.493)	-0.436 (-1.926)	-2.329 (-4.947)***	0.253 (0.798)	-0.446 (-1.822)	-0.405 (-1.855)	-2.270 (-4.868)***
R2	0.177	0.046	0.114	0.470	0.421	0.644	0.289	0.584
F-test						0.0000	0.0295	0.0006

*** 1 percent level of significance; ** 5 percent level of significance; * 10 percent level of significance. T-values in brackets.

Table 5: Baseline model: Dependent variable: nonperforming loan (NPL)

	Pooled model				Fixed effects model			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
X1 (Own)	8.158 (7.526)***	-	-		-	-	-	-
X2 (Asset Size)	-	-0.082 (-3.163)***	-		-	-0.035 (-1.122)	-	-
X3 (ROA)	-	-	-1.416 (-8.108)***		-	-	-0.828 (-4.599)***	-
X4 (ROCE)	-	-	-	-0.085 (-5.431)***	-	-	-	0.050 (-3.884) ***
R^2	0.095	0.047	0.130	0.046		0.278	0.316	0.288

*** 1 percent level of significance; ** 5 percent level of significance;
* 10 percent level of significance. T-values in brackets.

Table 6: Dependent variable: nonperforming loan (NPL)

Explanatory variables	Base model	Pooled model			Fixed effects model		
		Large	Medium	Small	Large	Medium	Small
X1 (Own)	8.158 (7.52) ***	8.264 (6.10) ***	8.098 (3.98***	-28.156 (-4.16) ***	-	-	-
X2 (Asset Size)	-0.082 (-3.16) ***	-0.042 (-1.515)	-0.000 (-1.18)	0.1023 (-2.233)	0.022) (-0.781)	-0.179 (-0.59)	-1.137 (-0.922)
X3 (ROA)	-1.416 (-8.10) ***	-1.598 (-4.73) ***	-0.206 (-1.27)	-2.795 (-10.51) ***	-1.510 (-3.86) ***	-0.526 (0.109)	-2.7079 (-7.72) ***
X4 (ROCE)	-0.085 (-5.43) ***	-0.216 (-5.55) ***	-0.177 (-2.23) **	-0.0433 (-3.28) ***	-0.209 (-4.59) ***	0.0478 (0.687)	(-0.041) (-3.65) ***
R2	0.119	0.151	0.159	0.603	0.27	0.417	0.156
F-test					0.0013	0.0000	0.2264

*** 1 percent level of significance; ** 5 percent level of significance;
* 10 percent level of significance. T-values in brackets.

3.1.2 Macro and NPLs variables across bank ownership categories

For bank ownership categories, full regression models for all banks was run and results shown in Table 4 columns 2 and 4. To check for robustness of the results, further pooled and fixed effects panel analysis was run to test effects of macroeconomic variables on NPLs levels across the bank ownership categories and results shown on Table 4.

Table 4 pooled and fixed effect models reveal that per capita was negative and significantly related to NPL levels across bank ownership categories (Pooled: Foreign; t-value -4.459,   local; t-value -6.531, government; t-value -6.415: Fixed effect: Foreign; t-value -5.540, local; t-value -6.717 government, t-value -6.930). The results implies that a negative development in per capita negatively affects NPL levels in kenyan commercial banks.

Real GDP was found negative and significantly related to NPL levels in local banks (t-value -5.414) and government banks (t-value -5.649) in pooled model. Similarly, real GDP was found negative and significantly related to NPL performance in local banks (t-value -5.546) and government banks (t-value -5.574) in fixed effect model. The results implies that a decrease in real GDP affects negatively NPL performamnce in commercial banks in kenya. However the study found no evidence that real GDP was related to NPL levels in foreign banks in Kenya. This suggests that oreign banks are not responsive to changes in real GDP in commercial banks in Kenya.

The pooled and fixed effect models in Table 4 show that lending interest rates was positive and significantly related to NPL performance across bank ownership categories in pooled and fixed effect models (Pooled: Foreign; t-value 5.222, local; t-value -4.533, government; t-value 6.266: Fixed effect: Foreign; t-value 7.647, local; t-value 4.635, government; t-value 6.351). The results implies that a negative development in lending interest rates negatively affects NPL levels in kenyan commercial banks.

Real interest rates across bank ownership categories was found positive and significantly related to NPL levels in both pooled and fixed effect model (Pooled: Foreign; t-value 2.596, local; t-value -4.787, government; t-value 3.808: Fixed effect: Foreign; t-value 5.301, local; t-value 3.333 government, t-value 4.204). The results implies that a positive development in real interest rates improves NPL levels in kenyan commercial banks.

Interest rates spread across bank ownership categories was found positive and significantly related to NPL levels in both pooled and fixed effect model (Pooled: Foreign; t-value 2.596, local; t-value -4.787, government; t-value 6.782: Fixed effect: Foreign; t-value 2.994, local; t-value 4.805, government   t-value 7.121). The results implies that a positive development in interest rates spread improves NPL levels in kenyan commercial banks.

Finally, Table 4 shows   inflation was found negatively related to NPLs levels in government banks (t-value 2.8) in both pooled and fixed effect models. However the study found no evidence that there exists significant realtion between

inflation and NPLs performance in foreign and local banks. This implies that NPLs performance in foreign and local banks are not responsive to changes in inflation

The F-test results shown in Table 4 confirm the fixed effect model stability and reliability (foreign banks, F-test, 0.000; local banks, F-test, 0.029; government banks, F-test, 0.000) hence validating robustness of the study findings.

3.2 Quality management ratios baseline model

Using bank specific variable under study a baseline model using pooled and fixed effect models was run to form the basis of panel regression for the study. Table 5 shows the panel estimation results based on the baseline model where noperforming loan was the dependent variable and the bank specific variables; X1 bank ownership, X2 bank size (based on total assets), X3 return on assets (ROA), X4 return on capital employed (ROCE) were the independent variables.

As shown on the baseline model on Table 5, bank ownership (X1) was found positive and significant (t- value 7.526) as shown in column 1. This revealed that the bank ownership structure significantly contributes to NPL levels in kenyan commercial banks. Further, bank size (X2) was found negative and significant as shown by the pooled (t- value, -3.163) but insignificant in fixed effect (t-value, -1.122) models on columns 2 and 6. This implies that NPLs levels of commercial banks in kenya are dependent on bank sizes (based on total assets) under pooled model but not under fixed model. Conversely, return on capital (X3) (t-value, -8.108) and return on capital employed (X4) (t- value, -5.431) as potrayed by pooled model in columns 3 and 4, were found negative and significantly related to NPLs levels.This further evidence that, a negative performance of ROA and ROCE leads to an increase in NPL levels in commercial banks in kenya. Similary , fixed effect model results on return on capital (X3) (t-value, -4.599) and return on capital employed (X4) (t- value, -3.884) as potrayed by fixed effect model in columns 7 and 8, were found negative and significantly related to NPLs perfomance. This further confirm ROA and ROCE affects nonperforming loan levels.

Generally therefore there was a negative and significant relationship between the bank size, ROA and ROCE and the nonperforming loans among the commercial banks in Kenya. To check for robustness of the results, bank ownership and bank sizes categories variables were included and results shown on Table 6 and 7.

3.2.1 Quality manangement ratios and bank sizes results

The relationship between the bank specific factors (X1, X2, X3 X4) and the nonperforming loans based on bank sizes (Large, Medium, Small) was shown on

Table 6. In the pooled model, bank ownership (X1) was found positive and significantly and related to NPLs levels in large (t- value, 7.52) and medium (t-value 3.98) banks while the relationship was negative and significant (t- value, -4.16) in small banks. These results concur with baseline model results in Table 5, suggesting that NPL levels are associated with banks ownership categories in commercial banks in kenyan. Concerning bank sizes (based on asset size) (X2), pooled and fixed effects models, reveal that the estimated coefficients were negative but insignificant across bank sizes categories. This implies that NPLs levels were not related to bank size categories in commercial banks in Kenya.

Table 6 further shows that return on assets (X3) was negative and significantly related to NPLs levels in large (t- value -8.10 and small (t- value -4.73) banks in both pooled and fixed models. However, the study found no evidence that NPLs performance are related to ROA in medium banks.It is important to note that in kenya majority of medium banks comprise foreign banks. The results suggests that good management of ROA in large and small banks decrease the NPLs levels.further the result suggest that management of ROA in medium banks is efficient. Introducing ROCE (X4) variable in the two models as shown on Table 6 yields results showing ROCE was negative and significant across banks (large t- value -5.43; medium t-values-5.55; small t-value -2.23) in pooled model. However fixed effect model reveal positive and insignificant relationship between the two variables in medium banks. On average Table 6 results suggest that any negative development of ROA and ROCE increases NPLs levels across bank size categories in commercial banks in Kenya while a positive development of ownership governance decreases NPLs levels.

The F-test results shown in Table 6 confirm the fixed effect model stability and reliability (large banks, F-test, 0.001; Medium banks, F-test, 0.000) hence validating robustness of the study findings. However fixed effect model proved weak in Small banks (F-test, 0.2264).

3.2.2 Quality Management Ratios and Bank Ownership Results

Table 7 shows pooled and fixed effect models results based on bank ownership categories according to central bank of Kenya.

The relationship between the bank specific factors (X1, X2, X3 X4) and the nonperforming loans based on bank ownership categories (foreign, local, government) is shown on Table 7. The variable ownership (X1) was found positive and significant across bank ownership categories (foreign: t- value -10.76; local: t-values-18.881; Government: t- value 13.74; in pooled model. This suggests that NPLs performamce was related to ownership structures and therefore ownership has an important role to play in driving NPL performance levels in Kenyan commercial banks.

In the pooled and fixed effect models bank size (total assets) (X2) was negative and insignificant in foreign and local banks but significant (t-value -2.55) in government banks under pooled model only. This sugggests that while

foreign and local banks NPLs performance were not responsive to size of total assets while government banks were responsive to the same. This may imply that government banks base their lending policies on total asset while foreign and local banks factor in other factors besides total assets. The role of ROA (X3) and ROCE (X4) in determining the nonperformance of loan levels in commercial banks was also examined. From the results, it was found that return on asset (ROA) in the pooled and fixed effects models produced negative and significant results in local and government banks (Pooled: local; t-value -8.41, government; t-value -3.99: Fixed effect: local; t-value -6.63, government, t-value -4.73. However, the study found no evidence that NPLs levels were significantly related to ROA in foreign banks. Similar results were found relating to ROCE (Pooled: local; t-value -3.96, government; t-value -3.62: Fixed effect: local; t-value -3.72, government, t-value -4.46. This suggests that foreign banks base their lending policies on other factors besides ROA and ROCE management issues. Also foerign banks appear to have efficient management on ROA and ROCE hence able to mitigate NPLs levels.

The F-test results shown in Table 7 confirm the fixed effect model stability and reliability (foreign banks: F-test, 0.001; local banks: F-test, 0.000; government banks: F-test, 0.0116 hence validating robustness of the study findings.

Table 7: Dependent variable: nonperforming loan (NPL)

Explanatory variables	Base model	Pooled model			Fixed effects model		
		Foreign	local	Government	Foreign	local	Government
X1 (Own)	8.158 (7.52)***	18.774 (10.76)***	11.085 (18.881)***	10.841 (13.74)***	-	-	-
X2 (Asset Size)	-0.082 (-3.16)***	-0.028 (-0.977)	-0.0705 (-1.288)	-0.302 (-2.55)***	0.0014 (0.044)	-0.1064 (-1.546)	-0.227 (-1.69)
X3 (ROA)	-1.416 (-8.108)***	-0.210 (-1.219)	-2.010 (- 8.41)***	-2.474 (-3.99)***	(-0.000) (0.000)	-1.734 (-6.63)***	-3.003 (-4.73)***
X4 (ROCE)	-0.085 (-5.431)***	-0.083) (-.636)	-0.0513 (-3.961)***	-0.250 (-3.62)***	(0.071) (1.310)	-0.044 (-3.72)***	(-0.271) (-4.46)***
R²	0.119	0.121	0.188	0.413	0.451	0.218	0.429
F-test					0.0000	0.0000	0.0116

*** 1 percent level of significance; ** 5 percent level of significance;
* 10 percent level of significance. T-values in brackets.

3.3 Macroeconomic and Bank Specific Factors Contrubtion to NPLs Levels

To determine the magnitude of macroeconomic and bank specific variables on nonperforming loans, pooled panel regression model was used as specified in section 2.2 of this paper.

$$Y_{it} = \beta_i + \beta_1 BS_{it} + \beta_2 Macro_{it} + \varepsilon_{it}$$

Ownership variable was used as proxy for bank specific variables while per capita was used as a proxy for macroeconomic variables. The two variables were chosen on the basis of their high level of performance as shown in Section 3 of this paper. The selected variable results are shown in Table 8.

Table 8: The selected model variable results

Dependent Variable: NPL				
Method: GLS (Cross Section Weights)				
Included observations: 15				
Total panel (unbalanced) observations 423				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.766966	1.833426	2.054604	0.0405
Bank Specific (Ownership)	8.361834	1.005023	8.320043	0.0000
Macro (Per capita)	0.561937	0.096870	5.800938	0.0000

Final Model

NPL = 3.7669656 + 8.361833698*BS + 0.561937289*Macro

The estimated regression coefficient (8.361) for bank ownership implies that an improvement in bank specific factors by one unit leads to a corresponding 8.361 decline in NPLs in commercial banks in Kenya. Conversely a unit increase in macroeconomic factors (estimated coefficient, 0.561) leads to a corresponding 0.561 increase in NPLs in commercial banks in Kenya. The study find evidence that bank specific factors contribute to NPLs performance at higher magnitude (β= 8.361) compared with macroeconomic factors (β=0.561).

3.4 Results discussion

3.4.1 Links between NPLs, macroeconomic and bank ownership structures

Per capita was found negative and significantly related to NPLs across bank sizes (large, medium and Small banks) and bank ownership categories (foreign, local and government banks). This implies that a positive development of per capita income leads to increased ability of banks to collect debts. Similary, real GDP was found negative and significantly related to NPLs perfomance across bank sizes (large, medium Small) and across bank ownership categories (local, government) except in foreign banks. It suggests that there are other incentives strategies foreign banks use to encourage borrowers to pay debts regardless of economic status to enable them meet cost of capital involved. Also results suggests that foreign banks may be more responsive to changes in real GDP growth rate than local and government banks. This may imply that government and local banks are vulnerable to manipulation. In addition government banks may not be responsive to macroeconomic factors because they are used to channel government funds for social economic activities whose repayment is not guaranteed. For instance, Economic Stimulus Programs (ESP) and Small and Medium Enterprises (SMEs) are government funded economic development strategies.

Further, positive and significant correlation between lending interest rate and NPL levels across bank sizes (except small banks) and ownership categories was confirmed. This implies that as lending interest rate increases, ability to collect debts by banks decreases. In this case lending interest rates are more important across all bank categories except in small banks. It suggests that there are other incentives strategies small banks use to encourage borrowers to pay debts regardless of lending interest rates levels. The study results confirm that excessive lending interest rate risk can pose a significant threat to a financial institution's earnings (Woodford & Michael, 2003). Further, the results concur with Espinoza & Prasad (2010) finding that the NPL ratio worsens as economic growth becomes lower and lending interest rates and risk aversion increase.

The study found evidence that interest rates spread was positive and significantly related to NPLs levels across all bank categories. From economic point of view, the wider the interest rates spread gap the more the profits earned by the banks.Therefore study result suggests that banks plow back the profits earned to improves the lending policies and procedure strategies for debt collections with an aim to improve NPL levels in kenyan commercial banks.

Finally, the study found no evidence that inflation was related to NPLs perfomance in Kenyan banks except lagre and government banks. In kenya large banks comprise the biggest percentage of government banks. Therefore these results may be attributed to political interference in management of government owned banks in terms of enforcement of regulators' lending interest rate to cub inflation while small, medium, local and foreign banks may be quick to

implement the regulators sanctions. These results support economic theory which alludes that, inflation leads to more profitability as more money chases few goods. Most borrowers are business people who seem to pass over the cost of inflation to consumers. For instance, when fuel prices go up, road transport players raise fare to consumers of their services. Thus business people retain their ability to repay their loans. Kevin & Tiffany (2010) findings support the view that macro-economic factors, such as per capita income, growth in real GDP, and interest rates, have an impact on the level of NPLs, as suggested by this study. However this study results contract Smith & Lawrence (1995) argument that macroeconomic variables have limited predictive power in explaining loan defaults. Further, this study results support Flamini (2009) findings that, weak economic performance expose banks to risk while low economic growth promotes the deterioration of credit quality, and increases the probability of loan defaults.

3.4.2 Link between NPLs and quality management ratios

The results in Table 6 reveal that bank ownership variable was positive and significant across different bank sizes (large: t-value 6.10; medium: t-value 3.98, small: t-value -4.16). The results suggest that NPL levels are associated with banks size categories in commercial banks in kenyan. Conversely, ROA and ROCE were negative and significant in large and small banks but not medium banks. This evidence therefore supports the notion that good management on return on capital employed decrease NPLs levels in large and small but not in medium banks. These findings supports Flamini (2009) Fama & Jensen (1983) results, who found that credit risk is associated with higher returns on assets and private ownership. Concurring with these findings, Bercoff, Giovanni & Grimard (2002) in Argentinean banks showed that asset growth and operating efficiency and exposure to local loans also help explain NPLs. However this current study did not find asset size significantly related to levels of NPL hence inconsistent with Flamini (2009), Chang et al. (2009), Salas and Saurina (2002) who found smaller bank sizes are associated with higher loan default rate with smaller asset base.

Further, bank ownership variable was found positive and significant across different bank ownership structures (foreign, local, government) as shown in Table 7. This indicate that NPLs performamce was related to ownership structures and therefore ownership has an important role to play in driving NPL performance levels in Kenyan commercial banks. In addition, ROA and ROCE was found negative and significant in local and government banks while in foreign banks was not statistically significant. This suggests that performance of NPLs in foreign banks were not responsive to the quality of management of ROA and ROCE in foreign banks in kenya, hence no relationship exists between the the two variables and NPL levels.   This finding is inconsistent with several studies (Nyamongo & Kebede, 2010), Fama &Jensen, 1983; Berg & Smith, 1978;

Brickley et al., 1997) that foreign ownership tends to post higher performance but such performance is not significantly different from those of other types of ownership. However this study findings supports Flamini (2009) & Abdelkader et al. (2009) results, who found that credit risk is associated with higher returns on assets and private ownership.

3.5 Conclusion

The study find evidence that bank specific factors contribute to NPLs performance at higher magnitude (β= 8.361) compared with macroeconomic factors (β=0.561. Therefore, for effective management of NPLs, it is critical for commercial banks to understand and focus more on the management of bank specific factors which they have more control over and seek practical and achievable solutions to redress NPLs problems.

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