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Credit risk and private sector loan growth under interest rate controls in Kenya

Roseline Nyakerario Misati[1*], Anne Kamau[1], Samuel Tiriongo[1] and Maureen Were[1]

[1] Central Bank of Kenya, Research Department, Nairobi, Kenya
[*] Corresponding author's email: misatirn@centralbank.go.ke

Abstract

The study examined the effect of credit risk on loan growth in the banking system in Kenya using panel data constituting 40 commercial banks over the period 2009 to 2018. The study employed a dynamic panel data approach to analyze both aggregated banking sector and bank-tier level models before and during interest rate controls regimes. Findings of the study show that credit risk affects loan growth for all banks on aggregate, but these effects are heterogeneous across bank tiers. In particular, the effect of credit risk on loan growth is found to be stronger for large and small banks than for medium size banks, both in the period before and during interest rate controls. The results also show that other bank specific factors, mainly size and capitalization are important for loan growth while macroeconomic factors are not significant in explaining loan growth for all banks. In addition to credit risk, liquidity, deposit growth, inflation and economic growth are the most important factors determining loan growth for small banks in the period of interest rate controls. Whereas the impact of monetary policy rate changes on loan growth has the same effect across all bank tiers in the period before interest rate controls, it is heterogeneous across the bank tiers in the interest rate control period.

Keywords: Non performing loans; interest rate controls; credit growth; Kenya.

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1. Introduction

The environment under which financial intermediation operates in Kenya has tremendously evolved in the last decade in terms of the financial products offered, and the policy and regulatory framework. The financial system in 2007 witnessed a dramatic revolution in product innovation with emergence of mobile money transfer system. Since then, telecommunication companies have partnered with banks and some non-bank institutions to provide banking services leveraging on the mobile money platform. The policy and regulatory regime has also evolved through three phases. The first phase was the period before 1993 that was characterized by financial controls with credit rationing to specific sectors of the economy. The second phase, which commenced in 1993, was associated with a liberalized interest rate regime and lastly, the introduction of interest rate controls in September 2016 that was targeted at protecting consumers from high cost of credit and support credit growth particularly to small borrowers. The impact of the rapidly changing environment on commercial banks – traditionally main players in the financial system – is evident in the transformation of most of their business models, including treatment of credit risk in loan extension.

The rapidly changing environment with effects on financial and non-financial institutions, financial products, policy and regulatory framework necessitates continuous analysis of its impact on key macro-economic variables. Private sector credit growth has been at the center of this analysis and a subject of debate among policy makers. Over the last two decades, credit growth patterns changed drastically from averages of 19.3 percent between April 2004 and June 2016 to 3.5 percent between July 2016 and December 2018. Whereas credit growth had started declining in the period prior to the enforcement of the Banking (Amendment) Act (2016) which introduced interest rate controls, the presence of the controls may have amplified the slow-down in credit growth. The implementation of the Banking (Amendment) Act (2016) required commercial banks to provide credit facilities at no more than 4 percentage points above the Central Bank Rate (CBR) and deposit rate at not less than 70 percent of the CBR.[1] At the same time, non-performing loans (NPLs) to gross loans ratio, which is a standard measure of credit risk, has been steadily rising since 2011 surpassing 5 year averages of between 5-7 percent in the last one decade. The ratio nearly tripled from 4.4 percent in 2011 to 12.3 percent in 2017. While the immediate concern of rapidly rising NPLs would be the soundness of the banking sector, it would also be important to assess its effect on credit growth.

As profit motivated entities, commercial banks have been constantly changing their business models to suit the changing policy and regulatory environment. In particular, commercial banks have adopted a dynamic lending behavior in the face of competition from other non-bank credit providers including digital lenders that have progressively entered the lending market amidst new regulations and policy changes. As evident in the Commercial Banks' Credit Officer Survey reports, following the implementation of the interest rate controls, commercial banks increased risk mitigation measures and tightened credit standards resulting in reduction of credit facilities especially to the Small and Medium sized Enterprises (SMEs).[2] Moreover, commercial banks intensified tightening of credit standards even further following the implementation of the International Financial Reporting Standard (IFRS) 9 on financial instruments from January 2018. The (IFRS) 9, required reporting institutions to move to Expected Credit Loss (ECL) model as opposed to the Incurred Credit Loss (ICL) model under the International Accounting Standard (IAS) 39.[3] The survey reports show that commercial banks have continued to maintain a cautious lending strategy especially to borrowers that are perceived as riskier than others. They have tightened credit standards and are more inclined towards secured or risk-free lending as opposed to unsecured credit facilities given the high provisioning requirements under IFRS 9.

Previous studies on credit risk-lending analysis are entrenched in the information asymmetry and agency theories. Information asymmetry is based on the assumption that the lender lacks adequate information on the borrower to set the price of loans, which should reflect the borrowers' riskiness, or their probability of default. The theory manifests itself through moral hazard and adverse selection in the credit market. Due to the existing information asymmetry between the bank and the borrower, the phenomenon of adverse selection

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[1] In September, 2018, Parliament amended this Act to remove the lower cap of interest rate payable upon bank deposits rate of 70 percent of the Central Bank Rate but retained the upper limit of 4 percent above the CBR payable on bank loans. The interest rate control was repealed in November 2019. Prior to interest rate capping regime, the Kenya Banks' Reference Rate (KBRR) and Annual Percentage Rate (APR) frameworks had been introduced in July 2014 aimed at facilitating a transparent credit pricing framework and enhancing the transmission of monetary policy signals through commercial banks' lending rates. The KBRR framework was suspended following introduction of interest rate capping regime in August 2016.

[2] On a quarterly basis, the CBK conducts a Commercial Banks' Credit Officer Survey to identify the potential drivers of credit risk.

[3] Details on the IFRS 9 are available on the guidance note issued by the Central Bank of Kenya in April 2018.

or anti-selection occurs before signing the credit agreement. After signing the credit agreement and granting credit, information asymmetry becomes a source of moral hazard. Banks thus face challenges in positively discriminating borrowers of good quality and mitigate this through high interest rates and/or aggravate loan conditions with negative implications on loan growth, (Tfaily, 2017; Okuyani, 2014; Janda, 2006). The agency theory is associated with the principal-agent relationship and it manifests itself when the incentives of the agent and the principal are not perfectly aligned leading to conflicts of interest. As a result, the agent may be tempted to act in his own interest rather than the principal's, (Felicio *et al*., 2018; Jensen and Meckling, 1976). In the credit market, the principal can be shareholders or bank managers where the agent is the bank manager and credit officer, respectively, (Mokete and Motelle, 2018; Fayed and Ezzat, 2017; Goetz, 2011). In this case, the agents self-interest leads to actions that elevate credit risk and lead to negative outcomes on loan growth.

Most of the previous studies have however concentrated on advanced economies with very little focus on developing markets in Africa. The ones using data on developing markets, particularly Africa, have mainly analyzed credit risk and bank performance and most of them have ignored country-specific characteristics (Chikalipah, 2018; Mpofu and Nikolaidou, 2018; Brei *et al.,* 2018; Amidu, 2014; Fofack, 2005). In Kenya, studies on credit risk have largely focused on the determinants of credit risk, credit losses and credit risk management systems (Barongo and Mukoma, 2019; Wairimu *et a*l., 2018; Murigi and Thuo, 2018; Mwangi and Muturi, 2016; Gitonga, 2014). Even the studies related to our work ignored the role of credit risk in explaining loan allocation by the private sector, focused on the performance of commercial banks were largely descriptive in nature (Siriba, 2019; Kajirwa and Nelima, 2019; Mutua and Gekara, 2017; Chebet and Muriu, 2016). Moreover, the previous studies assumed homogeneity in the relationship between credit risk and credit allocation across bank tiers and monetary policy regimes yet the trend analysis of this indicators reveal differences across bank tiers and policy regimes (Siriba, 2019; Muriithi *et al*., 2016).

It is against this background that the assessment of the impact of credit risk on commercial bank lending behavior is embedded to address some of the identified gaps in previous work on Kenya. This study contributes to the literature in at least four aspects, first, the study analyzes in detail the implications of credit risk on loan growth. Second, the study incorporates heterogeneity of bank responses to credit risk by demarcating the data into bank tiers. Third, the study accounts for

different policy regimes in Kenya over time that have had implications on credit growth. Fourth, the paper uses an alternative econometric analysis to quantify the impact of credit risk on loan growth across bank tiers and policy regimes in Kenya. This paper thus seeks to answer three main questions, (i) What is the quantitative effect of credit risk on the lending behavior of commercial banks? (ii) Does the impact of credit risk differ across bank tiers? (iii) Has commercial bank lending behavior and its sensitivity to credit risk changed under the interest rate capping period? The study utilized generalized method of moments (GMM) which is the most appropriate for dynamic panel data since it provides a convenient framework for obtaining asymptotically efficient estimators, (Hansen, 1982). Moreover, the GMM estimator solves the problems of serial correlation, heteroskedasticity and endogeneity of explanatory variables, (Santos-Arteaga *et al*., 2019). The study used panel data for 40 banks over the period 2009-2018.

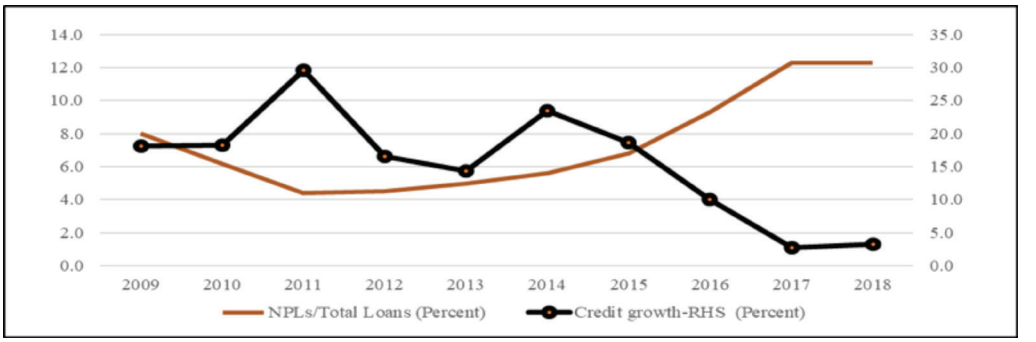
This study's results will provide useful insights on the implications of interest rate controls on credit growth besides establishing the differences in responses of commercial banks to credit risk based on their sizes. This information is important for policy makers who may be interested in understanding tier specific determinants of credit growth for purposes of implementing targeted policies. This study also provides useful information that can enlighten choices between controls and liberalized policy regimes on credit allocation that can be utilized for other countries considering such options. The study is useful to the academic fraternity as it forms additional empirical literature with new insights on credit risk-loan provision nexus for future academic work.

The next section provides trend analysis of indicators of credit risk and credit growth while section 3 provides a brief literature review. The method and results are presented in section 4 and 5, respectively, while section 6 concludes with some policy proposals.

2. Trends of non-performing loans and credit growth

In this section, we analyze trends of non-performing loans at aggregate banking sector levels and by bank tiers, for the period 2009-2018, that covers both pre and post interest rates caps regime. The trends in charts 1 and 2 representing all banks and large banks, respectively, show a negative relationship between non-performing loans and credit growth particularly in the period of interest rate controls/caps. The observed trends are explained by the events and market conditions prevailing during this period.

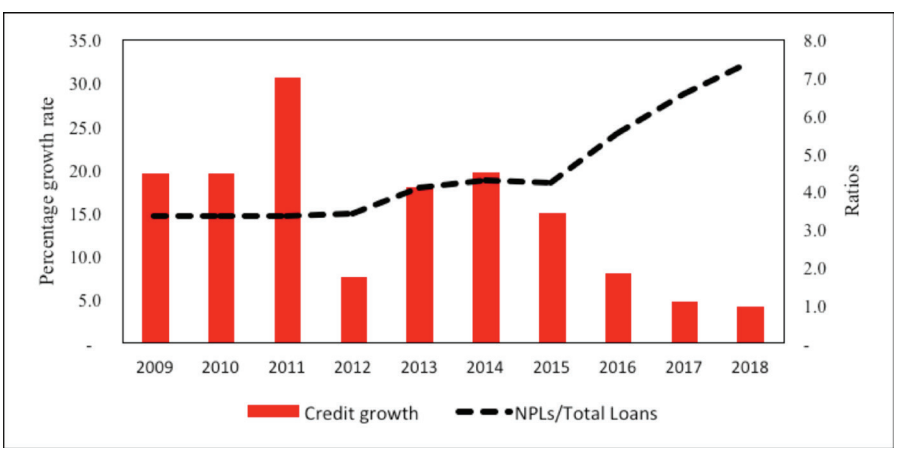
Chart 1: Non performing Loans and Credit Growth Trends (2009-2018) - All Banks



Source: Central Bank of Kenya

The period before September 2016, when interest rate caps were introduced, was characterized by high and prolonged inflationary episodes in 2009 and 2011, the 2008/09 global financial crisis, introduction of devolved units of government following the adoption of a new constitution in 2010, and the placement of three medium-size banks under receivership in 2015 and 2016. These events increased the cost of credit as markets became more alert to sources of risk and the government demand for funds to finance the new devolved units increased.

Chart 2: Non performing Loans and Credit Growth Trends (2009-2018) - Large Banks

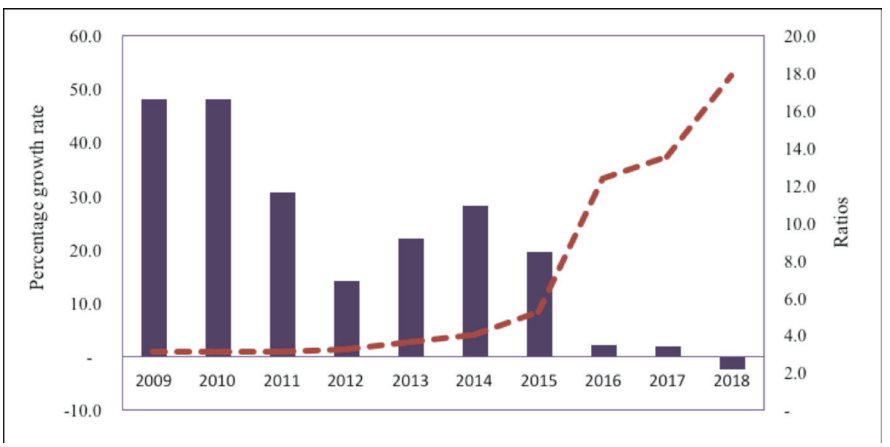


Source: Central Bank of Kenya

The main feature of the period between September 2016 and December 2018 was enforcement of interest rate controls. Other notable developments included increased skewness in liquidity in the financial system following the

collapse of three banks, and the implementation of the IFRS 9. Reflective of some of these market developments, commercial banks adjusted their lending practices accordingly with a bias towards increased risk aversion, a tendency to practice relationship lending in the interbank market and some build-up of excess liquidity. The impact of some of these events resulted in high NPLs and subdued credit growth as observed from all the charts in this section.

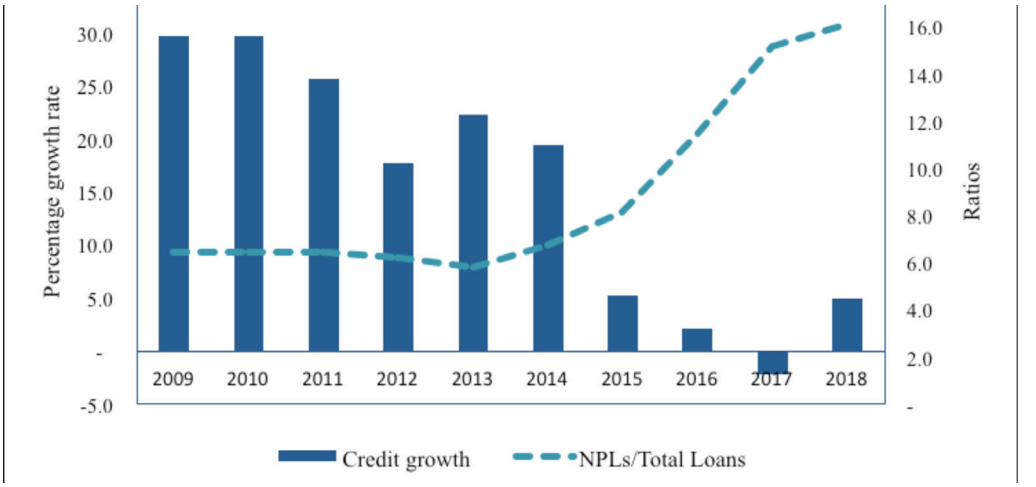
CHART 3: NON PERFORMING LOANS AND CREDIT GROWTH TRENDS (2009-2018) - MEDIUM BANKS



Source: Central Bank of Kenya

Similarly, in charts 3 and 4, representing medium sized banks and small banks, respectively, NPLs exhibited relatively stable trends in the period before 2015, but sharply increased from 2015 to 2017 before slightly moderating in 2018. Credit growth also declined after 2014 with negative growth rates in 2017 and 2018 for medium banks and small banks, respectively. This analysis shows that although the general trend showed an increase in NPLs and a decline in credit growth particularly after 2015, the impact was more severe for small and medium sized banks than for large banks, thus the need to analyze credit growth at bank-tier level.

Chart 4: Non performing Loans and Credit Growth Trends (2009-2018) - Small Banks



Source: Central Bank of Kenya

3. Literature review

The literature on the credit risk-lending analysis is dominated by asymmetric information, agency and credit risk theories. The information asymmetry theory invalidates the standard competitive market outcomes. The theory reveals itself in adverse selection and moral hazard in which case lenders face uncertainty about the creditworthiness of borrowers to the extent that they cannot observe some of the borrower's characteristics and actions, (Dell'Ariccia, 1998). Stiglitz and Weiss, (1992; 1981) provide theoretical underpinnings that illustrate the implications of information asymmetry on the credit market. Under their line of argument, equilibrium in the loan market is characterized by credit rationing. Banks are concerned with the riskiness of the loan and the interest rate received on the loan. However, the interest rate a bank charges may itself affect the riskiness of the pool of loans by either: i) sorting potential borrowers (the adverse selection effect); or ii) affecting the actions of borrowers (the incentive effect). Both effects derive directly from the residual imperfect information which is present in loan markets after banks have evaluated loan application, Stiglitz and Weiss (1981). Thus, inadequate information between the borrower and the lender lead to credit rationing in which case, from a pool of observationally identical borrowers, some borrowers get loans while others are denied loans. At the same time, due to moral hazard problems or hidden action, loan applicants would tend to prefer high-risk projects during the periods of higher interest rates. The

lender lacks the information upfront of the intended actions of the borrower and to mitigate against such uncertainty, the lenders increase the interest rate and/or aggravate loan conditions thus affecting loan growth, (Tfaily, 2017; Okuyani, 2014; Janda, 2006).

In a similar line of thought, the Jensen and Meckling, (1976) agency theory that was introduced to relax traditional perfect market assumptions, is applicable to the credit market. Agency problems take place when the incentives of the agent and the principal are not perfectly aligned and thus conflicts of interest occur. In the credit market, it is argued that a bank's organizational structure affects its risk taking behavior and the risk taking behavior of competing banks. The agency theory considers the bank manager as the principal and the loan officers as the agents, where loan officers choose a certain level of risk. The proponents of this theory posit that expansion of banks increase the scope of their organization and hence the number of loan officers to be supervised, thereby lowering loan officer's monitoring effort. At the same time expanding banks shift their lending towards borrowers with hard, verifiable information usually in real estate sector while non-expanding banks, who rely on soft data, increase their share of loans to individuals who are generally informationally difficult borrowers, (Fayed and Ezzat, 2017; Goetz, 2011). Complementary to the previous arguments, other authors consider shareholders of banks as the principals and bank managers as the agents. In this case, agency conflict may arise when bank managers act in their own interest by, for example, approving loans without proper vetting and credit scoring with negative implication on loan growth, (Mokete and Motelle, 2018). The credit risk theory posits that the lender primarily bears risks in loan transactions. The lender is vulnerable to partial or complete loss of the principal and interest rate, particularly in cases where insolvent banks are unable to return funds to depositors. Thus lenders conduct credit checks and require borrowers to provide insurance or security or guarantees of third parties. In most cases, the higher risk attracts higher interest rates on debt, (Taiwo *et al*., (2017).

Previous empirical studies on credit risk-loan growth nexus utilized both primary as well as secondary data but the findings reveal a lack of consensus. Although a negative relationship between credit risk and loan growth dominate the literature, some few studies have established a positive relationship while others find no impact of credit risk on loan growth. Theoretically, according to Accornero *et al*., (2017), the impact of NPLs' stocks and flows on credit growth is not uniform. On the one hand, high NPLs ratio might exert a permanent effect on banks via a riskier asset side which would spur the combined influence on

credit of regulatory constraints, market pressures on funding and adjustment in risk-taking mechanisms. An increasing NPLs ratio, on the other hand, negatively impacts loan supply through the profit and loss account, inducing banks to temporarily modify their lending policy while adjusting some quantities, notably provisions to restore equilibrium in their balance sheet. These views postulating that an increase in the value of NPLs imply deterioration of credit quality, higher provisions, lower profitability and considerable erosion of bank capital all lead to reduced lending dominate the literature (See for instance, Nguyen, 2017; Cucinelli, 2015). The empirical studies using secondary data are summarized in Table 1 below.

Some of the studies based on primary data include Mulafara (2015) who examined the relationship between loan appraisals and risk management techniques in Srilanka using census sampling techniques. The survey targeted all branch managers and credit officers. The results showed that loan appraisals, credit rating, risk transfer, risk diversification and financial viability do not significantly affect loan performance in Srilanka.

It is evident from the results obtained by the papers summarized in Table 1 that there is inconclusive evidence on the effect of credit risk on credit growth. While some studies (see for instance, Alihodzic & Eksi, 2018; Nguyen, 2017; Cucinelli, 2015; Ivanovic, 2016; Amidu, 2014 and Tracey, 2011) find a negative relationship, others such as Osei Assibey and Baimba (2013) find a positive relationship arguing that granting new loans can encourage repayment of doubtful debts. But still, others argue that the influence of credit risk on credit growth is non-linear (Dwike & Ulpah, 2017). In addition, it is noteworthy that most of these studies used aggregated banking sector data. This study contributes to the literature by considering country specific characteristics, isolating heterogeneous effects across bank tiers and including some notable developments in the financial sector-most importantly, the interest rate controls. This paper also contributes to the existing literature on the empirical determinants of loan growth besides studying asset quality in a more detailed manner as one of the critical factors explaining credit growth.

TABLE 1: SUMMARY OF EMPIRICAL EVIDENCE OF THE BANK RISK PROFILE-LOAN SUPPLY RELATIONSHIP

Year	Author/s	Country/ies	Data	Methodology	Findings
2018	Alihodzic and Eksi	Turkey and Balkan	2007-2017	Multiple regression	The results show a reverse relationship between NPLs and credit growth for all observed countries. High NPLs reduce profitability of the banking sector and increase systemic risk.
2017	Nguyen	Vietnam	2005-2015	GMM	The findings show a negative relationship between non-performing loans and bank profitability and lending behavior
2017	Accornero *et al*	Italy	2008-2017	Fixed effects	The banks' lending behavior not casually affected by the level of NPLs ratio but an exogenous emergency of new NPLs and the associated increase in provisions can cause a negative adjustment in credit supply
2017	Dwike and Ulpah	Indonesia	2006-2015	Threshold regression method	Moral hazard exists when NPLs ratio exceed 5.29 percent in which case banks with NPLs above 5.29 percent have loan growth that increase NPLs while banks with NPLs below 5.29 percent have loan growth that decrease NPLs. In this case, troubled banks adapt riskier lending strategies.
2015	Cucinelli	Italy	2007-2013	OLS and Fixed Effects	The findings show a negative impact of non- performing loans and loan loss provision ratio on bank lending behavior
2016	Ivanovic	Montenegro	2004-2014	Fixed effects	High NPLs have a negative effect on credit supply
2014	Amidu	SSA	2000-2007	Panel Data	Banks with higher NPLs relative to their total loan ratio supply fewer loans. Other factors affecting loan supply in SSA include: size of banks, liquidity and efficiency of management of banks.
2013	Osei-Assibey and Baimba	Sierra Leone	2002-2011	Fixed Effects	The study established a positive relationship between NPLs and loan supply. This result was rationalized based on granting of new loans to encourage repayment of doubtful debts.
2011	Tracey	Jamaica, Trinidad and Tobago	1996-2011	Ordinary Least Squares	Negative relationship between NPLs and loan growth

4. Methodology

4.1. Data type and sources

This study used monthly data from 40 commercial banks covering the period 2009-2018.[4] The choice of data is informed by availability, uniformity and consistency of the cross sectional units. The start period of 2009 reflects the year when Kenya rebased GDP and the end period is consistent with availability of data for all the variables considered in the study. Data on non-performing loans, liquidity, size, deposits, capitalization and loan advances is obtained from balance sheets and profit and loss accounts of commercial banks. Data on the CBR is obtained from the Central Bank while data on GDP and inflation is sourced from the Kenya National Bureau of Statistics.

4.2. Model and estimation method

$$Cred_{it} = \alpha_0 + \delta_1 Cred_{it-1} + \alpha_1 NPLs_{it} + \beta_1 X_{it} + u_{it} \quad (1)$$

Where $Cred_{it}$ is the growth rate of credit or loan advances by banks, $NPLs_{it}$ represent non-performing loans as a ratio of gross loans while X_{it} is a set of the other explanatory variables which include bank specific (liquidity, size, capitalization and deposit measures) and macro variables (GDP, inflation and interest rate) and μ_{it} is the error term. The subscripts i=1,…,N and t=1,…,T refer to the cross-section and time series dimensions of the data, respectively.

Equation (1) is a dynamic specification since it contains a lagged dependent variable as one of the explanatory variables. Baltagi (2002) has identified two main characteristics of dynamic regressions. First, is the autocorrelation due to the presence of a lagged depended variable among the regressors and second, is the presence of unobserved heterogeneity in individual behavior. However, panel datasets, where the behavior of N-cross sectional units is observed over T-time periods, provide a solution to accommodate the joint presence of dynamics and unobserved individual heterogeneity (Giovanni, 2004). Panel estimators solve the country specific problem besides permitting the use of instrumental variables to contain the potential joint endogeneity of the explanatory variables. Moreover, panel methods provide greater power than individual country studies and hence greater efficiency.

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[4] Prior to 2016, there were a total of 43 commercial banks in Kenya. In 2016, three banks were placed under receivership. This, coupled with ongoing mergers and acquisitions. informed our choice of banks that have consistent data covering our sample period. We therefore used data for 9 large banks, 10 medium banks and 21 small banks.

In static panel data models, it is possible to use pooled ordinary least squares (OLS), fixed effects (FE) and random effects (RE) and 2 stage least squares (2SLS), among others. However, in equation 1, OLS estimator of δ_1 is inconsistent since the explanatory variable $Credi_{t-1}$ is correlated with the error term μ_{it}, (Bond, 2002) while the 2SLS is not asymptotically efficient. Further, FE and RE are biased and inconsistent in the presence of a lagged dependent variable as an explanatory variable, (Bun and Sarafidis, 2013). The generalized method of moments (GMM) developed by Hansen, (1982) provides a convenient framework for obtaining asymptotically efficient estimators. Moreover, the GMM estimator solves the problems of serial correlation, heteroskedasticity and endogeneity of some explanatory variables, (Santos-Arteaga *et al*., 2019). In this study, we therefore used GMM which is the most appropriate for dynamic panel data since it solves problems of endogeneity and provides efficient estimators that are not obtainable from alternative methods such as OLS and FE. Furthermore, considering that we have some missing values in our data, this method is more representative as it uses all the available data by allowing for unbalanced panel data estimation. In addition to the already highlighted advantages of GMM methods, they also solve the problems of measurement error, omitted variable bias, endogeneity, besides allowing the users to discard error correction models, (Jose and Spiegel, 2002; Charalambos *et al*., 2005; Bond *et al*., 2001).[5]

4.3. Variable description

In this sub section, we describe all the variables that are considered in the study. The dependent variable is growth rate of loan advances by commercial banks each period. Our main explanatory variable is non-performing loans as a ratio of gross loans. Apriori, we expect a negative relationship between non-performing loans (NPLs) and loan advances by commercial banks since increase in the value of NPLs to gross loans imply deterioration of credit quality leading to reduced lending by commercial banks, (Cucinelli, 2015).

Consistent with previous studies on factors that explain credit growth using bank level data, we include other bank specific variables, mainly, liquidity, size, capitalization and deposit growth as well as macro variables, specifically, real GDP growth rate, inflation and interest rates (Ivanovic, 2016; Ono *et al*., 2016). GDP growth rate is included to reflect economic conditions which

[5] We have provided the evolution of estimation methods for dynamic models in Appendix 1.

capture consumption and investment demand and reflect credit demand. Apriori a positive sign is expected since a higher GDP growth implies high credit demand, (Ivanovic, 2016). Inflation is included to capture the macroeconomic environment. The expected relationship between inflation and loan advances can be either negative (inflation adversely affects profits and thus investment resulting in low loan demand) or positive (a rise in inflation leads to higher demand of nominal credit (Nyamekye and Poku, 2017; Hausman and Wieland, 2014; Chioma *et al*; 2014; Tan, 2012; Guo and Stepanyan, 2011).

Monetary policy operates through many channels including interest rate, credit/ bank lending, exchange rate, asset prices, risk and expectations.[6] In our study, we focus on the transmission of monetary policy through commercial banks. Under the bank lending channel view, monetary policy changes accommodate the transmission of policy decisions by altering the availability and supply of loans. The bank lending channel assigns a crucial role to financial intermediaries and largely focuses on quantities. The bank lending channel is based on the existence of asymmetric information between loan suppliers and the borrowers. In this case, a monetary policy contraction leads to a reduction in demand for deposits leading to a fall in loan supply. To the extent that banks (at least, some of them) are unable to offset this reduction in loanable funds, due to informational frictions between them and their providers of funds, there will also be a fall in bank loan supply (Apergis and Christou 2015; Bernanke and Gertler, 1995). This effect will be greater for small and less capitalized banks, which have more difficulty raising alternative forms of financing, and for less liquid banks that are less able to cushion the effect on loans, (Hernando and Jorge, 2001). The apriori sign between a monetary policy indicator and credit growth is therefore negative.

Bank size is measured by bank assets and in our case we use the natural logarithm of total assets. Apriori, a positive sign is expected between bank size and credit growth, since larger banks are more diversified, have larger pool of funds available, have access to larger and more credit worthy corporate borrowers and have more resources for the development of advanced credit risk management and evaluation systems (Djiogap & Ngomsi, 2012; Jose & Rochelle, 2010). Similar arguments also apply for capitalization as detailed in Bogoev, (2010).

Deposit growth is included to capture one of the sources of funds for commercial banks. Apriori, a positive sign is expected since higher deposit growth imply higher loanable funds and hence higher credit growth (Ivanovic, 2016). Liquidity

[6] See Mishkin, (1996) for a detailed account of monetary policy transmission mechanisms.

defined as the ratio of the sum of cash balances and government securities to total assets is also included and apriori, it is expected to impact positively on loan advances (Bogoev, 2010). In periods of tightened monetary policy when banks face a reduction in loanable funds, their capacity to extend loans is constrained.

5. Discussion of results

In this section, we present empirical results, from which we have used two different equations based on the period before and during interest rate controls. Results for all bank categories grouped together and another set using only the large banks are reported in Table 1. Table 2 reports the results for medium and small sized banks.[7]

Table 2: Total Loan Advances Models for all Commercial Banks and Large size Banks

Dependent variable is total loan advances	**Period before caps Model 1 All banks** (2009m03-2016m08)	**Period during caps Model 2 All banks** (2016m09-2018m06)	**Period before caps Model 3 Large banks** (2009m03-2016m08)	**Period during caps Model 4 Large banks** (2016m09-2018m06)
Independent Variables	Coefficient(t-statistics)	Coefficient(t-statistics)	Coefficient(t-statistics)	Coefficient(t-statistics)
NPLs	-0.31(-3.20)***	-0.28(-2.17)**	-0.09(-2.18)**	-0.17(-1.95)*
Liquidity	0.09(3.04)***	0.003(0.08)	-0.10(-2.61)***	-0.03(-0.87)
Size	0.56(3.11)***	0.33(2.23)**	0.50 (4.13)***	0.41(5.38)***
Deposits	0.03(0.39)	0.07(1.65)*	0.01(0.59)	-0.25(-3.81)***
CBR(-1)	-0.01(-1.70)*	0.78(3.79)***	-0.16(-1.75)*	0.14(1.80)*
GDP	-0.59(-1.22)	0.28(0.99)	-0.24(-0.82)	0.10(0.71)
Inflation	0.19(1.37)	-0.03(-0.25)	0.03(0.38)	-0.79(-2.73)***
Capitalisation	0.26(4.85)***	0.41(2.82)***	0.18(4.09)***	0.23(2.60)***
Loans(-1)	0.12(0.68)	0.31(1.80)*	0.44(6.11)***	0.66(11.6)***
J_stats (P_value)	12.8 (0.88)	10.6(0.99)	30.7(0.12)	17.3(0.63)

Note: For all the coefficients, the t–statistics are in parenthesis; *, **, *** denote 10%, 5% and 1%, significance levels, respectively.

In Table 1, the results for all banks are presented in columns 2-3. The results show that the quality of loans measured by non-performing loans has a negative and significant impact on all commercial banks and large banks both in the period before and during interest rate controls. From the results, it can also be

[7] We also conducted descriptive statistics presented in Appendix 2.

observed that, although commercial banks increased their risk aversion during the interest rate capping period, the impact of non-performing loans remained unchanged in terms of direction and magnitude for large banks. However, the magnitude of impact reduced during the interest rate controls period in the model for all banks. This implies that the weight of non-performing loans as a factor affecting loan supply may have diminished for some banks within the sample. These results are consistent with previous studies that also established that commercial banks supply fewer loans with higher credit risk, (Alihodzic and Eksi, 2018; Nguyen, 2017; Ivanovic, 2016; Cucinelli, 2015; Amidu, 2014).

The coefficient of liquidity is significant in the period before caps for all banks and large banks but with different signs. The positive and significant coefficient for all banks is consistent with the theory and expectations. However, the negative and significant relationship between liquidity and loan growth for large banks model, though not common, has been observed in previous empirical work particularly in markets with persistent excess liquidity. Three main reasons have been provided to explain this relationship. First, as argued in Kohler *et al*., (2006) a negative relationship between liquidity and credit growth reflects large accumulations of non-performing loans in some banks, due to informational asymmetry in the loan market. Consequently, these banks intentionally build up a higher buffer of liquid assets in order to hedge against borrowers' default in case of increased deposit withdrawals. Another possible explanation for this, according to Wrobel and Pawlowska (2002), is that in some markets, liquidity may not be the best distinguishing financial characteristic among banks. For instance, when the banking system is characterised by surplus liquidity, it is difficult to distinguish between the heterogeneous loan supply reaction function of benchmark banks that have a below-average level of liquid assets and those banks that have an above-average level of liquid assets. In this case of persistent liquidity, almost all banks keep a higher level of liquid assets than is needed. However, Chmielewski (2006) argues that banks that have accumulated a large amount of securities (liquid assets) and have not hedged against the interest rate risk, find that their opportunity costs increase when monetary policy tightens. Therefore, those banks reduce the quantity of loan supply proportionately more than the less liquid ones.

Size and capitalization are the other important bank specific factors that bear the expected positive sign and are significant throughout the periods before and during interest rate controls, when assessed in the models with all banks as well as with only large banks. The coefficients of these two variables are consistent

with theory and similar to results found by Accornero, (2017) and Ayman, (2017). However, the coefficient of deposits is significant only during the period under interest caps and bears different signs for the all banks and large banks models. The coefficient for deposits for all banks bears a positive and significant sign as expected but is negative and significant for large banks models. This unexpected result for large banks would be explained by the preference by commercial banks to invest in less risky government securities rather than lend to the private sector that is perceived as riskier. These results support the findings in Ayman, (2017), who explained the negative sign by arguing that most of the deposits received by banks are demand deposits or the volume of withdrawals is high. Consequently, banks may have to maintain large amounts of customer deposits as a reserve to meet withdrawals rather than lend.

The results on the coefficient of gross domestic product which captures credit demand conditions in the economy is not significant in any period considered both for all banks as well as for large banks implying that economic performance is not a statistically important factor in the lending decisions by all banks and large banks. Whereas the coefficient of inflation is not significant in explaining lending by all commercial banks in the period before caps and during the capping period, it is negative and significant for all banks model during the capping period. The negative relationship is consistent with theory that high inflation adversely affects profits and thus investment resulting in low loan demand.

The relationship between credit growth and the CBR, representing the policy rate bears the expected negative sign in the period before interest rate caps and a positive sign in the period during interest rates caps for the models of all banks and large banks. The positive sign which is inconsistent with the theory may be explained by the increased risk aversion by commercial banks following the enforcement of the Banking (Amendment) Act (2016) which introduced interest rate controls. The capping of lending interest rates at 4.0 percent above the CBR may have made pricing of borrowers within the set margins difficult with a possibility of rationing some of the borrowers out of the credit market. This assertion is confirmed by the CBK's Credit Officer Survey reports that showed an immediate tightening of credit standards following the introduction of interest rate controls. Moreover, some of these banks may have also preferred investing in less risky assets such as government securities.

In Table 3, based on the same set of variables, we present results for medium sized and small sized banks in models 5-6 and 7-8, respectively. The results show that the coefficient of non-performing loans bears the expected sign but

is not significant for medium sized banks in both periods of study while it is significant for small sized banks in both periods of study. This implies that while risk aversion has a bearing on medium sized banks, it is not a significant factor in explaining their lending behaviour as much as is the case in small sized banks. Similarly, liquidity is also not significant in explaining medium sized banks' lending behaviour for the two periods while it is important for small banks in the interest rate capping period. The significance of liquidity for small banks may be explained by the market conditions in the Kenyan market including the residual effects of the three banks placed under receivership in the period before caps. During this time, some small banks lost credit lines due to perceived risks while large banks were mainly lending to one another.

Table 3: Total Loan Advances Models for all Medium and Small size Banks

Dependent variable is total loan advances	**Period before caps Model 5 Medium banks** (2009m03-2016m08)	**Period during caps Model 6 Medium banks** (2016m09-2018m06)	**Period before caps Model 7 Small banks** (2009m03-2016m08)	**Period during caps Model 8 Small banks** (2016m09-2018m06)
Independent Variables	Coefficient(t-statistics)	Coefficient(t-statistics)	Coefficient(t-statistics)	Coefficient(t-statistics)
NPLs	-0.01(-1.00)	0006(0.10)	-0.16 (-2.72)***	-0.06(-1.71)*
Liquidity	-0.05(-1.46)	-0.09 (-0.13)	-0.0002(-0.01)	0.06(3.22)***
Size	0.08(2.01)**	0.38(2.10)**	0.83(5.93)***	0.16(1.35)
Deposits	0.05(2.00)**	0.10(1.85)*	0.07(1.32)	0.06(2.76)***
CBR(-1)	-0.01(-1.76)*	-0.51(-1.73)*	-0.007(-4.63)***	-0.02(-1.21)
GDP	-0.24(-1.35)	0.06(0.16)	0.33(2.14)**	0.49(3.76)***
Inflation	0.11(0.61)	0.008(1.01)	0.29(2.45)***	0.62(3.14)***
Capitalisation	0.65(9.48)***	-0.06(-0.59)	0.17(2.65)***	0.09(3.09)***
Loans(-1)	0.26(3.79)***	071(4.43)**	-0.01(-0.28)	0.30(1.62)
J_stats (P_value)	32.4(0.11)	7.72(0.90)	10.4(0.94)	19.7(0.47)

Note: For all the coefficients, the t–statistics are in parenthesis; *, **, *** denote 10%, 5% and 1%, significance levels, respectively.

Deposit growth and size are the other significant bank specific factors both in the period before and during interest rate controls for medium sized banks. This is consistent with the argument that larger banks tend to be more competitive, both locally and internationally, and therefore operate in a more competitive market framework than the smaller banks who may be more localized and better able to exploit only regional monopoly positions. Such banks are more diversified,

have larger pool of funds available, have access to larger and more credit worthy corporate borrowers and have more resources for the development of advanced credit risk management and evaluation system. The positive relationship between deposit growth and credit growth signifies the importance attached to deposit growth as a source of funding for medium sized banks unlike large banks where deposit mobilization is not necessarily the main driver of lending.

Whereas capitalization is significant with the expected sign during the two periods, the coefficient for size is only significant before caps for small banks. Deposits are significant in influencing loan advances during the period of interest rate controls. This is associated with the argument that small banks had already lost some credit lines from other banks following the placement of the three banks under receivership. In this case therefore, deposits constituted a major source of liquidity for small banks.

Inflation and GDP are significant in explaining lending by small banks and not for large and medium banks. These results imply that demand factors are important in determining credit provided by small banks. Whereas the relationship between the CBR and credit growth is negative and significant for medium banks, the coefficient is not significant for small banks during the interest rate capping period. Assessment of all the results in relation to the impact of the CBR show that only medium sized banks continued responding to changes in policy rate even during the interest rate control period while the policy rate lost its significance for small and large banks. During the capping period, large banks responded to policy changes in a manner contrary to expectation while the response of small banks was not significant. Generally, it is evident that the lending behaviour of large banks has a strong influence on the overall lending behaviour of the aggregate banking sector in Kenya, thus any policy targeting them can enhance loan growth.

6. Conclusions

The focus on credit risk intensified in Kenya following regulatory changes, compliance with international standard requirements and a rapid evolution of the market structure with implications on commercial banks. Commercial banks have experienced an environment buffeted by simultaneous occurrence of conditions directly affecting their business models and necessitating a need to collaborate with non-bank actors in their business activities. For instance, commercial banks responded to the introduction of interest rate controls and implementation of IFRS 9 by tightening credit standards and adopting a cautious

lending strategy. This was partly manifested in low credit growth to the private sector. While acknowledging that many factors affect loan growth, this study examined the relationship between credit risk and loan growth in the light of a rapidly changing financial, regulatory and market environment under which commercial banks are operating.

The study used bank level panel data covering the period 2009-2018 to establish the impact of credit risk on loan growth by bank tiers, in the period before and during interest rate controls. Generally, the results show that bank specific factors, mainly bank size, capitalization and non- performing loans are important in explaining loan growth for all banks in both periods while demand factors, that is, inflation and GDP are not significant in explaining loan growth. At an aggregate banking sector level, the policy rate is significant in explaining loan growth before caps but it bears a perverse sign in the period during interest rate controls. At a disaggregated level, the results for large banks mimic the findings of all banks except for the coefficient of liquidity in which, the large banks exhibit a behaviour of preferring to hold large liquid assets rather than utilizing them for lending to the private sector.

The results for medium sized banks show that credit risk is not the most important factor in lending decisions but rather bank size and deposit growth. Unlike large and small sized banks, the impact of the policy rate remains unchanged for medium sized banks in the period before and during interest rate controls. This is the only bank category in which policy changes have had the expected effect on loan growth. The nagative impact of policy rate on large banks during the interest rate controls period imply that the interest rate controls that were intended at supporting loan growth resulted in a perverse outcome. This can be attributed to the fact that banks tightened credit standards resulting in rationing of loans to borrowers that were perceived to be risky. This result reveals that interest rate controls complicated pricing of risk with further adverse implications on loan growth during periods of monetary policy easing. Moreover, monetary policy was effective across all bank tiers before the interest rate controls, but was largely ineffective during the period of interest rate controls. The policy implication of this finding therefore, is that a flexible interest rate policy regime provides better loan growth outcomes than controlled interest rate regimes.

Credit risk, inflation and economic growth are important for loan growth for small banks before and during the interest rate caps. However, liquidity and deposit growth are only important for small banks during the capping period,

partly explained by the elevated risk perceptions on the small banks due to the unique market conditions prevailing during the period under study. The impact of policy changes on loan growth is not significant during the capping period for small banks.

The findings of this study imply that strategies to reduce non-performing loans such as formulation of differentiated requirements for borrowers in particular groups in accordance with their specificity, appropriate determination of risk appetite of borrowers and usage of informal means to obtain extra information on borrowers would be beneficial to loan growth. In addition, the strong influence of large banks on the banking industry imply that policy interventions focusing on bank specific factors and bank tier specific issues such as reduction of non- performing loans and tier targeted policies would increase loan growth alongside the industry-wide policies. These findings also suggest a need for a deeper understanding of the behaviour of medium sized banks whose response to monetary policy seems to have been largely maintained in the period before and during interest rate controls. The results confirm the challenge of skewed liquidity in the banking system particularly for small banks where liquidity is one of the highly significant variables affecting loan growth.

This study's results provides useful insights on the implications of interest rate controls on credit growth besides establishing the differences in responses of commercial banks to credit risk based on their sizes. This information is important for policy makers who may be interested in understanding tier specific determinants of credit growth for purposes of implementing targeted policies. This study also provides useful information that can enlighten choices between controls and liberalized policy regimes on credit allocation that can be utilized even for other countries considering such options. The study is useful to the academic fraternity as it forms additional empirical literature with new insights on credit risk-loan provision nexus for future academic work. The study also reveals a need for further work on determinants of credit risk across bank tiers in Kenya as an important variable in loan growth models. It may also be useful to understand whether foreign or local ownership of banks matters in credit risk management and hence loan growth. This is important especially for developing markets where foreign banks are significantly present or rapidly penetrating while at the same time local banks are growing to replace previously state-owned banks.

Biographical Notes

Roseline Nyakerario Misati works as a Researcher with the Central Bank of Kenya. Her main responsibilities involve analytical and technical analysis on monetary policy, modelling and economic and policy research. She has previously worked with different government ministries for ten years, including Ministries of Finance, National Planning and Agriculture and the Kenya Institute for Public Policy Research and Analysis (KIPPRA). She has also worked as a guest lecturer at the University of Nairobi and a Senior Researcher in the African Institute for Remittances. Roseline holds a PhD in Economics. Roseline has conducted multidisciplinary research in areas of financial development, monetary policy, economic growth and fintech. Some of her audiences include universities, commercial banks, practitioners in the financial sector and central bankers.

Anne W. Kamau is an Economist at the Research Department of the central bank of Kenya with over 10 years' experience in central banking - specifically in monetary policy, Economic Modelling and forecasting. Her policy and banking career, have been enriched by her experience in high level public policy engagements, at the Executive office of the President of the Republic of Kenya and internationally at the Brookings institute based in Washington DC. Prior to joining the Bank she worked for a commercial bank, progressed to a government think tank – Kenya Institute for Public Policy Research and Analysis, where she was engaged in Economic policy modelling, research and providing public policy advice to key government officials. Anne has published several journal, discussion and working papers, policy briefs and policy opinions. She also features in several topical podcasts. She holds a PhD in Economics from the University of Nairobi.

Samuel Tiriongo is currently an Economist at the Central Bank of Kenya attached to the Secretariat of the monetary policy committee. His role is to conduct research and analysis targeted at informing monetary policy decisions. He has been involved in various research assignments that have shaped discourse, having published widely in peer reviewed research outlets on market microstructure, economic responses to crises, monetary policy communication, trade issues and credit market analyses, among other areas. Tiriongo holds a PhD in Economics of the University of Dar es Salaam –Tanzania, and has been a research fellow of the African Economic Research Consortium since 2016.

Maureen Were holds a PhD in economics. She has published research papers on various pertinent macroeconomic issues. She is currently a Research Fellow

at the United Nations University-World Institute for Development Economics Research (UNU-WIDER) in-charge of the UNU-WIDER collaborative research project with the Institute of African Leadership for Sustainable Development (UONGOZI Institute) in Tanzania. She is on leave of absence from the Central Bank of Kenya where she has worked since 2008. Previously, she worked at the Kenya Institute for Public Policy Research and Analysis (KIPPRA), Egerton University and Institute of Policy Analysis and Research (IPAR). Her research interests include macroeconomics, trade, financial sector, development economics and gender perspectives.

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Appendix 1

Dynamic Panel Data (DPD) estimation method

For purposes of illustration, an autoregressive, AR(1) model specified as follows is considered:

$$y_{i,t} = \gamma y_{i,t-1} + \beta' \chi_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where $y_{i,t}$ is the dependent variable, $x_{i,t}$ is a vector of explanatory variables, μ_i is the country specific time-invariant effect and $\varepsilon_{i,t}$ is the normal error term. In addition, it is assumed that $E[\mu_i]=0$, $E[\varepsilon_{i,t}]=0$ and $E[\mu_i \varepsilon_{i,t}]=0$ for all i=1,…, N and t=2,…,T.

The inclusion of a lagged dependent variable on the right hand side of the equation to be estimated renders Ordinary Least Squares (OLS), Fixed Effect (FE) and Random Effect (RE) estimators biased. This is because the lagged dependent variable is correlated with the error term. Instrumental estimators are used to solve the bias problem. The instrumental estimators approach was pioneered by Anderson and Hsiao (1982) and later modified by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The evolution of the instrumental estimators is discussed below.

Anderson and Hsiao Estimator (AH)

Anderson and Hsiao (1982) suggested first differencing the dynamic models to get rid of the individual effects and using $\Delta y_{i,t-2}$ as an instrument or using second lag differences as instruments. These instruments will not be correlated with the differenced error term so long as the error terms are not serially correlated.

However, Arellano (1989) found that the estimator that uses differences, $\Delta y_{i,t-2}$ rather than levels, $y_{i,t-2}$ for instruments has very large variances over a significant range of parameter values.

Generalized Method of Moments (GMM)

Arellano and Bond (1991) developed the GMM estimator, in which case the orthogonality conditions that exist between lagged values of $y_{i,t}$ and the disturbance term are utilized to obtain additional instruments. Moreover, they argued that the differencing proposed by AH imposes a moving average (1) structure on the error term even when the errors originally were not correlated over time. Thus the GMM is more efficient than AH estimator because it avails the following additional moment restrictions:

$$E\left[y_{i,t}\,\Delta\varepsilon_{i,t}\right]=0, \text{ for } t=3,\ldots,T \text{ and } s\geq 2 \quad (3)$$

$$E\left[x_{i,t-s}\,\Delta\varepsilon_{i,t}\right]=0, \text{ for } t=3,\ldots,T \text{ and } s\geq 2 \quad (4)$$

In this case, since lagged values of the explanatory variables are not correlated with the first differences of error terms, it is suggested that, the lagged levels of x and y can be used as potential instruments to estimate the first differenced equation.

Appendix 2

Descriptive Statistics

The table below presents the descriptive statistics. The statistics show the variables of NPLs, Liquidity, size and capitalization used in the analysis have a skewness above zero (positive), implying a right handed tail, larger than the left-handed tail. Symmetric distribution is observed for NPLs and Liquidity for medium sized banks whose skewness is close to zero. All variables show a kurtosis above 3 implying the dataset has heavier tails than a normal distribution. The standard deviation indicates data points spreading over a large range for values for large banks, followed by all banks and medium banks category. Small banks indicate observation that are close to the mean. In general, the means show that large banks dominate with highest levels of NPLs, liquidity, capitalization and size as expected.

TABLE: DESCRIPTIVE STATISTICS

Measure	**Bank Category**	**NPLs**	**Liquidity**	**Size**	**Capitalization**
Std. Dev.	Small banks	928.8	0.3	6166.0	5176.6
	Medium banks	6009.0	0.2	39832.9	33642.9
	Large banks	16354.3	0.1	118569.1	102996.9
	All banks	9849.8	0.3	74558.2	61660.5
Skewness	Small banks	2.2	7.9	1.4	2.0
	Medium banks	0.9	0.1	1.5	2.1
	Large banks	1.2	1.0	1.1	1.4
	All banks	3.2	7.6	3.1	3.5
Kurtosis	Small banks	11.3	142.7	5.0	10.3
	Medium banks	8.9	3.8	5.4	8.0
	Large banks	4.0	3.3	4.0	4.5
	All banks	16.0	172.5	14.6	17.9
Jaque-Bera	Small banks	15151.2	3237471.0	2001.7	11857.5
	Medium banks	4120.5	67.3	1624.3	4531.4
	Large banks	432.0	250.9	360.7	621.5
	All banks	72247.3	9473076.0	60048.5	93589.2