MACROECONOMIC DEVELOPMENTS AND BANKS' BEHAVIOUR IN KENYA: A PANEL DATA ANALYSIS

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Abstract

This paper examines the effect of macroeconomic developments on performance, credit quality and lending behaviour of banks in Kenya, by estimating a dynamic panel data model using Generalized Method of Moments. The paper finds banks' behaviour to be largely influenced by macroeconomic developments. During down turns, banks tend to lend less on account of increased credit risk, rationing credit as dictated by macroeconomic developments. The study suggests that banks need to continue pursuing risk sensitive loan pricing policies to ease the extent of procyclical/countercyclical behaviour during economic upswings/downswings respectively, which in turn reduces the chances of supply-driven credit crunch effects.

Keywords: "Credit Quality", "Macroeconomic Developments", "Banks' Behaviour".

JEL Classification: E02.

1. INTRODUCTION

The global financial and economic crisis has revived debate on the effects of macroeconomic developments on banks' behaviour. The crisis has affected the global real economy, which suffered from the deepest recession since the Great Depression of the 1930s. The ramification of the global recession has been fluctuations in macroeconomic variables for many countries in the world, including African countries. Macroeconomic and financial stability requires an understanding of the extent to which banks are affected by the macroeconomic environment. In particular, to ensure macroeconomic and financial stability, it is important to understand the influence of macroeco-

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nomic developments on banks' behaviour in order to ensure appropriate precautionary actions are taken in good or bad times. Banks earning performance and the probability of banking system distress depends not only on the conduct of business within banks largely associated with microeconomic factors, but also on macroeconomic factors. Macroeconomic developments therefore influence the behaviour of banks. In Kenya, as in most developing countries, the banking sector has remained resilient to the global financial crisis. However, Kenya's economy has been hit in the last couple of years by multiple shocks, including the post election violence, the high world oil and food prices, drought and the global financial and economic crisis. These shocks have impacted adversely on Kenya's macroeconomic stability. It is now urgent and more relevant to understand whether there are under currents of these multiple shocks being transmitted indirectly through macroeconomic variables to the banking sector in Kenya.

The very nature of banking activities exposes them to many potential sources of distress rooted in macroeconomic developments. Banks are characterized by an over reliance on creditors' funds (deposits), low capital ratios compared to the corporate sector, risky claims on different sectors of the economy, and their assets are in effect longer-term and less liquid than their liabilities (Laeven and Majoni, 2003). As a consequence, banks' health reflects to a large extent the health of their borrowers, which in turn reflects the health of the economy as a whole. Macroeconomic developments and policies therefore influence, to a great extent, the health of the banking sector. In addition, the probability of systemic crises is greater when unsoundness is due to macroeconomic factors, since all banks are more or less exposed to the same conditions. Indeed, banks health can be guaranteed not only by individual bank micro health but also by understanding if and to what extent they are affected by the macro-economy and if there are second round effects.

Certain macroeconomic variables typically display distinctive pattern (boom and bust pattern). Generally, the pattern is that of a rapid end to a boom: after rising rapidly, real GDP and domestic demand decline; acceleration in inflation is suddenly reversed; credit from the banking system to the private sector builds up rapidly, peaks, and then contracts; real interest rates increase steadily, etc (Bikker and Hu, 2002). The resultant business cycles may influence banks, necessitating the need for strengthening surveillance during recessionary phases when banks' are likely to be more fragile. However, when banks' reaction to macroeconomic shocks worsens the effects of the recession, it is appropriate to establish rules aimed at alleviating the procyclicality of banks' operations. During periods of economic expansion,

firms' profits increases, asset prices rises and consumer expectations become more optimistic. As a consequence, aggregate demand expands leading to growth in bank lending, while the economy indebtedness rises. Banks in the process may underestimate their risk exposures, relaxing credit standards and reduce provisions for future losses. After the peak and the downturn sets in, individuals' and firms' profitability deteriorates, leading to poor quality borrowers and an increase in non-performing loans, thus causing losses on banks' balance sheets – cyclicality. In addition, the erosion of profitability of firms and individuals may have resulted from a fall of asset prices that, in turn, further affects customers' financial wealth and depresses the value of collaterals. Economic downturn is often accompanied by a fall in employment, which directly reduces households' disposable income, further affecting their ability to repay debts. Banks' risk exposure increases, and consequently raises the need for larger provisions and higher levels of capital, exactly when it is more expensive or simply not available. Banks may react by reducing lending, especially if they have thin capital buffers above the minimum capital requirement, thus exacerbating the effects of the economic downturn – procyclicality (Albertazzi and Gambacorta, 2009; Marcucci and Quagliariello, 2009).

In the literature[1], loan loss provisions and bad debts have been generally considered to be the main transmission channels of macroeconomic shocks onto banks' balance sheets. Loan loss provisions acting as an insurance against default affects both banks' profitability – since such provisioning represent a cost for the bank, and capital by reducing the book value of the assets. Dynamic provisions are set against expected losses on non-impaired loans justified on the grounds that by granting a loan, there is already a positive and measurable probability that the bank will incur losses due to the debtor's inability to honour his obligations. Dynamic and forward looking provisions allow the volume of bank capital to be related to the unexpected losses and hence limit the procyclical effects of provisioning. In such a case, loan loss provisions are used to stabilise bank earnings over time, by reducing/increasing the flow of provisions when performance worsens/improves. In practice, loan loss provisions are often backward-looking, as banks tend to underestimate future losses in periods of economic expansion because of disaster myopia (Guttentag *et al*., 1986), herding behaviour (Rajan, 1994) or because higher provisions are interpreted by stakeholders as a signal of lower quality portfolios (Ahmed *et al*., 1999).

[1] See for instance, Albertazzi and Gambacorta, (2009); Marcucci and Quagliariello, (2009); Laeven L. and Majoni G., (2003), among others.

The Central Bank of Kenya has lately been implementing a loose monetary policy aimed at expanding lending. Banks have also been reporting increased profitability and declining non-performing loans, over the recent past. However, banks have been cautious in responding to this policy direction by the Central Bank, citing to a great extent the inhibiting role of macroeconomic factors. An empirical examination of the influence of macroeconomic development on banks could assist in understanding this behaviour. In this regard, the paper contributes to the existing empirical literature on the topic in three different respects. First, there are various channels through which macroeconomic developments impacts a bank's behaviour, such as decreased demand for credit and stock market transactions; increase in provisions necessitated by the deterioration of existing loans; and in some cases a less favourable interest structure. All these channels imply that a lesser proportion of profit is added to capital and reserves, while at the same time it is harder to raise new capital on the stock market. In particular, this study empirically analyzes how performance (in terms of profits or return on assets), credit quality (in terms of credit risk measures namely, provision for bad debts or non-performing loans) and lending (in terms of credit growth) aspects of bank's behaviour are affected by macroeconomic developments, adopting a theoretical model that takes into account the persistent effects of these variables. Second, to capture the persistent effects requires the use of lagged endogenous variables as explanatory variables, which creates bias and inconsistency in most parameter estimates. Whilst there are a number of maximum likelihood and bias-corrected Within Groups estimators that have been proposed for dynamic panel data estimation, it is far from clear how these others are affected by the presence of measurement error and endogenous right-hand-side variables. This study uses the GMM method to address the problems of omitted variable bias, endogeneity, and unit root effects in the choice of instruments (Arellano and Bover, 1995). Third, the study focuses on a panel of all banks in Kenya. Most other studies in this field are for developed countries, with but scanty literature existing for African countries.

2. THE LITERATURE REVIEW

There is resurgence of empirical work investigating the impact of macroeconomic developments on banks behaviour in the recent past as a reaction to the vulnerability of banks to macroeconomic shocks (ECB, 2001; Albertazzi and Gambacorta, 2009; Laeven and Majnoni, 2003). Most studies on

this subject, however, are for developed countries, with little, if any, work done on African countries. Gambera (2000) using a bi-variate VAR to analyzes how economic development affects bank loan quality. The study finds that a narrow number of macroeconomic variables (namely bankruptcy filings, farm income, annual product, housing permits and unemployment) are good predictors for the problem loans ratio. Laeven and Majnoni (2003) analyze Banks' provisioning behaviour through the business cycle to verify whether Banks use provisioning for stabilizing their income. They find a negative relation between provisions, and GDP growth, suggesting that banks on average, smooth their earnings, but they create too little provision in good macroeconomic times. Banks provision during and not before recessions, thus magnifying the effects of the negative phase of the business cycle. The European Central Bank (2001) provides similar evidence that there is an almost simultaneous relationship between provisions and non-performing loans. Banks seem to record provisions only when credit risk actually materialises. On the relation between provisions and profitability, the study finds no clear evidence of income-smoothing.

Cavello and Majnoni (2002) observes a negative loan loss provisioning and banks' pre-provision incomes for the non-G-10 countries, which on average provision too little in good times and are forced to increase provisions in bad times. However, for the G-10 countries, they recorded that banks look further ahead or, as they call it, even out their profits rather than allow them to fluctuate more strongly; thus during a cyclical boom, when net profits are high, they also make large provisions. Arpa *et al*. (2001) find a similar countercyclical behaviour for Austria. They examined the implication of macroeconomic developments on Austrian banks by estimating a distributed lag model over 1990-1999. They show that Austrian banks make more provisions for credit risk during recession and as net income rises, supporting the income-smoothing hypothesis.

Pain (2003) investigating the influence of business cycles on loan provisions finds that provisions exhibit some cyclical dependence. In addition, bank specific factors are also found to be relevant. In particular, mortgage banks provision less than commercial banks, since their loans are typically collateralized, suggesting that lending to riskier sectors is generally associated with higher provisions. In another study examining the procyclicality of banks' provisions for a panel of 26 OECD countries for the period 1979 to 1999, Bikker and Hu (2002) find a negative relationship for the coefficient of GDP growth and inflation, while unemployment rate has a positive relationship. Periods of higher net interest income are associated with higher provisions congruent to the income smoothing hypothesis. They argue that, even

if provisions go down in favourable (macroeconomic) times, banks tend to reserve more in good years (i.e. when profits are higher); as a result, banks are less procyclical than it would appear just looking at their dependence on the business cycle.

Analyzing the loan loss provisioning policy using a sample of 15 EU banks, Valckx (2003) finds that loan loss provisions are determined by GDP growth, interest rates and some bank specific indicators, both at sector level and for individual banks. Contrary to the ECB (2001) findings, Valckx (2003) finds a positive relation between income margin and provisions, supporting the income smoothing hypothesis for EU banks. Other than focusing on credit quality as the key indicator of bank fragility, some studies use profit and loss account ratios in analyzing banks' health over the business cycle. Gerlach *et al*. (2003), examine the effect of macroeconomic developments on profitability and asset quality of banks in Hong Kong. They find that small banks are more sensitive to macroeconomic shocks than larger ones, suggesting their larger exposures towards more risky firms that are more likely to be affected by the business cycle than larger banks.

Several studies examine the relationship between the business cycle and bank profitability. Demirgüç-Kunt and Huizinga (1999) relate bank profits to macro-economic indicators such as real GDP per capita. Based on aggregate data of the banking sector in a number of OECD countries, Bikker and Hu (2002) estimate the relation between bank profitability and real GDP growth. Albertazzi, and Gambacorta's (2009) study on the link between business cycle fluctuations and banking sector profitability for 10 industrialized countries finds a wide convergence on the levels of profitability of banking systems in the Euro area, but at a lower level compared to the US and UK, over the business cycle. They attribute bank profits pro-cyclicality to the effect that the economic cycle exerts on net interest income (via lending activity) and loan loss provisions (via credit portfolio quality). Noninterest income is found not to be significantly influenced by GDP changes, suggesting that, contrary to previous findings, revenue diversification contributes to the stabilization of bank profitability, while financial deepening seems to stimulate bank profitability. More recently, Wilko *et al*. (2010), analyzes the relationship between bank profitability and economic downturns for 17 OECD countries for the period 1979-2007. They find long-term interest rates from previous years to be important in explaining banks profitability, especially when economic growth (and hence, lending activity) is also relatively high. Bank profits behave pro-cyclically and that this co-movement is especially strong during severe recessions. Among the different profit components loan-loss provisioning is found to be the driver of this asymmetry.

Other studies relate lending to macroeconomic developments captured by GDP growth. Calza *et al*., (2006), Sørensen *et al*., (2009), Jiménez *et al*., (2009) all find bank lending to the private sector to depend strongly on GDP. Others find that loan losses increase during economic declines for a large panel of individual banks (Laeven and Majnoni, 2003; Bikker and Metzemakers, 2005; and Bouvatier and Lepetit, 2008). The negative co-movement of loan loss provisions is consistent with the findings by Quagliariello (2007), who also detects a positive relation between real GDP growth and the flow of new bad debt in a panel of Italian banks. Similar results were found by Salas and Saurina (2002), who analyzed the relation between problem loans and the economic cycle in Spain, over the period 1985-1997. They observe that banks increase lending during economic boom in an effort to increase their market share. In the process they end up lending to borrowers of lower credit quality. On the other hand, during a recessionary period the contemporary impact of an increase in bad loans is immediate. They concluded that macroeconomic shocks are quickly transmitted to banks' balance sheet. Besides measuring the effect of macroeconomic variables on problem loans faced by banks, a rich literature shows that macroeconomic variables explain part of the variation in default rates (Jacobson *et al*., 2005; Castrén *et al*., 2010; and Duffie *et al*., 2007). Marcucci and Quagliariello (2009) stress that researchers have not explored the possibility of asymmetric effects of bank credit risk during the business cycle. They fill this gap by means of a dataset with Italian banks' borrowers' default rates. They find evidence that the relation of the output gap and default rates is subject to a regime switch, such that the effect of the business cycle on the probability of default on bank loans is significantly more pronounced during severe economic downturns.

In summary, the empirical literature indicates that for some countries, good economic conditions positively affect the quality of banks' portfolios as captured by some measures of credit quality while business cycle affects bank profitability. Besides, there is some evidence that banks tend to use loan loss provisions to smooth their income, provisioning more when earnings increase. However, it also happens that they do not make enough provision in good macroeconomic times (i.e. when GDP and loan growth are high). Therefore, when economic conditions reverse, loan losses start to emerge, provisions rise, profitability decreases and credit supply tends to decrease, thus amplifying the effects of the recession. The mixed results from the literature therefore support further country specific empirical studies, especially for developing countries where such studies are still scarce or completely lacking.

3. EMPIRICAL ANALYSIS

3.1. Sample and Variable description

The Central Bank of Kenya (CBK) is the main source of bank level data. CBK, as the regulator of the banking sector, has been collecting data on banks financial statements. This study uses quarterly data for the period 2000 Quarter 4 to 2009 Quarter 4, since data at individual banks' levels does not exist before this period. For bank specific variables, Bank balance sheet and profit and loss accounts statements were utilized. Bank Scope data base which could have made the data collection process much faster and easier is currently not accessible. Macroeconomic data is sourced from Kenya Government Publications including various issues of the Economic Survey and Statistical Abstracts, supplement by the World Bank Development Indicators (WDI) and IMF International Financial Statistics (IFS), among others. To ensure data consistency, data is first sourced from Kenya official sources, while the others sources are only consulted when data is lacking from the local official compilers, over the study period.

The Kenya banking sector has witnessed the presence of 50 commercial banks which operated at different times over the study period. This study uses a sample of 42 commercial banks, since data on the other eight is not complete following collapse, mergers or late entry into the sector[2]. The banking sector has undergone significant transformation and expansion in the last decade, with most of the surviving banks' performance indicators showing an upward trend over the years. The asset base has increased from Kenyan Shillings - Ksh 439 billion in 2002 to Ksh 771billion in 2009 and the deposit uptake has moved from Ksh 347billion and hit the Ksh 1 trillion mark during the same period. The rapid growth in the asset and deposit base indicates expansion of the banking sector where more Kenyans are getting access to banking services. Further, these developments have been backed up by increased use of technology by commercial banks in the provision of services and competition. The branch network has grown significantly in the last one year, with 109 branches opened in the years 2008 to 2009 signifying increased financial inclusion. The industry however continues to show oligopolistic tendencies with six large banks dominating the sector. As at end of October, 2010, the six largest banks controlled 56 percent of gross

[2] The following banks did not have complete data over the study period, Akiba, First American Bank, First Community Bank, IDB, Prime capital, Daima, Gulf African Bank, UBA Bank.

assets, 55 percent of the total deposits, 56 percent of net loans and advances, 57 percent of total capital and 53 percent of profit before tax on the entire banking sector.

The variables to be used for estimation include the Bank Specific variables, macroeconomic factors and monetary and financial conditions indicators. Below are the descriptions of the variables under each category.

Bank specific variables include

(a) Loans (as a share of total assets) or credit growth denoted as **loansg**
As a measure of the relative size of lending, credit growth is expected to have a positive relationship with profitability, since lending generates interest income. However, lending also entails operational costs and credit losses, which if not adequately factored in the price of credit (i.e. the interest rate) may lead to losses and ultimately a decline in profits. The growth of performing loans for each bank is expected to have an ambiguous relationship with credit quality. During an economic boom, it may be negatively related with loan loss provisions reflecting improved credit demand. However, during a slow down, credit growth may be positively related with loan loss provision reflecting an aggressive credit supply policy by the banks that, in turn, entails the exposure to excessive risks and higher future provisions.

(b) Core Capital to Risk Weighted Assets denoted as **CCTRWA**
Capital to Risk-Weighted Assets constitute the "own funds" or core capital of a bank or its solvency. This variable has an ambiguous relationship with profitability, since on the one hand; more capital is associated with high returns, especially for high risk investments, so that a positive coefficient may be expected, depending on the degree to which risk pays off. On the other hand, when returns on equity constitute profits, then a relatively small capital may leverage high profits, and one should expect to see a negative coefficient. CCTRWA is expected to be positively related to lending.

(c) Return on Assets - ROA, Profit before tax denoted as **ROAs**
The two variables are used to measures banks' performance and efficiency in using their assets. They are also used to test whether banks use provisions to smooth their income. A positive relationship would mean that the income-smoothing hypothesis holds.

Macroeconomic factors

(d) Cyclical indicators

The position of the cycle determines the earnings power of the public and private sectors, and hence influences their debt servicing capability. When nourished by excessive borrowing, buoyant production and demand growth can turn out to be the first phase of a boom-bust cycle, whose second phase is a sharp downturn which often causes debt servicing problems for borrowers. In the boom phase, debt servicing problems are comparatively rare, due to the exceptional earnings quality which tempts loan officers and bank managements to underestimate the riskiness of their business and reduce the margins of safety. Buoyant economic growth in combination with declining interest rates spreads gives a strong hint that such risky (mis)behaviour is widespread. A swift and sharp decline in production, investment and consumption growth weakens the debt servicing capability of borrowers due to the declining financial surpluses of firms and reduced income growth of households. In addition, the value of collateral (equity and real estate) usually falls considerably in an economic slump, thus diminishing borrowers' secondary means of servicing their debt. The accompanying fall in the value of collateral may aggravate the problems of adverse selection and moral hazard.

Several variables have been used to proxy business cycle in the empirical literature (Jacobson *et al*., 2005; Castrén *et al*., 2010; Duffie *et al*., 2007; Gambera, 2000; Marcucci and Quagliariello, 2009). Some of these variables used as indicators of the general economic activities include GDP growth, investment changes, and consumption changes. Real GDP growth is the main and most direct indicator of aggregate economic activity. As a determinant of banks profits, real GDP growth captures the demand for banking services, including the extension of loans, and the supply of funds, such as deposits. However, a number of studies show that banks do not provision in good times, leading GDP growth to be inversely related with loan loss provisions. Exceptional growth rates may indicate a boom preceding a bust while sharply decelerating growth rates point to an increased likelihood of approaching debt servicing problems. Asset quality and earnings are expected to improve with income growth and to deteriorate with income contraction. This paper uses real GDP growth denoted as **RGDPG** as a proxy for business cycles.

(e) Unemployment (%) denoted as **Ug**

Although unemployment does not directly influence profitability, in the

short-term it reflects the business cycle, while in the long term it captures the structural disequilibrium in the economy. In addition, unemployment is a measure of the current phase in the business cycle, whereas a figure like GDP growth merely indicates the degree of change in the business cycle (Bikker and Hu, 2002). As a variable in the loan loss provision model, the unemployment rate variable is used to capture its influence on the income of households and, in turn, their debt servicing ability which may mean higher provisioning.

(f) Inflation (%) denoted as **OINF**
Inflation in the economy affects real values of assets, family and business spending, nominal interest rate, and share prices. For instance, high inflation rates lead to high nominal interest rates and will eventually lead to high real interest rates, reducing the profitability of credit-financed investment projects. On the other hand, rising inflation may temporarily reduce the real value of (fixed) interest payments by firms, thus increasing profitability for a certain period of time. In general, however, high rates of inflation may proxy for macroeconomic mismanagement, which adversely affects the economy and the banking sector.

Monetary and financial conditions indicators

The general monetary and financial conditions in an economy determine to some extent the health of the banking sector. More often, deteriorating monetary and financial conditions causes systemic banking crisis. Some of the basic indicators of monetary and financial conditions used in this study include:

(g) The Nairobi Stock Exchange (NSE) Index (% change) denoted as **NSEIG**
The Nairobi Stock Exchange Index is used as a proxy for the state of health of financial markets. It captures the fact that share prices reflect expectations on businesses' financial positions and future economic growth (Berk and Bikker, 1995; Arestis *et al*. 2001). Financial markets often show a boom and bust pattern where the bullish phase might precede a sharp decline of asset prices. As such, the NSE Index will be used as an indicator of (expected) cyclical development in the financial sector.

(h) Real money supply (M3; % change) denoted as **M3g**
The real money supply is obtained by deflating M3 with the GDP deflator. Money supply reflects the availability of money which makes possi-

ble money creation by banks through lending. At the macro level, growth of money supply brings about real growth and hence is an indicator of future growth potential (see Boeschoten *et al*. 1994; Berk and Bikker, 1995). However, excess sustained money supply growth causes the economy to overheat, causing inflationary pressures while decelerated money growth may be a sign of recession and deflationary effects in the economy and/or it can be the result of a restrictive monetary policy stance.

(i) Interest rates differential between Long-term interest rate (5 year government bonds) and Short term interest rates (91 day Treasury Bill rate) denoted as **intdif**.
Investment project decisions are long term in nature, and depend on the long-term interest rate. Such loans are based on the long term rate that is mostly based on long term government bonds returns. Beside the direct effect of such returns on bank profits, there is the indirect interest effect, caused by the (negative) long-term influence of the long-term rate on economic growth. The long-term interest rate affects the return on bank securities, and therefore imposes a market risk on the sector.

The correlation coefficients and summary statistics of these variables are shown in Tables 1 and 2 respectively. Table 1 shows that all selected variables have a positive significant correlation coefficient with highest significant coefficient correlations being between profits, broad money (M3), advances with RGDP of 84, 91.3 and 90.1 percent respectively. Further, the correlations indicate that the variables selected are suitable for this estimation, as they have some form of relationship with each other.

Table 1: Correlation Coefficient

	RGDP	ROA	PROFITS	NSEI	M3	ADVNS
RGDP	1					
ROA	0.73914	1				
t-Statistic	5.702139					
PROFITS	0.84478	0.474085	1			
t-Statistic	8.203113	2.797819				
NSEIG	0.603997	0.690113	0.359776	1		
t-Statistic	3.937911	4.954993	2.003617			
M3	0.913044	0.77356	0.798234	0.424517	1	
t-Statistic	11.63218	6.342731	6.885978	2.43628		
LOANSG	0.901481	0.737905	0.787339	0.382631	0.992797	1
t-Statistic	10.82261	5.681201	6.635837	2.15197	43.05702	

Source: Authors computation.

Table 2 below presents the summary statistics of some selected variables. The descriptive statistics show that the selected variables are normally distributed with a skewness of close to zero with exception of inflation that has a skewness of 1, and kurtosis is mainly leptokurtic with a value of close to three for most variables.

Table 2: Summary Statistics of some selected variables

	COD	RGDP	ROA	PROFITS	NSEIG	M3	OINF	LOANSG
Mean	2.805634	308406.9	2.60852	17437.8	3650.994	649627.7	7.437241	465340
Median	2.7904	312996	2.7245	13424	3521.18	605238.1	6.42	444286
Maximum	4.1649	360875	3.6036	48733	5645.65	1045657	18.64	771766
Minimum	1.3946	246466	0.9653	3324	1362.85	404805.5	1.96	276803
Std. Dev.	0.691836	34252.5	0.57751	12423.1	1194.382	194692.2	4.740268	153646
Skewness	-0.58536	-0.0637	-0.55636	0.93245	-0.023344	0.476219	1.101791	0.53873
Kurtosis	3.131179	1.798859	3.51162	2.89998	2.027283	1.97177	3.345618	2.1065
Jarque-Bera	1.676894	1.762924	1.81236	4.21453	1.145932	2.373647	6.011733	2.36746
Probability	0.432382	0.414177	0.40406	0.12157	0.563851	0.305189	0.049496	0.30613
Sum	81.3634	8943799	75.6471	505695	105878.8	18839203	215.68	1.3E+07
Sum Sq. Dev.	13.40182	3.29E+10	9.33849	4.32E+09	39943335	1.06E+12	6.29E+02	6.61E+11

Source; Authors computation.

3.2 The Methodology

3.2.1 Theoretical Model

We investigate the influence of macroeconomic developments at three levels of bank behaviour. That is, the influence of macroeconomic variables on banks performance ratios as measured by profit or returns on assets; the influence of macroeconomic variables on credit risks behaviour measured by credit quality variables, namely non-performing loans or Provisions for Bad debts; and the influence of macroeconomic variables on banks' lending behaviour.

The theoretical model for the three interrelated bank behaviour, as developed by Cavello and Majnoni (2002), can be expressed as:

$$(1) \qquad \prod = L((r_f + E(dr) + r_p) - r_D) - BL - [\lambda E(dr)L - BL] =$$
$$L((r_B + r_p) - r_D) + (1- \lambda)E(d)\ L \text{ if } LLR > 0$$
$$L((r_B + r_p) - r_D) + (E(dr)\ L - BL) \text{ if } LLR = 0$$

While from this equation,

$$PLL = [\lambda E(dr)L - BL] \quad (2)$$

where $\prod$ is the bank profits, L is the loans amount, r_f the risk free interest rate, E(dr) the expected default ratio on loans, r_P the risk premium, r_D the funding rate, BL is loans losses and LLR loan loss reserves, and PLL is provision for loans losses.

The loan loss provisions $[\lambda E(dr)L - BL]$ are set equal to a fraction λ of the expected default ratio E(dr) minus the expected losses, as long as the loan loss reserves allow for this reduction. Bank profits are influenced by macroeconomic fluctuations through bank losses (BL), the demand for loans (L) and, probably, the levels of the interest rates. In principle, the expected default ratio E(dr) does not depend on the business cycle, but in reality it may be affected.

3.2.2 Empirical models and estimation technique

The theoretical model developed by Cavello and Majnoni (2002) forms the basis for most empirical studies[3]. The standard approach has involved using bank performance ratios; credit quality and lending variables as dependent variables regressed against key financial ratios and a host of macroeconomic variables to take into account systematic problems arising from an adverse evolution of the macroeconomic environment, either in the context of static or dynamic panel data analysis, distributed lag or cross sectional analysis. In other words, the general form of the empirical model can be expressed as:

$$Bank\ specific\ variable_{it} = bank\ specific_{it-j} + macroeconomic\ variables_{it-j} + \sum_{it}$$

where the bank data might be either at single bank or banking system level and the regressors either coincident or lagged. The specification can thus be a simple static model (i=1 and j=0), a distributed lag model (i=1 and j>0) or a panel (i>1, either cross-bank or cross-country). For most variables, lags will be introduced in the specification to understand the delay effects of the various macroeconomic variables on banks profits, loan loss provisions and lending policies. For example, a bank that has high non-performing loans one year is more likely to have high non-performing loans the next year be-

[3] For instance, see Laeven and Majnoni, (2003); Bikker and Metzemakers, (2005); and Bouvatier and Lepetit, (2008).

cause it takes time for borrowers to improve their cash flows and for banks to sever their relationships with customers who are in poor financial condition. All the variables used in this section are as described in section 3.1.1.

Banks' performance and macroeconomic developments

Adopting Cavello and Majnoni's (2002) theoretical model, the influence of macroeconomic developments on banks performance takes the following specific form:

$$(3) \qquad \prod_t = \beta_1 RGDPg_t + \beta_2 Ug_t + \beta_3 Oinf_t + \beta_4 NSEIg_t + \beta_5 M3g_t + \beta_6 loansg_t + \beta_7 Intdif_t + \beta_6 \prod_{t-1} + \beta_7 CCTRWA_t + \omega_t$$

where RGDPg is the growth rate of real GDP, Ug_t is the unemployment rate, $oinf_t$ is quarterly overall inflation, $NSEIg_t$ is the growth rate of the Nairobi Stock Exchange Index, $loansg_t$ is credit growth, $intdif_t$ is the interest differential (long term 5 year bond rate minus short term –91 day Treasury Bill rate), $CCTRWA_t$ is the core capital to total risk weighted assets ratio, $M3g_t$ in the growth in real money supply, ω_t is the error term and subscript t refers to time. The dependent variable $\prod_t$ is either returns on assets or growth in profit before taxes as a measure of a bank performance. Use of profits before taxes eliminates the distotionary effects of taxes.

Credit quality and macroeconomic developments

From the theoretical model of Cavello and Majnoni (2002) as expressed in equation (2), λ may fluctuate according to income smoothing hypothesis, since credit loss provisions are meant to absorb (expected) credit losses to avoid depressing the profits. However, credit quality of loans is expected to move up and down with the business cycle. Macroeconomic developments affect the provisions for loan loss through loans and actual loan losses. Including the main macroeconomic variables, the empirical model for credit quality behaviour for estimation will be:

$$(4) \qquad CQ = \beta_1 RGDPg_t + \beta_2 Ug_t + \beta_3 Oinf_t + \beta_4 loansg_t + \beta_5 \prod_t + CQ_{t-1} + \mu_t$$

Deterioration in loan quality and hence earnings are the primary reasons that banks become distressed. Most empirical studies use a measure of loan

quality as the dependent variable since credit risk remains the main source of instability for most banks. Either Provision for bad debts to total loans (PBDsL) or non performing loans to total loans (NPLsL) ratio is used as a measure of the credit quality (CQ) in the dependant variable.

Lending and macroeconomic developments

The theoretical model linking lending and macroeconomic fluctuations is based on the bank lending channel theory. The theory argues that lending depends on either demand or supply variables. For the demand side, the general form is:

(5) L^D = f (interest rate on loans, macroeconomic variables)

While credit supply depends on the interest rate on loans, banking-specific factors and expected profits given as:

(6) L^S = f (capital, interest rate on loans, expected profits, macroeconomic variables)

Solving (5) and (6), the model for lending with the interest rate on loans as equating price becomes:

$$(7)\quad Loansg_t = \alpha_1 RGDPg_t + \alpha_2 Ug_t + \alpha_3 Oinf_t + \alpha_4 NSEIg_t + \alpha_5 M3g_t + \alpha_6 Intdif_t / (\prod^E)_t + \alpha_7 CCTRWA_t + \in_t$$

Credit growth denoted by $Loansg_t$ or simply lending is defined as the change in loans divided by total assets. Expected profits variable ($\prod^E$) is proxied by actual profits before taxes, and may be used alternatively with an interest differential – the greater the differential, the more attractive lending becomes. It is worth noting that bank lending relates to credit quality since it could harm the banking sector especially if it leads to an eventual deterioration in banks' asset quality, amid the loan growth.

The presence of lagged endogenous as explanatory variables creates bias and inconsistency in most parameter estimates. Lagged variables of the dependent variables are used as explanatory variables to control for persistence in behaviour. The resultant lag structure means, for example, the provisions for bad debts variable in one period is likely to be related to that of the previous periods, since problem loans are not immediately written off. Whilst

there are a number of maximum likelihood and bias-corrected Within Groups estimators that have been proposed for dynamic panel data estimation, it is far from clear how these others are affected by the presence of measurement error and endogenous right-hand-side variables. The GMM method addresses the problems of omitted variable bias, endogeneity, and unit root effects in the choice of instruments (Arellano and Bover 1995). Therefore, this study applies the GMM estimators for dynamic panel data. The potential for obtaining consistent parameter estimates even in the presence of measurement error and endogenous right-hand-side variables is a considerable strength of the GMM approach in the context of empirical panel data estimation.

GMM estimation improves upon the issues that cross-sectional or time series data fail to address, such as potential endogeneity of the regressors, and controlling for country specific effects. GMM controls for multicollinearity and hence yields efficient and consistent estimates (Arellano and Bond, 1991; Arellano and Bover, 1995; and, Blundell and Bond 1998, among others). The GMM estimator is less susceptible to the multicollinearity problem by giving less weight to observations that have high variances or are highly correlated. The problem of multicollinearity is less likely since explanatory variables vary in two dimensions (cross sectional and time series dimensions), while the availability of large number of data points in panel GMM estimation help in reducing the problem of limited degrees of freedom and enhance the efficiency of the estimators. GMM estimation enables researchers to address questions of intertemporal behaviour of cross-sections. Hence multicollinearity is considered not a serious problem under GMM estimation.

3.3 Results

The results of one-step GMM estimator for the banking performance behaviour are presented in this section.

Banks performance and macroeconomic developments

Table 2 presents the estimation results using profit growth (profitg) as the measure of banks' performance. The lower part of the table shows the fitness tests. In dynamic panel data estimation, the choice of instruments poses a challenge of identification to GMM parameter estimates since the number of instrumental variables or restrictions may be less than/equal to or exceeding the

Table 2: Dependent Variable: PROFITG
Method: Generalized Method of Moments
Included observations: 1544 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	16.31774	7.039202	2.318124	0.0206
NSEIG	6.067306	2.106608	2.880130	0.0040
M3G	6.903445	3.634551	1.899394	0.0577
LOANSG	16.66459	5.830228	2.858309	0.0043
INTDIF	0.024438	0.066878	0.365417	0.7149
PROFITG(-1)	13.04304	5.692263	2.291364	0.0221
OINF	-17.77763	4.839934	-3.673114	0.0002
Ug	0.174518	0.298781	0.584100	0.5592
CCTRWA	6.043751	3.207187	1.884440	0.0597

R-squared	0.8852856	Mean dependent var	2.077992
Adjusted R-squared	0.8903940	S.D. dependent var	2.633253
Durbin-Watson stat	2.035162		
J-statistic	4.94	(p>0.99, df = 14)	

number of coefficient to be estimated[4]. For GMM parameter estimates to be robust against autocorrelation and model misspecification, a standard J-test for the validity of the overidentifying restrictions is reported for all the models[5] The J-statistic of the Hansen test for overidentifying restrictions is chi-square (χ^2) -distributed. In Table 2, the J-statistic, is insignificant and hence cannot reject the overidentifying restrictions[6]. The insignificant J-statistic therefore confirms the validity of the instrument in the model in Table 2. Although not normally emphasized in panel data analysis, the R-squared and adjusted R-squared are reasonably high, while Durbin-Watson statistic indicates no autocorrelation, and hence all the statistics support the fitness of this model.

Congruent to other studies (e.g. Bikker and Hu, 2002), the real GDP growth show a positive and significant coefficient, indicating the strong correlation between banks performance and economic growth which could be

[4] See Arellano and Bover (1995), and Blundell and Bond (1998) for the main challenges of dynamic panel data estimation.

[5] See Hansen (1982) pioneering work for more on the J statistic.

[6] In all the models, the p – value is determined from the chi-square distribution tables based on the degrees of freedom and the J – statistic generated by the estimation process.

explained by improved demand conditions during good times.

As expected, the results show a positive and significant relationship between credit growth (loansg) and banks' performance. This suggests that banks are able to cover costs associated with loans and still ride on good profits. This might be explained by the oligopolistic structure of banking sector in Kenya and the subdued competition from the capital market, leaving banks as the main source of credit in financial sector in the country. As expected, previous profits growth [profitg(-1)] show a positive relationship with current profits. The inflation variable (Oinf) has a significantly negative relationship with bank profitability. This suggests that uncertainty and risks increase during periods of high inflation, leading to risk aversion in lending, which in turn translate into reduced profits for banks.

The coefficient on core capital to Risk-Weighted Assets (CCTRWA) is significantly positive, suggesting the important contribution of CCTRWA as a free source of finance for banks in Kenya. In other words, this relationship shows that high-risk credit portfolios carry a significantly lower profit margin. In other words, the extra-profit margin on high-risk loans does not compensate for the losses suffered from the additional risk. The positive NSEIg coefficient possibly depicts the fact that the demand for banking services depends partly on the developments of a vibrant stock market. A positive relationship with real money balances (M3g) suggests the important role money plays as a source of wealth and profits for individuals and banks. Hence growth in money supply seems to support growth in Kenya over the study period. The interest differential (intdif) variable and unemployment growth (Ug) variables are not significant. The insignificant relationship between interest differential and banks' profitability is rather unexpected possibly suggesting that banks also rely on other sources of income to counter declining interest earnings. This suggests room for cross subsidization where banks can move away from interest income to other banking services.

Table 3 shows the results of the same model using return on assets (ROAs) variable as the measure of bank performance. In general, the two measures of banks performance give similar results as depicted in Tables 2 and 3. The ROAs lagged one quarter supports the persistent effects of bank earnings.

In Table 3, the J-statistic, which tests the overidentifying restrictions (more instruments than parameters), is insignificant and hence confirms the validity of the instrument used in the model. The R-squared and adjusted R-squared are also reasonably high, while the Durbin-Watson statistic indicates no autocorrelation. Hence, the fitness statistics support proper model specification.

Table 3: Dependent Variable: ROAS
Method: Generalized Method of Moments
Included observations: 1552 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	0.789253	0.337512	2.338447	0.0195
NSEIG	0.080759	0.030934	2.610695	0.0091
OINF	-0.899824	0.153725	-5.853449	0.0000
M3G	0.314732	0.161160	1.952918	0.0510
LOANSG	0.799564	0.334629	2.389406	0.0170
INTDIF	0.074515	0.066775	1.115918	0.2646
UG	0.040453	0.069949	0.578324	0.5631
CCTRWA	0.070115	0.034411	2.037558	0.0418
ROAS(-1)	0.923437	0.125573	7.353766	0.0000

R-squared	0.7277314	Mean dependent var	2.077992
Adjusted R-squared	0.7320230	S.D. dependent var	2.633253
Durbin-Watson stat	2.036042		
J-statistic	8.41	(p>0.900, df = 14)	

Credit quality and macroeconomic developments

Table 4 and 5 reports the empirical relationship between credit quality behaviour of banks, as measured by provision for bad debts (PBDSL) and non-performing loans (NPLSL) to total loans ratios, and macroeconomic variables.

The model in Table 4 is supported by fitness tests, reported in the lower part of the table. The J-statistic is insignificant, confirming the validity of the instrument used in the model. The R-squared and adjusted R-squared are also reasonably high, while the Durbin-Watson statistic indicates no autocorrelation.

Table 4 indicates that provisions for bad debts rises when the growth rate of real GDP and profits falls, and loans rises. In addition, rising inflation is associated with an increase in provisions, since it increases risks and uncertainty which leads to higher risk provisions. The results show that provisions increase during depressions and decline during good times suggesting that banks tend to use provisions for bad debts to smooth their income. Previous period provisions have a significant positive relationship with current

Table 4: Dependent Variable: PBDSL
Method: Generalized Method of Moments
Included observations: 1548 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	-4.817987	1.737941	-2.772239	0.0056
UG	0.347960	0.261151	1.332412	0.1829
OINF	0.417039	0.127763	3.264170	0.0011
LOANSG	0.414296	0.064349	6.438238	0.0000
PROFITG	-0.168578	0.077126	-2.185752	0.0290
PBDSL(-1)	0.875201	0.411686	2.125894	0.0337

R-squared	0.8226561	Mean dependent var	2.077992
Adjusted R-squared	0.8274398	S.D. dependent var	2.633253
Durbin-Watson stat	2.034402		
J-statistic	6.29	(p>0.995, df = 17)	

Table 5: Dependent Variable: NPLSL
Method: Generalized Method of Moments
Included observations: 1548 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	-3.370748	1.697532	-1.985676	0.0472
UG	0.775845	0.920262	0.843070	0.3993
OINF	1.266204	0.387132	3.270727	0.0011
LOANSG	3.652908	1.631663	2.238764	0.0253
PROFITG	-0.494564	0.195452	-2.530366	0.0115
NPLSL(-1)	0.992108	0.017240	57.54817	0.0000

R-squared	0.903018	Mean dependent var	2.484313
Adjusted R-squared	0.912930	S.D. dependent var	3.541353
Durbin-Watson stat	2.064892		
J-statistic	5.304	(p>0.990, df = 15)	

period provisions which may suggest that credit risk exhibit persistence effects from one quarter to the next. The unemployment variable, however, is insignificant.

The model in Table 5 is supported by fitness tests, as reported in the lower part of the table. The J-statistic is insignificant, confirming the validity

of the instrument used in the model. The R-squared and adjusted R-squared are also reasonably high, while the Durbin-Watson statistic indicates no autocorrelation. Consistent with other studies, real GDP growth and profit growth are negatively and significantly related to non-performing loans, suggesting that during a cyclical downturn, banks set aside larger amount from already low profits as provisions (Albertazzi and Gambacorta 2009; Arpa *et al*. 2001). Inflation has a significantly positive relationship, suggesting that uncertainty during periods of high inflation disrupts economic activities and likely returns from investments, leading to higher non performing loans. A significant positive relationship with credit growth (loansg) means that the likelihood of having bad borrowers on banks' loan profiles increases with more loan advances, leading to higher non-performing loans. As expected, non-performing loans in the previous period have a significant positive relationship with current period non-performing loans.

Lending and macroeconomic developments

Table 6 report the results of bank lending behaviour and macroeconomic variables. As reported, the model in Table 6 is supported by fitness tests. The J-statistic is insignificant confirming the validity of the instrument used in the model. The R-squared and adjusted R-squared are reasonably high, while the Durbin-Watson statistic indicates no autocorrelation.

As expected, the coefficients on real GDP growth and real money supply are significantly positive. This suggests that lending is strongly dependant on cyclical developments of macroeconomic variables. This is consistent with the fact that banks are the main source of credit in Kenya, supported by strong lending demand. Lending fluctuates with macroeconomic variables, and appears to be driven by both demand and supply factors such as shortage of capital. The core capital to total risk weighted asset (CCTRWA) variable is significantly positive, implying that banks take supply considerations into account when extending credit in Kenya. That is, during cyclical down turn, there is some evidence of credit rationing as banks scrutinize borrowers more carefully by restricting lending, and vice versa.

The coefficient of the growth the Nairobi Stock Exchange Index (NSEIG) is significantly positive. A possible explanation is that increased lending could have supported enhanced stock market activity, as economic agents borrow from banks to invest in the stock exchange. Similarly, lagged lending coefficient is positive and impacts significantly on the current period lending, implying that lending has a persistence effect in Kenya. Consistent with

Table 6: Dependent Variable: LENDING
Method: Generalized Method of Moments
Included observations: 1553 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPG	33.94709	13.97488	2.429150	0.0152
UG	0.805844	5.229277	0.154102	0.8775
OINF	-6.139395	2.157480	-2.845632	0.0045
CCTRWA	1.480947	0.701355	2.111551	0.0349
INTDIF	-8.700929	5.413276	-1.607331	0.1082
M3G	28.31771	11.16275	2.536805	0.0113
NSEIG	77.54899	27.29180	2.841475	0.0045
LENDING(-1)	0.158409	0.042170	3.756406	0.0002

R-squared	0.7745348	Mean dependent var	2.077992
Adjusted R-squared	0.7790690	S.D. dependent var	2.633253
Durbin-Watson stat	2.032286		
J-statistic	7.81	(p>0.950, df = 15)	

the literature, banks in Kenya seem to learn from past lending experience by taking into account past behaviour of borrowers in determining current lending (Ahmed *et al*., 1999). Inflation impacts negatively on lending, possibly due to the risk averse tendency of banks during periods of high inflation, while unemployment growth and interest differential variables are insignificant. The insignificance of unemployment variable could probably be depicting the indirect effect on the banking sector of structural unemployment emanating from unbalanced and less favourable economic conditions.

4. CONCLUSION

This paper has shown that the behaviour of banks in Kenya is largely influenced by macroeconomic developments. During downturns, banks are less willing to loan money on account of increased credit risk, thereby reinforcing the cyclical downswing. Most cyclical variables have a significant effect on banks performance as measured by profit before tax or return on assets. In this regard, banks could be encouraged to pursue risk sensitive loan pricing policies in order to cover credit losses and the cost of capital require-

ments. This would mean that interest rates charged would discourage excessive risk taking during economic upswings (prevent procyclical behaviour). On the other hand, during economic downturn, such a policy would discourage banks from behaving countercyclically by preventing credit rationing. Such a policy improves the financial soundness of banks (Laeven and Majnoni, 2003).

Consistent with other studies, the paper finds that credit quality behaviour as measured by both provision for bad debts and non performing loans variables, also depends to a great extent on the development of macroeconomic variables (Arpa *et al*., 2001). During good times the counter cyclical behaviour of banks reinforces the cyclical nature of provisions. The results also indicate that banks in Kenya provision more for bad debts during periods of high profits. A policy where banks have surplus capital and provision enough to meet the minimum capital requirements even during economic downturn, should therefore be encouraged and supported. Banks should be more forward looking, and provision more in good times to even out profits later, rather than allow them to fluctuate violently. In addition, the paper also finds that the main credit supply variable, core capital to total risk weighted asset variable is significantly positive, implying that banks take into account supply consideration when extending credit in Kenya. That is, during cyclical downturn, there is some evidence of credit rationing as banks scrutinize borrowers more carefully by restricting lending, and vice versa. In this regard, banks in Kenya should be encouraged to pursue risk sensitive loan pricing policies in order to cover credit losses and the cost of capital requirements. This would go a long way towards easing the extent of procyclical behaviour during economic upswings and countercyclical behaviour during economic downswings, which in turn reduces the chances of supply-driven credit crunch effects. In general, the paper emphasizes the importance of macroeconomic developments in determining banks' behaviour, albeit the significance of microeconomic realities of individual banks, in the central banks' role as the supervisor of the banking system.

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Résumé

Ce document examine l'effet de l'évolution macro-économique sur les performances, la qualité du crédit et le comportement des banques au Kenya au niveau du prêt, en estimant un modèle de données de panel dynamique en utilisant le 'Generalized Method of Moments'. Cette étude conclut que le comportement des banques est largement influencé par l'évolution macroéconomique. Lors des virages vers le bas, les banques ont tendance à prêter moins pour l'augmentation du risque du crédit, en rationnant le crédit comme dicté par l'évolution macroéconomique. L'étude suggère que les banques doivent continuer à poursuivre les politiques de loan pricing sensibles au risque afin de faciliter la mesure du comportement procyclique / anticyclique respectivement pendant les périodes de haute conjoncture / ralentissements économiques, ce qui réduit les chances des effets supply-driven de crise de crédit.

Mots clés: La qualité du crédit, Développements macroéconomiques, Comportement des banques.

Classification JEL: E02.