



Loan Growth, Loan Deposit Ratio and Prediction of Bank Fragility in Kenya Using Generalised Linear Model

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Abstract

The purpose of this study was to investigate the predictive ability of growth of loan portfolio and loan deposit ratio on bank fragility in Kenya using Generalised Linear Model. Bank systemic crisis arises when the level of non-performing loans to total assets is between 5% -10%, while bank fragility is said to arise when the level of non-performing loans to total assets is above 10%. Bank crises have a social welfare consequence on various stakeholders and therefore there is need to find ways to minimize the negative effects. The study targeted 42 Commercial banks in operation at the end of 2015. Secondary data was collected from Central Bank of Kenya for period 2005 – 2015 for purposes of descriptive statistics; this was mainly to test the stability of study variables for a longer period. The generalised linear regression analysis was for period 2010-2014 considered close to bank distress events of 2015 and 2016. The study data was found to be non-normal and heteroscedastic the reason GLM was utilised. The credit creation and agency cost theories were used to explain the causal relationships. These theories expound on credit creation, lender behaviour and bank fragility. It has been established that most research on bank fragility have focused on Non-Performing loans, Loan loss provisions and Capital, Assets, Management, Earnings, Liquidity and sensitivity (CAMELS) indicators to detect bank instability. This study is a departure from CAMELS and tests if there are a few variables with distinctive ability to predict bank fragility. The findings of the study show, lagged dependent variable with powerful predictive ability. Besides, loan growth shows a negative significant relationship with bank fragility. Loan Deposit ratio (LDR) shows a positive significant relationship with bank fragility. This study is significant because it proves need to re-examine CAMELS indicators and identify new ratios which can predict bank fragility, distress and bank failure. Consequently, there is need for further studies to establish LDR percentage beyond which regulatory authorities should intervene in the Commercial banks' operations. The growth of loan portfolio showed a negative significant relationship, therefore there is need to find how this variable can be modelled to timely identify fragile institutions.

Keywords: Loan Portfolio Growth. Loan Deposit Ratio & Generalised Linear Model

INTRODUCTION

Drawing on the concept of credit creation and agency cost theory the research investigates the significance of growth of loan portfolio and loan deposit ratio on bank fragility. It is through granting credits that banks are able to grow their income and reward various stakeholders. As argued by Laeven (2011) large losses on bank's statement of financial position renders the bank insolvent. These losses generally arise as a result of long periods of poor asset quality due in part on excessive credit expansion. Caprio and Klingebiel (1997) state that banks can hide impaired loan credits

by rolling them over or embark on deposits mobilisation to help improve the outlook of their statements of financial position.

Demirguc-Kunt and Detragiache (1998) show that among the conditions to signify bank fragility is the ratio of non-performing loans to total assets in the banking system exceeding 10%. Daumont, Gall, and Leroux (2004) assert that a systemic banking crisis occurs when non-performing loans to total assets is between 5% - 10%. Demirguc-Kunt et al., (1998) argue that such crises could be related to adverse macroeconomic shocks due to bank managers choosing riskier loan portfolios.

Kenya has witnessed periodic bank distress with consequences on bank stakeholders and the economy. According to Brownbridge (1996) Kenya has had a history of bank instability since 1984-86. During this time Central Bank of Kenya liquidated banks that failed to repay deposits obtained from state owned enterprises. Brownbridge avers that a majority of these liquidated institutions were owned by local private sector businesspeople who had ventured into banking business. Daumont, Gall and Leroux (2004) further confirm Kenya's problem with its commercial banks, and state that four (4) banks and twenty-four (24) non-bank financial institutions accounting for 15% of Kenya's financial systems liabilities were affected by liquidity or solvency problems between 1985-1989. Daumont et al., (2004), find that between 1993-1995 there were solvency problems accounting for 30% of financial system assets.

Statement of the problem

According to Central Bank of Kenya annual supervision reports, during the latest episode of bank instability in Kenya 2015-2016; Dubai Bank Ltd with Kes 1.75 billion; Chase Bank Ltd Kes 79.15 billion and Imperial Bank Ltd Kes 48.17 billion in customer deposits were distressed. In total Kes 129 Billion tied up in bank deposits in the three banks was immediately inaccessible to the customers, with huge liquidity impact on retail and corporate clients. Besides, bank instability has negative impact on the deposit insurance corporation. Granja, Matvos, and Seru (2017) states that the mean FDIC loss from selling a distressed bank was 28% of assets over the period 2007 to 2013. The distress of commercial banks has consequences on the welfare of depositors, borrowers and the economy in general. It is these undesirable effects that call for new methods to predict weaknesses in the banking system.

Research Hypotheses

H₀₁: Growth of loan portfolio has no statistically significant relationship with bank fragility

H₀₂: Loans to deposit ratio has no statistically significant relationship with bank fragility

LITERATURE REVIEW

Laeven (2011) contends that banking crises have been a common feature throughout history. Berger, Imbierowicz and Rauch (2016), are of the view that financial crisis demonstrate that the knowledge gained about bank distress is insufficient to prevent large numbers of banks from being distressed.

Non-Performing Loans and Bank Fragility

An increment in impaired loan asset without corresponding expansion in good loan portfolio reduces the value of the loan portfolio and could precipitate bank solvency problems. Boudriga, Taktak and Jellouli (2009) state that gross NPL is a frequently used measure of bank soundness. Further they state that NPLs are a major problem for

both local and international regulators and whereas aggregate NPLs exhibit wide disparities between countries, some suffer severely with rates greater than fifteen (15%) percent. Fofack (2005) states that incidences of banking crises is frequently associated with a huge build-up of non-performing loans. Further non-performing loans account for a sizeable percentage of total assets of distressed financial institutions.

Growth of Loan Portfolio and Bank Fragility

Lu and Whidbee (2016) contend that excessive growth of loan portfolio has a high likelihood of causing bank instability. Iftikhar (2015) finds loan growth as a significant cause of bank riskiness. Essentially, at the peak of a boom, rapid loan growth is a predictor of bank problems. According to Rauch (2010), the higher the loan growth the higher the probability that the banks have started accepting loans from less creditworthy borrowers and therefore the higher loan charge off and probability of failure.

Foos, Norden and Weber (2010) find loan growth a key factor in bank risk studies. They argue that some of the methods of loan growth include lower interest and or lowering of credit standards. Due to these loosening of standards, loan growth should be examined as part of early warning systems of bank distress. Fahlenbrach, Primeier and Stulz (2016) observe that banks that tend to grow rapidly do grant loans whose performance is worse than loans of other banks. Fahlenbrach et al., concluded that loan growth is related to granting poor loans and therefore an indicator of bank fragility.

Jones, Lee and Yeager (2011) find that managers of financial institutions with deteriorating credit quality can postpone disclosure to the market and increase loan volume, which generates profitable upfront fees and improves the bank's income. Messai and Gallali (2015) find that during expansion phase banks take on more risks through uncontrolled lending activities without considering the quality of individual loans. Such loans are prime candidates of impairment during economic downturn thereby exposing the bank to insolvency. Altunbas, Manganelli and Marques-Ibanez (2015) concur and state that aggressive loan growth and excessive reliance on short term funding point to accumulation of risk. Jin, Kanagaretnam and Lobo (2018) find a positive association between higher loan growth rates and bank fragility. Logan (2001) argues that when there is fast loan growth, concentrations occur, appraisal standards may become weaker, and may be financed by more volatile funding sources. Following this sequence loan quality problems start, profits decline, and inadequate provision levels start to surface.

Loan Deposit Ratio (LDR) and Bank Fragility

Kazandjieva-Yordanova (2017) argues that deposits attracted by banks are a stable source of funding. In the circumstances, banks should be advised to cover their lending by resources attracted as deposits. Berg (2012) assert that regulatory authorities normally advise banks to fund their credit portfolio using customer deposits to avoid a liquidity crunch. The argument is premised on the fact that market funding has negative impact on financial stability as these funds tend to be less stable. Berg (2012) states that during the run up to the Norwegian banking crisis of 1990-92 the LDR declined from 100% to 60%; then rose to 80% but then declined from 1995 to 50% by 2012. According to Disalvo & Johnston (2017), LDR is a measure that a bank has inadequate liquid assets to cover a sudden loss of funding. Therefore, LDR is monitored as a measure of liquidity, a bank which finds itself with few deposits to fund loans must rely on non-deposit sources whose availability and prices are much more sensitive to changing economic and financial conditions. Generally, banks with high

LDR which are above average are likely to be risky, their lending is probably aggressive and with lower credit appraisal standards.

Cucinelli (2015) finds that lower level of the ratio of loans to deposits represents a lower dependence on wholesale funding which means that the bank is less market constrained in its asset growth. Arnould (1985) confirm LDR as a measure to be significant confirming agency cost theory. It therefore follows that manager will grant loans to generate additional income of which they will benefit in form of managerial compensation.

THEORETICAL PERSPECTIVE

The credit creation and agency cost theories are applied in the study to explain the link between the study variables.

Credit Creation Theory and Fragility

Werner (2014) and (2016), Schumpeter (2016) and McLeay, Radia and Thomas (2014) have argued that banks can create money without any reliance on customer deposits. These proponents of credit creation theory hold that each bank can individually create money out of nothing through accounting operations and it is done when creating loan facilities. MCleay *et al.*, (2014) state that when a bank grants a loan, it concurrently creates a matching deposit in the borrowers' bank account. They argue that commercial banks create money in the form of bank deposits by making new loans, which are credited to the borrower's bank account. Werner (2014) asserts that when a bank extends credit to a customer, it creates a fictitious deposit by recording the loan amount in the borrowers account even though no deposit was made. The bank credits the borrowers current account and debits the borrowers loan account. Ideally, what is created is a loan, disbursement of the loan to customers account creates a deposit. This credit creation according to Meera *et al.*, (2009) is an accounting process not involving real money. When a bank approves and disburses a loan to its customer, it does not reduce deposits of any of the other customers. Meera *et al.*, (2009) further argue that when a loan is disbursed, the borrower is denoted a debtor to the bank because of the loan and at the same time as a depositor because of the credit entry.

Credit creation is linked to the growth of loan portfolio and loan deposit ratio. A bank creates deposits from nothing when it credits borrowers both insiders and outsiders' current accounts with loan proceeds. This artificial deposit means the level of deposits goes up as more loans are granted. As the level of deposits increases, therefore the bank can lend more. However, due to impairment of credits, credit creation must have a limit. An impaired loan portfolio may lead the bank to non- disclosure of material facts, which ultimately lead to bank instability when the deterioration reaches an unsustainable level. Turner (2012) shows that poor credits can easily lead the bank to insolvency especially if depositors precipitate a run on the bank.

Agency Cost Theory and Bank fragility

Jensen (1986) shows that managers may be motivated to cause firms to grow beyond their desired size. This motivation is normally in the managers' interest as growth increases their power because of the resources they control. Besides, such growth of the firm is positively related to changes in compensation in managers interests rather than shareholders. However, with positive growth, bank management can still plead bad luck when outcomes are poor according to Heffernan (2010). Arnould (1985) argues that managers seek goals that deviate from those of the owners and especially where ownership of the firm is widely distributed as to put control in the hands of

management. In a study of Austrian cooperative banking, Gorton and Schmid (1999) find that bank performance diminishes with increase in the number of cooperative members. This is a reinforcement of the held view that as the magnitude of ownership dispersion goes up agency costs increase. It is the dispersed ownership, which then leads to higher agency costs.

Bank managers engage in expense preference behaviour, which means managers maximise expenses instead of maximising profit through executive compensation perks. Fama *et al.*, (1983) state that because contracts cannot be costlessly written and enforced that is the genesis of agency problems. In the process of aligning their interests, officers create suboptimal credits which when expectations are good lead to good profits but when the expectations are negative lead to bank distress. Depositors entrust banks to utilise their savings in a manner the deposits will be repayable on demand or notice, however, banks in an effort to make profits may lend to debtors who turn out to be bad credits thereby impacting the depositors' funds. In the case where the bank fails, depositors may not recover 100% of their deposits. Agency cost theory helps explain the growth of loan portfolio and loan deposit ratio. The agents possess more information than the principals and will grow the loan portfolio knowing well that their remuneration will be measured by bank performance.

METHODOLOGY

The research design in this study was explanatory research. Saunders *et al.*, (2009), Adams, Khan, Raeside, and White (2007) and Bhattacharjee (2012) argue that explanatory research seeks to establish causal relationships between variables, seeks explanation of observed phenomena, problems or behaviours and aims at advancing knowledge about structure, process and nature of social events. The target population of this research was forty-two (42) commercial banks.

A census was adopted predicated upon the fact that the population was small. According to Bryman (2012), a census study is justified if the entire population is very small and the data is to be gathered on every member of the population. Secondary data was collected from Central Bank of Kenya for period 2005-2015. The study did not extend data collection to 2016 and 2017 financial year as data was unavailable for distressed banks. Besides, following the Banking (Amendment) Act of 2016, which introduced interest rate caps in Kenya in September 2016, there was need to exclude subsequent years due to contamination from interest controls. The study examined the descriptive statistics for period 2005- 2015 to establish the variability or stability of the variables.

Entities that had less than five -years of data, zero non-performing loans, carry on Islamic banking, are branches and subsidiaries of foreign banks were excluded. According to Logan (2001) analysis of branches and subsidiaries of foreign banks is normally complicated by the fact that they are affected by events happening to the parent bank abroad.

Table 1: Measurement of Variables

Variables	Researcher(s)	Measures
Bank fragility	Iftikhar (2015); Shen et al., (2008).	Gross Non-Performing Loans Total loans
Growth of loan portfolio	Rauch (2010),	Total loans year t minus total loans year t-1 Total Loans year t-1
Loans to Deposit Ratio	Cecchetti, King & Yetman (2011)	<i>NetLoans</i> <i>CustomerDeposits</i>

Generalised Linear Model (GLM)

According to Osborne (2010), many statistical analyses assume variables are normally distributed and have homoscedasticity of variances. However, as argued by Bishara & Hittner (2015), non-normal data is common in social sciences and therefore need to transform data. Olivier & Norberg (2010) state that researchers should transform such data to approximately normal. Following from Osborne (2010) data was not transformed, since transformation introduces complexity in substantive interpretation of results. The complexity in interpretation arises due to changes in the nature of the variables following transformation.

The diagnostic tests carried out using Shapiro-Wilk W test and White's test show research data failed the normality and heteroscedasticity OLS test respectively. Consequently, the researcher, used the Generalised Linear Model.

Empirical model

Grodecka, Kenny and Ogren (2018) argue that in order to test the power of bank's statement of financial position characteristics as predictors of the past, it is imperative to consider a time period that is arguably close to the crisis event. It is with such argument that the research adopted the period 2010-2014 for generalised Linear regression. The researcher used autoregressive model to test the study model. Autoregressive model in this study was found appropriate because bank fragility does not happen immediately. Gujarati and Porter (2009) argue that the dependent variable responds to the independent variables with a lapse of time. Consequently, since bank fragility is a consequence of long-term growth in loan portfolio and loan deposit ratio, lagged bank fragility was a useful additional variable.

Multiple regression analysis was considered ideal in establishing if a relationship existed between variables. The regression equation was specified as follows:

$$g\left(E(Y|X_1, X_2, \dots, X_P, M)\right) = \beta_0 + \beta_1 Y_{Bfit-1} + \beta_2 lgit + \beta_3 ldr_{it}$$

The variables are defined as follows:

Y_{Bfit} = Bank Fragility for i^{th} firm in t^{th} year

Y_{Bfit-1} = lagged dependent variable

$lgit$ = Growth of loan portfolio (loan growth) for i^{th} firm in t^{th} year

ldr_{it} = Loan deposit ratio for i^{th} firm in t^{th} year

β_1 to β_3 = Coefficient of independent variables

$i = 1, 2, \dots, 42$ (Individual banks)

$t = 1, 2, 3, \dots, 11$ (time indicator)

RESULTS AND DISCUSSION

Descriptive statistical and regression analysis findings are discussed in this section.

Bank fragility

The NPL/total loans were at minimum of 0.00% with a maximum of 417.21%. In 2005 – 2007 the gross non-performing loans as a percentage of total loans was high, Kenya was emerging from the banking crisis of 1993-2005. Thereafter the maximum ratio ranged from 37.80% to 80.28%. During the period under review Imperial Bank and Chase Bank had bank fragility ratios of 10.02% and 7.48% respectively. On the other hand, Dubai Bank Ltd gross non-performing loans to total loans was 101.20%. It is not clear how the bank was able to generate income with such ratio, considering interest does not accrue on NPL instead it is placed in a suspense account. The sectoral maximum bank fragility variable consistently declined from 417.21% in 2005, 170.77% in 2006, 116.44% in 2007 to a low of 40.17% in 2015. The mean over the period 2005 to 2015 was 15.07%. Whereas the banking sector was on average stable, some banks in operation had problematic non-performing loans.

The explanation on unstable banks left to operate could be drawn from Bongini, Claessens and Ferri (2000) who show that politics, regulatory capture and forbearance have a role in dealing with financial crisis. Fofack (2005) reports NPL/total loans in sub-Saharan Africa reached 32% in 1993, and 25% during the 1997 Asian financial crisis. Therefore, the level of Kenya's bank fragility variable was at crisis level for some Commercial Banks compared to the 1993 sub-Saharan Africa banking industry problem and 1997 Asian financial crisis. The mean ratio of NPL/total assets for Kenya's banking industry was 7.64% however, the maximum ranged from 22.84% to 102.67% showing a number of banks showed characteristics of fragility during the period though the industry in general seemed solvent. The results, however, show evidence of systemic banking crises and fragility for the period 2005-2015.

Growth of Loan Portfolio

The maximum growth of loan portfolio for the three distressed banks ranged between 39.69% and 65.03%. The average growth in banking industry during the period was minimum of 21.30% with highest growth of 333.44%. Two banks had negative growth of 5.36% and 70.39%. Though the overall industry growth from 2005-2015 ranged from 21.30% to 41.16% there was mixed growth percentages. A negative growth of loan portfolio signals a contraction in loan asset ultimately resulting in decline in interest income. A rapid increase in loan portfolio could signal low standards of loan underwriting. On the converse, a decline in loan portfolio growth implies poor financial performance with undesirable consequences if the slide is not halted. A balanced growth is therefore desirable. With mean of 26.49%, minimum of -70.39% and maximum at 333.44% the variable can be a pointer to instability.

Loan Deposit Ratio

The mean LDR for the industry for the period was between 66.39% and 80.21%. The maximum LDR for the period ranged from 103.24% to 200.46%. During the entire period, the maximum LDR was above 100.00% signalling overreliance on loan capital by some Commercial Banks. Higher LDR as shown by some banks in this study reflect less customer deposits to fund loan book. However, LDR as a measure of fragility isolates one distressed bank with LDR of 101.68% that had weaknesses long before 2015. Bologna (2011) argues that LDR provides a measure of funding mix by a bank to finance its loan portfolio. Therefore, such high LDR has negative effect according to Bologna which leads to the likelihood of bank fragility. It is established that higher

level LDR means higher reliance on alternative funding compared to customer deposits significantly increasing the banks default probability. Bologna further argues that defaults are more likely immediately after higher level of LDR are observed but two to three years after such an increase. It is therefore important for banks to achieve a level of balance in their deposit mix.

GLM Regression

Iteration 0: log likelihood = 209.1052

Generalized linear models

Optimization : ML

Deviance = .2153540135

Pearson = .2153540135

Variance function: V(u) = 1

Link function : g(u) = u

Log likelihood = 209.1052024

No. of obs = 120

Residual df = 116

Scale parameter = .0018565

(1/df) Deviance = .0018565

(1/df) Pearson = .0018565

[Gaussian]

[Identity]

AIC = -3.41842

BIC = -555.1337

OIM						
bf	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
-						
lagbf1	.9101973	.0406044	22.42	0.000	.8306141	.9897805
lg	-.086297	.0245144	-3.52	0.000	-.1343444	-.0382497
ldr	.1297462	.0231959	5.59	0.000	.0842831	.1752093
_cons	-.0732897	.0192039	-3.82	0.000	-.1109286	-.0356508

The GLM regression results show lagged bank fragility variable $\beta=0.91$, $Z=22.42$, $P > z = 0.00$, while growth of loan portfolio variable had $\beta=-0.09$, $Z=-3.52$, $P > z = 0.00$, Loan Deposit ratio $\beta=0.13$, $Z=5.59$ with $P > z = 0.00$. The lagged dependent variable had the most significant influence on bank fragility followed by Loan deposit ratio. An increase in lagged bank fragility increased the risk of bank fragility, besides an increase in LDR was indicative of future instability of the institution. The growth of loan portfolio had negative relationship with bank fragility. The growth of loan portfolio is a significant variable. The level of NPL_{t-1} has an influence on the subsequent years bank fragility. Ho, Huang, Lin and Yen (2016) argued that the higher the ratio of the NPL to total loans means the higher the default rate. The fragility ratio seems sticky unless counterbalanced by growth in good credit with a much lower impairment to offset the previous NPL levels.

The loan growth $Z = -3.52$, $P > Z = 0.00 < 0.05$ shows that loan growth was significant and negative influence. Logan (2001) found loan growth at 5% level with coefficients of -0.0635 and t-value of -2.9811 and at 1% level coefficient of -0.0606 with t-value of -3.0259. Foos et al (2010) lagged loan growth (1-4) and found p-value of alg t-1 0.099, alg t-2 0.000, alg t-3 0.000 and alg t-4 0.005. Oordt & Zhou (2018) found that banks with asset growth rate that was 10% or more were associated with high bank tail risk, a higher probability of failure. Iftikhar (2015) concluded that an abnormal loan growth of 18.7% led to an increase in relative loan losses and therefore lowered bank solvency. This is consistent with Lu & Whidbee (2016) who state that loan growth is proxy for lax underwriting standards. Iftikhar (2015) found p-values significant at 1% and concluded that loan growth was significant variable in bank fragility in financial reform situations. The results of the study however show a negative relationship which means decline in growth of loan portfolio is symptomatic of bank instability; while an

increase in the ratio reduces possibility of bank fragility. Evidence that increases in growth of loan portfolio due to lower appraisal standards is not proven.

Iftikhar (2015) measured financial fragility using ratio of impaired loans to gross loans. Berger et al (2016) used quarterly data and found quarterly growth in total volume of outstanding loans to be statistically significant at 1% level in predicting distress in 1-year. The coefficient of loan growth indicates that for every one unit change in growth in loans, bank fragility declined by -0.09 which seems consistent with Kedir, Iftikhar, Murinde & Kamgnia (2018) who found that growth of loan was statistically significant at 10% level with coefficient of -0.019 which meant high loan growth reduced fragility as measured by impaired loans as a percentage of gross loans. This finding indicated that increases in loan portfolio was by performing loans with good quality underwriting standards. Therefore, the conclusion on growth of loan portfolio variable for this study was consistent with Kedir et al., (2018). Almanidis & Sickles (2012), Cleary & Hebb (2015) find that loan deposit ratio is negatively related to bank failure. Cucinelli (2015) concluded that loan deposit ratio had a significant effect at 5% level on bank lending behaviour.

H₀₁: The growth of loan portfolio has no statistically significant relationship with bank fragility.

The coefficient for loan growth was $\beta = -0.09$, $Z = -3.52$ and $P > z = 0.00$. We therefore reject the null hypothesis that growth of loan portfolio has no statistically significant relationship with bank fragility. The relationship is negative but significant, which means as loan growth increases the possibility of bank instability declines. The inference here is that the loan growth is of good credit quality.

H₀₂: Loans to deposit ratio has no statistically significant relationship with bank fragility

The coefficient for loan deposit ratio was $\beta = 0.13$, $Z = 5.59$ and $P > z = 0.00$. We reject the null hypothesis. There is a positive significant relationship between loan deposit ratio and bank fragility. As the LDR increases the chances of bank fragility also increases.

CONCLUSION AND RECOMMENDATIONS

The findings of this study show that there is need to review the overdependence on CAMELS indicators in bank instability studies. It is the case that a select ratio can predict weaknesses equally well. The growth of loan portfolio had a surprisingly negative significant effect on bank fragility. The inverse relationship meant an increase in loan portfolio improved bank solvency and therefore lowered the possibility of distress. This significantly meant, banks that experienced declining loan growth increased chances of distress. A distressed bank would be hard pressed to attract deposits in order to create credit. The loan deposit ratio had powerful predictive power. One of the banks that failed had LDR above 100% for many years before it was eventually placed under receivership. The LDR variable points at inability to attract customer deposits, therefore reliance on expensive whole deposits.

The level of NPL can act as an incentive for bank managers to seek deposits and lend more thereby exacerbating the problem. Consequently, it is recommended that any bank with NPL to gross loans greater than 20% should not be allowed to attract more deposits whether or not the value of collateral exceeds the level of gross NPL. The

second policy should examine the level of LDR in order further limit attraction of loan capital by banking institutions.

Further research should incorporate use of monthly data to flag out loan growth rates that are symptomatic of early warning. Besides research should be carried out to establish the loan deposit ratio beyond which sanctions should be applied to a commercial bank.

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