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Financial Fragility and Performance of Nigerian Banking Institutions: An Inter-Temporal Analysis

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Abstract

This study analyzes how balance sheet problems in the form of non-performing loans (npls) affect the liquidity, funding and profitability of selected Nigerian banks in two critical periods, the bank distress era (1999-2001) and the post- consolidation era (2007-2009). The data for this study were computed from the balance sheets of twenty-two universal banks in the first period, and twenty-two consolidated Deposit Money Banks in the second period. Three multiple regression models were estimated at the 5% level of significance. In the bank distress era (1999-2001), an average NPL ratio of 21.1% was accompanied by a Loan-to-Deposit Ratio (LTDR) of 53.9%, below the prudential maximum of 80.0%. However, in the post-consolidation era, the average NPL ratio fell drastically to 7.1% with an accompanying LTDR of 57.7%, still below the prudential maximum. The inferential results show that the explanatory powers of non-performing loans (NPLs) and Loan Loss Reserves (LLR) are high in causing variations in Loan-to-Total Assets (LTA) during the bank distress era (1999-2001). The deteriorating asset quality in the bank distress era constrained significantly bank liquidity, funding growth and profitability.. In the post-consolidation era, the pursuit of consolidation and risk-based supervision (RBS) moderated NPLs without a corresponding impact on liquidity and funding growth (LTDR). Heavier regulation in the post-consolidation era must aim at keeping the banks safe, profitable and relevant, and not merely becoming a stringent response to market failures and cumulative risk concentrations.

JEL classification numbers: G2
Keywords: Modelling, non-performing loans (NPL), liquidity, lending growth, profitability.

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1 Introduction

Financial fragility exists when substantial default of a 'number' of households and banks (i.e a liquidity 'crisis'), without necessarily becoming bankrupt, occurs and the aggregate profitability of the banking sector decreases significantly (i.e, a banking 'crisis'). Thus, financial fragility is characterized by both liquidity shortages and banking sector vulnerability (Tsomoscos, 2003). According to post-Keynesian economists, financial fragility is a process that can culminate in financial instability (an event). For mainstream or new Keynesian economists, financial fragility has been traditionally defined as a state in which a shock can trigger instability. Simply defined, fragility means that something is weak and prone to breaking.

In the economic literature, three categories of models have been employed to explain 'financial fragility'. The first-generation models explain crises as the result of budget deficits in a world of perfect foresight: disproportionate monetary increase to monetize fiscal deficits can reduce the Central Bank's foreign exchange reserves and decline its capacity to preserve the fixed exchange rate or peg (see Krugman, 1979). The second-generation fragility models (e.g. Obstfeld, 1994) consider that crises are a consequence of a conflict between a currency peg and the desire to follow a more expansionary monetary policy (Obstfeld, 1994).

In the third-generation literature, financial fragility has been defined as an important factor in turning a crisis into a major one (Corsetti, *et al*, 1999; Radelet and Sachs 1998, Kaminsky and Reinhart, 1999). In particular this literature points out that balance sheet problems in the banking or corporate sector work to increase the prospect of insolvency and can be a trigger for domestic and external investors to reassess their willingness to finance a country. In this respect, Dornbusch (2001) emphasizes three sources of vulnerability: a substantially misaligned exchange rate, balance sheet problems in the form of nonperforming loans (npls) and balance sheet problems of mismatched exposures. Sverre and Einar (2002) have provided a conceptual framework rooted in the assumption that a bank's willingness to accept the risk of suffering credit losses is dependent on both the macro-economic environment and the bank's internal governance and control systems. Losses may thus be caused by managerial decisions, by a general market movement, or by a combination of the two. This Sverre-Einar framework allows us to explain the simultaneous occurrence of an extensive banking crisis generalizing across the banking sector the different performance of individual banks during a period of crisis and even between various organizational units of the same bank. The works of Mora (2010) evaluate the capacity of American banks to provide liquidity in a financial crisis. The results suggest that banks were not as able to provide liquidity as would be implied by theory and evidence from other crises.

The deregulation of the Nigerian banking industry in 1986 induced an expansion in the number of operating banks, and new patterns of portfolio behaviour (Toby, 1994). During the eight years of Financial liberalization (1986-93), interest rates fluctuated perpetually and the Naira depreciated massively (Toby, 1997). The result was a high build-up of non-performing loans and advances, capital erosion and liquidity crises. The consequent shifts in banks' assets and liabilities portfolios, the increasing proportion of rate-sensitive components of assets and liabilities, growing interest rate elasticity of balance sheet items and the uncertainty in the regulatory environment provided strategic challenges for most banks, particularly during the liberalization period (Toby, 1993). With 120 operating banks, the average non-performing loans ratio (NPLR) stood at 33.0%

between 1989-2001. The average NPLR for distressed banks alone for the period was 66.3%. The average liquidity ratio of commercial banks stood at 45.1% between 1989-2001, cash reserve ratio averaged 6.8%, loan-to-deposit ratio stood at 64.5%.

The subsequent reduction in the number of operating banks from 120 to 89 banks, necessitated by the high risk concentration in the industry, provided the stimulus for the consolidation of the industry, which started in 2006. The new minimum capital requirement of N25billion reduced the number of banks further to 24. It has been argued that capital adequacy regulation is irrelevant in determining bank asset quality (Toby, 2005). The cash reserve ratio (CRR) has been shown empirically as an effective tool for moderating banking industry non-performing loans (see Toby, 2007). The evidence, however, confirms that a reduction in the cash reserve requirement necessitated an increase in average bank liquidity and a paradoxical decline in aggregate credit to the economy.

The works of Brownbridge (1998) have examined the causes of financial distress in local banks in Africa, and argued that the severity of the bad debt problems was attributable to moral hazards and adverse selection, with many banks pursuing imprudent lending strategies, and in some cases involving insider lending. Low levels of capitalization, the political connections of bank owners, the access to public sector deposits contributed to moral hazard behaviour. Moyo *et al* (2014) have found that the Sub-Saharan Africa (SSA) financial system is bank-based and weakly contestable, therefore, any systemic bank failures would have serious contagious repercussions in these economies. It is also found in the study that bank-specific, macroeconomic and institutional factors are important in predicting episodes of bank distress in Sub-Saharan Africa.

Degryse *et al* (2013) argue that regional banking system fragility reduces when banks in the region jointly hold more liquid assets, are better capitalized, and when regional banking systems are more competitive. The 2007-2009 global financial crisis suggests a need to make risk management a pervasive element of financial system culture and emphasizes the importance of robust liquidity management (Arjani and Pankin, 2013). A number of studies have recommended stringent regulation to curb increasing balance sheet fragility in the banking system (see Fulhert, 2009; Demirguc-Kunt *et al*, 2008; Beck *et al*, 2006). Kumar *et al* (2012) have shown that private sector banks perform better than public sector banks in the case of India.

This study adopts the framework of relating default in the non-financial sector using non-performing loans (npls) to liquidity, funding growth and profitability of Deposit Money Banks (DMBs) in Nigeria.

The major research questions in this study are (1) Are less fragile banks more liquid? (2) Do less fragile banks create more funding? (3) Are more fragile banks less profitable?

The following hypotheses were tested in this study:

H_1: There is a significantly inverse relationship between non-performing loans ratio and Loan-to-Deposit ratio.

H_2: There is a significantly inverse relationship between non-performing loans ratio and net interest margin.

H_3: There is a significantly positive relationship between loan-to-deposit ratio and net interest margin.

The next part of this article presents the symptoms of bank distress in the post-consolidation era in Nigeria, followed by an extensive review of related literature.
The methodology outlines data sources and model specifications. This is followed by the empirical results, and conclusion.

2 Symptoms of Post-Consolidation Bank Distress in Nigeria

A post-consolidation audit of five banks by a joint team of the Central Bank of Nigeria (CBN) and Nigerian Deposit Insurance Corporation (NDIC) officials revealed the following findings (Fiakpa, 2009):

(1) Excessively high level of non-performing loans in the five banks which was attributable to poor corporate governance practices, lax credit administration procedures and the absence or non-adherence to the bank's credit risk management policies.
(2) It is evident that the five banks accounted for a disproportionate component of the total exposure to capital market and oil and gas, thus reflecting heavy concentration in high risk areas relative to other banks in the industry.
(3) The huge provisioning requirements have led to capital impairment. Consequently, all the banks are undercapitalized for their current levels of operations and are required to increase their provisions for loan losses, which impacted negatively on their capital. Indeed, one is technically insolvent with a capital Adequacy Ratio of 1.01%
(4) The five banks were either perennial net-takers of funds in the inter-bank market or enjoyed liquidity support from the CBN for long periods of time, a clear evidence of liquidity crisis. In other words, these banks were unable to meet their maturing obligations as they fall due without resorting to the CBN or the inter-bank market. As a matter of fact, the outstanding on the Expanded Discount Window (EDW) of the five banks amounted to N127.85 billion by end of July 2009, representing 89.81% of the total industry exposure to the CBN on its discount window while their net guaranteed inter-bank takings stood at ₦253.30billion as at August 02, 2009. Their liquidity ratios ranged from 17.65% to 24% as at May 31, 2009. Regulatory minimum is 25%.
(5) The five banks together account for 39.93% for loans, 29.99% of deposits, and 31.49% of total assets as at May, 2009. Given the extent of the asset quality problem leading to liquidity stresses, and the variety of stress points on the banks' balance sheets, the widespread reforms of the CBN became inevitable. The CBN removed the 5 CEOs and their executive directors in the exercise of its powers as contained in Sections 33 and 35 of the Banks and Other Financial Institutions Act 1991, as amended, and after securing the consent of the Board of Directors of the CBN. Khan (2009) has argued that the problems in the banking sector stem partly from the weakness of past regulations. Meanwhile the Economic and Financial Crimes Commission (EFCC) and Police have recovered billions of Naira owed the banks (Aregbesola & Ojo, 2009). Stakeholders are now demanding punitive actions against auditing firms and CBN staff over professional laxity (Ajakaiye, 2009).

3 Review of Relevant Literature

In the framework of Kahn and Santos (2003) the term fragility stems from the interconnections banks establish to protect themselves from liquidity shocks. It is argued that since mutual insurance appears to be privately advantageous under the assumption that aggregate shocks are a zero probability event, banks may be indifferent between arrangements leading to varying degrees of fragility should the zero probability event actually materialize (Allen and Gale, 2000). Some other works have rather built a framework examining the consequences for interbank insurance when individual bank fragility stems from a moral hazard problem (see Calomiris & Kahn 1991).

It has been argued that for the most part financial institutions have the incentive to get it "right". The flexibility with which financial assets can be designed and priced causes the market participants to take into account the economic effects of their own independence. Diamond and Rajan (2001) provide a modification of the model of banks in which banks decide on the correct degree of mutual insurance.

On the other hand, when it comes to the role of financial institutions in the payments system, such flexibility is not available.

Tsomocos (2003) develops a general equilibrium model of an economy with incomplete markets (GEI) with money and default. The model is a simplified version of the real world consisting of a non-bank private sector, banks, a central bank, a government and a regulator. The model is used to analyze actions by policy makers. The key analytical results are: a financially fragile system needs not collapse; efficiency can be improved with policy interventions. A system with heterogeneous banks is more stable than one with homogeneous ones.

In the Tsomocos model, existence of monetary equilibria allows for positive default levels in equilibrium. It also characterizes contagion and financial fragility as an equilibrium phenomenon. Tsomocos defines financial fragility as a phenomenon in which aggregate profitability of the banking sector declines and defaults in the non-bank and banking private sectors increase. Thus, equilibria with financial fragility require financial vulnerability in the banking sector and liquidity shortages in the non-bank private sector.

Goodhart *et al* (2006) have provided a tractable model which illuminates problems relating to individual bank behaviour, to possible contagious interrelationships between banks, and to the appropriate design of prudential requirements and incentives to limit 'excessive' risk-taking. Among other results, a non-trivial quantity theory of money is derived, liquidity and default premia co-determine interest rates, and both regulatory and monetary policies have non-neutral effects. The model also indicates how monetary policy may affect financial fragility, thus highlighting the trade-off between financial stability and efficiency.

Lagunoff and Shreft (2001) present a dynamic stochastic game-theoretic model of financial fragility. The model has two essential features. First, inter-related portfolios and payment commitments forge financial linkages, among agents. Second, the shocks to investment projects' operations at a single date cause some projects to fail. Investors who experience losses from project failures reallocate their portfolios, thereby breaking some linkages.

In the Pareto-efficient symmetric equilibrium studied, two related types of financial crises can occur in response. One occurs gradually as defaults spread, causing even more links to break. An economy is more fragile ex post the more severe this financial crisis. The other type of crisis occurs instantaneously when forward-looking investors preemptively

shift their wealth into a safe asset in anticipation of the contagion affecting them in the future. An economy is more fragile ex ante the earlier all of its linkages break from such a crisis.

Detragiache (2002) presents a model of a small open economy with a fragile banking sector and imperfect international capital mobility. In the model, increased international integration of the market for bank deposits makes bank runs more likely, resulting in a welfare loss for the business sector. Bank depositors may gain or lose depending on the parameters. When depositors gain, whether the gains exceed the losses to the business sector or not depends on the size of the holdings of foreign assets relative to the deadweight costs of bank runs. Thus, limited international financial integration may not be desirable.

Devries (2005) provides a model in which banks are linked through the interbank deposit market participations like syndicate loans and deposit interest rate risk. The similarity in exposures carries the potential for systemic breakdowns. This potential is either strong or weak depending on whether the linkages remain or vanish asymptotically. It is shown that the linearity of the bank portfolios in the exposures, in combination with a condition on the tails of the marginal distributions of these exposures, determines whether the potential for systemic risk is weak or strong. The study shows that if the exposures have marginal normal distributions the potential for systemic risk is weak, while the potential is strong if the student distributions apply.

The works of Proto (2007) analyze a model of bank fragility and growth expectations. Banks supply liquidity to insure individuals against possible short-term consumption shocks. The higher this level of illiquidity insurance the lower the investments in long-run assets, and the higher the risk of a bank run generated by a real negative shock. If individuals are sufficiently risk-averse, competitive banks trade off liquidity insurance for portfolio risk. High growth expectations, typical of emerging economies, increases the risk of a bank run. On the contrary, deposit contracts offered when economic performances are very uncertain (like in less developed economies), and where output fluctuations are milder (like in developed economies), are less exposed to the risk of a bank run. In this setting, a bail-out in case of crisis is ex-ante Pareto efficient even if it always increases the risk of crisis.

Giuseppe and Brasil (2006) have studied the degree of exposures of European banks to common shocks over time. The study adopted a measure of co-movements in bank risk by means of a dynamic factor model, which allows us to decompose an indicator of bank fragility, the Distance-to-Default, into three main components: an EU-wide, a country-specific, and a bank-level idiosyncratic component. The results show that commonality in banks appears to have significantly increased. It is also found that co-movements in EU banks' fragility are only in part related to common macro shocks and that a banking system specific component at the EU-wide level appears relevant.

The research of Moheeput (2008) considers banking panic transmission in a two-bank setting, in which the main propagator of a shock across banks is the informational channel. Banks are perceived to be positively connected to some unobserved macroeconomic fundamentals. The game takes a dynamic Bayesian setting with depositors of one bank making their decision to withdraw after observing the event in the other bank. The study shows that, if this panic event is used for Bayesian inference about the state of the common macroeconomic fundamental, then, in the equilibrium profile of the game, contagion and correlation both occur with positive probability, with contagion modeled as a state-contingent change in the cross-bank correlation. Such endogenous

characterization of probabilistic assessments of contagion and correlation has the appealing feature that it enables us to distill between these two concepts as equilibrium phenomena and to assess their relative importance in given banking panic transmission setting. The work also shows that contagion is characterized by public informational dominance in depositors' decision set.

Bryant (1980) and Diamond and Dybvig (1983) were critical of our understanding that a bank is an inherently unstable financial institution. In these models, financial instability is associated with bank runs as a self-fulfilling prophecy ("sunspots"). Moreover, since they model the behaviour of a single representative bank, they are unable to consider the implications of bank interrelationships for industry stability.

The works of Gorton and Pennacchi (1990), Jacklin and Bhattacharya (1988) and Chari and Jagannathan (1988) have added to our understanding of the stability of the banking system by showing that when there is asymmetry of information between depositors and their bank the release of new information on the bank's condition may trigger a run on the bank's deposits. A full-scale financial collapse may only occur if a run on an individual bank provides depositors of other banks information about aggregate conditions. De Bandt (1995) models a form of this propagation mechanism in a setting where banks are subject to an aggregate and an idiosyncratic shock. If depositors in one bank learn about their bank's financial condition afterwards, other depositors may use this information to revise their expectations about the impact of the aggregate shock on their banks, creating a channel for the propagation of bank failures.

The works of Nikolaidi (2009) develop a post-Keynesian model with Minskyan insights that places emphasis on the interaction between the banking sector and the real economy and investigates the conditions under which the latter is likely to be brought into financial fragility. The analytical framework used to describe the banking sector explicitly incorporates the impact of banks' 'animal spirits', of firms' credit-worthiness and of banks' expectations on the provision of loans. The financial fragility of the economy is defined by drawing on Minsky's taxonomy and is assumed to rely both on the fragility of firms and on the fragility of the banking sector. The dynamic analysis investigates how the interaction between the fragility ratio of the banking sector and the real output can generate financial structures that are susceptible to financial fragility.

Using data on Indian banks for 1996-2008 the research of Ghosh (2010) examines the interconnect among credit growth, bank soundness and financial fragility. The analysis appears to indicate that higher credit growth amplifies bank fragility. Besides, the results point to the fact that sounder banks increase loan supply. In terms of ownership, the evidence testifies that credit growth has been rapid in state-owned and de novo private banks. In terms of policy implications, the analysis appears to suggest the need for giving priority to risk-based supervision as a way to contain the potential risks associated with rapid credit growth.

Kasselaki and Tagkalakis (2013) study the links between financial soundness indicators and financial crisis episodes for several macroeconomic and fiscal variables in 20 OECD countries. The key findings suggest that, in times of severe financial crisis, regulatory capital to risk-weighted assets increase, non-performing loans (NPL) to total loans increase dramatically but loan loss provisions lag behind NPLs and profitability deteriorates dramatically. Ruiz-Porras (2009) has shown that banking stability is enhanced in market-based financial systems, whilst financial development reduces it. An earlier study has provided "stylized facts" between financial systems and banking crises

(a Ruiz-Porras, 2006). Concretely, it shows that crises are more likely in bank-based financial systems and that financial development enhanced banking stability.

4 Data Sources and Methodology

Relevant bank performance data were generated from selected issues of Financial Standard, BusinessDay, Afrinvest Research and banks balance sheets for two crucial periods, 1999-2001 and 2007-2009. The first period epitomized the bank distress era or the pre-consolidation era in which many banks failed as a result of a high build-up in non-performing loans (npls). The second period coincides with the post-consolidation era, in which the number of banks reduced from 89 to 24 depont money banks.

In the first period (1999-2001), we obtained both non-performing loans (NPLs) and loan loss reserves (LLR) ratios for twenty-two (22) universal banks. CAMEL parameters depicting capital adequacy, asset quality, liquidity, efficiency, and profitability measures were also obtained for the twenty-two universal banks. In the 2007-2009 period, both absolute and relative measures of bank performance were generated for twenty-two (22) out of the existing twenty four (24) Deposit Money Banks in Nigeria. Critical relative measures obtained in this period are loan-to-deposit ratio (LTDR), net interest margin (NIM) and non-performing loans ratio (NPLR). The NPL ratio is measured by relating the level of non-performing loans to total loan portfolio outstanding and multiplying by 100. Similarly the loan loss reserves ratio is provision to total non-performing loans multiplied by 100.

The computation of performance averages enabled us to compare the financial characteristics of fragile banks in the two periods (1999-2001 & 2007-2009).

4.1 Model Specification and Inferential Statistics

To test our research hypotheses, four models are constructed as follows:

$$LTA = \alpha + \beta_1 NPL + \beta_2 LLR + \varepsilon_I \quad (1)$$

$$LTDR = \alpha + \beta_1 NPL + \beta_2 LLR + \varepsilon_I \quad (2)$$

$$LTDR = \alpha + \beta_1 NPL + \beta_2 NIM + \varepsilon_I \quad (3)$$

$$NIM = \alpha + \beta_1 NPL + \beta_2 LTDR + \varepsilon_I \quad (4)$$

Where
LTA = Loan–to-Total Assets Ratio,
LTDR = Loan-to-Total Deposit Ratio,
LLR = Loan Loss Reserves Ratio,
NIM = Net Interest Margin,
NPL = Non-performing loans ratio.

Having specified our models, we next use sample observations on Y, X_1 and X_2 and obtain estimates of β_0, β_1 and β_2. The estimates were obtained by minimizing the sum of squared residuals in equation (5):

$$\sum_{i=1}^{n} e^2 = \sum_{i=1}^{n} (Y_i - Y_i)^2 = \sum_{i=1}^{n} (Y_i - \hat{b}_0 - \hat{b}_1 X_{1i} - \hat{b}_2 X_{2i})^2 \quad (5)$$

ŶThe following formulae, in which the variables are expressed in deviations from their mean, were being used for obtaining values for the parameter estimates
(Equations 6-8):

$$\hat{b}_0 = \bar{Y} - \hat{b}_1\bar{X}_1 - \hat{b}_2\bar{X}_2 \quad (6)$$

$$\hat{b}_1 = \frac{(\Sigma x_{1i}y_i)(\Sigma x^2\,2i) - (\Sigma x_{2i}y_i)(\Sigma x_{1i}x_{2i})}{(\Sigma x_{1i}^2)(\Sigma x_{2i}) - (\Sigma x_{1i}x_{2i})^2} \quad (7)$$

$$\hat{b}_2 = \frac{(\Sigma x_{2i}y_i)(\Sigma x_i) - (\Sigma x_{1i}y_i)(\Sigma x_{1i}x_{2i})}{(\Sigma x_{1i}^2)(\Sigma x_{2i}^2) - (\Sigma x_{1i}x_{2i})^2} \quad (8)$$

The coefficient of multiple determination (or the squared multiple correlation coefficient), R^2, shows the percentage of the total variation of Y explained by the regression plane, that is, by changes in χ_1 and χ_2.

Specifically, equation (9) is derived as:

$$R^2 yx_1x_2 = \frac{\hat{b}_1\Sigma y_i x_{1i} + \hat{b}_2\Sigma y_i x_{2i}}{\Sigma y_i^2} \quad (9)$$

The value of R^2 lies between 0 and 1. The higher R^2 the greater the percentage of the variation of Y explained by the regression plane, that is, the better the

'goodness of fit' of the regression plane to the sample observations. The closer R^2 to zero, the worse the fit.

The student's t-test was adopted in testing our hypotheses as in equation 10:

$$t^* = \frac{\hat{b}_1}{S(\hat{b}_i)} \quad (10)$$

This is the observed (or sample) value of the t-ratio, which we compare with the theoretical value of the obtainable from the t-table with n-k = n-3 degrees of freedom. The theoretical values of t (at the 5% level of significance) are the critical values that define the critical region in a two-tail test, with n-k degrees of freedom.

(a) If t* falls in the acceptance region, we accept the null hypothesis, that is, we accept that b_1 is not significant at the 5% level of significance and hence the corresponding regressor does not appear to contribute to the explanation of the variations in Y.
(b) If t* falls in the critical region we reject the null hypothesis, and we accept the alternative one: b_1 is statistically significant.

The Software Package for Social Sciences (SPSS) was used to obtain the multiple regression estimates in this study.

5 Results

The results in Table 1 show critical averages for non-performing loans ratio (NPLs) and Loan-to-Deposit Ratio (LTDR) for the two periods under study (1999-2001 & 2007-2009). We find a radical decline in average NPLs from 21.1% in Period I (1999-2001) to 7.1% in Period II (2007-2009). The drastic improvement in bank asset quality could have been due to banking consolidation, the Central Bank of Nigeria (CBN) special audit of banks and risk-based regulatory reforms.

However, we notice a mild increase in the average loan-to-total deposits ratio (LTDR) from 53.9% in Period I to 57.7% in Period II. It is likely that a drastic decline in NPLs has not reasonably improved the LTDRs, thus the intermediation role of banks is still limited, although asset quality improved radically.

Table 1: Financial Characteristics of Selected Nigerian Banks: A Comparative Analysis

Financial Indicator	Period I (1999-2001)	Period II (2007-2009)
No. of Reporting Banks	22	22
Average Non-Performing Loans Ratio (NPL)	21.1%	7.1%
Average Loan Loss Reserves Ratio (LLR)	81.2%	N.A.
Average Loan-to-Total Assets (LTA)	30.6%	N.A.
Average Loan-to-Total Deposits (LTDR)	53.9%	57.7%
Average Net Interest Margin	3.7%	16.6%

Sources: Computations based on published data of the banks.

The financial characteristics of highly fragile and less fragile banks are summarized in Table 2. In the Period I (1999-2001), generally described as the bank distress era, most of the banks had loan loss reserves ratios (LLRs) mostly below an average of 81.1%. The average loan-to-deposit ratio (LTDR) in this period was below the prudential maximum of 80.0%. However, banks with low average NPLs in Period I recorded loan loss reserves that is mostly above an average of 81.1%. The average loan-to-deposit ratio (LTDR) still remained below the regulatory minimum of 80.0%.

In the Period II (2007-2009), described as the post-consolidation era intercepted by global financial crisis, the banks with high average NPLs recorded net interest margin below an average of 16.6%, and average loan-to-deposit ratio (LTDR) below the regulatory maximum of 80.0%. The banks with low average NPLs equally recorded net interest margin mostly below the average of 16.6%, with average loan-to-deposit ratio (LTDR) still below the prudential maximum of 80.0%.

Table 2: The Fragility-Performance Matrix in an Intertemporal Context

Fragility Levels	Period I (1999-2001)	Period II (2007-2009)
	Bank Distress Era	Post-Consolidation Era
Banks with Above-Average NPL Ratio	- Loan Loss Reserves (LLR) mostly below average of 81.1% - Average Loan-to-Deposit Ratio (LTDR) below 80.0%	- Net Interest Margin Below Average of 16.62 - Average Loan-to-Deposit Ratio below 80.0%
Banks with Below-Average NPL Ratio	- Loan loss reserves mostly alone average of 81.1% - Average Loan-to-Deposit Ratio (LTDR) below 80%	- Net Interest Margin (NIM) mostly below average of 16.6% - Average Loan-to-Deposit Ratio (LTDR) below 80%

Sources: Based on data generated from the banks in the bank distress era (1999-2001) and the post-consolidation era (2007-2009)

With a beta coefficient of -0.4208, and a partial correlation coefficient of -0.5262, we find an inverse relationship between non-performing loans (NPLs) and Loan-to-Total Assets Ratio (LTA) in the bank distress era (see Table 3).

With a t-statistic of -1.2850 falling outside the acceptance region of ±0.2197, we reject the null hypothesis ($H0_1$) and accept the alternate hypothesis that there is a significantly inverse association between NPL and LTA. Since the t-statistic of 0.4440 falls within the acceptance region of ±0.6637 at the 5% level of significance, we accept the null hypothesis of no significant association between loan loss reserves ratio (LLR) and loan-to-total assets ratio (LTA). Hence the partial correlation coefficient of 0.4503 is insignificant at the 5% level.

The results also show a significantly inverse relationship between NPL and Loan-to-Total Deposits Ratio (LTDR) at the 5% significance level. Although the beta and correlation coefficient are less than 0.50, the t-statistic of -0.668 falls outside the critical region of ±0.5148 at the 5% level. The level of loan to total deposits is not sensitive to changes in the loan loss reserves ratio (LLR). The t-statistic of -0.100 falls within the critical region of ±0.9215 at the 5% level.

Table 3: Effects of Financial Fragility on Bank Funds Management in the Bank Distress Era (1999-2001)

Model & Parameters	Independent Variables * Non-Performing Loans Ratio (NPLR)	Loan Loss Reserves Ratio (LLRR)
Model I (DV LTA)		
Beta (β)	-0.4208	0.1455
SE Beta	0.3275	0.3275
Corr.	-0.5262	0.4503
t-statistics	-1.2850	0.4440
Sig.t (0.05)	0.2197	0.6637
t-constant = 2.074 (0.0570) **		
Model 2(DV LTDR)		
Beta (β)	-0.2524	-0.3788
SE Beta	0.3777	0.3777
Corr.	-0.2250	0.1450
t-statistics	-0.668	-0.100
Sig.t (0.05)	0.5148	0.9215
t-constant = 0.988 (0.3397) **		

*The dependent variable in Model 1 is loan-to-Total Asset (LTA), Model 2 is Loan-to-Deposit Ratio (LTDR)
**The figures in bracket are significance values for the constants.
Source: SPSS Print-Out

The data in Tables 4 show critical statistical relationships in Period II (2007-2009). The beta coefficient of -0.2250 and partial correlation coefficient of -0.2051 show a weak inverse association between loan-to-total-deposit ratio (LTDR) and non-performing loans (NPL). However, the t-statistic of -0.9030 falls outside the critical region of ±0.3806 at the 5% significance level. Hence, we accept the alternate hypothesis that there is a significantly inverse association between LTDR and NPL. We also find a significantly inverse correlation between net interest margin and loan-to-total deposit ratio (LTDR).
The results also show a very weak beta and correlation coefficients -0.1440 and -0.1030 respectively. Since the computed t-statistic is -0.5600 falling within the critical region of ±0.5840 at the 5% level of significance, we accept our null hypothesis that there is no significant association between net interest margin (NIM) and non-performing loans ratio (NPL). We also observe a very weak inverse correlation between LTDR and NIM. The t-statistic of -0.7760 falls outside the critical region of ±0.4497 at the 5% level of significance, portending that the association, although weak, is significant.

Table 4: Effects of Balance Sheet Fragility on Bank Funding and Profitability Growth in the Post-Consolidation Era (2007-2009)

Model & Parameters	Independent Variables * Non-Performing Loans Ratio (NPLR)	Loan Loss Reserves Ratio (LLRR)
Model 3 (DV LTDR)		
Beta (β)	-0.2250	-0.1934
SE Beta	0.2491	0.2491
Corr.	-0.2051	-0.1702
t-statistics	-0.9030	-0.7760
Sig.t (0.05)	0.3806	0.4497
t-constant = 2.269 (0.384) **		
Model 4 (DV NIM)		
Beta (β)	-0.1440	-0.1997
SE Beta	0.2573	0.2573
Corr.	-0.1030	-0.1702
t-statistics	-0.5600	-0.7760
Sig.t (0.05)	0.5840	0.4497
t-constant = 6.433 (0.0000) **		

*The dependent variable in Model 1 is loan-to-Deposit Ratio (LTDR), Model 2 net interest margin (NIM)
Source: SPSS Print-Out

The overall model results are summarized in Table 5. With a coefficient of determination (R^2) of 0.2869, Model 1 shows that a little change in NPL and LLR leads to a more significant change in Loans-to-Assets Ratio (LTA). With F-ratio of 2.8162 lying outside the critical region of ±0.0938 at the 5% level of significance, we find that the explanatory powers of NPL and LLR are high and significant in causing variations in LTA. However, in Model II, the explanatory powers of NPL and LLR in determining variations in Loan-to-total deposit ratio
(LTDR) are significantly weak (R^2 = 0.0513). The F-ratio of 0.3785 falls within the acceptance region of ±0.6917 at the 5% level of significance.
In Model 3, the non-performing loan ratio (NPL) and Net Interest Margin (NIM) only explain 8% of the variation in LTDR while the model coefficients (α, β_1, & β_2) are statistically significant. In Model 4, NPL and LTDR only explain 5% of the variation in NIM while model coefficients are not statistically significant at 5% level.

Table 5: Model Summary Results

Parameter	Model 1*	Model 2**	Model 3***	Model 4****
Mult R	0.5356	0.2265	0.2812	0.2209
R^2	0.2869	0.0513	0.0791	0.0488
Adj. R^2	0.1850	-0.0842	-0.0437	-0.0780
F-Ratio	2.8162	0.3785	0.6439	0.3849
Sig. F	0.0938	0.6917	0.5391	0.6870
Constant	0.2900	0.1740	1.0927	0.1409

* Model 1: $LTA = \alpha + \beta_1 NPL + \beta_2 LLR + \varepsilon_i$

** Model 2: $LTDR = \alpha + \beta_1 NPL + \beta_2 LLR + \varepsilon_i$

*** Model 3: $LTDR = \alpha + \beta_1 NPL + \beta_2 NIM + \varepsilon_i$

**** Model 4: $NIM = \alpha + \beta_1 NPL + \beta_2 LTDR + \varepsilon_i$

Source: SPSS Print-Out.

6 Conclusion

Based on descriptive statistics, a very high NPL ratio of 21.1% in the bank distress era (1999-2001) portrays apparent weakness in regulatory and supervisory oversight over the universal banks. The existing Prudential Guidelines for Licensed Banks (1990) were incapable of moderating the level of non-performing loans in the loan portfolio, and ensuring strict compliance with loan loss provisioning.

However, the drastic decline in NPL ratio from 21.1% in Period I (1999-2001) to 7.1% in Period II (2007-2009) could have been explained by bankers' increasing risk aversion, and the pursuit of industry consolidation. The intercepting 2007-2009 Global Financial Crisis could have also raised the emphasis on adequate loan loss provisioning, requisite disclosure and transparency and regulatory interventions in unsound banks.

However, the loan-to-deposit ratios (LTDR) of banks in the two periods did not show any radical improvement, although NPLs declined drastically. The LTDRs in the two periods still remained below the prudential maximum of 80.0%. Bankers still preferred safe investments in treasury securities at the expense of increased funding. If relative bank funding continues to decline systematically below the prudential maximum, the intermediation role of banks would be adversely impaired.

The results also show that the radical improvements in banks' asset quality between Periods I & II did not translate to a corresponding radical improvement in bank liquidity and aggregate funding to the non-bank private sector. The significant decline in NPL ratios could have been induced by regulatory intervention, instead of internal loan recoveries. Except the newly formed Asset Management Corporation of Nigeria (AMCON) assists in improving banks' liquidity profiles, bankers' increasing risk aversion may curtail the loan-to-deposit ratios (LTDRs) further, thereby complicating the liquidity-profitability dilemma.

The incidence of NPL ratios did not actually matter to the banks' net interest margins (NIM). The high sensitivity of the net interest margin to the loan-to-deposits ratio (LTDR) shows banks preference for wider margins under the risk-based supervision (RBS) regime. The strict pursuit of the RBS model could deal with a liquidity crisis, but fail to deal with a banking crisis in the medium term as aggregate NIM declines. At this point the goals of bank management and banking regulation must be reconciled optionally to

keep banks safe, profitable and relevant, instead of just being a stringent response to market failures and cumulative risk concentrations.

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