A Nexus of Capital Base, Profit Generating Capacity and Operational Efficiency of Commercial Banks in Nigeria

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Abstract

The study analyzed the main determinants and the relationship between capital base, profit-generating capacity and operational efficiency of Nigerian commercial banks. This was with a view to providing empirical information on the relationship between capital base requirements and profit-generating capacity and efficiency in the Nigerian commercial banking sector.Secondary data covering 16years on key performance indicator of the banks such as total income, interest rates, total credits, and branch networks were sourced from the "fact books" published by the Nigerian Stock Exchange (NSE) and official publications of the selected banks. The data were subjected to the two-stage least square(TSLS) technique for the purpose of estimating the model. The results showed that capital base requirement was ineffective in reducing distress in the banking industry. The results further showed that the main determinants of bank capital base were lagged capital (t = -2.60, p<0.05), risk (t =2.30, p<0.05), size(t= -3.27, p<0.05), profit before tax (t =6.23, p<0.05), regulatory pressure (t=3.97, p<0.05) and profit generating capacity (t =2.54, p<0.05). It was also found that bank capital base significantly influenced bank efficiency (t= 2.14, p<0.05) and that changes in the bank capital determined the degree of efficiency of the banks (t =2.14, p<0.05). Furthermore, the capital base of the banks significantly influenced their profit generating capacity (t=10.2, p<0.05). This revealed that the Central Bank of Nigeria could use the regulatory power of raising the capital base of banks to stimulate greater profitability and efficiency in the banking sector.
Keywords: Financial Deepening, Commercial Banks, Capital Base, Efficiency, Profit Generation, Nigeria.

SECTION ONE

1. INTRODUCTION

It is quite known that well-functioning banking systems accelerate long-run economic growth but poorly functioning banking systems can impede economic progress, exacerbate poverty and destabilize economies (Bath, Capro and Levine, 2001). Therefore, efficient bank operation and stability should be a major macro-economic concern of a nation. To ensure that the banking system is efficient and operationally effective, the government of every country does exert some regulatory controls. The solid financial base will assist the banks to withstand fluctuations in the liabilities portfolio and be able to absorb some unexpected losses due to asymmetric information on their customers. The ability of banks to provide needed credit in a fast developing economy and to robustly compete in an ever increasingly competitive environment is enhanced with strong capital base, ceteris paribus.

However, while some financial theorists continued to emphasize the importance of capital base in banking effective operation, empirical studies in some countries had revealed that higher bank capital levels do not, by themselves, guarantee that banks are adequately capitalized. This is so whenever banks have high ratios of risk-weighted assets to un-weighted assets (See, for example, Shrives and Dahl, 1992)..For instance, despite the fact that the CBN has been enforcing capital adequacy requirements, the Nigerian banking system has always been under distress. For instance, six technically insolvent banks were taken over by the CBN in 1993. In 1995, seventeen other technically insolvent banks were taken over by the apex bank. Between 1994 and 1998, the operating licenses of thirty one banks were revoked by the CBN (Ogunbunmi, 2004). Surprisingly, the reform acclaimed panacea to the banking distress in Nigeria has begun to show sign of defect as three of the 25 banks were technically grounded just two years after the N25 billion naira minimum recapitalization reforms of 2005. Therefore this study attempts to investigate the relationship between the capital base requirement, profit generating capacity, and the operational efficiency of commercial banks in Nigeria.

The 1988 Basle standards are almost entirely focused on credit portfolio risk, the risk of loss due to counter party default (Roy, 2003). The basis of the 1988 Accord was that a consistent standard be applied for determining minimum capital requirements across internationally active banks. These capital requirements were structured to make regulatory capital sensitive to differences in risk portfolios across banks, with banks holding riskier assets required to hold a higher level of capital (Ford and Weston, 2003). In effect, the 1988 Basle Accord mandates banks to hold higher percentages of equity capital as the perceived credit risk of assets increases (Ford and Weston, 2003). In 2004, the 89 banks were squeezed to 25 with 14 completely liquidated while the rest regrouped for business as usual. It is amazing to observe that just two years of the consolidation one (4%) of the

25 banks that remained after the consolidation has been taken over by the CBN due to insolvency and a sign of collapse.

Perhaps the recent problems of some of the newly recapitalized banks in Nigeria might have been averted if the reform was based on proper appraisal of the past efforts and the underlining factors generating crisis in the banking system. While several attempts were made in the past to assess the overall effects of financial reforms on banking operation in Nigeria, less attention was paid to the issue of capital base especially the operational effectiveness of increasing capital base in the banking industry. The neglect of this important aspect of the banking regulation might undermine the policy relevance of the existing evidence on the operational efficiency of Nigerian banking industry. Appraising the contribution of bank capital on the banking operation in Nigeria is inevitable and urgent to lay solid foundation for further reforms in the banking industry in Nigeria. Hence, this study attempts to fill this empirical gap in the existing literature on capital base and banking operation in Nigeria.

Germane to this research in the right perspective, a pertinent issueisraised for investigation:

(ii)   What are the main factors determining changes in the bank efficiency in Nigeria?

(ii)   Is there any significant relationship between the regulatory capital structure   and   bank soundness?

The overall objective of the research is to investigate the relevance or otherwise of bank recapitalization to improving the operational efficiency of banks in Nigeria. Therefore, it is further narrowed down specifically: Determine the relationship between capital base, profit-generating capacity and operational   efficiency   of Nigerian commercial banks.

In order to achieve the above specific objective this proposition will be tested empirically:

H_o: There is no relationship between capital base and profit generating capacity of Nigerian Commercial Banks.

The increasing reliance of regulators on capital requirements raises some fundamental questions that have dominated the discussions on the bank capital adequacy: one, do banks respond to capital requirement, that is, are the penalties for falling below the regulatory guidelines large enough to induce banks to raise their capital ratio? Two, how do banks improve their capital ratio when they approach the regulatory minimum, that is, do they increase their capital or reduce their higher risk assets? Three, does increase in capital requirement induce banks to reduce or increase the riskiness of their portfolio? Two, decades after the adoption of the Accord and whilst new regulatory guidelines have been designed, it is fair to say that empirical research is still far from having answered the questions posed above. Financial analysts and scholars were divided over these questions. Many studies have tried to assess empirically the impacts of capital requirement on bank's behavior.

Thus, as efforts are being directed to examine issues that will improve the performance of the capital market in developed countries such efforts need to be extended to developing countries. Indeed, the developing economies like Nigeria deserve more attention than the developed economies such as UK and USA in view of the fragile and transition stage of financial systems in developing economies Thus, there is an important lacuna to filled in the empirical studies on the implication of bank recapitalization on financial development in Nigeria in particular and developing economies in general. This study attempts to take up this challenge by providing further evidence on bank capital behavior outside the developed economies.

The examination of Nigerian banks capital behaviour is of interest in several other respects. First, Nigeria has suffered from financial crises arising from the risk taking and weak capital base problem that nearly submerged the market in the 1990s. Examining the effect of recapitalization policy of Nigerian banks will further shed light on possible factors responsible for the crises and the appropriate policy response to prevent future occurrence. Second, regulatory pressure in Nigeria implied by the capital requirement may be stronger in Nigeria where a beach of the guidelines rapidly leads to the closure or takeover of the bank; unlike the case in some developed countries where undercapitalized banks are not necessarily closed, but are subject to restrictions on their activities and to higher deposit insurance premia. Third, financial structure and institutions in Nigeria are less developed than those in developed economies where the existing evidence are based, thus making the evidence from those countries less relevant in policy design and evaluation in Nigeria. This study therefore investigates the effect of capital regulation on bank performance in Nigeria.

This study covers a period of sixteen years from 1992 to 2007. The period was chosen as it coincided with the period Nigeria became a signatory to the Basle Accord and the period a new bank capital regulatory mechanism was introduced. In 2004 a new bank order in which recapitalization, merger, and acquisition of controlling interest as the central mechanism to achieve what the Basle Accord was also set to achieve. By implication, the study will serve as an appraisal of existing regulatory order as basis for the implementation of the new order in Nigeria. Extending the analysis to 2007 therefore serves as an appraisal of the ongoing reforms and the recapitalization policy of 2004. A cross-sectional time data were collected on the commercial banks that were in existence during this period Existence of bank's branches in the rural areas of the country and

availability of data on the bank were the criteria for bank selection.

2. Empirical Literature

In this section, we review the empirical bank literature which may give implications for the optimal capital structure, risk-taking, and interaction with regulation and supervision. We start with a presentation of the most extensive strand which studies the relationship between capital and risk under different regulatory regimes (flat and risk-based capital regulation). Then, we continue with more specific studies on questions concerning the impact of deposit insurance, charter value, and ownership structure on bank risk-taking. We round up with a review of capital market reactions to recapitalization.

Studies on Relationship Between Capital, Risk, and Regulation

Most authors try to explain changes in risk and capital in partial adjustment model. Changes in risk and capital are assumed to depend on two components, one discretionary and an exogenously determined random shock. The endogenous components are proportional to the difference between a bank's target level of risk (capital) and the risk (capital) level at the beginning of the period - the lag period. The target levels of risk and capital depend on exogenous variable such as the market interest rate, the degree of tax advantage of deposit relative to equity finance, and the degree of regulatory pressure as well as, for simultaneous equations models, capital and risk respectively.

Before the early 1980s, US regulation could be characterized by a peer group approach which means that supervisors oriented themselves at the average bank balance sheet. *Marcus (1983),* who tries to explain the decline in capital to asset ratios in U.S. commercial banks between 1965 and 1977, confirms the peer group theory of regulatory pressure. This implies that when all banks suffer capital losses (for example, from a rise in the interest rate), the increase in regulatory costs for a particular bank is much smaller than it would be if that bank alone lowered its capital. "Drops in capital common to all banks do not induce regulatory review of any particular bank and consequently do not require banks to readjust capital" (Stolz, 2002). In the early 1980s, minimum capital-asset ratio requirements supplanted the earlier peer group type of capital regulation (Stolz, 2002). Using the same methodology, *Keeley (1990)* studies the effect on the capital positions of the 100 largest bank holding companies. He finds that the regulations succeeded in causing banks with low capital ratios to increase their book value of capital ratios both absolutely and relatively to banks with initially high capital ratios, and that banks did so primarily by slowing asset growth.

Studies on Risk Sensitive Capital Requirements

Between 1989 and 1993, banks shifted their portfolio towards low-risk assets. For instance, while in 1989 U.S. banks held only 15 percent of their total loans in government securities, by 1993, this share had risen to 22 percent. Haubrich and Wachtel (1993) apply an analysis of variance to study the question whether this dramatic shift in bank portfolios can be attributed to the new risk-based capital Accord (Basle I) which were agreed upon in 1988 and gradually being phased in until 1993. Their findings suggest that the implementation of Basel I caused poorly capitalized banks to reconfigure their portfolios away from high-risk assets and towards low-risk assets. By using the same methodology as Shrieves and Dahl, Jacques and Nigro (1997) examine whether their results are changed under risk-based capital standards. They study the relationship between bank capital portfolio risk and the risk-based capital standards for US banks in the first year the Basel Accord was in effect (1991). Jacques and Nigro find that the risk- based capital ratios led to significant increases in capital ratios and decreases in risk exposure both for risk-based capital-constrained and unconstrained banks. Although the overall results suggest that the risk-based capital standards played a significant role, the banks' responses showed surprisingly little connection to the degree to which the banks fell short of the standards. This result of a negative relation of changes in capital ratios and risk is in contrast to the positive relation found by Shrieves and Dahl (1992).

By applying the Shrieves and Dahl methodology, *Rime (2001)* analyses adjustments in capital and risk of Swiss banks when they approach the minimum regulatory capital level. Switzerland is interesting insofar as Swiss capital requirements might be more risk-sensitive as the Basel Accord as they stipulate a larger number of risk classes. Furthermore, regulatory pressure might be stronger in Switzerland than in the US as a breach of the guidelines rapidly leads to the closure or to the take-over of the bank. Rime found the same empirical evidence for Switzerland as Ediz, Michael, and Perrauding for the U.K. This is that regulatory pressure induced Swiss banks to increase their capital, but did not affect the level of risk. A plausible explanation for the relative rigidity of Swiss banks' portfolios is the lower liquidity of assets due to a less developed market for small banks stocks and the absence of a market for asset-backed securities.

Studies within the Options Pricing Framework

This strand of the literature is reviewed in an own subsection because it applies a very different methodology to the studies just surveyed. Furlong (1988) studies how the default risk of large U.S. bank holding companies changed in the pre-Basel period from 1975 to 1986. His approach builds on the insights of the option pricing theory that the equity market capitalization of a bank may be regarded as the value of a call option

written on the bank's underlying asset value with deposits being interpreted as the option's strike price. Furlong then infers the volatility of the asset values by inverting the Black and Scholes call option pricing formula. He finds that asset risk measured in this way actually doubled in 1981-1986, the part of his sample in which banks faced capital requirements, compared to the earlier period. It appears that the large increase in asset risk more than offset the improved capital positions thereby increasing default risk.

Studies on Moral Hazard Due to Deposit Insurance

The findings by *Gropp and Vesala (2001)* stand in contrast to these former empirical results. They study the relationship between deposit insurance, debt- holder monitoring, bank charter values, and risk-taking for European banks. They find that the introduction of explicit deposit insurance reduces the risk-taking of banks. Gropp and Vesala explain their counterintuitive result by the expectation that in the absence of deposit insurance, a public bailout would save banks in time of distress. The establishment of an explicit deposit insurance system then actually limits the scope of the safety net. This result implies that the belief of the depositors in a public bailout is sufficient for moral hazard of banks. They also find that banks with lower charter values reduce risk taking more after the introduction of explicit deposit insurance. This supports the mitigating effect of charter value on moral hazard. The authors also show that large banks do not change their risk-taking in response to the establishment .of deposit insurance. This suggests that the introduction of explicit deposit insurance does not alleviate "too-big-to-fail" problems.

3.RESEARCH METHODOLOGY

Model Specification

The focus of this study was twofold. It examined the factors determining the capital size of the bank and how the changes in the bank capital due to these factors have impacted on the bank operational performance in Nigeria. To carry out these analyses therefore two distinct models were specified. First, one model examined the determinants of changes in capital base of bank and the other examined the relative contribution of capital base on bank operational performance in Nigeria.

The first model flowed from the theoretical framework discussed in chapter two section 2.4 that the level of capital raised depends on the following variables:

P_0, t, C_{DB}, r_y R_{DB}, a, p and the standard deviation of the earnings Y. The demand for capital can be written as follows:

$$W^d = (P_o - (t + C_{DB} + r_y R_{D,B}), a, \delta(Y), p) \dots\dots\dots\dots\dots\dots\dots\dots (3.1)$$

Where

W_d = Demand for equity capital

C_{db} = operating Cost

T_d = returns on deposits

R_y = opportunity cost of holding reserves

$P(o)$ = required rate of returns

P = cost of adjustment

A = asset return

Y = gross earnings

The theoretical framework discussed earlier is also presumed that capital and risk decisions are determined simultaneously. To recognize this, we based our analysis of Nigerian banks' capital behaviour on the model developed by Shrives and Dahl (1992). In the model, observed changes in banks' capital consist of two components, a discretionary adjustment and a change caused by factors exogenous to the bank:

$$\Delta CAP_{j,t} = \Delta^d CAP_{j,t} + E_j \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.2)$$

Where $\Delta CAP_{j,t}$ is the observed change in capital for bank j in period t.

The discretionary changes in capital $\Delta^d CAP_{j,t}$ is modeled using the partial adjustment framework, hereby recognizing that banks may not be able to adjust to their desired capital ratio level instantaneously. In this framework, the discretionary change in capital is proportional to the difference between the target level and the level existing in period t - 1:

$$\Delta^d CAP_{j,t} = \alpha(CAP^*_{j,t} - CAP_{j,t-1}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.(3.3)$$

Where *$CAP^*_{j,t}$ is bank) j's target capital.*

Substituting equations (3.3) into equations (3.2), the observed change in capital can be written:

$$\Delta CA_{j,t} = \alpha(CAP^*_{j,t} - CAP1_{j,t-1}) + E_{j,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.4)$$

This means that the observed change in capital in period t is a function of the target capital, the lagged capital ratio, and any random shocks.

Modeling Determinants of Banking Efficiency:

The outcome of bank activities can be deemed to mean their outputs. The aim of any bank is to be efficient in the optimal combination of its inputs using the existing technology to produce a desired level of service output. This efficiency of the bank can therefore be determined by the changes in the volume of service

output rendered by the bank relative to the inputs. Therefore the bank financial production function can be written in the form of CobbDouglasfunctionas:

$$Y = A\,L^{\alpha}\,K^{\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(3.5)}$$

Y represents service (output) produced by the banks by combining financial resources capital **K** and Human resources **L** and **α, β** are the parameters representing the output service elasticity of each input. A represents other factors that can affect output apart from physical and human capital. Such inputs captured by A are level of technology and other institutional factors. K in equation *3.5* can be replaced with CAP from equation 3.4 So that equation *3.5* becomes:

$$\Delta Y = \Delta(A\,L^{\alpha})\,\Delta(CAP)^{\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. \text{(3.6)}$$

Substituting for CAP in equation 3.6 with equation 3.4 then equation 3.6 becomes

$$\Delta Y = \Delta(AL^{\alpha})\,\mu\,(CAP^{*}_{j.t} - CAP_{j.t\text{-}1}) + E_{j.t})^{\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(3.7)}$$

Expressing Equation 3.7 in Log linear form we have

$$\Delta InY = InA + \alpha\Delta In1 + In\mu + \beta In\,(cap^{*}_{j.t} - \delta Incap_{j.t\text{-}1}) + E_{j.t} \dots\dots\dots\dots\dots\dots\dots\dots\text{(3.8)}$$

The target capital ratio *(cap*)* is not observable; it is assumed to depend on a set of observable variables describing the bank's financial conditions and the state of the economy. The variables that we used to approximate the target capital cap* were the size of the bank (SIZE), the loan ratio (LOANS), current profit (PBT), changes in the risk ratio (RISK), and the degree of regulatory pressure (REG). Apart from these bank variables, CAP* is approximated and redefined as by

CAP* = f(LLOSS, ΔRISK, CAP, SIZE, REG) ……………………(*3.9)*

Other variables considered important as major determinants of changes in bank operating performance are the bank input variables. The most commonly used are the labour inputs, capital input and deposit. Input variables: labour and physical capital will be proxies by the price of labour (PL) and price of capital (PC). In addition the price of deposits (PD) that also serves as capital to the bank but also liabilities is also included. Based on the objective of the study, two variables represent the dependent variables(Y); these are Profit generating capacity (PGC) and bank operating efficiency measured as returns on Asset (ROA).

On the basis of the analysis in sub-section 3.2, and in line with the objectives of the study, the model defined by equations (3.4) and (3.6) are remodified as follows:

$$\Delta CAP_{j,t} = \alpha_0 + \alpha_1 RISK_{j,t} + \alpha_2 LLOSS_{j,t} + \alpha_3 NM1_{j,t1} + \alpha_4 ML_{j,t} + \alpha_5 01_{j,t} + \alpha_6 FBT_{j,t\text{-}1}$$
$$+ \alpha_7 ROA + \alpha_8 SIZE_{j,t} + \alpha_9 REG_{j,t} + \varepsilon_{j,t} \qquad \textbf{(3.10)}$$
$$\Delta PGTC_{j,t} = \alpha_0 + \alpha_1 PL_{j,t-1} + \alpha_2 PD_{j,t-1} + \alpha_3 PC_{j,t-1} + \alpha_4 CAP_{j,t} + \varepsilon_{j,t} \textbf{(3.11)}$$
$$\Delta ROA_{j,t} = \alpha_0 + \alpha_1 PL_{j,t} + \alpha_2 PD_{j,t-1} + \alpha_3 PC_{j,t} + \alpha_4 CAP_{j,t} + \varepsilon_{j,t} \textbf{(3.12)}$$

4.DATA PRESENTATION, ANALYSIS AND DISCUSSION

In order to explore further the linkage and to avoid spurious interpretation of the result from the causality nexus among the variables examined to determine the causal relationship between bank efficiency indices and capital base requirement as well as other bank related variables, the correlation coefficients between pairs of these variables are examined before granger causality is used to determine the direction of influence. To this effect, the correlation and causality among the key variables are presented in table 4.1. As shown in table 4.1 the relationship between changes in return on assets (ROA) and changes in capital base of the banks is positive but very low. Similar pattern is observed in the cases of bank risk level, profit before tax, input variables (prices of physical capital (PC), deposits (PD) and labour (PL)) and profit generating capacity (PGC).

Table 4.1: Correlation Matrix

Correlation Coefficient of the Key Determinants of Bank Performance

	ROA	CAP	PD	PC	PL	RISK	LLOSS	PBT	PGC
ROA	1.000								
CAP	0.043	1.000							
PD	0.247	0.009	1.000						
PC	0.030	0.115	−0.075	1.000					
PL	−0.091	0.128	0.144	0.090	1.000				
RISK	0.033	0.161	0.060	0.019	0.084	1.000			
LLOSS	−0.037	−0.100	0.099	0.012	0.195	0.133	1.000		
PBT	0.204	0.622	0.226	0.018	0.070	0.088	−0.085	1.000	
PGC	0.078	0.223	0.074	0.051	0.042	0.010	−0.200	0.181	1.000

Source: **Panel Study 2007**

Generally, Return on assets has low correlation with most of the variables. Except with price of deposit

and profit before tax which have about 20% correlation coefficient, the correlation coefficients of all other variables are less than 10%. The table further reveals that return on assets is only negatively correlated with price of bank labour and changes in loan loss (LLOSS). The correlation between the capital base requirement and profit generating capacity as well as profit before tax are also worth mentioning. BothProfit generating capacity and profit before tax have positive but low correlation with most all the variables except loan loss ratio. The size of the correlation is low but the fact that they are positive shows that the variables move in tandem.

One major shortcoming of correlation coefficient analysis is that the direction of the influence could not be detected and also the high or low correlation between two variables does not imply the existence or non-existence of causal nexus between the variables. The granger causality approach is adopted to examine the causal nexus between the bank efficiency factors and profit generating capacity. The granger bivariate causality is done to determine the one-to-one causal effects among the variables.

Table4.2: Results of the Estimates of Causality Test

Null Hypothesis:	F-Statistic	Probability
LPD does not Granger Cause LROA	5.51047	0.00453
LROA does not Granger Cause LPD	11.0853	2.40E-05
LROA does not Granger Cause LPL	5.48407	0.00464
LCB does not Granger Cause LPC	3.03478	0.04983
LCB does not Granger Cause LPL	2.88347	0.05775
LCB does not Granger Cause LPBT	8.1624	0.00037
LPGC does not Granger Cause LCB	21.803	1.80E-09
LPL does not Granger Cause LPD	5.67361	0.00387
LLLOSS does not Granger Cause LPD	3.45609	0.03302
LPBT does not Granger Cause LPD	6.93642	0.00116
LPGC does not Granger Cause LPC	56.5078	0.00007
LRISK does not Granger Cause LPL	4.34042	0.01398
LLLOSS does not Granger Cause LPL	6.98861	0.00111
LRISK does not Granger Cause LLLOSS	7.3062	0.00082
LPGC does not Granger Cause LPBT	24.2007	2.30E-10

Note: the F-statistics is significant if probability value is less than 0.5
(p ≤ 0.5) at 5% critical level.
Source: Panel Study 2007

As shown by causality test reported in table 4.2 above, profit generating capacity has oneway directional causal effect on both capital base and price of deposit. Capital base has one way causal effect on profit before tax, and profit before tax unidirectional causal effect on price of deposit. The causal relationship between prices of deposit and return on assets is in both ways; that is, price of deposit affects return on assets and at same time return on assets also affects price of deposit. Price of deposit is also affected by provision for loan loss while provision for loan loss is affected by risk- taking behavior. Loan loss rate and return on assets also cause changes in the price of labour of the banks.

Therefore, capital base requirement has only indirect significant causal effect on bank efficiency, since bank capital base causes profit generating capacity which in turn causes price of deposit that has direct causal effect on return on assets, then it can be said that capital base requirement may influence changes in the bank performance through its channel. Similarly, risk behavior of banks many not have direct effects on returns on assets but it has indirect effect through the deposit price channel.

Similarly, risk behavior of banks many not have direct effects on returns on asset but it has indirect effect through the deposit price channel. The direction of causation is illustrated in the diagram below.

Model Estimations, Analyses of Estimation Results and Inferences
Financial Determinants of Bank Capital Base Requirement

Given the simultaneity of relationship in the model, the conventional Ordinary Least Square (OLS) technique will be inappropriate in estimating it. The OLS assumes, among other things, that the explanatory variables are either not stochastic or if stochastic are distributed independently of the stochastic disturbance term. In a model of simultaneous relationship, such as our model, the above condition is violated. The use of OLS in the estimation of such a model would produce not only biased estimates but also inconsistent estimates. That is, as the sample size increase indefinitely, the estimates would not converge to their true (population) values (Gujarati, 2005). Since the OLS is inappropriate there is the need to use alternative estimation technique that will make the model estimates unbiased, consistent and efficient.

A thorough examination of the model reveals that it is over identified based on the order and rank of conditions for identification. When a model is over identified, the most appropriate single equation estimation technique for it is the two-stage least square technique (TSLS). The TSLS is well known for its ability to provide satisfactory results for the estimates of structural parameters and has been accepted as the most important single-equation technique for the estimation of over identified models (Madallas, 2001). Therefore the behavioral relationship of the model will be estimated by TSLS technique, using annual data that run from 1992 to 2007.

It has also become fashionable in contemporary econometric analysis to consider issues of stationary, co integration and error correction mechanism (ECM) when dealing with models involving time series variables. Stationary assures non-spurious results; co integration captures equilibrium long run or relationship between (co integrating) variables, and error correction mechanism is a means of reconciling the short run behavior of an economic variable with its long run behavior (Gujarati 1995). However, the foregoing issues are not necessary for this particular model because it is considering short run effects and it is a multi-equation system. Furthermore it is using a powerful functional form-logarithmic indexation, where the index forms of virtually all the variables are taken and the logarithmic of all the variables are used. This ensures the robustness of estimates.

As can be seen from Table *4.2* the explanatory powers as judged by the adjusted R^2, is relatively high given the fact that the variables are in log-linear form. The significance of the proportion explained by the variables in the model which is captured by the R2' the coefficient of determination is not in doubt as the F-statistics sufficiently confirms the significance of the R2. Hence the model adequately captured the empirical relationship between economic growth and the variables included as its determinants in the model. As a further confirmation of absence of serial correlation among the variables and because of the general concerns about the statistical reliability of OLS estimates when pooled data series are involved, the Breusch-Godfrey Serial Correlation LM Test was conducted and the output of the estimation is provided in table 4.6. As clearly indicated by the F- statistics the presence of serial correlation is rejected, thus confirming the low correlation reported among the variables in the correlation matrix reported earlier.

In term of relative contributions of each variable in the model, results in table *4.5* shows that the signs on the coefficients of the variables are mixed. Some have positive while a reasonable number also has negative sign. For instance lag capital (CAP (-1)), bank size (LSIZE) and loan loss provision (LLOSS) are negative. The significant negative effect of the previous level of bank capital indicates that the banks were only slowly adjusting their capital to desired levels in period under study. Indeed, banks, most often, wait for the CBN directive before initiating any significant change in their banks capital size. The fear of unknown in the Nigerian banking industry makes some banks reluctant to increase their capital base.

The coefficient on risk ratio is significant and positive. Suggesting that the higher the increase in the risk levels the more the banks are compelled to increase capital base. Bank size has significant negative impact on bank capital ratios. Possible interpretations are that large banks have access to capital market, and can therefore operate with lower amount of capital or that they feel less pressure to increase capital because of a *too-big-to-fail-effect;* a larger size also allows greater diversifications to mitigate the credit risk exposure. As hypothesized, net loans as percentage of total assets are good proxy of target risk profile of banks as they always increase significantly the credit risk by less than what is necessary to compensate the increase in risk. The coefficient on risk exposure is positive and significant. This positive relationship between risk exposure and bank capital does not support Koehn and Santomero's conclusion that banks will try to offset the loss in utility from the upper limit on leverage by choosing a riskier portfolio. Indeed, higher risk ratios do lead to an increase in capital. The return on asset was found to have a positive effect on bank capital ratios, a result consistent with the hypothesis that banks with higher earnings could retain more capital. Finally, loan loss provision as percentage of total asset (LLOSS) had no significant effect on bank capital. More important, examining the coefficient on the regulatory pressure by CBN (REG) which is positive and significant; banks in Nigeria generally are not proactive in the capital mobilization. They tend to wait till they are externally forced/compelled to shift their capital base. Most often the CBN strikes the big stick whenever there are serious signs of distress and the banks capital base is seriously undermined. The implication of this is that, central bank in Nigeria plays a significant role in bank capital determination. Thus, suggesting that bank capital of Nigerian banks at least

during the study period depended less on market forces but more on institutional pressure.

Profit generating capacity and profit before tax are other variables with significant positive effects on bank capital. This strong relationship is expected since the higher the profit made by banks the higher the ratings of the banks and the confidence of investors and core shareholders. As the capacity of the banks increases and the banks make more profit, the existing capital may become inadequate to withstand the financial pressure generated from the increase profit and earnings capacity. Thus the bank capital will be reviewed upward even when there is less regulatory pressure from the CBN. A careful analysis of the size of coefficient shows that regulatory pressure is the most important factor that determines the size of bank capital. Apart from the regulatory pressure, the next most important factor is return on Asset and followed by profit before tax level and risk exposure. Profit generating capacity and loss provision trailed behind.

Table 4.3: Results of Estimates of Bank Capital Base Determinants

Dependent Variable: LCB				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCAP(-1)	-0.123689	0.077443	*-2.597149*	0.0115 x
LRJSK	0.401229	0.174836	2.294884	0.0225 xx
LLLOSS	*-0.051563*	0.065867	-0.782833	0.4344
LSIZE	-0.225675	0.068994	-3.270937	0.0012 x
LPBT	0.467117	*0.074425*	6.276376	0.0000 x
LPGC	0.127144	0.050123	2.536640	0.0118 x
REG	1.950007	*0.633509*	3.972246	0.0001 **x**
LROA	1.932696	1.005080	1.922928	0.0556 xx
R-squared	0.758943	Mean dependent var		14.01706
Adjusted R-squared	0.746668	S.D. dependent var		2.089722
S.E. of regression	1.530401	Akaike info criterion		3.718771
Sum squared resid	599.5848	Schwarz criterion		3.827 133
Log likelihood	-482.8778	F-statistic		33.48116
Durbin-Watson stat	1.958506	Prob(F-statistic)		0.000000

Guide to analyses of estimates:X Beta coefficient is significant at 1% level of significance; and XX Beta coefficient is significant at 5% level of significance.
Source: Panel Study 2007

Table 4.4: Results of Breusch-Godfrey Serial Correlation LM Test:

F-statistic	18.78936	Probability	0.000000
Obs*R-squared	34.02436	Probability	0.000000
Test Equation:			
Dependent Variable: RESID			
Date: 05/24/08 Time: 11:00			
Presample and interior missing value lagged residuals set to zero.			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LLLOSS	0.027915	0.061986	0.450334	0.6529
LSIZE	-0.036774	0.064985	-0.565882	0.5720
LROA	0.009258	0.072749	0.127264	0.8988
LPBT	0.001669	0.069740	0.023931	0.9809
LPGC	-0.011723	0.047016	-0.249332	0.8033
LRISK	-0.415313	0.183169	-2.267378	0.0242
REG	-1.37E-09	1.55E-09	-0.883010	0.3781
C	0.676917	0.948604	0.713592	0.4761
RESID(-1)	0.303797	0.069755	4.355217	0.0000
RESID(-2)	0.186143	0.061244	3.039341	0.0026
R-squared	0.128880	Mean dependent var		9.58E-15
Adjusted R-squared	0.098014	S.D. dependent var		1.509897
S.E. of regression	1.433994	Akaike info criterion		3.595947
Sum squared resid	522.3102	Schwarz criterion		3.731400
Log likelihood	-464.6650	F-statistic		4.175412
Durbin-Watson stat	1.951723	Prob(F-statistic)		0.000048

Source: Panel Study 2007

Contribution of Bank Capital to Bank Operational Efficiency

The effects of bank capital on bank efficiency measures in terms of returns on asset are examined in this section. The estimated values of bank capital are used as the proxy for the effects of other variables in the bank capital model on bank efficiency. In this way, the effects of all the bank variables in the capital model are incorporated in addition to the separate effect of capital base itself. Hence, the other bank variables are excluded from the model since their effects are already captured by the predicted bank capital series derived from model used in model for bank capital above. Table 4.5 presents the estimates of the model with predicted values for bank capital (CAPF) as measures of bank capital. The other variables in the model are price of labour (LPL), price of capital (LPC), price of deposit (LPD), non mortgage loans (LNM), mortgage loans *(LML),* and other loans and investment (LOT).

The explanatory power as judged by the adjusted R2, (70%) is relatively high. The significance of this the R2' is not in doubt as the F-statistics sufficiently confirms the significance of the R2. Hence the model adequately captured the empirical relationship between bank capital and bank efficiency and the variables in the model.

Table 4.5: Results of Estimates of Bank Efficiency Model
Dependent Variable: LROA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LPD	0.468907	0.103320	*4.538394*	0.0000 x
LPL	-0.284671	0.144645	-1.968069	0.0501 xx
LPC	0.037 194	0.086949	0.427769	0.6692
LML	*-0.050467*	*0.045254*	-1.115185	0.2658
LNM	-0.036907	0.055969	-0.659415	0.5102
LOl	**0.094676**	**0.036840**	**2.569899**	**0.0107 x**
CAPF	0.136033	0.063307	2.148773	0.0326 xx
C	-3.872573	0.917793	-4.219440	0.0000
R-squared	0.724433	Mean dependent var		-2.379786
Adjusted R-squared	0.700492	S.D. dependent var		1.257834
S.E. of regression	1.192960	Akaike info criterion		3.220586
Sum squared resid	364.3272	Schwarz criterion		3.328949
Log likelihood	-417.1174	F-statistic		5.197445
Durbin-Watson	2.065733	Prob(F-statistic)		0.000015

Source: Panel Study 2007
Guide to analyses of estimates:X Beta coefficient is **significant at 1% level of significance; and**
XX Beta coefficient is significant at 5% level of significance.

Inference

According to table 4.5, the beta coefficient of capital base (CAPF) is significant and positive at 5% level of significance. The null hypothesis - there is no relationship between capital and operational efficiency of Nigerian Commercial Banks is rejected.

Before analyzing the effect of capital base of banks on their performance, it is important to examine the relative contributions of other determinants of bank performance first starting from the input variables: the price of deposits *(t = 4.53)* and price of labour (t = - 1.97) are both significant, while the effect of price of capital employed is insignificant (t = 0.4). However, the effect of cost of labour in the banking industry has negative effect on the efficiency of the banks. The coefficient is negative and indeed a 10 percent increase in the cost of labour is likely to result in reduction of the efficiency and or in return on asset of the banks by as much as 3 percent. This implies that workers' emoluments are one of the main factors determining the profitability and performance of Nigerian banks. This is not surprising as there is salary war among the Nigerian banks. The rate of staff turnover is high and most banks tend to lure their strategic workers with salary incentives.

Interestingly, the effect of cost of deposit is positive and by implication an increase in the interest rate on deposits results in increase in bank efficiency and performance. This may look unintuitive as one would have expected the increase in cost of deposit to have negative effect on the profitability and return on assets. However, a deep thought will show that increase in cost of deposit need not result in reduction in efficiency of banks. As the interest on deposit increases, the public will be encouraged to convert their money balance from checkable account to long term savings. This increase in savings due to increase in deposit rate, provides banks with funds to engage in long term investment, and be able to earn higher returns that can adequately pay for the increase in the cost of deposit. The determining factor therefore is not the absolute increase in the cost of deposit but the differences between the cost of deposit and lending. If the differential is wide and high then bank will make

more profit. Hence, increase in the cost of deposit may promote bank efficiency and higher profitability.

The cost of physical capital is not significant though positive. This means that bank's returns on assets respond sluggishly to stimulus from changes in the cost of capital procurement. One possible reason for this is that most banking operations are becoming less of physical capital intensive. The technological revolution has brought a lot of changes into the banking industry. Gone are the days where cubicles and walls are the orders of the days. The most important physical capital now is computer and the use of the internet has even reduced the need for several computer points. The use of ATMs has also allowed the sharing of cost on capital among banks. These have resulted in reduction in overhead cost and increase in return and bank operational efficiency and performance. It has also resulted in higher profit and better customer relations and bank access by the public.

The effect of investment in mortgage (loans) is negative (-0.05, t-l. 12) and insignificant. Similar pattern is observed in the case of none mortgage loans. The effect of non-mortgage loans was also insignificant and negative. This implies that banks financial intermediation in general and specifically into properties development is not a significant determinant of bank performance. This may not be surprising. Most of Nigerian banks are leaving their core financial intermediation activities to none conventional banking activities. In present day Nigeria, banks engage more in sales of forms for institutions, collection of dues for government agents and indeed earn much of their income from forex trading and financing. On the other hand, the effects of other investments such as engaging in stock trading, credit financing and other commercial papers has significant positive effects on bank performance.

To the main focus of the study, the relative effect of bank capital base on bank performance. As can be seen from the estimates in Table 4.5, the coefficients of bank capital base is 0.13 with t-value of 2.14 and a p-value of less than *0.05,* thus implying that the effect of changes in bank capital base is positive and significant at least at *5%* critical value. The consequence of this is that, the size and changes in the capital base of bank determine to a large extent the degree of healthiness and profitability of banks. This explains why the Central bank of Nigeria emphasizes the centrality of strong capital base as sine quo non to sound and efficient banking system. The capital base of the bank is very important; it is the main linkage between the shareholders and the banks. The more the capital invested and committed by the .bank shareholders, the more their interest in the survival of the bank. Banking sector is a special case of general profit and rent seeking business. The specialty arises from the fact that they utilize other people's money to trade. If there are no checks and balances on the bank management, it may not bother about what happens to their liabilities since their own liabilities are limited by law. So the only way to entrench commitment and dedication to public interest is to make it mandatory for banks to have sufficient proportion of the funds they trade with as their contribution through capital base. The recent experience in Nigeria, when the capital base minimum bench mark was raised from mere N2billion to N25billon, has really turned around the banking operations in Nigeria.

Contribution of Bank Capital to Bank Profit Generating Capacity

As part of second and the third objectives is the examination of the determinants of profit generating capacity of banks and the relative contribution of bank capital base to the changes in profit generating capacity of banks. The profit generating capacity is therefore made the dependent variable as done in the case of return on asset. The results of the estimation of the model are presented in table 4.8. As the estimates in Table 4.8 show, unlike the case of return on asset, the only output that is significant in the determination of profit generating capacity of banks is the other investment (LOl) of the banks. All the costs of inputs are insignificant and also the effect of mortgage investment financing is also inconsequential on the determination of bank. profit generating capacity. The same reason for non-significance of the mortgage investment finance in the case of return on assets also applies. That is, banks engage more in none conventional bank business practices and this crowd out their financial intermediation to real sectors However, despite the insignificance of both bank input and output variables, the effect of bank capital is phenomenal and overwhelming. In relative terms, it is roughly about the sum of all the effects (0.73) of the inputs and output variable together. In essence, only none mortgage investment finance and capital base of banks are the main determinants of profit generating capacity of banks. Moreover, capital base is the most outstanding determinant of bank capacity to generate profit in Nigeria.

Table 4.6: Results of the Estimates of Profit Generating Capacity of Bank Model
Dependent Variable: **LPGC**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LML	0.014345	0.061286	0.234061	0.8151
LNM	0.017438	0.072664	0.239980	0.8105
LOI	0.104147	0.050242	2.072911	0.0392 xx
LPL	0.072702	0.205439	0.353887	0.7237
LPC	0.095288	0.117946	0.807891	0.4199
LPD	0.106341	0.141517	0.751435	0.4531
CAPF	0.724742	0.071310	10.16327	0.0000 x
C	5.127082	1.285455	3.988536	0.0001
R-squared	0.608032	Mean dependent var		14.07963
Adjusted R-squared	0.588963	S.D. dependent var		1.918895
S.E. of regression	1.618070	Akaike info criterion		3.830404
Sum squared resid	665.0106	Schwarz criterion		3.939361
Log likelihood	-493.7830	F-statistic		16.15275
Durbin-Watson stat	1.841563	Prob(F-statistic)		0.000000

Source: Panel Study 2007
Guide to analyses of estimates: X Beta coefficient is significant at 1% level of significance; and XX Beta coefficient is significant at 5% level of significance.

Inference
According to table 4.6, the beta coefficient of capital base (CAPF) is significant and positive at 1% level of significance. The null hypothesis — there is no relationship between capital base and profit generating capacity of Nigerian Commercial Banks is rejected.

General Discussion
The main findings from the empirical analysis are:

(i)   There were low but positive correlation between bank efficiency and profit generating capacity on one hand and bank risk exposure, loan provisions, size and input and output variables on the other hand. This low correlation implies little presence of multicollinearity that usually affects the statistical robustness of the result from regression and the positive correlation shows that the variables move in tandem and a significant causal effect can be detected among them.

(ii)   There was a significant causal nexus between bank capital base and the two measures of bank performance. However, capital base requirement has only indirect significant causal effect on bank efficiency because bank capital base did not cause return on asset directly. Bank capital base causes profit generating capacity which in turn causes price of deposit that has direct causal effect on return on asset. Then it can be said that capital base requirement may influence changes in the bank performance through cost of deposit mobilization and credit channel. Similarly, risk exposure behavior has indirect effect throughthe deposit cost channel.

(iii)   The previous level of bank capital has negative effects on current bank efficiency. The significant negative effect of the previous level of bank capital indicates that the banks were only slowly adjusting their capital to desired levels.

(iv)   The major determinants of changes in bank capital are bank size, risk exposure, loan loss provision, the regulatory pressure, Profit generator g capacity and profit before tax. However, while risk exposure, profit generating capacity and regulatory pressure have positive effects, bank size has negative effects on bank capital base.

(v)   Bank capital was found to be a significant determinant of both bank operating efficiency and profit generating capacity. Indeed, bank capital was the most significant contributor to growth and increase in the capacity of banks to generate greater profit and to enhance its operating efficiency.

(vi)   Other variables found to be significant are labour and deposit price, and other bank investments. Mortgage and none mortgage loans, and risk exposures were not significant. Bank size has negative effect as against the positive effect apriori postulated.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

The thesis has shown that the regulatory pressure is an integral factor in bank efficiency determinant. It was crucial to ensuring bank efficiency and ability to generate greater profit and yield higher returns for the shareholders. More important, bank capital was a major determinant of bank performance and efficiency. This suggests that the central bank of Nigeria can use the regulatory power of raising the capital base of banks to stimulate greater efficiency and ensure that the bank still generate sufficient profit for the shareholders. Indeed, the more efficient the banks the more their ability to generate greater profit and the more they require more capital for operation. In essence the three variables are interwoven. Hence, anything that affects one of them will affect the other two. The regulatory authority must ensure that policy that may hinder any bank capital growth or profit generating capacity may affect overall bank efficiency. However, a caveat needs to be added. The fact that capital base has positive effects on both profit generating capacity and bank efficiency does not translate automatically that at higher capital level bank will surely make profit. The recent development in the mega banks in the US and other advanced European countries is signal that bank has optimal threshold level at which additional increase in capital base may be inimical to the healthiness of the banking industry and the overall economy. The regulatory authority must ensure that check and balances are put in place to check the excesses of banks so as to prevent financial crises.

Recommendations

Since capital base has significant positive effect on bank operational efficiency and capacity to generate profit, it can be instrumental in promoting bank soundness and stability. The followings are therefore recommended:

1.   Bank capital regulation must be anchored on a sound monitoring system which regularly assesses the economy, ascertains, and establishes the level of capital commitment required by the banking sector;

2.   Adjustment must be made to the established level of capital commitment in (i) above so that the weakness in bank asset portfolio and liability portfolio are adequately taken into cognizance;

3.   A prudently established new capital requirement must be promptly and rigorously enforced;

4.   The system of internal control must ensure checks and balances at all time and there must be transparency and accountability in each bank so that the efforts of recapitalization will not be in vain.

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