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Asset Quality Management and the Performance of Deposit Money Banks in Nigeria: A Co-integration and Variance Decomposition Analysis

Eze, Gbalam Peter Department of Finance and Accountancy, Niger Delta University, Wilberforce Island, Amassoma, Bayelsa State, Nigeria

Ogbulu, Onyemachi Maxwell* Department of Banking and Finance, Abia State University, Uturu, Abia State, Nigeria

Abstract: Given the continued poor performance experienced in the banking sector as indicated by high levels of credit risk, poor quality loans and high incidence of non-performing loans, in spite of the frequent reforms that various governments in Nigeria have embarked upon, there is the need to constantly examine and analyse the factors that could affect bank performance with the aim of providing empirical evidence based on which solutions can be proffered. The paper examined the impact of asset quality management on the performance of deposit money banks in Nigeria. The paper adopted the ECM and co-integration techniques using annual aggregate data sourced from the CBN and the NDIC publications for the period 1990-2013. The findings of the study indicate that the selected measures of asset quality have significant impact on all the three indicators of bank performance namely- return on equity, return on total assets and return on shareholders' fund respectively. In addition, the results of the impulse response and variance decomposition show that own shocks from the performance indicators ROE, ROTA and ROSF account for a greater proportion of the forecast errors of the variables within the ten-year forecast period. In the light of the above, it is recommended that deposit money banks in Nigeria should intensify their efforts in designing and implementing good asset quality management policies in order to further improve on their performance. This can be through human capacity building for personnel in the form of frequent professional training as well as strict adherence to the prudential guidelines.

Keywords: Asset quality; Bank Performance; ECM; Co-integration; Variance Decomposition.

1. Introduction

Banks and other financial intermediaries play the important role of channeling funds from savers to borrowers. The various areas of financial management have been studied in relation to bank performance and growth usually depicted by profitability. There is sufficient empirical evidence that poor performance is manifest in banks as indicated by low bank performance indicators including: high levels of credit risk, poor quality loans, limited and or inadequate capitalization, operational inefficiencies, higher incidence of non-performing loans, higher levels of liquidity risk, and so on.

Although these are mentioned as constraints affecting banks' performance, they are based on a few studies and non-elaborate methods to generate sufficient and valid conclusions. This study therefore becomes an extension of the few studies undertaken with a view to generating more and further information based on empirical evidence on deposit money banks. The purpose of this paper is to ascertain whether there is any significant impact of asset quality management on the performance of deposit money banks in Nigeria. The following three null hypotheses were formulated and tested in order to achieve the stated objectives of the paper:

(1) Asset quality management has no significant impact on the return on equity of deposit money banks in Nigeria;

(2) Asset quality management has no significant impact on the return on assets of deposit money banks in Nigeria;

(3) Asset quality management has no any significant impact on the return on shareholders' fund of deposit money banks in Nigeria.

This paper is organised in five sections. Section one is the introduction. Section two is the review of related literature, the third section talks about the methodology of the study, section four presents and analysis the data, and finally, section five summarises and concludes the work.

*Corresponding Author

2. Review of Related Literature

This section reviews the conceptual and theoretical issues relating to the study as well as a brief review of previous related empirical studies.

2.1. Conceptual and Theoretical Review

Asset quality management is considered extremely important by the banking sector at home and abroad. The Basel Committee on Banking Supervision in 1997 issued an important document, "Core Principles for Effective Banking Supervision," which has been endorsed by the central bank governors of the group of ten countries, to present a comprehensive set of twenty-five core principles. Of these, one fourth are designed to address the relevant issues of bank asset quality or credit risk management suggesting that asset quality is a general concern for the financial supervisory authorities in every country throughout the world. Nagle (1999) indicated that the problems of asset quality may become the future time bomb for banks. In 1995, the "Standards for safety and soundness," which was established by the United States Federal Reserve Board, became effective, requiring U.S. financial institutions to set up asset quality monitoring systems for identifying possible emerging problems of bank asset quality and demanding banks to regularly present the asset quality reports to the Board of Directors so as to evaluate the risks associated with asset quality deterioration.

Streeter (2000) also found that based on the questionnaires completed by the Board members of the American Bankers Association, the management of asset quality is considered one of banks major management problems in 2001. On account of the American Bankers Association being composed of one-third of bankers from all U.S. banks, the result of the above survey sufficiently proves that asset quality management is a common issue for bankers in practice. For example, Gene Miller (Chairman and CEO of America Corp.) regarded asset quality as the second most important management issue and formed a task force to specifically handle rising bad assets (see details in Streeter (2000)). Bank asset quality not only affects the financial and operating performance of the bank itself, but also further impinges on the soundness of the national financial system. Yin (1999) inferred that the deterioration of asset quality from the ignorance of loan quality by banks is one of the main causes behind the Asian Financial Crisis.

2.2. Empirical Review

Tsai (1999) stated that based on the S&P (Standard and Poor's) global credit rating reports that embody their search of sixty-one countries' financial systems released in 1994, Taiwan belonged to the division of frail financial systems. Banking institutions residing in a country with frail banking systems should pay more attention to managing asset quality in order to warrant the sound development of the banking industry.

The intense competition has forced banks to work harder for more market share and sales, thus allowing their loan quality to slowly deteriorate (Wang, 1999).The nonperforming loan ratio of domestic banks in Taiwan has recently doubled from 2.5% in June 1995 to 5.89% in March 2001. Given that bad assets significantly influence the constitution and profit of banks, bank loan quality (referred to as bank asset quality) is worth being discussed. Even though most bank practitioners realize the great relevance of asset quality and operating performance, the literature of academic research on this subject using actual operating data is found to be limited.

Many studies on bankruptcy have agreed that a huge amount of nonperforming loans exists before banks go bankrupt. Statistically, bank asset quality is an indicator for the liquidation of banks (Barr and Seims, 1994; Demirguc-Kunt and Huizinga, 1999; Whalen, 1991). Asset quality and bank efficiency are non-related, because operating personnel normally are not involved in the selection and supervision of borrowers and loan and credit personnel do not engage in the management of operations. However, banks at the edge of bankruptcy appear to have a high non-performing loan ratio as well as a low cost efficiency. Some analysts discovered that the level of liquidated banks and high efficient banks (the most efficient banks) is huge (Barr and Seims, 1994; Berger and Humphrey, 1992; DeYoung and Whalen, 1994; Wheelock and Wilson, 1995).

Other researchers found that banks having non-bankruptcy problems exhibit a negative relationship between efficiency and non-performing loans (Kwan and Eisenbeis, 1994; Resti, 1995). In addition, Havrylchyk and Jurzyk (2006) found a positive and direct relationship between asset management and profitability of bank. Accordingly, a more effective bank should have more profits because it can maximize its net profit income.

Furthermore, Khalid (2012) investigated the effects of loan quality on the profitability of private banks in India between 2006/2007 and 2010 2011 financial years using return on assets and profitability ratios as proxies for bank profitability for the sampled banks while Asset Quality Ratios employed include Gross Non-Performing Assets (NPA) to Gross Advances; Net NPAs to Net Advances; Total Investments to Total Assets Ratio and Net NPAs to Total Assets ratio. The correlation coefficient and multiple regression model was employed to examine if bank asset quality and operating performance are positively correlated. The results of the study showed that a bad asset ratio is negatively associated with banking operating performance, after controlling for the effects of operating scale, traditional banking business concentration and the idle fund ratio. The results further support the hypothesis that the higher the quality of the loan processing activities before loan approval, the lower the non-value-added activities that is required to process problematic loans and thus the higher the banking operating performance will be.

In his study Abata (2014) examined and evaluated banks asset quality and performance in Nigeria using secondary data obtained from the annual reports and accounts of the six largest banks listed on the Nigeria Stock Exchange based on market capitalization with a sample interval of fifteen-year period from1999 to 2013. The author adopted the use of ratios as a measure of bank performance and asset quality since it is a verifiable means for

gauging the firms' level of activities while the data were analyzed using the Pearson correlation coefficient and the OLS regression tool with the aid of the SPSS 17.0 software package. The findings revealed that asset quality had a statistically significant relationship and influence on bank performance. Based on these findings the author recommended the formulation and implementation of policies that would encourage revenue diversification, minimize credit risk and encourage banks to minimize their liquidity holdings.

In an IMF Working paper, De Bock and Demyanets (2012), assessed the vulnerability of emerging markets and their banks to aggregate shocks. The authors found significant links between banks' asset quality, credit and macroeconomic aggregates. lower economic growth, an exchange rate depreciation, weaker terms of trade and a fall in debt-creating capital inflows reduced credit growth while loan quality deteriorated. In addition and particularly noteworthy according to the authors is the sharp deterioration of balance sheets following a reversal of portfolio inflows. They also found evidence of feedback effects from the financial sector on the wider economy. GDP growth fell after shocks that drive non-performing loans higher or generated a contraction in credit. The authors reported that the analysis was used in chapter 1 of the Global Financial Stability Report (September 2011) to help evaluate the sensitivity of banks' capital adequacy ratios to macroeconomic and funding cost shocks.

Alhassan *et al.* (2014), carried out a study to examine the factors that account for the deterioration in the asset quality of Ghanaian banks during a period of financial crises using a unique dataset on 25 banks from 2005 to 2010. Based on the econometric technique of Generalized Method of Moments estimations, the authors found that the persistence of non-performing loans in addition to loan growth, bank market structure, bank size, inflation, real exchange rate and GDP growth are the significant determinants of banks asset quality in Ghana. The authors noted that the findings have implications for both bank management and regulators in emerging economies.

3. Methodology

The research design of this study is the ex-post facto investigative econometric research as it is meant to investigate and analyse the relationship between two or more variables, namely, asset quality management and performance.

3.1. Variable Definition

3.1.1. Dependent Variable

In this study, performance is the dependent variable represented by return on total assets (ROTA), defined as profit after tax divided by total assets; return on equity (ROE), defined as profit after tax divided by equity; and, return on shareholders' fund (ROSF), defined as profit after tax divided by shareholders' fund. The above performance indicators have been used extensively in previous studies and with satisfactory results (Berger and DeYoung, 1997; Okafor, 1983).

We have therefore chosen to use return on equity (ROE), return on total assets (ROTA) and return on shareholders' fund (ROSF) as measures of performance representing the dependent variable (Ogbulu, 2012).

3.2. Independent Variables

3.2.1. Asset Quality

Asset quality is one of the main parameters to measure the strength of a bank. For asset quality, we used three ratios: (1) default ratio - ratio of non-performing loans and advances to total credit (RNPC); (2) the ratio of non-performing loans and advances to total assets (RNPA); and the ratio of non-performing loans and advances to shareholders' fund (RNPS).

3.3. Model Specification

Since this study is interested in establishing relationships between variables and possible projections, we specified our model in the multiple regression form as follows:

$Y = b_0 + b_1x_1 + b_2x_2 + \ldots + b_nx_n + u$ linear form

Where y = the dependent variable, performance indicators.

$X_1..Xn$ = the independent variables representing asset quality management indicators

b_0 = the intercept, that is, the value of the dependent variable y, when the explanatory variable x assumes a value of zero.

$b_1 \ldots b_n$ = coefficients of the explanatory variable or the slope; that is, the rate at which a change in the explanatory variable affects the behaviour of the dependent variable.

The above is functionally expressed as:

$roe = f(rnpc, rnpa, rnps)$ 1

$rota = f(rnpc, rnpa, rnps)$ 2

$rosf = f(rnpc, rnpa, rnps)$ 3

Econometrically, the regression models can be specified as:

$roe = b_0 + b_1rnpc + b_2rnpa + b_3rnps + u$ 4

$rota = b_0 + b_1rnpc + b_2rnpa + b_3rnps + u$ 5

$rosf = b_0 + b_1rnpc + b_2rnpa + b_3rnps + u$ 6

where:

roe = return on equity
roa = return on assets
rosf = return on shareholders' fund
rnpc = ratio of non-performing loans to total credit
rnpa = ratio of non-performing loans to total assets
rnps = ratio of non-performing loans to shareholders' fund
b_0 = intercept
b_1 .. b_3 = coefficients to be estimated
u = error term

This study employed bank aggregate data (all licensed Deposit Money Banks in Nigeria) sourced from the Central Bank of Nigeria Statistical Bulletin and Annual Reports of the Nigerian Deposit Insurance Corporation for the period 1990 to 2013. The data collected were analysed using the E-views 7.1 software.

4. Data Presentation

Table 4.0 below shows the data used for this study – that is, the independent variables as well as the dependent variables from 1990 to 2013.

Yrs	RNPC	RNPA	RNPS	ROE	ROSF	ROTA
1990	44.10	0.14	344.00	63.20	23.77	17.57
1991	39.00	0.14	222.00	26.40	25.87	7.14
1992	45.40	0.10	299.00	9.70	21.67	1.97
1993	41.00	0.12	380.56	33.90	3.79	-5.68
1994	43.00	0.12	567.70	12.62	-8.77	0.33
1995	32.90	0.10	496.00	44.84	1.45	1.29
1996	33.90	0.12	419.80	56.78	0.18	1.99
1997	25.81	0.13	253.09	96.56	2.92	3.35
1998	19.35	0.17	89.20	86.08	-0.98	4.52
1999	25.61	0.08	102.00	80.59	7.71	4.13
2000	21.50	0.30	92.20	99.45	-1.83	3.96
2001	16.90	0.25	77.10	114.29	-11.18	4.82
2002	21.27	0.21	85.90	41.63	0.14	2.63
2003	21.59	0.28	89.70	29.11	0.07	2.00
2004	23.08	0.31	105.30	27.23	0.07	2.58
2005	20.13	0.35	57.18	4.81	0.03	0.49
2006	7.92	0.33	22.50	17.36	0.51	2.65
2007	8.30	0.03	22.66	36.83	6.60	5.92
2008	6.25	0.03	16.62	24.11	7.93	4.29
2009	32.80	0.03	135.70	-64.72	13.63	-9.28
2010	15.04	0.16	250.85	16.00	-0.16	3.91
2011	4.95	0.06	17.13	-0.28	-0.71	-0.04
2012	3.51	0.02	14.34	22.20	-0.01	2.62
2013	4.12	0.01	20.54	23.21	0.03	2.89

Source: Compiled by the author, 2015

4.1. Descriptive Statistics

Table-4.1. Descriptive statistics

Statistic	RNPA	RNPC	RNPS	ROE	ROSF	ROTA
Mean	0.15	24.75	188.19	39.34	3.86	3.33
Medium	0.13	22.34	103.65	31.51	0.16	2.64
Maximum	0.35	45.40	567.70	114.29	25.87	17.57
Minimum	0.01	3.51	14.34	-64.72	-11.18	-9.28
Std. Dev.	0.10	13.28	165.89	39.11	9.16	5.48
Skewness	0.52	0.01	0.78	-0.21	1.10	0.69
Kurtosis	2.11	1.85	2.43	3.63	3.75	5.34
Jarque-Bera	1.86	1.32	2.78	0.56	5.37	7.35
Probability	0.39	0.52	0.25	0.75	0.07	0.02
Obs.	24	24	24	24	24	24

Source: Researcher's compilation from E-views results

Table 4.1 above shows the descriptive statistics of the variables. The results indicate that the mean values of the ratio of non-performing loans to assets (RNPA) is 0.15 with a standard deviation of 0.10, ratio of non-performing

loans to total credit (RNPC) is 24.75 with a standard deviation of 13,28, ratio of non-performing loans to shareholders' fund (RNPS) is 188.19 with a standard deviation of 165.89. The mean value for return on equity (ROE) is 39.34 2 with a standard deviation of 39.11, return on total assets (ROTA) is 3.86 with a standard deviation of 9.16 and return on shareholders' fund (ROSF) is 3.33 with a standard deviation of 5.48.

The Jarque-Bera statistic for the variables in Table 4.1 indicate that all the variables are normally distributed except ROTA which is not normally distributed at the 5% level of significance.

4.2. Correlation Matrix

Table-4.2. Correlation matrix

Statistic	RNPA	RNPC	RNPS	ROE	ROSF	ROTA
RNPA	1.00	0.21	0.09	0.21	-0.30	-0.05
RNPC	0.21	1.00	0.81	0.02	0.24	0.12
RNPS	-0.09	0.81	1.00	0.05	0.12	0.09
ROE	0.21	0.02	0.05	1.00	0.01	0.52
ROSF	-0.30	0.24	0.12	0.01	1.00	0.75
ROTA	-0.05	0.13	0.09	0.52	0.75	1.00

Source: Researcher's compilation from e-views results

Table 4.2 above is the correlation matrix showing the degree of correlation between the variables. The table reveals that the variables among themselves have both positive and negative correlations among themselves. For example, RNPA and RNPC are positively correlated (0.21), whereas RNPA is negatively correlated with RNPS (-0.09), ROSF (-0.30), and ROTA (-0.05), respectively.

4.3. Level Series Regression Results

Level series regression was used to test the impact of the independent variables on the dependent variables to enable us accept or reject the null hypotheses. In all cases, we regressed the independent variables as indicators of asset quality management implications on each of the dependent variables as indicators of bank performance.

The results of the Durbin Watson statistics indicate strong positive autocorrelation in all the models. This indicates that there could be some degree of time dependence in the level series which could lead to spurious regression results, suggesting the need for more rigorous analysis of the stationarity properties of the level series data. (See table 4.3 below for the summary of ordinary least squares (OLS) level series results).

Table-4.3. Ordinary least squares (OLS) test results summary

Model	Variables		F-statistic		Durbin-Watson Statistic	Auto-correlation
	Dependent variable	Independent variables	F-statistic	Probability		
	ROE	RNPC, RNPA, RNPS	0.55	0.65	0.86	Present
2	ROTA	- do -	0.20	0.90	1.11	Present
3	ROSF	- do -	2.84	0.06	1.06	Present

Source: Author's compilation from OLS test results (eviews)

4.4. Unit Root Test Results

Next, we used unit root test to test for the stationarity of the individual variables. This test is carried out to ensure that our t-statistics are valid on account of the stationarity of the data; and secondly, in order to rule out serial correlation.

Table-4.4. Augmented Dickey-Fuller Unit Root Test Results Summary

Variable	ADF - Test statistic at first difference	Critical Values	Order of integration
RNPA	-5.431633	1% -3.769597 5% -3.004861 10% -2.642242	1(1)
RNPC	-6.228475	1% -3.769597 5% -3.004861 10% -2.642242	1(1)
RNPS	-3.943577	1% -3.769597 5% -3.004861 10% -2.642242	1(1)
ROE	-6.087285	1% -3.769597 5% -3.004861 10% -2.642242	1(1)

ROSF	-4.784789	1% -3.769597 5% -3.004861 10% -2.642242	1(1)
ROTA	-6.057175	1% -3.769597 5% -3.004861 10% -2.642242	1(1)

Source: Author's compilation from ADF Unit Test Results

Table 4.4 above presents the summary results of the ADF unit root tests. The results show that the null hypotheses of a unit root test for first difference series for all the variables can be rejected at all the critical values indicating that the level series which is largely time-dependent and non-stationary can be made stationary at the first difference and maximum lag of one. Thus, the reduced form model follows an integrating order of 1(1) process and is therefore a stationary process. It also reveals that the test of stationarity in the residuals from the level series regression is significant at all lags. Furthermore, this indicates that the regression is no more spurious but real. That is to say, all the variables are individually stationary and stable. At this level, all the t-statistic became significant at 5 percent. Also, Durbin-Watson reported values of between 1.8 and 2.2 indicating absence of autocorrelation.

Having established the stationarity of the individual variables, it is also important to establish the stationarity of the linear combination of the variables as to whether there could be a long-run or equilibrium relationship between the dependent variables and the independent variables (that is they are co-integrated). We, therefore, tested for co-integration to establish long-run stationary or stable relationship using the Johansen Co-integration test.

4.5. Johansen Co-Integration Test Results

Table -4.5. Johansen Co-Integration Test Results Summary

Model	**Variables**		**Number of co-integrating equations at 5 percent**		**Lag intervals**
	Dependent variable	**Independent variables**	**Trace tests**	**Max-eigenvalue test**	
1	ROE	RNPC, RNPA, RNPS	2	2	1 to 2
2	ROTA	RNPC, RNPA, RNPS	2	2	1 to 2
3	ROSF	RNPC, RNPA, RNPS	2	2	1 to 2

Source: Author's compilation from Johansen Co-integration Test Results

Table 4.5 above shows the summary of results of Johansen Co-integration test, to test for the long run co-integration relationship between bank performance represented by return on equity (roe), return on total assets (rota), and return on shareholders' fund (rosf), and asset quality management of deposit money banks. The impact of asset quality management represented by ratio of non-performing loans and advances to total credit (rnpc), ratio of non-performing loans and advances to total assets (rnpa) and ratio of non-performing loans and advances to shareholders' fund (rnps) on bank performance represented by the respective dependent variables, namely: return on equity (roe), return on total assets (rota) and return on shareholders' fund (rosf), have two co-integrating equations each for both trace tests and max-eigenvalue test with one to two lag intervals taken at 5 percent significant level.

4.6. Test of Hypotheses

Having established the co-integrating equations, we now establish a link between short-run relationships of the dependent and independent variables to the long-run by estimating an error correction model (ECM). The ECM is written in such a way that the first difference of each variable is related to both the current and the lagged variables, as well as incorporating the error correction coefficient. This, we did by relating the current and the lagged values of both the dependent and independent variables to the dependent variables in order to determine both the current and the lagged effects of the independent variables on the dependent variables.

Each of the variables (both independent and independent) was lagged three periods. We thereafter successively deleted the most insignificant parameters (redundant variables) one after the other using the Akaike Information Criteria (AIC) and Schwarz Criteria (SC), until we obtained a parsimonious representation of the models containing only parameters that are relatively statistically significant. The Ordinary Least Square (OLS) estimation method was used as it is an essential component of the most other estimation techniques. Furthermore, the OLS remains one of the most commonly used methods in econometric investigations involving large models. Estimates of the preferred specifications were obtained from the over parameterized results using general-to-specific method, and were used to test the hypotheses formulated in this study as presented below.

Hypothesis 1

Asset quality management does not have any significant impact on the return on equity of deposit money banks in Nigeria.

Tables 4.6 below shows the results of the parsimonious error correction for the impact on return on equity (roe) of the independent variables representing asset quality management, ratio of non-performing loans to total credit (rnpc), ratio of non-performing loans to total assets (rnpa), and, ratio of non-performing loans to shareholders' fund (rnps), each lagged three periods.

Table-4.6. Parsimonious Error Correction Result

Dependent Variable: D(ROE)
Method: Least Squares
Date: 05/17/15 Time: 15:40
Sample (adjusted): 1990 2013
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.85071	3.274169	-4.230297	0.0029
D(ROE(-1))	0.528541	0.181458	2.912748	0.0195
D(ROE(-3))	0.485546	0.109255	4.444154	0.0022
D(RNPC)	-4.619576	0.699283	-6.606165	0.0002
D(RNPC(-1))	-1.011915	0.597836	-1.692628	0.1290
D(RNPC(-2))	-4.690000	0.769498	-6.094882	0.0003
D(RNPA)	127.1213	38.58326	3.294728	0.0109
D(RNPA (-2))	201.8792	47.25052	4.272529	0.0027
D(RNPA (-3))	-58.43371	42.31001	-1.381085	0.2046
D(RNPS)	0.093180	0.050161	1.857631	0.1003
D(RNPS(-3))	-0.087835	0.057552	-1.526185	0.1655
ECM21(-1)	-0.729742	0.175184	-4.165567	0.0031
R-squared	0.965531	Mean dependent var		0.625000
Adjusted R-squared	0.918137	S.D. dependent var		37.22434
S.E. of regression	10.65054	Akaike info criterion		7.852807
Sum squared residual	907.4713	Schwarz criterion		8.450246
Log likelihood	-66.52807	Hannan-Quinn criter.		7.969433
F-statistic	20.37222	Durbin-Watson Stat.		2.277257
Prob (F-statistic)	0.000118			

Source: E-views econometrics output

The Parsimonious Error results (table 4.6 above) reveal that the ratio of non-performing loans to total credit has a t-statistic of -6.606 with a probability value of 0.0002 (statistically significant), the ratio of non-performing loans to total assets has a t-statistic of -6.095 with a probability of 0.0003 (statistically significant), and the ratio of non-performing loans to shareholders' fund has a t-statistic of 1.858 with a probability of 0.1003 (statistically insignificant at 5 percent, but significant at 10 percent).

The overall result reveals that r-squared is 0.97 (with adjusted r-squared = 0.92) indicating that 92 percent of the variations in return on equity could be explained by the combined effect of changes in the return on equity itself, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund.

F-statistic shows 20.37 with a probability of 0.0001 indicating that the combined effect of return on equity itself, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund respectively, have significant impact on bank performance represented by return on equity at 5 percent. Hence, we reject the null hypothesis and conclude that asset quality management strategies have a significant impact on the return on equity of deposit money banks in Nigeria.

Furthermore, the Error Correction Co-efficient of -.729742 is appropriately signed, being negative and also significant at 5% level of significance. The co-efficient shows that the speed of adjustment of the model is approximately 72.97 percent annually due to a deviation from equilibrium.

Hypothesis 2: There is no significant relationship between asset quality management and return on total assets (rota) of Deposit Money Banks in Nigeria

Tables 4.7 below shows the results of the parsimonious error correction for the impact on return on total assets (rota) of the independent variables representing asset quality management, ratio of non-performing loans to total credit (rnpc), ratio of non-performing loans to total assets (rnpa), and, ratio of non-performing loans to shareholders' fund (rnps), each lagged three periods.

Table-4.7. Parsimonious Error Correction Result

Dependent Variable: D(ROTA)
Method: Least Squares
Date: 05/17/14 Time: 15:47
Sample (adjusted): 1990 2013
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.482645	0.496147	-2.988320	0.0174
D(ROTA(-1))	0.518346	0.314100	1.650256	0.1375
D(ROTA(-2))	0.741563	0.141080	5.256321	0.0008
D(RNPC)	-0.561886	0.129293	-4.345837	0.0025
D(RNPC(-3))	-0.356593	0.085450	-4.173110	0.0031
D(RNPA)	12.86434	7.382360	1.742578	0.1196
D(RNPA(-1))	-13.46063	5.701386	-2.360939	0.0459
D(RNPA(-2))	8.418955	5.477283	1.537068	0.1628
D(RNPA(-3))	20.68076	6.679125	3.096328	0.0147
D(RNPS)	0.027114	0.011526	2.352425	0.0465
D(RNPS(-2))	-0.002519	0.007681	-0.327915	0.7514
ECM22(-1)	-0.953941	0.300125	-3.178141	0.0130
R-squared	0.948223			
Adjusted R-squared	0.877029	Durbin-Watson Stat.		1.708009
F-statistic	13.31895			
Prob (F-statistic)	0.000565			

Source: E-views econometrics output.

The Parsimonious Error Correction results (table 4.7 above) reveal that the ratio of non-performing loans to total credit has a t-statistic of -4.346 with a probability value of 0.0025 (statistically significant), the ratio of non-performing loans to total assets has a t-statistic of 1.743 with a probability of 0.1196 (statistically insignificant), and the ratio of non-performing loans to shareholders' fund has a t-statistic of 2.354 with a probability of 0.047 (statistically significant).

The overall result reveals that r-squared is 0.95 (with adjusted r-squared = 0.88) indicating that 88 percent of the variations in return on total assets could be explained by the combined effect of changes in the return on total assets itself, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund.

F-statistic shows 13.32 with a probability of 0.0006 indicating that the combined effect of return on total assets itself, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund respectively, have significant impact on bank performance represented by return on equity at 5 percent. We, therefore, reject the null hypothesis and conclude that asset quality management strategies have a significant impact on the return on total assets of deposit money banks in Nigeria.

Furthermore, the Error Correction Co-efficient of -0.953941 is appropriately signed, being negative and also significant at 5% level of significance. The co-efficient shows that the speed of adjustment of the model is approximately 95.39 percent annually due to a deviation from equilibrium.

Hypothesis 3

There is no significant relationship between asset quality management and return on shareholders' fund (rosf) of Deposit Money Banks in Nigeria.

Tables 4.8 below shows the results of the parsimonious error correction for the impact on return on shareholders' fund (rosf) of the independent variables representing asset quality management, ratio of non-performing loans to total credit (rnpc), ratio of non-performing loans to total assets (rnpa), and, ratio of non-performing loans to shareholders' fund (rnps), each lagged three periods.

The Parsimonious Error Correction results (table 4.8 above) reveal that the ratio of non-performing loans to total credit has a t-statistic of –0.524 with a probability value of 0.615 (statistically insignificant), the ratio of non-performing loans to total assets has a t-statistic of -1.004 with a probability of 0.345 (statistically insignificant), and the ratio of non-performing loans to shareholders' fund has a t-statistic of 1.022 with a probability of 0.337 (statistically insignificant).

The overall result reveals that r-squared is 0.84 (with adjusted r-squared = 0.61) indicating that 61 percent of the variations in return on shareholders' fund could be explained by the combined effect of changes in the return on shareholders' fund itself, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund.

F-statistic shows 3.75 with a probability of 0.036 indicating that the combined effect of return on shareholders' fund itself on the long run, management of non-performing loans and advances in relation to total loans and advances, total assets and shareholders' fund respectively, have significant impact on bank performance represented

by return on shareholders' fund at 5 percent. We conclude, therefore, that the asset quality management strategies of deposit money banks in Nigeria have significant impact on their return on shareholders' fund.

Table-4.8. Parsimonious Error Correction Result

Dependent Variable: D(ROSF)
Method: Least Squares
Date: 05/17/14 Time: 15:57
Sample (adjusted): 1990 2013
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.307851	1.193890	-1.933052	0.0893
D(ROSF(-3))	0.371592	0.200077	1.857250	0.1004
D(RNPC)	-0.137484	0.262485	-0.523779	0.6146
D(RNPC(-2))	-0.692017	0.224006	-3.089284	0.0149
D(RNPC(-3))	-0.653902	0.257472	-2.539704	0.0347
D(RNPA)	-16.59011	16.52867	-1.003717	0.3449
D(RNPA (-1))	-27.69975	12.08261	-2.292531	0.0511
D(RNPA (-3))	38.84948	18.50843	2.099015	0.0690
D(RNPS)	-0.016755	0.016397	-1.021862	0.3368
D(RNPS(-2))	0.088345	0.022314	3.959237	0.0042
D(RNPS(-3))	-0.041292	0.021481	-1.922251	0.0908
ECM23(-1)	-0.275529	0.274808	-1.002622	0.3454
R-squared	0.837567	Mean dependent var		-0.188000
Adjusted R-squared	0.614221	S.D. dependent var		6.997971
S.E. of regression	4.346516	Akaike info criterion		6.060335
Sum squared residual	151.1376	Schwarz criterion		6.657775
Log likelihood	-48.60335	Hannan-Quinn criter.		6.176862
F-statistic	3.750094	Durbin-Watson Stat.		1.886339
Prob (F-statistic)	0.035600			

Source: E-views econometrics output.

Furthermore, the Error Correction Co-efficient of -0.275529 is appropriately signed, being negative and also significant at 5% level of significance. The co-efficient shows that the speed of adjustment of the model is approximately 27.55 percent annually due to a deviation from equilibrium.

Table-4.9. Summary of Results of Test of Hypotheses

Fin. Mgt. Strategy	Hypo-thesis No	Performance Indicators (Dependent Variables)	Independent Variables	Apriori Expec-tation	F-statistic	Prob	Accept/ Reject
Asset Quality Mgt	1	ROE	RNPC, RNPA, RNPS	Reject	20.37	0.000	Reject
	2	ROTA	RNPC, RNPA, RNPS	Reject	13.32	0.000	Reject
	3	ROSF	RNPC, RNPA, RNPS	Reject	3.75	0.036	Reject

Source: Author's compilation

4.7. Pair-wise Granger Causality Test Results

The purpose of the pair-wise granger causality test is to ascertain the direction of cause between each of the independent variables and the dependent variables. This is also to determine whether a specific variable or group of variables play any significant role in the determination of other variables in the Vector Error Correction (VEC). It tests whether an endogenous variable can be treated as exogenous and was done by examining the statistical significance of the lagged error correction terms by applying separate t-tests on the adjustment coefficients. A shock to any variable in the VEC model not only directly affects the variable, but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VEC.

Apriori expectation is that the independent variables should cause changes in the dependent variable both on the short-run and on the long-run. But in reality, the relationship could be the other way round.

Table 4.10 below shows the direction of causality of changes in the variables representing asset quality management indicators and those representing bank performance.

Table 4.10. Pair-wise Granger Causality Tests Results

Pairwise Granger Causality Tests Sample: 1990 2013 Lags: 2			
Null Hypothesis	**Obs**	**F-statistic**	**Prob**
ROE does not cause RNPC RNPC does not cause ROE	22	1.65009 0.98144	0.2213 0.3950
ROSF does not cause RNPC RNPC does not cause ROSF	22	1.76868 0.21232	0.2005 0.8108
ROTA does not cause RNPC RNPC does not cause ROTA	22	3.00350 0.03725	0.0764 0.9635
ROE does not cause RNPS RNPS does not cause ROE	22	2.61408 1.03854	0.1024 0.3754
ROSF does not cause RNPS RNPS does not cause ROSF	22	1.52594 0.06530	0.2458 0.9370
ROTA does not cause RNPS RNPS does not cause ROTA	22	15.6737 0.56794	0.0001* 0.5771
ROE does not cause RNPA RNPA does not cause ROE	22	4.18500 0.18097	0.0333* 0.8360
ROSF does not cause RNPA RNPA does not cause ROSF	22	1.51963 0.66659	0.2271 0.5264
ROTA does not cause RNPA RNPA does not cause ROTA	22	0.36747 0.66403	0.6979 0.5276

Source: E-views econometrics output. * Sig at 5%.

The Granger causality test results on table 4.10 above reveals that return on total assets (ROTA) significantly granger cause the ratio of non-performing loans to total loans and advances (RNPS). Similarly, return on equity (ROE) significantly granger-cause the ratio of non-performing loans to total assets (RNPA): but, not the other way round.

4.8. Impulse Response Analysis and Forecast Error Variance Decomposition

Results of impulse response and variance decomposition forecast on appendix 1A – 3B of the impact of asset quality management on bank performance show that the ratio of non-performing loans to total loans and advances is forecast to explain between 18.74 percent to 19.16 percent of future changes in return on equity, 15.46 percent to 16.2 percent to future changes in return on total assets, and tends to be stable around 5.9 percent to future changes in return on shareholders' fund from the 5^{th} to the 10^{th} years. Whereas, ratio of non-performing loans and advances to total assets is found to explain between 0.94 percent to 3.04 percent of future changes in return on equity, 6.68 to 6.95 percent to future changes in return on total assets, and 3.78 to 3.95 percent to future changes in return on shareholders' fund for the same time frame. The ratio of non-performing loans to shareholders' fund is seen to explain between 14.11 to 14.86 percent of future changes in return on equity, 5.12 to 5.61 percent to future changes in return on total assets, and 6.52 to 6.79 percent to future changes in return on shareholders' fund for the same time frame.

4.9. Discussion of Findings

In this study, we have analysed the impact of asset quality management indicators on the performance of deposit money banks. It is generally agreed that quality management of resources is the main factor contributing to bank performance, as evidenced by numerous studies that have focused on U.S. banking system (Bhuyan and Williams, 2006; DeYoung and Rice, 2004; Hirtle and Stiroh, 2007; Stiroh and Rumble, 2006) and the bank systems in the western and developed countries (Albertazzi and Gambacorta, 2009; Athanasoglou *et al.*, 2007; Ho and Tripe, 2002; Kosmidou and Zopounidis, 2008; Pasiouras and Kosmidou, 2007; Williams, 2004).

To achieve the objectives of the study, we formulated three hypotheses to test the impact of each of the asset quality management indicators used in this study on each of the three performance indicators. Three models were therefore formulated to test asset quality management indicators against each of the three performance indicator. The essence is to ascertain whether the asset management indicators impacts significantly on each of the three performance indicators in the same way or otherwise.

The results show that asset-quality management has significant impact on all the three performance indicators. Bank asset quality not only affects the financial and operating performance of the bank itself, but also further impinges on the soundness of the entire financial system. This is in line with apiori expectations. Yin (1999) referred that the deterioration of asset quality from the ignorance of loan quality by banks is one of the main causes behind the Asian Financial Crisis.

5. Summary of Findings and Conclusion

This work is an analysis of the impact of financial management strategies on the performance of deposit money banks. The findings of the study are summarized below: That, asset-quality management has significant impact on all the three performance indicators. That notwithstanding the relationships established between the asset quality management indicators and performance of deposit money banks, the measure of relationship varies among the different measures (indicators) of performance; namely, return on equity, return on total assets, and return on shareholders' fund. Also, that the direction of relationship between the various asset quality management indicators and the various measures of performance flowed only from dependent variables (performance indicators) to the independent variables (asset quality management indicators).

Based on the foregoing, we conclude that there is a significant relationship between the various asset quality management indicators employed in this study for deposit money banks and their financial performance.

6. Recommendations

Based on the findings, this study recommends that deposit money banks in Nigeria should improve on the design and implementation of their asset quality management policies in order to significantly improve on their performance. This, they can do by adhering strictly to the prudential guidelines and employing best practice in credit administration, particularly, following the Basel principles. In addition, banks should more pay attention to human capacity building in the form of frequent professional training of credit administration personnel.

Finally, the regulatory authorities should also pay more attention to compliance by deposit money banks to the relevant provisions of the Banks and Other Financial Institutions Act (BOFIA) 1999 and the prudential guidelines issued by the Central Bank of Nigeria from time to time.

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Appendix

1A – Impulse Response to Cholesky (d.f. adjusted) One S.D. Innovations

Response of ROE:				
Period	**ROE**	**RNPC**	**RNPA**	**RNPS**
1	33.61783	0.000000	0.000000	0.000000
	(5.06808)	(0.00000)	(0.00000)	(0.00000)
2	13.55414	13.38969	-1.747406	-2.238834
	(9.08510)	(8.21538)	(8.23659)	(8.13003)
3	9.491295	6.610674	3.710662	7.626795
	(9.21985)	(6.91108)	(6.79647)	(8.58799)
4	6.264252	11.22002	-0.407937	12.53838
	(8.95594)	(7.14092)	6.15886)	(8.45612)
5	0.884061	7.732164	-1.854119	9.352925
	(8.69649)	(6.74612)	(5.75279)	(8.38181)
6	1.100756	4.097974	-3.387190	4.577345
	(8.44610)	(6.34505)	(5.06244)	(7.74523)
7	0.334884	2.533522	-3.968917	-0.287140
	(7.74053)	(5.90496)	4.34592)	(6.80991)
8	-0.28219	1.316397	-3.235102	-2.413227
	(6.95962)	(5.66976)	(3.73843)	6.08214)
9	-0.861238	1.413079	-2.617186	-2.281153
	(6.07235)	(5.28230)	(3.34582)	(5.45171)
10	-1.652952	1.563690	-2.194710	-1.507766
	(5.17943)	(4.65285)	(3.08500)	(4.94540)

Source: E-views software output.

1B Variance Decomposition

Variance Decomposition of ROE:					
Period	**S.E.**	**ROE**	**RNPC**	**RNPA**	**RNPS**
1	33.61783	100.0000	0.000000	0.000000	0.000000
2	38.74562	87.52019	11.94252	0.203396	0.333886
3	41.31520	82.24971	13.06339	0.985529	3.701371
4	45.04945	71.11270	17.19054	0.837115	10.85965
5	46.04945	71.11270	17.19054	0.837115	10.85965
6	47.23734	64.76714	19.06696	1.429603	14.73630
7	74.47348	64.12938	19.16254	2.114359	14.59372
8	47.66375	63.62190	19.08614	2.558192	14.73378
9	47.81867	63.24277	19.04999	2.841197	14.86604
10	47.94677	63.02414	19.05470	3.035560	14.88560

Source: E-views software output.

2A - Impulse Response to Cholesky (d.f. adjusted) One S.D. Innovations

Response of ROTA :				
Period	**ROTA**	**RNPC**	**RNPA**	**RNPS**
1	3.730278	0.000000	0.000000	0.000000
	0.56236	(0.00000)	(0.00000)	(0.00000)
2	0.082088	0.357397	-0.325195	-0.859489
	(0.79734	(0.93029)	(0.69577)	(0.80474)
3	-0.021117	0.837284	0.972841	0.394672
	(0.82591)	(0.92859)	(0.58092)	(0.61310)
4	-0.401263	1.432647	0.450346	0.139579
	(0.71132)	(0.78579)	(0.45933)	(0.41471)
5	-0.901125	0.532785	0.336023	0.366275`
	(0.62922)	(0.67162)	(0.42536)	(0.54270)
6	-0.058883	0.405044	0.137001	0.340790
	(0.56871)	(0.68343)	(0.43875)	(0.52904)
7	-0.189782	-0.063348	-0.200297	0.043334
	(0.48186)	(0.61510)	(0.38686)	(0.40193)
8	0.176904	-0.223358	-0.104727	0.069937
	(0.43995)	(0.53063)	(0.34220)	(0.29130)
9	0.207715	-0.128710	-0.158526	-0.085901
	(0.36476)	(0.40922)	(0.27649)	(0.26680)
10	0.090452	-0.124457	-0.054410	-0.055876
	(0.30960)	(0.32625)	(0.22930)	(0.22874)

Source: E-views software output.

2B Variance Decomposition

Variance Decomposition of ROTA:					
Period	S.E.	ROTA	RNPC	RNPA	RNPS
1	3.730278	100.0000	0.000000	0.000000	0.000000
2	3.859263	93.47247	0.857615	0.710032	4.959882`
3	4.086268	83.37824	4.963452	6.301333	5.356978
4	4.374171	73.60526	15.05878	6.559127	4.776830
5	4.525077	72.74349	15.45743	6.680366	5.118721
6	4.558373	71.70139	16.02200	6.673462	5.603143
7	4.567361	71.59211	15.97824	6.839539	5.590113
8	4.577972	71.40992	16.14230	6.860202	5.587566
9	4.588034	71.30205	16.15028	*6.949532*	5.598142
10	4.591275	71.24022	16.20096	6.953767	5.605051

Source: E-views software output.

3A - Impulse Response to Cholesky (d.f. adjusted) One S.D. Innovations

Response of ROSF:				
Period	**ROSF**	**RNPC**	**RNPA**	**RNPS**
1	6.618938	0.000000	0.000000	0.000000
	(0.99784)	(0.00000)	(0.00000)	(0.00000)
2	3.086338	-0.555030	-1.443876	1.200343
	(1.65655)	(1.71160)	(1.65532)	(1.27725)
3	0.463006	1.127147	-0.277175	1.570929
	(1.45349)	(1.73174)	(1.61137)	1.20578
4	-0.072929	1.470230	0.348866	0.461385
	(1.25250)	(1.72999)	(1.63588)	(0.94667)
5	-0.632274	0.321887	0.389291	-0.279105
	(1.09969)	(1.21163)	(1.32647)	(0.80633)
6	-0.712699	-0.048545	0.299775	-0.372619
	(0.92078)	(0.90872)	(1.00507)	(0.65137)
7	-0.250406	-0.088816	0.230454	-0.287390
	(0.78728)	(0.72579)	(0.72845)	(0.53303)
8	0.058162	-0.088021	0.075450	-0.151847
	(0.73987)	0.51412	0.45075	0.39900
9	0.118187	-0.029226	0.001303	-0.015313
	(0.65237)	(0.39989)	(0.29515)	(0.29407)
10	0.098491	0.063064	-0.007356	0.038902
	(0.48526)	(0.36535)	(0.21497)	(0.25207)

Source: E-views software output.

3B Variance Decomposition

Variance Period	Decomposition of ROSF: S.E.	ROSF	RNPC	RNPA	RNPS
1	6.618938	100.0000	0.000000	0.000000	0.000000
2	7.561050	93.29422	0.538851	3.646662	2.520268
3	7.822976	87.50181	2.579323	3.532092	6.386779
4	7.981255	84.07401	5.871381	3.584451	6.470157
5	8.027033	83.73824	5.965408	3.778885	6.517469
6	8.072934	83.56809	5.901380	3.873924	6.656609
7	8.085701	83.40031	5.894825	3.942933	6.761935`
8	8.088167	83.35464	5.903075	3.949231	6.793059
9	8.089098	83.35680	5.903021	3.948325	6.791854
10	8.090040	86.35221	5.907723	3.9488	6.792584

Source: E-views software output.