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POST-MERGER EFFICIENCY OF BANKS IN NIGERIA: A D.E.A. BASED IMPACT ANALYSIS:

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ABSTRACT

The paper examines an alternative approach to estimating the gains from effective consolidation of banks by employing the C²R model of DEA to calculate efficiency indexes of some key Nigerian banks based on their tier positions. The template of the various efficiencies are linked to how well they benefit the lot of the banks' stakeholders and came to the conclusion that the first tier banks enjoy improved weighted average of efficiencies (i.e. technical pure, scale and regulatory) as revealed by their return to scales – the cases of other tier banks have suggested less likely. The lessons however are for the top tier banks to adopt a more robust approach to attaining appropriate levels of the four (4) efficiencies; and for the rising counterparts to accelerate up. This is necessary as a precaution against regulatory sanctions – which in itself suffers quantum inadequacy (i.e. regulatory inefficiency).

KEY WORDS:

M & A *(Merger and Acquisition)*

D.E.A *(Data Envelopment Analysis)*

C²R *(Charnes, Copper & Rhodes (1978))*

1st tier *banks in Nigeria in post-2009 reform: ACCESS bank PLC; FIRST BANK NIGERIA PLC; UNITED BANK FOR AFRICA, and Zenith bank PLC,; Bank Stakeholders {share holders, employees, government, loan creditors, customers}*

N.F.S *(Nigerian Financial System)*

1.0 INTRODUCTION

One very significant fall out of every banking reform in the annals of Nigeria banking history, is the twin effect of REDUCTION IN NUMBER OF EXISTING BANKS and INCREASED CAPITAL REQUIREMENT among others {Nnanna 2004), Adeyemi 2005), CBN (2008).Ekundayo 2008), Alao (2010), Sanusi (2010)}. Explorations of some of the many merger syndromes in the banking industry have given rise to empirical evidences manifesting in such benefits as : high profitability and liquidity, risk and intelligent sharing, higher loss absorbing capacity, commendable asset/net worth situation amongst many other synergetic effects attending such consolidation exercises – Alashi (2003), CBN (2005), Adeyemi (2005) Ibru (2006), Agbaje (2008)} In these studies, the ECONOMIC IMPACTS of merger and acquisition are hardly contentious since they bother practically on analysis of existing financial data, i.e. both at pre- and post-consolidation levels. The crux of measurement here resides in the financial gain (or otherwise) derivable from the fall out of such merger and acquisition exercises in the financial subsector of the Nigerian economy.

Quite in line with the above thinking (i.e. economic efficiency of bank merger), findings of notable experts in the field could also take any of these three (3) positions namely; *pro-merger*, *anti-merger* and the *neutral view to the likely benefits of merger*. These positions, for the convenience of this study, could be deemed "OPINION CONTRIBUTIONS" on merger issues. It is just about the convenient submission of "LITERATURE REVIEW" on the subject matter.

Where bias does not get in the way, both templates of merger effect (i.e. the economic and opinion contributions or simply *empirical evidence based on secondary data* and *literature review of notable writers on M & A of banks*) have globally been accorded recognitions and have proved to be potent tools of merger assessment. They however have created a gap in that the EFFICIENCIES of these merger dispensations on banking publics have been largely ignored. As an illustration, where a research is based on secondary data, the empirical findings represent the sum total of the quantitative computations – often devoid of *human or socio effects*. Even where opinions are sought, the common bias of the researcher normally endeared him to seek contributions of *expertise* through literary submissions. It is quite obvious that many deserving literary contributions have graced this particular portion of banking sphere in Nigeria. Besides, It is also, almost incontrovertible that findings in this regard have always been meted via empirical results feasting on already gathered data {Wshencar and Raveh (1996), Subrahmanyam. Rangan, Toyne, and Tripp (1998).Coyle, (2000), Weber and Camerer (2003), McConnell (2003), Fisher (2007), DeYoung and Molyneux (2009}. These two aforementioned approaches to research study cannot be said to be adequate when the Nigerian banking sector is the focus, hence the need to "tick outside the box and fill the *yawning gap*. At this juncture, the STAKEHOLDER APPROACH comes handy. (The key stakeholders of any typical banking system are the *bank shareholders, employees, creditors, regulatory* *authority, and customer-(borrowing and deposit*. This bothers on assessing various forms of efficiencies that trails merger and acquisition practices. This will help to fill the measurement gap regarding "Social" impact of bank mergers. By modest consideration, this research approach presumably offers a menu for appropriate patronages, namely: first, the study is apt to offer a good degree of relevance for further research. Further, public policy custodian and financial analyst would find this research effort applicable for assessing the social contribution of banks' consolidation in Nigeria – particularly in the current banking era where the post consolidation impact is still being largely felt.

2.0 THEORETICAL REVIEW OF SOCIO-ECONOMIC BENEFITS (AND COSTS) OF M&A ACTIVITIES

In line with maintenance of brevity, this study profiles two competing schools with regard to the social and economic impact of post-merger activities on the value of the firm. It is a statement of fact that up till the present era, (previous and extant) scholars are yet to come to a universal agreement on the unique merits of bank merger, rather we have conflict of opinions regarding the subject matter- Boyd and Graham (1991), Chong, (1991),Comett and De. (1991), Srinivasan and Wall (1992), De-Young, Robert (1993): Baradwaj, Dubofsky and Fraser (1992), Rhoades (1987) & (1993), Spindt and Tarhan (1993), Benston, Hunter, and Wall (1995) Craig, (1997) Where these plethora contributions are anything to go by, thus one could speak in the affirmative that the schools of thought differ on various grounds regarding the subject matter of *mergers and acquisition*.

Tables 1 & 2 below provides a menu of such dynamic positions.

Table 2.1. SUMMARY TABLE: [PRO-MERGERS]

AUTHORS	RESEARCH EFFFORT	FINDINGS
1-Akhavein, Berger, and Humphrey (1997).	analyze changes in profitability experienced in the same set of large mergers as examined by Berger and Humphrey.	They find that banking organizations significantly improved their profit efficiency ranking after mergers
2--Spindt and Tarhan (1993)	Find gains in their sample of 192 commercial bank mergers completed in 1986 --using a Non-parametric tests	Indicate that mergers led to operating improvements. The results, however, may be due primarily to economies of scale.
3..-Chamberlain (1992) .	demonstrates the importance that sample selection can have in influencing the results of a merger study	finds evidence of overall gains when Texas mergers are omitted from the sample,

Table 2.2. SUMMARY TABLE: [ANTI-MERGERS]

AUTHORS	RESEARCH EFFFORT	FINDINGS
1-ALinder and Crane (1992).	Analyze the operating performance of 47 banks-level merger in New England between 1982 and 1987	They find that the results indicate that mergers did not result in improved operating income.
2-DeYoung (1993).	also utilizes frontier methodology similar conclusions as Berger and Humphrey.	Cost benefits from mergers did not exist for 348 bank-level mergers taking place in 1986 and 1987
3.Srinivasan and Wall (1992) Srmivasan (1992) reaches a similar conclusion.	examine all commercial bank and bank holding company mergers occurring between 1982 and 1986.	They find that mergers did not reduce non-interest expenses
*1Rhoades (1987)	examines the impact of mergers on the ratios of net income before extraordinary items to assets and non-interest expenses to assets.	Rhoades finds that neither income nor non-interest expenses were affected by merger activity.
*2Rhoades (1990)	Conducted with 13 acquisitions involving billion dollar banks.	Rhoades finds no performance effect due to mergers.
*3Rhoades (1993)	conducted a thorough examination of in-market mergers	In both sets of tests, cost reductions and efficiency gains were not significantly related to horizontal mergers

Source: Pillof ((2012) and other various contributions

2.1. GLOBAL DIMENSION TO BANK MERGERS

One of the most prominent features of global financial transaction in the past two (to three) decades is the pervading incidences of bank mergers and related acquisitions – most particularly in banks. Its pervasive influence is easily noticeable in reported headlines across the globe (Boyd, Graham, 1991). In particular over the last decade, the above rate has risen to astronomical height in both the developed and developing economies (Coyle, 2012). The discussion here opens a profile of its dimension from both the international and local endpoints.

Taking off from the United States (the haven of global corporate development), thus where the brevity notion is adhered to, this paper would summarily agree with the report below – which ordinarily captures the intent of this segment:

"Bank mergers and acquisitions in the US have been occurring at an unprecedented rate. From 1990 through 1998, the number of banks has dropped from 12,347 to 8,774 banks resulting in a 28.9% decline. During this same period, there have been 4,625 unassisted mergers with only 569 failures…. thus the major contributor to the 28.9% decline in the number of banks is likely attributable to the merger activity within the industry…." (Pillof, 2012).This development thus lend credence to the argument of pervasive influence of mergers sweeping across the global banking sector, i.e., perceived from the US position since it benchmarks the global financials in the main.

In Table 2.3 below profiles a summarized list of notable mergers, their nature and motivating factors are profiled. A curious peep into some wave-making mergers in the United States (US) appears succint for this purpose.

2.3. SUMMARY OF MAJOR MERGERS AND ACQUISITIONS WAVE IN THE US

WAVE	UNDERLYING FACTORS	CHARACTERISTICS
1st Wave [1897 – 1904]	-technological development -rapid economic expansion -voluntary development to work together	-horizontal mergers -heavy manufacturing industry
2ndt Wave [1897 – 1904]	-post -WW1 economic boom -technological development. -govt. encouraged firms to work together	-emergence of oligopolies, vertical mergers, and conglomerates (usually related)' -used significance proportion of debt to finance deals
3rd Wave [1897 – 1904]	-booming economy -rising stock price -high interest rate -tough anti-trust enforcement -mgt. science development -financial manipulations	-Primarily conglomerate mergers -some bidder smaller than targets -primarily owners financed investment banks did not play central role -executive managers with vision to create conglomerate
4th Wave [1897 – 1904]	-expanding economy -technological development -internationaal competition -deregulation -increased pension fund assets -financial innovations -investment banking industry much more competitive -failure of conglomerates	-size and prominence of acquisition targets much greater than before -foreign mergers and acquisition Became common -heavy use of debt to pay for acquisition -more hostile takeovers
5th Wave [1897 – 1904]	-Expanding economy, rising stock prices -technological	-emphasized longer-term Strategy rather

	development -globalization -reduced govt. Regulation	Han immediate financial gains -consolidation in the telecoms and banking industries.

Adapted from: Ensico & Garcia(1996);Gaughan(1999), Lipton (2006) Shleifer and vishny(1991), Sudarsanam (2003)

As earlier implied in the opening phase of this write up, the most appreciable driver of mergers and acquisition (particularly in the banking sub-sector) is the advantage that abounds in quantitative lift in corporate (or bank) financials inclusive of other indirect benefits- Hunter and Wall (1989), Hawawini and Swaey (1990), Madura, Want and Palia1994), Porter (1980), Davidson (2005),

Another notable subscriber to the above position is Stewart (2**000)**. He remarked that the actual motivating forces behind mergers should be ones that will (i) increase financial performance (net operating profits), (ii) financial benefits through borrowing against the seller's unused debt capacity or against an increase in the consolidated debt capacity (lending capability for banks), and (iii) tax benefits derived from expensing the stepped-up basis of assets acquired or from the use of otherwise forfeited tax deductions or credits. Before embarking on further exploration of various *efficiencies attending bank merger syndrome (*and the benefits thereof), the paper will pause to review some relevant local perspectives.

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[1][“**A STRATEGIC FRAMEWORK CONTENT ANALYSIS”:**Chery Frohlich, University of North FloridaCfrohlic@unf.edu**C. Bruce Kavan, University of North Florida**].

2.2. THE NIGERIAN PERSPECTIVE

From the preamble of global highlights, it could be inferred that mergers and acquisition are common place issues in developed economies. In spite of the synergy and other benefits inherent in its adoption however, the Nigerian banking system could well be deemed as “just taking off'. This is courtesy of the fact that, “The *Nigerian banks have not fully embraced mergers and acquisitions as expected because of their cultural background in terms of assets ownership, greediness, shame, fear of what people will say and lack of proficiency required for mergers and acquisitions, among other reasons*” (Olokoyo, Umoren 2007).

Generally speaking, the Nigerian notion of merger and acquisition can be traced to be the subset of a wider 'reform' agenda of the monetary authority. For sake of convenience, these reforms can be highlighted in phased regimes as follows;

-the 1986-SAP period;

-the 1991 prudential guideline/1993 managed deregulation era;

-the 2005 post consolidation; and

-the August 2009 period

It is however, important to stress at this early juncture, that energy will not be dissipated on extensive discussion of every phase of the Nigerian banking/financial reform.

<u>The 1986-SAP Period:</u>

Firstly, the 1986 Structural Adjustment Phase of *austerity measures* brought in its wake a phenomenal increase in number of banks. This came courtesy of a major policy shift initiated by the monetary authorities between 1986 to the early part of the 1990s. This took the form of relaxation of controls and liberalization of the Nigerian economy. Thus the fallout of this policy shift was the astronomical increase in licensed banks by over 300%, i.e. from **40 in 1985 to 120 in 1991** (Agbaje, 2008; Bichi, 1996; Ebhodaghe, 1995; Mordi, 2004).

Pre Consolidation Era

The decade 1995 and 2005 were particularly traumatic for the Nigerian banking industry; with the magnitude of distress reaching an unprecedented level, thereby making it an issue of concern not only to the regulatory institutions but also to the policy analyst and the general public. Thus the need for a drastic overhaul of the industry was quite apparent.

In furtherance of this general overhauling of the financial system, the Central Bank of Nigeria introduced major reform programmes that changed the banking landscape of the country in 2004.The main thrust of the 13 point agenda by Professor Charles Soludo who was then Governor of the Central Bank of Nigeria was the prescription of a minimum shareholders funds of 25billion for the Nigerian deposit money bank not later than December 31, 2005 and also, consolidation of banking institution through mergers and acquisitions. This is done in order to arrest systems decay, restoration of public confidence, building of strong, competent and competitive players in the global arena, ensuring longevity and higher returns to investors, considering the inability of most Nigerian banks to perform well due to operational hardship, expansion bottlenecks as a result of heavy fixed and operating costs coupled with volatility between deposits and lending rates. Out of the 89 banks that were in operations before the reform, more than 80% (75) of them merged into 25 banks while 14 that could not finalized their consolidation before the expiration of deadline were liquidated (Elumilade, 2010).

The 2005 Post Consolidation

At the end of 31 December 2005. 25 groups emerged from 75 banks out of the 89 licensed banks, these 25 bank groups that were able to meet the N25 billion capital base, either through organic growth by raising funds from the capital market by way of 'public offering' or by mergers and acquisition had their operating licenses renewed, while 14 unsuccessful banks had their operating licenses revoked (CBN, 2005: 45; CIBN, 2008). Alphabetically itemized in Table 2.1 below are the successful banks that attained theN25 billion capitalizations by December 31. 2005:

Current Situation

In August 2009, a kind of tsunami ravaged the entire banking sector in Nigeria, at the initial stage 5 bank CEO's were suddenly relieved of their position and a #450billion capital was injected into the banking system. Rationale for this steps includes (CBN, 2009):

- poor capital base caused by non performing loans
- poor liquidity position
- high level of risky asset that could lead to systematic risk
- poor corporate governance

As a result of the 2009 banking reform that shook the entire banking sector, AMCON, Asset Management Corporation of Nigeria was established. It bought over the non performing loans of banks by issuing AMCON bonds to raise capital and pay for the loans (Okpanachi, 2010).

Because of the apparent advantage of efficiency related benefits, the banking industry has experience an unprecedented level of consolidation as merger and acquisition among financial institutions have become a general phenomenon globally.

The Post-August 2009 period

One very obvious fall out of the explosive capital market activities that greeted the 2005 post-consolidation was the excesses this unprecedented event generated. As some notable observers (Sanusi et al 2009) would say, "the Nigerian capital market was over liquefied". This event was easily noticeable as the over-blown interest in capital market activities led to many 'uncommon' investors who easily found an 'investment haven on the Nigerian stock market'. It was even so pervasive that the ordinary 'market woman' cultivated the habit of buying shares.

Thus when Sanusi (2009) came on board as the CBN governor, he introduced what in some quarter was branded a "radical sweep" or "Tsunami" what took off five (and later three) chief executive officers of the 25 banks to the 'cleaners'. Some further mergers were equally encouraged. This culminated in the unification of the IBTC PLC and the Stanbic bank to Stanbic-IBTC PLC; the taking over of IBPLC by the Access bank PLC and some other dynamics greeted the coming on board of the CBN governor .

Table 2.4 List of Banks in Nigeria as at January 1 2006

	Bank	Constituent member
1	**Access Bank Nigeria Plc**	Access Bank, Marina Int'l Bank & Capital Bank International
2	Afribank Nigeria Plc	Afribank Plc And Afribank International (Merchant Bankers)
3	Bank PHB Plc	Platinum Bank Limited and Habib Nigeria Bank Limited
4	Diamond Bank Plc	Diamond Bank, Lion Bank and African International Bank
5	**EcoBank Plc**	EcoBank Plc
6	Equatorial Trust Bank Plc	Equatorial Trust Bank Ltd and Devcom Bank Ltd
7	Fidelity Bank Plc	Fidelity Bank FSB International Bank and Manny Bank
8	First Bank of Nigeria Plc	First Bank Plc, MBC International Bank & FBN (Merchant Bankers)
9	First City Monument Bank Plc	First City Monument Bank, Coop Development Bank Nigeria-American Bank and Midas Bank
10	First Inland Bank Plc	First Atlantic Bank, Inland Bank (Nigeria) Plc, IMB International Bank Plc and NUB International Bank Limited
11	GT Bank Plc	GT Bank Plc
12	**IBTC-Chartered Bank Plc**	IBTC, Chartered Bank Plc and Regent Bank Plc
13	Intercontinental Bank Plc	Intercontinental Bank Plc, Global Bank Plc, Equity Bank of Nigeria Limited and Gateway Bank of Nigeria

		Plc
14	Nigeria International Bank LimitedCITI Group)	Nigeria International Bank Limited
15	Oceanic Bank International Plc	Oceanic Bank International Plc and International Trust bank
16	Skye Bank Plc	Prudent Bank Plc, Bond Bank Limited, Reliance Bank Limited, Cooperative Bank Plc and EIB International Bank Plc
17	Spring Bank Plc	Citizens International Bank, ACB International Bank, Guardian Express Bank, Omega Bank, Trans International Bank and Fountain Trust Bank.
18	**Stanbic Bank of Nigeria Ltd**	Stanbic Bank of Nigeria Limited
19	Standard Chartered Bank Ltd	Standard Chartered Bank Limited
20	Sterling Bank Plc	Trust Bank of Africa Limited, NBM Bank Limited, Magnum Trust Bank, NAL Bank Plc and Indo-Nigeria Bank
21	United Bank for Africa Plc	United Bank for Africa Plc, Standard Trust Bank Plc and Continental Trust bank
22	Union Bank of Nigeria Plc	Union Bank Of Nigeria Plc, Union Merchant Bank Limited, Broad Bank of Nigeria Limited and Universal Trust Bank Nigeria Plc
23	Unity Bank Plc	Intercity Bank Plc, First Interstate Bank Plc, Tropical Commercial Bank Plc, Centre-Point Bank Plc, Bank Of The North, New African Bank, Societe Bancaire, Pacific Bank and New Nigerian Bank.
24	Wema Bank Plc	Wema Bank Plc and National Bank of Nigeria Limited
25	**Zenith Bank Plc**	**Zenith Bank Plc**

Foreign owned banks

Source: CBN Annual Reports 2012

-**NOT MERGED BANKS**: Stanbic bank ltd., Std chartered bank ltd. **Nigeria International Bank Limited (CIti Group), EcoBankPlc, GT Bank Plc**[Note: Access Bank merged with Marina Int'l Bank & Capital Bank International**]

Table 2.5 SOME OF THE BANKS WHICH WERE DISTRESSED AND THE BANKS THAT ACQUIRED THEM ARE:

Distress bank	New bank/Acquirer
Afribank Plc-	Mainstreet bank ltd
Equatorial trust bank-	Sterling Bank PLC
First Inland Bank-	First City Monument Bank
Oceanic Bank Plc-	Ecobank Nigeria plc
Spring Bank-	Enterprise bank ltd
Platinum Habib Bank-	Keystone Bank Ltd
Union Bank-	owned by African Capital Alliance Consortium
Intercontinental Bank Plc-	Access Bank Plc

Source: CBN Annual Reports 2012

3.0 METHODOLOGY

In summary, this study proffers an adaptation of the basic model of DEA/C^{2}R model developed by Farrell (1957) for the purpose of measuring banks' efficiency[2]. The DEA is to test the consolidation impact of selected commercial banks on the Nigerian socio-economic variables. Necessary financial data were sourced from *financial statements* of (2) groups of banks based on tier system (i.e. first and second tier banks – see Appendix)...

[2]The quantitative/ calculations processes are done via the adoption of "LINDO software of operational research". This empirically based research model has been successfully applied to test the post-M&A impact on Chinese and American commercial banks efficiency in the new millennium}. In this study, data from financial statements are drawn and relevant qualitative and quantitative analysis derived. For instance, summary comparison of deterministic and mean-variance model were made yielding consistent results for the first tier bank but varied for the second tier counterparts. The benchmarks of Input and output variables using the DEA/C^2R model (including the character and description of relevant variables) are also applied. The input variables cover customers deposit liabilities (X^2) depicting both the total deposit of customers and that of inter-bank. The total net asset represents total equity to shareholders (X^1). The non-performing loan represents the total loan loss provision bank set aside according to the different risks of different loans. On the other hand, the output variables involves net earnings before interest and tax which is the profit derived after deducting benefit expenses to bank employees, ordinary shareholders' expenses and tax to government. Output variables also includes gross loan and advances (Y^2) which depicts the total loan after deducting the provisions for bad debts and net profits – this invariably attracts interest of regulatory authority.

3.1. ANALYSIS OF MERGER IMPACT ON COMMERCIAL BANKS' EFFICIENCY

Generally, the Data Envelopment Analysis (DEA) uses Linear Programming techniques to estimate a non-parametric frontier. *One of the main attractions of DEA is its minimal requirement for prior production assumptions. Nevertheless, its practical applicability is handicapped by its implicit distributional assumptions that all input-output variables are measured accurately, and its consequent non-robustness regarding external effects, outliers and measurement error, this limitation has been recognized in the DEA literature and a number of solutions has been proposed to deal with stochastic environment.*(Post and Spronk, 1997)

This model has a very wide applicability and scores the credit of being adopted by landmark efforts in bank performance evaluation. This is seen in the research efforts of reputable scholars like Sherman and Gold (1985), Rangan et al, (1988), Ferer and Lovell(1990), Oral and Yolalan (1990), Vassiloglou and Glokas(1990), Glokas (1990), Leibenstein and Maital (1992), Kantor and Maital (1995), Soteriou and Zenios (1996), Yeh (1996) and Resti (1997). {as applied in Thierry Post and JaapSpronk (1997)[3] *Bank performance benchmarking in stochastic environments using a log-linear mean-variance DEA model*)

The C^2R efficiency evaluation model assumes production technique of each DMU that has constant returns to scale. It can deduce a frontier of efficiency and calculate the relative efficiency of each DMU by analyzing the input. The DMU which falls on the frontier of efficiency is called DEA efficiency and the value of it is1. While DMU which does not fall on the frontier of efficiency is called DEA inefficiency and the value of it is between 0 and 1.

Assuming there are *n* banks each bank use *m* kinds of inputs to produce *s* kinds of outputs.(i.e. 21 banks currently in the NIGERIAN FINANCIAL ENVIRONMENT; the major input of bank trading is the loan or credit facility; while the output relates to interest receivable and the net profit thereof), DMU_j denotes bank j, x_{ij} denotes the input i of bank j and $x_{ij}>0$. Y_{rj} denotes the output r of bank j and $y_{rj}>0$. The relative efficiency of a specific DMUj0 can be calculated with the following basic model.

$$\text{Max } hjo = \frac{\sum_{r=1}^{s} u_r y_{rj0}}{\sum_{i=1}^{m} v_i x_{ij0}} \qquad (1)$$

$$s.t. \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij0}} \leq 1, j = 1,2......,n;$$

$$u_r, v_i \geq 0, i=1,2....m; r=1,2....,s.$$

In above equation, u_r and vi denote the weight of output *r* and input *i* respectively,.h_{j0} denotes the relative efficiency of bank $_j$.

Equation (1) calculates the maximal relative efficiency of bank *j*m so it meets the requirement of $0 < h_{j0} \leq 1$. But this equation is a non-linear programming model, so the result of (u_r^*, v_i^*) is infinite. In order to solve this problem, this equation should be converted into a linear programming model as the equation (2) below.

$$\text{Max } hjo = \sum_{r=1}^{s} u_r y_{rj0} \quad (2)$$

$$\text{s.t.} \sum_{r=1}^{s} u_r x^{y}_{ij0} = 1$$

$$\sum^{s} u_r y_{rj} - \sum_{i=1}^{s} v_i x_{ij} \leq 0,$$

$$u_r,\ v_i \geq 0,\ i=1,2\ldots.m;\ r=1,2\ldots.,s.$$

Equation (2) calculates the maximal total weight of output after considering the restriction of the total weight of input is 1. The number of restricted equation is more than the number of variables, so the above equation can be converted into a dual linear programming model as below. After the conversion, the equation becomes the unique form of DEA.

$$\text{Min } h_{j0} = \theta \ (3)$$

$$\text{s.t.} \sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{ij0},\ i\text{-}1,2\ldots\ldots.,m;$$

$$\sum_{j=1}^{n} \lambda_j y_{ij} \geq y_{rj},\ r=1,2\ldots\ldots\ldots,s;\ \lambda_j \geq 0,\ j=1,2\ldots\ldots,n.$$

In above equation, θ is the relative efficiency of bank *j*.

C^2R model assume commercial banks operate under constant returns to scale. It is not accord with the reality. If variable returns to scale exist, the SE could not be separated from the TE when measuring the TE. Therefore, we should consider the circumstance of Variable Returns to Scale (VRS). In 1984, Banker, Charnes & Cooper removed the assumption of constant Returns to Scale (CRS) from C^2R model in order to measure the relative efficiency under VRS.

BC^2 model introduces the concept of Distance Function, so TE can be divided into PTE and SE. That is to say, not only the allocation of input and output, but also the factor of scale can affect TE. So the inefficiency state can be changed by adjusting the scale. Therefore, one restriction is added on the equation (3).

$$\sum_{j=1}^{n}\lambda_j=1 \qquad (4)$$

The h_{j0} calculated here is PTE.

3.2 SEPARATION OF TE AND DETERMINING THE CHANGE OF RETURNS TO SCALE

Generally speaking, PTE calculated by BC^2 model is larger than TE calculated by C^2R model. If both values have no difference, it shows the inefficiency of bank is not due to the factor of scale. But if the two values are different, it means the inefficiency of bank is due to the inefficiency of scale. One can explain the relation of TE and SE with the equation below.

$$TE_{CRS}=TE_{VRS}\times SE \qquad (5)$$

In above equation, TE_{CRS} denotes the TE under CRS and TEVRS denotes the TE under VRS. So TE_{VRS} we calculated here is PTE. SE denotes Scale Efficiency. From this equation, we can understand the degree of technical inefficiency comes from pure technical inefficiency or scale inefficiency or both.

Consequently, we can estimate the change of commercial bank's returns to scale with a simple method. First, we add the assumption of Non-increasing Returns to Sale (NIRS) to Equation (4) and

Substitute $\sum_{j=1}^{n}\lambda j \leq 1$ 1 for $\sum_{j=1}^{n}\lambda_j = 1$. So the h_{j0} we calculated here is the TE under NIRS. Then, we can evaluate the degree of returns to scale change. If $TE_{NIRS}\neq TE_{VRS}$, the returns to scale of this bank is increasing. If $TE_{NIRS} = TE_{VRS}\neq TE_{CRS}$, the return to scale of this bank is decreasing. And if the returns to scale of this bank is constant.

3.3 APPLICABILITY OF DEA'S BANK (M&A) EFFICIENCY TO THE NFS

DEA method is one in a relatively emerging realm which levels the research domains of operational research, management science and mathematical economics. It has a strong relevance/suitability to a complex system with multi-input and multi-output index as are located in Nigeria. Especially, it also has strong application value in evaluating issues of society, technology and economy. Its advantages are: Firstly, it does not need to constitute a frontier for concrete function like parameter method. So it can avoid wrong conclusion by using the improper function. Second, the unit standardization of input and output item, such as currency unit, number of employee and time of transaction, is unnecessary for DEA. Third, the index of complex system is hard to compare while the DEA method need not to determine the comparability of each index in advance. Fourth, DEA method needs not to determine the weight of input/output index in advance. It utilizes the weight of each input/output (DMU) as variable to evaluate from the aspect most suitable to DMU. So it can exclude many subjective factors and has high objectivity. Fifth, the relation among each input/output (DMU) is quite complex. But the DEA method can measure the quantitative index of each DMU's comprehensive efficiency without determining the explicit relation among them. It can determine the efficient DMU and analyze the cause of inefficiency so as to adjust the direction and extent of input (DMU).

These characteristics of DEA are very suitable for evaluating the Nigerian banking efficiency. First, the relative efficiency is a good index to measure banks' performance in a highly volatile and competitive market as found in Nigerian banking environment. Besides, it also serves to provide potential signal which can determine whether a bank is failure or not. Second, efficiency index can also be used to evaluate the effect of supervision and market environment on bank's performance. Lastly, this *mathematics* method will help the bank to find the cause of low efficiency. So banks can adopt corresponding strategies to enhance the relative position in the market. Of course, this evaluation method can also provide the information about change of efficiency index before and after the bank M&A. So the management of banks can compare the change of index to evaluate the efficiency improvement of bank M&A.

4.0 ANALYSIS OF FINDINGS

As shown in Tables A & B, the empirical results gave the efficiency indexes of the two categories of banks which in turn determined their levels of Financial Statement optimality (particularly in the Balance Sheet. framework). Put in a more comprehensive context, the mode of measuring optimality is based on efficiencies that are benchmarked by technical, pure and scale efficiencies.

A general overview of the structure of the efficiency category reveals why the banks have been duly represented as the "visibly viable" one and their "struggling" counterparts. [i.e. the ACCESS, FIRST BANK PLC, UNITED BANK FOR AFRICA PLC and the ZENITH representing the former, while the latter position was occupied by the group of AFRIBANK PLC BANK PHB, FINBANK AND SPRING BANKS. The ever-dropping syndrome of TECHNICAL EFFICIENCY in the LP model for these group A banks testifies to its ranking above the distress group B. in similar vein, the pure efficiency yardstick employed have shown some consistency in its fair fluctuation amongst the group A – well above average performance by the group B. Moreover, the fluctuation of efficiency indexes is more obvious for banks that engages in recent mergers. For instance, Access Bank, acquired the International Bank of Nigeria of late(2011); Access Bank, Marina Int'l Bank &

Capital Bank International in 2005 which marked the opening period of this research. This development probably explains the 2005 cost of this M&A which was deemed to be relatively high – but which later fell courtesy of eventual ROE. The success of the ROE had been "swallowed up" by the increased (volume of equity position) of the acquired banks in 2005. The efficiency indexes of Group B members were inefficiency as a whole (Inefficiency as a whole means the PTE and SE are all manifestly less than 1.) and its returns to scale was decreasing during these years. From the empirical results, it is found that SEs of Group A banks generally maintained above 0.9 from 2005 to 2009 which goes to substantiate the fact that the larger the bank, the less effect it projects on banking efficiency. The results of these banks are quite indicative of this suggestion. Thus one is able to locate a robust rationale such as *poor interior management* (as reflected in the technical efficiency) of the merged bank to be responsible for this unwanted position. Thus in the "final result table" it could then be traced that the inefficiency (hence the inability to obtain optimality) in some of these cases could be caused by scale inefficiency or technical inefficiency. Invariably, the inefficiency as a whole that caused by scale inefficiency is increasing which reveals the fact that the ability to achieve SE for higher ranking (1st tier) banks is stronger than that of lower ranking (2nd tier) counterparts.

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