EFFICIENCY OF DEPOSIT MONEY BANKS AND BANKING REFORMS IN NIGERIA

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Abstract

This paper examines the effect of the 2005 and 2009 banking reforms on the efficiency of Nigerian deposit money banks. The study also sought to examine the extent to which the global financial crisis (GFC), the bridge banking resolution technique and the bailout strategy affected Nigerian DMBs. The DEA window analysis technique is employed to determine the efficiency of DMBs within the period of 2000 – 2013. The data used in this study was obtained from the Bureau Van Dijk Bankscope Database. Average aggregate efficiency scores peaked at 89.83% in relation to the 2005 banking reforms but plummeted to 82.92% in reaction to the global financial crisis. However, the aggregate average efficiency levels improved to 85.26% after the adoption of the bridge banking technique. The results indicate that efficiency scores reacted positively to the 2005 and 2009 banking reforms and responded negatively to the episode of the global financial crisis. The study also found that the bailout strategy was not effective in resolving troubled banks, while the bridge banking technique was successful in preventing bank failures. Conclusively, this study holds that banking efficiency improves after a year or two of capital injections. This study therefore recommends that continuous efficiency of banks should not be dependent on the amount of capital requirement or capital injected but on the judicious utilisation of bank assets and the proper management of liability.

Keywords: Bailouts, Bank Efficiency, Banking Reforms, Bridge Banking, Global Financial Crisis, DEA Window Analysis

Introduction

The vital role played by banking institutions in fostering economic development and growth makes them unique. Put differently, the performance of the banking sector is vital to the health of every economy. Banks are important because they perform the important roles of

intermediation, maturity transformation, maintaining financial discipline among borrowers, and facilitation of payment flows. On account of the important roles banking institutions play in economic growth and development, this study investigates the actions taken by Nigerian regulators towards ensuring bank efficiency and stability. More so, the 'specialness' of banking institutions and the need to preserve financial stability has resulted in the banking industry being the most regulated and supervised (Chortareas, Girardone, & Ventouri, 2010).

This study explores the extent to which the Nigerian banking reforms of 2005 and 2009 improved the efficiency of deposit money banks. This study dwells only on the Nigerian banking sector because Nigerian DMBs are supervised by the same regulatory agencies; operate the same accounting framework; have the same customer type; and are exposed to the same opportunities. In a nutshell, Nigerian DMBs operate under the same conditions and clime; hence they are appropriate for comparison. The two Nigerian banking reforms which happened within a period of five years and the episode of the global financial crisis serve as the rationale for this study.

Literature Review

Conceptual Review – *Bank Efficiency*

Efficiency is the best allocation of resources to obtain the highest level of outputs. Efficiency is defined as the choice of alternatives which produce the largest outcome for the given application of resources. Efficiency of the banking sector upmost importance in developing countries (Bhatia & Mahendru, 2015). For banking institutions, efficiency infers improved profitability, greater amount of funds utilized in better ways, service quality for consumers and greater safety in terms of improved capital buffer in absorbing risk (Berger et al., 1993). It is connected to how a bank concurrently minimizes cost and maximizes revenue. The efficiency of banks is vital to uphold trust, confidence and soundness in the banking sector (Zeitun & Benjelloun, 2013). Additionally, greater efficiency in the banking sector leads to greater financial stability, product innovation and access of households and firms to financial services, which in turn affects economic growth (Egesa, 2010). The efficient performance of banking institutions helps them to survive and better compete with other financial institutions. Efficient banks can achieve higher rate of return relative to cost, and at the same time participate in economic development. More so, efficient banking systems can charge on average lower credit and higher deposit rates compared to a less

efficient banking system (Hollo & Nagy, 2006). On the other hand, Inefficient banks are dangerous to the entire financial system as they have the tendency to enhance misappropriation of funds which could lead to bank failures (Fioderlisi, Marques-Ibanez, & Molyneux, 2011).

Measuring the level of efficiency of banking institutions assist in identifying the performance of inputs and proves avenue for eventual improvements. These measurements may provide valuable information to regulators and bank managements for decision making.

Theoretical Review – *Efficiency Structure Theory*

This study rests on the "efficiency structure theory" proposed by Demesetz in 1973. The theory is anchored on two hypotheses: X-efficiency and scale efficiency hypothesis. The x-efficiency hypothesis represents the ability of management to control costs and use resources to produce output. It seeks to ascertain whether banks are operating with an efficient mix of inputs. X-efficiency has however in recent times been the focus of bank efficiency studies (Chen, Skully & Brown, 2005). While the scale-efficiency hypothesis suggests that the most efficient companies are positioned to better compete, develop and grow in scale, thus resulting in an increase in the degree of market concentration. The scale-efficiency hypothesis dwells on market concentration and is widely employed in banking competition and concentration studies, hence this study rests on the x-efficiency angle of the efficiency structure theory. The efficiency structure theory supports the connections between management efficiency and bank performance. The theory opines that improved managerial scale efficiency translates to stability. Achieving higher earnings is derived from efficiency, which is obtained by the effectual utilisation of inputs. In a nutshell, the theory holds that the more efficient banking institutions and the banking sector are, the more stability they achieve in their transactions and their day to day operations.

Empirical Review

Sahin, Gokdemir, & Ozturk (2016) examined the effects of the global financial crisis in the Turkish banking sector and suggested an increasing trend of efficiency during the global financial crisis. In addition, they found that private banks were responsible for the decrease in the average efficiency of the Turkish banking sector as their efficiency scores plummeted in the post global financial crisis period. Moradi-Motlagh & Babacan (2015) examined

the efficiency of eight Australian banks using the bootstrap DEA method within the period of 2006 – 2012. The study found that the efficiency of Australian banks dropped considerably during the global financial crisis. They also pointed out that the efficiency of the examined Australian banks did not improve till in 2012 as all the banks showed low efficiency levels in 2009. Gulati & Kumar (2016) assessed the impact of the global financial crisis on the Indian banking sector. They found that the efficiency levels dropped mildly during the global financial crisis but recovered immediately after the crisis. The DEA scores showed that private banks were the worst hit by the global financial crisis, while foreign banks performed better because of their adherence to best practices and access to superior technology.

Even though there are several studies that employed the use of DEA to evaluate bank efficiency and performance world over, only a handful of these studies are centred on Nigerian banks.

Eriki & Osagie (2014) used DEA analysis to examine the performance efficiency of nineteen (19) commercial banks in Nigeria for the year 2009. They found out that the small and medium sized banks in the Nigerian banking industry were more efficient than mega banks. Muhammad (2008) utilised the DEA and Malmquist Productivity Index (MPI) to analyse the performance of Nigerian commercial banks over a five (5) year period. The study showed that the CRS and the VRS of the banks revealed continuous improvement. More so, the results on the average indicated that the banks consistently improved within the five-year period although the improvement in the third year under review appeared lower than in the other years.

More so, Obafemi (2012) used DEA to ascertain the technical efficiency of Nigerian banks. The study made use of sixty-seven (67) commercial and merchant banks in the periods of 1984/1985, 1994/1995, 1999/2000, and 2003/2004. Based on the technical efficiency scores of sampled banks, the banking consolidation reforms embarked upon by the CBN was not apt. He opined that the 2005 banking consolidation reform weeded out inefficient banks from the banking system, thus ensuring that bank resources were better used by more efficient banks. Obafemi, Ayodele, & Ebong (2013) in their study employed a two-stage DEA approach to examine technical efficiency in Nigerian commercial and merchant banks. They submitted that the Nigerian banking industry was inefficient before the banking consolidation reform of 2005 and that the 2009 banking reform that aimed to reform bank management practices and corporate governance was a step in the right direction. Tankoano (2013) compared the efficiency and

productivity of Burkina Faso and Nigerian banks around the 2008 global financial crisis. Based on a sample of thirty-three (33) banks, he used the DEA window Analysis and the Malmquist Productivity Index Approach to assess the efficiency and productivity of the banks from 2004 – 2011. The findings indicated that both the Burkina Faso and Nigerian banking industries were affected by the global financial crisis.

Methodology

This study applies the Data Envelopment Analysis Window approach to evaluate the efficiency of Nigerian DMBs in this study. The DEA approach estimates the efficiency of Decision Making Units (DMU) with multiple inputs and multiple outputs. The efficiency of a DMU according to the DEA approach is defined by the ability to transform inputs into the maximum amount of outputs.

The efficiency, performance, and stability of Nigerian DMBs are examined over a period of fourteen years (2000 – 2013). This period is chosen by virtue of the events that transpired in the Nigerian banking industry and the world. In view of the Nigerian banking sector, the banking system went through two banking reforms that changed the landscape of the industry. The Nigerian banking sector went through the 2005 and 2009 banking reforms within a period of five years. More so, Nigerian regulators bailed-out eight DMBs in 2009, and adopted the bridge banking model to resolve three (3) distressed banks in 2011. While in general, the global financial crisis that affected global economies and financial institutions started in the second half of 2007.

This study considers the following formulas in line with Gu & Yue (2011) and Repkova (2014), where *N* DMUs (*n* = 1, 2, …, *N*) observed in *T* (*t* = 1, 2, …, *T*) periods using *r* inputs to produce *s* outputs. Let DMU_n^t represents a DMU_n in period *t with a r* dimensional input vector $x_n^t = (x_n^{1t}, x_n^{2t}, \dots x_n^{rt})'$ and *s* dimensional input vector $y_n^t = (y_n^{1t}, y_n^{2t}, \dots y_n^{st})'$. If windows start time *k* (1 ≤ *k* ≤ *T*) with window width *w* (1 ≤ *w* ≤ *t* - *k*), then the metric of inputs is given as follows:

$$X_{kw} = (x_1^k, x_2^k \dots, x_N^{k+1}, x_2^{k+1}, \dots, x_N^{k+1}, \dots, x_1^{k+w}, x_2^{k+w}, \dots, x_N^{k+w})'$$

And the metric of outputs as:

$$Y_{kw} = (y_1^k, y_2^k \dots, y_N^{k+1}, y_2^{k+1}, \dots, y_N^{k+1}, \dots, y_1^{k+w}, y_2^{k+w}, \dots, y_N^{k+w})'$$

The CCR model (constant returns to scales, CRS) of DEA window problem for DMU_n^t is given by solving the following linear program:

$$\begin{aligned} & \min \quad \theta \\ \textit{subject to} \quad & \theta' X_t - \lambda' X_{kw} \geq 0 \\ & \lambda' Y_{kw} - Y_t \geq 0 \\ & \qquad (1) \\ & \lambda_n \geq 0 \ (n = 1, 2, \ldots, N \times w). \end{aligned}$$

The BCC model -variable returns to scales (VRS) formulation can be obtained by adding the restriction $\sum_{n=1}^{N} \lambda_n = 1$ (Banker *et al.,* 1984). The objective value of the CCR model is given as technical efficiency (TE), and the objective of BCC model is pure technical efficiency (PTE). The BCC model is given as follows:

$$\begin{aligned} & \min \quad \theta \\ \textit{subject to} \quad & \theta' X_t - \lambda' X_{kw} \geq 0 \\ & \lambda' Y_{kw} - Y_t \geq 0 \\ & \qquad (2) \\ & \sum_{n=1}^{N} \lambda_n = 1 \\ & \lambda_n \geq 0 \ (n = 1, 2, \ldots, N \times w) \end{aligned}$$

Importantly, there is no theory that justifies the most appropriate window size (Sufian, 2007). Charnes (1995) opined that major technological and environmental changes do not usually occur in narrow window widths, thus they suggested that the adoption of a three or four-year window will result in more reliable comparable results.

The first window incorporates years 2000, 2001, and 2002. The earliest period is dropped anytime a new period is introduced. Year 2000 is dropped in window two, and year 2003 is added to the window. Successively, years 2002, 2003 and 2004 are assessed in window three. The window analysis is performed in twelve (12) windows and ending in the analysis of years 2011, 2012 and 2013. And as suggested that each back is treated as a different entity in each year and there are 82 banks used in this study, the DEA window analysis technique results in 1,164 observations.

Variable Definition and Selection

An important element of DEA rests on the appropriate selection of the input and output variables. There is no general consensus amongst researchers on the best combination of input and output variables. The production and the intermediation approaches are the two main approaches competing in literature in regards to the definition and measurement of the input and output variables (Avkiran, 2006). Avkiran submitted that the other models are the value-added approach and the user-cost approach. However, this adopts the intermediation approach.

The Intermediation approach views banks as the intermediaries that transform and transfer financial assets from the surplus side of the economy to the deficit side of the economy. This study follows a variant of the intermediation approach as used by Yue in his study of the performance of Missouri banks in 1992.

Table 1.0

Banks' Inputs	**Banks' Outputs**
Interest Expenses (IE) Non-Interest Expenses (NIE) Total Deposits (TD)	Interest Income (IC) Non-Interest Income (NIC) Total Loans (TL)

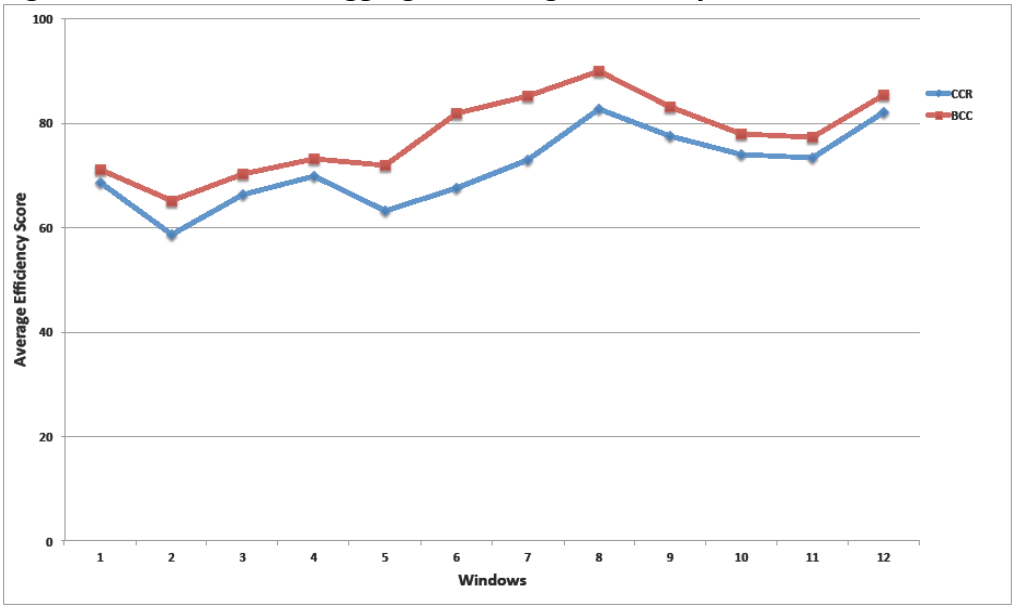
The data set covering the period of 2000 – 2013 of the selected input and output variables from eighty-two banks is used in this study. Prior to the 2005 banking consolidation reforms, the Nigerian banking sector had a total of eighty-nine (89) deposit money banks. Due to the various mergers and acquisitions, and purchase and assumption agreements, the numbers of banks were reduced to twenty-five (25) at the end of 2005. However, at the time of data collection and at the beginning of this study, the Central Bank of Nigeria put the number of commercial banks operating in Nigeria at twenty-one (21). The data used in this study was obtained from the Bureau Van Dijk Bankscope Database. The choice of eighty-two banks was due to the availability of data in the database. Even though it was the intention of this study to include input and output data from all the eighty-nine (legacy) commercial banks, the database only had information on eighty-two (82).

Results

The basic DEA models are based on two main assumptions i.e. the constant returns to scale (CCR) and the variable returns to scale (BCC). This study initially set out to ascertain the efficiency of Nigerian banks based on the calculated CCR and BCC efficiency scores for the period of 2000 to 2013. However, this section relies largely on the BCC efficiency scores to draw conclusions owing to the similarity in the pattern of efficiency scores.

In addition, the similarity in the slope of the aggregate efficiency scores of both the CCR and BCC models as depicted in the diagram below affirms the position of the study to rely on the efficiency scores of one (BCC Model) out of the two models.

Figure 1.0: BCC and CCR Aggregate Average Efficiency Score



The superior slope of the BCC is an indication that the BCC (VRS) efficiency scores are higher than the CCR (CRS) efficiency scores. Hence, when the results of the BCC model are compared against those of the CCR model, the DMUs under the BCC model show higher degrees of efficiency, although there are instances where they are the same. Therefore, the number of efficient banks (DMUs), the percentage of efficient banks, and the average efficiency score under the BCC model are higher than those of the CCR model.

Banker – Charnes – Cooper (BCC) Model

The BCC model is centred on the variable returns to scale assumption. The table below is a summary of the BCC model analysis and it shows the number of banks in each window, the number of DMUs or observations, the number of efficient and inefficient DMUs, the percentage of efficient and inefficient DMUs, and the average efficiency score of each DMUs in each window.

Table 2.0: BCC Outcome

Windows	1	2	3	4	5	6	7	8	9	10	11	12
Years	2000 – 2002	2001 – 2003	2002 – 2004	2003 – 2005	2004 – 2006	2005 - 2007	2006 – 2008	2007 – 2009	2008 - 2010	2009 - 2011	2010 - 2012	2011 - 2013
No. of Banks	75	73	70	62	40	29	24	23	23	25	24	20
No. of DMUs	187	186	163	127	89	72	65	64	63	63	61	60
Efficient DMUs	21	14	13	20	22	21	21	26	18	16	18	23
Inefficient DMUs	166	172	150	107	67	51	44	38	45	47	43	37
Efficient DMUs	11.23%	7.53%	7.98%	15.75%	24.72%	29.17%	32.31%	40.63%	28.57%	25.4%	29.51%	38.33%
% of Inefficient DMUs	88.77%	92.47%	92.02%	84.25%	75.28%	70.83%	67.69%	59.38%	71.43%	74.6%	70.49%	61.67%
Average Efficiency Score	71.04%	65.07%	70.15%	73.07%	71.85%	81.83%	85.1%	89.83%	82.92%	77.91%	77.23%	85.26%

Window 1: BCC (2000, 2001, and 2002)

Table 2 above shows that 75 banks with data translated to 187 DMUS or observations in window 1 in line with the three-year window size adopted for this study. The results revealed 21 efficient DMUs and 166 inefficient DMUs. Thus, 11.23% of the DMUs are efficient, while 88.77% are inefficient. The lowly 11.23% is a poor showing for the Nigerian banking sector, especially for a period that consists of 187 DMUs. The average efficiency score of 71.04% is 28.96% less of the efficiency mark of 100%. Therefore, in line with the

principles of DEA, the aggregate performance of Nigerian banks in window 1 is not good enough to be tagged as efficient.

Window 2: BCC (2001, 2002, and 2003)

73 banking institutions with a total of 186 DMUs are examined in window 2. 14 out of the 186 DMUs in window 2 are efficient whereas 172 are inefficient. Therefore, the proportion of efficient DMUs stood at 7.53%, while the remaining 92.47% of the DMUs were inefficient. When compared to the results of window 1, the results of window 2 reveal an aggregate fall in the efficiency level of Nigerian banks. Equally, the average efficiency score in window 2 plummeted to 65.07% by 5.97% from that of window 1. Despite the fact that the performance of this window was worse than that of window 1, it has the same conclusion. Nigerian banks when compared to themselves and their peers in the years, 2001, 2002, and 2003 indicates that the summative performance of the banking sector was also inefficient.

Window 3 – BCC (2002, 2003, and 2004)

Window 3 consists of 70 banks and 163 DMUs, analysed in the years 2002, 2003 and 2004. Owing to the three year window size adopted in this study, 2002 is the first year to appear in all three windows thus far. The performances of banks in 2000 are only examined in window 1, while the performances of banks in 2001 are examined in window 1 and window 2. The results showed 13 efficient DMUs out of 163. Therefore, 150 out of the 163 DMUs examined in window 3 were inefficient. The percentage of efficient DMUs stood at 7.98%, while that of the inefficient DMUs was 92.02%. Although window 2 had more efficient DMUs, there was a slight positive movement in the percentage of efficient DMUs in window 3. In the same manner, the average efficiency score witnessed a growth of 5.08% to tally up at 70.15% in this window. Conversely, though a positive movement occurred in the aggregate efficiency score of the Nigerian banking sector, the performance of the Nigerian banking sector was inefficient in line with the principles of the DEA methodology.

Window 4 – BCC (2003, 2004, and 2005)

Following the announcement of the commencement of the banking reform programme that culminated on 31 December 2005, banking institutions embarked on various capital raising initiatives within this window. For that reason, the number of money deposit banks examined in this window

reduced to 62, which then amounted to 127 DMUs. The number of efficient DMUs under the BCC model increased to 20, with the inefficient banks amounting to 107. As such, the percentage of efficient DMUs stood at 15.75%, with the remaining 84.25% being inefficient. In like manner, the average efficiency score increased to 73.07% (window 4) from 70.15% (window 3). However, in view of the theory of the DEA methodology, the average efficiency score of 73.07% remains insufficient to declare the Nigerian banking sector efficient.

Window 5 – BCC (2004, 2005, and 2006)

The years examined in this window are integral to achieving the aims and objectives of this study. Although the number of DMUs decreased because of the consolidation exercise of the 2005 banking reforms, the number of efficient DMUs positively increased to 22, while the number of inefficient DMUs conversely fell to 67. In like manner, the percentage of the efficient DMUs amounted to 24.72%, with the percentage of inefficient DMUs totalling up to 75.28%. Though the number of efficient DMUs increased and translated to an increase in the proportion of efficient DMUs, the average efficiency score plunged to 71.85%. The drop in the average efficiency score indicates that although a larger number of banks were efficient in this window; other DMUs within the window had inferior efficiency scores that pulled down the efficiency level of the window.

Window 6 – BCC (2005, 2006, and 2007)

With the elimination of 2004 from the window and the introduction of the year 2007, the number of Nigerian banks further dropped to 29 in all the years x-rayed. 21 out of the 72 DMUs in this window were efficient, while 51 DMUs were inefficient. The percentage of efficient DMUs in window 6 tallied up to 29.17%, with the remaining 70.83% were inefficient. The average efficiency score improved by almost 10% from 71.85% in window 5 to 81.83% in window 6. And just like in previous windows, the aggregate efficiency of the Nigerian banking sector remains unsatisfactory. However, the improvement in the average efficiency score even though is still far from the efficiency level of 100% indicates that the 2005 banking reforms had a positive effect on the Nigerian banking sector.

Window 7 – BCC (2006, 2007, and 2008)

Sequel to the 2005 banking reforms, a total of 24 banks which translated to 65 DMUs (observations) are examined in this window. There are 21 efficient DMUs and 44 inefficient DMUs in this window. Put differently, 32.31% of the DMUs are efficient, while the remaining 67.69% are inefficient. The percentage of efficient DMUs is an improvement on the 29.17% of window 6, even as the financial crisis started and took root within this window. Similarly, the average efficiency score of this window is also greater than that of window 6, as the efficiency scores of DMUs in the years 2006, 2007 and 2008 tallied up to 85.1%.

Window 8 – BCC (2007, 2008, and 2009)

The years x-rayed in this window predominately covers the entire period of the global financial crisis. 23 banks that translated to 64 DMUs (observations) are examined in this window. According to the results obtained, there are 26 efficient DMUs in this window, while 38 DMUs are inefficient. As such, 40.63% of the DMUs are efficient while 59.38% of the total numbers of DMUs are inefficient. The increase in the percentage of efficient DMUs from 32.31% (window 7) to 40.63% (window 8) is a substantial leap. In the same vein, the average efficiency score increased to 89.83%. Even though the average efficiency score falls short of the efficiency level of 100% by 10.17%, this result is impressive given that the three years examined in this window are the years in which the global financial crisis took root and ran its course. However, is should be noted that the efficiency scores of organizations are dependent on the most efficient frontier, and that is the reason why some DMUs (banks) are efficient in a particular year in one window and are not efficient in that same year in another window.

Window 9 – BCC (2008, 2009, and 2010)

Just as in the previous window, there are 23 banks in this window. The banks with data translated to 63 DMUs, of which there are 18 efficient DMUs and 45 inefficient DMUs. As a result, 28.57% of the DMUs were efficient, while the remaining 71.43% were inefficient. In the same vein, the average efficiency score of this window also plunged to 82.92% after attaining the average efficiency score of 89.83% in window 8. The plummeting average efficiency score could be due to the negative effect of the global financial crisis and in general the changing financial landscape of the Nigerian banking

sector. In conclusion, just like all the windows reviewed thus far, the average efficiency score falls short of the 100% efficiency mark of the DEA technique.

Window 10 – BCC (2009, 2010, and 2011)

This window consists of the 2009 reforms and the latter days of the global financial crisis. A total of 25 banks with data translate to 63 DMUs are examined in this window. There are 16 efficient DMUs this window, while the inefficient DMUs (observations) are 47. In terms of the proportion of efficiency within the window, the percentage of efficient DMUs was 25.4%, while 74.6% was inefficient. The average efficiency score further dropped to 77.91% from 82.92% (window 9). This is the second window the average efficiency score is falling. The fall in the average efficiency score in two consecutive windows could be a confirmation that the performances of Nigerian banks have been less than satisfactory or the efficiency frontier has improved in relation to the performance of other banks in the Nigerian banking sector. More so, the decreasing average efficiency score could be because of the adverse effect of the global financial crisis. Nevertheless, in line with the principles of DEA, the average efficiency score of 77.91% indicates that the Nigerian banking industry is inefficient.

Window 11 – BCC (2010, 2011, and 2012)

These windows consist of the post global financial crisis and post 2009 Nigerian banking reforms, and comprises of the years 2010, 2011 and 2012. 24 money deposit banks that translate to 61 DMUs or observations are examined in this window. There are 18 efficient DMUs within this window, while the remaining 43 DMUs are inefficient. As such, the percentage of the efficient DMUs stood at 29.51%, whereas the remaining 70.49% are inefficient. Just as in windows 10, the average efficiency score of this window dropped from 77.91% to 77.23%. The performance of the bailed-out banks and those of the Bridge banks in 2011 account largely for the decline in the average efficiency score. Therefore in line with the principles of the DEA technique, the aggregate performance of Nigerian banks (77.23%) suggests that the banking sector was inefficient in window 11.

Window 12 – BCC (2011, 2012, and 2013)

In view of the efficiency of the Nigerian banking sector in window 12, the result shows 23 efficient DMUs 37 inefficient DMUs. Put differently, 38.33% of the DMUs in this window are efficient, whereas the remaining 61.67% of

the DMUs are inefficient. The percentage of efficient DMUs in this window witnessed an increase of 29.51% from that of window 11. Still, on the positive premise, the average efficiency score surged to 85.26% after steadily plummeting from 89.83% in window 8 to 77.23% in window 11. The surge in the average efficiency score could be an indication that the Nigerian banking sector has started to recover from the adverse effect of the global financial crisis that saw a drop in the efficiency level of some banks. Additionally, it could also be an indication that the initiative to reform the Nigerian banking sector by Nigerian regulators was a step in the right direction. Nonetheless, the inability of the banking sector to attain a 100% efficiency score suggests in line with the principles of DEA that the Nigerian banking sector was inefficient in window 12.

Effect of banking reforms

The performance and efficiency of Nigerian DMBs improved overtime, although there are windows where efficiency levels plummeted. Efficiency levels dropped in window 2, and immediately rose in window 3 in the pre-2005 banking reforms era. The rise continued in the 2005 banking reforms era in window 4. However, efficiency levels dropped in window 5. The year 2004 is in 3 windows (window 3 – window 5), while the year 2005 is in window 4 – window 6. 2004 has the least amount of DMUs in all the three windows it was reviewed in, which implies there were more efficient DMUs in 2005 when compared to the efficient DMUs in 2004. In similar fashion, the year 2006 is in window 5 – window 7 and it has more efficient DMUs when compared against the efficient DMUs in 2005. The increase in the number of efficient DMUs suggests that money deposit banks in the Nigerian banking sector reacted positively to the 2005 banking reforms. More so, the percentage of efficient DMUs in the Nigerian banking sector increased steadily after the 2005 banking reforms (from window 4 – window 8).

The effects of 2005 banking reforms on the performance of banks as reviewed in this study suggests that the efficiency level of Nigerian money deposit banks improved in the post 2005 banking reforms era. Even though, efficiency levels did not reach 100% after the 2005 banking reforms, and Nigerian banks remained inefficient according to the principles of the DEA frontier technique, the reforms had a positive effect on the general performance of Nigerian banks.

The failure of Nigerian banks to attain expected efficiency and performance levels led to the 2009 banking reforms. According to the obtained BCC efficiency scores, the aggregate efficiency of the Nigerian banking sector

peaked at 89.83% in window 8 and plummeted to 82.92% in window 9 and this decline continued till window 12 when efficiency levels improved to 85.26%. It is possible that the performance of Nigerian banks did not continue to improve because of the episode of the global financial crisis. Moreover, the tenets of the 2005 banking reforms were unable to prevent the plunge in the efficiency scores of the banks in the wake of the 2008 global financial crisis. Owing to the fact that the 2005 banking reforms was supposed to protect the Nigerian banking industry from adverse effects of financial and economic crises, the initiative to embark on the 2009 banking reforms suggests flaws in the 2005 banking reforms.

In summary, even though the aggregate performance of the Nigerian banking sector did not reach the 100% efficiency level in all the windows examined, the 2005 and 2009 Nigerian banking reforms had positive effects on the efficiency of individual banks.

Global Financial Crisis

In view of the performance of the Nigerian banking sector during the global financial crisis (2007 – 2009), this study examines the effect of the financial crisis in five windows (window 6 – window 10). The aggregate efficiency scores increased in window 6 (BCC – 71.8% to 81.83%). Similarly, the aggregate efficiency level of the banking sector continuously improved in window 7 i.e. to 85.1% and window 7 consist of two global financial crisis years (2007 and 2008). Impressively, window 9, which consists of the entire global financial crisis period (2007 – 2009), has the highest aggregate efficiency score of 89.83%. In sum, these results suggest that the performance of most banks operating in the Nigerian banking sector did not decline during the global financial crisis.

On the other hand, high efficiency scores could be that the best practice bank or the most efficient of the set of banks is second-rate. In the event that the best practice bank or the banks on the efficiency frontier are not in reality efficient, the other inefficient banks will appear efficient. If that is the case in the windows that contain the global financial crisis period, then the banking sector was not as efficient as the efficiency scores portrayed. However, the efficiency scores of some banks deteriorated during the financial crisis. The 8 banks that were eventually bailed out revealed inferior efficiency scores during the global financial crisis. Therefore, suggesting that the global financial crisis had a negative impact on the Nigerian banking sector.

Efficiency of Bailed Out Banks

The bailout of eight Nigerian banks in 2009 by Nigerian regulators was borne out of the desire to save the banks from collapse. The CBN and NDIC found eight Nigerian banks to be in danger of distress, hence the bailout. The bailed out banks include Equitorial Trust bank, Unity bank, Fin bank, Union bank, Afri bank, Bank PHB, Intercontinental bank, and Oceanic bank.

Relying on the efficiency scores after the injection of the bailout funds, the efficiency level of Unity bank, Oceanic bank, Afribank, improved in 2009 (i.e. in the year the bailout was received), while the efficiency scores of Union bank, Equitorial Trust bank, Bank PHB, and Intercontinental bank did not improve in 2009. Progressively, while Unity bank was not able to post a 100% efficiency score in 2009, in all the windows 2009 is reviewed. Nonetheless, the efficiency score of Unity bank rose to 100% efficiency scores in 2010 in windows 8, 9, and 10. Whereas, the efficiency scores of the bailed-out banks deteriorated to below the 60% in 2010. Moreover, the efficiency scores of the bailed-out banks in 2010 and 2011 was unable to show improved performances due to the 2009 capital injection by Nigerian regulators. In essence, the bailout strategy did not have a lasting positive effect on the performance and efficiency of the troubled deposit money banks.

Efficiency of Bridge Banks

Three Nigerian banks were nationalised into bridge banks (Afribank became Mainstreet Bank Ltd, Bank PHB became Keystone Bank Ltd, and Spring Bank became Enterprise Bank Ltd). Apart from Spring bank, Afribank and Bank PHB were bailed out in 2009. The inability of the banks (especially the bailed-out banks) to improve their risk positions and recover from the event of the global financial crisis led to the adoption of bridge banking by Nigerian regulatory authorities. The efficiency scores of Afribank and Bank PHB show that sustained efficiency was not achieved after the injection of the bailout funds, thus the adoption of the bridge banking strategy was appropriate.

Relying on the BCC efficiency scores of the three bridge banks, the results indicate that the efficiency scores of all three bridge banks remained low in 2011 in window 10, window 11, and window 12. Efficiency levels improved in 2012 across all three windows (10, 11, and 12), however, the level of increase in Enterprise bank and Mainstreet bank were weightier to that of Keystone bank. More so, only Mainstreet bank achieved an efficiency score

of 100% in 2013 (window 12), as Enterprise bank had an efficiency score of 68.51%, while Keystone Bank came last with an efficiency score of 58.13%.

To conclude, even though the efficiency scores of the Bridge banks did not transform instantaneously to depict impeccable efficiency levels, the efficiency scores of the Bridge banks indicate steady improvements. Therefore, as at 2013, the efficiency scores of the three Bridge banks suggest that the bridge banking strategy was effective.

Conclusion

This paper examined the efficiency of DMBs in Nigeria and found that both the 2005 and 2009 banking reforms positively affected DMBs. The study also concludes that just like most financial institutions in developed and developing countries, the global financial crises impacted negatively on the efficiency of DMBs. More so, of the two banking resolutions techniques (bailouts and bridge banking) adopted by Nigerian regulatory authorities, the bridge banking technique was more effective in preventing bank failures.

The study therefore recommends that regulatory agencies should look beyond capital injections and enact policies that enhance the efficient utilisation of bank assets and proper management of liquidity in banking institutions.

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