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Bukola Olaosebikan, '09
Illinois Wesleyan University

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Surveying Efficiencies of Nigerian Banks before and after the Minimum Capital Requirement Increase

Abstract

This study investigates the efficiency of the Nigerian banking system between the years of 1999 and 2005. Bank efficiency is evaluated using Data Envelopment Analysis (DEA), and the main determinants are identified by using a Tobit model. The results indicate that efficiency fluctuated during the first part of the period and improved during the recent years, a period associated with the increase in minimum capital requirement. Differences in bank efficiency are explained by problematic loans and bank size.

1. Introduction

The dynamics of banking in developing nations are constantly changing, generating a surge of interest in researching these economies. Amongst others, it has been established that a rising percentage of foreign bank ownership in low-income countries is attributable to other low-income countries, as opposed to high-income countries (Horen, 2006). Additionally, the efficiency advantages of foreign-owned banks relative to domestically owned banks have also been studied (Berger). In a like-manner, this study investigates the efforts of the Central Bank of Nigeria to reform the Nigerian banking sector, and hence the country's economy.

Over the past two decades, the Nigerian banking system has shown resilience to significant fluctuations in the overall economy and has been reshaped by numerous changes in banking legislations. Many of the regulatory changes have occurred due to a shift in banks' focus from financial intermediation to foreign exchange activities in the late 1980s and early 1990s; however, others are a result of general instabilities in the economy as a whole. While some researchers argue that excessive regulations stifle the essence of a largely capitalist economy, others insist that regulations are necessary for efficiency[1] (Demirguc-Kunt, Laeven, and Levine, 2004).

This study aims to assess the short-term impact of regulation enforcement

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[1] One of the more recent recognitions of Nigerian economic development was the debt agreement with the Paris Club on June 2005. The agreement allowed Nigeria to obtain a debt cancellation estimated at US$ 18 billion, which represented 60% of its total debt (US$ 30 billion) to the Paris Club. It has been stated that the large debt relief included in this agreement reflects Paris Club creditors support to Nigeria's economic development policy and its fight against poverty.

on the banking industry by estimating bank industry efficiency over the period spanning 1999 to 2005. Extant literature documents that the level of efficiency of banking sectors in developing countries is lower and more volatile than the efficiency in developed countries (Berger et al., 2000; Grigorian and Manole; 2002; Havrylcyk, 2006). Some of the recent studies examine the banking crisis of the late 1980s and early 1990s of the Sub-Saharan Africa (Daumont, Le Gall, and Leroux, 2004) and the subsequent improvement in bank efficiency experienced by some of these countries (Hauner and Peiris, 2005). This undertaking seeks to contribute to the aforementioned literature by providing evidence for the efficiency of the Nigerian banking system and identifying the main determinants of the efficiency differences across banks.

The DEA results indicate that the Nigerian bank efficiency fluctuated during the early part of the period under analysis and showed signs of steady improvement during the more recent years, starting with the first year of the minimum capital requirement implementation period. These results are consistent with the general positive developments reported by banking systems subject to major restructuring process (Isik and Hassan, 2002, and Hauner and Peiris, 2005). Similar to the Ugandan banking system, the Nigerian system is more efficient mainly due to officials' decision to close distressed banks, as well as more efficient supervision exercised by the Central Bank of Nigeria. In addition to the increased economies of scale and operational efficiency induced by the said reforms, Hess anticipates that many Nigerian banks will expand operations to other West African regions. It is also anticipated that the abnormal profit margins

from non-lending activities characterized by the Nigerian banking sector will be significantly diminished following the new legislation (2007).

The remainder of this paper is structured as follows: Section 2 presents the institutional background. Section 3 surveys existing literature on the efficiency of banking industries in the Sub-Saharan Africa. Section 4 describes the non-parametric approach employed in this study ☐ Data Envelopment Analysis. Section 5 presents the data and the main empirical results of the study, and Section 6 concludes.

2. Institutional Background

In the early 1990s, the Nigerian banking sector underwent significant changes ranging from the reform of the banking accounting procedures in 1990 and bank privatization in 1992, to the restructuring of distressed banks in 1993 and liberalization of capital flows in 1995. During the various reform exercises of the 1990s, the sector experienced a high increase in the number of banks specializing in foreign exchange activities and an accompanying decline in the number of banks focusing on deposits and credit services (Beck et al, 2005). This influx was a consequence of the lax restrictions on market entry and the returns on equity earned from arbitrage transactions in FOREX markets (Lewis and Stein, 2002).

Despite the aforementioned efforts, the banking sector experienced a bank run that resulted from a failed attempt at instituting civilian rule, a decline in the financial sector's contribution to GDP, and a sharp increase in non-performing

loans (Beck et al, 2005). In order to secure the efficacy of the banking system, the government instituted several regulatory bodies. The Federal Ministry of Finance (FMF), Central Bank of Nigeria (CBN), Nigeria Deposit Insurance Corporation (NDIC), The Federal Mortgage Bank of Nigeria (FMBN), and the Financial Services Coordinating Committee (FSCC) are a few of these establishments. Other recent changes in Nigerian banking rules include the promulgation of the Failed Banks (Recovery of Debt) and Financial Malpractice in Banks Decree No. 18 of 1994, the implementation of the Money Laundering Decree, amendments to the Central Bank of Nigeria (CBN) Decree 24 and BOFI Decree 25 in 1997, and amendments to the Nigeria Deposit Insurance Corporation Decree 22 of 1998. However, an immensely unpopular reform on the banking industry was announced in July 2004, when Central Bank of Nigeria mandated an increase in the minimum capital requirement of all banks from NN 2 billion to NN 25 billion—representing a 1150% increase.

According to the Banking Supervision Annual Report released by the CBN, the first phase of the reform began in July 2004 and was concluded on December 31, 2005, with the number of banks reduced from 89 to 25[2]. During the compliance process, banks alone raised NN 406.4 billion from the capital market; of this amount, the CBN verified and accepted NN 360 billion. The process also led to the inflow of Foreign Direct Investment (FDI) of USD 652 billion and GBP 162,000. Over the course of 2005, the total assets of the banking sector increased by 29.37%; "Cash and Cash due from other banks" increased by 10.57%.

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[2] See Appendix 1 for a list of surviving banks.

Rankings of the major components of liability remained largely unchanged. The twenty-five banks that emerged from the consolidation exercise accounted for 93.5% of the banking system's deposit liabilities.

The report further explains that the structure of the banking system prior to consolidation stifled its performance due to operational and structural incapacities. These inadequacies included low capital bases in most banks, a plethora of small banks with few branches, poor bank ratings, weak corporate governance characterized by inaccurate reporting, declining ethics, and non-performing insider related credits. Furthermore, other banking shortages included non-compliance with regulatory requirements, over-dependence on public sector funding, foreign exchange exploitation, and neglect of small and medium scale enterprises. Some of the consolidation benefits reported by officials include greater ease in regulatory oversight since all banks are currently quoted on the stock exchange, a reported reduction in interest rates accompanied by a 40% increase in lending, and a favorable boost in depositor confidence.

3. Previous empirical findings

The literature on the financial sector in Nigeria covers most of the recent developments of the Nigerian banking system. Lewis and Stein (1997) argue that the Nigerian financial crisis of the early and mid1990s was the burst of the bubble created by the late 1980s liberalization. Despite an extremely volatile environment, 51% of total banking assets (14 banks) were privatized in early 1990s. Beck et al (2005) analyze the performance of the privatized banks during

the years of 1990-2001 and document that privatization resulted in a significant improvement in performance for nine of them. A major initiative to improve the system was undertaken in 1998 and resulted in 26 banks having their licenses revoked. However, the banking system remained fragmented and characterized by a relatively low financial intermediation. This condition is consistent with the observations made by earlier studies. Banking systems in transition economies, such as the Nigerian economy, are typically characterized by a need for major restructuring in order to boost efficiency (Fries et al, 2002). Given the higher minimum capital requirement imposed in 2004, however, Hesse (2007) argues that the newly emerged banking system, flushed with cash and equity, will probably witness an erosion of the margins and consequently seek product and geographical diversification.

Interestingly, such positive developments have been recorded for some other banking sectors of the Sub-Saharan African countries. Hauner and Peiris (2005) document an increase in Ugandan banking efficiency as a result of the recent reforms. The privatization of the Ugandan Commercial bank, the closure of distressed bank, and strengthen supervision have resulted on a higher growth rate and higher stability of the system. However, the authors argue that Ugandan banks still rely on the revenues derived from government securities and bigger banks are better positioned to face the competitive pressure of the monopolistic banking system. The study identifies some other challenges faced by the system such as: high overhead, personnel, and loan loss provisioning costs due to poor infrastructure, inflexible labor markets, and cumbersome commercial courts.

4. Methodology

This study measures the efficiency of the Nigerian banking system by employing Data Envelopment Analysis (DEA), a mathematical, non-parametric method used to measure relative efficiency and managerial performance of different types of productive units. It is used to evaluate the relative efficiency of banks by identifying the efficient banks and using them as benchmarks to measure the inefficiencies in input variables of the other banks in the sample. The DEA approach has been employed by several studies (Elyasiani and Medhian, 1990; Berger and Humphrey, 1997; Grigorian and Manole, 2002), and it is considered suitable for studies of transition-economy banking systems (Havrylchyk, 2006). Two different approaches in measuring efficiency have been developed based on different views of the bank activity. The production approach relates the main role of a bank to cost-revenue management, while the intermediation approach assumes that banks use capital and labor to transform deposits into loans and different types of securities. Following similar studies (Isik and Hassan, 2002; Havrylchyk, 2006), this study employs the intermediation approach.

Following is a brief overview of the DEA approach. For more detailed information, the interested reader should refer to Coelli (1996), Lovell (1993; 1994), and Charnes et al (1995). For a set of N banks, with K inputs and M outputs for each bank, two matrices of inputs and outputs ($K \times N$ input matrix, $M \times N$ output matrix) are built. The cost efficiency is measured by the ratio of all

outputs over all inputs $\left(\dfrac{u'y_i}{v'x_i}\right)$ where u is a $M \times 1$ vector of output weights and v is

a $K \times 1$ vector of input weights. The optimal weights are specified by the following

mathematical programming problem:

$$v'x_i = 1$$

In order to calculate the cost efficiency, the following constraint is imposed:

$$N1'\lambda = 1.$$

To calculate allocative efficiency, the following minimization problem is solved:

where w_i is a vector of input prices, and x_i^* is the cost-minimizing vector of input

quantities.

The overall cost, technical, and allocative efficiency are then computed. Technical efficiency (TE) is the ability to produce the maximum outputs at a given level of inputs, allocative efficiency (AE) is the ability to select the optimal mix of inputs for given prices in order to produce a given level of outputs, and the overall cost or economic efficiency (CA) is the product of technical and allocative

efficiency (Coelli, 1996). The efficiency measures obtained in the first stage are the dependent variables in the second stage Tobit model. A Tobit Model is an econometric approach that takes into account, the presence of dependent variables that are censored. Since the distribution of the disturbances and the dependent variables is not normal, a Tobit model is used instead of an Ordinary Least Squares (OLS) regression.

5. Data and Empirical results[3]

In order to assess the short-term impact of the increase in the minimum capital requirement, the data used in this study comprises Nigerian banks for the period 1999–2005. The year 1999 is the selected start date because Nigeria transitioned into civilian rule that year, lending more credence to the reliability of data available. In addition to unavailability of data, the year 2005 is the selected end date in order to focus on the short-term impact of the new legislation. Balance sheet and income statement figures were obtained primarily from the *African Financial Markets* database, and banks with missing data were excluded. Individual bank's websites were consulted for supplementary financial information.

The efficiency scores are based on the intermediation approach with two outputs (loans, liquid assets) and three inputs (capital, deposits, and labor). All variables are measured in thousands of Nigerian Naira (NN), and Labor is measured in numbers of employees. Following Grigorian and Manole (2002) and

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[3]   Considering the advanced nature of the tests employed, all tests were run by Professor Elisabeta Pana of Illinois Wesleyan University

Havrylchyk (2006), loan loss provisions are subtracted from loans to ensure that loan portfolios are of comparable quality. The vectors of prices required by the allocative efficiency are defined as follows: *Price of capital* is calculated as depreciation of fixed assets divided by fixed assets, *Price of labor* is total staff cost divided by the number of employees, and *Price of deposits* is defined ad the interest expense divided by the total amount of deposits.

Table 1 presents the summary statistics of the outputs, inputs, and prices of inputs. The change in the average size of the bank over time reflects the effect the M&A and the IPO wave generated by the increase in minimum capital requirement imposed in 2004, as well as elimination of the small distressed banks. While the price of deposits and price of fixed assets remain relatively constant over time, the price of labor show an upward trend for the period under analysis.

High allocative inefficiency documented for the first five years of the period under analysis is attributable to fluctuations in input prices, which stifle management ability to take long term decisions. It is interesting to note that the restructuring process of years 2004-2005 has resulted in a significant increase in the efficiency without having a significant impact on costs. An alternative explanation for the fluctuation in efficiency during the early part of the period could be the growth of certain types of loans and the volatility of the non-performing loans in total assets.

The Tobit model results show that scale is one of the significant factors in explaining differences in efficiency. Similar results are documented by Hauner

and Peiris (2005) on the efficiency of the Ugandan banking system. However, the results are in sharp contrasts with the evidence of Bonin, Hasan, and Watchel (2004). Using a panel of eleven countries, the authors show that bank efficiency decrease nonlinearly with bank size. Their result provides no support to the effort undertaken by many governments of transition economies to consolidate their banking systems in order to align them to international standards.

The significant negative coefficient of the loan loss provisions/loans variable suggests that problematic loans create additional costs associated with monitoring and enforcement of loan repayment. Similar findings have been documented by Hauner and Peiris (2005) for Ugandan banks, as well as Havrylchyk (2006) for Polish banks. The coefficient estimate of the directors' pay/staff cost is insignificant, consistent with the economic theory on banking compensation structures. The compensation should have low pay performance sensitivity because of the high leverage of banks and the fact that banks are highly regulated institutions (John and Quian, 2003).

6. Conclusion

This study investigates the short-term impact of recent reforms on the efficiency of the Nigerian banking system. While reforms imposed during the late 1990s have reduced the number of distressed banks, the efficiency of the banking system was volatile until the minimum capital requirement was imposed in 2004. The consolidation process that followed, coupled with a wave of IPOs, has strengthened the banking system and led to an increase in efficiency.

The results show that cost inefficiency is mostly explained by fluctuations in allocative efficiency during the five year period following the year 1999. The findings of this study also show that bigger banks have a higher ability to improve efficiency and are better positioned to compete. These results underscore the importance of addressing the loan loss provisions costs to improve bank efficiency. There is no evidence of a statistical relationship between managements' compensation and bank efficiency.

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Appendix

Surviving Bank	Member of the group	Surviving Bank	Member of the group	Surviving Bank	Member of the group
1. Access Group	Marina International Bank Ltd Capital Bank International Ltd Access Bank of Nigeria Plc	9. ETB/Devcom Group	Equitorial Trust Bank Ltd Devcom Bank Ltd	17. Platinum/Habib Group	Platinum Bank Ltd Habib Nigeria Bank Ltd
2. Oceanic Bank	Oceanic Bank Plc International Trust Bank	10. STB/UBA	Standard Trust Bank United Bank for Africa Plc Continental Trust Bank	18. Diamond Bank	Diamond Bank Ltd Lion Bank Plc African International Bank Ltd
3. Zenith Bank Plc	Zenith Bank Plc	11. IBTC/Chartered Bank Group	Regent Bank Ltd Chartered Bank Plc IBTC Ltd	19. First Inland Group	IMB Bank Plc Inland Bank Plc First Atlantic Bank Ltd NUB Bank Ltd
4. Sterling Group	Magnum Trust Bank Ltd NBM Bank Ltd NAL Bank Plc INMB Bank Ltd Trust Bank of African Ltd	12. Unity Bank Group	Bank of the North New Africa Bank Plc Tropical Commercial Bank Centre Point Bank Plc New Nigerian Bank Plc First Interstate Bank Ltd Intercity Bank Societe Bancaire Ltd Pacific Bank Ltd	20. Springbank Group	Guardian Express Bank Ltd Citizens International Bank Ltd Fountain Trust Bank Ltd Omega Bank Plc Trans International Bank Ltd ACB International Bank Plc
5. Guaranty Trust	Guaranty Trust Bank Plc	13. Union Group	Union Bank of Nigeria Plc Union Merchant Bank Universal Trust Bank Broad Bank Ltd	21. Fidelity Group	Fidelity Bank Plc FSB International Bank Plc Manny Bank Ltd
6. First Bank Plc Group	First Bank of Nigeria Plc FBN Merchant Bankers MBC International Bank Ltd	14. Afribank Group	Afribank Nigeria Plc Afribank Int'l Ltd (Merchant Bankers)	22. Ecobank	Ecobank Bank Nigeria Plc
7.	Global Bank Plc	15. FCMB Group	FCMB Bank Plc	23. Skye Group	Prudent Bank Plc

Intercontinental Bank Group	Equity Bank of Nigeria Ltd Gateway Bank Intercontinental Bank Plc		Cooperative Devpt. Bank Plc Nig-American Bank Ltd Midas Bank Ltd	Bond Bank Ltd Cooperative Bank Plc Reliance Bank Ltd EIB Bank Ltd
8. Wema Bank Group	Wema Bank Plc National Bank Plc	16. NIB	Nigeria International Bank Ltd	24. Stanbic
				25. Standard Chartered

24. Stanbic — Stanbic Bank Ltd

25. Standard Chartered — Standard Chartered Bank Ltd

Table 1
Summary statistics

		1999	2000	2001	2002	2003	2004	2005
Number of banks		25	28	31	22	23	18	13
Total assets	Mean	25,976,824	24,498,840	36,728,156	59,464,059	84,900,318	94,824,507	193,850,074
	Median	11,401,209	15,593,183	23,420,889	32,080,630	44,504,039	43,843,662	131,341,343
Inputs								
Deposits	Mean	17,564,957	16,627,777	26,103,314	40,014,854	57,604,590	65,045,692	125,680,633
	Median	5,476,064	8,443,911	12,253,638	21,775,005	31,182,927	32,551,514	80,402,716
Fixed Assets	Mean	1,855,782	1,732,301	2,324,929	4,297,010	4,736,136	8,329,226	12,653,831
	Median	745,396	764,876	1,287,180	2,239,086	3,854,671	2,833,894	5,522,495
Number of employees	Mean	1,444	866	1,094	1,484	1,615	1,580	2,269
	Median	425	466	553	574	655	671	1,303
Outputs								
Loans	Mean	7,097,666	6,344,542	9,555,778	15,184,578	20,006,081	26,921,040	55,826,041
	Median	3,382,612	3,650,709	5,307,042	10,687,660	14,512,444	17,090,396	46,183,046
Total Investments	Mean	14,947,264	14,844,965	23,066,476	37,086,432	54,865,046	53,892,809	112,485,885
	Median	4,785,270	7,135,844	8,407,134	16,794,755	22,636,306	20,227,43?	67,395,993

Prices

Price of Deposits	Mean	0.0834	0.0997	0.0871	0.1088	0.0830	0.0714	0.0591
	Median	0.0689	0.0873	0.0834	0.0861	0.0934	0.0708	0.0445
Price of Fixed Assets	Mean	0.1678	0.1777	0.1671	0.1401	0.1684	0.1542	0.1632
	Median	0.1223	0.1459	0.1650	0.1309	0.1554	0.1399	0.1322
Price of Labor	Mean	614	787	910	1,055	1,415	1,671	2,072
	Median	527	678	873	1,076	1,288	1,479	2,162

Table 2
The summary of the efficiency measures for the years 1999-2006

Cost Efficiency (CE)

	Mean	Standard Deviation	Maximum	Minimum
1999	0.8744	0.1781	1.000	0.5130
2000	0.6973	0.2404	1.000	0.3080
2001	0.7332	0.1964	1.000	0.4100
2002	0.8947	0.1445	1.000	0.5760
2003	0.6140	0.2864	1.000	0.1870
2004	0.9092	0.1149	1.000	0.5770
2005	0.9545	0.0912	1.000	0.6910

Technical Efficiency (TE)

	Mean	Standard Deviation	Maximum	Minimum
1999	0.9312	0.1177	1.000	0.6760
2000	0.8799	0.1453	1.000	0.5280
2001	0.8753	0.1435	1.000	0.6510
2002	0.9444	0.1067	1.000	0.6540
2003	0.9166	0.1003	1.000	0.7150
2004	0.9764	0.0453	1.000	0.8570
2005	0.9824	0.0635	1.000	0.7710

Allocative Efficiency (AE)

	Mean	Standard Deviation	Maximum	Minimum
1999	0.9302	0.0987	1.000	0.6960
2000	0.7817	0.1985	1.000	0.3730
2001	0.8325	0.1445	1.000	0.5200
2002	0.9428	0.0696	1.000	0.8140
2003	0.6552	0.2631	1.000	0.2250
2004	0.9311	0.1073	1.000	0.5770
2005	0.9704	0.0504	1.000	0.8730

Table 3

Tobit regression of the efficiency measures on bank characteristics

	TE	AE	CE
Loan Loss Provisions / Loans	-0.12 ***	-0.12 **	-0.22 ***
	(0.00)	(0.02)	(0.00)
Loans / Total Assets	0.04	-0.05	0.01
	(0.64)	(0.61)	(0.99)
Log of Total Assets	0.02	0.04 **	0.05 **
	(0.10)	(0.01)	(0.01)
Directors Pay / Staff Cost	-0.05	0.02	-0.04
	(0.70)	(0.89)	(0.84)
Constant	0.84***	0.77***	0.65***
	(0.00)	(0.00)	(0.00)

Explanatory variables were calculated as follows: *Loan Loss Provisions / Loans*: loan loss provisions divided by total loans; *Loans / Total Assets*: total amount of loans excluding loans to other financial institutions divided by the total assets; *Log of Total Assets*: logarithm of the total bank assets; *Directors Pay / Staff Cost*: total amount of directors pay divided by the staff cost.
* Level of Significance at 10% (p < .1).
** Level of Significance at 5% (p < .05).
*** Level of Significance at 1% (p < .01).