Acta Univ. Sapientiae, Economics and Business, **6** (2018) 61–87

DOI: 10.1515/auseb-2018-0004

Bank Capital, Operating Efficiency, and Corporate Performance in Nigeria

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Abstract. This study examines the impact of bank capital and operating efficiency on the Nigerian deposit money bank financial performance with a view to resolving risk-based and non-risk-based capitals' dichotomy existing in the bank literature. Using bank-specific data obtained from the annual reports and accounts of 15 banks listed on the Nigerian Stock Exchange between 2012 and 2015, the panel data regression analyses revealed the superiority of standard capital ratio of equity-to-total-assets, a non-risk-based capital, over other measures. While all measures, both risk-based and non-risk-based capitals, showed significantly positive effects on bank performance as measured by return-on-asset, mixed results were obtained from other indicators: return-on-equity and net-interest-margin. Overall, only equity-to-total-assets influenced all adopted performance indicators positively. It was also found that operating efficiency measured by cost-to-income ratio had negative impact on bank performance, but on the average it appeared too high. Thus, incorporating the standard capital ratio of equity-to-total assets into regulatory regime by the banks' regulator is recommended to ensure its relevance is not overshadowed.

Keywords: risk-based capital, non-risk-based capital, cost-to-income ratio, deposit money banks, Nigeria
JEL Classifications: G21, G32, L25, M41

1. Introduction

Banking business is expected to be run in a way to guarantee a safer return on investment to both shareholders and depositors. The role that capital plays in this regard cannot be overemphasized. The general consensus that brought about the

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Basel Accords – an exercise that has given birth to Basel I, II, and III – with a view to entrenching the financial system's soundness and ensuring sustainable growth and increased profitability remains a global phenomenon. The significance of adequate capitalization and efficient running in the determination of the operating performance of a bank has been stressed (Eldomiaty, Fikri, Mostafa & Amer, 2015; Mills & Schumann, 1985). Capitalization, which comes in the form of capital adequacy, has been an integral part of the instrument used by bank regulators worldwide to regulate banking activities (Hogan, 2015). Bank capital could be either risk-based or non-risk-based. Risk-based capital (RBC) conforms to the requirements of the Basel Accords, and it is aimed at identifying risk banks, but despite this noble objective agreement is yet to be reached on whether RBC ratio has any value-added benefit over standard capital ratio (Hogan, 2015). While the motive behind the regulation of bank capital adequacy – shielding them from unexpected collapse (Abdulkarim, Hassan, Hassan & Mohamad, 2013) – remains sacrosanct, the influence of its accounting measure – risk-based or non-risk-based – is ever controversial (Hogan, 2015).

Evidence from previous research shows that RBC has lately contributed significantly to the financial crisis (Alkadamani, 2015; Dowd, Hutchinson, Ashby, and Hinchliffe, 2011; Friedman, 2011). This has led to the call by experts for the revocation of regulatory RBC in the United States (Hogan, 2015). Further empirical evidence showed that 'non-performing assets coverage ratio' (NPACR) – a non-risk-based capital (NBC) adequacy measure – outperformed RBC ratio in the ability to detect problem banks and predict bank failure (Chernykh & Cole, 2015). Although both RBC and NBC ratios are strongly informative of the financial condition of a bank, RBC is seen as the most effective predictor of banks' financial condition over long-time horizons (Estrella, Park, and Peristiani, 2000). This might suggest that NBC ratio has a greater positive impact on the performance of banks since profitability is a short-term measure of performance. The foregoing empirical results are not in tandem with that of Mathuva (2009), who found that RBC has a significantly positive impact on profitability measures.

Operating efficiency appears to be a reliable driving force of the banks' corporate performance (Eldomiaty et al., 2015). An organization believed to be efficient has the capacity to deliver products and services without sacrificing quality (Allen & Rai, 1996). That is why an efficient banking sector has the wherewithal to absorb unfavourable shocks and improve financial system stability (Odunga, 2016). Broadly, efficiency is an agent that ensures the inevitability of economic changes (Mat-Nor, Mohd Said, and Hisham, 2006), and banks as agents of economic growth (Ongore & Kusa, 2013) are required to be run in a manner to have a positive impact on the nation's overall economic growth (Rozzani & AbdulRahman, 2013). From a regulatory perspective, an insight into operating efficiency and the on-going measurement of banks' overall performance ensure better resource allocation, the

realization of audit objectives, and an understanding of banking operations (Barr, Seiford, and Siems, 1994).

Apart from the fact that studies providing a linkage of bank-operating efficiency and capital adequacy with their profitability failed to have a consensus view (Almazari, 2013; Mathuva, 2009), previous studies, most especially in Nigerian context, have ignored the dichotomy of the impact of RBC and NBC ratios on bank performance (see: Ejoh & Iwara, 2013; Ezike & Oke, 2013; Olanrewaju, 2016). The introduction of leverage ratio as a measure of capital adequacy by Basel III, which is non-risk-based and designed to act as a credible supplementary measure to RBC requirements (Bank for International Settlements–BIS, 2010), appears as a threat to the RBC regime. Based on prior rationale, this study examined the RBC–NBC dichotomy, incorporating measures of operating efficiency, and, indeed, contributed to the capital adequacy and bank performance literature.

The remaining part of this study is structured as follows. Section 2 focuses on the review of related literature, done both conceptually and empirically, as well as on the development of the hypotheses. Section 3 spells out the procedures adopted for data collection and analysis. Section 4 presents and discusses the results of data analysis, while the last section (Section 5) summarizes and concludes the study.

2. Literature Review and Hypothesis Development

This section reviews past studies in capital adequacy and bank performance literature. It navigates from conceptual issues to the empirical reviews and culminates in the hypothesis development.

2.1. Nigerian Banking Sector in Perspective

Although Nigeria is a developing economy, the modern banking system has spanned over a century in her financial system having been in existence more than sixty years before her independence (Oluduro, 2015). Specifically, the present system of banking was launched in Nigeria in the year 1892 when the African Banking Corporation, a South Africa-based bank, opened a branch in Lagos (Igweike, 2005; Oluduro, 2015; Uche, 1997). The era of banking in Nigeria between 1892 and 1951 could be described as the period of free banking (Ikpefan, 2012a; Oluduro, 2015) because the banking activities then were subject to no regulation (Oluduro, 2015). The year 1952 heralded banking regulation with an enactment of a banking ordinance that provided for a system of licensing, minimum capital base, liquidity ratio, maintenance of reserve, and bank supervision and regulation (Ikpefan, 2012a; Igweike, 2005; Obademi & Elumaro,

2014). This was subsequently followed by the enactment of the Central Bank of Nigeria (CBN) Act of 1958 and Banking Act of 1969 (Igweike, 2005). Indeed, the banking era between 1959 and 1969 marked the establishment of the formal money market, capital market, and portfolio management in Nigeria, including the enactment of Company Act in 1968 (Somoye, 2008).

The banking activities in Nigeria are governed by both statutory and regulatory frameworks. Notable among these legal frameworks are: Companies and Allied Matters Act (CAMA) Cap C20 and Banks and Other Financial Institutions Act (BOFIA) Cap B3 – both of Law of Federation of Nigeria (LFN) 2004. The BOFIA spells out the provisions guiding a banking business from establishment to winding-up. The regulators include CBN, Nigeria Deposit Insurance Corporation (NDIC), Securities and Exchange Commission, and Financial Reporting Council of Nigeria. Also guiding the activities of banks in Nigeria are monetary policy circular and prudential guidelines issued from time to time by the CBN.

The journey of the Nigerian banking system from the 1951 banking ordinance to the recapitalization and consolidation regimes between 2004 and 2011 was shaped by a number of significant events (Clementina & Isu, 2013). These events include: Indigenization Policy, Structural Adjustment Programme, universal banking (UB) model, global financial crisis, recapitalization and consolidation reforms, corporate governance reforms, and the adoption of International Financial Reporting Standards – IFRS (Clementina & Isu, 2013; Sanusi, 2012; Somoye, 2008; Yakubu, 2015). Based on the purpose of this study, events concerning capitalization and its attendant influence on the operation of Nigerian banks are cardinal points of focus.

In order to achieve the CBN bank's reform blueprint built around four basic pillars, that is, "enhancing the quality of banks, establishing financial stability, enabling healthy financial sector evolution and ensuring that financial sector contributes to the real economy" (Sanusi, 2010: 3), the bank capital adequacy is never taken with levity (Ikpefan, 2012b). The minimum capital base of Nigerian banks, most especially of the commercial and merchant banks, has been on the increase from the meagre amount in 1958 to a modest value of 10 million naira in 1988, 20 million naira in 1990, 50 million naira in 1996, a huge sum of 1 billion and 2 billion naira at the beginning of the era of the UB model in 2001 and 2002 respectively, and a whopping 25 billion naira in 2005 (Onaolapo, 2008; Somoye, 2008).

The periodic increase in the minimum capital base is not unconnected with the instability in the general price level represented by the consumer price index (CPI) otherwise known as inflation. The increase in capital base to 10 million and 6 million naira for commercial and merchant banks, respectively, in 1988 (Somoye, 2008) could be attributed to the inflation rate which stood at 61.2% in the same year compared to 1% and 9.7% in 1985 and 1987 respectively (CBN, 2014). The rationale for the increase in the minimum capital requirement to 50

million naira in 1996 (Somoye, 2008) cannot be separated from the higher inflation rate which ranged from 23% to 76.8% between 1991 and 1995 from a moderate rate of 3.6% in 1990 (CBN, 2014). Despite that the inflation rate plummeted to an all-time low of 0.2% in 1990, the increase in capital base to an all-time high of 25 billion naira in 2005 is evident from the CPI's skyrocketing increase to 23.8% in 2003. As provided by CBN (2017a), Nigeria was unable to sustain the single-digit CPI maintained between 2013 and 2015, when it rose to an average of 18.55% in 2016. This shows that the upsurge in the minimum capital requirement is to some extent associated with the increase in the inflation rate.

In order to attend to the problems associated with the UB model, where banks concentrate on non-bank financial businesses to the detriment of core banking activities (Sanusi, 2012), the model was reviewed to ensure that attention is shifted to core banking businesses, including commercial and merchant banking. This necessitated a review of minimum capital base because deposit money banks (DMBs) are now allowed to operate commercial banking on a regional, national, or international basis. Thus, with a minimum paid-up capital of 10 billion, 25 billion, or 50 billion naira, commercial banks can be operated with regional, national, or international licensing respectively. These periodic banking reforms, including the recapitalization exercise, have led to the rise and fall in the number of DMBs (Obademi & Elumaro, 2014) from 45 in 1978 to all-time high 112 in 1996 and later to 25 in the year 2005 (Somoye, 2008). As at May 25, 2016, DMBs with commercial banking licence are 21 in number, excluding the merchant and non-interest banks, which are 4 and 1 respectively (CBN, 2016).

To ensure that Nigerian DMBs are safe and sound, the Asset Management Corporation of Nigeria (AMCON) was established in the year 2010 (Sanusi, 2012). This singular effort reduced the banking industry ratio of non-performing loans to gross loans from 34.4% in November 2010 to 4.95% in December 2011 (Sanusi, 2012) because of its acquisition of the industry's toxic assets. All these periodic recapitalization exercises and other reforms have put some of the DMBs on a sound footing with dominance in the West African sub-region.

The banks under the supervision of CBN are not restricted to DMBs; there are other banks categorized as "other financial institutions and specialised banks" (BOFIA 2004, s. 31/2). The DMBs comprise commercial and merchant banks considered as those with core banking activities. The commercial banks consist of banks with conventional commercial and non-interest banking licences (CBN, 2017b). The banking businesses recognized as "other financial institutions and specialised banks include: development financial institutions (DFIs), primary mortgage banks, bureau-de-change, community banks, and discount houses (BOFIA 2004, s. 34/1). Other Financial Institutions which stood at 4,409 out of 4,435 as at the end of the first half of 2017 account for not less than 99% of the Nigerian banking structure (CBN, 2017b), while the remaining proportion

accounts for commercial and merchant banks. Among these banks, only the majority of DMBs have their financial information in the public domain with more than 60% being listed on the Nigerian Stock Exchange (NSE). The number of each type of bank under the supervision of CBN as at the end of June 2017 is presented in *Table 1*. Based on the information depicted in *Table 1*, there are 4,436 players, including CBN, in the Nigerian banking system. It is also evident that that bureau-de-change has the highest number of players – 3,292 (74.23%) – followed by microfinance banks (22.53%) and finance companies (1.74%), while mortgage refinancing companies are the smallest in number, but the Nigerian banking system is dominated by DMBs.

Table 1. *Banks and Other Financial Institutions under the supervision of CBN*

S/N	Bank Type	Number as at 30/06/2017	Percentage
1	Commercial Banks	22	0.50%
2	Merchant Banks	4	0.09%
3	Bureaux-de-change	3,292	74.23%
4	Finance Companies	77	1.74%
5	Microfinance Banks	999	22.53%
6	Development Financial Institutions	6	0.14%
7	Primary Mortgage Banks	34	0.77%
8	Mortgage Refinancing Company	1	0.02%
	TOTAL	**4,435**	**100%**

Source: adapted from CBN Financial Stability Report, June 2017. Items 1 and 2 stand for deposit money banks (DMBs), while items 3–8 belong to Other Financial Institutions and Specialized Banks.

2.2. Capital Adequacy and Bank Performance

In the regulation of banks, an all-encompassing importance is attached to the banks' capital. The strategic importance of capital in bank management cannot be overemphasized (Scannella, 2012). There is evidence in the literature that capital generally accounts for a small percentage of the financial resources of banking institutions, but it plays a crucial role in their long-term financing and solvency position and therefore in public credibility (Barrios & Blanco, 2000). The golden value assigned to banks' capital makes its regulation have an international touch (Scannella, 2012), although compliance is monitored and ensured by central banks of various jurisdictions. Capital plays a dual role of investment function and insurance function in the banking sector, meaning that their long-term investment is covered and stabilizing their economic and financial results becomes easier (Scannella, 2012). It is a known fact that no bank would like to appear undercapitalized because

doing so may amount to risking shareholders' reluctance to contribute to new capital (Rime, 2001). Capital is not only the first but also a very important component of the CAMEL model of banks supervision and regulation. CAMEL is an acronym for five components of bank safety and soundness: capital adequacy, asset quality, management quality, earning ability, and liquidity (Kumar & Sayani, 2015: 2).

Berger, Herring, and Szegö (1995) demonstrated that a decline in the capital ratios of a bank leads to an increase in the expected costs of financial distress, which eventually causes a rise in the probability of insolvency. This might be responsible for the idea of minimum capital requirement. Capital, whether economic, funding, regulatory, or risk (Frost, 2004), is expected to be kept at a level at which absorbing shocks will not be difficult. While regulatory or risk capital is a product of the Basel Accords, which forms the fulcrum of banking regulation worldwide, economic or funding capital is well-known and remains the source of standard capital ratio of shareholders' fund over assets. The RBC ratio is computed as the ratio of total RBC to total risk-weighted assets (RWA) (see: Białas & Solek, 2010; Hogan, 2015; Mayes & Stremmel, 2014). RBC incorporates Tier 1 (basic funds) and Tier 2 (complementary funds) capital – as defined by the Basel Accords – adjusted for items including intangible assets and unrealized gains or losses (Białas & Solek, 2010; BIS, 2010; Hogan, 2015). Tier 1 and Tier 2 capital are jointly referred to as going-concern capital in the Basel Accords standards (BIS, 2010). RWA is the addition of all bank asset categories multiplied by their designated risk weightings (Hogan, 2015) or an aggregate of credit RWA, market RWA, and operational RWA (CBN, 2015). Apart from the ratio of total RBC to total RWA (TRWA), Basel capital standards also require a capital adequacy ratio (CAR) of Tier 1 capital–core capital to total RWA–TWA (BIS, 2010).

Aside from a standard capital ratio of equity over total assets (ETA), other NBC ratios considered relevant in the determination of banks' financial condition include gross revenue ratio (GRR), leverage ratio (LVR), and non-performing assets coverage ratio (NPACR) (see: Chernykh & Cole, 2015; Estrella et al., 2000; Mayes & Stremmel, 2014). GRR is described as the ratio of Tier 1 capital to total interest and non-interest income (Mayes & Stremmel, 2014); it is comparable to TWA except that its denominator is a bank's gross revenue. There is a tendency that gross revenue reflects the riskiness of bank assets better than traditional total assets but not as well as regulatory RWA (Estrella et al., 2000). Although the use of LVR as a measure of bank capital adequacy is not novel as it has been in use in the United States of America (see: Baral, 2005; Estrella et al., 2000); its incorporation into bank capital regulation regime by the Basel Committee on Banking Supervision (BCBS) accentuates its importance (BIS, 2010) in the determination of banks' corporate performance.

The need to constrain the build-up of excessive leverage in the banking sector and reinforce risk-based requirements with a simple, non-risk-based backstop

measure is paramount, most especially during the banking crisis (BIS, 2010). "Leverage allows a financial institution to increase potential gains or losses on a position or investment beyond what would be possible through a direct investment of its own funds" (D'Hulster, 2009: 1). Although leverage is of three types – balance sheet, economic, and embedded (D'Hulster, 2009) –, balance sheet leverage appears most visible and widely adopted (D'Hulster, 2009). LVR is usually measured as the ratio of Tier 1 capital to total adjusted assets (TAA), where TAA is total assets less intangible assets, which include goodwill, software expenses, and deferred tax assets (D'Hulster, 2009). NPACR, proposed by Chernykh and Cole (2015), is also a non-risk-based measure of capital adequacy and has been found to be a good predictor of bank failure. NPACR is defined as the "total equity capital plus loan-loss reserves less non-performing assets, all divided by total assets" (Chernykh & Cole, 2015: 132).

A number of indicators are used to measure bank profitability, but the most prominent of them are return on assets (ROA), return on equity (ROE) (Olson & Zoubi, 2011), and net interest margin (NIM) (see: Alper & Anbar, 2011; Aymen, 2013; Ejoh & Iwara, 2014; Eldomiaty et al., 2015; Odunga, 2016; Tan, 2016). ROA is obtained by dividing Net income by total assets, while ROE is generated from the results of the ratio of Net income to shareholders' fund. NIM is the net interest income, that is, interest received minus interest paid, expressed as a percentage of earning assets, that is, loans plus other earning assets, excluding fixed assets (Eldomiaty et al., 2015). It is a reflection of how successful a bank's investment decisions are relative to its interest expenses and is distinguished from ROA because it focuses on profit earned on interest-generating activities against ROA's focus on profit earned per unit of total assets (Tan, 2016). These three variables have been individually or collectively used in the literature in related studies as dependent variables (see: Almazari, 2013; Mathuva, 2009; Ozili, 2015; Tan, 2016). Thus, they are adopted for this study as measures of bank performance.

Past research findings on the impact of bank capital on bank performance are diverse. While some studies found a positive impact, others reported negative effects. It is also important to state that only a few studies have examined the RBC–NBC dichotomy, and in Nigeria this area is yet to be explored. For Mathuva (2009), who conducted his study for the Kenyan banking environment and examined the RBC–NBC dichotomy, RBC ratio has a significantly positive impact on bank performance. He specifically found significant positive relationship between regulated and risk-based capital adequacy measures of the leverage ratio (LVR) and the ratio of Tier 1 capital to total RWA (TWA) as well as profitability measures of ROA and ROE. He also found standard capital ratio of shareholders' equity to total assets (ETA) to have a significantly negative impact on both measures of profitability. Although Mathuva (2009) found mixed results of the impact of the ratio of total RBC to total RWA (TRWA) with positive and negative impact on ROA and ROE respectively, the study

showcased the relevance of Basel capital standards with LVR and TWA. In a Saudi context, Almazari (2013) could not establish empirically that any of the capital adequacy measures – both RBC and NBC ratios – have a positive relationship with bank profitability as well; capitalized banks were found to have negative returns.

In a study examining the effectiveness of various measures of capital adequacy in predicting bank distress, Mayes and Stremmel (2014) concluded that an NBC and regulatory capital measure of leverage ratio (LVR) explains best a bank's financial condition, with considerable accuracy against another NBC ratio – GRR – and an RBC ratio of TRWA. An earlier study – Estrella et al. (2000) – conducted in the same banking environment with Mayes and Stremmel (2014), that is, in the United States of America, had confirmed the superiority of both GRR and LVR in the same capacity, most especially over short-term horizons as against the TRWA that works more efficiently over long-term horizons. While comparing LVR and GRR, Estrella et al.'s (2000) further evidence specifically revealed that GRR seems to have a higher significance. Hogan (2015) examined the predictive abilities of RBC and NBC ratios of the bank risk using standard deviation of stock returns and Z-score indicator of bank insolvency. He found that both ratios are good predictors of banks' stock returns volatility and z-score, but in comparison ETA is statistically significantly better than TRWA in the prediction of bank stock returns volatility and insolvency, most especially during financial crisis. Using univariate logistic regression, Chernykh and Cole (2015) empirically found his proposed capital adequacy measure (NPACR) to be statistically superior to regulatory capital ratios: TWA, TRWA, and LVR, as well as ETA in triggering prompt corrective actions and predicting bank financial condition. For Azar, Bolbol, and Mouradian (2016), a Lebanese study which used bank-level data between 2003 and 2014, capital adequacy ratio (CAR) measured by TRWA has a significantly positive relationship with bank profitability represented by return on average total assets. Ramlan and Adnan (2016), a Malaysian study, tested only the impact of ETA on ROA and ROE and found a negative impact of ETA on both measures of performance for both Islamic and conventional banks. Ramlan and Adnan's (2016) findings are at variance with the findings of a recent Bangladesh study of Siddiqua et al. (2017), which empirically established a positive relationship between an NBC ratio of ETA and profitability measures of ROA and ROE.

Okafor, Ikechukwu, and Adebimpe (2010), who measured capital adequacy with natural logarithm of shareholders' fund (NBC measure), found with a bank-level data of twenty banks in Nigeria between 2000 and 2003 that bank earnings, as measured by profit after tax (PAT), are driven by capital adequacy and liquidity but with a clause that the effect is more pronounced for weak banks than strong banks. Ejoh and Iwara (2014) tested only the impact of the NBC ratio of ETA among other variables, using the Engle–Granger two-step procedure in co-integration, and found a positive relationship with ROA for Nigerian DMBs

with bank-level data of 1981–2011. As for the Nigerian banking world using bank-level data of systematically important banks (SIBs) between 2006 and 2013, Ozili's (2015) empirical conclusion was that the RBC ratio has a significantly positive impact on bank profitability as measured by ROA and NIM, but the Basel capital regime – a binary variable – provides no significant impact on Nigerian DMBs' corporate performance.

Evidence from the foregoing empirical findings reviewed shows that there are mixed conclusions of the effect of capital adequacy measures on bank performance. Based on this and the fact that capital is an important ingredient in the world of bank regulation, it is hypothesized that:

Hypothesis I

Capital adequacy has a significantly positive impact on Nigerian DMBs' corporate performance.

It is evident that there are different measures of capital adequacy, including NBC, RBC, and regulatory capital ratios, and that each has its place in the literature. Using the foreknowledge of different measures of capital adequacy in the bank, the first hypothesis is divided into the following:

H_{1a}: Ratio of total RBC to total RWA (TRWA) has a significantly positive impact on the Nigerian DMBs' corporate performance.

H_{1b}: Tier 1 capital – core capital – to total RWA (TWA) has a significantly positive impact on the Nigerian DMBs' corporate performance.

H_{1c}: Standard capital ratio of shareholders' fund to total assets (ETA) has a significantly positive impact on the Nigerian DMBs' corporate performance.

H_{1d}: Gross revenue ratio (GRR) has a significantly positive impact on the Nigerian DMBs' corporate performance.

H_{1e}: Leverage ratio (LVR) has a significantly positive impact on the Nigerian DMBs' corporate performance.

2.3. Banks' Operating Efficiency and Corporate Performance

The central factor which prioritizes the need for banks to operate efficiently is to avert failure (Barr et al., 1994). A bank's efficient operation is noticeable in its ability to compete favourably in the market and survive in the long run against all odds (Mat-Nor et al., 2006; Rozzani & Abdul Rahman, 2013). A bank or any other business is said to be efficient if it utilizes the technical facilities and input factors in the optimal way, uses the resources in the best possible way, and produces at an optimal scale (Coelli, Rao, O'Donnell, and Battese, 2005). Efficiency could be measured with a number of indicators, including asset utilization ratio (AU) and cost-to-income ratio (CIR), but the discussion about the productivity and efficiency

in banks is often based on CIR (Burger & Moormann, 2008). CIR symbolizes a relationship between the expenses and operating income of a bank or a measure of cost of running a bank as a percentage of income generated before provisions (Burger & Moormann, 2008; Eldomiaty et al., 2015). The general rule is that a high CIR is synonymous to low productivity and efficiency (Burger & Moormann, 2008), indicating that a decrease in efficiency ratio is a positive sign, while an increase is undesirable (Odunga, 2016). An insight into the past works in this regard appears to be in compliance with the CIR-Profitability golden rule. The findings of a number of previous studies are that CIR has a negative impact on or is negatively related to bank corporate performance (see: Almazari, 2013; Mathuva, 2009; Ozili, 2015; Siddiqua et al., 2017). Based on this, it is hypothesized that:

Hypothesis II

Cost-to-income ratio (CIR) has a significantly negative impact on Nigerian DMBs' corporate performance.

2.4. Other Relevant Variables

There are a number of other relevant variables which have bearing on bank performance. These variables, as obtained from previous studies, include: asset growth (AGR), ratio of assets to liabilities (RAL), debt–equity ratio (DER), and bank size measured by natural logarithm of total assets–LgTA (see: Christian, Moffitt, and Suberly, 2008; Ghosh, Narain, and Sahoo, 2003; Mathuva, 2009; Olson & Zoubi, 2011; Tan, 2016). Others include risk as measured by ratio of risk-weighted assets to total assets (RATA) (Van Roy, 2008), deposit specialization ratio (DPLB) defined as ratio of total deposit to total liabilities (Olson & Zoubi, 2011), and diversification measured by ratio of non-interest income to gross revenue (NIGR) (Tan, 2016). It is also considered appropriate to examine the impact of deposit growth (DGR), bank status (BST), and listing status (LST) on bank corporate performance. Asset growth (AGR) is defined as the difference between current year total assets and previous year total assets scaled by previous year total assets. Like AGR, deposit growth (DGR) is computed as the difference between current year and previous year total deposit scaled by previous year total deposit. Bank status (BST) emphasizes whether a DMB is classified as a systematically important bank (SIB) or not. "1" is assigned if a DMB is classified as SIB; it is otherwise "0". Listing status (LST) is also accorded the same treatment as BST. A DMB listed in other jurisdiction besides Nigeria is assigned "1", otherwise "0". All these variables, labelled "control variables", are adopted for this study. It is expected that AGR, LgTA, DGR, and BST have a positive impact, while DER has a negative impact on bank corporate performance. There is no prior expectation for other control variables.

3. Methodology

Having realized the need to resolve RBC–NBC controversy, this paper examined the impact of a number of measures of capital adequacy and efficiency ratio on Nigerian DMBs' corporate performance. In an attempt to do this, banks' profitability measure is modelled as a function of capital adequacy ratios (CARs) and a number of control variables on the one hand and then as a function of CIR and other control variables on the other hand. This is presented below:

Bank corporate performance (BCF) = f (CARs and other variables),

Bank corporate performance (BCF) = f (CIR and other variables).

BCF is the dependent variable and has three proxies – ROA, ROE, and NIM – as adopted for the study. CAR, as an independent variable, is measured by five indicators: TRWA, TWA, ETA, GRR, and LVR, while CIR, an indicator of efficiency, is another independent variable. Based on the purpose of this study, a multiple regression analysis is considered appropriate in determining the effect of CARs and CIR on bank profitability. It is recognized that all measures of bank performance have the same purpose, while all capital adequacy indicators are close substitutes; therefore, for each model, each of the dependent variables is applied to each of the independent variables alongside all the control variables at a point in time. This translates into six models for each of the dependent variables. Thus, the relevant equations for this study are:

For models using ROA as dependent variable:

$$(1) \quad ROA_{it} = \alpha + \beta_1 CAR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

$$(2) \quad ROA_{it} = \alpha + \beta_1 CIR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

For models using ROE as dependent variable:

$$(3) \quad ROE_{it} = \alpha + \beta_1 CAR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

$$(4) \quad ROE_{it} = \alpha + \beta_1 CIR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

For models using NIM as dependent variable:

$$(5) \quad NIM_{it} = \alpha + \beta_1 CAR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

$$(6) \quad NIM_{it} = \alpha + \beta_1 CIR_{it} + \beta_2 AGR_{it} + \beta_3 RAT_{it} + \beta_4 DER_{it} + \beta_5 LgTA_{it} + \beta_6 RATA_{it} + \beta_7 DGR_{it} + \beta_8 DPLB_{it} + \beta_9 NIGR_{it} + \beta_{10} BST_{it} + \beta_{11} LST_{it} + \in_{it}$$

In the equation with CAR as explanatory variable, CAR represents TRWA, TWA, ETA, GRR, and LVR, each being incorporated at a point in time. Thus, five separate models are derived altogether.

'i' stands for bank 1–15, while 't' represents years 2012–2015.

A description of all the study's variables is presented in *Table 2*.

Data were extracted from annual reports and accounts of Nigerian DMBs between 2012 and 2015. These annual reports were downloaded from the websites of the individual DMBs and the repository of NSE. The period was chosen because it marked the era of regulatory changes in the financial reporting system, most especially the adoption of International Financial Reporting Standards (IFRSs) by Nigerian DMBs. Although there are 26 DMBs licensed to operate in Nigeria, only 15 of them have their financial information in public domain in the sample period. By this, 60 firm-year observations were expected, but, due to missing annual reports of a number of banks, the analysis was carried out with an unbalanced panel data of 57 firm-year observations.

The panel data regression analysis requires a choice between fixed-effects model and random-effects model based on the result of the Hausman test (Gujarati & Porter, 2009). For this study, random-effects model was adopted for all models with ROA and ROE, while a mix of the two approaches was adopted for models with NIM based on the results of Hausman tests. To control for the presence of heteroscedasticity and autocorrelation, cluster robust was added to any model with significant results of both tests. The results of Hausman tests and tests of autocorrelation are included in the results of regression estimates presented in tables 5, 6, and 7.

Table 2. *Description of all variables of the study*

S/N	Variable	Variable Name	Measurement
1	**ROA**	Return on Asset	Net income scaled by total assets
2	**ROE**	Return on Equity	Ratio of Net income to shareholders' fund
3	**NIM**	Net Interest Margin	The net interest income, expressed as a percentage of earning assets
4	**TRWA**	Total risk-based capital ratio	Sum of Tier 1 and Tier 2 capitals scaled by risk-weighted assets
5	**TWA**	Core capital ratio	Tier 1 capital scaled by risk-weighted assets
6	**ETA**	Traditional capital ratio	Ratio of equity over total assets
7	**GRR**	Gross revenue ratio	The ratio of Tier 1 capital to total interest and non-interest income
8	**LVR**	Leverage ratio	The ratio of Tier 1 capital to total adjusted assets

S/N	Variable	Variable Name	Measurement
9	**CIR**	Cost-to-Income ratio	Ratio of operating expenses to operating income
10	**AGR**	Asset Growth	Difference between current year total assets and previous year total assets scaled by previous year total assets
11	**RAT**	Asset-Liability Ratio	Ratio of total assets to total liabilities
12	**DER**	Debt-Equity Ratio	Total debts scaled by Shareholders' funds
13	**LgTA**	Size	Natural Logarithm of Total Assets
14	**RATA**	Risk	Ratio of risk-weighted assets to total assets
15	**DGR**	Deposit Growth	Difference between current year and previous year total deposit scaled by previous year total deposit.
16	**DPLB**	Deposit specialization ratio	Ratio of total deposit to total liabilities
17	**NIGR**	Diversification	Ratio of non-interest income to gross revenue
18	**BST**	Bank Status	"1" is assigned if a DMB is classified as Systematically Important Bank (SIB), otherwise "0"
19	**LST**	Listing Status	DMB listed in other clime besides Nigeria is assigned "1", otherwise "0"

Source: authors' compilation (2017). Items 4–8 represent different measures of Capital Adequacy Ratio (CAR) adopted for the study.

4. Results and Discussion

This section presents the results of descriptive statistics, correlation analysis, and regression analysis. Descriptive statistics provides majorly the mean, standard deviation, and minimum and maximum values of all variables of the study. The correlation matrix is set to determine the extent of multicollinearity among explanatory variables, while regression depicts the impact of each of the explanatory variables on DMBs' performance in Nigeria.

4.1. Descriptive Statistics

Basically, it is observable from *Table 3* that Nigerian DMBs have a positive profitability between the sample periods with an average profit of 1.6% and 4.1% for ROA and ROE, but negative minimum values of -5.6% and -394% should be a source of concern. From a capital adequacy angle, Nigerian DMBs appear to meet the CARs requirements with mean values of 16.8% and 14.3% for TRWA

and TWA respectively. Although CARs (RBC) are as high as 30.5% and 30.3% respectively, the negative minimum value of 21.46% is also a serious regulatory matter. Among all the CARs, it is only ETA that does not have a negative minimum value though is close to zero, that is, 0.5%. Although CIR is as low as 39.8%, a maximum value of 284% is not tenable for a profit-oriented sector like banking. An average CIR of 78% is said to be too high compared to the average CIR in Egypt, a number of Middle East nations, and China with CIR below 50% (Bratton & Garrido, 2016). Deposit specialization ratio (DPLB) and diversification (NIGR) are as high as 81.6% and 24.2%. Regression results will reveal whether this influences positively the performance of Nigerian DMBs within the sample periods. Other summary statistics are as presented in *Table 3*.

Table 3. *Descriptive statistics of all variables in the study*

Variables	Observation	Mean	Std. Dev.	Min.	Max.
ROA	57	0.016	0.016	-0.056	0.053
ROE	57	0.041	0.555	-3.94	0.296
NIM	57	0.058	0.017	0.03	0.115
TRWA	57	0.168	0.094	-0.2146	0.305
TWA	57	0.143	0.09	-0.2146	0.303
ETA	57	0.137	0.039	0.005	0.23
GRR	57	0.777	0.464	-0.74	1.56
LVR	57	0.092	0.061	-0.144	0.18
CIR	57	0.78	0.33	0.398	2.84
AGR	57	0.148	0.143	-0.11	0.6
RAL	57	1.44	1.507	1	11.14
DER	57	9.85	24.52	3.33	191.2
LgTA	57	20.91	0.666	19.32	22.05
RATA	57	0.633	0.111	0.32	0.84
DGR	57	0.124	0.139	-0.17	0.56
DPLB	57	0.816	0.072	0.65	0.95
NIGR	57	0.242	0.065	0.15	0.44
BST	57	0.386	0.491	0	1
LST	57	0.316	0.469	0	1

Source: authors' computation (2017) based on Stata version 14 outputs

4.2. Correlation Matrix

An inference from correlation matrix as depicted in *Table 4* is that there is a high correlation among the independent variables, most especially the CARs. This is suggestive of multicollinearity, but having considered CARs as close substitutes and deciding not to use them concurrently in a model have adequately taken care

of it. Thus, multicollinearity is no more an issue. Another deduction is that high correlation among CARs is indicative of their similar explanatory potentials. This shows that similar explanatory effects on bank performance of TRWA and TWA, GRR and TRWA, GRR and TWA, LVR and TRWA, LVR and TWA, and LVR and GRR are imminent.

Table 4. *Correlation matrix among explanatory variables*

	TRWA	TWA	ETA	GRR	LVR	CIR	AGR	RAL	DER	LGTA	RATA	DGR	DPLB	NIGR	BST	LST
TRWA	1.000															
TWA	0.946	1.000														
ETA	0.348	0.364	1.000													
GRR	0.864	0.931	0.335	1.000												
LVR	0.901	0.959	0.367	0.968	1.000											
CIR	-0.60	-0.62	-0.41	-0.64	-0.69	1.000										
AGR	0.190	0.201	-0.17	0.193	0.182	-0.17	1.000									
RAL	0.055	0.061	0.003	0.109	0.069	-0.04	0.077	1.000								
DER	-0.50	-0.48	-0.53	-0.46	-0.44	0.303	-0.02	-0.04	1.000							
LGTA	0.484	0.543	0.258	0.699	0.618	-0.50	-0.05	0.094	-0.34	1.000						
RATA	-0.11	-0.03	0.016	0.227	0.197	-0.07	-0.03	0.027	-0.10	0.409	1.000					
DGR	0.214	0.232	-0.19	0.147	0.141	-0.06	0.809	0.106	0.061	-0.10	-0.25	1.000				
DPLB	0.223	0.240	-0.21	0.328	0.255	-0.10	0.266	0.122	-0.16	0.340	0.149	0.221	1.000			
NIGR	0.224	0.197	0.108	0.144	0.217	-0.27	0.099	0.137	-0.14	0.094	0.045	0.132	-0.08	1.000		
BST	0.108	0.156	-0.03	0.331	0.246	-0.28	-0.17	0.092	-0.11	0.678	0.361	-0.21	0.258	0.003	1.000	
LST	0.185	0.260	0.099	0.421	0.357	-0.31	0.215	-0.12	-0.10	0.460	0.423	0.154	0.203	0.043	0.547	1.000

Source: authors' computation (2017) based on Stata version 14 outputs

4.3. Regression Results

The results of panel data regression models are presented in tables 5, 6, and 7 based on the dependent variables (one for each) adopted for the study. Regression results with ROA as dependent variable, as contained in *Table 5*, show that all proxies of CARs have significant positive impact on Nigerian DMBs' performance as measured by return on assets. This means that the higher the bank's capital ratio, the higher its profitability when it is measured by ROA, regardless of the measures of CAR (NBC or RBC). While TRWA, TWA, and LVR are significant at 1%, ETA and GRR are significant at 10% and 5% respectively. Most of the control variables do not exhibit any significant effect except for LgTA, DER, NIGR, and BST. LgTA is positively significant at 1%, 5%, and 1% when TRWA, TWA, and ETA, respectively, are independent variables. This shows that the higher the total assets, the higher the bank profitability as measured by ROA. NIGR exhibits an effect similar to LgTA but when TRWA, TWA, GRR, and LVR are independent variables. DER and BST have significant negative impact when CIR is the independent variable. The results obtained from BST show an inverse relationship between being categorized as SIB and increased profitability.

Table 5. *Regression estimates of all models with ROA as a dependent variable*

Var.	Model I	Model II	Model III	Model IV	Model V	Model VI
TRWA	0.0581(3.27)*	.....	.....	.....	.....	.....
TWA	.....	0.0756(3.64)*	.....	.....	.....	.....
ETA	.....	.....	0.2352(1.79)***	.....	.....	.....
GRR	.....	.....	.....	0.0176(2.53)**	.....	.....
LVR	.....	.....	.....	.....	0.1416(4.54)*	.....
CIR	.....	.....	.....	.....	.....	-0.0390(-16.25)*
AGR	0.0249(0.68)	0.0286(0.77)	0.0212(0.76)	0.0257(0.71)	0.026(0.76)	-0.0036(-0.48)
RAL	-0.0002(-0.35)	-0.0003(-0.69)	-0.0005(-0.97)	-0.0006(-1.56)	-0.0004(-1.00)	-0.0003(-1.63)
DER	-0.00(-0.66)	-0.0000(-0.40)	0.0000(0.44)	-0.0000(-0.41)	-6.09e(-0.24)	-0.00003(-2.21)**
LgTA	0.0085(3.19)*	0.007(2.42)**	0.0092(4.2)*	0.0051(1.18)	0.0057(1.46)	0.0026(1.26)
RATA	-0.0104(-0.39)	-0.0086(-0.32)	-0.0116(-0.54)	-0.0183(-0.74)	-0.021(-0.87)	0.0064(0.63)
DGR	-0.0218(-0.43)	-0.0265(-0.52)	-0.0046(-0.14)	-0.0234(-0.46)	-0.022(-0.46)	0.0082(1.01)
DPLB	-0.0144(-0.66)	-0.0172(-0.74)	0.011(0.40)	-0.0197(-0.90)	-0.0187(-0.82)	0.0146(1.43)
NIGR	0.047(2.05)**	0.050(2.12)**	0.0441(1.42)	0.0563(2.30)**	0.0438(1.97)**	0.0078(0.53)
BST	-0.005(-1.34)	-0.0043(-1.30)	-0.0038(-1.01)	-0.0043(-1.34)	-0.0037(-1.18)	-0.0044(-1.83)***
LST	0.0056(0.71)	0.0045(-0.61)	0.0029(0.48)	0.0031(0.47)	0.0032(0.47)	-0.0003(-0.09)
Cons.	-0.165(-2.61)**	-0.1340(-2.05)**	-0.2229(-5.59)*	-0.0900(-0.94)	-0.0982(-1.12)	-0.0234(-0.58)
R^2	0.5981	0.6316	0.5311	0.6464	0.6098	0.7829
Haus.	3.83(0.9746)	3.21(0.9877)	4.04(0.9688)	3.1(0.9893)	4.26(0.9618)	10.65(0.4731)
AutoC	17.66(0.0009)**	46.42(0.0000)**	1.50(0.2406)	15.68(0.0014)**	54.88(0.0000)**	0.249(0.6255)

*Source: authors' computation (2017) based on Stata version 14 outputs. Coefficients and z-values are reported, with z-values in parentheses, where *, **, and *** stand for significance at 1%, 5%, and 10% respectively. Hausman tests (Haus) report chi-square values and tests of autocorrelation (AutoC) report F-values with p-values in parentheses.*

With ROE as a measure of performance (see *Table 6*), all the measures of CAR have positive impact but with only four being significant – TRWA, TWA, ETA, and LVR, all at 5%. Like its effect on ROA, CIR has a significantly negative impact on ROE. DER has a significantly negative influence on ROE, which is in agreement with prior expectation. LgTA and DGR are also positively significant when ETA and CIR, respectively, are the independent variables.

Using NIM as the proxy of bank performance (see *Table 7*), all indicators of CARs exhibit negative influence except ETA, although TWA and LVR are not significant. While the TRWA and GRR are significant at 1% and 10% respectively, ETA is significantly positive at 5%. CIR maintains its negative influence at 1% level of significance. Another significant result is that of NIGR, which exhibits negative influence regardless of the independent variables. This result is regarded as statistically sensible because it is justifiable to say that the higher the ratio of non-interest income to gross revenue, the lower the net-interest-margin (NIM). The BST has a significantly negative impact on NIM when TRWA is the independent variable.

The findings of this study are consistent with the findings of Mathuva (2009) on the impact of TWA and LVR on ROA but in contrary to his findings on ETA and bank performance. They also conform to the works of Ozili (2015) on the relationship between ROA and TRWA but disagree on the effect of TRWA on NIM. Despite using different dependent variables, these findings are also at par with the work of Hogan (2015) on the superiority of ETA. Although different methodologies were applied, these results accord substantially with the findings of Ejoh and Iwara (2014) on the impact of ETA on ROA. On CIR, there is an agreement between the findings of this paper and those of Mathuva (2009), Almazari (2013), Ozili (2015), and Siddiqua et al. (2017).

Table 6. *Regression estimates of all models with ROE as a dependent variable*

Var.	Model I	Model II	Model III	Model IV	Model V	Model VI
TRWA	0.5689(2.22)**	.....	.....	.....	.....	.....
TWA	.....	0.6319(2.09)**	.....	.....	.....	.....
ETA	.....	.....	2.6415(2.24)**	.....	.....	.....
GRR	.....	.....	.....	0.1513(1.64)	.....	.....
LVR	.....	.....	.....	.....	1.2504(2.54)**	.....
CIR	.....	.....	.....	.....	.....	-0.3841(-31.78)*
AGR	0.3331(0.90)	0.3642(0.97)	0.3174(0.89)	0.3324(0.92)	0.3279(0.96)	-0.0584(-1.21)
RAL	-0.0018(-0.30)	-0.0032(-0.57)	-0.0021(-0.47)	-0.0055(-1.04)	-0.0039(-0.68)	-0.0002(-0.02)
DER	-0.0203(-38.43)*	-0.0204(-38.26)*	-0.0209(-16.82)*	-0.0204(-32.09)*	-0.0203(-44.33)*	-0.0205(-218.60)*
LgTA	0.0489(1.56)	0.0406(1.17)	0.0862(4.07)*	0.0251(0.52)	0.0282(0.65)	0.0047(0.19)
RATA	-0.2088(-0.78)	-0.204(-0.79)	-0.3285(-1.22)	-0.2936(-1.08)	-0.3139(-1.17)	-0.0913(-1.32)
DGR	-0.2259(-0.46)	-0.2576(-0.52)	-0.1732(-0.44)	-0.2311(-0.47)	-0.2163(-0.47)	0.1525(1.91)***
DPLB	-0.0522(-0.22)	-0.5556(-0.22)	0.0232(0.09)	-0.1014(-0.43)	-0.1062(-0.42)	-0.0798(-0.74)
NIGR	0.3136(1.08)	0.3491(1.17)	0.3804(1.18)	0.3979(1.24)	0.2797(0.97)	-0.1442(-1.00)
BST	0.0026(0.09)	0.0095(0.37)	-0.0202(-0.74)	0.0059(0.24)	0.0112(0.45)	-0.0135(-0.99)
LST	0.0117(0.26)	0.0023(0.06)	0.0191(0.46)	-0.0069(-0.17)	-0.0046(-0.12)	-0.0088(-0.43)
Cons.	-0.8004(-1.26)	-0.6292(-0.96)	-1.5344(-3.20)*	-0.2408(-0.25)	-0.2646(-0.29)	0.6024(1.19)
R^2	0.9555	0.9616	0.9420	0.9593	0.9564	0.9646
Haus.	2.41(0.9965)	2.74(0.9937)	7.84(0.7280)	2.64(0.9947)	4.31(0.9599)	1.90(0.9988)
AutoC	17.60(0.0009)**	18.73(0.0007)**	2.79(0.1168)	14.79(0.0018)**	112.69(0.0000)**	5.24(0.0382)**

*Source: authors' computation (2017) based on Stata version 14 outputs. Coefficients and z-values are reported, with z-values in parentheses, where *,**, and *** stand for significance at 1%, 5%, and 10% respectively. Hausman tests (Haus) report chi-square values and tests of autocorrelation (AutoC) report F-values with p-values in parentheses.*

Table 7. *Regression estimates of all models with NIM as a dependent variable*

Var.	Model I	Model II	Model III	Model IV	Model V	Model VI
TRWA	-0.0528(-3.18)*	……	……	……	……	……
TWA	……	-0.0251(-0.69)	……	……	……	……
ETA	……	……	0.2358(2.54)**	……	……	……
GRR	……	……	……	-0.0113(-1.94)***	……	……
LVR	……	……	……	……	-0.0371(-0.97)	……
CIR	……	……	……	……	……	-0.0081(-3.40)*
AGR	-0.0092(-0.43)	0.017(0.87)	-0.0095(-0.58)	0.019(0.90)	0.0184(0.87)	-0.0047(-0.28)
RAL	-0.0008(-2.70)*	-0.0005(-1.17)	-0.0008(-1.42)	-0.0002(-0.57)	-0.0005(-1.15)	-0.0006(-2.56)***
DER	-0.0001(-2.73)*	-0.00004(-0.54)	0.0001(2.81)*	-0.0001(-1.04)	-0.00004(-0.54)	0.00001(0.55)
LgTA	0.0010(0.15)	-0.017(-0.93)	-0.0041(-0.56)	-0.0176(-1.02)	-0.0172(-0.95)	-0.0047(-0.57)
RATA	0.0115(0.66)	0.0021(0.10)	0.0190(1.11)	0.0049(0.23)	0.0063(0.31)	0.0160(1.07)
DGR	-0.0090(-0.29)	-0.0455(-1.59)	-0.0033(-0.20)	-0.0479(-1.57)	-0.0477(-1.55)	-0.0185(-0.94)
DPLB	0.0233(0.65)	0.0508(1.12)	0.0263(1.09)	0.0583(1.42)	0.0508(1.22)	0.0335(1.17)
NIGR	-0.0859(-3.19)*	-0.0997(-5.71)*	-0.1169(-3.84)*	-0.1041(-5.46)*	-0.0966(-6.12)*	-0.1071(-4.09)*
BST	-0.0077(-2.25)**	-0.0032(-0.65)	-0.0033(-0.91)	-0.0032(-0.67)	-0.0031(-0.64)	-0.0049(-1.38)
LST	0.0075(1.15)	0.0019(0.34)	0.0048(0.95)	0.0019(0.31)	0.0025(0.44)	0.0054(1.15)
Cons.	0.0459(0.33)	0.4035(1.05)	0.1092(0.72)	0.4151(1.15)	0.4054(1.05)	0.1554(0.89)
R^2	0.4533	0.3349	0.2322	0.3619	0.3344	0.1559
Haus.	11.52(0.4005)	37.31(0.0001)**	2.15(0.9979)	31.52(0.0009)**	50.17(0.0000)**	4.52(0.9920)
AutoC	9.56(0.0080)**	7.51(0.0159)**	11.01(0.0051)**	12.32(0.0035)**	7.82(0.0143)**	8.99(0.0096)**

*Source: authors' computation (2017) based on Stata version 14 outputs. Coefficients and "z" or "t" values are reported, with z/t values in parentheses, where *, **, and *** stand for significance at 1%, 5%, and 10% respectively. Hausman tests (Haus) report chi-square values and tests of autocorrelation (AutoC) report F-values with p-values in parentheses.*

5. Summary and Conclusions

This paper investigated the potential influence of risk-based and non-risk-based measures of capital and CIR on DMBs' performance in Nigeria. Three measures of performance were identified – ROA, ROE, and NIM –, while five measures of capital adequacy were adopted – TRWA, TWA, ETA, GRR, and LVR. CIR was adopted as the indicator of bank operating efficiency. Two of the capital adequacy indicators are risk-based (RBC) (TRWA and TWA), while the remaining are non-risk-based (NBC), but TRWA, TWA, and LVR are regulatory. Six models, one for each, based on all CARs and the CIR were used with particular reference to each measure of performance. This turns out to be eighteen models in all. The data related to the study's variables were extracted from the annual reports and accounts of all commercial banks listed in NSE between 2012 and 2015.

With panel data regression analyses, the findings revealed that all measures of CARs had a significantly positive impact on ROA as a measure of performance. All these measures of capital adequacy also positively influenced ROE, with only TRWA, TWA, ETA, and LVR being significant. Nonetheless, mixed results were obtained with NIM as a measure of performance. While the ETA exhibited a significantly positive impact, others negatively influenced DMBs' performance, with only TRWA and GRR being significant. The findings also complied with the CIR-profitability golden rule by showing a significantly negative effect on all adopted measures of bank performance. These findings have policy implications for the supervision and regulation of DMBs in Nigeria, whereby attention is required in the regulation of non-risk-based capital. The findings further have implications for DMBs–investors relations, whereby additional information will be required in the DMBs' periodic investors' presentations.

Based on these findings, it is concluded that, first, the effect of CAR (RBC or NBC) on bank performance depends on the measure of the performance adopted. It is also observable that RBCs are still much relevant given their effect on ROA and ROE. The results also provide empirical support for the inclusion of leverage ratio in the regulatory regime by Basel III. Although ETA is regarded as archaic, its superiority and much more relevance is manifest given its positive influence on all adopted measures of performance. Since the indicators of bank performance are not restricted to ROA and ROE (see Eldomiaty et al., 2015), there is an urgent need to take cognizance of a measure of CAR with consistent predictive potentials on bank profitability. This conclusion necessitates the need for banks to include the ETA prominently in their investors' presentations in addition to RBC. Also, the investors are advised to pay emphasis on the ETA in their analysis of DMBs' performance. Overall, bank regulators – Central Bank of Nigeria (CBN) – should incorporate ETA into the regulatory regime by fine-tuning it to the banking supervision model to ensure its relevance is not eroded.

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