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The Impact of Bank Regulation on Bank Performance: A Novel Analysis of the Pre-Covid Era with Cross-Country Evidence

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Abstract

Banks play a pivotal role in all economies by bringing balance to the economic flows of surplus and deficit. As a result of this, they are heavily regulated by national and globally accepted regulations such as the Basel III Accord. This research aims to ascertain the impact of the prudential Basel III regulations on the financial performance of selected listed African banks before the advent of Covid-19. The study used the fixed effects and random effect estimator to fit the static panel data established for the study. A panel of 45 listed banks from six African nations were used, covering the period from 2010 to 2019. The study concludes that the adoption of tighter and higher Basel III regulatory requirements has a double-edged-two-face implication on African banks' financial performance. This conclusion is based on the findings that the capital adequacy ratio has a positive effect on the financial performance of African banks while the liquidity and minimum capital requirement have a negative effect.

Keywords

African Nations, Banks, Basel III Accord, Financial Performance, Global Financial Crisis, Panel Data

1. Introduction

As a primary financial intermediary, the banking sector provides liquidity and payment services, converts deposits into loans and manages and monitors investment projects (Banerjee & Mio, 2018). The successful functioning of banks not only supports economic growth but also influences it distribution of the economy's wealth (Bilal & Salim, 2016). However, the 2008 global financial crisis

(GFC) proves that banks are not always financially efficient. Before the GFC, financial service firms, especially in the United States (US), were heavily involved in the real estate bubble and credit boom through off-balance sheet (OBS) activities. The collapse of the banking industry in 2008 quickly spread to the global financial system across the globe.

In addition to the predominant OBS activities (DeYoung & Torna, 2013), ineffective regulation and oversight (Brunnermeier, 2009) in banking industries are possible reasons for the fragile financial system and massive economic upheavals. This also triggered the GFC re-evaluation of official interventions in the financial system (Čihák & Demirgüç-Kunt, 2013). In practice, regulation and supervision define capital standards, set requirements for entry into the banking market and define acceptable ownership structures including business guidelines for banking (Banerjee & Mio, 2018).

Compared to countries in other regions, most countries in Africa have financial systems controlled by central or reserve banks. Financial systems in the African region have undergone deep deregulation and privatisation over the years. After the GFC, African governments from leading African nations made some structural changes and reforms, both in banking systems and in regulatory and supervisory mechanisms. In response to the 2008 GFC, most countries in the African region fully implemented Basel II whilst a few others were in a better position to introduce Basel III Accord regulations (International Monetary Fund, 2010).

According to the Bank for International Settlements (2013), there are three main changes introduced in the Basel III regulatory framework, which justified its reasons for adoption by banks. First, the minimum capital requirement as highlighted in Basel II was amended and increased for banks to maintain a buffer of capital that could be used to absorb losses during periods of financial and economic stress such as the GFC. Second, the leverage requirements were improved to include a non-risk-based leverage ratio for the banks to prevent a banking crisis that could cause a lowered leverage which could result in a downward trend of asset prices and bank capital. Finally, the liquidity requirement was amended to include two new liquidity ratios; the liquidity coverage ratio (LCR), and the net stable funding ratio (NSFR). The LCR requires banks to hold sufficient high-liquid assets that can withstand a 30-day stressed funding scenario as specified by the bank supervisor, and the NSFR requires banks to maintain stable funding above the required amount for one year of extended stress. The NSFR is primarily designed to address liquidity mismatch in banks and to reduce liquidity crises in case of shocks.

Despite the functionalities and effectiveness of the changes made to the Basel Accord, these regulations are associated with extra financial burdens and costs to the banks. Several researchers such as Bilal and Salim (2016), Ahmed, Ahmed, Islam and Ullah (2015), and Parcon-Santos and Bernabe Jr (2012) identified the effects and consequences of Basel III on the performance of banks, especially from developed countries. However, these studies document conflicting and in-

conclusive findings regarding the impact of Basel III on the financial performance of banks.

Chiaramonte and Casu (2017) and Ahmed et al. (2015) argue that the implementation of Basel III regulatory requirements with stricter capital requirements harms bank performance as they invest less to meet minimum capital requirements. This means that when a bank puts more capital aside and does not invest it in the hope of meeting and exceeding the minimum capital target and capital buffer requirements, the subsequent impact will be felt on the bank's earnings. This results in a lower return on capital and limits the availability of funds that can be loaned to businesses.

Bilal and Salim (2016) reported that the initial adoption of Basel III by banks in advanced economies during the five-year implementation period adversely affected bank performance, which in turn affected the country's economy and its gross domestic product (GDP). They argue that strict requirements on a bank's capital base reduce the amount a bank can invest, leading to lower returns and declining profitability.

Also, Banerjee and Mio (2018) conducted a survey of banks in the UK and concluded that the new liquidity requirements under Basel III adversely affected the profitability of UK banks, as the tighter liquidity requirements forced them to shift to low-interest liquid assets with lower returns.

On the contrary, Santos and Elliott (2012) find, using the case of banks in the United States, Europe, and Japan, that the implementation of Basel III did not significantly reduce lending rates or affect the risk behaviour of banks in the regions they study. They further add that despite the strict requirements of Basel III, banks' financial results were not negatively affected, thanks to banks' ability to adapt to regulatory changes within their risk capacity.

Also, Mashamba (2018) conducted similar research on emerging markets and found that the stricter Basel III liquidity standards were less effective in emerging economies because banks in emerging economies already had elevated liquid asset holdings or large liquidity buffers before Basel III came into effect. Hence, Basel III liquidity requirements adoption in emerging markets did not have adverse effects on banks' profitability but rather increased their financial performance. Similarly, Parcon-Santos and Bernabe Jr. (2012) added that the new capital adequacy requirements enhanced the financial stability and profitability of commercial banks in Bangladesh.

This paper investigates the impacts of the Basel III adoption on the financial performance of selected listed African banks. The novelty of the study makes significant contributions to the literature in several ways. Empirical studies on Basel III and bank financial performance are rare in the African literature due to the lack of implementation of Basel III in several African countries. Previous studies have largely examined the impact of Basel I and II on bank financial performance, neglecting the impact of Basel III in preventing events such as the GFC. In addition, several empirical works conducted in the African context have attempted to examine the impact of Basel III excluding the new liquidity regula-

tory framework. This study examined in detail the impact of the liquidity coverage ratio and other Basel III requirements on the financial performance of 45 listed African banks. The study, therefore, provide some innovative perspective on the interrelationships between Basel III and bank financial performance, so that some recommendations can be made on whether to adopt Basel III or what part of the agreement other African states should adopt.

The remaining part of the paper is arranged as follows: Section 2 provides a brief literature review regarding the interrelationship between the Basel III Accord and bank performance and evolution of bank regulation; Section 3 presents the research methodology used in the study; Section 4 discusses the empirical findings; whilst Section 5 concludes the paper.

2. Literature Review

2.1. Empirical Review

A study conducted by De Bandt, Camara, Pessarossi and Rose (2014) analysed the effect of the Basel III capitalisation measures on the performance of banks which was measured by return on equity. Their research focused only on a sample of large French banks before and after the GFC. Their research showed that an increase in the capital base, as recommended by the Basel III framework, results in a proportional increase in the banks' ROE. This positive relationship appears to be a result of the operational efficiency within the large French banks. De Bandt et al. (2014) conclude that the Basel III capital measures have a positive and significant impact on a bank's operational efficiency which consequentially has a positive effect on financial performance. This is because a bank's minimum regulatory capital enables it to generate and maintain sustainable revenue which is achieved at a reduced cost.

Similarly, Lee and Hsieh (2013) in their study of European banks, concluded that well-capitalised banks tend to be more profitable than those that were poorly capitalised. Furthermore, banks with a higher level of capital face lower expected bankruptcy costs for their investors and customers invariably reduce their cost of capital. In other words, well-capitalised banks can have access to funds at a lower cost because they are considered as being less risky (De Bandt et al., 2014; Lee & Hsieh, 2013).

Furthermore, De Bandt et al. (2014) claims that banks which have more capital make stronger monitoring and supervisory efforts. They make better lending decisions than they would do if they were less capitalised, and they can extract higher payments from the borrowers. Monitoring increases the probability that a company repays its loan, which increases the return to the bank. Hence, increasing the capital ratio is consistent with the maximisation of the profits which is in line with the Basel III capital regulatory framework.

In an investigation of how capital affects bank performance after the global financial crises, Berger and Bouwman (2013) found a direct association and considerable impact of capital on bank profitability. They noted that while operating

at an international level, banking regulators demand a high level of capital to ensure that the banks are more capable of taking extra risks associated with global trading. Gropp and Heider (2010) indicate there is a positive connection between the core capital and the earnings of the banks. They assert that more capitalised banks are more profitable because they have sufficient financial resources to invest in high-return investments which generate higher returns for the banks (Gropp & Heider, 2010).

Al-Hares, AbuGhazaleh, and El-Galfy (2013) analysed the financial performance and compliance of the Gulf Cooperation Council (GCC) region with the Basel III capital standard. Their study used bank-level data from 75 banks in Kuwait, the United Arab Emirates, the Kingdom of Saudi Arabia, Oman, Qatar, and Bahrain as their sample study. They used the key financial performance ratio as a measure of the financial performance of the sampled bank. Their findings showed that banks appeared to be largely sufficiently capitalised with Basel III. Thus, the GCC banks are well-financially positioned to absorb higher provisions and impairment charges given the higher capital adequacy ratios reported by most of them.

A direct association between capital levels and bank profit were respectively observed in two separate studies of European commercial banks by Lee and Hsieh (2013) and Lipunga (2014). The findings of these studies showed that capital plays a vital role in the performance of a bank because the banks that have higher capital perform well as compared to undercapitalised ones. Lipunga (2014), further noted that banks are expected to absorb losses from their normal earnings, but due to unforeseen circumstances, there may be some unanticipated losses which cannot be absorbed by normal earnings. The capital buffer premium comes in handy in such abnormal loss situations to cushion the losses. In this way, the capital buffer premium plays an insurance function (Udom & Onyekachi, 2018; Aspal & Nazneen, 2014).

Aspal and Nazneen (2014) further elaborate that adequate capital in banking is a confidence booster. It provides the investors, the depositors, the public and the regulatory authority with confidence in the continued financial viability and stability of the bank. Caggiano and Calice (2011) concur that adequate capital provides confidence to the depositor that his or her money is safe; to the public that the bank will be, or is, in a position to give genuine consideration to their credit and other banking needs both in bad and good times; and to the regulatory authority and the investors that the bank is, or will remain, in continuous existence.

Nguyen (2020) examined the impact of capital adequacy on bank profitability in the context of the Basel III Accord implementation in Vietnam. Bank profitability is measured by return on assets and return on equity. Apart from the capital adequacy, other various potential determinants of profitability were also tested, such as bank-specific variables, (net interest margin, non-performing loans, non-interest income, ownership and regulatory variable which were proxied by the bank's application of Basel III Accords), and macroeconomic in-

dicators (growth rate of gross domestic product, and inflation rate). The study used panel data regression analysis with a sample of 22 Vietnamese commercial banks for the period 2010-2018. Their paper revealed that bank capital adequacy, net interest margin, and non-interest income measures were positively correlated with profitability indicators while non-performing loan indicators and state ownership measures negatively affect bank profitability. The study found that bank capital adequacy has a positive impact on return on assets for small-sized banks meanwhile it has no significant impact on profitability for large-sized banks in Vietnam.

Furthermore, Ajayi, Ajayi, Enimola and Orugun (2019) examined the effect of the capital adequacy ratio on the profitability of Nigeria's Deposit Money Banks (DMBs). They employed the regression analysis on eight banks using their published annual report. Their study reported a strong positive relationship between the capital adequacy ratio and the return on assets of Nigerian banks. Furthermore, Mamoud Abdul (2017) examined the impact of capital adequacy on the performance of Nigeria Banks using the Basel Accord Framework. His study employed the use of an ordinary least square (OLS) estimator to analyse data collected from nine banks in Nigeria with foreign operations. Their findings showed that 76% of the variations in profit after tax (PAT) were caused by independent variables such as total assets (TA), loans and advances (LA), customer deposits (CD) and owners' capital (OC). This suggests that the level of bank performance was largely influenced by their capital adequacy proxies. The study, thus, recommended that banks' regulators should focus also on other methods to maintain financial strength and stability amongst Nigerian banks, such as supervisory review and market discipline.

Similarly, Mwai, Jagongo and Fredrick (2017) evaluated the relationship between Basel III capital requirements and financial performance of commercial banks in Kenya, they adopted descriptive and inferential research techniques of correlations and regression analysis to analyse the relationship between the variables. Their study used secondary data with a target population of 45 banks in Kenya. The findings of their study showed that capital requirements had positive linear relationship with financial performance of commercial banks in Kenya. They recommended that CBK should strengthen the capital requirements for commercial banks even more to ensure optimal performance and industry growth.

Ugwuanyi and Ewah (2015) investigated whether Basel III capital requirement as a regulatory tool in Nigeria enhanced bank performance. The findings of their study similarly showed that an improved capital base had a positive impact on banks performance. Similarly, Ikpefan (2015) and Ejoh and Iwara (2014) assessed the impact of capital adequacy on large commercial banks in Nigerian and found that capital adequacy played an important role in explaining bank returns on assets (ROA), which is a measure of bank performance among other performance variables.

Ayaydin and Karakaya (2014) conducted a similar study on Turkish commercial banks, investigating the impact of regulatory capital on a bank's profitability and risk. The study found that there was a positive relationship between capital and profitability. Furthermore, Raman (2015) analysed the impact of the minimum capital requirements on the performance of commercial banks in Zimbabwe. Their findings showed that there was a significant and positive relationship between commercial banks capitalisation and its performance.

On the contrary, some studies did not find a positive and significant impact of the Basel III regulatory framework on the performance of banks. Andaiyani, Hidayat, Djambak and Hamidi (2021) investigated the impact of Basel III buffer capital premium on the regional development of bank profitability in Sumatra and Indonesia. Their study employed a time series of major regional development banks in Indonesia, and the methodology used in this study was a panel dynamic model using the Generalized Method of Moment (GMM) techniques. The findings of their study showed that capital accumulation or increase through the implementation of the Basel III countercyclical capital buffer policy did not have a significant positive impact on the profitability of the regional development banks in Sumatra and Indonesia.

Guidara, Soumaré, and Tchana (2013) conducted a study using Canadian banks and concluded that there was no strong evidence that Basel III capital requirements positively impacted the return on equity which is a measure of performance. Moreover, Goddard, Liu, Molyneux, and Wilson (2010) concluded that a negative relationship existed between capital regulation and performance in the banking of European Union member countries. Similarly, Taskinsoy (2013) conducted a study on the possible impact of Basel III on the financial performance of Turkish banks. He argues that the Basel III capital requirement had no significant impact on the financial sector of Turkey even though they maintained a very high CAR of 16%.

Furthermore, Lee and Chih (2013) found that the capital adequacy ratio was relevant for small banks but irrelevant for large banks with market power in the Asian market. Similarly, the study of Kosmidou and Zopounidis (2008) on European banks found that regulatory requirements had a negative impact on the return on equity and the return on assets of banks. Moreover, Onaolapo and Olufemi (2012) examined the effect of capital adequacy on the profitability of the Nigerian banking sector using OLS estimation. Their findings revealed that the capital adequacy framework did not have any significant impact on the performance of the Nigerian banking sector.

Nguyen (2020), Ajayi et al. (2019), Mamoud Abdul (2017), Mwai et al. (2017), Udom and Eze (2018), Ikpefan (2015), Ayaydin and Karakaya (2014), De Bandt et al. (2014), Lipunga (2014) and Lee and Hsieh (2013) concur that the Basel III capital requirements have a positive impact on the performance of banks, whilst Andaiyani et al. (2021), Guidara et al. (2013), Taskinsoy (2013), Lee and Chih (2013), Onaolapo and Olufemi (2012) and Kosmidou and Zopounidis (2008) ob-

serve that the Basel III capital requirements harm the performance of the banks.

2.2. Overview of Banking Regulation in the Selected African Countries

The regulation of banks in South Africa, Nigeria, Kenya Malawi, Uganda, and Tanzania has evolved since the GFC. South African government adopted the global macro-prudential guidelines of the Basel III Accord as the pacesetter and first adopter in Africa. They adopted the Basel III Accord in line with the South African Banking laws (SARB, 2013). The South African financial system made some structural adjustments to accommodate the Basel III new global liquidity requirement, such as the amendment to regulation 28 of the bank's regulations to the Pension Fund Act 1956 which allows banks access to more long-term financing (SARB, 2013). Also, the Act specifies that any bank that fails to comply with section 70 (minimum share capital and unimpaired reserve funds) or section 72 (minimum liquid assets), must report reasons for her inability or failure to comply (SARB, 2013), as non-compliance attracts a penalty deemed fit by the regulator.

Nigeria on the one hand adopts the Basel III framework through its central bank. The Central Bank of Nigeria (CBN) issued a circular to all the commercial banks to implement the Basel III Accord with the main focus on regulatory capital, leverage ratio, liquidity monitory tools, large exposures, liquidity risk management and internal liquidity adequacy assessment process (CBN, 2011). These processes were implemented in phases, unlike the South African swift implementation of Basel III, the CBN run Basel III concurrently with the Basel II already in place until it fully gained ground.

Kenya on the other hand, adopted the Basel III Accord to strengthen the regulation and stabilisation of its financial system. The CBK adopted the Basel III Accord on capital adequacy and liquidity management standards (IMF, 2010). According to Kenyan Bank Act, its prudential guidelines on capital adequacy require 1billion KES and 200 million KES as a minimum core capital for mortgage finance companies and KES200 million for financial institutions (CBK, 2010). Kenya's compliance with the Basel III core principles has significantly increased over time with its key driver being the CBK.

Also, Uganda adopted the Basel III Accord in alignment with its BoU mission, which is to foster price stability and a sound financial system within its economy (IMF, 2010). BoU played a pivotal role in the implementation of the Basel III Accord by formulating the macro-prudential policies aimed at mitigating systemic risks to the Ugandan financial system and ensuring financial sector surveillance to identify systemic risks, performing stress tests for plausible shocks and disruption in the financial system (BoU, 2013). These are put in place mainly to enhance the efficiency of the financial market within Uganda. BoU was the first regulator in East Africa to comprehensively adopt the Basel III guidelines on capital conservation (BoU, 2013).

Furthermore, Malawi through its reserve bank ensures financial stability in the country by issuing guidelines and regulations for banks and supervises full compliance by commercial banks. The RBM ensured full compliance with Basel III even though the implementation is a voluntary requirement for banks (Reserve Bank of Malawi, 2012). By doing so, they monitored how banks manage their businesses and capital to survive a recession or market disruption while meeting minimum regulatory standards. The Malawian financial service Act 44 (5) also specifies capital adequacy for banks with the following objectives: to ensure that banks have an adequate cushion of capital to absorb losses; to protect the stake and interest of depositors, creditors and the general public; to ensure that banks maintain internationally recognised prudent capital requirements; and to promote self-discipline in the management of banks. Also, the capital requirement for Malawi banks as specified in their financial service Act (2018) indicates that a bank shall maintain a minimum core capital of Malawi Kwacha equivalent of five million United States Dollars (USD 5,000,000.00) or such higher amount as the registrar may determine and for transactional capital computation purpose.

More so, Tanzania through its reserve bank ensures that banks and financial institutions maintain a level of capital adequate to protect them against the risk of loss that may arise from their business activities (BOT, 2010). The Bank of Tanzania has continued to implement prudential measures to strengthen risk management practices in the financial sector and to direct banks with high non – performing loans to formulate and implement some strategies to bring the capital ratio to at most 5%. Also, financial institutions licensed by the BOT are required to hold a capital conservation buffer of 2.5% above the minimum ratio to enable them to withstand future periods of financial distress (IMF, 2010).

In sum, the impact of banking regulation on the performance of banks globally cannot be overemphasised. This section has elaborately discussed the evolution of banking regulation in South Africa, Nigeria, Kenya Malawi, Uganda, and Tanzania and the adoption of the Basel III Accord in the six nations. More so, the empirical evidence documented in this section has shown that in some countries and context the adopted banking regulations positively impacts banks' profitability whilst in others, banking regulations impair their profitability, leaving this pointer discourse largely inconclusive.

3. Methodology

3.1. Data Sources

The bank-level financial data used in this study comprised audited financial statements of individual banks obtained from the IRESS database. The IRESS database is a comprehensive and reliable database that contains detailed financial information for public and private global banks and is used by more than 500,000 users globally. Many countries in Africa are yet to adopt the Basel III regulatory Accord. However, leading African nations such as South Africa, Nigeria, Kenya, Tanzania, Uganda, and Malawi have adopted it (Financial Stability

Institute, 2009). The adoption of Basel III regulatory requirements by the above leading African nations therefore justifiably influences the purposive selection of the study sample.This sample consisted of 45 listed banks from South Africa, Nigeria, Kenya, Tanzania, Uganda and Malawi, covering the period from 2010 post-GFC to 2019. The summarised definitions of variables are shown in Appendix A **Table A1**. The financial performance of a bank is predominantly measured by its profitability and returns to its stakeholders. Previous studies such as those of Gungoraydinoglu and Oztekin (2011) and Kayo and Kimura (2011) measured bank financial performance using return on equity (ROE) and return on assets (ROA). The ROE is an indication of the profit generated by the bank with the money invested by the shareholders, and the ROA indicates how efficiently management uses the assets to generate earnings. This study used the return on equity and return on assets as measures of financial performance.

Following the Basel III regulatory requirement (BCBS, 2013), this study used the multi-level components of the Basel III Accord namely the minimum capital requirement (MCR), capital adequacy ratio (CAR), capital buffer premium (CBP) and liquidity requirements (LCR) as the main factor determining the financial performance of African banks.

3.2. Financial Performance Estimation: Panel Data Approach

This research adopted the panel data methodology used in a similar study of Obadire (2022). Panel data methodology collects observations of a cross-section of subjects over a period, whereby each variable is studied repeatedly over a period of time. This methodology allows for an increase in the amount of data, as it combines cross-sectional and time-series data. This increases the degrees of freedom and reduces the collinearity between the explanatory variables, leading to more efficient econometric estimation. This methodology also allows the researcher to analyse various econometric problems that cannot be accurately studied using only longitudinal or time series methods (Obadire, 2022).

The main advantage of this methodology is that it improves the efficiency of the data set estimation and widens the range of conclusions, it is more informative than pure time series or cross-sectional data analysis, so it is suitable for detecting the dynamics of changes, and it also allows the use of various appropriate estimators, which can be categorised into static and dynamic data estimates.

The study adopted the static panel data model to test the relationship between the Basel III Accord and bank financial performance. The static panel data model is suitable over the dynamic panel data model in this instance because the present value of bank performance is not affected by its previous year's values.

Though a model is not without its limitation, the major drawbacks of the panel data model are heterogeneity, sample selectivity biases, and short time-series dimension problems (Malik & Rafique, 2013). The researcher, therefore, conducted various tests to verify the presence or absence of multicollinearity, heteroscedasticity and cross-sectional independence. In the presence of any of the

panel data model errors, it is necessary to introduce corrective measures such as differencing the data set in order not to compromise the reliability of the results.

There are some estimators used in constructing a static panel data model, such as pooled ordinary least squares (OLS), fixed effect (FE), and random effect (RE) (Francis & Osbome, 2012; Lee & Hsieh, 2013). The pooled OLS estimator, on the one hand, uses a constant intercept across all cross-sectional units and assumes the same slope and intercepts for all observations (Melese, 2015; Torres-Reyna, 2007). Thus, the estimator suffers from the problem of unobserved heterogeneity between units of analysis. However, this problem can be easily solved by differentiating the dataset. FE estimation, on the other hand, assumes that the sample is not random and the variables have constant slopes but different intercepts in the cross-section and can handle unbalanced panel data. The main problem with the FE estimator is that of time-constant heterogeneity, which can be overcome by introducing dummy variables, usually referred to as least squares dummy variable (LSDV) estimators (Arellano & Bover, 1995). The RE estimator is used to address the assumption that the error term follows classical assumptions so that individual differences in the variable intercepts are captured by the error term. The main advantage of the RE estimator is that it preserves both observed individual heterogeneity and n-degrees of freedom in the regression model, whereas FE estimators' decay and lose individual heterogeneity and n-degrees of freedom (Yimer, 2016; Dougherty, 2006).

F-test, Hausman-Wu, and Breusch and Pagan tests were performed to select the appropriate estimator among pooled OLS, FE, and RE to fit the static model equation. These models, estimates, and statistical tests were implemented in STATA 15 econometric software. Taking into account the adopted methodology, the following models were proposed to test the relationship between the Basel III regulatory requirements and African banks' financial performance.

$$\mathrm{ROE}_{ijt} = \beta_0 + \beta_1 \mathrm{MCR}_{ijt} + \beta_2 \mathrm{CAR}_{ijt} + \beta_3 \mathrm{CBP}_{ijt} + \beta_4 \mathrm{LR}_{ijt} + \beta_5 \mathrm{LCR}_{ijt} + \varepsilon_{ijt} \quad (1)$$

$$\mathrm{ROA}_{ijt} = \beta_0 + \beta_1 \mathrm{MCR}_{ijt} + \beta_2 \mathrm{CAR}_{ijt} + \beta_3 \mathrm{CBP}_{ijt} + \beta_4 \mathrm{LR}_{ijt} + \beta_5 \mathrm{LCR}_{ijt} + \varepsilon_{ijt} \quad (2)$$

In the above model Equations (1) and (2), β_0 represents the intercept/slope parameters, while $\beta_{1\text{-}5}$ represents the coefficient of the variables and ε_{ijt} represents the error term.

On the one hand, model Equation (1) is aimed at testing the extent to which the financial performance of banks, which is represented by the ratio of profit after taxes to equity (ROE), was affected by the Basel III regulatory requirements. On the other hand, model Equation (2) aimed at testing the extent to which the financial performance of banks, which is represented by the ratio of profit after taxes to total assets (ROA), was affected by the Basel III regulatory requirements. To fully understand the abbreviations and acronyms used in the model equations, see Appendix A **Table A1**.

4. Discussion of Empirical Findings

To carry out the data analysis in this study, static panel data and econometric

methodology using STATA 15 were employed. The descriptive statistics and normality tests of the data used were presented in Table 1.

Table 1 presents the summary statistics for the dependent and independent panel data variables. The panel data variables were constructed from the data drawn from the annual financial statements which were obtained from the IRESS database. To eliminate outlier observations and the most extremely misreported data, all variables were winsorised to the 99th percentile. The dependent variable is defined as ROE which denotes the ratio of profit after tax to equity and ROA which denotes the ratio of profit after tax to total assets. The independent Basel III Accord variables in the Table are defined as follows: MCR denotes the minimum capital requirement; CAR denotes the capital adequacy ratio; CBP denotes the capital buffer premium, and LCR denotes the liquidity coverage ratio. All the variables are well defined in Appendix A Table A1.

From the observation of descriptive statistics and normality test results, it can be concluded that MCR, CAR, CBP and LCR of African banks are on average 13.59%, 29.37%, 15.78% and 181.72% respectively. First, the higher MCR means that African banks maintain Tier 1 and Tier 2 capital of 13.59% on average, which is more than the minimum capital requirements set out in the Basel III Enhanced Capital Regulatory Framework (BIS, 2013). Second, the higher CAR indicates that African banks are maintaining their capital adequacy ratio well above the 8% CET 1 ratio and Tier 1 capital ratio prescribed by Basel III. Moreover, a comparison of CAR and MCR shows that African banks held higher protective capital overall. Finally, a high LCR means that in the period under review, African banks held liquid assets above the LCR threshold to withstand liquidity pressure. This reduces the chances of a future banking crisis and the associated losses in economic performance in the short term.

In addition, the minimum capital requirement, capital adequacy, capital buffer premium and liquidity coverage ratio are variables that have little to do with volatility, as their standard deviations are smaller than their means, suggesting some level of stableness.

Table 1. Summary statistics and normality test results of the variables.

Variables	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
ROE	0.1934	0.2135	0.0033	3.9432	0.1286	2.1687
ROA	0.0279	0.0185	0.0004	0.1793	0.0284	0.2153
MCR	0.1359	0.0620	0.0628	0.2090	0.0054	0.0204
CAR	0.2937	0.1851	0.1056	0.4818	0.0156	0.0518
CBP	0.1578	0.1231	0.0428	0.2728	0.0950	6.0737
LCR	1.8172	1.1984	0.7053	2.6991	0.0251	0.1170
No of Obs.	450					

Source: Authors Compilation (2022).

Also, the mean value of ROE and ROA is 19.34% and 2.79% respectively. This suggests that on average, the financial performance of African banks was not as high as compared to other well-established banks from the developed Nations (De Bandt et al., 2014; Lee & Hsieh, 2013). In addition, looking at the descriptive statistics in Table 1, the study found that there was little or no difference in mean and median for most variables. This is likely because the study only used data available after the GFC, as well as the dataset only covers African countries that share similar stages and levels of economic development.

In addition, the skewness normality test of data integrity shows that all variables are uniformly distributed with skewness coefficients close to zero. All variables are right-skewed, which means that the variables are asymmetrically distributed, where the mean, median, and mode do not occur at a regular frequency or at the same point (Obadire, Moyo, & Munzhelele, 2022). The kurtosis coefficients for most variables also have values less than 3, indicating that there is no positive excess kurtosis following a light-tailed distribution known as a platykurtic distribution. An exception to this general light distribution is the capital buffer premium with a kurtosis coefficient of 6.0737, which follows the heavy distribution, thus exhibiting one of the important characteristics of financial and economic panel data, namely leptokurtosis (Obadire, 2018). Thus, the study transformed the capital reserve premium variable by differencing it to the 1st order level to remove any presence of unit root in the data, making it suitable for a panel data regression model.

In addition to differencing the dataset, the study conducted a multicollinearity test on the adjusted stationary variables and found no multicollinearity in the predictor variables which could lead to a wrong understanding of the coefficient's statistical significance. The test was done by calculating the variance inflation factors (VIF) for the variables in the model equation. The VIF test result was reported in Table 2.

Table 2 presents the results of the multicollinearity test for the bank financial performance model. The test was done by calculating the variance inflation factors for the variables in the bank stability model equation. The variable definition follows the same as presented in Table 1 and Table 2 for the exception of

Table 2. Multicollinearity test results for the Z-score model.

Variables	ROE		ROA	
	VIF	1/VIF	VIF	1/VIF
MCR	2.85	0.3507	2.85	0.3507
LCR	1.91	0.5222	1.91	0.5222
CAR	1.56	0.6393	1.56	0.6393
DCBP	1.03	0.9737	1.03	0.9737
Mean VIF	**1.84**		**1.84**	

Source: Authors Compilation (2022).

the DCBP which denotes thecapital buffer premium differenced on the 1st order level.

The VIF for the relationship between the independent and dependent variables as shown in Table 2 is less than 10 with a mean VIF of 1.84. This is evident that there is no existence of multicollinearity in the independent variables associated with the regression models.

Choosing a suitable estimator was done after calculating the F-test, Breusch and Pagan test and the Hausman specification test. The F-test is used to determine the existence of fixed effects in a regression model. If the H_0 is rejected and the P-value is statistically significant, then the FE model is suitable. The Breusch and Pagan test is used to determine the existence of random effects in a regression model. If the H_0 is rejected and the P-value is statistically significant, then the RE model is suitable. However, in a situation where there are no fixed or random effects in a regression model, that is, whereby the P-value of both tests is statistically insignificant, the pooled OLS model is favoured.

Furthermore, peradventure there are fixed and random effects in a regression model. That is, in a situation where the P-value of both tests is statistically significant, the Hausman specification test is used to select the most suitable estimator between the FE and RE. A fixed effects model is chosen if the H_0 of the Hausman test is rejected, that is, when the p-values of the Hausman tests are statistically significant and vice versa.

The findings of this study further show that with regard to the ROE and ROA financial performance models, the results for the F-test and Breusch and Pagan test were statistically significant. This suggests that the fixed and random effects for both ROE and ROA financial specification models exist. Hence, the Pooled OLS estimate was dropped and the Hausman specification test was used to arrive at a suitable estimator between FE and RE.

The p-values of the Hausman specification tests are statistically significant for the ROE financial performance model. Therefore, the null hypothesis was rejected in favour of the fixed effects estimator. On the other hand, the p-values of the Hausman specification tests are statistically insignificant for the ROA financial performance model, which suggests that the null hypothesis was not rejected in favour of the fixed effects estimator. Hence, the fixed effects estimator was favoured and used to report the results for the ROE financial performance model whilst the random effects estimator was favoured and used to report the results for the ROA financial performance model.

Table 3 shows the regression results of the financial performance model. The Table shows the estimation results for the relationship between the financial performance of African banks and the Basel III regulatory requirements. All the coefficients were estimated at 99% confidence level. The financial performance was measured by both the ROE and ROA. The independent variable MCR denotes the minimum capital requirement; CAR denotes the capital adequacy ratio; DCBP denotes the capital buffer premium differenced on the 1st order level;

Table 3. Static panel regression result for the financial performance regression model.

Variables	Random Effects Model	Fixed Effects Model
	ROA	ROE
MCR	−0.0011 (−0.05)	−1.1056*** (−2.83)
CAR	0.0109 (1.17)	0.4288** (1.84)
DCBP	0.0139 (0.78)	−0.4258 (1.38)
LCR	−0.0016* (−1.81)	0.0007 (0.05)
Obs.	450	450
Adjusted R^2	0.2180	0.3130
F statistics		1.51**
BP L-M statistics	357.39***	
Hausman Test:		
Chi^2-value	4.45	10.83**
Prob > chi^2	0.4860	0.0548

Source: Authors Compilation (2022).

and LCR denotes the liquidity coverage ratio. The t-statistics for the FE models as well as the z-statistics for the RE model are presented in parentheses. The markings ***, **, and * indicate significance levels at 1%, 5% and 10% respectively. All the variables are defined in Appendix A. The static panel data estimate test results are shown at the bottom of the Table.

The static panel data regression results of the ROA and ROE models are presented in Table 3. Based on the preliminary diagnostic tests and the selection criteria previously enunciated, the ROA model was fitted with the RE estimator and the ROE model was fitted with the FE estimator.

On the one hand, Table 3 shows that there is a significant relationship between capital adequacy ratios and the financial performance of African banks. This is evident from the FE estimation results of the ROE measure of financial performance. The coefficient for the CAR variable is positive and significant at the 5% level for the ROE measure of financial performance. This suggests that an increase in the capital adequacy ratio resulted in a consequential increase in the profitability of African banks.

Previous studies such as Nguyen (2020), Ajayi et al. (2019), Mwai et al. (2017) and Lipunga (2014) suggest that an increased and stricter capital requirement promotes the financial performance of the banks (BCBS, 2010). Similarly, an increased CAR gives African banks some level of confidence, as the CAR serves as a cushion against economic and financial shocks. Hence, banks can carry out

their lending operations smoothly and confidently undertake profitable and high-yielding investments, which invariably lead to an increase in the profitability of a bank and its return to the shareholders. This argument is consistent with the findings of De Bandt et al. (2014), who assert that an increase in the capital base as recommended by the Basel III framework results in a proportionate increase in the French banks' ROE. They opine that the positive relationship appears to be as a result of the operational efficiency within the large French banks with a high capital base; which can generate and maintain sustainable revenue which is achieved at a reduced cost. Similarly, Lee and Hsieh (2013) argued in their study of European banks that banks which have more capital make stronger monitoring and supervisory efforts. They make better lending decisions than they would do if they were less capitalised, and they can extract higher payments from the borrowers. This increases the profitability of a bank and its return to the shareholders. Hence, a bank increasing its capital ratio is consistent with the maximisation of the profits which is in line with the Basel III capital regulatory framework.

A further analysis of past studies from the Asian and European banks shows that there is a positive connection between the core capital held and the earnings of the banks. They assert that more capitalised banks are more profitable because they have sufficient financial resources to invest in high return investments which generate higher returns for the banks (Nguyen, 2020; Lipunga, 2014; Aspal & Nazneen, 2014; Berger & Bouwman, 2013; Gropp & Heider, 2010).

On the other hand, the results shown in **Table 3** depicts that there is a significant negative relationship between the LCR and ROA and the MCR and ROE. This result is argued on the premise that as African banks subscribed to the tighter and higher regulatory liquidity and capital requirements proposed by the Basel III Accord, this put a strain on African bank operational activities as they focused on meeting the minimum liquidity and capital requirements. This consequentially restricts the bank's ability to lend and engage in profitable investment activities, which invariably severe their financial performance. This is in line with studies such as those of Andaiyani et al. (2021) on Asian banks, Guidara et al. (2013) on Canadian banks and Goddard et al. (2010) on some European union member countries argued that there is a negative relationship between the Basel III higher regulatory requirements and bank financial performance.

5. Conclusion

The current paper aimed to investigate the impacts of the Basel III adoption on the financial performance of selected listed African banks pre-covid era. The findings were summarised as follows. On the one hand, the findings show that the capital adequacy ratio has a positive effect on African banks' financial performance. This implies that the higher the CAR, the higher the financial performance of the understudied banks. This finding is predicated on the premise

that highly capitalised banks are more profitable because they have sufficient financial resources to invest in high-value investments which generate higher returns for the banks.

On the other hand, the study reveals that the liquidity coverage ratio and minimum capital requirements have a negative effect on the financial performance of African banks. This is predicated on the premise that the tighter liquidity and capital requirements put a strain on African bank operational activities as they focused on meeting the liquidity and capital requirements which consequentially severe their financial performance. Hence, based on the contrasting pieces of evidence from the study findings, the adoption of tighter and higher Basel III regulatory requirements has a double-edged, two-face implication on African banks' financial performance. This study, thus, provides relevant information, guide and serve as a recommendation for factors to consider by African bank regulators and CEOs in making informed decisions regarding the improvement of their financial performance.

The study, however, has some limitations that conditioned the research. The first limitation is the small dimension of the sample which consisted of only 45 listed banks. This is because the study focused only on the African countries that have adopted the Basel III regulatory framework. Future studies can use a larger sample size with the expectation that other African countries would have adopted the Basel III regulatory requirements by then. Lastly, the study is limited to some Basel III regulatory requirements such as the minimum capital requirements, capital adequacy ratio, capital buffer premium, and liquidity coverage ratio. These requirements have been largely adopted within the context of African banks. It is recommended that future studies should test the significance of other revised sections of the Basel III regulatory requirements such as the minimum haircut floors for security financing transactions, standardised credit risk mitigation approach, credit valuation adjustment framework, securitisation of non-performing loans, and models to counterparty credit risk amongst many others, provided they are adopted within the African context, as they might prove yet important. The current study could not consider these revised sections because they are recent amendments mostly made to take effect from the year 2023.

Authors Contribution

All authors contributed equally to the conception and design of the study

Transparency

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained

Ethical Statement

This study followed all ethical practices and is fully the professional opinions of

the authors and not of their affiliations.

Competing Interests

The authors declare that there is no competing interest.

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Appendix A

Table A1. Definition of the dependent and independent variables.

S/N	Variables	Acronym	Variable Measurement
	Dependent Variables		
1	Financial Performance	FP	ROE = ratio of profit after taxes to equity; ROA = ratio of profit after taxes to total assets.
	Basel III regulatory requirements: Independent Variables		
2	Minimum Capital Requirement	MCR	Minimum ratio of Tier 1 + Tier 2
3	Capital Adequacy Ratio	CAR	Tier 1 + Tier 2/Risk Weighted Asset
4	Capital Buffer Premium	CBP	Actual capital (core capital plus supplementary capital) less minimum regulatory capital.
5	Liquidity Requirements	LCR	HQLA/ENCO

Source: Authors compilation (2022).