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An Empirical Analysis of the Dynamics Influencing Bank Capital Structure in Africa

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Abstract: Financial institutions, particularly banks, have long grappled with the dilemma of structuring their capital optimally. This process, commonly referred to as capital structure decision-making, is of paramount importance, especially within the financial services sector, where strict regulations are imposed by reserve and central banks in alignment with global Basel guidelines. This study unveils the key factors that determine the capital structure choices of African banks, using panel data encompassing 45 listed banks across six nations that had embraced the Basel III Accord spanning the years 2010 to 2019. The study used the system-generalised moment methods (sys-GMM) estimator to fit the formulated panel data regression model. The study findings showed positive associations between ZSCORE, an indicator of bank financial stability, and net interest margin ratio (NIMR) with bank leverage (TCTE). In addition, the results revealed positive correlations between earnings volatility (EV), profitability (P), and risk (R) with bank leverage (TDCE). This suggests that profitable banks are inclined to favour debt financing, a phenomenon driven by their ability to comfortably service debt obligations with free cash flows. This study's overarching conclusion underscores the dominant influence of the Liquidity Coverage Ratio (LCR) on African bank capital structures. Whether assessing traditional or Basel III-prescribed measures of bank leverage, LCR consistently emerged as the primary determinant. This finding is of significant relevance to bank executives and regulators, offering them essential insights for informed decision-making by considering striking a balance between equity and debt financing based on financial stability, profitability, and risk profiles.

Keywords: asset tangibility; Basel III Accord; capital adequacy ratio; leverage; profitability; pecking order theory; trade-off theory

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1. Introduction

Banks' financing decisions, also referred to as capital structure, have remained a puzzle for decades, leaving those charged with the responsibility of directing and controlling the banks in a state of dilemma. These decisions have received enormous research attention in the academic and corporate finance world due to their importance for the profitability and growth of firms (Kayo and Kimura 2011). Banks and other financial services companies are not exempt from the challenges they face when choosing between different financing options, such as debt and equity, among others. According to Nikoo (2015), choosing the optimal capital structure among alternatives is essential for a bank's performance, operational efficiency, and resilience.

According to the Bank for International Settlements (BIS 2017), banks are financial institutions that provide intermediary functions in an economy through channelling surplus financial resources from depositors to borrowers of funds who are in deficit. To reduce distress and the likelihood of failure in banking firms, and to promote the economic health of countries and international markets, it is necessary for regimes across the world to regulate bank capital structure and financing decisions. Due to the need to regulate the

financial structure of banks, the Basel Committee for Banking Supervision (BCBS) has established a series of international banking standards from the first to the third. These Basel agreements are internationally accepted standards in banking finance laws because the BCBS acts as the supreme international coordinator of banking policies and provides banking monitoring agreements (Bank for International Settlements BIS 2017).

The Basel III Accord, which is currently the most recent of the three Accords improving on the capital composition requirements of banks by addressing the under-capitalisation, over-leverage, and excess reliance on short term funding of the banks globally (BIS 2017). The Basel III requirements represent a stricter definition of capital and improve on the quality of the capital, which invariably affects the capital structure of the banks.

The global Basel III regulation has impacted the financing decisions of banks in several ways. According to BIS (2017), the elements of the Basel III Accord, such as the capital adequacy requirements, mandate banks to maintain higher levels of regulatory capital as a buffer against potential losses. This influences banks' financing decisions by encouraging them to raise additional equity capital or retain earnings to meet the new requirements. Also, the liquidity coverage ratio mandates banks to hold sufficient high-quality liquid assets to meet short-term liquidity needs during times of financial stress. This consequentially impacts the financing decisions of banks as they prioritise holding liquid assets over riskier investments. The introduction of the Basel III leverage ratio also limits a bank's overall leverage by comparing its Tier 1 capital to its total exposure. This means banks now carefully manage their financing decisions to ensure compliance with the prescribed leverage limits (Obadire et al. 2022b). As a result of this, the global Basel regulation plays a crucial role in the financing decisions of banks.

Yitayaw (2021), Lemma and Negash (2014), and Frank and Goyal (2009) added that, despite the capital regulation mandated by the BCBS, other factors can significantly impact its financing decisions. These factors are internal to the bank and reflect its unique characteristics, performance, and risk profile. Profitability, risk, size, stability, earnings volatility, and asset tangibility are popular factors that influence the financing decisions of banks (Yitayaw 2021; Lemma and Negash 2014).

In the realm of banks' capital structure research, there is a notable scarcity of studies conducted within the African context. Previous studies have predominantly focused on data from developed nations, resulting in a significant knowledge gap in the literature concerning developing nations, particularly in Africa (Barclay and Smith 2020; Chiaramonte and Casu 2017; Fu et al. 2014; Dietrich et al. 2014). To address this gap, our previous study on African banks' capital determinants (Obadire et al. 2022b) utilised the Basel III prescribed leverage ratio, known as the Tier 1 capital to total exposure, as a measure of banks' financing decisions.

In the current study, the regression model was enhanced and expanded by incorporating seven (7) important parameters largely ignored in the study of bank financing in the developing nations. Firstly, this study introduced the traditional ratio of total debt to capital employed as another measure of banks' capital structure. Secondly, the study included the liquidity ratio as an explanatory variable in the expanded model. Incorporating the liquidity ratio as an additional explanatory variable holds crucial implications for banks. It provides valuable insights into various aspects of a bank's operations, including risk management practices, regulatory compliance, funding strategy, financial stability, and response to economic conditions. The liquidity ratio measures a bank's ability to meet short-term financial obligations and signals its capacity to convert assets into cash to cover liabilities as they fall due. By assessing the bank's ability to manage daily operations and withstand financial shocks, the liquidity ratio offers a comprehensive understanding of how liquidity considerations influence capital structure decisions. This addition allows the researcher to examine how liquidity considerations influence banks' financing decisions and effectively fill the research gap in the African context.

Thirdly, the study included ZSCORE as a measure of bank's financial stability. According to Fiordelisi and Mare (2014), a higher ZSCORE indicates better financial health,

implying that the bank is better positioned to cover its financial obligations. Banks with higher ZSCOREs are more likely to have access to debt capital at favourable terms, potentially leading to a higher proportion of debt in their capital structure (Rajhi and Hassairi 2013). The study also included net interest margin and the ratio of operating expenses to total assets as a measure of bank efficiency in the regression model (Miah and Sharmeen 2015). On the one hand, a higher net interest margin indicates that the bank is earning more from its core lending activities relative to the cost of funds (Corporate Finance Institute (CFI) 2022). Banks with higher net interest margin might have greater profitability and cash flow, allowing them to service debt obligations. This can contribute to a higher proportion of debt in their capital structure. On the other hand, a lower ratio of operating expenses to total assets signifies efficiency in cost management and banks that efficiently manage their operating expenses may have more funds available to cover interest and debt payments (Miah and Sharmeen 2015). This efficiency can positively impact the bank's creditworthiness, potentially leading to a higher proportion of debt in their capital structure.

Also, this study considered the inclusion of non-performing loan ratio and earning volatility as intervening factors to bank financing decisions. The ratio of non-performing loans to total loans indicates the quality of a bank's loan portfolio and a higher non-performing loans ratio suggests higher credit risk, which can make it difficult for a bank to attract external debt financing (Rahman et al. 2018). As a result of this, banks with higher non-performing loan ratios might choose to rely more on equity financing, resulting in a lower proportion of debt in their capital structure. Lastly, earnings volatility refers to the fluctuation in a bank's earnings over time and high earnings volatility can impact a bank's ability to generate and retain capital, which largely influences its capital structure (Kayo and Kimura 2011). As a result of these enhancements to the model, the study has yielded significant findings that contribute not only to the body of knowledge in Africa but also to the global understanding of bank financing decisions. Furthermore, the insights provided in this research are valuable for bank executives and regulators, offering them relevant information for effective decision-making.

Accordingly, the main purpose of this study is to ascertain the influence of Basel III regulations and other determining factors on the financing decisions of African banks after the 2008 global financial crisis (GFC). The specific objectives of the study were to firstly identify how the Basel III regulatory requirements influence the financing decisions of African banks. Secondly, the study investigated other factors outside the Basel III regulatory requirements that impacts the financing decisions of African banks. Lastly, the study investigates what factors influence both traditional and Basel III-specific measure of African bank leverage.

The 2008 GFC has opened the eyes of some African countries to adopting international banking regulations to stay afloat from financial and economic crises. Countries such as South Africa have evolved rapidly in these past years from the traditional approach of regulating banking activities to adopting the global macro-prudential guidelines of the Basel III Accord (SARB 2013). Also, a few other African countries such as Nigeria, Uganda, Malawi, Kenya and Tanzania have largely mirrored the global best practices of the Basel III Accord (IMF 2014).

In the quest to achieve the study aim, the study drew its data specifically from listed banks of six African countries that have adopted the Basel III regulatory requirements, namely, South Africa, Nigeria, Kenya, Tanzania, Uganda, and Malawi, covering the period 2010 to 2019. Following the brief introduction, the rest of the article is organised as follows: literature review, methodology, empirical discussion of results and, lastly, the conclusions.

2. Literature Review

2.1. Conceptual Understanding of Banks' Capital Structure

The understanding of the capital structure decision of banks is an imperative and a crucial concept in corporate finance. Acharya et al. (2016) argue that the capital structure of banks is not influenced by similar variables as compared to the non-banking sectors.

Owing to the importance and the peculiarity of banks' financing behaviour as compared to the non-financial firms, an enormous research attention has been given to the study of banks' capital structure and its determinants.

According to Kalemli-Ozcan et al. (2012), the funding of banks is unique because they are obliged to follow the regulations set out by the country's delegated regulatory body, such as the prudential regulatory authority, which assesses their capital structures. The Central or reserve banks fully or partially adopt the guidelines set out by the Basel Committee on banking regulation in regulating the capital structure of local banks (Al-Najjar and Hussainey 2011). Acharya et al. (2016) and Kalemli-Ozcan et al. (2012) concede that the bank capital structure consists of the minimum regulatory capital, capital buffers, and the discretionary capital. According to the guidelines set out by the Basel Committee on Banking Supervision (BCBS 2013), banks are expected to retain a minimum capital base and capital buffers to foster banks stability, safeguard against unexpected shocks, and to maintain their financial resilience. Furthermore, banks are free to keep more capital than the threshold recommended by the Basel Accord (Delimatsis 2012).

Aboura and Lépinette (2015) and Gropp and Heider (2010) define bank capital as "the difference between a bank's assets and its liabilities, which represents the net worth of the bank or its equity value. The asset portion of a bank's capital includes cash, government securities, and interest-earning loans such as mortgages, letters of credit, and inter-bank loans, while the liability portion includes the short-term and long-term deposits amongst others, such as equity and regulatory equity capital" (Lim 2016). Aboura and Lépinette (2015) further argue that for banks to maximise their capacity to absorb losses, they should move from the composition of 100% equity towards a composition that includes debt capital to benefit from lower costs of financing and reduce the level of taxable income. Beltratti and Stulz (2012) argue that banks, like any other firm, enjoy a tax shield when they use debt funding up to a certain point when the current worth of the tax buffers on extra debt is balanced out by a rise in current value of economic stress costs and the agency implications. This implies that banks are able to benefit from an optimal mix of financing in their capital structure.

According to Lim (2016), bank operations are financed predominantly through equity and debt capital. On one hand, bank funding through equity capital consists of the owners' equity, minimum regulatory capital, reserves arising from revaluations of non-current assets, and long-term securities. On the other hand, debt capital consists of unsecured, fully paid debt instruments, and other subordinate debts with a minimum fixed maturity date of five years (BCBS 2013). Pistor (2013) further indicates that banks finance their operations through depositors' funds, which include the customers' deposit and savings accounts.

Along with the customers' deposits and savings accounts, banks are also involved in a lot of other profitable activities such as investment in safe government securities in order to raise additional funding. Furthermore, banks provide loans and other credit facilities to their customers and charge interest on the loans advanced. Nonetheless, banks face the risk of loan default from their customers and this kind of hazard is identified as credit risk. According to Okafor and Fadul (2019) and Badawi (2017), other risks that banks face which arise from their trading activities include market, counterparty, credit risk, liquidity, and operational risks.

Affinito and Tagliaferri (2010) argue that, despite all the sources of finance available to them, banks largely rely on debt capital to meet their financial and operational needs. In support of this finding, Acharya et al. (2016) argue that the financing implication of using debt funding is lesser as compared to the financing implication of other sources, especially equity capital, and with debt funding firms enjoy debt interest tax shields. The heavy reliance of banks on debt capital often explains the reason why banks have high leverage (Berger and Bouwman 2013). Nonetheless, Lim (2016) argues that the choice and mix of bank funding and its capital structure have a direct influence on its earnings, operational efficiency, stability and the risk of bank failure.

Berger and Bouwman (2013) posit that one of the major risks arising from the capital structure of a bank relates to the high proportion of short-term funding, such as customers' deposit and savings accounts, which is used to finance long term loans, which could lead to a liquidity crisis. Furthermore, Adrian and Shin (2010) posit that depositors and other creditors can demand payment on their deposit or savings accounts anytime without proper prior notice which contributes to increased liquidity risk. However, Al-Najjar and Hussainey (2011) indicate that many countries insure deposits as a safeguard to mitigate the risk of customers' unannounced notice of withdrawals of funds leading to bank operational failure.

The safety, efficiency, and stability of banks have been questioned by the public. Because of this and the credit and liquidness risks related to the sources of bank funding, the need for bank regulations arises. These guidelines, such as the Basel Accords, are designed to limit banks' exposures to credit, market, solvency, and liquidity risk (Obadire et al. 2022a).

2.2. Empirical Review of Bank Capital Structure and Its Determinants

The impact of the Basel III Accord in determining the financing choices and capital structure of banks cannot be overemphasised. The current Basel III guidelines have been amended in respect of the capital structure, constraining the elements of capital that are eligible for inclusion in the definition of regulatory capital (BIS 2017). Ramli et al. (2019) and Chadha and Sharma (2015) posit that the capital requirement and the new liquidity framework also can influence the choices and decisions made by those charged with the governance of the bank. They further indicate that financing decisions play a vital role in the performance and stability of the financial institution.

Similarly, Lim (2016) observes that a bank can decide to finance its projects with common stock, preferred stock, or debt. These elements are components of the bank's capital structure. On the one hand, the financial institution raises equity in the form of common and preferred stock, which is held by the owners of the bank. A long-term relationship exists with these equity holders, who hope that the firm will have high growth in the future and who expect regular dividend payments. On the other hand, debt can be made of loans payable, bonds, notes payable, and debentures amongst others. The debt holders, such as the individual and the institutional investors, do not have any long-term commitment to the bank except in the case of irredeemable debentures. This is because they are mainly interested in the repayment of the principal amount and the interest. Most importantly, for the bank, the depositors' funds are regarded as capital, through short-term funds (De Silva et al. 2019; Aboura and Lépinette 2015).

The main function of capital is to finance the banks' operational activities and the acquisition of assets. Moreover, bank capital is needed to protect the bank from all kinds of unsecured and uninsured risks that may turn into losses. According to De Silva et al. (2019), capital has a loss-absorbing function that allows the bank to cover any losses with its own funds, and thus, any loss that occurs decreases the bank's capital. Furthermore, the interest margins and other spreads have sufficient capacity to cover the ordinary expenses that ensue from the normal course of business activities.

The most important risk for which financial institutions need equity concerns borrower default, which makes some assets partly or entirely irrecoverable (Goyal 2013). Furthermore, capital has a confidence function because it convinces the bank's creditors and the depositors that their deposits and assets are safe. The ability of banks to absorb losses indicates that they can use their assets to cover the liabilities, which builds and sustains their credibility (De Silva et al. 2019). Demirguc-Kunt et al. (2013) indicate that funding through equity places a restrictive capacity, which places some limits on various banking transactions and prevents banks from taking risk that is too high. Thus, the capital structure of banks runs within the scope of the Basel III Accord through the minimum capital requirements, buffer requirements and leverage requirements.

As previously indicated, the main objective of the Basel III Accord is to increase a bank's stability (BCBS 2013). Chun et al. (2012) suggest that the increase in the capital requirements and a higher proportion of equity funding, as compared to debt funding, restrict a bank's ability to lend, which in turn affects its main operational activities and stability. Conversely, Admati et al. (2013) argue that banks can restructure their financing decision and make significant changes to their capital structure without harming their performance or ability to lend to the public through asset liquidation, recapitalisation and asset expansion. Firstly, banks can achieve these by scaling back the size of their balance sheet in a significant way by liquidating a certain proportion of their assets and reducing their liabilities by using the proceeds from the assets. They can also recapitalise by issuing an amount of additional equity, removing the same amount of liability, and raising additional equity capital to expand the balance sheet and use the proceeds to acquire new assets (Admati et al. 2013).

Gavalas and Syriopoulos (2018) analysed the Basel III accord index on the main banks' leverage. Their study examined nine Brazilian banks for the period of five years from 2012–2016, employing both descriptive and inferential statistics to analyse their data. The major estimator used in their study was the ordinary least square estimator. The findings of their study showed that Brazilian banks suffered a direct impact on the capital structure concerning regulations and their size. This is because the concentration of the sector produced a structure that sought the efficiency of bank activities. The findings also showed that there was a positive relationship between the Basel III index and the leverage size of the Brazil financial institutions.

Similarly, Klefvenberg and Mannehed (2017) investigated the extent to which the capital structure of Swedish banks was affected by the implementation of Basel III. The methodology of their study focused on the use of OLS multiple regression analysis. Furthermore, their study focused on the relationship between capital structure and the implementation of the Basel III Accord. The findings of their study showed that the Basel III Accord caused a decrease in the capital structure and that affected some of the determinants of capital structure of the Swedish banks. They concluded that the findings were probably influenced by the current Swedish negative repo rate policy.

Furthermore, Gabriel (2016) analysed the impact of the Basel III capital requirements on the capital structure of European banks. The purpose of this study was to empirically test the relationship between the new regulatory capital requirements and the leverage and performance of European banks. The study selected a sample of European banks and employed regression analysis to examine the relationship between the Basel III regulatory requirement and the capital structure levels. The findings of this study showed that a positive relationship between the variables existed.

In contrast, Okahara (2018) analysed the capital structure and the effect of regulating the banks' capital adequacy ratios, or the ratio of equity financing to risky assets. Specifically, the study investigated whether bank lending decreased when the banks raised their CAR to satisfy the regulation. The study employed a model in which households had bargaining power concerning deposits, and in which a bank was compelled to adjust its capital structure indirectly through the households' decision-making. The study further postulated that a bank with bargaining power always chose to use equity financing more and that as a result there was no probability that the bank lending would decrease. In other words, the findings showed a negative relationship between the capital adequacy ratio and the level of bank leverage.

Gavalas and Syriopoulos (2018), Klefvenberg and Mannehed (2017) and Gabriel (2016) conclude that the Basel III regulatory requirements have a positive impact on the leverage of banks. On the other hand, Okahara (2018) and Chun et al. (2012) hold contradictory views on the above conclusion. In line with the previous findings, and despite the inconclusive results of some studies, the current study expected the Basel III regulatory requirements to have a positive impact on the capital structure of banks. This is justifiable based on the premise that the overarching aim of the Basel III Accord is to strengthen the capital base of

banks to promote their resilience and stability by redefining what constitutes their capital structure component.

Furthermore, studies from developed nations and a few from developing nations have considered some factors as determinants of bank capital structure. Ahmad et al. (2008), in their study of the determinants of bank capital in the developing economy, identified minimum regulatory capital and bank profitability as the concerning factors of bank capital decision. Similarly, Le et al. (2020) reported that stricter capital ratio influences the capital structure decision-making of British and Australian banks. Furthermore, Tran et al. (2020) conducted a novel study on the determinants of bank capital structure in the world and affirm that bank capital structure is largely influenced by similar factors affecting non-financial firms. They concluded that asset tangibility, bank size, risk, profitability and liquidity creation are the main factors that determine banks' capital structure except for growth opportunities. Emphatically, adding the African voice, Sibindi (2016) alluded that bank risk and size are the significant factors that determine the capital structure of financial service firms in South Africa. The richness of these studies formed the bedrock for the selection of bank capital structure determinants being investigated within the African context of the current study.

2.3. Theoretical Motivation

This study is grounded on three relevant theories that explain the dynamics of bank financing decisions. The underpinning theories are the trade-off theory, the pecking order theory, and the agency cost theory.

The review of these theories shed light on and provided insight into the financing behaviour of financial services firms.

The trade-off theory of Kraus and Litzenberger (1973) proposes that there is an optimal capital structure where a firm's value is maximised whilst its weighted average cost of capital (WACC) is minimised. Optimal capital structure occurs at a point where the target debt benefit, which is the interest tax shield, offsets the costs of bankruptcy and financial distress. Bertrand and Schoar (2002) added that the optimal capital structure refers to the debt ratio whereby a firm's value is maximised whilst its WACC is minimised. Myers (2003) asserts that, on the one hand, the static trade-off theory postulates that firms set a target debt-to-value ratio and gradually move towards the target. On the other hand, the dynamic trade-off theory proposes that firms passively accumulate earnings and losses, letting their debt ratios deviate from the target as long as the cost of adjusting the debt ratio does not exceed the costs of having a suboptimal capital structure (Barclay and Smith 2020; Frank and Goyal 2009).

Myers and Majluf's (1984) pecking order theory hypothesised that firms minimise their time-varying adverse selection costs by relying more on internal funding. The theory indicates that the information costs associated with issuing securities are so large that they dominate all other financing considerations. According to the pecking order theory, companies maximise value by systematically choosing to finance new investments with the cheapest or internally generated funds called retained earnings before considering any external funding (Barclay and Smith 2020). Leary and Roberts (2010) and Moyo (2015) state that in a situation where firms are faced with internal fund deficiency, and the external fund seems to be inevitable, they prefer debt to equity because of the lower information costs associated with debt issues. In other words, firms issue equity as a last resort because the equity instrument is perceived negatively by the market, and they highly associate information cost with equity.

Moreover, Jensen and Meckling's (1976) agency cost theory postulates that firm managers may not always act in the best interests of the firm owners. As a result, firms employ more debt capital to align the managers' actions with the interest of the shareholders. This is because the debt financing decision has a first-order real effect on the managers' incentives and their investment and operating decisions (Barclay and Smith 2020; Myers 2003).

3. Methodology

3.1. Data and Variables Description

This study covers the implementation period of the Basel III Accord, which began in 2010. The population of the study consisted of commercial, investment, development, merchant, corporative, and microfinance banks in selected African countries that had adopted the Basel III Accord at the time of the study. These countries included South Africa, Nigeria, Kenya, Tanzania, Uganda, and Malawi, with a total of 145 registered banks, 45 of which were listed on the African stock market. Given the nature of the population of the current study, the non-probability sampling technique was used to select a sample of listed banks. Purposive non-probability sampling was found to be the most applicable method in the current study because the researcher focused specifically on the listed bank that had adopted the Basel III regulatory requirements. Patton (2007) asserts that purposive sampling is widely used in research to identify and select information related to the phenomenon of interest. Here, the phenomenon of interest was the listed banks that have adopted the Basel III regulatory requirements. This invariably influenced the sampling of 45 listed African banks. Panel data from 2010 to 2019, totalling 450 observations, were employed in the study. The data were obtained from the IRESS database and standardised to ensure consistency in the analysis and categorisation of financial statement items, allowing for meaningful data extraction and sorting. The summarised details of sample selection by country are shown in Appendix A.

In this study, leverage is traditionally measured by the ratio of total debt to total equity (Zhang and Liu 2017; Bartoloni 2013; Mateev et al. 2013). For the uniqueness of this study, we adopted both the traditional measure of leverage and the Basel III-prescribed measure of leverage which is the ratio of Tier I capital to total exposure (BCBS 2013). The Basel III leverage measure is a non-risk- based leverage ratio aimed to supplement the capital minimum requirements.

The study used minimum capital requirement (MCR), capital adequacy ratio (CAR), capital buffer premium (CBP), liquidity coverage ratio (LCR), liquidity ratio (LR), financial stability (ZSCORE), ratio of operating expenses to total assets (OETA), net interest margin ratio (NIMR), non-performing loan ratio (NPLTL), earnings volatility (EV), bank size (BS), profitability (P), growth rate (GR), asset tangibility (AT), and risk (R) as the determinants of African bank leverage. These are popular measures adopted by previous authors such as Zheng et al. (2017), Anarfo (2015), Zhang and Liu (2017), Kayo and Kimura (2011), and Frank and Goyal (2009) and can be largely relied on in the context of African banks.

The minimum capital requirement is defined as the level of capital that a bank should mandatorily maintain in any situation (BIS 2017). According to the Basel III requirements, the minimum regulatory ratio expected of a bank is 8% which includes both Tier 1 and Tier 2 minimum requirements. This study used the sum of the minimum ratios of Tier 1 and Tier 2 capital as the measure of the minimum capital requirement.

According to BIS (2017), the capital adequacy measure is a suitable measure of bank capital because it considers the risk factor of a bank operation, implying that it measures the ability to meet maturing obligations as they come due and indicates the capability of a bank to manage risk. The study used the ratio of Tier1 and Tier 2 capital to total risk-weighted assets as the measure of CAR.

Banks are required to hold a certain minimum level of capital to safeguard them against financial distress and failure; however, banks often hold capital above the required regulatory minimum to protect them against unexpected shocks which may result in a bank failure. This excess capital is referred to as the capital buffer premium (BIS 2017). This study used the difference between the actual capital held by the bank and the minimum capital prescribed by the regulator as the measure of capital buffer premium.

According to the global liquidity standards and supervisory monitoring of the new Basel III requirements (BCBS 2013), there are two quantitative measures developed to measure liquidity and these are the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). Recent studies, such as those by Sadien (2017) and Mashamba (2018),

measured the liquidity ratio in line with the Basel III Accord as the difference between the bank's LCR and the Basel minimum threshold of 100%. For the current study, the liquidity requirements were measured by the ratio of high-quality liquid assets (HQLA) to the expected net cash outflows (ENCO) and the ratio of total loans to the total asset. The study computed the ZSCORE of the sampled banks as a measure of financial stability. According to Rajhi and Hassairi (2013), and Gadanecz and Jayaram (2015), the financial health and stability of banks influences its capital structure choices. Also, the study used the ratio of operating expenses to the total assets of the bank, and net interest margin ratios as a measure of bank operational and investment efficiencies. This study used the return on equity (ROE) as a measure of profitability. This is because the ROE is an indication of the profit generated by the bank with the money invested by the shareholders (Taskinsoy 2013; Kayo and Kimura 2011). According to Zheng et al. (2017), size is a significant determining factor of bank capital structure. The proposition 'too big to fail' is accrued to the large banks as they are well diversified, highly leveraged, securitised and more volatile in return (Zheng et al. 2017). This study used the natural logarithm of total assets as a measure of bank size as adopted by previous researchers.

A reliable proxy for a firm's growth is the ratio of the market value of equity to the book value of equity (Anarfo 2015). It follows that the higher the market value relative to the book value of equity, the higher the growth prospects for the firm. The study used the ratio of the market value of equity to the book value of equity as adopted by previous researchers (Zhang and Liu 2017; Anarfo 2015). This study used the ratio of fixed assets to total assets as the measure of asset tangibility. This measure was largely adopted by authors such as Frank and Goyal (2009), Öztekin and Flannery (2012) and De Jonghe and Öztekin (2015). Following the study of Jokipii and Milne (2011) and Zhang and Liu (2017), this study adopted the ratio of risk-weighted assets to total assets as a measure of risk. The summarised definitions of variables are shown in Appendix B.

3.2. Model Specification

This study adopted the dynamic panel data specification technique which is represented in model Equations (1) and (2). The study adopted a dynamic regression model approach, owing to the premise that the parameters of bank leverage are best estimated using dynamic panel model, as these models include the lagged dependent variables as an additional explanatory variable because the present value of leverage are affected by the previous years' value. These lagged variables were represented in the model equations. More so, authors such as Rahman et al. (2020) and Neves et al. (2020) around firms' leverage investigation have adopted a similar model. Numerous estimators can be adopted in the dynamic panel data model, which includes the ordinary least square (OLS), generalised least square (GLS) and the generalised methods of the moment (GMM) (Francis and Osborne 2012; Lee and Hsieh 2013). However, Francis and Osborne (2012) argue that the dynamic panel data are fraught with two sources of persistence over time. These fraught are the autocorrelations arising from the lagged dependent variables among the regressors; and the presence of individual effects characterising the heterogeneity among the individual variables. Thus, this renders estimations with either OLS or GLS biased or inefficient. Francis and Osborne (2012) further argue that the use of GMM is more efficient as compared to other dynamic panel data estimators. To cater for the fraught and limitations in the adoption of dynamic panel data and the model, the researcher conducted various tests to verify the presence or absence of multicollinearity, heteroskedasticity, and cross-sectional independence. The variance inflation factor (VIF) test, sargan test, and first- and second-order autocorrelation tests were performed to address multicollinearity, heteroskedasticity, and cross-sectional independence bias in the panel data.

Out of the numerous estimation techniques that can be used to fit a dynamic panel data regression model, the system GMM estimation technique is the most suitable for the research instrument which is the audited bank-level financial data of the sampled African banks. Thus, based on the nature of the study and the research instrument, the system

GMM estimation technique was adopted to fit the dynamic panel data represented in model Equations (1) and (2) and are implemented in the STATA 15 econometric software. STATA 15 is deemed suitable for the analysis of the panel data because it allows for the use of various model estimators as compared to other econometric software.

The dynamic models are represented in the equations below:

Model Equation (1)

$$TCTEijt = \beta_0 TCTEijt - 1 + \beta_1 MCRijt + \beta_2 CARijt + \beta_3 CBPijt + \beta_4 LRijt + \beta_5 LCRijt + \beta_6 NPLTLijt + \beta_7 EVijt + \beta_8 Z - SCOREijt + \beta_9 OETAijt + \beta_{10} NIMRijt + \beta_{11} Pijt + \beta_{12} BSijt + \beta_{13} GRijt + \beta_{14} Rijt + \beta_{15} ATijt + \varepsilon ijt. \quad (1)$$

Model Equation (2)

$$TDCEijt = \beta_0 TDCEijt - 1 + \beta_1 MCRijt + \beta_2 CARijt + \beta_3 CBPijt + \beta_4 LRijt + \beta_5 LCRijt + \beta_6 NPLTLijt + \beta_7 EVijt + \beta_8 Z - SCOREijt + \beta_9 OETAijt + \beta_{10} NIMRijt + \beta_{11} Pijt + \beta_{12} BSijt + \beta_{13} GRijt + \beta_{14} Rijt + \beta_{15} ATijt + \varepsilon ijt. \quad (2)$$

In the above model Equations (1) and (2), the $ijt-1$ represents the lagged dependent variable capturing the firm, country, and time dimensions, while $\beta_{1–15}$ represents the coefficient of the variables and εijt represents the error term. On the one hand, model Equation (1) is aimed at testing whether the capital structure of banks which is measured by the ratio of Tier 1 capital to total exposure (TCTE), was affected by the Basel III regulatory requirements and other determinants. On the other hand, the model Equation (2) is aimed at testing whether the capital structure of banks, which is measured by the ratio of total debt to capital employed (TDCE), was affected by the Basel III regulatory requirements and other determinants. Using financial data from different African countries, this study recognised and adjusted for country-specific effects during data cleaning and sorting of the financial data by converting each country's currencies into a uniform currency, using the South African Rand as the standard currency rate across all countries. This afforded uniformity of the financial data used across all the selected African nations. Also, since the data used in the study were obtained across comparable African countries with similar institutional fundamentals, the institutional and firm differences were accounted for not only by controlling for the exchange rate differences but also using robust system GMM techniques. More so, for robustness purposes, the study used BS, GR, and AT as control variables in the panel data regression model. To fully understand the abbreviations and acronyms used in the model equations, see Appendix B.

4. Empirical Results and Discussion of Findings

Dynamic panel data and econometric methodology using STATA 15 were used to perform the data analysis in this study. This study used a balanced panel across all variables across the years of observation. Descriptive statistics and the normality test of the data used are shown in Table 1.

Table 1 shows that the panel data variables were constructed from the data drawn from the annual financial statements which were obtained from the IRESS database. The dependent variables are defined as follows: $TCTE$ denotes the ratio of Tier 1 capital to total exposure; $TDCE$ denotes the ratio of total debt to capital employed, which are both measures of bank capital structure. The independent 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; LR denotes liquidity ratio and LCR denotes the liquidity coverage ratio; $NPLTL$ denotes non-performing loan ratio; EV denotes earnings volatility; $ZSCORE$ denotes the financial stability of banks; $OETA$ denotes the ratio of operating expenses to total assets; $NIMR$ denotes the ratio of net interest revenue to total earnings; P denotes profitability; BS denotes bank size; GR denotes growth rate; R denotes risk and AT denotes asset tangibility.

Table 1 presents the summary statistics for the dependent and independent panel data variables. The statistics from Table 1 provide insights into the capital structure positions of banks. A higher TCTE mean suggests a stronger core capital base, which may influence a bank's decisions regarding the mix of debt and equity in its capital structure. On the other

hand, the mean TDCE value indicates that banks, on average, have a relatively high debt load compared to their capital employed.

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

Variables	Mean	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
TCTE	0.907	0.1903	0.643	1.316	0.523	0.962
TDCE	1.929	0.0712	0.861	2.406	0.745	2.327
MCR	0.948	0.1115	0.778	1.021	0.876	−1.239
CAR	1.258	0.1510	1.079	1.613	0.136	0.453
CBP	0.312	0.3351	0.176	1.519	0.084	−0.061
LCR	2.054	0.1403	1.904	2.581	0.185	3.068
LR	1.401	0.4677	−0.938	2.236	0.290	2.248
NPLTL	1.310	0.8060	−2.562	3.637	0.658	2.893
EV	−0.619	0.6482	−3.078	1.062	−0.556	1.306
ZSCORE	1.818	0.6593	−0.883	4.218	0.228	1.904
OETA	−0.163	0.2457	−0.961	0.932	0.356	1.041
NIMR	2.703	0.3462	1.717	4.325	−0.854	2.255
P	1.193	0.2959	−0.477	2.596	0.183	3.103
BS	0.934	0.0338	0.816	0.994	−0.622	0.370
GR	0.720	0.8900	−1.933	3.145	0.158	−0.037
R	1.143	0.8305	−0.685	3.373	0.106	−0.707
AT	0.435	0.3127	−0.293	1.174	0.393	−0.092

Source: Authors compilation (2023).

The skewness and kurtosis values give further information about the distribution of these variables. The skewness normality test shows that all variables are uniformly distributed with skewness coefficients close to zero. Moreover, the kurtosis coefficients for most variables have values less than 3, indicating that there is no positive excess kurtosis following a light-tailed distribution. Positive skewness suggests some banks have higher values than the average.

As depicted in Table 1, on average, all sampled banks have a TCTE (Tier 1 capital to total exposure) and a TDCE (Total Debt to Capital Employed) of 90.7% and 192.9% respectively. On the one hand, for TCTE, this suggests that, on average, the sampled banks have Tier 1 capital equivalent to approximately 90.7% of their total exposure. Tier 1 capital is the core capital of a bank, including common equity and retained earnings. In the context of capital structure, a higher mean value for TCTE indicates that banks, on average, have a significant amount of core capital relative to their total exposure, which makes them inclined towards debt funding over equity. Also, for TDCE, on average, banks have a total debt of approximately 192.9% of their capital employed. Capital employed typically includes shareholders' equity and long-term debt. In terms of capital structure, this mean value suggests that banks, on average, have relatively high debt levels compared to their equity employed. These results are in line with the argument of Affinito and Tagliaferri (2010), who purport that despite all the sources of finance available to banks, they largely rely on debt capital to meet their financial and operational needs. Similarly, Acharya et al. (2016) argue that the financing implication of using debt funding is lesser as compared to the financing implication of other sources, especially equity capital and, with debt funding, firms enjoy debt interest tax shields.

Also, from Table 1, MCR (minimum capital requirement), CAR (capital adequacy ratio), CBP (capital buffer premium), LCR (liquidity coverage ratio), LR (liquidity ratio), NPLTL (non-performing loan ratio), EV (earnings volatility), ZSCORE (stability and financial health of banks), OETA (ratio of operating expenses to total assets), NIMR (net margin ratio), P (profitability), BS (bank size), GR (growth rate), R (risk), and AT (asset tangibility) have mean values of 0.948, 1.258, 0.312, 2.054, 1.401, 1.310, −0.619, 1.818, −0.163, 2.703, 1.193, 0.934, 0.720, 1.143, and 0.435, respectively.

The mean value for MCR, CAR, CBP, and LCR suggest that the sampled African banks adhere strictly to the Basel III regulations and are kept well above the prescribed minimums of capital and liquidity buffers required to maintain the stability and resilience of banking operations (BIS 2017). Also, the mean values for LR suggests that, on average, banks have a reasonable liquidity ratio, which indicates that banks have a balance between liquid assets and their liabilities can meet their short-term debt obligations.

Furthermore, to better understand the factors influencing bank capital structure, we considered BS, GR, and AT as control variables. Bank size (BS) was quantified using the natural logarithm of total assets, while asset tangibility (AT) was assessed using the ratio of fixed assets to total assets. As highlighted in studies by Zheng et al. (2017) and Drakos and Kouretas (2015), bank size is expected to exhibit lower mean values for smaller banks and higher mean values for larger banks.

The summary statistics presented in Table 1 indicate that the mean values for BS, GR and AT are 0.934, 0.720, and 0.435, respectively. These values suggest that the sampled banks possess a moderate size, experience moderate growth, and maintain a moderate level of asset tangibility. Asset tangibility can significantly influence the availability of collateral for capital raising among the banks in our sample, as noted in studies by Mukherjee and Mahakud (2010) and Öztekin and Flannery (2012). Considering these observations, variables such as BS, GR, and AT were chosen as control variables, as they aptly capture the similar characteristic features of the sampled banks and are pertinent to the analysis of bank capital structure. The study conducted numerous tests to ascertain the presence or absence of unit root multicollinearity and autocorrelation. The nature of the data used in this study warrants checking for the existence of non-stationarity in the data series. Non-stationary data generate the problem of spurious regression between unrelated variables; therefore, both variables on the left and right sides of the regression model must be stationary to avoid the spurious regression problem (Obadire 2018). The study conducted a unit root test and found the presence of unit roots in the study variables. The study transformed the variables by removing the presence of unit root and ensuring stationarity by introducing log of 10 to the variables. The transformed results are reported in Table 1.

Also, the study conducted a multicollinearity test on the adjusted stationary variables and found the existence of collinearity in the CAR predictor variable. To avoid the misrepresentation of the point estimates and wrong understanding of the coefficient's statistical significance, the study dropped the CAR variables from the panel data regression model. The multicollinearity test was performed by calculating the variance inflation factors (VIF) for the variables in the model equation. Furthermore, other dynamic panel specification tests such as the Wald test, the autocorrelation (AR) test, and the Sargan test were performed when performing the dynamic panel data regression of the Blundell and Bond system. The results of these tests were presented together with the output of the regression result. Table 2 shows the results of the BB sys-GMM estimations for the regression model. It also shows the results of the Wald Chi2, Prob > Chi2, AR (1), AR (2) and Sargan test statistics, which confirm that the model was well-fitted.

The Wald test for joint significance of time effects for the regression model is met at the 1% significance level. The AR results also revealed that the estimates are consistent as there is no autocorrelation of the second-order residuals, indicating that the models used were correctly specified (Obadire 2018). The Sargan test confirms the validity of the over-identification restriction, which means that all instrumental variables are valid for estimating the BB sys-GMM. Overall, this shows that the results are robust to panel-specific heteroskedasticity and autocorrelation.

Table 2 shows the regression results of the capital structure specification model. This dynamic panel regression model was fitted with the Blundell and Bond (1998) system GMM estimator. Leverage was measured by $TCTE$ and $TDCE$. All the coefficients were estimated at a 99% confidence level. $TCTE_{t-1}$ denotes the lagged ratio of Tier1 capital to total exposure; $TDCE_{t-1}$ denotes the lagged ratio of total debt to capital employed. Other variable definition is the same as presented in Table 1. The T-statistics 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 AR (1), AR (2) and the Sargan test statistics are shown at the bottom of the table.

Table 2. Dynamic panel data regression results for the capital structure model.

Variables	TCTE	Variables	TDCE
	Coefficients		Coefficients
$TCTE_{t-1}$	0.7909 *** (39.15)	$TDCE_{t-1}$	0.0771 *** (2.70)
MCR	0.0328 * (1.74)	MCR	0.2945 (0.97)
CBP	0.0264 ** (2.17)	CBP	−0.0399 (−0.16)
LR	−0.0026 (−1.10)	LR	−0.0593 ** (2.04)
LCR	0.0085 *** (5.57)	LCR	0.0704 *** (3.75)
NPLTL	0.0004 (0.30)	NPLTL	0.0087 (5.58)
EV	0.0522 (1.09)	EV	3.3144 *** (5.94)
ZSCORE	0.0055 ** (0.26)	ZSCORE	0.0002 (1.20)
OETA	0.0831 (0.64)	OETA	−3.8614 ** (−2.71)
NIMR	0.0098 ** (0.56)	NIMR	−0.0006 (−0.28)
P	−0.0016 (−0.07)	P	0.0821 ** (2.62)
BS	0.1971 (0.26)	BS	1.5905 (0.54)
GR	−0.0003 (−0.36)	GR	−0.0172 (−1.38)
R	−0.0037 (−0.64)	R	0.0307 *** (−6.22)
AT	0.0012 (0.04)	AT	1.8321 (5.81)
Obs.	450	Obs.	450
Wald Chi^2	5960.84	Wald Chi^2	427.10
Prob > Chi^2	0.0000	Prob > Chi^2	0.0000
AR (1)	−9.103 ***	AR (1)	−2.1381 ***
AR (2)	3.001	AR (2)	1.027
Sargan Test	61.1018 **	Sargan Test	43.1519 **

Source: Authors compilation (2023).

The comprehensive findings encompassing both TCTE and TDCE are detailed in Table 2. Notably, in the context of the TCTE measure of capital structure, there have been noteworthy augmentations compared to our prior study (as referenced in Obadire et al. 2022b). In this iteration, the model has been enriched by the inclusion of six additional predictor variables. The introduction of these variables, namely LR, NPLTL, EV, ZSCORE, OETA, and NIMR, has had a discernible impact on the results, leading to the following outcomes:

Both Minimum Capital Requirement (MCR) and Capital Buffer Premium (CBP) exhibit a positive and statistically significant correlation with Tier 1 capital to total exposure (TCTE). This suggests that an increase in MCR and CBP is associated with a subsequent increase in bank leverage. This outcome is not surprising as it aligns with the findings of previous studies such as Obadire et al. (2022b), Gavalas and Syriopoulos (2018), and Klefvenberg and Mannehed (2017). These studies have argued that, despite having various funding sources

at their disposal, banks tend to rely significantly on debt capital to fulfill their investment and operational funding needs. This reliance on debt financing is often driven by the potential tax advantages that highly profitable banks can derive from their substantial reliance on debt funding.

However, the unexpected positive relationship between the Liquidity Coverage Ratio (LCR) and bank leverage, as observed in this study, challenges conventional argument and offers valuable insights into the dynamics of bank capital structure. Traditionally, it has been widely accepted and argued by prior authors (Obadire et al. 2022b; Sadien 2017; Chadha and Sharma 2015) that higher liquidity, as measured by the LCR, should be inversely related to bank leverage. The reasoning behind this expectation is straightforward as banks with ample liquidity coverage are thought to rely less on debt financing because they have a cushion of readily available liquid assets to meet their obligations. This perspective aligns with the recommendations of the Basel Committee on Banking Supervision (BCBS), as highlighted in their 2013 guidelines, which emphasise the importance of maintaining a high level of liquidity coverage to withstand financial and economic shocks.

However, the finding that an increase in the LCR is associated with higher bank leverage challenges this conventional argument. In essence, it suggests that when banks have a more significant proportion of their assets in highly liquid forms (as indicated by a higher LCR), they are also more inclined to take on additional debt. This result raises several intriguing questions and potential explanations. The reason for this could be related to the trade-off between liquidity and profitability. Banks may opt to maintain a higher LCR to comply with regulatory requirements and ensure they have sufficient liquidity to meet short-term obligations. However, this cautious approach towards liquidity management might come at a cost in terms of missed opportunities for profit generation. To enhance returns, banks may decide to increase their leverage by borrowing more to invest in income-generating assets. Also, banks with higher LCR values might be operating in environments or markets where opportunities for profitable lending and investment are limited, such as Africa, which is the current study focus. In such cases, sampled banks might resort to leveraging their capital more aggressively to seek higher returns elsewhere. Furthermore, it's worth considering that there are more unique factors added to this panel data regression model and others as control variables which could explain this relationship.

Also, the positive and statistically significant relationship observed between the ZSCORE, which measures bank financial stability, and the ratio of net interest margin (NIMR) with bank leverage (TCTE) is an intriguing finding. It implies that, as the ZSCORE and NIMR increase, so does the bank's leverage. One possible explanation for this relationship is that a higher ZSCORE reflects greater financial stability within the bank. Banks with a strong financial position may feel more confident in taking on additional leverage to fund investments and expand their operations. This could be because they have a larger cushion to absorb potential losses. Similarly, the positive relationship with NIMR suggests that banks with higher net interest margins are more profitable. These profitable banks may opt to use leverage as a strategy to magnify their returns on equity. By borrowing funds at a lower cost than the return they can earn on investments, they can boost their profitability. This is similar to the findings of Abbas and Younas (2021) and Ha and Quyen (2018). However, it is important to note that, while this relationship exists, it does not necessarily imply causation.

Secondly, reporting for the TDCE measure of capital structure, LCR and EV have a significant positive relationship with the TDCE. This suggests that an increase in these variables results in a consequential increase in the African banks' leverage ratios.

The positive relationship between earnings volatility (EV) and TDCE implies that banks with more volatile earnings are inclined to rely more on debt in their capital structure. This could be attributed to a few factors. Banks with fluctuating earnings may choose to use debt financing to smooth out their financial performance. Additionally, during periods of economic uncertainty, banks may resort to debt as a source of stability, as the interest payments on debt are generally fixed and can provide a degree of predictability

in funding costs. More so, by utilising debt capital, banks can access funds without diluting ownership or control, which can be particularly valuable when opportunities for profitable investments arise. This observed relationship is also influenced by banking regulations which often impose minimum liquidity capital requirements, and banks may adjust their capital structures to meet these requirements while optimising their leverage for profitability. This is consistent with the argument of Gabriel (2016), Berger and Bouwman (2013). They argued that an increase in the regulatory liquidity capital instituted by the Basel Accord propels the banks to increase their share of debt capital proportionately over equity capital to remain operationally and financially stable.

On the contrary, the coefficients related to the liquidity ratio (LR) and the ratio of operating expenses to total assets (OETA) exhibit a noteworthy pattern. They display negative and statistically significant relationships at the 1% and 5% significance levels with respect to the ratio of total debt to capital employed (TDCE), implying a specific trend in the capital structure of African banks.

This signifies that an increase in LR and OETA is linked to a subsequent reduction in the leverage ratios of African banks. In other words, as the liquidity ratio increases, banks tend to shift toward a capital structure that relies more on equity financing rather than debt. This observation aligns with the arguments presented by Chortareas et al. (2012), who suggest that higher liquidity ratios prompt banks to decrease their reliance on debt capital. This strategic move helps them maintain a balanced liquidity profile, mitigating the risk of liquidity and operational crises. In essence, these findings underscore the significance of liquidity management in influencing the financing decisions of African banks. When faced with higher liquidity levels, banks in the region appear inclined to bolster their equity components, thereby enhancing their ability to navigate financial challenges and uphold liquidity stability. This aligns with the prudent practice of safeguarding against potential liquidity risks by opting for less debt-dependent capital structures.

Lastly, it is worth noting that variables P and R exhibit a positive relationship with the TDCE, and these relationships hold statistical significance at the 1% and 5% confidence levels. This outcome aligns with the findings of previous research by Al-Najjar and Hussainey (2011) and Bartoloni (2013), who have argued that highly profitable firms often favour the utilisation of debt capital over equity capital. This preference stems from the fact that profitable banks typically generate sufficient free cash flows to comfortably service their debt obligations. Additionally, their solid financial positions provide adequate security for debt capital, allowing them to benefit from debt interest tax shields associated with substantial reliance on debt funding. Furthermore, the variable representing firm risk also demonstrates a positive association with leverage, corroborating the pecking order theory. This relationship is postulated based on the concept that greater cash flow volatility directly corresponds to increased earnings volatility. Consequently, firms with higher earnings volatility find themselves constrained when it comes to financing from their retained earnings. As a result, they must seek external sources of funding, as discussed by Al-Najjar and Hussainey (2011).

5. Conclusions

The present study aimed to ascertain factors that determines the financing decisions of African banks after the 2007–2008 GFC. Accordingly, the specific objectives of the study were to firstly identify how the Basel III regulatory requirements influences the financing decisions of African banks. Secondly, to find out other factors outside the Basel III regulatory requirements that determine the financing decisions of African banks and lastly to investigate what factors influence both traditional and Basel III-specific measures of African bank leverage. The study used the system generalised moment methods (sys-GMM) estimator to fit the dynamic panel data regression model that was formulated to test the determinants of African bank capital structure.

This conclusion presents significant findings regarding the capital structure of African banks, with a focus on both Tier 1 capital to total exposure (TCTE) and total debt to capital

employed (TDCE). Notably, the inclusion of six additional predictor variables in the TCTE and TDCE models has provided fresh insights compared to previous studies (Obadire et al. 2022b).

One remarkable result is the positive relationship between the Liquidity Coverage Ratio (LCR) and bank leverage (TCTE). Traditionally, it has been expected that higher liquidity, as measured by the LCR, should be inversely related to bank leverage. However, this study challenges this notion by suggesting that higher LCR values are associated with increased bank leverage. Potential explanations include the trade-off between liquidity and profitability. Banks may maintain a high LCR to meet regulatory requirements but then seek higher returns through increased leverage. Moreover, the study considers that sampled banks with high LCR values operate in African markets with limited profitable opportunities, pushing them to leverage their capital more aggressively elsewhere.

The positive relationship observed between the ZSCORE (bank stability) and the net interest margin ratio (NIMR) with bank leverage (TCTE) is intriguing. It implies that, as the ZSCORE and NIMR increase, bank leverage also rises. A potential explanation is that banks with strong financial positions feel more confident taking on additional leverage to fund investments. Additionally, profitable banks may use leverage to amplify returns on equity.

In the context of TDCE, liquidity coverage ratio (LCR) and earnings volatility (EV) exhibit significant positive relationships with bank leverage. This suggests that higher LCR and EV values result in increased leverage for African banks. Banks with fluctuating earnings might use debt financing to stabilise financial performance, especially during economic uncertainty. Additionally, during regulatory changes like the Basel III Accord's liquidity capital requirements, banks may adjust their capital structures to meet these requirements while optimising leverage for profitability.

Conversely, liquidity ratio (LR) and the ratio of operating expenses to total assets (OETA) exhibit negative relationships with TDCE. This implies that higher liquidity ratios prompt banks to decrease their reliance on debt capital, maintaining a balanced liquidity profile to mitigate liquidity and operational risks.

Finally, profitable banks (P) and risk (R) demonstrate positive relationships with TDCE. Highly profitable banks tend to favour debt capital due to their ability to service debt obligations with free cash flows. Riskier firms seek external funding as earnings volatility limits financing from retained earnings. These findings shed light on the intricate relationships between various regulatory and firm variables and bank capital structures in African banks, challenging some traditional expectations while reinforcing others.

The study's conclusion highlights that, among the variables tested, only the LCR consistently and significantly affects the leverage of African banks, regardless of whether traditional or Basel III-prescribed measures of bank leverage are considered. This underscores the pivotal role of LCR in shaping the capital structure choices of African banks, with other variables yielding varying results. In essence, the LCR emerges as the primary determinant in African bank capital structures, reflecting its critical impact on their leverage decisions.

This study, thus, provides relevant recommendations for African bank regulators and bank CEOs in making informed decisions regarding their capital structure, as the findings depict which factor to significantly consider when making the capital structure decision. Firstly, for policy implications, regulators from Africa nations should consider the impact of liquidity regulations, such as the LCR, on African banks' capital structures. The positive relationship between LCR and bank leverage suggests that overly stringent liquidity requirements may inadvertently encourage higher leverage. A more balanced approach to liquidity regulation should be explored to ensure stability without stifling banks' growth opportunities. Secondly, policies that encourage bank profitability, as indicated by the positive relationship between profitability and bank leverage, could be beneficial. This will create an environment that supports banks in generating consistent profits and reduce their reliance on debt financing, leading to a more sustainable capital structure.

Furthermore, regulators and banks should focus on robust risk management practices, given the positive relationship between risk and leverage. Banks with effective risk management systems may be better equipped to handle the additional leverage associated with riskier operations. Because strengthening risk assessment and mitigation strategies can enhance the resilience of African banks. Most importantly, banks should regularly assess and optimise their capital structures. This entails striking a balance between equity and debt financing based on their financial stability, profitability, and risk profile. The study's findings underscore the importance of aligning the capital structure with the bank's unique characteristics and market conditions. These recommendations aim to enhance the understanding of the intricate relationship between regulatory requirements, financial performance, and bank capital structures in African banks. By implementing these suggestions, policymakers and banks can work together to foster a more stable, profitable, and resilient banking sector across the continent.

Despite the uniqueness of this study, its primary limitation lies in its restricted scope. It focuses solely on banks listed on the African Stock Exchange that have embraced the Basel III regulatory framework. Consequently, the sample size is relatively small. As a result, the findings may not be universally applicable to unlisted banks or those yet to implement the Basel III Accord. However, these findings can serve as a foundational reference for other African banks contemplating the adoption of the Basel III Accord. It provides valuable insights into making informed capital structure decisions within this regulatory framework. To address this limitation, future research should endeavour to utilise a more extensive sample size. This expansion is especially relevant as more African countries are expected to adopt the Basel III regulatory requirements in the coming years. A broader dataset would contribute to a more comprehensive understanding of the intricate dynamics influencing bank capital structures across the continent.

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Appendix A

Table A1. Summarised Details of Sample by Country.

Country Wise Distribution and Bank Year Observations from 2010 to 2019			
Country	**Population**	**Number of Listed Bank (Sample)**	**Bank Year Observations**
Kenya	43	11	110
Nigeria	22	13	130
South Africa	16	6	60
Tanzania	29	7	70
Uganda	25	5	50
Malawi	10	3	30
Total	145	45	450

Source: Authors compilation (2023).

Appendix B

Table A2. Definition of the Dependent and Independent Variables.

S/N	Variables	Acronym	Variable Measurement
	Dependent Variables		
1	Basel III Leverage	C/S	Tier 1 capital/Total Exposure
2	Traditional Leverage	C/S	Total Debt/Capital Employed
	Basel III determinants of capital structure: Independent Variables		
3	Minimum Capital Requirement	MCR	Minimum ratio of Tier 1 + Tier 2
4	Capital Adequacy Ratio	CAR	Tier 1 + Tier 2/Risk Weighted Asset
5	Capital Buffer Premium	CBP	Actual capital (core capital plus supplementary capital) less minimum regulatory capital.
6	Liquidity Coverage Ratio	LCR	HQLA/ENCO
7	Liquidity Ratio	LR	Total Loan/Total Asset
	Other determinants of capital structure: Independent Variables		
8	Non-performing Loans Ratio	NPLTL	Ratio of non-performing loan to total loan.
9	Earnings Volatility	EV	Standard Deviation of ROA (ROA = ratio of profit after taxes to total assets.)
10	Financial Stability	ZSCORE	(ROA + ratio of equity to total asset)/standard deviation of ROA
11	Operational Efficiency	OETA	Ratio of operating expenses to total assets
12	Net Interest Margin	NIMR	Ratio of net interest revenue to total earnings
13	Profitability	P	ROE = ratio of profit after taxes to total equity
14	Bank Size	BS	Natural Log of Total Asset
15	Growth Rate	GR	Market value of equity/book value of equity
16	Risk	R	Ratio of risk-weighted assets to total assets
17	Asset Tangibility	AT	Fixed Asset/Total Asset

Source: Authors compilation (2023).

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