UNIVERSITY OF CAPE COAST

REGULATORY CAPITAL REQUIREMENT, INSTITUTIONS AND BANK STABILITY IN SUB-SAHARAN AFRICA

ISAAC ASANTE

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ……..... Date ….....

Name:

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines of supervision of thesis laid down by the University.

Principal Supervisor's Signature: ……... Date …….

Name: Prof. William G. Brafu-Insaidoo

Co-Supervisor's Signature: ……..... Date …….

Name: Dr. Adams Sorekuong Yakubu Adama

ABSTRACT

Regulatory capital is a current topic in the discourse on bank stability, especially within homogeneous financial systems. However, the regulatory capital-stability nexus cannot be examined in isolation from the prevailing institutional context. This study, therefore, employs a balanced panel of 25 countries from 2007 to 2017 to examine the role of regulatory capital in bank stability, highlighting the conditioning effect of institutional quality and regulatory capital type on the capital-stability nexus in sub-Saharan Africa. Using the Dynamic Panel Threshold Methodology (DPTM) developed by Seo and Shin (2016), this study also identifies the threshold effect of risk-based and non-risk-based regulatory capital on bank stability. The results indicate that while risk-based regulatory capital reduces bank stability, non-risk-based improves bank soundness, particularly in the case of the z-score. In the case of the NPL, both types of regulatory capital improve bank stability. Furthermore, the results reveal that institutional quality enforces a positive effect of both risk-based and non-risk-based regulatory capital on bank stability in the case of the z-score, but it has negative or no implications in the case of the NPL. This suggests a complementary effect in the case of the former and a substitutionary effect in the case of the latter. Finally, the results reveal the existence of a non-risk-based regulatory capital threshold level of 11-13% and a risk-based regulatory capital threshold level of 15-22%. The study thus suggests advancing institutions to minimize their negative impact on stability and the strict implementation of capital regulations that recognize regulatory types and their thresholds.

KEYWORDS

Bank Stability

Institutional Quality

Panel Threshold

Regulatory capital

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DEDICATION

To my late Brother.

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LIST OF ACRONYMS

BPT	–	Breusch Pagan Test
GDP	–	Gross Domestic Product
IFS	–	International Financial Statistics
IMF	–	International Monetary Fund
NPLR	–	Non-Performing Loan Ratio
PCSE	–	Prais-winsten Panel Corrected Standard Error
DSGE	–	Dynamic stochastic general equilibrium
OECD	–	Organization for Economic Co-operation and Development
VAR	–	Vector Autoregressive models
GMM	–	Generalized method of moments
GFDR	–	Global Financial Development Report
VIF	–	Variance Inflation Factor
NPL	–	Non-Performing Loans
DPTM	–	Dynamic Panel Threshold Methodology
SSA	–	Sub-Saharan Africa
RE	–	Random Effects
FE	–	Fixed Effects
WGI	–	World Governance Indicators
GFDD	–	Global Financial Development Database
CAR	–	Capital Adequacy Ratio
ROA	–	Return on Assets
OLS	–	Ordinary Least Square
GFC	–	Global Financial Crisis
NPV	–	Net Present Value

CHAPTER ONE

INTRODUCTION

Since 1988, the effects of regulatory capital on bank stability have been one of the pervasive issues in both local and global banking literature as it has been seen in the three recurrent Basel accord regulations (Haider, 2013). Though capital requirement in the form of leverage ratios used to reduce bank insolvencies has been in practice (Mosko & Bozdo, 2016), this was however heightened after the 2008/2009 Global Financial Crisis (GFC) that affected the world economy both in the financial and the real sectors. Among many other factors, the role of capital and thus its regulation in recent regulatory requirements or impositions calls for evaluation. As a consistent item on the Basel Accords with the objective of ensuring global bank stability, the sub-Saharan region not being exempted, two questions beg for answers; what is the influence of capital regulation in minimizing bank default risk or minimizing bank losses in the event of crisis thus, ensuring stability of the banking system.

In spite of the incessant implementation of capital regulatory frameworks, researchers are divided on the capital-stability hypothesis thus this study seeks to understand this phenomenon in the sub-Saharan context.

Background to the Study

The wake of the global financial crisis revealed significant weaknesses and irregularities in the regulatory and supervisory structure of the global financial space, necessitating substantial reform efforts (Calomiris, 2012, 2017). Barth et al. (2012) assert that challenges in the financial sector largely stem from the lack of enforcement and implementation of existing regulatory

requirements, thus hindering the banking system's ability to manage insolvency spikes with high-quality equity capital or effectively control bank risk-taking before a crisis.

The banking sector has been subject to varying regulatory efforts (e.g., interest rate ceilings, restrictions on lending and financial activities, etc.) since the 1960s (Harnay & Scialom, 2016). Although this has yielded positive outcomes for some economies, the financial space is not immune to banking crises. In the midst of these crises, the relationship between capital regulation and bank stability has sparked an interesting debate among policymakers and scholars. Given this situation, and with free banking as a major concern of regulators, maximum simple leverage ratios were first enforced. This decision was based on the understanding that the banks' risk-management incentives and their ability to withstand financial shocks largely depend on the level of capital in the bank's vaults.

Due to banks' proclivity for higher risks, the theories and links between regulatory capital and bank stability were settled by regulators. This was evidenced in the implementation of the first Basel Accord (the global banking regulatory framework of the Bank for International Settlement) in 1988, which primarily focused on capital regulation issues. Based on the shortcomings of the first agreement, the second one introduced three pillars while omitting the calculation of minimum capital requirements. The second agreement is built on three pillars: a minimum capital requirement, a supervisory review process, and market discipline. Basel III was later implemented for the purposes of financial stability, with the understanding that increased bank capital would

enhance financial stability by reducing banks' financial insolvencies and minimizing losses due to default (Westermeier, 2018).

The capital-stability nexus hinges on various mechanisms identified in both literature and practice. According to the World Bank (2020), in the economic sense, bank capital comprises the value of equity that can withstand losses, and in the regulatory sense, bank capital comprises the weighted and unweighted assets of the bank required by their financial sector regulator to carry out their intermediation function. One essential purpose of capital is to help banks endure unexpected losses without distorting their intermediation and other obligations. If a bank's assets are less valuable than its liabilities, capital can function as a cushion to absorb unforeseen shocks, allowing the bank to maintain its solvency and continue its smooth operations (Berger, Herring, & Szegö, 1995), implying that higher capitalization increases stability, resiliency, or the likelihood of surviving a financial crisis.

Capital also incentivizes reduced excessive risk-taking by banks. Due to the moral hazard problem coupled with the presence of deposit insurance, banks are highly leveraged. However, the motivations for risk-taking are minimized by capital requirements in the phenomenon known as 'skin-in-the-game,' i.e., the higher the core capital that shareholders contribute, the more is their skin in the game (Gazdar and Cherif, 2015). By requiring bank owners to put more skin in the game, capital requirements can help curb undue risk-taking and improve supervision, hence reducing the probability of default and increasing stability. Laeven et al. (2016) identify a negative correlation between common capital and systemic risk that increases in level with bank size. Berger and Bouwman (2013) posit that higher core capital (common

equity) ratios enhance the likelihood of bank survival in moments of distress, regardless of bank size.

In furtherance of this, banks may have an incentive to maintain an insufficient equity capital ratio in the absence of regulatory capital requirements or the presence of government safety nets such as deposit insurance and bailouts. Regulatory capital requirements then incentivize banks to improve risk management, and in areas where supervision and regulation are minimal, the role of capital in bank stability is strong, as incentives for risk-taking are theoretically among the most significant sources of financial instability (Calomiris, 2012; World Bank, 2012).

The debates on capital as a preventive measure after the Great Financial Crisis (GFC) underscore mixed opinions among researchers, firstly due to the fact that a large bank may not necessarily imply safety, as the bank, due to its size, may take on excessive risk thinking it is 'too big to fail,' as well as the perception of receiving state bailouts in the event of insolvency (Louzis et al., 2012). In furtherance of this, Sanusi (2012) opines that 8 out of the 24 banks that were capital-adequate in Nigeria were declared bankrupt in 2009. Needless to say, the 'too big to fail' hypothesis failed, as consolidation was not enough. On the flip side of the coin, Santos (1999) and Van Roy (2003) observe that there is a higher proclivity for well-capitalized banks to withstand financial imbalances, thus promoting the stability of the banking sector due to their resilience. Moreover, Pagano (1993) employs the competition-efficiency and stability hypothesis to underscore the fact that consolidation may not necessarily promote stability. The study argues that capital consolidation drives down competition in the banking sector since stringent requirements

increase barriers to entry, thus allowing existing banks to increase their market power. Reduced competition may have implications for inefficiency and instability since banks with higher market power enjoy a quiet life without consequences for their inefficient performance and are under less pressure to minimize costs due to less competition (Shepherd, 1983; Berger et al., 1993). Predicated on the preceding discussions, the capital-stability hypothesis is inconclusive, thus warranting a closer look into understanding the precise impact of regulatory capital buffers on bank stability.

In furtherance of this, the call for capital buildup in the context of bank stability cannot be made in isolation. The post-GFC period of 2008/2009 raises questions on whether the banks are showing similar risk-taking as before, coupled with whether or not the country's political and institutional quality affects the bank's risk-taking behavior on one side and how the country's institutional underpinnings affect the effectiveness of the regulatory requirements. This throws conditional factors such as the institutional setting, governance, capital regulatory type, etc. into the ongoing debate on the capital-stability nexus. Institutional quality refers to a measure showing the quality of governance and institutions in the nation, seen in the set of ethics to be complied or complied with by members of the society, which include bankers. Evidence thus exists for the influence of institutions on society. Comprehensive institutions, therefore, guarantee efficient financial and economic systems by applying an acceptable financial regulatory and supervisory framework (Uddin et al., 2020).

The effect of institutional quality on bank stability is still a novelty in literature, let alone the African context. While studies on institutional quality

primarily focus on the real sector, most studies in the financial sector rather focus on the effects of financial development on bank stability. However, institutional quality is critical for financial sector growth. The presence of strong institutions and regulations helps attain the opportunities of financial development while reducing risks. Sahay et al. (2015) observes that better defense of property rights, creditor rights, and information, higher regulatory quality, and rule of law—all elements of institution quality—are positively associated with financial development. It should be noted, however, that there is a clear positive relationship between the rate at which financial institutions deepen or grow and financial instability. This is because when financial institutions expand quickly, they frequently do so by taking on excessive risk and leverage, especially when the system is poorly regulated and supervised. In furtherance of this, Sahay et al. (2015) opine that the relationship between financial development and financial stability can be thought of as nonlinear. For example, a big financial system can promote stability through profitability and efficiency largely across the financial space. However, as noted by Sahay et al. (2015), beyond a threshold, as it continues to expand, technological progress may induce retardation as a result of restructuring of portfolios (e.g., from shares to cryptos) for higher compensation since banks are highly leveraged.

The discourse on capital and institutions is integral to achieving aspiration 6 of Africa's Agenda 2063 which is the establishment of robust financial institutions and governance systems that will underpin sustainable development. The study on "Regulatory Capital, Institutions, and Bank Stability" is a pivotal contribution within this context, offering nuanced

insights into the intricate dynamics shaping the economic landscape of the continent.

At its essence, the study resonates with the principles of Aspiration 6 by recognizing that a people-driven development agenda necessitates financial systems characterized by stability, inclusivity, and responsiveness to the diverse needs of African communities. Regulatory capital emerges as a linchpin in this endeavor, providing the financial sector with resilience against external shocks and uncertainties, thereby safeguarding the economic interests of Africa's people. By delving into the intricate relationship between regulatory measures, institutional frameworks, and bank stability, the study contributes valuable knowledge to the ongoing discourse on how to fortify the financial pillars supporting Africa's aspirations.

The call for the establishment of robust financial institutions and governance systems necessitates an empirical guide in understanding how regulatory frameworks influence the stability and accountability of financial institutions. There’s the need for a practical and evidence-based insights into strategies that promote inclusive growth, leveraging the potential of Africa's vast human resources, particularly its women and youth.

Even if there will be difficult times ahead in a world of greater uncertainty and complexity or not, progress in the practice and implementation of prudential measures is a cornerstone in realizing the aspirations of Africa's Agenda 2063, specifically Aspiration 6 as it provides a roadmap for the development of financial institutions that prioritize the well-being of Africa's people, fostering economic stability, and ensuring governance excellence. As the continent progresses toward a future of prosperity, inclusivity, and

empowerment, the findings of this study offer tangible and actionable guidance, ensuring that the financial systems supporting Africa's Agenda 2063 are not only resilient but also poised to uplift every African citizen.

Problem of the study

Previous literature underscores the bank-dependent nature of Africa's financial sector (Levine, 2002). According to Moyo et al. (2014), the stock market value to GDP was 23% without South Africa but 42% for the entire Sub-Saharan Africa (SSA) in 2011. This bank-dependent and relatively homogeneous financial system calls for careful attention. As the major form of financial intermediation, instability in this area would have acute effects on both the financial and real sectors due to limited diversity to mitigate the effects of crises. Closely linked to this, Klomp and Haan (2015) observes that the homogeneity of the financial system affects financial innovation and limits avenues for regulatory arbitrage, suggesting a more pronounced effect of regulatory capital requirements on bank behavior and consequently (in)stability. This calls for a closer look, especially in the case of SSA.

The global financial industry has seen major structural upheavals over the years, with the most severe being the financial crises of 2008, which saw many banks suffer bankruptcy and a general systemic failure. Notable among the contributing factors is capital inadequacy. Consequently, the surfacing of the Basel accords has been to enable banks to keep enough capital against crises such as bank runs, high default rates, non-performing loans, etc. The call for capital buildup is recognized in the subregion. According to the World Bank (2020), 55%, 35%, and 10% of countries in sub-Saharan Africa are under Basel Accords I, II, and III, respectively, implying adherence to various

forms of capital adequacy measures. Moreover, as observed by Yakubu and Bunyaminu (2021) and Oduor, Ngoka, and Odongo (2017), many countries in the subregion have recently scaled up their capital requirements, notably South Africa, Ghana, Zambia, Algeria, and Kenya. The objective is due to the fact that the amount of capital a bank has influences its risk-management incentives and ability to withstand economic shocks.

However, trends in the capital-stability nexus need a closer look. Despite the call for more capital adherence, such as Basel Accord III, there still persist firstly, pockets of bank stability concerns, and secondly, diverging views over the effect of capital beef-up on bank stability in the literature. For the former, Ozili (2018) and Beck and Cull (2013) observe that the fragility of the African banking sector has been in sharp view in recent years, presaged by exchange rate volatility, structural and institutional failures that undermine the effectiveness of banks' risk management tactics. Thus, understanding the effects of regulatory capital on the stability stance of the SSA is imperative. For the latter, while a body of researchers observes significantly positive effects of building capital buffers, as well-capitalized banks have higher tendencies to have reduced risk-taking and able to withstand bank crises (Delis, 2015; Santos, 1999; Van Roy, 2003), others underscore variant observations by asserting that capitalized banks may compromise on efficiency as they consider themselves 'too big to fail.' The reduced competition in this case also increases banking rates, which can exacerbate instability through increased default rates (Berger & Mester, 1997; Berger et al., 1993).

The banking sector regulation and stability hypothesis cannot be discussed as a solo phenomenon or mechanism, as several empirical literatures highlights cogent factors such as industry and macroeconomic environment, corporate governance, etc., to a large extent, conditioning this relationship (Laeven and Levine, 2009). Bermpei et al. (2018) observes that institutional quality could condition the regulation-stability hypothesis by reinforcing or complementing the effect on stability by improving implementation capacity. A well-functioning institutional setting, due to the fact that it has minimal information asymmetry, wields less incidence of adverse selection and moral hazard, thus decreasing monitoring costs necessitated by the imposition of capital requirements. This serves as an incentive for capital regulation compliances (which improves shock management), decreases default rates, or improves loan repayment rates (Bae and Goyal, 2009). The above discussion underscores the need to study the complementary or substitutionary role of institutional quality in the capital regulation-stability hypothesis.

In furtherance of this, the effect of regulatory capital on bank stability may be conditional. In other words, the effectiveness of regulatory capital requirements may not be one-size-fits-all but dependent on first, factors such as industry level, governance, and macroeconomic characteristics, among others, and second, the regulatory capital type implemented. Closely linked to this is the debate on the effectiveness of bank risk-based regulatory capital regulation of the Basel accords. The World Bank (2020) observes that, unlike non-risk-based capital ratios, banks have the tendency to underestimate their risk levels in risk-based regulations, which may endanger the stability of the banking sector. Thus, in the regulatory sense, the need to hold capital, how

much capital, and the type of capital to hold in the context of the underlying institutional structures is a topical issue in the stability discussion.

The corpus of literature examining the nexus between capital and stability, as delineated by Caprio and Honohan (1999), underscores the presence of a heterogeneous empirical landscape, as evidenced by divergent findings (Fratzscher et al., 2016; Odongo et al., 2017). However, despite these empirical observations, the intricate causes and conditions contributing to the observed variations in the relationship remain largely unexplored. Consequently, while some studies (Kamau et al., 2004; Berger and Mester, 1997; Klomp and de Haan, 2014; Martynova et al., 2014; Ashraf, 2017; Jayaraman and Thakor, 2013) endeavor to shed light on these variations, their exploration is confined primarily to risk-based capital models and exhibits a noticeable scarcity concerning the context of sub-Saharan Africa.

Furthermore, in the context of universally expanding equity capital, as cautioned by Berger and Mester (1997), the specific thresholds and mechanisms that instigate these conditional effects have not been exhaustively investigated. The existing body of literature, while offering a rich tapestry of insights, presents a paradoxical landscape marked by contradictions and inconclusive findings. This inconclusiveness implies the presence of critical gaps in comprehending the intricacies inherent in the capital-stability nexus. To address these gaps and enhance our understanding of the subject, further research is imperative.

In consequence of this, the study seeks to examine the comparative effect of risk-based and non-risk-based regulatory capital and the mediating effect of institutional quality on the stability of banks in the subregion. Also,

to contribute to the debate on regulatory capital calibration and the diverging views on the effect of regulatory capital on bank stability, this study explores the level of both simple leverage and risk-based capital regulation necessary to have a positive impact on bank stability.

Purpose of the study

The purpose of this study is to examine the effect of regulatory capital requirements, institutional quality on bank stability in sub-Saharan Africa.

Research objectives

1. Examine the effect of regulatory capital on bank stability in sub-Saharan Africa.
2. Investigate the effect of institutional quality on bank stability in sub-Saharan Africa.
3. Examine the joint effect of regulatory capital and institutional quality on bank stability in sub-Saharan Africa.
4. Examine the threshold effect of regulatory capital requirement on bank stability.

Research hypothesis

The study is predicted on the general capital-stability hypothesis and seeks to specifically examine the following hypothesis;

1. H_0: Regulatory capital has no effect on bank stability.

H_1: Regulatory capital effects on bank stability

2. H_0: Institutional quality has no effect on bank stability.

H_1: Institutional quality affects bank stability.

3. H_0: Institutional quality and regulatory capital do not jointly affect bank stability.

H_1: Institutional quality and regulatory capital jointly affect bank stability.

4. H0: There is no threshold effect of regulatory capital on bank stability

   H0: There is a threshold effect of regulatory capital on bank stability.

Significance of the Study

Due the fact that macroeconomic policy effectiveness borders on systemic effects, findings of this study are important to policy makers especially central banks and their regulatory bodies, researchers and development experts in terms of determining measures to ensure both idiosyncratic and systemwide resilience of the financial sector. In the sub-Saharan African region, the central bank is the main agency in charge of these policies for which both financial sector and the real sector stability are of their major concern due to their interconnections. Thus, since bank stability has become a topical issue in recent times, the study will inform policy makers on the channels through regulatory capital affect stability in the lenses of institutional quality.

The outcomes of this study are significant to the government and its policy-makers, analysts (especially researchers) and the general public. As for government, this study outcomes are an eye-opener on capital-stability nexus, thus, enabling policy-makers like central banks, finance ministries, etc. to make effective banking sector stabilization policies. The findings contribute to existing theories and practices as well as serve as a reference point in discourses on regulatory capital requirement, institutions and bank stability.

By investigating the interplay between regulatory measures, institutional frameworks, and the stability of banks, the study contributes to the overall financial well-being of individuals and businesses. The findings

inform policymakers about effective strategies to enhance regulatory capital requirements, thereby safeguarding the financial interests of depositors and investors. This, in turn, fosters consumer confidence, promoting trust in financial institutions and mitigating the risks of bank failures that could have far-reaching consequences on employment, investments, and economic stability.

The dissemination of these findings to the public enhances financial literacy, empowering individuals to make informed financial decisions, and promoting a transparent and accountable banking environment that aligns with the broader interests of the public.

Delimitation of the study

This study focused on sub-Saharan Africa. Covering a period of 11 years, the study will use sub-Saharan African countries with adequate data that can sourced the databases of the world bank's international financial statistics, world governance indicators and world development indicators as well as other relevant materials.

Limitation of the study

The study was strictly limited to the number of years and countries used. Needless to say, though a better understanding would have been observed if the study had employed more countries in the subregion and a wider year to obtain a clearer picture of the situation, the study would still reach a detailed understanding of the capital-stability nexus.

Organization of the Study

The study will be organized in five chapters. Chapter one presents a background to the study, statement of the problem, objectives of the study,

hypotheses of the study, significance of the study, scope of the study and the organization of the study. Chapter two presents the major themes so far as bank stability and capital regulation policies are concerned, theoretical and empirical literature review on the relationship between regulatory capital policies, institutions and bank stability. Chapter three will highlight the methodology to be employed in the study. The fourth chapter will present results of the study by analyzing and discussing the findings with respect to the literature. To crown it all, the fifth chapter will conclude the study by presenting the summary, conclusion, recommendations based on the outcomes of the study, limitations and other suggestive areas for future research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter contains a review of relevant literature for the study. The review of literature is divided into two sections. The first section discusses background issues, the concepts of financial stability and institutions, as well as tools and policies developed and used in bank stability analysis. The theoretical literature on the impact of these policies on bank stability is also presented. The second section focuses on the review of empirical literature on institutions, regulatory policy and banking sector stability. As the world, for that matter Africa, continues to investigate ways of solving or mitigating the impact of financial crisis owing to the incidence in the past, studies highlighting the link between economic policies and the stability of the financial sector shall continue to dominate within the circles of policy debate. This study explores the interplay of capital regulation and stability in the context of the underlining institutional structures.

Overview of the financial sector and capital regulation in SSA

Moyo et al. (2014) mention that though the financial atmosphere of SSA countries is largely underdeveloped in terms of depth and efficiency, it has moved from being a narrow financial system to one characterized by a more comprehensive banking sector concentrated with large foreign-own banks. Specifically, Beck et al. (2011) states that the average total asset of a non-African bank is USD 1 billion vis-à-vis USD 220 million of an African bank. The majority of SSA banks are risk-averse and prefer to invest in relatively more appealing government treasury securities. The banking

system's reliance on government securities has hampered active financial development and the expanding of capital and money markets, primarily because banks purchase and hold these securities to maturity without the need for secondary market trading.

Ikhide (1998) documents in Nigeria that, a robust secondary market meant to foster active participation could hardly thrive in an institutional certain where there's high dominance of primary market for government securities. As a result, the economic effect of bank lending in SSA has been limited as firms with a questionable credit history are cut out of the credit market. Another drawback of financial reforms in the most of SSA countries is the failure to encourage the development of alternative sources of financing. It is interesting to note that the average value of the stock market relative to GDP with and without South Africa was 42% and 23% respectively in 2011. This thus, indicate that save South Africa, most of the SSA countries' capital markets are severely underdeveloped.

Following the 2007-2009 world financial crisis, in order to achieve a more stable banking system, strict regulatory standards such as higher capital adequacy requirements were implemented. The need for more bank capital is as a result of the belief that banks with stronger capital bases are more capable of withstanding financial distress, and invariably boost financial system stability (Santos, 2001; Van Roy, 2005). This has prompted most African Central banks to implement the Basel accords on capital requirement, among others. For instance, according to Oduor, Ngoka and Odongo (2017), the minimum capital requirement for commercial banks in Zambia was raised from $8,240 to $2.2 million in 2007, while in Kenya, the capital base for

commercial banks was augmented from $3.3 million in 2008 to $12.5 million by 2012. Furthermore, they assert that the South-African Reserve Bank (SARB) in 2013, saw to the implementation of a raise in the capital requirements to 250 million rand. Similarly, in Nigeria, a minimum capital base of twenty-five billion naira was implemented for all commercial banks in 2005 by the apex bank.

In terms of the Basel accord regulation, the World Bank (2020) observes that relative to South Asia and the Middle East and North Africa (MENA) regions, the adoption of the Basel standards has been slow since more than half (55%) are still under Basel I with only 10% practicing Basel III. In furtherance of this, among the SSA countries that have implemented Basel III, only two-thirds have put in place a capital conversion buffer (puts limit on a bank's discretionary distributions when common equity falls into the buffer range) as compared with countries in other regions. The implementation of the countercyclical capital buffer (to handle credit risk or future potential losses) and the leverage ratio requirements is also slow.

Bank capital and the capital-loss absorption mechanism

The concept of bank capital can be in the economic sense and the regulatory sense. For the first option, it implies the value of the equity owned by shareholders (Mosko & Bozdo, 2015). The second option underscores the level of capital required of bank by regulatory bodies to fund their activities often in the form of a ratio. The numerator represents the required capital base, while the denominator represents the bank's assets, which can be unweighted or risk-weighted. In bank stability discuss, bank capital remains a key ingredient for limiting bank risk taking and protecting depositors by absorbing

losses in times of crises. The need to hold capital and how much capital to hold is of global concern and it depends on the extent of bank's risk. On the bank balance sheet, bank capital represents the second component on the liabilities side after debt. Bank regulatory capital, as the amount of capital required of banks to ensure the smooth running of their intermediation functions without interruptions by losses, generally includes shareholder's equity capital (core capital) in the form of common stock and retained earnings, cumulative preferred stock, loan provisions, etc. According to the World Bank (2020), the regulatory capital as an instrument of bank stability is divided into tiers; Tier 1, considered as the safest and Tier 2, consisting of instruments considered less safe. Figure 1 represent the bank balance sheet. As an outlay or a tool for monitoring unexpected losses, it refers to the difference between the assets (cash, investments and loans) i.e., the supply side and the liabilities (demand deposits, shareholder equities, etc.) i.e., the demand side. If a bank's assets are less valuable than its liabilities, capital can act as a buffer, absorbing unexpected shocks and allowing the bank to remain solvent and operate.

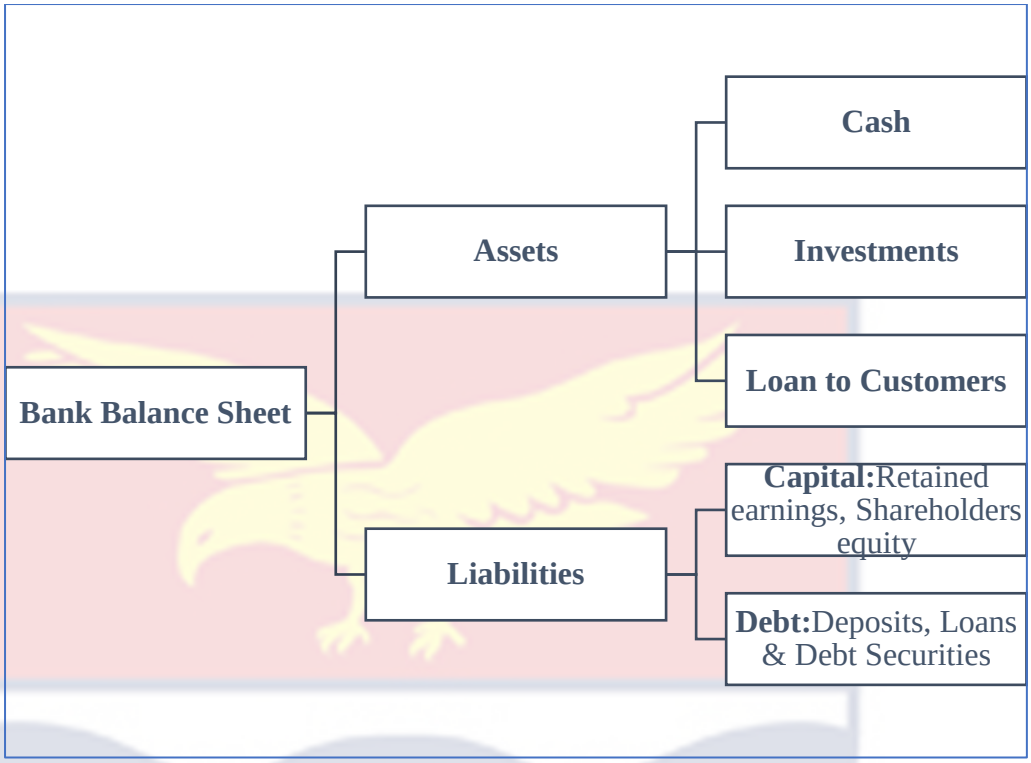

Figure 1: Bank Balance Sheet.
Source: Authors own construct.

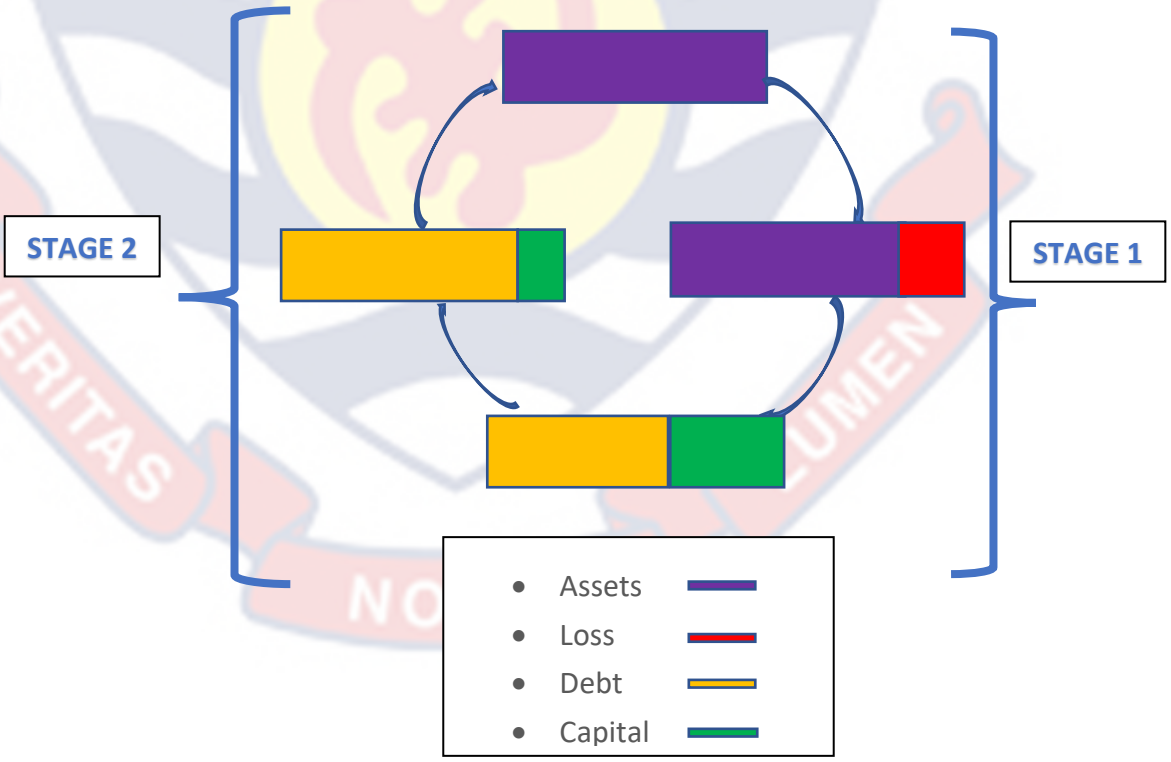

Figure 2: Capital-Loss absorption mechanism.
Source: authors own construct.

In times of bank crisis, capital acts as a buffer or a cushion against losses to the bank. For example, in the event of panic withdrawals, in order to have the bank's intermediation function undisturbed or avoid bankruptcy, the bank uses it capital base accumulated in adherence to regulatory capital requirements to maintain a sound system. From the figure 2 above, in stage one, on condition that the bank falls into crises (e.g., increased default rate emanating from NPL, panic withdrawal, etc.) that leads to the depletion of a fraction of the bank's assets, it falls on its capital buffer to absorb the loss without becoming insolvent (stage two). Thus, adherence to the regulatory capital requirements instituted by regulators, the bank builds or rebuilds its capital base in order to withstand future crises. Capitalization should thus assist banks in reducing default risk and increasing their chances of survival during times of financial turmoil.

World Bank (2020) it must be noted that in this event, the quantity and quality of capital is key to the ability of the bank to sufficiently manage the crises. In terms of quality, the Basel accord regulation divides the capital composition into tiers 1, 2 and 3 where tier 1 forms the core and the most preferred. In terms of quantity, the Basel Accord III postulates a general minimum required regulatory capital (risk-weighted) of 8%, with at least 4% in the form of Tier 1 capital and 2% in the form of common equity.

Concepts of banking sector capital, regulation and stability

Concept of Bank stability

The concept of financial stability (and its subsections) and its precise definition, is a challenge in literature as there exist complex interdependence and interactions among variable within the financial system as well as with the

real economy (Gadanecz & Jayaram, 2008). A financial system stability is noted to be robust to external shocks as well as internal imbalances (Allen & Wood, 2006; Padoa-Schioppa, 2003; Houben et al., 2004), taking into consideration all the subsectors viz banking, insurance, pension and the capital market subsectors.

Bank stability represents the state of the banking system that has the capacity to endure shocks and financial imbalances such as bank runs and insolvency emanating either from external sources (systemic) and internal sources (idiosyncratic) thus avoiding a discontinued financial intermediation process necessary to ensure the welfare of market participants both in the financial and the real sectors (ECB, 2007; World Bank, 2019). In other words, a stable banking system will absorb shocks and prevent adverse incidence from disrupting the smooth functioning of real economy or its interactions with the banking system. A system free from instability is free from bank runs, insolvency, liquidity or currency crisis, debt and equity crisis (leverage ratios), just to mention a few (Gadanecz & Jayaram, 2008; World Bank, 2019). In furtherance of this, due to the complexities in defining financial stability and the difficulty of identifying stability variables, many studies use different measures to capture financial fragilities notable being the Z-Score which reflects the tendency of a banking default (Altman, 1968; Altman et al,1977; Boyd and Graham, 1986; Hannan & Hanweck, 1988; and Uhde & Heimeshoff, 2009). Among many others, loan-to-value ratios, loan loss provision to total loans to capture credit risk in the banking sector, standard deviation of private credit to GDP to capture financial imbalances, and the CAMELS to detect financial distress have been used by Iannotta et al. (2007),

Loayza and Ranciere (2006) and Mannasoo and Mayes (2009) among others. Composite indicators have also been used to measure financial stability (Hollo et al, 2012).

The banking sector, as a significant section of the financial system, plays a critical role in most developing and developed countries' financial intermediation processes, necessitating continuous monitoring and implementation of appropriate regulatory changes to enable the sector to perform its functions effectively and efficiently. Because the factors of banking stability and their impact on financial system stability vary by country as well as the fact that a crisis in one bank may affect others in what is called the contagion effect, regulators of national banks are interested in learning more about them.

A stable banking system is required to achieve efficiency in financial intermediation by channelling surplus funds for investments through the supply of credits by banks and other financial institutions to encourage rapid economic growth (King & Levine, 1993). However, banks' credit-creation operation opens them to liquidity issues and default risks, which could have a negative impact on profitability and, as a result, the overall stability of the financial system. Bateni, Vakilifard and Asghari, (2014) have postulated that banks and other financial organizations must achieve a balance between adequate capital and the creation of credit assets in order to encourage stability.

To create a stable and secure banking system, banks are examined and monitored using the CAMELS framework, which stands for Capital adequacy, Asset quality, Management quality, Earnings ability, Liquidity, and Sensitivity

(Roman & Sargu, 2013). These metrics, which have been acknowledged and recommended by the IMF and the World Bank (2005), are far more important in determining bank stability and soundness than bank size, which can be misleading and does not always represent soundness. Larger banks that are considered "too large to fail" are more likely to participate in high-risk banking operations that expose them to market hazards than smaller banks that are more cautious and engage in lower-risk banking activities.

Banking sector regulation

The implementation of capital adequacy regulations is theoretically and empirically relevant to deal with the risk of contagion and minimize fragility through the creation of "circuit breakers". In other words, the necessity of global financial regulation is seen its effectiveness mitigating the risk of bank failures as the occurrence of the 2007 GFC is explained by the existence of the moral hazard problem and information asymmetry caused by weak regulations and its implementation (Stiglitz, 2010; Vuckovic, 2010). Recent concerns on the stability of the banking sector not only centre on bank regulation, but the quality and the effective implementation of these regulations, outdating the narrowed and highly politicized regulatory compliance schemes existing in the financial space (Rodríguez, 2003; Barth et al, 2013; Das et al, 2003). Highlighting the essence of financial regulation, the need for a more wholistic regulation that encapsulates not only robust capital adequacy measures but very recent implementation modules of supervision, market discipline and regulatory governance stands paramount. The potency of a regulatory compliance scheme is its ability to minimize the information asymmetry problem and promote private sector corporate control for

improving bank stability. Tadesse (2006) opines that there's minimal tendencies of banking sector crises in the presence of regulatory schemes that prescribe robust bank disclosures and strict auditing procedures. However, Africa is least said in the context of sound regulatory framework given the attending challenges associated with its economic development agenda that lacks the policies and governance for regulatory compliance (Laderkarl & Zervos, 2004).

According to Boyfield (2009) and Jones (2000), closely linked to the challenges capital regulation is the unintended consequences of regulatory arbitrage where banks forfeiting compliance to the regulatory capital requirements, substitute for portfolios in comparatively informal and less regulated markets that promises high return but high risk since banks to do adjust their portfolios to reflect the economic risk attending them. This invariably undermines the effectiveness of capital accords and regulatory tools intended to militate against bank failure.

As a sector characterized by higher leverages, volatility and fragilities, financial crisis is inevitable (as market participants constantly seek to place their private benefit above the social optimum) without regulations to enforce information disclosures, healthy intermediation activities and calculated risk taking. From micro to macroprudential regulations, the financial sector has seen phases of varying approaches and tools suit for curbing both systemic and idiosyncratic crises. This section outlines some theories and empirics on the call for banking sector regulation for that matter, capital regulation.

Micro prudential regulation

This serves to curb crises at the individual bank level. This is called idiosyncratic crises. In the face of deposit insurance coupled with moral hazard due to information asymmetry, banks have greater incentive to take excessive risks in what is called 'reach for more yield' due to the presence of government bail outs and minimal depositor monitor. The micro prudential regulator ensures the bank maintain a capital ratio of bank capital to its assets, necessary to keep the bank's probability of failure at a tolerable level. Hanson et al. (2011) put forward that the primary objective of a micro prudential regulation is to reduce the moral hazard problem and either minimize the likelihood of losses or force banks to internalize the losses. In furtherance of this, the bank is made to raise capital (equity) from which losses made on the bank's portfolios will be used to restore back to previous position necessary for smooth running of the bank rather than falling on the deposit insurance fund. Alternatively, though healthy in the idiosyncratic sense, the bank can as well shrink its assets in order to maintain the regulator's tolerable level of bank probability of failure. This pose serious challenges of credit crunch in the systemic sense, which is very detrimental to the overall growth on the economy through reduced credit extension for private sector growth, investments and employment. This then calls for a regulation, more systemic in its objective.

Macroprudential Regulation

In an attempt to control the effect of multiple shrinkage of bank asset rather than raising enough capital, regulators resort to macroprudential regulations which is systemic in its objectives. Thus, it forms the main

regulation to control the collapse or the cost associated with the fall of the financial systems or the shrinkage of many financial institutions hit with a crisis (contagion effect). As noted earlier, shrinkage of several banks' asset results firstly in credit crunch through lending cut and this affect investment and employment, plunging the whole economy into contractionary periods. Secondly, asset shrinkage results in fire sale of undervalued assets and this reenforce the credit crunch since the market equilibrium will always favour potential buyers who has the option of choosing between new loans or buying these troubled securities.

Macroprudential policy regulations refers to policy tools that are implemented with the objective of preventing financial imbalance or limiting its impact as well as curtailing the macroeconomic effect attendant with it. Hollander (2015). Handled by the government or not, as the case differ from country to country, these financial policy tools are specific requirements, restrictions and guidelines intended to ensure the stability and the integrity of the financial system that is to maintain confidence in the financial system, improve the resilience of the financial systems to internal and external imbalances as well as protecting financial market participants (Kronke, 2008). Kronke (2008) in addition, maintains that, a financial sector regulation among many others, is predicated on credit risk (booms), options of raising capital and financial collateral that is, the housing sector regulations. Also, Einsele (2018) adds that, a classic regulation borders on financial restrictions on institutions regarding trans-border banking transactions, deposits, lending and collateral guarantees which maximizes efficiency of risk transfer through the financial collateral structure.

Given the fact that it is safer for banks to raise additional capital to cater for losses or enough capital as contingency or buffer for future crises, why do banks often opt for shrinking their assets that is reducing the denominator coefficient of their capital adequacy ratio? Understanding this phenomenon can be done in two ways that if the banks are already in crises or not. Various researchers assert that;

Firstly, the debt overhang problem claimed by Myers (1977) may be identified with this phenomenon. In a systemic crisis, a troubled bank with an impaired debt will be unwilling to fund investment with new equities since returns will be siphoned off by the large creditors of the bank. In other words, owners of the bank would view injecting more equity into the bank as a negative-NPV project, even if it increases total value of the bank, because the returns are shared between the interconnected banks. (Hanson et al. 2011; Thakor, 2014)

Secondly, in the absence of a crises, the political economy incentivizes banks owners to shirk funding by equity. The financial sector and the government are two inseparable entities that constantly interact for both community-based benefits and private benefits on both parties. The intermediation activities of the banking affect the allocation of resources and economic growth, a principal objective of governments since the effectiveness of governmental intervention to some extent depend of the financial atmosphere. However, in the political space, the politicians' whims and caprices may prevails through regulations to serve their private benefit together with the social benefits. In furtherance of this, banks in order to win certain contracts and exemptions, may dance to the political tunes of the

prevailing government through negotiations. This may involve compliance to regulations if the bank perceives the regulations to be burdensome. Thus, through the political economy, a sufficiently convincing and politically positioned bank may prevail in defeating the push for higher requirements, thereby evading the apparent costs of compliance.

In addition, banks are highly leverage and averse to higher capital requirements due to deposit insurance and credit rating opportunities and tax benefits. Merton (1977) mentioned that bank capital shares a negative relationship with the value of the deposit insurance fund. Thus, bank managers will be reluctant to keep capital high when the bank is insured. In furtherance of this, the presence of these insurance protections and bail outs that bank debt generates, the credit ratings of the banks are generally low as compared to if the bank was not protected. Thakor (2014) reveal that this implies a subsidy that is not available with equity. Also, Modigliani and Miller (1963) posit that banks are highly leverage due to the relative tax benefits on debt interest payments to dividends payments on equity. banks find high leverage attractive due to the tax advantage on debt interest payments relative to dividends on equity. Kok and Schepens (2013) and Schandlbauer (2013) affirms this scenario in a 2006 Belgian tax code and the U.S. state corporate taxes respectively. In the case of the former, bank capital ratios saw a significance increase due to the permission of a tax deductibility return on book equity and the later saw under-capitalized banks alter the asset side of the balance sheets while well-capitalized banks increase their leverages due to the taxes.

Macroprudential tools

In the wake of bank regulation given the advent of bank crises, it is the regulators' objective to prevent banks from shrinking their asset in order for its capital to asset ratio to fall and encourage them to raise adequate equity to cushion the bank against shocks to its value. Among the toolset are;

1. Countercyclical capital buffers. Regulators through this scheme demand banks' capital ratios to follow the business cycle. Banks are asked to maintain high capital ratios in booms than in recess. Previous prudential requirements were cyclical in nature. This provides the bank with the financial base to smoothen pressure in times of crises like bank runs in order to maintain the confidence in the financial system instead of shrinking its assets (Kashyap & Stein, 2004)
2. Given the advent of financial crises, regulators are not only concern about the quantity of the capital buffer but the quality of capital as well. Prudential regulation underscores the importance of the ratio of total Tier 1 capital (core/common equity, preferred stock, etc.) to risk-weighted assets. In furtherance of this, with the objective of reducing losses and keeping the banking sector safe and protecting the deposit insurance fund, keeping the deposit insurer senior to the common equity holders in terms of priority will provide the needed loss-absorption buffer. In addition, Hanson et al. (2011) posit that common equity is more friendly to the recapitalization process than preferred stock because it is more junior and hence less problematic in terms of the debt overhang problem. Demirgüç-Kunt et al. (2013) mentioned that higher quality capital displayed a stronger correlation with

subsequent stock market returns than other capital, justifying Basel III emphasis on higher quality capital in the form of Tier 1 capital of common equity.

3. A distress bank who is constrained by regulators to repair its capital ratio may opt to beef up the ratio by reducing the asset base. As a result, Hanson et al. (2011) disclosed that regulators may target actual capital instead of ratios by creating an incentive for the bank to raise incremental currencies of the new capital. This is done by giving the bank no choice than to maintain a capital ratio above the required level relative to both the current year's (t) and the future year's (t+1) asset in the incremental sense. Thus, the absence of bank discretion in this sense reduces the adverse selection associated with the capital ratio.
4. Contingency capital. According to World Bank (2020), Basel III introduced two new capital buffers that is the capital conversion buffer and the countercyclical capital buffer. In the event of triggering financial shock such as a fall in stock prices below a pre-specified edge or bank portfolio losses that lead to the depletion of regulatory capital below a threshold, the convertible buffer (debt instruments) can be converted to equity. Thus, in times of bank crisis, these bonds can provide supplementary capital to help stabilize the bank by absorbing losses (Calomiris & Herring, 2011).

The Basel Accord regulations and bank capital adequacy

In a more narrowed view, capital regulation in the financial space has receive much attention in recent times due to the emergence of its use to curb financial crisis. The regulatory process that engineers the level of capital

needed in the banks' vaults to withstand the shocks originating from its operations and to perpetuate its financial health and soundness forms what is called capital regulation (Ejoh & Iwara, 2014). In other words, since banks thrive on debts, maintaining a sufficient capitalization is necessary to maintain depositor confidence.

As the amount of capital resources that a bank should have under regulatory restriction, capital adequacy functions as a cushion against losses and it's thus an indication of the financial soundness of the bank. A sufficient capital held relative to the risks of the bank's portfolios, foster its stability. The capital adequacy ratio, often computed as the ratio of bank total capital to total assets (which can be risk weighted or not) or the ratio of total equity to total assets, is empirically employed as a gage for determining the capital adequacy of the bank (Athanasoglou, Sophocles & Matthaios, 2008; Bateni, Vakilifard & Asghari, 2014; Diamond & Rajan, 2000; Al-Sabbagh, 2004; Dang, 2011; Roman & Sargu, 2013)

However, the literature on bank's capital adequacy hypothesis is inconclusive because though the primary aim of regulating bank's capital is to ensure stability by minimizing the banks' excessive risk taking and maintaining confidence in the financial system, the existing empirical studies on bank capital adequacy requirements relative to their actual capital levels presents mixed findings (Martnova, 2015). This marks an indication that capital beef-up may exacerbate banks' risk-taking tendencies leaving the debate whether capital requirements actually influence banks' real capital choices unsettled. Nonetheless, to protect the depositor, the deposit insurer and maintain the safety and continuity of the banking system, bank regulators

implement capital prerequisites and monitor bank compliance. International efforts to harmonize capital standards emerged in the 1980s, and the international meeting of bank capital regulation began with the 1988 Basel Capital Standards Accord.

The primary objectives of the Basel Accords are: to perpetuate a globally sound financial banking system, maximize the benefits of a competitive financial market and provide a robust financial scheme for curbing shocks. The postulates of hinges on four divisions namely types of capital and their ratios with their corresponding risk weights and a strategy for its implementation. Thus, bank capital; its type and ratio, weighted or not was central in this framework in order to minimize risks. As postulated by the Bank for International Settlements (2011), Basel accord one (I) required banks to hold a regulatory minimum capital (both tier 1 and tier 2) of eight percent (8%) of their risk weighted assets. Risk weights were categorised into 0%, 20%, 50% and 100% with 0% as riskless assets such as cash at hand and 100% indicating highly risky assets such as Eurobonds. Implementation was designed to be transitional spread across a number of years.

Basel II was designed as a response to the banking crises of the 1990s. the regulatory tool kit had strict compliance with the 8% minimum require capital, two methods of calculating credit reserve i.e., the standard and the Internal Rating Based (IRB) approaches and a system that allowed banks to calculate their own operational risk using the Value at Risk (VaR) method. The VaR method however, managers the opportunity to understate the actual risks present in their vaults. This was addressed by the introduction of the Basel accord III by the addition of leverage and liquidity coverage ratios to

enhance the banks' ability to withstand financial shock as it became necessary owing to the GFC of 2007 where Basel Accord II failed (Basel Committee on Banking Supervision, 2010).

Non-risk-based and risk-based capital regulations

The banking sector and capital requirements are bedmates since the introduction of the later in early 1980s. However, the internationally popular standards are the risk-based capital regulations officially introduced in 1989 called the Basel Accord (see section above). This framework relied on capital ratios weighted according to the risks associated with the banks portfolios to promote bank soundness and a yardstick to signal the necessary intervention of regulators. This regulatory type was necessitated by the concerns that banks circumvent their capital ratios less of what is socially optimum based on their risks. Because regulatory enforcement imposes significant costs on banks, it serves as an important incentive for banks to limit risk-taking (Westermeier, 2018).

As stated in the previous section, unlike the simple leverage ratios, the risk-based ratios required banks to keep capital in proportion to their risk-weighted assets which will help reflect the actual risks of default associated with the bank's portfolios. Both risk-based and non-risk-based capital requirement are used in stability studies with varying relationships in terms of the threshold level and the impact.

There is an ongoing discourse on the level and type of capital banks should have among regulators and academics. Lev Ratnovski (2013) highlighting on the difficulty of quantifying regulatory capital in precrisis periods since banks understated risk weights, claim that the rule of thumb of

converting the non-risk-based leverage ratio into the risk-weighted capital is to multiply it by 2; thus the 3% of the Basel accord III will be 6% which is half of the 8-12% required of banks. Akin to the Basel Accord III, they use a non-performing loan ratio of 19% and a Schuermann (2004) loss given default of 50% (9.5% loan losses) among OECD countries and find that a suggested capital regulation of 9% equity-to-total-assets ratio (leverage), corresponding to 18% equity-to-risk-weighted-assets ratio (risk-weighted capital), would protect banks from the majority of asset shocks of the magnitude seen in OECD banking crises.

Calibrating a sufficient level of regulatory capital necessary for bank stability as well as choosing between risk-based and non-risk-based regulation is an active debate in the financial space among regulators and academics with varying views. Admati et al. (2010) in a Financial Times paper opines that a 15% or higher of equity to total assets ratio (non-risk-based) would prevent future bank crises. Hellwig (2010) submitting to the discussion on the potency of bank capital in curbing stability assert that the aim of regulators should be to increase regulatory capital substantially above 10% and even closer to 20% or 30%. Miles et al. (2012) using a data on shocks to income for varying countries over a period of 200 years disclose that proportional increases in bank capital results in small impact implying that the bank's funding would still be 90% by debt. They note that substantially higher regulatory capital requirement (risk weighted) would help in reducing the probability of systemic banking crises. Specifically, their view is variant of the requirements of the 10% risk weighted assets of the Basel accord III, suggesting rather 16% to 20% as the optimal amount of bank capital to risk weighted assets

According to Goodhart (2012), the marginal social return on adding more equity at about 20% of (risk-weighted) assets cease to be greater than its marginal cost which is about 12% of total assets. They suggest a threshold regulation since the ratio of equity to total asset cannot exceed 100%. Based on the 20% threshold observed, they suggest banks are allowed to choose their level between 20 and 100% ratio depending on their business model. If an economy has been practicing a certain level of capital requirement, Martinez-Miera and Suarez (2012) opines that the transition to higher levels is beneficial but should be gradual. Using a DSGE model to study the macroeconomic social optimum of regulatory capital requirement, they observe an optimum level of 14% capital requirement using 7% as a base level with a gradual transition period of 9 years.

Excessive loan growth is known to be positively related with default rate which has negative connotations with the stability of the bank if there is no sufficient capital to serve as cushion to the asset damage. In furtherance of this, Bernanke and Lown (1991) and Peek and Rosengren (1992) opine that there is a positive relationship between the non-risk-based capital-to-asset ratio and loan growth. Brinkmann and Horvitz (1993) in a comparative study of the risk-weighted standard ratio and the capital-to-asset standard ratio, taking into consideration the size of the bank, observes a greater boost in loan growth with risk-based standard relative to the capital-to-asset standard among large banks with little differentiation among smaller banks (under $300 million in assets). In addition, Furfine (1994) in a dynamic model studies the bank's contemporaneous capital-to-asset and its risk-weighted capital ratio in a nonlinear fashion and mention that the bank's ratio of capital to risk-

weighted-assets ratio had a large positive effect on loan growth while the bank's non-risk-based capital ratio had a large negative effect on loan growth suggesting that the risk-based capital requirements have a significant impact on bank lending reduction.

Despite the objectives of the accord however, economies especially emerging economies face the challenge of risk weight representation. According to Abdel-Baki (2012), emerging economies face the challenge of excessive drain of foreign funds due to high risk-weights imposed on long term market debt which encourages hot money transactions. In addition, emerging market experience significant reduction in their loan-deposit ratios due to overestimation of risk weights of commercial and sovereign loans.

Also, though Basel Accord III seeks to deal with the procyclicality of the capital requirements, yet the demands of risk weights are inherently procyclical in nature. This is seen in increased motives of lending in booms where the probability of default decrease and economic recessions which results in credit crunch due to increased risk of default. This affects highly rated borrowers directly (Griffith-Jones & Spratt, 2001). Closely linked to this is the issue of proportionality and simplicity as submitted by the World Bank (2020). The regulatory tool kit may not be a one-fit-all for all countries thus the adoption of specific regulatory element should reflect the sophistry of the banking environment with differentiation between the regulatory needs of developed countries and that of the developing countries since more complex operations, and tougher supervisory power may not be suitable for the later. They also claim that simple capital ratio may be reliable than the risk-weighted ratio as risk-based regulations tends to be less informative due to

measurement difficult. Simple leverage ratio also leaving no room for banks to circumvent about their risk weights and is comparatively transparent and verifiable (Haldane, 2011; Calomiris, 2012).

From the forgoing, it is understand that both risk-based and non-risk-based presents varying observations on the impact on stability and the level necessary to ensure stability. Due to the inherent difficult of risk calculation and the tendency of banks to circumvent the actual riskiness of assets with respect to the risk-based capital standards on the one hand and the inability of the non-risk-based capital standards to commensurate the level of risks inherent in a given bank's portfolio on the other hand, coupled with the discrepancies of the threshold level necessary to ensure stability, more empirical studies are needed in this regard.

Theoretical Framework

This section attempts to render an exposition on related theories regarding regulatory capital requirements, institutional quality and bank stability as well as the relationships and transmission channels existing among the afore mentioned variables.

Information asymmetry, moral hazard and regulatory capital requirements

Agoraki et al. (2011) and Barth et al. (2004) states that when there is more private monitoring present, the extent of a bank's nonperforming loans reduces, implying stability of the bank. However, in the presence of information asymmetry, private monitoring becomes difficult resulting in higher levels of moral hazard (Klomp & de Haan, 2014). Regulatory capital requirements by increasing the liability of the bank in what is called 'more

skin to the game' reduces the opportunities for excessive risk taking by the bank and increasing the bank's monitoring activities thus solving the double moral hazard problem which enhances the stability of the bank. In furtherance of this, a well-capitalized banking institution is noted to be efficient and stable due to the moral hazard conditions that is a bank near bankruptcy (undercapitalized) turns to take more risk by pursuing their own interest than a bank far from bankruptcy. The theory of 'too big to fail' also stands contrary to this theory. When banks become well capitalized, bank managers turn to take more risk since they see bankruptcy afar off which affect the stability of the banking sector.

Hakenes and Schnabel (2011) also opines that increasing capital requirements exacerbates the investor moral hazard problem. As seen, due to the difficulty associated with equity financing, banks often turn to adjust the asset side of the capital adequacy ratio purposely to meet the supervisory capital requirement. This induces banks to decrease aggregate deposit volume (due to equity financing) and loan volumes which in turn increases loan rate due to the reduced aggregate loan volume. The increase loan rate is as a result of weakened banking sector competition and this results in increase risk-taking by investors or entrepreneurs with it attending stability implications of higher default rate.

Boyd et al. (1998) documents a positive relation between regulatory requirements and improved social welfare and stability. In the presence of well-functioning deposit insurance, bank managers are incentivized to wield excessive risk due to the moral hazard problem of not bearing the consequences of default because of the insurance. Thus, bank activity

restrictions through capital regulation are beneficial for ensuring stability under these circumstances. Barth et al. (2004) reveals a positive correlation between deposit insurance and stringent capital requirement since the former exacerbate the moral hazard problem causing major bank crisis thus countries adopt the later for risk curtailment and stability.

Regulatory capital, risk-taking and intermediation cost of banks

Risk-taking; an incentive to borrow and lend stands as one of the prominent channels discussed in literature through which regulatory capital impact bank stability. Regulatory capital compliance increases bank managers skin to the game which in turn increase their incentive to thoroughly screen and monitor borrowers. This due diligence in loan supply procedures which according to Agénor and Pereira da Silva (2017) help mitigate risks in the banking sector by eliminating specific type of credit (loans to risky borrowers) rather than the amount of credit that the bank provides, not only mitigate against excessive credit growth but also reduces bank credit risk or default rates thus helping the banks avoid bankruptcy. In furtherance of this, reduced default rates in the long run will boost investor/depositor confidence in the financial system thus promoting growth and profitability of the banking sector (since it is deemed safer to reallocate their portfolios towards deposits) through lending. The increase in the core bank portfolios also promote economic growth all of which share a positive relationship with bank stability.

According to the double moral hazard problem due to information asymmetry hinted by Holmström and Tirole (1997), both the bank and borrowers have the incentive to shirk practices. That is, while borrowers opt for less productive projects with high non-verifiable returns banks shirk

monitoring due to the cost associated which increases the likelihood of default. Thus, regulatory capital requirement serves as an insurance avenue to compensate depositors if the bank fails and to an extent help the bank continue with its activities. However, it must be noted that to deal with the moral hazard problem associated with borrowers as stated above, banks will have to bear the intermediation (monitoring) cost which may offset the effect of the capital requirement by not only reducing the supply of loanable funds but lessens the bank's incentive to monitor if the private benefit of the borrower's project is not decreasing with the intensity of the monitoring.

Bank leverage, regulatory capital and bank stability

The impact of bank capital on the stability of the banking sector also largely depends on its effects on the banking activities of lending, liquidity creation and shareholder value. Literature assert that banks are highly leveraged and that is beneficial to the bank due to the supposed rent associated with bank deposits. Though bank deposit forms a major form of bank liability, Song and Thakor (2007) argue that banks through the provision of liquidity and transaction services to depositors serves as a source of rent. This is among other the reason why banks are leveraged. Bank capital regulation on the other hand, mandate bank to fund their intermediation activities by raising enough equities to ensure stability of the system. However, Thakor (2014) ague that requiring banks to fund with much equity does not affect the value of the bank due to the fact that the equities need not replace the rent-generating deposits. Should the lending opportunities of the bank exceed the deposit and equity levels, the bank will invest the fraction left thus increasing its asset value.

This, however is not a guarantee of a positive relation between bank activity to higher capital requirements. Given that there is a socially optimal level of bank deposits, higher capital requirements may compel banks to keep less in deposits. Also, under the assumptions that banks provide reliable liquidity services and that there is an optimality for bank size, requiring banks to hold excess equity could be detrimental. According to DeAngelo and Stulz (2013), requiring banks of some optimal finite size to hold equity reduces the bank's liquidity creation, so allowing banks to be highly leveraged is both privately and socially optimal.

Higher leverage positively affects the stability of the banking system as it induces monitoring discipline thus ensuring the smooth running of bank activities of lending and liquidity creation. In the absence of deposit insurance, depositor risk increases as there is it results in uninsured debt. Thakor (2014) posits that, in this occurrence, depositors are incentivize to monitor the management of the bank. This is known as the 'effect of debt'. Informed depositors threaten the bank of withdrawal of funds in case they realize or suspect that the bank is in trouble. For fear of panic withdrawal bank managers maintain the integrity of the bank. This discipline induce by depositor monitoring ensures the stability of the bank. Unlike debt threat, equity required of bank by regulators does not have the tendency to arouse the same kind of threat needed to ensure the honesty of banker. The Calomiris and Kahn (1991) argument is that equity lacks this premature-withdrawal threat and is therefore not endowed with the same disciplining potential though may incentivize banks to keep more capital to avoid creditor panic withdrawal. It must be noted however, that the 'effect of debt' hypothesis is effective under

the assumptions of no information asymmetry, no deposit insurance and optimal monitoring cost (e.g., auditing cost) where depositors have access to information from the banking system and that Deposit insurance removes much of the monitoring incentive of informed creditors.

The Capital Buffer Theory

The capital Buffer theory postulates that adequate capital tends to absorb hostile shocks and thus ensure the stability of the bank (Rime, 2001). Marcus (1984) and Milne and Whalley (2001) posit that through regulatory supervision, banks, as an insurance against breach of regulatory minimum capital requirements, aim at holding more capital than required (i.e., maintaining regulatory capital above the regulatory minimum). According to the capital buffer theory, banks with low capital buffers try to rebuild an adequate capital buffer by raising capital, while banks with high capital buffers attempt to preserve their capital buffer.

As a result, it is assumed that portfolio risk and regulatory capital are positively related. Banks raise capital when portfolio risk increases in order to maintain their capital buffer as sighted by Laeven and Levine (2009) which appears to relate to capital adequacy and performance of the banks. Regulations aimed at increasing capital buffers are intended to reduce the procyclical nature of lending by encouraging the development of countercyclical buffers as it fosters excess capital held by the bank over the minimum required capital which limits change trends in the probability of default due to good and bad economic periods (Jokipii & Milne, 2011; Von Thadden, 2004).

This study adopted the buffer theory of capital adequacy as a bank stability enforcement tool. According to the theory, regulating banks' capital provides a "buffer" of excess capital to prevent the financial intermediation function from being crippled due to risks. Regulatory capital, regardless of risk weighting, will have a limited long-term impact on bank risk-taking. The degree of capitalization will determine the short-run relationship between the capital buffer and risk. There is a positive association for banks that are close to their chosen level of capital, while those who are approaching the legal minimum will have a negative relationship (ElBannan, 2015). That is, a rise in the regulatory minimum will have a short-term effect.

Charter Value Theory

The concept of bank's charter value underscores the loss the bank will face in the event of bankruptcy. Chen et al. (2012) documents a positive relationship between the bank's charter value and equity ratio. Thus, higher regulatory requirement in equity financing increases the banks charter value but since bank managers will have 'more skin to the game', they will have incentive to avoid excessive risk-taking as they will have more to lose in the event of insolvency (Chen et al., 2012; Collins et al., 1994). In furtherance of this, Blasko and Sinkey (2003) and Osborne and Lee (2001) assert that observing the charter value from the stand point of bank risk for that matter stability reveal a positive relationship with bank risk among commercial banks if the charter is not completed by effective regulations. Martynova, Ratnovski, and Vlahu (2014) in a study to understand the emerging issues in the traditional theory of positive charter value-bank risk nexus expound that high charter value incentivizes bank to borrow more and thus, increase their risk

especially in the presence of better institutional setting. This may also be due to the theory of 'Too big to fail' allowing banks to want to take on more risk.

In conclusion, bank regulatory capital through the moral hazard theory and information asymmetry, presents a diverging effect on bank stability in what is called 'more skin to the game' and 'too big to fail'. As the former minimizes bank instability, the later may induce instability. In the positive charter value theory, the presence of a good institutional environment such property rights and deposit insurance, governance, etc. exacerbate bank instability though institutional transparency may enforce bank stability by minimizing the moral hazard and asymmetric information inherent in the banking sector. Regulatory capital through the buffer capital theory, cushions the bank against shocks. This effect may only be a short run phenomenon with limited long-term impact on stability. Understanding the sub-Saharan narrative of the bifocal theoretical mechanism of regulatory capital, institutional and stability thus becomes an imperative.

The Agency Theory

Agency theory, a framework rooted in economics and organizational theory, provides insights into the intricate dynamics among stakeholders within organizations. (Feschiyan & Andasarova, 2019). In the banking context, this theory delves into the relationships between shareholders, who are the owners of the bank, and the management or executives who act as agents in running the institution Mahadwartha (2008). The inherent conflict of interest arises from the differing objectives of shareholders seeking maximum returns and risk-averse management aiming to protect their positions and reputation. Regulatory authorities, such as central banks, address this conflict

by imposing regulatory capital requirements on banks, mandating a specific capital buffer to mitigate potential losses and ensure financial stability (Yoon, 2019; Safieddine, 2009; Khalid et al., 2021).

The impact of regulatory capital requirements on bank stability is significant. Gondwe et al., (2023) observe that, shareholders may express concerns about the dilution of their ownership when additional capital needs arise, while management might view stringent capital requirements as constraints on pursuing potentially profitable yet riskier activities. The relationship between regulatory capital and stability is further nuanced by the incentives it creates for risk-taking. If capital requirements are deemed excessive, there may be pressure on management to engage in riskier ventures to maintain profitability and appease dissatisfied shareholders.

The institutional environment, encompassing the legal and regulatory framework, plays a pivotal role in shaping these dynamics. Effective enforcement of regulations and the presence of robust regulatory institutions can act as mitigating factors, aligning the interests of management with shareholders and contributing to overall financial stability (Bermpei et al., 2018). Additionally, Musa (2016) assert that regulatory institutions serve as external monitors, overseeing bank activities to ensure compliance with rules and regulations. This external oversight not only aligns the interests of management with shareholders but also contributes to the broader stability of the financial system. In essence, agency theory provides valuable insights into how regulatory capital and institutional factors interact to influence the stability of banks.

Empirical review

Capital Regulation and Bank Stability

Caprio and Honohan (1999) documents that literature is strewn with evidences of the reliance on capital adequacy measures for stability by bank regulators. However, empirical findings on the capital-stability nexus are mixed. Bank capital regulation is known to have positive influence on bank stability according to some scholarship on one hand while others present a negative relationship. Fratzscher et al. (2016) using 50 advanced and emerging economies in a difference-in-difference study investigates the effect of tighter capital regulation on bank stability and disclosed that higher capital buffers improved aggregate bank stability in the post crises periods. In his study among G10 countries, Van Roy (2003) claimed that strict regulatory capital requirements improved financial stability and credit risk reduction in the early 1990's. Tight regulatory capital requirements increase bank monitoring and loan extension procedures and thus improved bank stability by reducing bank default rate (Bolt & Tieman, 2004; Martinez-Miera & Suarez, 2014). Alemu (2015) in a 2000-2013 study on bank performance of Ethiopia, documents that capital adequacy positively influences bank performance and stability.

Moreover, despite these positive findings of the capital adequacy-stability nexus outlined, some studies also have found that higher capital adequacy have a negative effect on bank stability. Based on data from 167 banks in 37 African countries, Oduor, Ngoka, and Odongo (2017) discovered that increased capital build-up significantly decreases financial stability in Africa (save in large banks), indicating that stricter capital adequacy regulations do not make African banks safer. Furthermore, they discovered

that unlike domestic banks, higher regulatory capital boosts foreign banks' competitive pricing due to the economies of scale they enjoy in obtaining funding from parent banks abroad. This affects the stability conditions of domestic banks.

Thus, a notable gap emerges concerning the lack of consensus or unified perspective on this relationship. The existing research falls short in unravelling the underlying causes and conditions contributing to this mixed empirical evidence. Therefore, there is a pressing need for further exploration that delves deeper into the diverse factors influencing this relationship, providing a more comprehensive and nuanced understanding.

Some scholarships also underscore conditional result depending on the quality of the institutional setting and the level of the regulatory level. These highlights the possible threshold effect of regulatory capital. Kamau et al. (2004) in a 2000-2002 study in Kenya, modelled the effect of regulatory capital requirement on both capital levels and bank risk-taking incentives using the simultaneous equations approach and the three stage least square method and identify variation in terms of capitalized and under-capitalized banks. They also find a positive relationship between risk-based regulatory capital and capital levels for capitalized banks unlike that of the under-capitalized banks. Their main conclusion was however that, though bank behaviour was a function of regulatory capital constraints, regulatory capital requirements should be set at a threshold that will ensure asset quality and non-risky propensities.

For example, Berger and Mester (1997) in a study of bank efficiency and profitability finds that very risk averse managers may keep higher level of

regulatory capital than maximizes profits or minimizes cost which has stability implications. In furtherance of this, they assert that equity capital cannot be expanded invariably for small banks as with large bank without affecting bank profitability levels. This means that, above a certain threshold, increased bank capital causes a bank to become inefficient and unstable. Similarly, Hakenes and Schnable (2011) discover that tougher capital requirements increase the risk inherent in specific loans and may also increase the risk of loan default as they reduce competition for loans, resulting in banking sector disruptions. However, they did not explore the level at which capital requirement become pernicious to the banking sector.

The above mixed finding suggests the need to identify the sources of the contrasting findings. As Agenor et al. (2018) put forward that financial sector stability could be as a result of many fluctuating variables, Delis et al. (2012) maintain that there is the need to examine the heterogeneity in the effect of the capital regulation on bank stability.

Institutional Quality, regulatory capital and Bank Stability

Fratzscher et al. (2016) opines that quality institutions especially those bordering on control of corruption, property rights and good governance can foster effective financial and contractual arrangements which in turn improves the flexibility of the bank's operations which ensure stability. John et al. (2008) notes that increase in the quality of institutions reduces risky behavior by both the investor and the bank due to less information asymmetry. Klomp and de Haan (2014) using 371 banks from emerging and developing countries in a GMM study, finds a negative relationship between regulation and banking risk and thus a positive relationship between regulation and stability.

However, the extent of the impact is conditioned on the institutional quality level. For instance, they note that liquidity regulation and activity restriction limit banking risk but only when there is a high level of institutional quality.

Martynova, Ratnovski, and Vlahu (2014) in a study to reconcile theory and practice, mentions that the quality of the institutional environment does not guarantee prudential banking activity as bank are incentivized to borrow more resulting in excessive risk taking. In furtherance of this, better institutional environment reenforces the positive relationship between charter value and bank risk taking when it is easier for banks to lever up (more incentive to take risk) with more protection of creditor rights.

The stability of the financial system is predicated on the soundness and effectiveness of its institutions. Ashraf (2017) observes that institutional variables such as the soundness of political systems and corruption stimulate bank risk-taking behavior and have stability implications. A higher incidence of corruption disturbs the lending and investment decisions of banks as well as leading to higher levels of nonperforming loans (Park, 2012). Firms are also able to leverage political connections to secure loans with no or less collateral base, which in turn may result in high default rates. The presence of corruption and the absence of rule of law breed illegal practices in loan processing, which results in higher monitoring costs, financing of less efficient projects, and higher levels of nonperforming loans (Agoraki et al., 2011).

The literature introduces the concept of a conditional relationship between regulatory capital and bank stability. They suggest that this relationship is contingent on various factors, including institutional quality. However, the existing literature lacks a thorough investigation into the specific

thresholds and mechanisms triggering these conditional effects. The identified gap lies in the insufficient understanding of how these conditions manifest and what specific institutional qualities or regulatory levels act as critical determinants. Addressing this gap would involve a more in-depth exploration of the nuanced dynamics that govern the conditional nature of the capital-stability relationship.

In furtherance of this, Agenor et al. (2018) assert that financial instability is connected with volatility in several financial and real economic variables rather than in just a few variables such as asset prices. As a result, assessing financial stability by focusing solely on a single or limited set of financial or real economic variables may not give a full picture of stability conditions. Also, in the same vein, Delis et al. (2012) observes the importance of understanding the conditioning and heterogeneity of the regulation-stability hypothesis. These challenges, therefore, warrant new practices and analytical reflections about theory, empirical analysis, and policy by learning from the failures and achievements of past years in terms of institutions and dedication to macroeconomic stability objectives. Financial anomalies, such as bank failures, have serious negative externalities, leading to a loss of trust in the financial system. This necessitates the supervision and regulation of individual banks. These prudential regulations governing banking and non-banking financial transactions seek to achieve a sound and efficient banking system in the interests of depositors and other customers of these institutions, as well as the economy as a whole.

Bank capital and bank activities

Bank activity of screening borrowers in the process of loan extension is heighten by the presence of higher capital. Jayaraman and Thakor (2013) using a sample of 74,102 banks in an OLS model conduct a comparative study on monitoring inducing roles of bank debt and equity and finds out that bank equity serves as a major source of motivation for bank managers to monitor borrowers. The traditional text on this issue posits that bank debt induces higher monitoring than bank equity does, hence it increases stability. There is also evidence of lower lending due to lower level of capital. According to Peek and Rosengren (1997) as cited by Jayaraman and Thakor (2013) in a study on Japanese banks in the U.S. and their parent banks, as a result of the sudden fall in the Japanese stock market in the early 90's, the depleted capital levels resulted many banks reducing their lending levels. They demonstrate that these US branches significantly reduced lending as a result of the parent banks' lower capital levels. The transmission mechanism could be due to the banks' inability to meet capital requirements or prudential levels necessary for lending activities.

Using a sample of commercial banks in the U.S. from 1993 to 2003 in an instrumental variable approach, Berger and Bauwman (2009) documents that higher levels of capital leads to greater liquidity creation. This revealed positive relationship between capital levels and liquidity creation is not the same for smaller banks. In furtherance of this, others studies conducted on the advent and implementation of the Basel accord 1, reveals a negative effect of leverage requirements on liquidity creation and that risk-based capital

requirements had minimal effect on liquidity creation. (Berger & Udell, 1994; Hancock, Laing, & Wilcox, 1995)

Other macroeconomic and bank-specific factors

Bank competition affects bank stability. According to Schaeck and Cihák (2014) in a study on the effect of competition on bank stability among European banks, there is a positive relationship between stability and competition though the effect is stronger for healthy banks than for week banks. In additions,

The general economic atmosphere affects the performance and stability of the banking sector. Using a quarterly data of 18 OECD countries over the 1980 to 2008 period in a VAR methodology, Jokipii and Monnin (2013) assert that there is a positive relationship between bank stability and real output growth. Incidence of banking sector instability according to Segoviano and Goodhart (2009), are due to unexpected fluctuations in economic cycles that is the effects of recessions and booms.

The channels of the concentration-stability nexus argue that, a less concentrated banking space tones done the levels of competition due to relatively small number of competitors which in turn reduce excessive risky lending. However, there is heightened complexity of supervision and monitory with many small banks than with few large banks which thus have stability implications (Beck et al., 2006). Sáez and Shi (2004) opine that concentration limits the tendency of instability through the contagion effect in two ways: the presence of many banks would crowd out the effect of a shock to the market and banks in the market could unite to support a troubled bank before the idiosyncratic shock become systemic or wide-spread. However, the incident of

support from a concentrated banking system may lead banks to become too-big-to-fail which would result in lender moral hazard problems (Mishkin, 1999). Closely linked to this, there is borrower moral hazard problem in a more concentrated banking system due to higher loan rates in a 'reach for more yields' scenario. This can increase default rates and also induce borrowers to invest in more risky investments with banking sector instability consequences (Boyd & De Nicoló, 2005). Thus, from the forgoing, the effect of bank concentration is mixed.

Uhde and Heimeshoff (2009) using an aggregate balance sheet data from banks across the European union over the period from 1997 to 2005 and the Z-score as a stability measure, underscores that banking market concentration has a negative impact on stability. This relationship is largely due to volatility of returns among the large banks in the banking sector. Ijtsma (2017) finds no significant effect of banking concentration on bank stability using the Z-score and 25 European countries over the 1998 to 2014 period.

Using a GMM approach with 100 Chinese banks over the 2003 to 2013 period, Tan and Anchor (2016) investigate the profitability-stability inter-relationship and finds that low bank stability leads to higher profitability measured as ROA, and that higher profitability leads to higher bank fragility for Chinese commercia banks. Literature underscores the existence of the efficiency-stability nexus. Berger and DeYoung (1997) using the granger-causality techniques to investigate this nexus asserts that efficient banks are stable due to their ability to reduce non-performing loans thus managing credit risks. They document that cost efficiency signal future loan problems as reductions in cost efficiency precedes higher non-performing loans.

Tan (2014) uses the Lerner index and the Panzar-Rosse H statistic to study the effect of bank competition on the risk taking in the Chinese banking industry and finds that a more competitive environment tends to exacerbate higher credit risk. In a later study, Tan and Floros (2018a) again document that higher competition raises liquidity risks while lowering credit and insolvency risks. In their competition-risk study, Tan and Anchor (2017) submits that a competitive banking environment regardless of bank ownership type increases credit risk and liquidity risk but decreases insolvency risk, indicating that competition has some negative effects on stability. Schaeck and Cihák (2014) in a study of European banks finds that competition has a positive effect on banks stability. This effect was seen to be stronger for healthy banks than for weak banks.

In summary, in order to capture the relevant variables within the context of the study, relevant related materials on non-African nations and regions were considered in addition to the African literature. Most of the studies reviewed though were on country level panel studies, few have considered regional basis forfeiting the contagion effect of financial sector connectivity. With respect to the link between the relationship between regulatory capital and bank stability, evidence of both positive and negative relationship has been documented. Thus, no universal generalization has been made regarding the exact relationship. Most of the reviewed papers used the z-score to measure banking sector stability and discovered that regulatory capital had a significant effect on bank stability. It must be noted that, though there is an extensive empirical works on issues of regulatory capital and bank stability, most of them overlook the conditioning effect of institutions and the

regulatory type as well as the effect of varying regulatory level in the capital-stability nexus. The present study addresses the issue by incorporating the role of these institutions into the capital-stability nexus as well as presenting a comparative understanding of the regulatory type and level.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter discusses the methods and techniques employed in the analysis of data and the estimation procedures used towards addressing the objectives of the study. Documented in this chapter is the research philosophy, approach and design as well as the sources and type of data used, the choice of variables and estimation techniques used, and the justification.

Research philosophy, design and approach

Research philosophy, encompassing positivism and interpretivism, shapes the researcher's stance. Positivism aligns with experimental designs, manipulating variables for causation, while interpretivism fits non-experimental designs, observing phenomena without intervention. For example, health research may use positivism for quantitative treatment impact measurement and interpretivism for exploring nuanced patient experiences (Babbie, 2005; Creswell, 2003). Research design, the study's blueprint, structures the overall approach. Experimental designs establish causation, while non-experimental designs observe without intervention. In practice, an experimental design might assess a new teaching method's efficacy through a comparison with traditional methods. Research approach, the strategic roadmap, dictates methods. Quantitative approaches use numerical data and statistics, suitable for surveys (Babbie, 2010). Qualitative approaches focus on non-numerical data, employing methods like interviews. For business, a survey quantifies customer satisfaction (quantitative), while interviews explore perceptions (qualitative).

Integration ensures a systematic methodology aligned with goals. Philosophy guides positivist or interpretivist choices, design structures the study, and approach details specific methods. This cohesive integration yields robust insights into research questions or hypotheses. Since it employs the formulation and verification of theoretical hypothesis using quantitative techniques, the study adopts the explanatory research design based on the bank stability literature to explain cause and effect relationship that exist between regulatory capital, institutional quality and bank stability.

Data Types and Sources

This study is based on a panel dataset of a sample of 25 SSA countries covering a range of 11 years, from 2005 to 2017. The study excludes countries and years (before the starting year) for which there is not sufficient observation for the explanatory variables, affecting the length of the period and the number of countries. The most recent day is for 2017. In line with Moyo et al. (2014), the countries selected for the study sample account for more than 70% of the SSA banking market share; thus, it is reasonable to assume that the sample is fairly representative for the purposes of this analysis. Bank specific data on bank capital requirements, bank concentration as well as other macroeconomic variable are sourced from both the International Financial Statistics Database and the world bank's World Development Indicators. These have significant implications on performance and stability of the banks in the economy. Data on institutional variable are obtained from the World Governance Indicators dataset (WGI) of the world bank developed by Daniel Kaufmann D. and Kraay A. (2018).

Model Specification and Estimation Techniques

Literature is strewn with a lot of studies adopting the panel data model to ascertain the effect economic and financial variables have on the stability of the banking sector (Bermpei, et al., 2018; Oduor, Ngoka, & Odongo, 2017; Abbas & Younas, 2021). These variables include bank-specific factors (idiosyncratic), industry-wide factors(systemic) and macroeconomic factors. Following the works of Yakubu and Bunyaminu (2021), Ozili (2018) and Abbas and Younas (2021). The model specification is underpinned by the theories of the study. In the context of banking, the presence information asymmetry i.e., the gap in information between bank management and external stakeholders like shareholders, depositors or regulators, increases banks risk-taking initiatives which may destabilize the bank. However, the presence of regulatory capital and institutional quality reduces the informational gab by serves as a signal to external stakeholders about the financial health and risk-taking behavior of the bank. In other words, while regulatory capital provides assurance of a buffer, quality institutions make information accessible thus reducing the bank's risk-taking incentives which ensures the stability of the bank. In this sense, regulatory capital and institutional quality compliments or reenforces each other.

In furtherance of this, quality institutions with higher incidence of bailout and government intervention may exacerbate the banks' incentives for risk-taking due to the moral hazard problem i.e., when one party is insulated from the full consequences of its actions. Nonetheless, regulatory capital requirements act as a mechanism to mitigate moral hazard by ensuring that banks have a stake in their own risk-taking and this increases the stability of

the bank. In this sense, regulatory capital acts as substitutionary to the level of institutional quality.

Generally, the basic model is specified as

$$Y_{it} = f(X_{it}, Z_{it}, U_{it}, I_{it}) \ldots\ldots\ldots\ldots\ldots\ldots \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y represent the various measures of bank stability. X represent the risk and non-risk-based regulatory capital instruments employed by the banking sector as well as other macro-economic indicators including inflation and Gross Domestic Product. Z is the vector of independent variables representing bank-specific factors that influence the stability of the banking sector including provisions to Non-Performing Loans and bank interest rate spread. U represent a vector of independent variables representing industry or financial structure including banking sector competition (Lerner index), bank concentration and the financial sector development proxied by domestic credit to private sector (dctps), I is the institutional quality index. Specification, the model is specified as

$$BankStab_{it} = \alpha_i + \beta_i RegCap_{it} + \gamma_j insq_{it} + \phi_j BankXtics_{it} + \mu_t + \varepsilon_{it} \quad (2)$$

α_i is the bank-specific unobserved heterogeneity.

μ_t is the time-invariant heterogeneity.

ε_{it} is the vector of residuals.

Using the fixed and random effect estimations, the study empirically test the effect of risk-based and non-risk-based regulatory capital as measured by bank regulatory capital to risk weighted asset and bank equity to assets respectively, institutional quality as well as their joint effect on bank stability in sub-Saharan Africa.

In order to obtain the first and second objectives of the study, which seeks to examine the effect of regulatory capital and institutional quality on bank stability, the equation is stated as:

$$BankStab_{it} = \beta_0 + \beta_1 rbcr_{it} + \beta_2 nrbcr_{it} + \beta_3 insq_{it} + \beta_4 X_{it} + \mu_t + \varepsilon_{it} \quad i = 1,2,3,\dots,28 \quad t = 1,2,3,\dots,11 \quad (3)$$

Where $BankStab_{it}$ represents bank stability. $rbcr_{it}$ represents risk-based regulatory capital, $nrbcr_{it}$ is non-risk-based regulatory capital, $insq_{it}$ represents institutional quality variable, X_{it} represents a vector of other control variables including both bank specific and industry specific variables as well as macroeconomic variables. $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ represent the parameters or coefficients of interest. ε is the error term whilst i and t represent individual country and time.

In achieving the third objective which seeks to investigate the joint effect of regulatory capital and institutional quality on bank stability, the equation is specified as:

$$BankStab_{it} = \beta_0 + \beta_1 rbcr_{it} + \beta_2 nrbcr_{it} + \beta_3 insq_{it} + \beta_4 X_{it} + \beta_5 (rbrc_{it} * insq_{it}) + \beta_5 (nrbrc_{it} * insq_{it}) + \mu_t + \varepsilon_{it} \quad i = 1,2,3,\dots,28 \quad t = 1,2,3,\dots,11 \quad (4)$$

$(rbrc_{it} * insq_{it})$ denote the interaction term of risk-based regulatory capital and institutional quality while $(nrbrc_{it} * insq_{it})$ represent the interaction term of non-risked-based regulatory capital and institutional quality.

As there have been debates and conflicting findings in the literature regarding the connection between regulatory capital and stability in banking, and considering the potential existence of a critical threshold level in this

connection as suggested by various researchers such as Lev Ratnovski (2013), Admati et al. (2010), Hellwig (2010), Martinez-Miera and Suarez (2012), Berger and Mester (1997), and Kamau et al. (2004), our study employs the dynamic panel threshold model developed by Kremer et al. (2001). This model helps us explore the non-linear relationship between regulatory capital and bank stability, especially as it accommodates endogenous regressors. The study employs this approach for several reasons: 1) it enhances the ability to analyze any spatial differences between the variables of interest; by accommodating spatial heterogeneity, the model allows researchers to explore whether the regulatory capital-stability connection holds uniformly or if there are variations that need to be considered 2) it allows for both static and dynamic model specifications, enabling us to include lagged dependent variables to address endogeneity concerns when necessary; an insignificant lagged dependent variable implies a static model is preferred otherwise, a dynamic model is specified and 3) by specifying a kink model, it unveils the true nature of the relationship (whether it's kinked or discontinuous) among variables in the model, particularly when the regulatory capital threshold is reached.

The presence of a kink in the model allows for the possibility of observing different relationships and magnitudes on either side of the threshold. This is crucial because, even though the model may suggest a kink instead of a jump or discontinuous relationship, alternative threshold models assume the presence of discontinuity in the regression function (Okunade, 2022; Seo et al., 2019; Seo & Shin, 2016). Following Okunade (2022), the study firstly specifies a non-threshold static model in equation (5)

$BankStab_{it} = \alpha_i + \sum_{J=1}^{n} \beta_1 X_{it} + \varepsilon_{it} \quad i = 1,2,3,\ldots,25 \quad t = 1,2,3,\ldots,11$ ..... (5)

Where X_{it} indicates an m-dimensional vector of explanatory regressors that includes the dependent variable's lagged values as well as other endogenous variables such as the threshold variable, regulatory capital (rc_{it}); risk-based ($rbcr_{it}$) and non-risk-based ($nrbcr_{it}$), bank concentration ($bcon_{it}$), domestic credit to private sector ($dctops_{it}$), bank loan to deposit spread ($bldspread_{it}$), Lerner index ($bcompetition_{it}$), bank provisions for non-performing loans ($prov\_npl_{it}$), institutional quality index($insq_{it}$), inflation and gross domestic product(gdpg). α_i is the country-specific fixed effect, $\varepsilon_{it} \approx (0, \sigma^2)$ is the independently and identically distributed error term. Following Aydin and Esen (2018), panel threshold model was specified in equation (6);

$BankStab_{it} = \alpha_i + \beta'_1 X_{it} I(rc_{it} \leq \gamma) + \beta'_2 X_{it} I(rc_{it} > \gamma) + \varepsilon_{it}$..... (6)

$I(.)$ is the indication function specifying the regime, γ is the threshold parameter that divides the equation into two regimes slope coefficients β_1 and β_2. More explicitly, to examine the static and the dynamic effects of the regulatory capital threshold value on stability, X_{it} may or may not contain the lagged values of the dependent variable accordingly. In order to capture the lagged dependent variable, the endogenous covariates as well as the kink restrictions, equation (6) thus becomes

$BankStab_{it} = \alpha_i + \beta X'_{it} + k(rc_{it} - \gamma) I(rc_{it} > \gamma) + \varepsilon_{it} \ldots . i = 1, \ldots, n \; and \; t - 1, \ldots, T$ .....(7)

X'_{it} is a vector of all endogenous variables which may include the lagged dependent variable; k(.) indicates the kinked restriction; rc_{it} is the

threshold variable (regulatory capital-bcrwa and bcta-refer to table 1); γ is the threshold parameter; $\varepsilon_{it} \approx (0, \sigma^2)$ is the independently and identically distributed error term.

Testing for threshold

Equation (6) represent the panel threshold kink model specified using the GMM to examine the influence of regulatory capital on bank stability when the regulatory capital is above the minimum level. The study seeks to establish the threshold level of regulatory capital beyond which regulatory capital enforces the stability of the banking sector in sub-Saharan Africa. To achieve this, it becomes important to test the statistical significance of the threshold effect by testing the null hypothesis that the threshold level of regulatory capital in equation (6) does not exist ($H_0: \beta_1 = \beta_2$) against the alternate hypothesis that threshold level of regulatory capital exists ($H_1: \beta_1 \neq \beta_2$) beyond which regulatory capital ensures bank stability.

Also, the study presents the descriptive statistics and the correlational matrix as it plays a pivotal role. Descriptive statistics illuminate the inherent characteristics, patterns, and trends within the dataset, aiding in hypothesis formulation and research focus. They also contribute to assessing data quality by identifying outliers and ensuring dataset integrity. Meanwhile, the correlational matrix explores relationships between variables, guiding variable selection for subsequent analyses. This preliminary step not only refines the research focus but also facilitates effective communication of findings, making the study accessible to diverse audiences, including researchers, policymakers, and industry stakeholders. Ultimately, these analyses lay a foundational understanding for more advanced statistical modeling in the study.

Definition and Measurement of Variables

Bank stability according to the literature is determined by various factors including those emanating from bank-specific characteristics, industry-wide characteristics, and those outside the control of the banking industry. Various stability measures and regulatory capital were analyzed in the study.

Dependent Variables

The study employs two indicators of bank stability i.e., the aggregate Z-score, following Fratzscher et al. (2016), Laeven and Levine (2009), Anginer et al. (2014) or Lambert et al. (2015), and the non-performing loans (Ozili, 2018; Fernández, González & Suárez, 2016). As noted by Agenor et al. (2018), financial stability has no narrow definition and hence indicator. Financial stability may be influenced by fluctuations in a number of financial and real variables thus may be difficult to assess by merely focusing on a single variable. The World Bank's Global Financial Development Indicators include the Z-score (GFDI). A bank's Z-score is defined as the sum of its Return on Assets (ROA) and Capital Adequacy Ratio (CAR) divided by the standard deviation of the ROA indicated as;

$$Z - SCORE = \frac{E(ROA_{it}) + CAR_{it}}{ROA_{it}}$$

In the GFDI database, aggregate Z-score data are computed by aggregating ROA and CAR on a country level from bank-by-bank unconsolidated data from Bureau van Dijk's Bank scope database. A more stable banking system is indicated by higher aggregate Z-score values. The inverse (and squared) Z-score basically serves as an upper bound on the likelihood of insolvency. The Z-score can be further interpreted as a 'distance-to-insolvency' measure since it indicates the number of standard deviations

that realized returns have to fall below expected returns before insolvency ensues. The logged value of the z-score was used due the reported skewedness of the raw z-score (Laeven & Levin, 2009).

The second dependent variable is the bank's non-performing loans to total loan ratio as an indicator of its asset quality thus lower levels of non-performing loans means better assets quality which improves bank stability. It is expected that level of regulatory capital maintained by the banks enables them to absorb unexpected losses to its assets. Also, regulatory capital encourages banks to be thorough with the extension of loans thus reducing the incidence of higher losses to assets (Diamond & Rajan, 2000)

The Z-score and Non-Performing Loans (NPL) ratio are commonly used proxies for measuring the stability of banks. The Z-score, a comprehensive metric amalgamating various financial ratios, provides a holistic overview of a bank's financial health, allowing for comparative analyses within and across industries. However, represents a static snapshot, potentially limited in capturing rapid changes in a dynamic banking environment. On the other hand, the NPL ratio, offers a timely indicator of a bank's loan portfolio quality and is particularly adept at reflecting short-term changes though its scope is limited largely to credit risk, one side of bank stability. For this reason, the study opts for a complementary use of both measures to capture a nuanced understanding of a bank's stability, leveraging the Z-score for a baseline assessment and the NPL ratio for timely insights into specific risk exposures.

Independent Variables

The main variable of interest for the study are the regulatory capital (risk-based and non-risk-based) and institutional quality. The also employs other control variables at the bank level namely, industry level as well as macroeconomic factors that affect the stability of the banking sector. These includes bank interest rate spread, provisions for non-performing loan loss, banking sector development (domestic credit to private sector), Lerner index ($bcompetition$), bank concentration (Bcon), inflation, economic growth (GDP)

Regulatory Capital

Regulatory capital has been on the prominent items of regulatory authorities. This is because the stability of the banking sector is function of these ratios, with the ratios being both positively and negatively related to bank stability. The study employs both risk-based capital regulation and non-risk-based capital regulation. The study employed regulatory capital to risk weighted assets (Ozili, 2018) for the former and the capital-asset ratio (Fratzscher et al., 2016) for the later. In furtherance of this, Barth et al. (2004) documents the prudency of examining multiple regulatory policies in the financial sector space as it helps to identify those that have a strong independent relationship with stability. The two definitions of regulatory capital are;

Regulatory capital to risk weighted assets

This reflect the level of capital banks are required to keep adjust by the extent of the risk of their portfolios. Thus, this capital requirement is positively related to the underlining risk of the bank's portfolio. Higher capital

requirements ensure that banks have sufficient capital to absorb unexpected losses should they occur as well curb the extent of risk taking of banks therefore improving the stability stands of the bank. In consequent of this, compliance with this capital regulation would lead to greater safety for the banking sector and should lead to greater banking stability (Besanko & Kanatas, 1996; Aiyar et al., 2015); therefore, a positive relationship between regulatory capital ratios and banking sector stability is expected.

Bank Capital to Total Assets

This is the ratio of bank capital and reserves to total assets. In other words, it is the simple non-risk-based bank capital representing total equity capital to total assets (Altunbas et al., 2007; Lee & Hsieh, 2013). Capital and reserves include funds contributed by owners which increases the owner's skin to the game, retained earnings, general and special reserves, provisions, and valuation adjustments. Total assets include all nonfinancial and financial assets. This is used an independent variable by using instructions of regulators and previous literature. Bank capital is used as an independent variable and is defined by using the instructions of regulators and previous literature (Guidara et al., 2013; Kola, Gjipali & Sula, 2019; Shrieves & Dahl, 1992; Abbas, Iqbal & Aziz, 2019).

Table 1: Definition and Measurement of Variables

Variable	Definition	Description	Source	Year
Bank Specific Factors				
Bankstab1	**Bank Z-Score**	Z-score is estimated as (ROA+ equity/assets)/sd (ROA); sd (ROA) is the standard deviation of ROA. Higher values indicate higher bank stability and less overall bank risk.	**GFDR**	**2021**
Bankstab2	**Non-Performing Loans**	The ratio of non-performing loans (payment of interest and principal past due date by 90 days or more) to total gross loans	Financial Soundness Indicators Database (fsi.imf.org), International Monetary Fund (IMF)	2021
inf	**Inflation**	Inflation, consumer prices (annual %). Inflation (IFL) as macroeconomic factor affects banks stability positively since in inflationary periods banks have the leverage of charging higher prices which increases their profitability all this being equal and thus stability. (Jokipii and Monnin (2013))	World Development Indicators (WDI), World Bank	2020
Economic Growth	**Gross Domestic Product**	Gross Domestic Product per capita (GDP) as a macroeconomic factor capturing economic growth also influences the stability of the banking sector. Laeven and Majnoni (2003) observe that there is a negative relationship between default rates and the level of economic growth which thus affects the stability of the banking sector. A positive relationship is expected between stability and economic growth.	World Development Indicators (WDI), World Bank	2020
Bank Competition($bcompetition$**)**	**lerner index**	The Lerner index is defined as the difference between output prices and marginal costs (relative to prices). Lerner index is widely used as an indicator of the degree of market power or competition for the banking sector (Beck et al., 2013). The Lerner index has a value between one and zero, with higher numbers indicating greater market power and thus less competition (Tan, 2016). The Lerner index measures a bank's market power to set its price above the marginal cost (Tan, 2016). According to Caminal and Matutes (2002), lower	Global Financial Development Database. World Bank	2017

		competition can lead to less credit rationing and larger loans, which can increase the likelihood of bankruptcy and thus bank instability. This implies that competition and stability have a positive relationship.		
Bcon	**Bank Concentration**	Banking concentration is defined as the ratio of the assets of the three largest commercial banks to total commercial banking assets in a country Banking sector concentration (BCON) may have a positive or a negative relationship with bank stability as seen in the literature. Through the competition channel, bank concentration may have a positive relationship with bank stability. Also, through the contagion effect, bank concentration may have a negative effect on stability.	Global Financial Development Database. World Bank	2021
Banksize	**Bank credit to private sector.**	Closely linked to bank concentration is bank size proxied by credit to private non-banking sector. Bank stability may have either positive or negative relationship with the size of the bank.	World Development Indicators (WDI), World Bank	2020
rbrc	**Bank regulatory capital to risk-weighted assets (%) used as risk-based regulatory capital**	The capital adequacy of deposit takers. It is a ratio of total regulatory capital to its assets held, weighted according to risk of those assets.	Financial Soundness Indicators Database (fsi.imf.org), International Monetary Fund (IMF)	2020
nrbrc	**Bank capital to total assets (%) used non-risk-based regulatory capital**	Ratio of bant capital and reserves to total assets. It includes funds contributed by owners, retained earnings, provisions, etc. it includes several specified types of subordinated debt instruments that need not be repaid if the funds are required to maintain minimum capital levels including tier 1, tier 2 and tier 3 capital.	Financial Soundness Indicators Database (fsi.imf.org), International Monetary Fund (IMF)	2020
bldspread	**Interest rate spread.**	Interest rate spread- measures the margin between the cost of mobilizing liabilities and the earnings on assets - measures financial sector efficiency in intermediation.	Financial Soundness Indicators Database (fsi.imf.org), International Monetary Fund (IMF)	2020

		A low spread means low transaction cost thus lower profitability to the bank and instability.		
Prov_npl	**Provisions to nonperforming loans (%)**	The provision for nonperforming loans (NPL) is a financial metric that reflects the amount of money set aside by a financial institution to cover potential losses from loans that are classified as nonperforming. It is calculated as the percentage of the provisions to the total NPL.	Financial Soundness Indicators Database (fsi.imf.org), International Monetary Fund (IMF)	2020
insq	**Institutional Quality**	The banking operation is duly affected by the institutional setting of the bank. In an attempt to understand the impact of the institutional environment on bank stability and its mediating effect on the capital-stability nexus, the study employed six different indices from the World Governance Indicators (WGI) dataset. They are control of corruption, government effectiveness, regulatory quality, political stability and rule of law. Following Yakubu (2020) the study employs the aggregated measure of institutional quality variable using the principal component of the WGI indicators to obtain the aggregated institutional quality variable. Better institutional environment in expected to boost stability of the banking sector directly or indirectly through stability driving factors thus will have a positive and negative relationship with the Z-score and the non-performing loans respectively.	World Governance Indicators	2021
rbrc*instq	**Risk-based regulatory capital*institutional quality**	This captures the interactive term that measures the joint effect of the risk-based regulatory capital and the institutional quality.		
nrbrc*instq	**Non-risk-based regulatory capital*institutional quality**	This captures the interactive term that measures the joint effect of the non-risk-based regulatory capital and the institutional quality.		

Panel Data Estimation Techniques

The study employed the panel estimation techniques due its ability to ensure reliability of the results by dealing with the inherent problems of multicollinearity, heterogeneity, omitted variable biases that are usually found in stand-alone time series or cross-sectional data analysis (Hsiao, 2007; Gujarati, 2003). Thus, to explore the underpinnings of both time and cross-sectionally in the analysis, panel estimation techniques are preferred.

Fixed effect models and random effect estimations were first conducted based on the assumptions which underpin the individual-specific effects in the data. To select the most appropriate model and the solve the issues of autocorrelation and heteroskedasticity, the Hausman test was employed in the case of the former and the Prais-winsten panel corrected standard error (PCSE) in the case of the later.

Fixed Effect Estimation Technique

The fixed effect estimator makes the assumption that the variation in the intercept among individual subjects is constant and that the slope of the model does not change over time. Individual-specific effects are permitted to be correlated with some other regressors because they are time-invariant and also considered a component of the intercept. The functional form of the fixed effect is stated as:

$$y_{it} = (\alpha + u_i) + X'_{it}\beta + v_{it}$$

Where u_i is the individual or specific time-invariant periods omitted from the regression whose errors are independently identically distribute. The assumption underlying the random effect model is that individual heterogeneities are uncorrelated with any regressors and the error variance of

the estimates specific to the groups. The random effect model is functionally set as

$$y_{it} = \alpha + X'_{it} + (u_i + v_{it})$$

This implies that μi is a random heterogeneity specific to individuals or a component of the composite error term. Just like with the fixed-effect model, the slope and intercept of the regressors are constant across individuals.

Post-Estimation analysis

Diagnostics Test

Panel Unit Root Test

Due to the time-series component in the data. A test for unit root according to the time series estimation procedure is carried. For checking unit root in panel data setups, various measures are proposed which include, the Levin-Lin-Chu test, Im-PesaranShin test, and the Fisher's test. Fisher's test for unit roots comes strongly when using an unbalanced panel. It however gives misleading results for balanced panels (Barbieri, 2006). The Levin-Lin-Chu test is however able to correct for the inconsistency in the estimation of the Fisher's test, it will therefore be employed. The Levin-Lin-Chu test relies on the assumption there is no cross-sectional dependence between the individual units in the panel set up even though it gives a restrictive null and alternate hypothesis (Hoang & McNown, 2006). Another test that is suitable for balanced panels is the Harris-Tzavalis test. It also assumes that all the panels have the same autoregressive parameter and also that the number of periods is fixed (Harris-Tzavalis, 1999).

Autocorrelation and Heteroskedasticity

The study uses the Arellano and Bond (1991) and the Woldrigde test for serial correlation to test for the cross-sectional independence between the individual units in the data. The test is based on the assumption that there exists serial independence in the idiosyncratic error term of a difference equation. To correct for autocorrelation in the model, the study reports robust standard errors instead of the usual standard OLS errors. To achieve this, just used by Ofoeda et al. (2012), the study employs the Prais-winsten panel corrected standard error (PCSE) technique. The approach used by the Prais-winsten panel corrected standard error (PCSE) technique is such that it can correct for both autocorrelation and heteroskedasticity.

Hausman Test (Fixed Effect versus Random Effect) for Model Selection

The Hausman specification test is an approach used to decide whether a fixed effect or random effect model is appropriate. Thus, the Hausman specification test identifies whether the fixed-effects or random-effect model is most appropriate under the null hypothesis that unobservable individual effects are uncorrelated with 64 one or more of the explanatory variables. Gujarati (2003) noted that fixed effect model is most appropriate when the null hypothesis is rejected whereas the random effect is appropriate when the null hypothesis is not rejected. The Hausman test is based on the following hypothesis (Hausman, 1998);

$H0$: Random Effects (RE) regression model is appropriate

$H1$: Fixed Effects (FE) regression model is appropriate.

Decision Rule: Reject $H0$ (Reject RE) if probability of chi-squared (Prob. X2) < 0.05. Do not reject H_0 If otherwise. If RE is rejected, the FE

estimates or results explain the determinants of bank stability. However, if RE is accepted based on the Hausman test results, a cross-check of the appropriateness of the RE model is done by conducting a Breusch Pagan Test (BPT).

Breusch Pagan Test (BPT)

In Panel regression analysis, the BPT is a test that is employed to examine the appropriateness of the RE and the Pooled OLS estimations. It is conducted under the following hypothesis: *H*0: Random Effects (RE) regression model is appropriate *H*1: Pooled OLS regression model is appropriate. 65 Decision Rule: Reject *H*0 if probability of chi-squared (Prob. X2) < 0.05 Do not reject *H*0 if otherwise (i.e., probability of chi-squared (Prob. X2) > 0.05)

Chapter summary

This chapter delineates the systematic methodology employed to address the study's objectives. It begins by elucidating the research philosophy, firmly rooted in positivism and interpretivism, which guides the researcher's stance. The choice of an explanatory research design, blending both experimental and non-experimental approaches, aligns with the study's goals. A strategic integration of research philosophy, design, and approach ensures the adoption of quantitative methods for numerical data and qualitative methods for non-numerical data, enhancing the study's comprehensiveness.

The subsequent sections delve into data types, sources, and the model specification, emphasizing the use of a dynamic panel threshold model to explore the non-linear relationship between regulatory capital, institutional

quality, and bank stability. The chapter highlights the significance of robust diagnostic tests, including panel unit root tests, autocorrelation, and heteroskedasticity assessments. The decision-making process for model selection is elucidated through the Hausman test, distinguishing between fixed and random effects, and further validated by the Breusch Pagan test. In addition, the chapter details the measurement of variables, ranging from dependent variables like aggregate Z-score and non-performing loans ratio to key independent variables such as risk-based and non-risk-based regulatory capital. The use of fixed and random effect estimations, along with post-estimation corrections, ensures a rigorous analysis, addressing challenges like multicollinearity and heterogeneity, ultimately contributing to the reliability of the study's findings.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter discusses the estimated empirical relationship between regulatory capital, institutions and bank stability. The study seeks to examine the effect of regulatory capital and institutional quality on banking sector stability using country level data spanning over 11 years and involving 25 SSA countries. The chapter is organized into four sections. Section One (1) presents the descriptive and correlation statistics of the variables employed in the study. The second section presents the effect of regulatory capital and institutional quality as well as the moderating role of institutions in the capital-stability nexus while the third section determines the existence of a threshold of regulatory capital on bank stability. The fourth section summarizes the chapter.

Descriptive Statistics

The descriptive statistics of the variables employed for the analysis in this chapter are presented in Table 2. There are two proxies used as an indicator of bank stability viz z-score and NPL. The z-score has a mean value of 11.295; the standard deviation is 5.817 whereas the minimum and the maximum values are 2.548 and 44.413 respectively. This mean is fairly above the 1.8-3 threshold posited by Altman and Hotchkiss (2006) with the upper bound indicating higher stability. This then indicate that SSA banks are generally stable. The average value of the NPL is 8.986 with a standard deviation of 7.636. the minimum and maximum values are 0.964 and 45.3 respectively. Also, the study uses a risk-based (rbrc) and a non-risk-based

(nrbrc) regulatory capital measure. The average values of the non-risk based is 11.515 and that of the risk-based is 19.228 which are generally above the Basel accord recommendation.

Table 2: Summary Statistics of variables

Variables	Obs.	Mean	Std. Dev.	Min	Max	Skew.
zscore	266	11.295	5.817	2.548	44.413	1.674
nrbrc	221	11.515	3.516	1.49	23.677	.707
rbrc	221	19.228	6.516	1.755	43.4	.905
npl	221	8.986	7.636	.964	45.3	1.841
inflation	264	6.885	5.117	-2.405	36.965	1.84
gdpg	275	4.116	4.806	-36.392	20.716	-2.804
Prov_npl	216	61.96	29.164	0	193	1.138
bldspread	206	9.31	8.212	.525	49.046	3.23
bconcentration	238	69.518	19.597	32.521	100	-.004
bsize	275	30.334	41.253	2.267	257.181	3.276
bcompetition	121	.291	.088	.007	.468	-.266
instq	275	0	1	-2.039	2.513	.415
rbcr*instq	221	.368	21.058	-86.038	51.643	-.368
nrbcr*instq	221	-.438	11.626	-44.729	26.441	-.565

Source: Author's computation

Correlation Analysis

Table 2 presents the correlation between the variable employed in the study. Both risk-based and the non-risk-based regulatory capital positively correlate with both the z-score and the non-performing loans. Positive correlation in the case of the z-score implies that an increase in regulatory capital should make banks more stable while the opposite is true in the case of the non-performing loans. Also, institutional quality has a negative correlation with both the z-score and the NPL. The indication is that while institutional quality reduces bank stability in the case of the z-score, it improves bank stability by reducing the level of non-performing loans. This correlation is similar to that of the interaction between the institutional quality and regulatory quality.

Another variable of interest is the level of financial development proxied by domestic credit to private sector. it positively correlates with the z-score and negatively correlative with the non-performing loans. The indication is that financial sector development should increase (decrease) bank stability when financial sector development increases (decreases).

Generally, the correlation coefficients amid the variables are low indicating that there is no multi-collinearity problem. The variance inflation factor (VIF) analysis is used to confirm the absence of multicollinearity. A variable must have a VIF value less than 10 and a tolerance value greater than 0.10 to be free of a multicollinearity problem. As indicated in Table 2, all our variables fulfill the conditions of the VIF analysis, hence the absence of multicollinearity.

Table 3: Correlation analysis of variables used in the study

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	VIF	Tolerance
(1) zscore	1.00															
(2) nrbrc	0.12	1.00													4.51	0.22
(3) rbrc	0.09	0.76	1.00												5.03	0.20
(4) npl	0.20	0.38	0.47	1.00											1.69	0.59
(5) inflation	-0.07	0.08	0.01	-0.02	1.00										1.19	0.84
(6) gdpg	-0.08	-0.17	-0.19	-0.19	0.03	1.00									1.39	0.72
(7) prov_npl	-0.16	-0.14	-0.28	-0.13	-0.05	0.11	1.00								1.56	0.64
(8) bldspread	-0.22	0.12	0.04	0.14	0.08	-0.06	0.03	1.00							1.65	0.61
(9) bconcentration	-0.18	-0.15	0.00	-0.08	-0.12	-0.24	0.12	0.27	1.00						2.26	0.44
(10) bsize	0.44	-0.16	0.02	-0.00	-0.10	-0.13	-0.25	-0.21	0.02	1.00					2.40	0.42
(11) bcompetition	0.41	0.43	0.44	-0.00	0.08	-0.04	-0.34	-0.11	-0.29	0.18	1.00				2.35	0.42
(12) instq	-0.07	-0.28	-0.12	-0.24	-0.00	0.14	-0.24	-0.39	-0.24	0.37	-0.06	1.00			2.93	0.34
(13) rbcr*instq	-0.17	-0.33	-0.20	-0.24	-0.01	0.25	-0.19	-0.29	-0.26	0.27	-0.00	0.94	1.00			
(14) nrbc*instq	-0.14	-0.35	-0.19	-0.25	-0.01	0.29	-0.21	-0.36	-0.28	0.28	0.00	0.94	0.98	1.00		

Source: Author's computation

Model Selection

To obtain the most appropriate model needed for objectives one (1) to three (3) of the study, the study employed the fixed effect and random effects for these objectives. In the first equation, the effect of regulatory capital and institutional quality on bank stability is examined while in the second equation, the moderating effect of institutional quality in the regulatory capital-stability nexus is examined. A Hausman test is then carried out to determine the best model fit between the fixed effect and the random effect models.

Using z-score as a stability measure, the results of the test indicate the null hypothesis of differences in coefficients not being systematic is rejected, and thus the fixed-effect models for models three (3) and four (4) but random-effect models were accepted for models one (1) and two (2). However, in the case of the NPL, the test rejected the null hypothesis of differences in coefficients and thus, the fixed-effect models were estimated in all models. Results of the Hausman test for model selection are indicated beneath tables 4 and 5 as well as in the appendices.

Post-diagnosis tests for heteroskedasticity and autocorrelation are also carried out to determine their existence in the models. The results are indicated beneath Table 4 and Table 5 respectively below. The existence of heteroskedasticity and autocorrelation in the data implies standard errors will be corrected using the Paris-Winsten corrected standard errors (PCSE) estimation approach. The approach used by the Prais-winsten panel corrected standard error (PCSE) technique is such that it can correct for both autocorrelation and heteroscedasticity

Effects of Regulatory Capital on Bank Stability

This section presents the results of the fixed and random effect regression estimations and discussions in the context of literature. Table 4 and table 5 examines both the effects of risk-based and non-risk based regulatory capital and institutional quality as well as the joint effect of the risk-based and the non-risk based regulatory capital and institutional quality on bank stability. Also, Table 6 present the threshold effect of the risk-based and the non-risk-based regulatory capital on bank stability.

Table 4: Effect of regulatory capital on bank stability(z-score)

	Panel A		Panel B	
Variable	(1)	(2)	(3)	(4)
	LnZscore	LnZscore	LnZscore	LnZscore
rbrc	-0.139***	0.00684		
	(0.0453)	(0.0726)		
nrbrc			0.00186	0.0162**
			(0.0151)	(0.00722)
GDP	-0.00388	-0.00123	-0.00177	-0.00254
	(0.00647)	(0.00622)	(0.00626)	(0.00665)
Blspread	-0.0173***	-0.0150***	-0.00960	-0.0100
	(0.00551)	(0.00559)	(0.0130)	(0.0130)
Bank size	0.0887**	0.0927**	0.105	0.0823
	(0.0414)	(0.0399)	(0.0803)	(0.0621)
Inflation	-0.0519*	-0.0320	-0.0293	-0.0129
	(0.0268)	(0.0265)	(0.0361)	(0.0252)
bcompetition	0.111***	0.0799**	0.0788**	0.0542*
	(0.0352)	(0.0352)	(0.0302)	(0.0265)
Bcon	-0.00223	-0.00102	-0.000390	0.00117
	(0.00214)	(0.00214)	(0.00539)	(0.00522)
Prov_npl	-0.000141	-0.000114	0.000739	0.000251
	(0.00116)	(0.00109)	(0.00101)	(0.000779)
insq	-0.0857	-0.366***	0.00653	-0.335**
	(0.0662)	(0.139)	(0.113)	(0.139)
rbcr*instq		0.0177**		
		(0.00708)		
nrbcr*instq				0.0290**
				(0.0103)
Constant	3.220***	2.608***	2.411***	2.233***
	(0.311)	(0.388)	(0.423)	(0.442)
Observations	210	210	210	210
R-squared	0.375	0.468	0.281	0.424
F-statistic			16.22	76.01
Hausman(X^2)	10.12	11.35	17.41	23.50
Prob>chi2	0.3412	0.3311	0.0427	0.0090
Wald test				
chi2 (14)	3.9e+28	8.3e+28	4.0e+28	6.9e+27
(Prob>chi2)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Wooldridge Test	F (1, 12)	F (1, 12)	F (1, 12)	F (1, 12)
Degrees of freedom	15.331***	15.434***	3.248*	5.018**
Prob > F				

Standard errors in parentheses *** *p<.01*, ** *p<.05*, * *p<.1*

Source: Author's computation

Effect regulatory capital on Bank stability

Table 4 present the effect of risk-based and non-risk-based capital regulation on bank stability in sub-Saharan African with some control

variables. Hausman test was executed to select the appropriate estimation techniques. Using the z-score as a proxy for bank stability, the study underscores the robustness of the results. The Paris-Wisten fixed effect panel corrected standards errors approach is employed to correct for the inefficiencies in the default standard errors resulting from disturbances in the data due to heteroskedasticity and serial correlation.

In Panel A, in the first model, it is revealed that the risk-based regulatory capital has a negative and significant effect on bank stability. A unit change in the risk-based capital regulation leads to a 13.9% reduction in the stability of the banks implying that capital accumulation does not make banks in sub-Saharan Africa safer. This finding is in accordance with the results of Odongo et al. (2017) who opines that save big banks, increased regulatory capital increases financial instability among African banks largely due to the use of more complex in-house risk assessment models that enables banks to understate the risk levels underlining their portfolios thus holding less capital than required to mitigate banking sector instability. In Model two (2), it is revealed that the interactive effect of the risk-based capital regulation and the institutional quality variable is significantly positive though institutional quality variable has a significantly negative effect on bank stability. The negative effect of the institutional quality variable is in agreement with the study by Yakubu and Bunyaminu (2021) who suggests that, perhaps this is due to pockets of corruption and weak governance which affects bank stability.

However, the interactive effect of the risk-based capital regulation and the institutional quality has a significantly positive effect on the stability of the

bank at the 5% alpha level. Specifically, a joint effect of 1.77% on bank stability is observed. A well functional institutional setting has the potency of limiting the avenues through which banks take on excessive risk by understating their risk levels and the dire effects of complex regulatory capital requirements for developing economies in the sub-Saharan region World Bank (2020).

Turning to the control variables in Panel A, model 1 and 2, the study finds that economic growth, proxied by Gross Domestic Product is negatively related to bank stability albeit insignificant. Furthermore, banking sector profitability proxied by interest rate spread is seen as significantly negatively related to bank stability. This implies that an increase in bank profitability does not make African banks safer. This finding is in line with the study by Tan and Anchor (2016) who submit a negative relationship between profitability and bank stability among Chinese banks largely due to the risk-return hypothesis. Also, the development of the banking sector proxied by the extent of capital to the private sector is positively related to bank stability and it is significant at the 5% level. This implies as African banks experience excessive credit growth; the stability of the banking sector increase. This contradict the study of Moyo et al. (2014) which claimed an inverse relationship between credit growth and stability as was the case of the GFC when credit boom made the financial sector riskier.

The results also reveal a 10% significant relationship between inflation and bank stability. The negative effect indicates reductions in bank stability at higher levels of inflation. This is in agreement with the study by Bermpei et al. (2018). An inverse relationship may stem from the fact that higher levels of

inflation thwarts expenditure levels which in turn affect bank cash flows and liquidity thus increasing the likelihood of bank losses with attending stability concerns (Yakubu & Bunyaminu, 2021). In both models, there's a significantly positive relationship between bank competition (proxied by the lerner index) and bank stability. The positive effect implies that at higher levels of bank competition, leads to the stability of sub-Saharan banks since it leads to higher credit rationing and it limiting effect on large loan extensions thus minimizing the probability of loan default (Ozili, 2018). From the model, both provisions-to-NPL and bank concentration are negative though insignificant.

In Panel B, in model (3), both the non-risk-based capital regulation and the institutional variables positively affect bank stability albeit insignificant. However, adding the interactive effect of the non-risk-based capital and the institutional variable in model (4), the non-risk-based capital positively and significantly influences bank stability at the 5% alpha level while the institutional variable still shares an inverse relationship with banking sector stability. A unit increase in the non-risk-based capital leads to 1.62% increase in bank stability. This finding is in agreement with the findings of Abbas and Younas (2021) who note that bank non-risk-based capital improves stability by reducing banking sector risks associated with the bank's assets. The interactive effect of the bank's non-risk-based capital and the institutional quality variable significantly improves banking sector stability. More precisely, there is a 2.9% positive joint effect on bank stability. Save bank competition which reports positive and significant relationship with bank stability, all the other controls though maintain their expect signs however

insignificant.

In the context of agency theory, the relationship between regulatory capital requirements, institutional quality, and bank stability can be understood through the lens of the principal-agent framework. Agency theory posits that conflicts of interest arise between principals (shareholders or regulators) and agents (bank management), as agents may prioritize their interests over those of the principals. Regulatory capital requirements act as a mechanism through which regulators, as representatives of the broader public interest, seek to align the incentives of bank management with the stability and soundness of the financial system.

Higher regulatory capital requirements serve as a form of control or monitoring by regulators, intending to mitigate the agency problem by reducing the likelihood of excessive risk-taking by banks. However, the study's findings suggest that, in the case of risk-based regulatory capital, an inverse relationship exists with bank stability. This could be attributed to the use of complex risk assessment models by banks, allowing them to understate the risk levels in their portfolios. In the agency framework, this implies that banks, as agents, may manipulate risk assessment models to fulfill regulatory requirements while engaging in riskier behavior.

Moreover, the interactive effect of risk-based capital regulation and institutional quality indicates that a well-functioning institutional setting positively influences bank stability. This aligns with the agency theory perspective, as a robust institutional environment acts as an external monitoring mechanism, curbing the agency problem by ensuring that banks adhere to regulatory requirements genuinely.

The negative impact of institutional quality alone on bank stability suggests that weak governance and corruption, elements often associated with poor institutional quality, can undermine stability. However, when combined with risk-based capital regulation, there is a positive joint effect on stability. This implies that effective institutions enhance the regulatory impact, providing a check against potential agency problems and ensuring that the intended stability measures are effectively implemented.

Table 5 displays the regression results of both fixed and random effects models for bank stability using NPL as dependent variables and examine the effect of both risk-based and non-risk-based regulatory capital with some control variables. All models are jointly significant at the 1% alpha level with explanatory powers of 28.1%, 42.4%, 74.6% and 78.7% for models 1, 2, 3 and 4 respectively implying variations in the dependent variable is explained more by the regressors in models 3 and 4 than in models 1 and 2.

Table 5: Effect of regulatory capital on bank stability (NPL)

	Panel A		Panel B	
Variable	(1)	(2)	(3)	(4)
	NPL	NPL	NPL	NPL
rbcr	-7.121***	-5.194		
	(0.440)	(4.357)		
nrbcr			-0.993**	-0.662**
			(0.307)	(0.187)
GDP	-0.295*	-0.259*	-0.229	-0.246
	(0.110)	(0.110)	(0.141)	(0.126)
Blspread	0.103	0.144	0.0103	0.0000158
	(0.120)	(0.127)	(0.196)	(0.178)
Bank size	9.027***	9.106***	9.273***	8.745***
	(0.928)	(1.136)	(1.236)	(0.848)
Inflation	-1.250*	-0.970	-1.306	-0.928
	(0.498)	(0.689)	(0.615)	(0.563)

bcompetition	-1.775***	-2.153*	-1.509*	-2.077***
	(0.311)	(0.937)	(0.543)	(0.484)
BCon	0.316***	0.328**	0.358*	0.394*
	(0.0680)	(0.0958)	(0.136)	(0.135)
prov-npl	0.00864	0.00822	0.0170	0.00580
	(0.0242)	(0.0255)	(0.0237)	(0.0207)
insq	-7.929*	-11.91	-6.138	-13.99**
	(2.689)	(8.483)	(3.066)	(3.461)
rbcr*instq		0.226		
		(0.482)		
nrbcr*instq				0.668*
				(0.258)
Constant	-18.27*	-26.12	-31.34**	-35.43**
	(7.909)	(24.05)	(8.438)	(10.54)
Observations	210	210	210	210
R-squared	0.281	0.424	0.746	0.787
F-statistic	16.22	76.01	220.5	770.5
Hausman(X^2)	24.20	21.57	34.43	33.95
Prob>chi2	0.0040	0.0174	0.0001	0.0002
Wald test				
chi2 (14)	2804.89	5450.66	11128.45	3848.03
(Prob>chi2)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Wooldridge Test				
Degrees of freedom	F (1, 12)	F (1, 12)	F (1, 12)	F (1, 12)
Prob > F	0.995	5.376**	4.287*	1.366

Standard errors in parentheses *** *p<.01*, ** *p<.05*, * *p<.1*

Source: Author's computation

Consistent with the results in table 5, the risk-based regulatory capital, in the relevant specification (Panel A, model 1), has a significant coefficient and appear to be an effective tool in ensuring banking sector stability by reducing credit risk. This is consistent with the findings of Barth et al. (2004). Considering the interactive effect of the risk-based regulatory capital and institutional quality in model (2), the study finds no significant relationship with banking sector stability. This implies that the risk-based regulatory

capital has no indirect effect on bank soundness through institutional quality. The general effect of the institutional quality variable is negative and, in some cases, significant (i.e., model 1 and 4) signifying a reduction in credit risk thus stabilizing the banking sector. In Panel B, for both models, the non-risk-based regulatory capital significantly improves banking sector stability by reducing credit risk. However, this stabilizing effect minimizes with higher institutional quality as the interactive effect of the non-risk-based regulatory capital and institutional quality is significant and positive. This signifies that, higher levels of institutional quality dampen the effects of non-risk-based regulatory capital on bank credit risk thus reducing the stability of the bank. Bermpei et al. (2018) states that in a well-functioning institutional setting, given loan repayment possibilities or ease of collateral, the bank may be less strict on its loan acquisition processes. Thus, given this revealed substitutionary relationship between non-risk-based regulatory capital and institutional quality, bank stability will be at stake.

Turning to the control variables, GDP ha a negative and significant effect on bank stability in models 1 and 2. Possible explanation to this is the increased tendency for loan repayment in economic booms thus stabilizing the economy. The results also show that banking sector concentration and bank capital to private sector both have significantly positive effect on bank credit risk thus reducing the stability of the bank. The former is in line with Ozili (2018) and the later agrees with the findings of Inflation has a negative but insignificant effect on bank stability. both bank interest rate spread and bank provisions to NPL are positive albeit insignificant.

On the measure of efficiency, the Lerner index, it is significantly positive with the z-score and significantly negative with the NPL as measures of bank stability. These results support the study of Berger and DeYoung (1997) who mentions that efficiency of African banks is shown through minimizing the levels of NPL. Higher levels of bank efficiency significantly reduce the levels of the NPL thus improving the stability of the banking sector.

Threshold Effect of regulatory capital on bank stability

To determine the sustainable or the minimum level of regulatory capital required to effect a positive significant impact on banking sector stability in sub-Saharan Africa, the study employed a Dynamic Panel Threshold Model (DPTM) introduced by Seo and Shin (2016). Thus, equation (6) is estimated to determine the threshold level of regulatory capital that stimulate banking sector stability.

Table 6: Dynamic panel threshold of regulatory capital on bank stability

Variables	(1)	(2)	(3)	(4)
	z-score	z-score	npl	npl
Lag_Dependent	0.242**		-0.235**	
	(0.097)		(0.114)	
nrbcr	-1.903***		1.026***	
	(0.520)		(0.362)	
rbcr		-0.872***		0.719***
		(0.278)		(0.173)
inflation	-0.068	-0.090	0.175	-0.201
	(0.081)	(0.071)	(0.126)	(0.154)
Bcon	-0.030	0.009	0.073***	-0.105*
	(0.024)	(0.027)	(0.028)	(0.056)
Bank size	-0.019**	-0.063***	0.054***	0.128
	(0.009)	(0.020)	(0.005)	(0.091)
bldspread	0.155	-0.048	0.255***	0.568***
	(0.148)	(0.106)	(0.076)	(0.203)
bcompetition	6.369	-12.750	6.190	-9.347
	(6.298)	(9.038)	(11.018)	(16.801)
Pro_npl	0.001	0.008**	-0.050**	-0.043**
	(0.006)	(0.004)	(0.021)	(0.022)
instq	3.871	3.990	3.249	-28.866***
	(4.014)	(3.182)	(6.833)	(8.174)

GDP	-0.088	0.206***	-0.215*	-0.335*
	(0.055)	(0.065)	(0.119)	(0.203)
kink_slope	3.181***	1.380***	-3.815***	-1.201*
	(0.735)	(0.413)	(0.866)	(0.641)
Threshold (rc)	11.203***	15.328***	12.556***	21.867***
	(0.819)	(1.511)	(0.538)	(6.150)

Note 1: (***), (**) and (*) indicates significant at 1%, 5% and 10% level respectively. Note 2:" r" is the threshold level of regulatory capital (non-risk-based in model 1&3 and risk-based in model 2&4).

Source: Author's Computation, 2022.

In Table 6, model 1 and 3 showed that the lagged value of Z-Score and NPL has a positive and negative significant effect respectively on the present values at five percent level of significance. The significance of the lagged dependent variable justified the adoption of a dynamic panel threshold model in such models. In addition, it underscores the importance of the initial level of stability in the current status of stability in sub-Saharan Africa. Models 2 & 4 specified a static model due to the insignificance of the lagged dependent variables.

Also, the result in table 4 showed a true dynamic panel threshold model for the panel selected African countries depicted by the statistically significant kink model reported at the 1% and 10% alpha levels for models 1 to 3 and 4 respectively. The positive coefficient of the kink-slope in the Z-Score [model one (3.181) & two (1.380)] reveal the progression in the trend of capitalization, which implied that a number of countries in the subregion demonstrated a fairly capitalized vault around the threshold level. This is probably, as observe by Oduor, Ngoka, and Odongo (2017), due the recent hast in capital buildup among most sub-Saharan African countries towards Basel III objectives. The negative coefficient of the kink-slope in the case of the NPL in model 2 and model 4 reveal the deterioration in the trend of non-performing loans which implied that a number of countries among the selected

sub-Saharan African countries are leveled with various forms of credit risks. Moyo et al. (2014) opines that the period leading to the GFC of 2008 was characterized by the proliferation of non-performing loans among SSA countries.

In addition, the result showed that the threshold variable (regulatory capital) in all the models was statistically significant at 1% alpha level. This indicates the presence of a threshold thus rejecting the null hypothesis of no threshold effects of the regulatory capital on bank stability. This result implies that the relationship between regulatory capital and bank stability is nonlinear and conditional on the level and type of regulatory capital: risk-based or a non-risk-based. In addition, the result confirms findings in previous literature (Lev Ratnovski, 2013; Schuermann, 2004; Admati et al., 2010; Hellwig, 2010; Miles et al., 2012; Goodhart, 2012; Martinez-Miera & Suarez, 2012) which asserted that regulatory capital is more beneficial and positively related to bank stability if it is pegged at a specific threshold.

In table 6 (model 1&2), using the z-score as a stability measure, though does not represent exactly the rule of thumb posited by Lev Ratnovski (2013) and supported by Schuermann (2004), that the optimum threshold of a risk-based regulatory capital should be twice of the non-risk-based regulatory capital, the study observes a variation in the threshold levels of the non-risk-based regulatory capital (11%) and the risk-based regulatory capital (15%). This thus, agrees with the requirement that in order to capture the inherent risks likely to affect the bank's portfolios, the risk-based regulatory capital is higher than the simple leverage ratios. In model 3&4 of table 6 however, using

the NPL as a stability measure, the study reveals a risk-based regulatory capital threshold (22%) close to twice of the non-risk-based (13%).

In furtherance of this, the results underscore the certainty of a threshold in the capital-stability nexus with variations depending on the type of regulatory capital employed and the stability measure. Generally speaking, the results reveal that a non-risk-based regulatory capital threshold level of 11-13% will have a positive effect on stability and a 15-22% threshold level for that of the risk-based regulatory capital. The former(non-risk-based) is in line with Martinez-Miera and Suarez (2012) who observe an optimum level of 14% capital requirement using 7% as a base level with a gradual transition period while the later (risk based) is in line with Miles et al. (2012) and Goodhart (2012) who suggest a 16% -20% bank capital to risk weighted assets as the optimum regulatory capital. The rest of the independent variables are consistent with their expected signs and in some cases significant (bank concentration, domestic credit to private sector, bank spread, provisions-for-npl, gdpg and institutional quality) while insignificant in the case of inflation and lerner index.

Chapter summary

In this chapter, the researcher presented the descriptive statistics and the relationship that exist among the variables employed in the study in a correlational analysis. Following this was the results from a panel corrected standard errors (PCSE) fixed effect models and the Seo and Shin (2016) Dynamic Panel Threshold Methodology (DPTM). Objective one sought to examine the effect of the two types of regulatory capital on bank stability. The results showed that while risk-based regulatory capital reduces bank stability,

the non-risk-based stability improves bank soundness in the case of the z-score. In the case of the NPL, they both improves bank stability. The second objective sought to examine the effect of institutional quality on bank stability. The results show that on the whole, institutional quality reduces bank stability.

The third object sought to assess how institutional quality moderates the effects of regulatory capital on bank stability within the SSA region. The results indicate that while institutional quality maximizes a positive effect of both the risk-based and non-risk-based regulatory capital on bank stability in the case of the z-score, it has negative or no implications in the case of the NPL. This suggests a complementary effect in the case of the former and a substitutionary effect in the case of the later. The final object sought to explore the existence of a threshold in the capital-stability nexus. The results indicate the existence of a non-risk-based regulatory capital threshold level of 11-13% and a 15-22% threshold level for that of the risk-based regulatory capital.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter serves as the study's endpoint, encompassing a summary, conclusions, and recommendations. It unfolds in three sections: Section One provides an overview of the entire study, while Sections 2 through 4 present conclusive insights, policy recommendations, and suggestions for future research in a systematic manner.

Summary of findings

The study observes that risk-based regulatory capital and institutional quality has a negative relationship with bank stability using z-score as a measure of stability which not only validate our expectation but affirms the findings of other studies that due to the possibility of banks circumventing about their actual risks inherent in their vaults in a risk-based regulatory capital, their stability may be compromised. However, the result indicates a positive effect of the risk-based regulatory capital on bank stability in the presence of institutional quality signifying a complementary role of capital and institutional quality. A well-functioning institutional setting reenforce the implementation of capital regulation through heightened monitoring and compliance enforcement.

In addition, the results reveal that the non-risk-based regulatory capital has a positive effect on bank stability and by a wider magnitude in the presence of institutional quality as compared to the risk-based regulatory quality.

Unlike the z-score, the study finds that both the risk-based and the non-risk-based regulatory capital improves bank stability by reducing bank credit risk (NPL). However, the risk-based regulatory capital has no indirect effect on credit risk through institutional quality while the stabilizing effect of the non-risk-based on credit risk dampens in the presence of institutional quality. Thus, signifying a substitutionary role of regulatory capital in the case of credit risk. Institutional quality was likewise revealed to reduce credit risk unlike the case of default risk.

In addition, using the Dynamic Panel Threshold Model (DPTM) introduced by Seo and Shin (2016), the study reveals that a non-risk-based regulatory capital threshold level of 11-13% will have a positive effect on stability and a 15-22% threshold level for that of the risk-based regulatory capital.

Other factors such as bank concentration, domestic credit to private sector, bank interest rate spread, provisions for NPL, GDP growth, inflation and bank competition were revealed to affect the stability of the banking sector in sub-Saharan subregion.

Conclusion

The capital-stability nexus is an ongoing debate among both academic and non-academic scholars. Recent stability concerns of the banks underestimating their risk levels in risk-based regulations coupled with mixed findings in the capital-stability nexus necessitated this study in order to understand the complementarity or the substitutionary nature of the risk-based and the non-risk-based regulatory tools as well as their indirect or conditional effect through the quality of institutions.

To achieve the objectives of the study, the fixed effect panel regression methos was adopted. For the purposes of testing for the non-linearity between regulatory capital and bank stability, the Seo and Shin (2016) Dynamic Panel Threshold Methodology (DPTM) is employed. Stability proxies used are the z-score and the nonperforming loans while bank capital to risk weighted assets and bank equity to total asset are used as the risk-based and the non-risk-based regulatory measures.

The study concludes that regulatory capital (risk-based and non-risk-based) and institutional quality affect the stability of the banking sector and the effect of each type of regulatory capital as well as the institutional quality depends on the banking sector stability proxy employed. In furtherance of this, depending on the type of bank stability proxy employed, both the risk-based and the non-risk-based regulatory capital will have a complementary and substitutionary joint effect with institutional quality on the stability of the banking sector. More specifically, in the presence of the institutional quality, risk-based regulatory capital improves the stability of the bank signifying complementarity using the z-score and in the case of the NPL, the presence of the institutional quality, dampens the effect the regulatory capital signifying a substitutionary role.

Also, it is further established that the relationship between banking sector regulatory capital and bank stability, exhibit a non-linear behavior. In consequent of this, given a determined threshold, each type of regulatory capital influences bank stability differently. The implication therefore is that, as enshrined in the Basel accords, the determination of a threshold for a desired effect of a bank capital regulation is important in ensuring its

effectiveness in improving the stability of banks. Thus, the null hypotheses set out are therefore rejected.

Recommendation

Banking sector stability is of a major concern to today's financial sector regulators. Due to the difference in the outcomes of risk and non-risk-based regulation, the ideal solution is to adopt a diversified regulatory capital measure in ensuring the stability of the banking sector. In furtherance of this, the identification of a threshold therefore implies that for regulatory policy to be effective in ensuring the soundness of the banking sector, bank capital regulators must be guided by the identified threshold while paying critical attention to the variations in the risk-based and the non-risk-based regulatory capital. Risk based regulatory capital should be set between 15 to 22 percent and non-risk-based set between 11 to 13 percent.

Moreover, our results highlight the impact of institutional quality on sub-Saharan African banking stability. Improving institutional frameworks in Sub-Saharan Africa should be a policy priority to mitigate the negative impact of institutional quality on bank stability and to reengineer its conditioning effect on the regulatory capital-stability nexus. In the case of bank credit risk, there's a substitutionary relationship between non-risk based regulatory capital and institutional quality. This suggest that adequate consideration must be made in the implementation of the regulatory capital as the institutional base such as the presence of government bailouts and investor protection which results in minimal depositor monitory, can exacerbate the lender moral hazard problem. Thus, the need for regulators such the central bank of Ghana to

create avenues for improved loan acquisition procedures and monitoring mechanisms.

Suggestions for future research

Further studies could look at the disaggregated effect of the institutional quality variables to better understand the specific areas of priority. Another possible area of future study could be to study the threshold effect of conditioning variables such as the level of institutional quality, financial sector development, etc. in the regulatory capital-stability nexus. Further studies may focus on large number of countries or bank level data instead of the country level. It could also be interesting if future works could compare the findings of this study using different methodologies.

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APPENDICES

A: Hausman Test Results

Model 1 (Z-SCORE)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)) S.E
logbrcrwa	-0.145	-0.139	-0.006	0.011
gdpg	-0.005	-0.004	-0.001	0.002
bldspread	-0.014	-0.017	0.003	0.005
log_dctops	0.079	0.089	-0.010	0.022
logIflation	-0.054	-0.052	-0.002	0.007
Loglerner	0.101	0.111	-0.010	0.010
bconcentra~n	-0.001	-0.002	0.001	0.002
prov_npl	0.000	-0.000	0.000	0.000
INSTQ	0.038	-0.086	0.124	0.081

consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 10.12

Prob>chi2 = 0.3412

Model 2 (Z-SCORE)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
logbrcrwa	0.047	0.007	0.041	0.026
gdpg	-0.001	-0.001	-0.000	0.002
bldspread	-0.010	-0.015	0.005	0.004
log_dctops	0.087	0.093	-0.006	0.017
logIflation	-0.026	-0.032	0.006	0.007
Loglerner	0.064	0.080	-0.016	0.009
bconcentra~n	0.000	-0.001	0.001	0.001
prov_npl	0.000	-0.000	0.000	0.000
INSTQ	-0.359	-0.366	0.007	0.086
regula~pinst	0.023	0.018	0.005	0.002

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 11.35
Prob>chi2 = 0.3311

Model 3 (Z-SCORE)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b-V_B)). S.E.
bcta	0.002	0.006	-0.004	0.004
gdpg	-0.002	-0.000	-0.002	0.004
bldspread	-0.010	-0.016	0.006	0.007
log_dctops	0.105	0.131	-0.026	0.032
logIflation	-0.029	-0.027	-0.002	0.013
Loglerner	0.079	0.080	-0.002	0.014
bconcentra~n	-0.000	-0.003	0.003	0.002
prov_npl	0.001	0.000	0.000	0.000
INSTQ	0.007	-0.127	0.134	0.109

b = consistent under Ho and

Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 17.41
Prob>chi2 = 0.0427

Model 4 (Z-SCORE)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)). S.E.
bcta	0.016	0.013	0.003	0.005
gdpg	-0.003	-0.001	-0.002	0.003
bldspread	-0.010	-0.016	0.006	0.007
log_dctops	0.082	0.128	-0.046	0.031
logIflation	-0.013	-0.018	0.006	0.013
Loglerner	0.054	0.064	-0.010	0.014
bconcentra~n	0.001	-0.002	0.003	0.002
prov_npl	0.000	0.000	0.000	0.000
INSTQ	-0.335	-0.299	-0.036	0.131
regula~vinst	0.029	0.020	0.010	0.004

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 23.50
Prob>chi2 = 0.0090

Model 1 (NPL)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)). S.E.
gbrcrwa	-7.121	-6.934	-0.187	0.409
gdpg	-0.295	-0.050	-0.246	0.086
bldspread	0.103	-0.090	0.194	0.176
log_dctops	9.027	7.763	1.264	0.791
logIflation	-1.250	-0.832	-0.418	0.276
Loglerner	-1.775	-2.028	0.253	0.357
bconcentra~n	0.316	0.130	0.186	0.058
prov_npl	0.009	0.002	0.007	0.011
INSTQ	-7.929	-8.510	0.582	2.745

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 24.20
Prob>chi2 = 0.0040

Model 2 (NPL)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)). S.E.
logbrcrwa	-5.194	-5.112	-0.082	1.044
gdpg	-0.259	-0.040	-0.220	0.080
bldspread	0.144	-0.071	0.215	0.166
log_dctops	9.106	8.042	1.064	0.699
logIflation	-0.970	-0.619	-0.351	0.308
Loglerner	-2.153	-2.390	0.237	0.375
bconcentra~n	0.328	0.163	0.165	0.053
prov_npl	0.008	0.001	0.007	0.009
INSTQ	-11.909	-12.456	0.547	3.216
regula~pinst	0.227	0.233	-0.006	0.101

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 21.57
Prob>chi2 = 0.0174

Model 3 (NPL)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)). S.E.
bcta	-0.993	-0.621	-0.372	0.133
gdpg	-0.229	0.124	-0.353	0.118
bldspread	0.010	-0.080	0.090	0.238
log_dctops	9.273	7.858	1.415	1.084
logIflation	-1.306	-0.379	-0.927	0.442
Loglerner	-1.509	-2.201	0.692	0.490
bconcentra~n	0.358	0.076	0.282	0.077
prov_npl	0.017	0.015	0.002	0.015
INSTQ	-6.138	-8.727	2.589	3.544

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 34.43
Prob>chi2 = 0.0001

Model 4 (NPL)

Explanatory Variable	(b) Fixed Effect	(B) Random Effect	(b-B) Difference	sqrt(diag(V_b -V_B)). S. E.
bcta	-0.662	-0.441	-0.221	0.148
gdpg	-0.246	0.064	-0.310	0.101
bldspread	0.000	-0.098	0.098	0.209
log_dctops	8.745	7.966	0.779	0.951
logIflation	-0.928	-0.159	-0.769	0.392
Loglerner	-2.077	-2.607	0.530	0.427
bconcentra~n	0.394	0.130	0.263	0.068
prov_npl	0.006	0.006	0.000	0.013
INSTQ	-13.990	-14.080	0.091	3.965
regula~vinst	0.668	0.603	0.065	0.122

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 33.95
Prob>chi2 = 0.0002

B: Country Names

Botswana	Equatorial Guinea	Lesotho	Namibia	Sierra Leone
Burundi	Eswatini	Madagascar	Nigeria	South Africa
Cameroon	Gabon	Mauritania	Rwanda	Tanzania
Central African Republic	Ghana	Mauritius	Senegal	Uganda
Congo, Rep.	Kenya	Mozambique	Seychelles	Zambia