EFFECT OF CAPITAL ADEQUACY ON PERFORMANCE OF LISTED BANKS IN GHANA

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Dissertation submitted to the Department of Accounting and Finance, Christian Service University College in partial fulfillment of the requirement of the award of Master of Science in Accounting and Finance.

SEPTEMBER, 2019
DECLARATION

Candidate’s Declaration

I hereby declare that this dissertation is the results 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: Pious Vincent Abakah.

Supervisors’ Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the Christian Service University College.

Supervisor’s Signature…………………… Date…………………………

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ABSTRACT

The study investigated the impact of capital adequacy on financial performance of banks listed on Ghana Stock Exchange. Among the performance indicators, the study focused on profitability and was guided by three objectives. To determine the impact of capital adequacy on return on asset, return on equity and net interest margin. The data were sourced from six banks, namely Ecobank, Barclays Bank, Agricultural Development Bank (ADB), GCB Bank, Societe General and National Investment Bank (NIB) over the period 2005-2018. The study controlled for firm size, firm growth, tangibility, interest cover and credit risk as firm-specific factors. The data collected were screened before estimation of the models. The model estimation employed were random effect and fixed effect where post-diagnostic tests such as normality and heteroskedastic tests were performed. Random effect model estimate showed that capital adequacy has significant positive impact on return on asset with magnitude of impact of 0.0872326 at 5% significance level. Random effect model further showed that capital adequacy has significant positive impact on return on equity and the marginal impact is 0.056881 at 10% significant level. Fixed Effect Model showed that capital adequacy has significant positive impact on net interest margin of the selected banks with 0.2366788 magnitude of impact at 5% significance level. This study recommends that Bank of Ghana should ensure continual enforcement of compliance of capital adequacy requirement within the banking industry.
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I am also thankful to Mr. Amoako Prince (aka PROF) for his time and guidance. I wish to express my profound gratitude to all my family member for their supports throughout this course of study. To all I say ‘‘Bravo’’, may God bless you all.
DEDICATION

I dedicate this work to MY LOVELY WIFE RITA ABAKAH ANDOH.
# TABLE OF CONTENTS

Declaration........................................................................................................... ii

Abstract............................................................................................................. iii

Acknowledgements............................................................................................ iv

Dedication........................................................................................................... v

List of Figures..................................................................................................... x

## CHAPTER ONE: BACKGROUND OF THE STUDY .............................................. 1

1.0 Introduction .................................................................................................. 1

1.1 Statement of the Problem............................................................................ 2

1.2 Research Objectives ................................................................................... 3

1.3 Research Hypotheses ................................................................................ 4

1.4 Significance of the Study .......................................................................... 4

1.5 Delimitations of The Study ....................................................................... 5

1.6 Limitations of the Study .......................................................................... 6

1.7 Brief Methodology ..................................................................................... 6

1.8 Operational Definitions of key Terms ....................................................... 7

## CHAPTER TWO: LITERATURE REVIEW ......................................................... 9

2.0 Introduction .................................................................................................. 9

2.1 Theories Of Capital Adequacy .................................................................. 9

2.1.1 Buffer Theory ..................................................................................... 9

2.1.2 The Financial Stewardship Theory ...................................................... 10

2.1.3 Financial Intermediation Theory ......................................................... 10

2.1.4 Stakeholder Theory ............................................................................. 11

2.2 Conceptual Framework ............................................................................ 12

2.2.1 Concept Of Capital Adequacy .............................................................. 12

2.2.3 The Measure Of Capital Adequacy ...................................................... 14

2.3 Factors That Influence Capital Adequacy ............................................... 15

2.3.1 Credit Risk And Asset Quality ............................................................ 16

2.3.2 Inflation And Interest Risks ................................................................. 16

2.3.4 Size Of Bank ....................................................................................... 17
CHAPTER THREE: METHODOLOGY

3.0 Introduction ................................................................................. 28
3.1 Research Design ........................................................................ 28
3.2 Research Population .................................................................... 29
3.3 Sampling Procedures ................................................................... 29
3.4 Data And Data Sources ................................................................. 30
3.5 Model Specification ..................................................................... 31
3.6 Measurement Of Variables ............................................................ 34
3.7 Data Analysis ............................................................................. 34

CHAPTER FOUR: RESULTS AND DISCUSSIONS ................................. 36

4.0 Introduction ................................................................................. 36
4.1 Capital Adequacy Of Selected Banks ............................................. 36
4.2 Description Of Dependent Variables .............................................. 38
4.3 Impact Of Capital Adequacy On Return On Asset ......................... 39
4.4 Impact Of Capital Adequacy On Return On Equity ....................... 42
4.5 Impact Of Capital Adequacy On Net Interest Margin .................... 45
4.6 Model Adequacy And Reliability Test .......................................... 48

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS .............................................................................. 49
5.0 Introduction

5.1 Summary

5.2 Conclusions

5.3 Recommendations

5.4 Suggestions For Future Studies

References

Appendix 1

Appendix 1a: Estimated Results On Return On Asset

Appendix 1b: Impact Of Capital Adequacy On Return On Equity

Appendix 1c: Impact Of Capital Adequacy On Net Interest Margin
LIST OF TABLE

Table 1: Descriptions of Study Variables ................................................................. 34
Table 2: Capital Adequacy of the Selected Banks over 2005-2018 .......................... 37
Table 3: Average Return on Asset, Return on Equity and Net Interest Margin Over 2005-2018 ................................................................................................................. 38
Table 4: Correlation Coefficient Between Capital Adequacy and Return on Asset...... 40
Table 5: Impact of Post- acquisition on Return on Asset ............................................ 41
Table 6: Correlation Coefficient Between Capital Adequacy and Return on Equity ..... 43
Table 7: Impact of Capital Adequacy on Return on Equity ........................................ 44
Table 8: Relationship between Capital Adequacy and Net Interest Margin .......... 46
Table 9: Impact of Capital Adequacy on Net Interest Margin .................................... 47
Table 10: Model Diagnostics and Stability Tests ...................................................... 48
LIST OF FIGURES

Figure 1 Conceptual Framework of impact of Capital Adequacy on Financial Performance ........................................................................................................................................... 12

Figure 2: Line graph of Return on Assets and Capital Adequacy over the period of 2005-2018 ........................................................................................................................................................................... 40

Figure 3: Line graph of Return on Equity and Capital Adequacy over the period of 2005-2018 ........................................................................................................................................................................... 43

Figure 4: Line graph of Net Interest Margin and Capital Adequacy over the period of 2005-2018 ........................................................................................................................................................................... 46
CHAPTER ONE

BACKGROUND OF THE STUDY

1.0 Introduction

The banks in Ghana have witnessed an up review of capital requirement as a means of improving their capital adequacy to make them more sustainable and resilient (BoG, 2018). In 2008 for example, the Bank of Ghana increased the minimum capital requirement for commercial banks to GH¢60 million and this figure further increased to GH¢120 million in 2013. Just recently, in 2018, Bank of Ghana increased the minimum capital requirement for commercial banks to GH¢400 million.

The increase in the capital requirement has resulted in improved capital adequacy ratio above its minimum level in the recent times. Nwokoji (2013) noted that the average Capital Adequacy Ratio (CAR) of the banks has been consistently above the stipulated minimum of 10.0 percent over the years. Capital adequacy play important roles in the banking industry. Olalekan and Adeyinka (2013) indicated that capital adequacy provides the customer, the public and the regulatory authority with confidence in the continued financial viability of the bank. With higher capital adequacy, depositors for example are confident that their money is secured and they can have them at any time and any day. For regulators, higher capital adequacy makes them confident that banks are sustainable and their depositors are secured as well.

Banks like any private business entity aim at improving performance. Financial performance indicators in banking sector include profitability, leverage and liquidity. However, among these indicators, profitability has been the focus in empirical works. This may be to the fact that profit is the major aim of existence of private entity and private entities do not just earn profit but aim at maximizing it. Profitability is a key
target for all financial institutions as banks must keep adequate liquidity amounts so as to guarantee continuity. Almazari and Alamri (2017) noted that profitability is one of the key sources of capital mobilization. High profitability helps banks to attract external capital to strengthen its investments and cope with increasing competition in the industry. Profitability is as indicator used by regulator (Bank of Ghana) to determine the direction of the bank, that is whether the bank doing well or not. Profitability in the banking industry is measured by many indicators, especially return on asset (ROA), return on equity (ROE) and net interest margin (NIM) [Olalekan & Adeyinka, 2013; Hassan & Bashir, 2003; Rivard & Thomas, 1997]. In view of this, many empirical studies have focused on effect of capital adequacy on these profitability indicators. Some of the studies have found significant positive impact of capital adequacy on profitability (Kosmidou, 2008; Gul, Irshad and Zaman, 2011; Nusaibah and Kazuhiro, 2016; Moussa, 2013). However, Almazari and Alamri (2017) found in SABB bank in Saudi Arabia that there is strong negative relationship between capital adequacy and profitability (ROA and ROE).

These empirical studies make the debate and empirical studies on the subject matter inconclusive; hence the motivation to conduct empirical study on impact of capital adequacy on financial performance in banking industry in Ghana, where such studies are scarce.

1.1 Statement of the problem

Banks maintain high capital adequacy for several reasons, including attracting more depositors; thereby increasing deposit mobilization, and also attracting more equity holders, thereby increasing equity for more investment. These put together is expected to increase financial performance of the banks. Moreover, in recent times, the Bank of
Ghana has been increasing the capital requirement to improve capital adequacy ratio within the banking industry. One of the main argument put forward in favour of increased capital requirement is that it would make the banks more resilient and enhance their performance (BoG, 2018).

Though many empirical studies (Kosmidou, 2008; Gul, Irshad and Zaman, 2011; Nusaibah & Kazuhiro, 2016; Moussa, 2013) support the above assertion, Almazari and Alamri (2017) indicate otherwise. Moreover, to the best of the researcher’s knowledge, few studies have been carried out in banking industry in Ghana to verify the argument in support of higher capital adequacy in the recent times. Therefore, the impact of capital adequacy on financial performance in banking industry in Ghana still remains unclear and unverified in the recent times.

This study therefore bridges this knowledge gap in empirical literature by investigating the impact of capital adequacy on financial performance of banks listed on Ghana Stock Exchange.

1.2 Research objectives

This study seeks to investigate the impact of capital adequacy on financial performance of banks listed on Ghana Stock Exchange. It specifically looked at the following objectives;

1. To determine the impact of capital adequacy on return on asset of listed Banks in Ghana.

2. To determine impact of capital adequacy on return on equity of listed banks in Ghana.

3. To determine impact of capital adequacy on net interest margin of listed banks in Ghana.
1.3 Research Hypotheses

Based on the above specific research objective, the study tested the following hypotheses:

1. $H_0$: capital adequacy does not significantly impact on return on asset of listed banks in Ghana.
   
   $H_1$: capital adequacy significantly impacts on return on asset of listed banks in Ghana.

2. $H_0$: capital adequacy does not significantly impact on return on equity of listed banks in Ghana.
   
   $H_1$: capital adequacy impacts significantly on return on equity of listed banks in Ghana.

3. $H_0$: capital adequacy does not significantly impact on net interest margin of listed banks in Ghana.
   
   $H_1$: capital adequacy impacts significantly on net interest margin of listed banks in Ghana.

4. $H_1$: capital adequacy impacts significantly on net interest margin of listed banks in Ghana.

1.4 Significance of the study

This study would be significant to commercial banks, listed banks, Bank of Ghana and researchers. This study is about capital adequacy which is the ratio of capital to asset. The study would bring to bear the state of capital adequacy of listed banks in Ghana using current data (2005-2018). This study would moreover estimate the impact of capital adequacy on the key performance indicator (profitability) peculiar to banks to indicate how capital adequacy affects them. This information would help the listed banks to know how to treat capital adequacy within banking industry.
Bank of Ghana is the regulator of financial institutions in Ghana and is party to success or failure of banks. Bank of Ghana as a regulator aims at among other things to strengthens the banks through its policies and regulations to make them profitable and sustainable. Therefore, capital adequacy within the bank industry is important to Bank of Ghana. The information on capital adequacy from current data would help Bank of Ghana to adopt appropriate policies regarding capital adequacy of banks.

Researchers need empirical studies on their specific areas of study or research to set the tone and direction for further research. This study would add to the body of knowledge on capital adequacy and its effect on financial performance in banking industry in Ghana. This study when completed would serve as reference material to many researchers wishing to conduct studies on the subject matter in other industries or geographical areas.

1.5 Delimitations of the study

The focused on Ecobank, Barclays Bank, Agricultural Development Bank (ADB), GCB Bank, Societe General and National Investment Bank (NIB) because these banks have up-to-date published financial statements on their respective website, making adequate data more accessible.

Contextually, this study considered capital adequacy and its impact on financial performance. Among the indicators of financial performance, this study focused on profitability. This is because profit is the main goal of all private entities, including banks. The profitability indicators are many but this study focused on return on asset (ROA), return on equity (ROE) and net interest margin (NIM) because these are key profitability indicators in banking sector.
With regards to the time period, this study considered time period of 2005-2018 since to the best of researcher’s knowledge, all empirical study on capital adequacy in banking industry were done before this time period.

1.6 Limitations of the study

The major limitation of this study was the number of banks considered in the study. The study considered 6 listed banks Ghana due to data problem. This would undermine the generalization of this study.

However, this study is still relevant and realistic since it used audited financial statements of the selected banks. Moreover, this study controlled firm specific variables affecting return on asset, return on equity and net interest margin as performance indicators.

1.7 Brief methodology

This study adopted quantitative strategy where data were obtained from audited financial statements of the selected banks (Ecobank, Barclays Bank, Agricultural Development Bank (ADB), GCB Bank, Societe General and National Investment Bank (NIB)) over 2005-2018.

The study through fixed effect model or random effect model estimated the impact of capital adequacy on profitability using ROA, ROE and NIM as indicators. The study used banks specific factors such as bank size and bank’s age as controlled variables to minimize the effect of heterogeneity problem due to differences in banks sampled for the study.
1.8 Operational Definitions of key terms

The key terms in this study are banks, capital adequacy, return on asset, return on equity and net interest margin. Acquisition and they are operationalized in this study as follows;

1. Banks: these are financial institutions allowed by Bank of Ghana by regulations to operation as a commercial bank and listed on Ghana Stock Exchange.

2. Capital adequacy: this is the ratio of equity capital to total asset.

3. Return on asset: this rate measures the overall effectiveness of the company to make a profit through investments and assets at its disposal. It is the ratio of net income to total asset.

4. Return on equity: it measures the return achieved by the company's shareholders. It is the ratio of net income to shareholders’ equity.

5. Net interest margin: It is the interest income earned by the banks less the interest paid to lenders.

1.9 Organization of the study

The study was divided into five chapters. Chapter One dealt with the introduction. The introduction contained background to the study, statement of the problem, research objectives and hypotheses, significance of the study, scope of the study, definitions of key terms and organization of the study.

Chapter Two provided an overview of existing literature. This literature review was be grouped into three as theoretical review, conceptual framework and empirical review. The theoretical review will focus on three theories of capital adequacy. The
conceptual framework provided the pictorial linkages between capital adequacy and profitability. Empirical review provided extensive review of empirical studies on impact of capital adequacy on profitability.

Chapter Three highlighted methodology to be employed in the research and the profile of the study area. It described the data that formed the basis for the research and provided an overview of the methods or the methodology to be used in the study.

Chapter Four reported the results of the empirical analysis and Chapter Five which is the last chapter looked at the summary of the findings, conclusions, and recommendations in relation to the study.
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter looks at the review of literature related to capital adequacy and firm performance in Ghana. The literature review is sub-divided into three as conceptual review, empirical review and conceptual framework.

2.1 Theories of capital adequacy

The theories that underpin this study include buffer theory, financial stewardship theory and financial intermediation theory and stakeholder theory.

2.1.1 Buffer theory

The buffer theory predicts that a bank may have an incentive that may increase capital when the bank is nearing its required minimum capital ratio (Ikpefan, 2013). Ikpefan (2013) stated that banks have a preference of gaining a buffer capital to reduce the potency of falling beneath the legal capital requirements most especially when the capital adequacy ratio is most volatile. Capital buffer can be defined as the threshold of capital to asset ratio which is mostly more than the needed minimum capital requirement established by central bank (Noreen, Alamdar, & Tariq, 2016). Banks that are poorly capitalized may be convinced to take additional risks in the wake of higher expected returns in order to improve the capital.

The theory stipulates that banks should hold more capital than it is required. The capital buffer theory shows that banks that have a low capital buffers try to rebuild an adequate capital buffer which is done by raising capital and banks that on the other hand have capital buffers try to maintain their capital buffer.
2.1.2 The Financial stewardship theory

The primary target of the financial stewardship theory is for the commercial banks to maximize their value. The theory postulates that the management of the bank must consider the interests of the stakeholders (Khaled & Samer, 2013). It includes the steward’s efficiency and knowledge base which is gained through education and experience. The stewards make financial decisions on behalf of shareholders in a way that will maximize the returns of the stakeholders and protect the interest of the shareholders so as to establish a sound commercial banking system in an economy (Noreen, Alamdar, & Tariq, 2016).

The theory explains the relevance of the banks’ position as the stewards of the moneys of the depositors. This gives a meaning that the commercial banks need to have a strong financial base in order to tackle the risks that come through their operations.

2.1.3 Financial intermediation theory

Financial intermediation can be defined as a process whereby financial institutions lend credit to the deficit units from the surplus units who deposit their funds with these financial institutions. The theory of the financial intermediation as propounded by Diamond (1984) was based on solving incentive problems that exist between borrowers and lenders in a financial system. The intermediaries serve some purposes such as reducing the costs of transactions and also the asymmetry of information. The most vital purpose of the financial intermediaries is the creation of specialized financial commodities (Scholtens & van Wensveen, 2013). The financial commodities are mostly created when the intermediary sees that a franchise can be made for prices which at a point can cover either opportunity or direct costs of production and they mostly exist due to imperfections in the market.
Banks mostly due to the need to make profits for themselves and also as a result of a limited capacity of capital base, they end up lending more leading to liquidity problem. This theory stipulates that for banks to effectively perform their operations, they must have adequate and vibrant capital so that their objectives can be achieved.

2.1.4 Stakeholder theory

This theory posits that managers have responsibility not to the shareholders or stockholders but to the stakeholders (Freeman, Harrison & Wick, 2010). The stakeholders of a business organization are the people have stake in the business or affected by the operation of the business. This theory points out that shareholder or stockholder are not the only ones affected by the operations of a business. Stakeholders of a business are grouped into two, namely primary stakeholder and secondary stakeholder (Khaled & Samer, 2013). The primary stakeholders include community within which the business operate, customers, financiers, suppliers and employees and they are people who are directly affected by the business operation or have direct contact with the business. However, secondary stakeholders include the media, special interest group, consumer advocate group, competitors and government.

With reference to the stakeholder theory, everyone is interested in the effect of capital adequacy on financial performance of listed banks in Ghana. Therefore, this study would help the various stakeholders in banking industry to know the impact that capital adequacy has had on profitability of the banks.
2.2 Conceptual framework

This study conceptualizes the impact of capital adequacy on financial performance as shown in Figure 1.

![Conceptual Framework of Impact of Capital Adequacy on Financial Performance](image)

Figure 1: Conceptual Framework of Impact of Capital Adequacy on Financial Performance

Source: Author’s Own Construct (2019)

From the conceptual framework, this study expects direct impact of capital adequacy on financial performance of the banks. Financial performance in study is measured as return on asset, return on equity and net interest margin.

Thus, based on the conceptual framework, this study review literature on capital adequacy and financial performance as follows;

2.2.1 Concept of Capital Adequacy

Capital is an essential element for the pursuance of economic activities in any organization. In the banking sector, capital is a very key element in the management of finances as it is perceived that the adequacy of capital of any financial institution is seen as the most efficient and effective way of keeping the business running and sustaining the bank’s activities. The banking sector’s regulatory bodies pay much attention to the capital level of banks (Tiryaki, 2009). Bank managements also pay much attention to capital levels of the bank so as to enable the bank to function in a sound way.
Capital can also be said to be the value of the net assets of the firm’s owners which in this case is the bank. Capital is defined as the value of resources that are being supplied by the owners (Wood and Sangster, 2002). Capital refers to amount of paid up share capital and its reserves that have been accumulated (Torbira & Zaagha, 2016). Capital refers to the reduction of the equity worth of a bank to its present worth of its future gaining. Bank capital is the net value of an owner in the bank and all the payment in capital together with the capital resources that the bank has (Ejoh & Iwara, 2014). Capital can also be defined as a fund that is owned by an organization (Hassan, 2007). The regulators also see capital as funds surrendered by owners which do consist of stocks, reserves that are kept for contingencies and profits retained. The premium source of funds for the banks is the capital that is used for the purchasing of essential necessary fixed assets and for providing surplus for working capital.

The Central Bank of Nigeria (CBN) and Nigeria Deposit Insurance Corporation (NDIC) (1995) stated that the roles of capital is to acquire fixed assets, which serves as a basis or platform for operations, absorb operation shocks and losses and clinch the confidence that the public, depositors and financial regulators have in the bank and portray the strength of the bank together with its limits in giving out loans. Capital is expected to be adequate always due to the fact that the decline in the amount of capital could cause problems. The defect in capital size leads to a disruption in the smooth functioning of the bank both in operational and financial terms which adversely affect the performance of the bank (Ejoh & Iwara, 2014). New firms or businesses also are of a need of land acquisition, equipment purchases, hire an office and the staff, the development of services and facilities and all these require sufficient capital to achieve them (Rose & Hudgin, 2018). The regulatory and
financial system require that capital is sufficient enough to have a control over the risks of assets and this ensures that growth of banks is more sustainable in the long run.

Maisel (2015) was of the view that capital adequacy is the maintenance of a level of capital to the extent that an insurer is fully covered of the risks by the premiums that are being paid by the bank. A bank can be considered as insolvent when it cannot compensate for its debts due to the fact that liquidity is so low and when the value of liabilities supersede the market value of assets. Capital adequacy refers to the given amount of capital that is being required for a bank as per the satisfactory level of the regulatory and supervisory institutions in a way that will facilitate strong and sound financial base (Ngoc, 2015). Capital adequacy can be said to be in two folds. First, there are the owners who have a basic target of accumulating return in the form of profit which is done by investing in the bank. There are also regulators who have the major objective in ensuring protection of uninsured depositors by keeping tabs on the level of capital the bank has and also providing a safe and sound financial system.

2.2.3 The measure of capital adequacy

Basel I has set the standard for measuring capital adequacy. According to Ngoc (2015) stated that the Basel I has a set of rules that the ratio of capital to assets must be at a value of 8%. Asset can be classified as risk-free asset or not. Risk-free asset includes specific government bonds, issued by central bank. Inter banks loan has a value of up to 20% risk, and corporate loans are up to 100%. Tier-one capital which is also the share capital absorbs the losses without the requirement of the bank in question to close trading. It also includes basically the main capital involved which include common stock, surpluses, capital reserves, consolidated subsidiaries of minority interests. They are basically gained from the ownership of bank and are of
great quality of capital that is of a capability of absorbing losses. Tier-two capital which also is the preference share and subordinated debt absorbs losses in the events of bank liquidation which in a way provides some security for the depositors who are funding the bank. They are mostly considered as the supplementary capital and are mostly less reliable and is also comprised of the hybrid equity or debt instruments, reserves that are retained for loan losses and term subordinated debt. The low quality of Tier two has made the Basel I restrain the amount of Tier 2 capital which can be added to the bank’s 100% tier one capital. To be considered as adequately capitalized banks need to have a capital ratio of 8% (Hempel et.al, 2013).

The ratio of equity is also another dimension that is used in the measurement of bank capital adequacy and this does measure the percentage of the total asset that equity capital finances (Mustafa & Bassam, 2012). In real sense, the higher the equity to asset ratio, the lower the need for external sources of funds which results in the high profitability of the bank. Banks that are well capitalized are less likely to run into bankruptcy which does reduce the costs of their funding. Banks that have capital to asset ratio to be high are always considered to be safe and have a boost which aids them to thrive even in economically difficult times. Banks that have a lower capital adequacy tend to bump into huge risks than as compared to the well capitalized banks. On such note, capital adequacy has an effect on profitability.

2.3 Factors that influence capital adequacy

Many factors influence capital adequacy of a bank. Among the factors key ones identified in literature are credit risk and asset quality, inflation and interest rate, the size of the banks and capital risk.
2.3.1 Credit Risk and Asset Quality

Uncollected loans or funds are mostly covered for with a fund base known as the loan loss provision. The loan loss provision funds are scaled to that of the total loans that have been disbursed so as to know the quality of the bank’s assets (Million, Matewos & Sujata 2015). When the management of banks are giving out loans they know for sure that the borrowers cannot pay the total amount of loans the bank has disbursed in full. The bank then has to create room for the losses made through the loan loss reserve and the higher the ratio, the lower the quality of asset which in turn adversely affects the capital holdings of the bank (Ishmael 2015). According to Bessis (2012), credit risk is the risk of an asset that cannot be recovered in the instances of outright default or the risk involved in disbursing loans. Credit risks can cause insolvencies due to its potency of having rippling effects (Bessis, 2012). When there is a high bad debt to advances ratio, the credit risk also gets high. The solvency of the bank is undermined as the present worth of asset keeps declining. Poor asset quality can have a significant negative impact on profits that the bank makes and further does increase the costs of provisions. The risks are mostly represented in the form of losses that the bank is susceptible to incur as a result of the incapability of the customers to pay the loans in accordance with loan agreement. There are scholarly works that suggest there is a relationship between credit risks and capital adequacy. For instance, Khaled and Samer (2013) revealed that there is an inverse relationship between capital adequacy and credit risk.

2.3.2 Inflation and interest Risks

This refers to the continuous rise in the general price levels or also the depreciation in the value of the currency over a given period of time. It can also be known as the persistent spike in the level of prices of various goods and services which is staged by
some social malaise (Saheed, 2018). Christos (2014) was of the view that inflation brings about some changes in the demand for the financial services and cash flow issues are being encountered by the borrowers which is due to some unanticipated spikes in interest rates. These developments can cause the borrowers to abruptly terminate their loan arrangements with the banks which in the long run lead to loan losses of the bank. This adversely affects the bank’s capital base as the unanticipated spike in interest rates will force the bank to review its policies and when the customers find it to be a burden in such arrangement, it becomes difficult for them to be convinced to be in a continuous relationship with the bank. This in the long run can also adversely affect the quality of assets that the bank has. The uncertainty of future inflations does affect the bank loan negotiations of its customers which is because a rise in inflation causes an increase in the nominal interest rates.

Interest rates risks possess great risks to both capital and profits and so they require effective management of interest rate by the bank (Khaled & Samer 2013). Interest rates also have various vital elements which include the different maturation dates as against the fixed interest rates, liabilities of the bank’s financial aspects apart from the balance sheet and also the variable interest rate of bank assets pricing (Abdelkareem & Salah, 2017). Interest rate risks is measured as interest rate sensitive assets divided by rate sensitive liabilities.

2.3.4 Size of Bank

The size of a bank is most usually represented by the total assets that the bank does hold at the present. The total assets of a bank refer to the total equity and the total of liabilities (Khaled & Samer 2013). It can also be the capital that has been generated by the owner and total liabilities funds from other parties (stakeholders, depositors etc.) which the bank currently holds. Bank size is mostly used in way to make
accounts for the probable economies and diseconomies of scale within the banking industry. There is a positive relationship between capital adequacy and the size of a bank as banks that are larger enough tend to be able to raise capital at a relatively lower cost (Rumangu et al, 2017).

2.3.5 Capital risks
Khaled and Samer (2013) were of the view that capital risk paid capital divided by risk weighted assets. The paid capital represents the capital that have been invested in the bank and the risk weighted assets are asset which are not in the form of cash and it does measure the degree to which the value assets reduce before it affects the funds of the depositors and the owners. Some scholarly works show there is a close relationship between capital risks and capital adequacy. It is well noted that an increase in capital risks requires that capital must be adequate enough to counter the risks of investment. The bank then will have to increase the owners’ equity so as to meet capital risk (Khaled & Samer, 2013). There is an inverse relationship between capital risks and capital adequacy (Khaled & Samer, 2013).

2.4 Financial performance
The major aim of banks is to maintain a vibrant performance as currently major corporate organizations are recording declines in their profits. This poses the question of whether the banks are performing satisfactorily or performing below the expectations of shareholders. Ellis-Christensen (2010) defined performance as the appropriate steps that are chosen to evaluate the performance of a corporate organization depending on the type of corporate organization and the targets that are set to be reached through the evaluation process. Performance measurement is the process whereby corporate organizations set up boundaries within which policies, investments, outputs and acquisition are heading towards the required end result.
Performance measurement does include the notification of progress towards certain set goals of an organization with the use of statistical instrument, the assessment of progress that has been made in achieving the set targets of the corporate organization by developing measurable indicators (Ellis-Christensen, 2010). Nuviyanti and Anggono, (2014) was of the view that performance measurement includes the process assessing the attainment of set targets using measurable indicators like inputs, the processes of delivery of operations and service outputs and their outcomes.

The fundamental goal of banks is to improve the value of shareholders through a consistency in performance improvement and so the management of various banks aim at attaining this very goal. Various models have been developed by various authors but there has not been any of them which has been approved as the most valid (Nuviyanti & Anggono, 2014). The regulatory authorities adopt the CAMEL common rating system in the assessment of the performance of banks. The C stands for the evaluation of capital adequacy, A is for the test for assets and the quality of asset and quality of advances. The M stands for the assessment of the quality of the management, E is for the evaluation of earnings the bank is able to accrue for itself and the L stands for the measurement of liquidity ratio and this system of rating is what is used to determine the condition that the bank is in. The usage of the CAMEL rating system revealed some problems that banks mostly faced. For instance, CBN and NDIC (1995) made a confirmation that the insufficiency of capital and operational losses contributed to the lag in the performances of banks.
In accountancy, financial performance is measured using financial ratios such as profitability ratio, liquidity ratios, activity ratio and leverage and this study relied heavily on these financial ratios.

### 2.4.1 Profitability Ratios

Profitability ratios help to assess the health of a company with regard to its profitability to know whether or not the company is profitable. It is a comparative analysis in that it is compared to the previous ratio or industry average or competitors in the industry. If a company's profitability ratio is higher than the industry average or it competitors or the previous ratio of the same company, then the company’s profit had increased or is higher than other companies in the industry.

In this study, two main profitability ratios, namely return on equity (ROE) and return on asset (ROA) are reviewed.

#### 2.4.1.1 Return on Equity (ROE)

Return on equity measures the rate of returns that are made by the owners of common stock of a company and receive their fair share of their shares. Return on equity portrays the potency of a company in accumulating returns from the investments that were made by the shareholders (Nuviyanti & Anggono, 2014). It is used to further express the extent to which the bank was successful and effective in the use of owners’ fund. This in turn does increase the profits of the bank and causes a spike in the value of shares which has an impact on the security of finance. Some scholars show a direct relationship between the return on equity and capital adequacy (Molyneux & Thornton, 1992). The return on equity is calculated as net profit after tax divided by total owner’s equity.
2.4.1.2 Return on Assets

The return on assets gives a representation of all the assets that are owned by a bank and their capability of accruing returns for a given period of time. It can also be referred to as the degree of success that a bank attains after investing its assets. Return on assets is mathematically calculated as the net profit after tax divided by the total asset. The return on assets measures critically the efficiency of management in the utilization of resources and potentials in accumulating revenue from the funds or resources provided from the various resource finances and so it does show the effect of the operational and financial endeavours of the bank. Some researches prove that there is a direct relationship between return on assets and capital adequacy (Samuel, 2013).

2.4.2 Liquidity

Liquidity is of various importance and they include ensuring that there is much adequate funds that will be able to withstand the withdrawal needs of the public, to be able to meet the capital reserve needs of the bank and to also meet the short term expenditures that the bank makes (Ngoc, 2015). Cash holdings always seem to have a zero interest yield and this certainly can hinder the prevalence of the banks’ earnings or profits. Liquidity then needs to be critically managed in order to maintain enough cash so as to fully perform the functions that have been mentioned above. Banks mostly take funds from the customers in the form of deposits and in return give out loans. Liquidity risks mostly are compounded as a result of the bank being unable to perform its duties effectively like for instance, being unable carefully manage the adjustments that are made in the conditions of the market which have the capability of forcing major impact on the ability to quickly liquidate assets without having an effect of losses on their value. When the banks are unable to foretell amount of loans that
will be demanded or foretell the amount of deposits that will be withdrawn and are unable to accumulate new funds that will deal with these demands, then there is a liquidity risk (Khaled & Samer, 2013). It can be said that there is an inverse relationship between liquidity and capital adequacy (Khaled & Samer, 2013).

2.4.2.1 Cash to Deposit Ratio
Cash in a bank vault is the most liquid asset of a bank. Therefore, a higher cash-to-deposit ratio indicates that a bank is relatively more liquid than a bank, which has lower cash to deposit ratio. Depositors’ trust to bank is enhanced when a bank maintains a higher cash deposit ratio. The cash-to-deposit ratio is computed as ratio of total cash to total deposit.

2.4.2.2 Loan to Deposit Ratio
Loan to deposit is the most important ratio to measure the liquidity condition of the bank. Bank with low loan-to-deposit ratio is considered to have excessive liquidity, potentially lower profits, and hence less risk as compared to the bank with high loan-to-deposit-ratio. However, high loan-to-deposit-ratio indicates that a bank has taken more financial stress by making excessive loans and shows risk that to meet depositors’ claims bank may have to sell some loans at loss. Loan-to-deposit is measured as total loan to total deposit.

2.5 Empirical review
Many studies have been carried out on effect of capital adequacy on performance of banks across the world. However, findings were different, with some studies pointing significant positive impact whiles others point significant negative effect.

Umoru and Osemwegie (2016) looked at capital adequacy and financial performance of Banks in Nigeria using a data from 2007 to 2015. They used GLS Estimator to estimate the impact of capital adequacy on financial performance. They established
that capital adequacy enhances the financial deeds of Nigerian banks. Nevertheless, the impact of the estimated capital adequacy is below 30%. According to Bouheni (2016), in the recent global financial crisis, regulators have increased their focus on capital adequacy of banking institutions in order to enhance stability of the financial market. The interaction between capitalization and risk level is negative, which means that an increase in capital is followed by a decrease in banking risk-taking; hence increasing financial performance of the banks.

Hafez (2018) conducted a research on the relationship between the efficiency of banks in Egypt and capital adequacy ratios using data 40 banks comprising Islamic banks and conventional banks over 2002 to 2015. Therefore, the pre the financial crisis, findings, concluded that, there is a significant positive relationship between the efficiency of banks and capital adequacy ratios. Yahaya et al. (2016) on capital adequacy ratio in Japan using 64 regional banks over 2005 to 2014 and found significant positive relationship between capital adequacy and financial performance. Also need to improve the level of capital adequacy for a stable security to all parties. Hashim et al. (2018) on financial performance of commercial banks in Malaysia over 2003 until 2013 noted positive relationship between capital ratio and financial performance. The study was based on secondary data which had been collected from the balance sheets and income statements of the banks from Thomson Reuters.

Mamun and Fahim (2014) found similar result in Bangladesh that capital adequacy significantly improves financial performance. Zheng and Huq (2017) examined both causality effect of banks' capital regulation and risk-taking behavior based on generalized methods of moment (GMM) for a dynamic unbalanced panel observation of 32 commercial banks in Bangladesh over the period 2000–2014. The empirical findings of the study revealed that capital regulation has significant effect on risk-
taking behavior, and excessive risks impede the growth of capital ratio as well as the stability. Higher capital adequacy reduces risk exposure and increases performance (Zheng & Huq, 2017).

Datta and Mahmud (2018) looked at the effect of capital adequacy on the profitability of listed commercial banks operating in Bangladesh. Profitability was measured as ROA and ROE and data was collected from 29 listed banks over 2007-2014. Therefore, the study found that the regulatory capital held by banks is greater than the minimum capital requirement guided under Basel II accord. Again, capital adequacy, operating efficiency and loan structure are positively related to profitability of a bank.

Lotto (2018) aimed at examining the impact of capital requirements regulation on bank operating efficiency in Tanzania with the aid of bank level data for the period between 2009 and 2015. The findings show a positive and significant relationship between capital ratio and bank operating efficiency of commercial banks in Tanzania with more stringent capital regulations are more operationally efficient. Hence, the relationship proposes that capital adequacy does not only strengthen financial stability by providing a larger capital cushion but also improves bank operating efficiency by preventing a moral hazard problem between shareholders and debt-holders.

IUdom and Onyekachi (2018) conducted a study on “Effect of Capital Adequacy Requirements on the Profitability of Commercial Banks in Nigeria”. They used secondary time series data sourced from the NDIC and CBN Annual and Bank Supervision Reports. The data analysis technique employed include the Ordinary Least Squares (OLS) regression method. Their study found out that capital adequacy impact positively on the financial performance of commercial banks in Nigeria.

Olalekan and Adeyinka (2013) used both primary from 518 staff of banks and
secondary data from financial statement of banks over 2006 – 2010 and found two contradictory results. Primary data revealed a non-significant relationship but the secondary data showed a positive and significant relationship between capital adequacy and profitability of bank. Almazari and Alamri (2017) studied “The Effect of Capital Adequacy on Profitability: A Comparative Study Between Samba and Saab Banks Of Saudi Arabia”. They study used financial statements from two banks, namely SAMBA and SABB in Saudi Arabia. SABB bank shows strong significant positive relationship between capital adequacy and profitability (Return on Asset and Return on Equity). However, SAMBA bank shows negative relationship between capital adequacy and profitability (Return on Asset and Return on Equity).

However, studies below noted otherwise. Eyo and Offiong (2015) conducted a research on effect of capital adequacy on the performance of Access Bank Plc., using a data from 1999 to 2012. They established that there is no significant relationship between core capital and profitability of Access Bank Plc. They however noted that there exists a significant relationship between supplementary capital and profitability of the bank under study. It was found out that supplementary capital is thus, a backbone of profitability.

Abba et al. (2018) attempted to analyze the bank-specific determinants of CAR in the Nigerian Deposit Money Banks (DMBs) using balanced panel data collected from financial statements of 12 selected quoted banks for the ten-year period 2005-2014. In their findings, they found out that capital adequacy ratio of Nigerian deposit money banks is well above the regulatory minimum set by Central Bank of Nigeria (CBN) as well as the requirements of Basel Accord. Also, Nigerian banks’ risk portfolio is quite high and ROA is quite low and again Depositors’ interests are well protected as the asset base of DMBs is well above the total deposits. This is a clear indication that
higher capital adequacy ratio for the banks in Nigeria has not resulted in higher financial performance.

Airout and Airout (2017) evaluation of financial performance on two of the oldest banks in Jordan, thus, Jordan Islamic Bank and Arab Islamic International Bank over 2001 - 2010. Therefore, with both descriptive and inferential statistical analysis and the study found that there are no significant differences between the performance of the Arab Islamic Bank and the Jordanian Islamic Bank, though capital adequacy ratio significantly differed in the two banks. Arab Islamic Bank where it was (60.78%), we conclude from that the Jordan Islamic Bank has the ability to meet short-term liabilities when due through its short-term assets more than Arab Islamic Bank.

Jheng et al. (2018) carried out a study to examine the relationship between capital adequacy and stock prices of Malaysia banking institution in responses to the decision made by the Malaysia Central Bank, Bank Negara Malaysia (BNM) that required every bank in Malaysia to implement the latest international banking regulation. The study employed linear regression analysis to examine the relationship between capital adequacy ratio and stock price of Malaysia banks from 8 local licensed commercial banks from 2005 to 2014. The findings showed that the capital adequacy ratio has no impact on the bank's stock price. Nevertheless, these findings were important as it evidenced that, the new banking regulation is insufficient to aid address financial distress of bank and public confidence in Malaysia.

2.6 Research Gaps

Based on the empirical review above, the following research gaps were identified. Firstly, this study identified geographical gap where most of the studies are over concentrated in some countries at the expense of others. For example, most the
current capital adequacy studies were done in Nigeria (for example, Jheng et al., 2018; IUdom and Onyekadu, 2018, and Umoru and Osemwege, 2016) and Bangladesh (for example, Mamum & Fashin, 2014; Datta & Mahmud, 2018). Scan in literature revealed that little current capital adequacy studies with emphasis on listed banks are done in Ghana.

Secondly, empirical reviewed showed that there are differences in the conclusion of impact of capital adequacy on financial performance. Some studies found positive impact whiles others found insignificant or negative impact. Therefore, the studies on capital adequacy on financial performance is inconclusive.

Thirdly, though there are many indicators of financial performance, most studies focused on return on asset only as financial performance indicator. Thus, studies on capital adequacy have largely ignored other important financial indicators like return on equity, net profit margin and net interest margin.
CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter details the methods and procedures used to analyze the capital adequacy of listed banks and its impact on performance of the banks. It includes research strategy and design, study population, sampling techniques and sample size, data collection procedure, model specifications and data analysis.

3.1 Research Design

Literature has identified three main research strategies and these include quantitative, qualitative or mixed strategy. The adoption of research strategy depends on the objective and the nature of the study. Per the objectives and the nature of this study, quantitative research strategy was employed. This strategy was employed for two main reasons. Firstly, quantitative research strategy helps to test theories or hypotheses; hence it is more scientific than other research strategies (Creswell, 2013). Thus, with quantitative research strategy, the hypotheses of this study were tested using secondary data from selected listed banks and Ghana Statistical Service. This helped to establish the impact of capital adequacy on performance of listed banks (return on asset, return on equity and net interest margin). Secondly, the idea of scientific studies is to use sample data and then generalize the outcome of the study, thus scientific studies lead to generalization. Grix (20004) noted that quantitative research strategy is scientific as compared to qualitative; hence has high degree of accuracy of generalizing its outcomes. Grix (2004) explained that quantitative research strategy uses sampled data to study a given phenomenon and generalize the outcome to the entire population. Therefore, with quantitative research strategy, this
This study was able to generalize the outcome of impact of capital adequacy on performance of sampled listed banks to entire listed banks in Ghana.

This study on the basis of quantitative research strategy, employed explanatory research design. According to Brains, Willnat, Manheim and Rich (2011), explanatory research design is about cause and effect relationship. They further explained that explanatory research design is used when the idea is to establish impact of one or more variables on other variables. This is estimating the impact of independent variables (s) on the dependent variable. Given the above features of explanatory research design, it is the most suitable for this study; hence its used.

3.2 Research Population

The target population of this study is the listed banks in Ghana. Ghana has about twenty-four (24) banks but this study targeted eight (8) listed banks on Ghana Stock Exchange due to data availability. The targeted banks were Ecobank, Barclays Bank, Agricultural Development Bank (ADB), GCB Bank, Societe General and National Investment Bank (NIB). This is because these banks have available data over the period of consideration in this study (2005-2018).

3.3 Sampling Procedures

Agyedu et al. (1999) acknowledge the difficulty of obtaining data from the entire population; hence advocated for sample of the population in scientific research work like this. They explained that time constraint and cost involve in collecting data, make it if not impossible, very difficult to obtain data from the entire population.

This study on the advice of Aguedu et al. (1999) adopted sampling approach where stratified sampling and convenience sampling were used. Stratify sampling is used
when the population under consideration has clear stratum. The listed banks in Ghana can be grouped into two as private listed banks and public listed banks. Thus, this study stratified the population accordingly. This stratification helps to ensure fair representation, thereby reducing sampling bias.

After stratification, this study then employed convenience sampling technique to sample the listed banks from each stratum. Convenience sampling technique is mostly used when a researcher has research population in mind (Henn et al., 2006). Convenience sampling is a type of non-probability sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability of data, or the willingness to participate (Dörnyei, 2007). Lisa (2008) added that researchers use convenience sampling technique when the population in question is accessible to them.

This study adopted convenience sampling techniques based on data availability. This study through google search listed all listed banks in Ghana. Google search for audited financial statements from the websites of banks revealed that 16 banks had not up-to-date (2010-2018) audited financial statements; hence those banks were dropped from the study. The study was left with 8 banks with up-to-date data from 2010 to 2-18 and these banks were Ecobank, Barclays Bank, Societe General, Agricultural Development Bank (ADB), GCB Bank and National Investment Bank (NIB).

3.4 Data and Data Sources

This study used secondary data. The data was obtained from audited financial statements of the selected listed banks over 2010-2018. This study pooled audited financial statements from the websites of the selected listed banks. It was revealed that some of the banks had no published audited financial statements prior to the year
2005; therefore, this study conveniently focused on the period 2005-2018. Banks specific variables influencing performance and performance indicators were manually computed from the audited financial statements.

### 3.5 Model specification

This specified the model appropriate for the testing of research hypothesis stated in Chapter One of this study. The main objective of this study was to estimate the impact of capital adequacy on performance of the selected listed banks. Therefore, model appropriate for this study is either fixed effect model or random effect model.

The fixed effect model is different from random effect model. The main differences include the following:

i. With fixed effect model, the parameters are fixed or non-random whiles in random effect model, the parameters are random.

ii. In fixed effect model the group means are fixed but with random effect model the group means are random sample from the population (Ramsey & Schafer, 2002; Greene, 2011).

iii. Fixed effect model assumed that individual-specific effects are correlated with the independent variables within the model whereas random effect model assumed that the individual-specific effects are not correlated with the independent variables within in the model (Cameron & Trivedi, 2005; Nerlove, 2005).

Authors have suggested that tool to choose between fixed effect model and random effect model and this tool is known as Durbin–Wu–Hausman test (Cameron & Trivedi, 2005; Nerlove, 2005). This study on the basis of Durbin-Wu-Hausman Specification Test chose Random Effects over the Fixed Effect Model; hence the
Random Effect Model is the most appropriate model for this study and it is specified as shown in equation 3.1.

\[ FINP_{i,t} = \infty + \beta_i \sum_{i=1}^{k} X_i + \gamma_i \sum_{i=1}^{k} Z_i + f_i + t_i + \gamma_{i,t} \ldots \ldots \ldots \ldots . \text{Equation 3.1} \]

Where;

FIN= financial performance of the bank

X= capital adequacy of the listed banks

Z= controlled factors which are bank specific factors.

f_i= fixed effect

t_i= time effect

Previous studies have identified firm size (Kuntluru, Muppani & Kan, 2008), capital intensity (Ravenscroft, 1983), market capitalization (Ravenscroft, 1983) and interest cover (Ravenscroft, 1983) as firm specific factors that influence financial performance of banks. The macroeconomic factors identified in literature that influence performance of banks include inflation rate, gross domestic product growth and exchange rate.

Financial performance in this study is measured using profitability ratio (ROA, ROE and Net Interest Margin) since financial performance is the most important indicator to banks. This is because, firms aim at maximizing profit or owners’ wealth. The equation 1 is thus on the basis of financial performance indicators specified the impact of capital adequacy on performance as shown in equation 2, 3 and 4.
\[ \text{ROA}_{i,t} = \beta_0 + \beta_1 \text{CAPAD}_{i,t} + \infty_1 \text{FIRMS}_{i,t} + \infty_2 \text{CRIDITR}_{i,t} \\
+ \infty_3 \text{INTCOV}_{i,t} + \infty_4 \text{FIRMG}_{i,t} + \infty_5 \text{TANG}_{i,t} + f_i + t_i \\
+ \gamma_{i,t} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots Eqn \ [2] \]

\[ \text{ROE}_{i,t} = \beta_0 + \beta_1 \text{CAPAD}_{i,t} + \infty_1 \text{FIRMS}_{i,t} + \infty_2 \text{CRIDITR}_{i,t} \\
+ \infty_3 \text{INTCOV}_{i,t} + \infty_4 \text{FIRMG}_{i,t} + \infty_5 \text{TANG}_{i,t} + f_i + t_i \\
+ \gamma_{i,t} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots Eqn \ [3] \]

\[ \text{NIM}_{i,t} = \beta_0 + \beta_1 \text{CAPAD}_{i,t} + \infty_1 \text{FIRMS}_{i,t} + \infty_2 \text{CRIDITR}_{i,t} \\
+ \infty_3 \text{INTCOV}_{i,t} + \infty_4 \text{FIRMG}_{i,t} + \infty_5 \text{TANG}_{i,t} + f_i + t_i \\
+ \gamma_{i,t} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots Eqn \ [4] \]

Where;

ROA=return on asset

ROE= return on equity

NIM= net interest margin

CAPAD= capital adequacy

FIRMS= firm size

CRIDITR= credit risk

INTCOV= interest cover

FIRMG= firm growth

TANG= Tangibility
### 3.6 Measurement of variables

The variables in equations 1-6 are measured or described in this study as shown in Table 1.

<table>
<thead>
<tr>
<th>Variable Type</th>
<th>Specific ratio</th>
<th>Formula used in computation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td>Return on Asset (ROA)</td>
<td>[Net profit before interest and tax / total asset]</td>
<td>Financial statements</td>
</tr>
<tr>
<td></td>
<td>Return on Equity (ROE)</td>
<td>[Net profit before interest and tax / shareholders’ fund]</td>
<td>Financial statements</td>
</tr>
<tr>
<td></td>
<td>Net interest margin</td>
<td>[Interest income –interest expense]/ total asset</td>
<td>Financial statements</td>
</tr>
<tr>
<td><strong>Independent Variable</strong></td>
<td>Capital adequacy</td>
<td>Core capital/ risk weighted asset</td>
<td>Financial statements</td>
</tr>
<tr>
<td><strong>Controlled Variables</strong></td>
<td>Firm Size</td>
<td>Natural log of total asset</td>
<td>Financial statements</td>
</tr>
<tr>
<td>(Firm Specific Variables)</td>
<td>Credit risk</td>
<td>Ratio of total bad debt to total advances</td>
<td>Financial statements</td>
</tr>
<tr>
<td></td>
<td>Interest cover</td>
<td>Ratio of earnings before interest and tax to financial charges</td>
<td>Financial statements</td>
</tr>
<tr>
<td></td>
<td>firm growth</td>
<td>Growth rate of</td>
<td>Financial statement</td>
</tr>
<tr>
<td></td>
<td>Tangibility</td>
<td>Ratio of fixed asset to total asset</td>
<td></td>
</tr>
</tbody>
</table>

### 3.7 Data analysis

The data was analyzed using STATA, 13 (64-bit). The analysis was done in two parts, namely descriptive statistics and econometric analysis. The descriptive statistics analyzed capital adequacy of the listed banks and further uses Independence Samples T Test to statistically test the difference capital adequacy of private listed banks and public listed banks.

The second part of the analysis looked at the estimation of the random effect models as specified in equations 2-4. Before estimations, this study tested for multicollinearity problem and ensured that the data were free from multicollinearity.
Multicollinearity is a situation whereby two independent variables in a regression model are serially correlated, such that one independent variable predicts another independent variable in the same regression model (Belsley, 1991). The presence of multicollinearity affects coefficient of individual variables but not regression model as a whole. Therefore, multicollinearity will make the whole regression model significant but individual variables not statistically significant.

The usual interpretation of a regression coefficient is that it provides an estimate of the effect of a one-unit change in an independent variable, holding the other variables constant. If a predictor variable is highly correlated with another predictor variable in the given data set, then we have a set of observations for which two predictor variables have a particular linear stochastic relationship and this represents mutlicollinearity problem.

For this reason, this study tested for multicollinearity with Tolerance level and Variance Inflation Factor (VIF). The formulas are shown in equation 7 and 8 respectively.

\[ Tolerance\ Level = 1 - R^2 \quad \text{Eqn 7} \]

\[ Variance\ Inflation\ Factor = \frac{1}{Tolerance\ Level} \quad \text{Eqn 8} \]

According to Brien (2007), Variance Inflation Factor (VIF) of independent variables with less than 3 with tolerance level above 0.4 indicate no problem of multicollinearity problem.
CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This study focused on impact of capital adequacy on performance of listed banks in Ghana. The data were collected from audited financial statements of six banks over a period of 2005-2018. The presentation and discussions of data were done in accordance with the arrangement of the research objective as follows;

i. To determine the impact of capital adequacy on return on asset of listed Banks in Ghana.

ii. To determine impact of capital adequacy on return on equity of listed banks in Ghana.

iii. To determine impact of capital adequacy on net interest margin of listed banks in Ghana.

This study however, presented and discussed capital adequacy of the banks selected for this study to form the basis of discussions.

4.1 Capital Adequacy of Selected banks

The average capital adequacy over 2005-2018 of the selected banks are presented in Table 2.
Table 2: Capital Adequacy of the Selected Banks over 2005-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Average capital adequacy</th>
<th>Proportionate change</th>
<th>Percentage change</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.13337</td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>2006</td>
<td>0.154807</td>
<td>0.160739</td>
<td>16.07394</td>
<td>Good</td>
</tr>
<tr>
<td>2007</td>
<td>0.123796</td>
<td>-0.20032</td>
<td>-20.0324</td>
<td>Good</td>
</tr>
<tr>
<td>2008</td>
<td>0.101875</td>
<td>-0.17707</td>
<td>-17.7073</td>
<td>Good</td>
</tr>
<tr>
<td>2009</td>
<td>0.166522</td>
<td>0.63457</td>
<td>63.45696</td>
<td>Good</td>
</tr>
<tr>
<td>2010</td>
<td>0.169419</td>
<td>0.017399</td>
<td>1.739904</td>
<td>Good</td>
</tr>
<tr>
<td>2011</td>
<td>0.148483</td>
<td>-0.12358</td>
<td>-12.3576</td>
<td>Good</td>
</tr>
<tr>
<td>2012</td>
<td>0.164839</td>
<td>0.110157</td>
<td>11.01568</td>
<td>Good</td>
</tr>
<tr>
<td>2013</td>
<td>0.159702</td>
<td>-0.03117</td>
<td>-3.11672</td>
<td>Good</td>
</tr>
<tr>
<td>2014</td>
<td>0.154311</td>
<td>-0.03376</td>
<td>-3.37566</td>
<td>Good</td>
</tr>
<tr>
<td>2015</td>
<td>0.146506</td>
<td>-0.05057</td>
<td>-5.05744</td>
<td>Good</td>
</tr>
<tr>
<td>2016</td>
<td>0.139515</td>
<td>-0.04772</td>
<td>-4.77184</td>
<td>Good</td>
</tr>
<tr>
<td>2017</td>
<td>0.146423</td>
<td>0.049512</td>
<td>4.951221</td>
<td>Good</td>
</tr>
<tr>
<td>2018</td>
<td>0.13944</td>
<td>-0.04769</td>
<td>-4.76886</td>
<td>Good</td>
</tr>
</tbody>
</table>

Source: Computed from Audited financial Statements of the Selected Banks over 2005-2018: Decision of good capital adequacy was based on at least 8-10% Basel III recommendation

The results in Table 2 show that capital adequacy for the selected banks was good over the period of 2005-2018. Table 2 further shows that capital adequacy decreased in most of the years within the period. For example, between 2013 and 2016, capital adequacy consistently decreased but increased in 2017 by 4.95% and decreased thereafter by 4.77% in 2018. In 2006, capital adequacy increased by 16.07% over 2005 value and also increased in 2009 by 63.46% over 2008 value. One of the reasons for consistent decrease in capital adequacy of the banks over 2013-2016 period may be the power crisis (popularly known as “Dumsor”) that hit Ghana within the same period. This power crisis affected general economic activities in Ghana and the banking industry was mostly hit by the crisis. The power crisis reduced deposit mobilization and loan repayment rate by clients and increased cost of doing business through higher power cost.
4.2 Description of Dependent Variables

The dependent variables used in this study are the return on asset, return on equity and net interest margin and they are presented in Table 3.

Table 3: Average Return on Asset, Return on Equity and Net Interest Margin Over 2005-2018

<table>
<thead>
<tr>
<th>Year</th>
<th>ROA</th>
<th>Percentage Change</th>
<th>Decision</th>
<th>ROE</th>
<th>Percentage Change</th>
<th>Decision</th>
<th>NIM</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>0.0253</td>
<td>-</td>
<td>Poor</td>
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<td>74</td>
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<td>27.6065</td>
<td></td>
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</tbody>
</table>

Source:Computed from Audited financial Statements of the Selected Banks over 2005-2018: Decision of good ROA and ROE were based on 5% recommendation by Alexander and Nobes, 2001. ROA=return on asset; ROE=return on equity; NIM= net interest margin
From Table 3, return on asset was not good in all the years within the period (2005-2018) except 2006, 2013 and 2014. However, return on equity was good in all the years. This is based on recommendation of good return on asset and equity by Alexander and Nobes (2001). According to Alexander and Nobes (2001) a good return on asset and return on equity should be at least 5%. Return on asset decreased consistently from 2014 to 2016.

Averaged interest margin experienced rise and fall like return on asset and return on equity over the period. Averaged net interest margin in all the years within the period (2005-2018) were below 10.0% except 2005, 2017 and 2018 where it was 14.5%, 14.6% and 10.6% respectively.

**4.3 Impact of Capital Adequacy on Return on Asset**

This section focused on research objective one, that is assessing the impact of capital adequacy on return on asset of the sampled banks. However, the section first presents that pictorial relationship between capital adequacy and return on asset as shown in Figure 2.
From Figure 2, capital adequacy and return on asset move is similar patterns. The study further used correlation coefficient matrix showing the relationship between capital adequacy and return on asset as shown in Table 4.

**Figure 2: Line graph of Return on Assets and Capital Adequacy over the period of 2005-2018**

From Table 4, capital adequacy and return on asset have significant positive correlation. However, the correlation is weak. This shows that capital adequacy increases return on asset in the selected bank.
This study estimated the impact of acquisition on profitability indicators (return on asset and return on equity) using both fixed effect and random effect model since the data used is panel. However, based on Hausman Specification test (see appendix 1A), the random effect model was most appropriate and the estimated result is shown in Table 5.

Table 5: Impact of Post-acquisition on Return on Asset

| Variables  | Coef.    | Std. Dev. | Z      | P>|z|  | (95% Conf. Interval) |
|------------|----------|-----------|--------|------|---------------------|
| CAPAD      | 0.0872326| 0.0295867 | 2.95   | 0.001** | 0.0292437 - 0.1452216|
| FIRMZ      | 0.1371746| 0.0353765 | 3.88   | 0.000***| 0.0678379 - 0.2065113|
| INTCOV     | 0.001182 | 0.0007067 | 1.67   | 0.094*  | -0.0002032 - 0.0025671|
| TANG       | 0.2867885| 0.1350792 | 2.12   | 0.034** | 0.0220381 - 0.5515389|
| FIRMGW     | -0.0069657| 0.0391052 | -0.18  | 0.859  | -0.0836104 - 0.0696791|
| CREDITR    | 0.0004703| 0.0003236 | 1.45   | 0.146  | -0.000164 - 0.0011046|
| CONSTANT   | -0.060567| 0.4902273 | -4.20  | 0.000***| -3.021395 - 1.099739 |

No. of obs. 84
No. of groups 6
Wald chi² (6) 76.03
p-value 0.4349
r-sq. within 0.7100
between overall 0.4968

Source: Audited Financial Statements of selected Banks, 2005-2008, *** significant at 1%; ** significant at 5%; * significant at 10%; Dependent Variable= Return on Asset (ROA), CAPAD= capital adequacy (main independent); FIRMZ= firm size; INTCOV= interest cover; TANG= tangibility; FIRMG=firm growth; CREDITR=credit risk

From Table 5, capital adequacy has significant positive impact on return on asset of the selected banks. The results show that capital adequacy significantly increase return on asset by 0.0872326. This therefore rejects the null hypothesis in favour of alternative hypothesis that capital adequacy significantly increases return on asset. This finding is consistent with findings of some previous studies. For example, Datta and Mahmud (2018) looked at the effect of capital adequacy on the profitability of listed commercial banks operating in Bangladesh, and used a data from 29 listed banks over 2007-2014. Datta and Mahmud (2018) found that capital adequacy
significantly increase return on asset. Similarly, Almazari and Alamri (2017) studied “The Effect of Capital Adequacy on Profitability: A Comparative Study Between Samba and Saab Banks Of Saudi Arabia”. They study used financial statements from two banks, namely SAMBA and SABB in Saudi Arabia. SABB bank shows strong significant positive relationship between capital adequacy and return on asset. However, SAMBA bank shows negative relationship between capital adequacy and Return on Asset.

Among the controlled variables, firm size has significant positive impact on return on asset at 1% significant level. Tangibility has significant positive impact on return on asset at 5% significance level whiles Interest cover has significant positive impact on return on assets at 10% significance level.

From Table 5, overall R-square of 0.4968 shows that explanatory variables used in this study explained 49.68% of the variation in return on asset. The model as a whole is statistically fit for predicting the impact of capital adequacy on return on asset (Wald Chi\(^2\)=76.03; p= 0.000).

### 4.4 Impact of Capital Adequacy on Return on Equity

The estimate the impact of capital adequacy on return on asset, this study first used line graph to show pictorial pattern of both capital adequacy and return on equity over the period of consideration (2005-2018). The line graph is shown in Figure 3.
From Figure 3, capital adequacy and return on equity have common pattern. Both rose and fell together, except between 2007 and 2011. The study proceeded to statistically test the direction and degree of relation between the two variables using Pearson’s correlation Coefficient Matrix as shown in Table 6.

**Table 6**: Correlation Coefficient Between Capital Adequacy and Return on Equity

<table>
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<th>Return on Equity</th>
<th>Capital Adequacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on Equity</td>
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<td></td>
</tr>
<tr>
<td>Capital Adequacy</td>
<td>0.2700**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: audited Financial Statements of Selected Banks, 2005-2018, **correlation is significant at the 0.05 level (2-tailed)**
From Table 6, capital adequacy and return on equity have significant positive correlation. However, the correlation is weak. This shows that as capital adequacy increases return on equity increases in the selected bank. On the other hand, a fall in capital adequacy reduces return on equity.

This study further estimated the impact of capital adequacy on return on equity using both fixed effect model and random effect model (see appendix 1B). However, based on shown Hausman Specification Test, random effect model was appropriate for estimating the impact of capital adequacy on return on equity and the estimated results are summarized in Table

**Table 7: Impact of Capital Adequacy on Return on Equity**

|          | Coef.  | Std. Dev. | Z     | P>|Z| | (95% Conf. Interval) |
|----------|--------|-----------|-------|-----|----------------------|
| CAPAD    | 0.056881 | 0.033614  | 1.69  | 0.091* | -0.009001 0.1227632 |
| FIRMG    | 0.0073534 | 0.0034044 | 2.16  | 0.031** | 0.0006808 0.0140259 |
| INTCOV   | 0.0017477 | 0.0007515 | 2.33  | 0.020** | 0.0002749 0.0032206 |
| TANG     | -0.0400367 | 0.1142967 | -0.35 | 0.726 | -0.264054 0.1839806 |
| FIRMZ    | -0.0482304 | 0.0268286 | -1.80 | 0.072* | -0.1008135 0.0043527 |
| CREDITR  | -0.0002648 | 0.0003202 | -0.83 | 0.408 | -0.0008923 0.0003627 |
| CONSTANT | 0.8347191 | 0.4175267 | 2.00  | 0.046** | 0.0163818 1.653056 |

No. of obs. 84  
No. of groups 6  
Wald chi² 30.58  
p-value 0.0000  
R-sq. within 0.3116  
Between 0.0058  
Overall 0.2842  

Source: Audited Financial Statements of selected Banks, 2005-2008, *** significant at 1%; ** significant at 5%; * significant at 10%; Dependent Variable = Return on Equity (ROE), CAPAD = capital adequacy (main independent); FIRMZ = firm size; INTCOV = interest cover; TANG = tangibility; FIRMZ = firm growth; CREDITR = credit risk

From Table 7, capital adequacy has significant impact on return on equity. Any unit increase in capital adequacy significantly increases return on equity by 0.056881 in the selected banks at 10% significant level. This study thus rejects the null hypothesis in favour of alternative hypothesis that capital adequacy significantly increases return
on equity. The finding is consistent with study by Almazari and Alamri (2017) on “The Effect of Capital Adequacy on Profitability: A Comparative Study Between Samba and Saab Banks Of Saudi Arabia”. They study used financial statements from two banks, namely SAMBA and SABB in Saudi Arabia. SABB bank shows strong significant positive relationship between capital adequacy and Return on Equity. However, SAMBA bank shows negative relationship between capital adequacy and Return on Equity. This study however contradicts findings by Eyo and Offiong (2015) that there is no significant relationship between capital adequacy and profitability indicators such as return on equity.

Among the controlled variables, firm size has a significant negative impact of return on equity at 10%. However, interest cover and firm growth have significant positive impact on return on equity at 5% significance level.

The explanatory variables used in this study explained 28.42% of the variation in return on equity (overall R-square= 0.2842). From the Wald Chi² test, the estimated model is statistically for for predicting the impact of capital adequacy on return on equity (Wald Chi²=30.58; p-value=0.0000).

**4.5 Impact of Capital Adequacy on Net Interest Margin**

The section focused on research objective three “To determine impact of capital adequacy on net interest margin of listed banks in Ghana”. This study addressed this research objective by using line graph to show pictorial relationship between capital adequacy and net interest margin and statistical estimation of impact of capital adequacy on net interest margin. The pictorial relationship between capital adequacy and net interest margin is shown in Figure 4.
Figure 4: Line graph of Net Interest Margin and Capital Adequacy over the period of 2005-2018

Figure 4 shows that capital adequacy and net interest margin have close relationship. They mostly move in the same direction. The direction and degree of relationship between capital adequacy and net interest margin are computed using Pearson’s correlation Coefficient as shown in Table 8.

Table 8: Relationship between Capital Adequacy and Net Interest Margin

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<td>Net Interest Margin</td>
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<td>1.0000</td>
</tr>
</tbody>
</table>

Source: Audited Financial Statements of Selected Banks, 2005-2018; *Correlation is significant at 5%

The results in Table 8 show that capital adequacy and net interest margin have positive relationship is the relationship is significant at 5%.

This study used Fixed Effect Model and Random Effect Model to estimate the impact of capital adequacy on net interest margin [see appendix 1C]. However, this study
chose Fixed Effect Model on the basis of Hausman Specification Test and the summarized estimated results are shown in Table 9.

Table 9: Impact of Capital Adequacy on Net Interest Margin

| Variables  | Coef.    | Std. Error | Z     | p>|z|   | 95% conf. Interval |
|------------|----------|------------|-------|-------|-------------------|
| CAPAD      | 0.2366788| 0.1170728  | 2.02  | 0.047**| 0.0032985 - 0.4700592|
| FIRMZ      | -0.0188374| 0.0122523  | -1.54 | 0.129 | -0.00432619 - 0.0055871|
| INTCOV     | 0.0011262| 0.0013362  | 0.84  | 0.402 | -0.00015375 - 0.0037899|
| TANG       | 0.2728602| 0.347208   | 0.79  | 0.435 | -0.4192863 - 0.9650067|
| FIRMG      | 0.7366938| 0.0579827  | 12.71 | 0.000***| 0.6211074 - 0.8522802|
| CREDITR    | 0.0029462| 0.0006753  | 4.36  | 0.000***| 0.0015999 - 0.0042925|
| CONSTANT   | 4.012894 | 0.9717186  | 4.13  | 0.000***| 2.075809 - 5.94998|

No. of obs. 84
No. of groups 6
F (6,72) 59.15
p-value 0.0000
R-sq. within 0.8314
Between 0.4618
Overall 0.7258

Source: Audited Financial Statements of selected Banks, 2005-2008, *** significant at 1%; ** significant at 5%; * significant at 10%; Dependent Variable= Net Interest Margin (NIM), CAPAD= capital adequacy (main independent); FIRMZ= firm size; INTCOV= interest cover; TANG= tangibility; FIRMG=firm growth; CREDITR=credit risk

The results in Table 9 show that capital adequacy has significant positive impact on net interest margin of the selected banks. A unit increase in capital adequacy significantly increase net interest margin by 0.2366788. on the other hand, a unit decrease in capital adequacy significantly decrease net interest margin by 0.2366788 in the selected banks. Mamun and Fahim (2014) found similar result in Bangladesh that capital adequacy significantly improves financial performance indicators like net interest margin. Similarly, Datta and Mahmud (2018) found in commercial banks operating in Bangladesh that capital adequacy significantly improved all profitability indicators over the period of 2007-2014. IUdom and Onyekachi (2018) also find similar results in listed banks in Nigeria.
Among the controlled variables, firm growth and credit risk significantly increases net interest margin at 1% significant level.

The explanatory variables together explained 72.58% of the variation in net interest margin. The model as a whole is statistically fit for predicting the impact of capital adequacy on net interest margin (F[6,72]=59.15; p=0.000).

4.6 Model Adequacy and Reliability Test

This study performed post-estimation diagnoses tests on all the three estimations, that is impact capital adequacy on return on asset; impact of capital adequacy on return on equity; impact of capital adequacy on net interest margin. The postestimation diagnosis tests performed were normality test and heteroscedasticity test and the results are presented in Table 10. Heteroscedasticity test was performed by using Breusch-Pagan test.

<table>
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<th>p-value</th>
<th>Impact of capital adequacy on return on equity Statistic</th>
<th>p-value</th>
<th>Impact of capital adequacy on net interest margin Statistic</th>
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<td>Heteroscedasticity</td>
<td>0.8</td>
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<td>0.4106</td>
<td>11.1065</td>
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From Table 10, there is no normality problem and heteroscedasticity, hence the results produced by the impact of capital adequacy on return on asset, return on equity and net interest margin are reliable and valid.
CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This study focused impact of capital adequacy on performance of listed banks in Ghana. This chapter summarizes the study, concludes the study based on the findings and suggests recommendation enhance performance of listed banks.

5.1 Summary
The study focused on impact of capital adequacy on profitability. The study sourced data from six banks, namely Ecobank, Barclays Bank, Agricultural Development Bank (ADB), GCB Bank, Societe General and National Investment Bank (NIB) over the period 2005-2018. Thus, the total number of observations was 84. The data were collected from audited financial statements. The data collected included return on asset, return on equity and net interest margin as profitability indicators; and firm size, firm growth, tangibility, interest cover and credit risk as firm-specific factors. The data collected were screened before estimation of the models. The model estimation employed were random effect and fixed effect where post-diagnostic tests were performed.

The specific objectives were first, to estimate the impact of capital adequacy on return on asset; second to determine the impact of capital adequacy on return on equity and third, to determine the impact of capital adequacy on net interest margin.

On the first objective, this study found out that capital adequacy and return on asset move is similar patterns and the correlation coefficient between them was 0.3583 and this was significant at 5%. Random effect model estimate showed that capital
adequacy has significant positive impact on return on asset by 0.0872326 when firm size, interest cover, tangibility, bank growth and credit risk are controlled for.

On the second objective, line graph showed that capital adequacy and return on equity have common pattern. The correlation coefficient between capital adequacy and return on equity was 0.2700 at 5% significant level. From Random effect model, capital adequacy has significant positive impact on return on equity and the marginal impact is 0.056881 at 10% significant level.

On the third objective, the results revealed that capital adequacy and net interest margin have close relationship and the coefficient of the relationship is 0.3421 and this was significant at 5%. Fixed Effect Model showed that capital adequacy has significant positive impact on net interest margin of the selected banks. The marginal impact was 0.2366788 and this was significant at 5%.

5.2 Conclusions

This study focused on impact of capital adequacy on performance of listed banks in Ghana. This study on the basis of the findings, concludes as follows;

Capital adequacy has significant positive impact on return on asset of listed banks in Ghana. Banks meet the capital adequacy required through having enough internal funds or raising funds externally. To be able to have enough internal funds, asset need to be effectively and efficiently utilized. Efficient and effective utilization of asset increases return on asset, hence capital adequacy and return on asset are positively related.

This study also confirms that capital adequacy has significant positive impact on return on equity but this is significant at 10% significance level.
Finally, this study concludes that capital adequacy has significant positive impact on net interest margin at 5% significance level. One of the main sources of income for banks is interest income whiles interest expense also constitutes one of the main outflows. To maintain adequate capital, there is the need to increase interest income and reduce interest expense, thereby leading to higher net interest margin. Therefore, capital adequacy leads to higher net interest margin.

5.3 Recommendations

With regards to the analysis of data and information provided in the research findings, the following recommendations are suggested:

1. The study observed that capital adequacy has significant positive impact on return on asset, return on equity and net interest margin. This study therefore recommends that Bank of Ghana should ensure continual enforcement of compliance of capital adequacy requirement within the banking industry.

2. Bank management should improve on the management of bank assets and liabilities, especially on the quality of assets portfolio and deposit liabilities in order to improve performance within the banking industry.

3. The banks should adopt effective loan management to reduce loan default in order to increase inflows to ensure sustainable capital adequacy.

4. The management of the banks should continue to improve upon their asset management in the phase of meeting new capital adequacy requirement.

5. The study recommends that the effort to meet capital adequacy requirement should not undermine return on equity. This is because shareholders expect good returns on their investment at all time.
5.4 Suggestions for Future Studies

This study suggests the following improve future research on capital adequacy in listed banks in Ghana.

1. This study suggests that future research should consider role of internal control in the impact of capital adequacy on performance of listed banks in Ghana.

2. This study suggests that future research should consider the role of bank ownership in the impact of capital adequacy on performance of listed banks in Ghana.
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APPENDIX 1

Appendix 1A: Estimated results on return on asset

```
. xtab ROA capitaladequacy FIRMS INTCOV TANG FIRMS CREDITR, fe
Fixed-effects (within) regression
Number of obs      =        84
Group variable: bank
Number of groups   =        6
R-sq: within       =  0.4685
Obs per group: min =        14
between            =  0.4645
avg               =  14.0
overall            =  0.4648
max               =        14
F(6,72)             =  10.16
corr(u_i, X)       =  -0.6704
Prob > F            =  0.0000

| ROA | Coef. | Std. Err. | t   | P>|t|  | [95% Conf. Interval] |
|-----|-------|-----------|-----|------|----------------------|
|     |       |           |     |      |                      |
| ROA |  0.597315 |  0.281177 |  3.44|  0.001 |  0.041244             |  1.153385  |
| capitaladequacy |  0.140346 |  0.0524977 |  2.67|  0.009 |  0.035721             |  0.2450144  |
| FIRMS |  0.011624 |  0.0060368 |  2.12|  0.033 |  0.0052254            |  0.0229795  |
| INTCOV |  0.0234139 |  0.180516 |  0.13|  0.897 | -0.3747667            |  0.3659445  |
| TANG |  -0.0394955 |  0.0528497 | -0.75|  0.453 | -0.1452135            |  0.0569945  |
| FIRMS |  -0.050055 |  0.005143 |  1.47|  0.146 |  -0.0000055           |  0.0001524  |
| _cons |  -0.515851 |  0.440939 | -2.20|  0.036 |  -2.553346            |  -0.4386361  |

sigmas_u = 0.8454569
sigmas_m = 0.1176536
rho = 0.2365112 (fraction of variance due to u_i)

F test that all u_i=0:  F(5, 72)   =  2.87  
Prob > F    =  0.0202

. xtab ROA capitaladequacy FIRMS INTCOV TANG FIRMS CREDITR, re
Random-effects GLS regression
Number of obs      =        84
Group variable: bank
Number of groups   =        6
R-sq: within       =  0.4649
Obs per group: min =        14
between            =  0.4700
avg               =  14.0
overall            =  0.4648
max               =        14
Wald chi2(4)       =  76.03
Prob > chi2        =  0.0000

corr(u_i, X)       = $ (assumed) 
Prob > chi2        =  0.0000

| ROA | Coef. | Std. Err. | t   | P>|t|  | [95% Conf. Interval] |
|-----|-------|-----------|-----|------|----------------------|
|     |       |           |     |      |                      |
| ROA |  0.0772326 |  0.209847 |  3.75|  0.000 |  0.033327             |  0.1612156  |
| capitaladequacy |  0.1377446 |  0.055765 |  2.48|  0.017 |  0.020379             |  0.255123  |
| FIRMS |  0.001182 |  0.007047 |  1.67|  0.098 |  -0.002032            |  0.0025611  |
| INTCOV |  0.2867845 |  0.155792 |  2.01|  0.046 |  0.0020321            |  0.5515349  |
| TANG |  -0.0089817 |  0.090552 | -0.18|  0.859 |  -0.083104            |  0.0652161  |
| FIRMS |  -0.004703 |  0.003236 |  1.45|  0.146 |  -0.000164            |  0.0011044  |
| _cons |  0.060567 |  0.490273 | -0.12|  0.901 |  -0.631395            |  0.652538  |

sigmas_u = 0
sigmas_m = 0.1176536
rho = 0 (fraction of variance due to u_i)
```

61
Appendix 1B: Impact of capital adequacy on return on equity

. hauman fe1.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>(b)</th>
<th>(b-R)</th>
<th>sqrt(diag(V_b-V_B))</th>
<th>Difference</th>
<th>n.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>capitaladeq</td>
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<td>.0100831</td>
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<td>.</td>
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<td>firegrowth</td>
<td>.103843</td>
<td>.107146</td>
<td>.0320583</td>
<td>.</td>
<td>.</td>
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<td>INTCOV</td>
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<td>.001182</td>
<td>.0004285</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>TARGS</td>
<td>.036374</td>
<td>.064785</td>
<td>.2611744</td>
<td>.1203477</td>
<td>.</td>
</tr>
<tr>
<td>FIRMSEQ</td>
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<td>-.0000515</td>
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<td>.000525</td>
<td>.0004703</td>
<td>.0000554</td>
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<td>.</td>
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</tbody>
</table>

- C = consistent under H0 and H1; obtained from xtrg
- K = inconsistent under H0, efficient under H1; obtained from xtrg

Test: H0: difference in coefficients not systematic

\[ ch2(4) = (b-R)'[V_{b-V_B}^{-1}]-1][b-R] \]

= 4.67

Prob(ch2) = 0.2485

(V_b-V_B is not positive definite)

. xtrg ROE capitaladeq firegrowth INTCOV TARGS FIRMSEQ CREDITB, fe

Fixed-effects (within) regression

Number of obs = 84
Number of groups = 6

R-sq: within = 0.3216
Oba per group: min = 14
between = 0.0465
avg = 14.0
overall = 0.2542
max = 14

F(6,72) = 5.49
Prob > F = 0.0001

corr(u_i, X) = -0.2485

. estimates store fe5

. xtrg ROE capitaladeq firegrowth INTCOV TARGS FIRMSEQ CREDITB, re

Random-effects GLS regression

Number of obs = 84
Number of groups = 6

R-sq: within = 0.3116
Oba per group: min = 14
between = 0.1058
avg = 14.0
overall = 0.2842
max = 14

Wild ch2(4) = 30.38
Prob > ch2 = 0.0000

corr(u_i, X) = 0 (assumed)

. estimates store re5

62
. hausman fe5.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>(B)</th>
<th>(b)</th>
<th>sqrt(diag(V_b-V_B))</th>
<th>S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>capitala-y</td>
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<td>0.056881</td>
<td>0.0077663</td>
<td>0.0323172</td>
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<tr>
<td>firmgrowth</td>
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<td>0.067354</td>
<td>-0.0003498</td>
<td>0.008040</td>
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<tr>
<td>INTCOV</td>
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<td>-0.040597</td>
<td>-0.1741746</td>
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<td>SKEISTR</td>
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<td>-0.0002448</td>
<td>0.0000311</td>
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</tbody>
</table>

k = consistent under H0 and Ha; obtained from xtest
b = inconsistent under Ha, efficient under H0; obtained from xtest

Test: H0: difference in coefficients not systematic

\[ \text{chi2}(6) = (b-k)'[(V_b-V_B)^{-1}][b-k] \]

= 3.24

Prob>chi2 = 0.7782

(V_b-V_B is not positive definite)
### Appendix 1C: Impact of capital adequacy on net interest margin

```
. xtabreg capitaladequacy FINADsize INTCOVER TANSIZE FINRMB CRB, fe
table
Fixed-effects (within) regression
Number of obs = 84
Number of groups = 6
R-sq: within = 0.8214
between = 0.4610
overall = 0.7258
u = 0.076
F(5, 72) = 59.15
Prob > F = 0.0000

<table>
<thead>
<tr>
<th></th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>Prob &gt;</th>
<th>(95% Conf. Interval)</th>
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<tbody>
<tr>
<td>capitaladequacy</td>
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<td>2.02</td>
<td>0.047</td>
<td>[.0032985, .470554]</td>
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<td>FINADsize</td>
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<td>.012523</td>
<td>-1.54</td>
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<tr>
<td>INTCOVER</td>
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<td>.001362</td>
<td>0.84</td>
<td>0.402</td>
<td>-.000357, .000798</td>
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<tr>
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<td>.272462</td>
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<tr>
<td>FINRMB</td>
<td>.736493</td>
<td>.057927</td>
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<td>0.000</td>
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<tr>
<td>_cons</td>
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<td>.871186</td>
<td>4.63</td>
<td>0.000</td>
<td>2.875809, 5.149588</td>
</tr>
</tbody>
</table>

F test that all u_i=0:     F(5, 72) = 6.64               Prob > F = 0.0000
. estimates store fe9

. xtabreg capitaladequacy FINADsize INTCOVER TANSIZE FINRMB CRB, re
table
Random-effects GLS regression
Number of obs = 84
Number of groups = 6
R-sq: within = 0.7903
between = 0.7801
overall = 0.8239
F(5, 72) = 154.36
Prob > F = 0.0000

<table>
<thead>
<tr>
<th></th>
<th>Coef.</th>
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<td>INTCOVER</td>
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</table>

F test that all u_i=0:     F(5, 72) = 6.64               Prob > F = 0.0000
. estimates store re9

. hausman fe9

<table>
<thead>
<tr>
<th></th>
<th>Coefficients</th>
<th>Diff</th>
<th>sqrt(diag(V_b-V_R))</th>
<th>Diff.</th>
<th>S.E.</th>
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<tbody>
<tr>
<td></td>
<td>(b)</td>
<td>(b-R)</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

k = consistent under Ho and Ha; obtained from xtabreg
k = inconsistent under Ha, efficient under Ho; obtained from xtabreg

Test: Ho: difference in coefficients not systematic

ch2(6) = (b-R)'[(V_b-V_R)'(b-R)]'b-R
= 41.61
Prob > ch2 = 0.0000
(V_b-V_R is not positive definite)
```

---

64