

LIQUIDITY RISK AND BANK PROFITABILITY IN GHANA

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
THE AWARD OF MPhil FINANCE DEGREE**

JUNE, 2013

DECLARATION

This is to certify that this thesis is the result of research undertaken by **SAMUEL SIAW** towards the award of the **MASTER OF PHILOSOPHY IN FINANCE** in the Department of Finance, University of Ghana Business School, Legon.

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DEDICATION

This work is dedicated to my wife, parents, siblings, Lecturers, MPhil colleagues, friends and all those who have in diverse ways contributed to the success of this work.



ACKNOWLEDGEMENTS

My greatest appreciation goes to the Almighty God for giving me the direction, strength, wisdom and dedication to finish this work successfully. Immense gratitude also goes to my supervisors Prof. A.Q.Q. Aboagye and Dr. A. Gemegah whose rich advice guided me through the thesis process not forgetting Dr. Simon Harvey and Dr. Lord Mensah who are both Lecturers of the Finance Department of the Business School.

Special thanks go to my parents, Mr. Francis Amponsah and Mrs. Elizabeth Asantewaa, to my uncle and grandmother, Mr. Alex Tabiri Gyamfi and Madam Akua Kyeraa respectively and more especially to my Sweetheart Albertha Fosuaa who have been the inspiration and motivational force throughout my entire academic life. I am very thankful to Mr. Michael Kaku Minlah of the University for Professional Studies and Mr. Haruna Issahaku of the University for Development Studies for their unique assistance. I am also grateful to all my Mphil Classmates especially Basil Damanka, Mathew Ntow Gyamfi, John Kennedy Akotia and Angela Alu Azumah for their kind assistance with respect to their real time information provision.

Though I received a lot of guidance and support from my supervisors and colleagues I claim sole responsibility for any errors, omissions or misrepresentation that may be found in this work.

Samuel Siaw

June, 2013.

ABSTRACT

The study examines the determinants of liquidity risk of Ghanaian banks and how it affects their profitability. Theory on the effects of liquidity risk on bank profitability is mixed; while some studies conclude that high liquidity risk increases bank profitability through high net interest margins, others indicate that it reduces profitability due to the high cost associated with securing funding at such times.

With an unbalanced data set of 22 banks over a 10 year period spanning 2002 and 2011, the random effects GLS regression based on the Hausman test is used to estimate the determinants of bank liquidity risk. The instrumental variables regression through the two stage least squares (2SLS) approach is applied to estimate the effects of liquidity risk on bank profitability due to the endogenous nature of liquidity risk as a bank profitability determinant while controlling for other variables (bank size, capital adequacy, credit risk, operational expenditure, non-interest income, industry concentration and change in GDP). The study employs the financing gap ratio (FGAPR) as the measure of liquidity risk (dependent variable) with bank size, liquid assets ratio which is further divided into risky and less risky liquid assets, non-deposit dependence, ownership type, industry concentration and change in inflation as the explanatory variables.

While bank size, non-deposit dependence and change in inflation exhibit a positive and a statistically significant relationship with liquidity risk (financing gap ratio); meaning that an increase in any of these variables leads to an increase in liquidity risk, risky liquid assets, less risky liquid assets and industry concentration show a negatively significant relationship. Ownership structure has no significant relationship with the financing gap ratio (dependent variable). In order to ascertain the robustness of the results, the ratio of net loans to total deposits (NLD) as an alternative measure for liquidity risk is also applied and the results

show consistency with the results obtained from the use of the financing gap ratio as a measure for liquidity risk.

Again, the results from the use of instrumental variables for liquidity risk while controlling for other variables (determinants) also show a positive relationship between liquidity risk (both the financing gap ratio and the ratio of net loans to total deposits) and bank profitability measured by the return on assets (ROA) and the return on equity (ROE).

The study suggests that banks institute strategies that provide effective diversification in the sources of funding while exploiting deposits as a stable cheap source of funding in order to mitigate their liquidity risk exposure. Again, banks in Ghana should strengthen their treasury departments mandated to manage liquidity risk to ensure a sound process for identifying, measuring, monitoring and controlling liquidity risk in order to maximize the positive risk return relationship.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 INTRODUCTION

This chapter commences the foundation of the entire study. It lays clear the background to the study by providing an insight into the concept of liquidity risk and bank profitability. The chapter continues with the explanation of the problem statement and goes on to specify the objectives to be achieved by the end of the study which are based on the research questions. The justification or the significance of the study is subsequently provided in this section followed by the scope and the organization of the whole study.

1.1 BACKGROUND TO THE STUDY

The banking system plays a major role in the financial intermediation process of every economy making its efficiency and effectiveness an essential requirement towards ensuring stability and growth (Halling and Hading, 2006). Diamond and Rajan (2001) assert that banks engage in valuable economic activities and have major primary concerns to address in order to ensure their survival and profitability. On the asset side of the balance sheet, banks ensure the smooth flow of funds by lending to deficit spending units while providing liquidity to savers on the liability side. In addition, facilitating trade through the provision of payment and settlement systems, ensuring the productive investment of capital and the profitability of other varied functions according to Jenkinson (2008) expose banks to a large number of risks which include liquidity risk, credit risk, foreign exchange risk, market risk, interest rate risk among others. Iion and Dragos (2006) advice that the primary purpose of commercial bank liquidity is to support other banking functions by maintaining adequate reserves to meet

unanticipated withdrawals and an inventory of near cash funds to satisfy potential credit demands. According to Mishkin and Eakins (2009), managers of banks have to make sure that the bank has enough ready cash to pay its depositors when there are deposit outflows—that is when deposits are lost because depositors make withdrawals and demand payment. That is, the execution of the core mandate of commercial banks with respect to financial intermediation gives rise to an intrinsic risk that lies very deep in their daily operations (Bonfim and Kim, 2012)

The Basel Committee on Banking Supervision (2008) defined liquidity as the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. The Committee posits that the vulnerability of a bank to liquidity risk usually arises when the bank plays the fundamental role of maturity transformation of short-term deposits into long-term loans (the conversion of short term liquid liabilities to long term illiquid assets), both of an institution-specific nature and that which affects markets as a whole. Again almost every financial transaction or commitment has implications for a bank's liquidity. Effective liquidity risk management helps ensure a bank's ability to meet cash flow obligations which are uncertain as they are affected by external events and other agents' behaviour. Iion and Dragos (2006) explain the liquidity risk for a bank; as the expression of the probability of losing the capacity of financing its transactions, or the probability that the bank cannot honor its daily obligations to its clients which includes the withdrawal of deposits, maturity of other debt, and cover additional funding requirements for the loan portfolio and investment. According to Crowe (2009), a bank having good asset quality, strong earnings and sufficient capital may still fail if it is not maintaining adequate liquidity.

Said and Tumin (2011) consider liquidity risk as an important internal determinant of bank profitability among other firm specific variables such as credit risk, capital adequacy, expenses management, business diversification bank size etc together with industry and macroeconomic variables. This is mainly because it can be a source of bank failure and therefore to avoid insolvency, holding a considerable value of liquid assets with easy transformation into cash becomes very prudent. Nonetheless, normally associated with keeping a higher amount of liquid assets is the lower rate of return as strongly supported by Molyneux and Thornton (1992) who establish a weak relationship between the liquidity level and bank profitability while Bourke (1989) finds a strong and positive relationship between them. In analysing the behaviour of firms, economists often assume that firms seek to maximize profits (Atkinson and Miller, 1988) making profitability the best measure in the assessment of performance of any profit making oriented organization such as commercial banks. Mishkin and Eakins (2009) argue that in order to understand how well a bank is doing, one needs to start by analysing the bank's income statement, the description of the sources of income and the expenses that affect the bank's profitability.

In literature, fundamental measures of bank profitability include return on assets (ROA), return on equity (ROE) and net interest margins (NIM) usually expressed as functions of internal and external determinants which are mainly influenced by a bank's management decisions and policy objectives (Athanasoglou et al, 2006). Return on Asset (ROA) is calculated as net profit after tax divided by total assets, return on equity (ROE) defined as the ratio of net profit after tax to total equity and net interest margin (NIM), ratio interest income less interest expense to total assets. Existing literature on bank liquidity risk and profitability gives empirical results of the varied liquidity risk measures employed and its effect on bank profitability. Among the widely used measures of liquidity risk include the ratio of liquid

assets to total assets, the ratio of loans to total assets, the ratio of liquid assets to total deposits, the ratio of liquid assets to customer and short term funding, the ratio of net loans to customer and short term funding etc. The findings and conclusions made by different researchers in adopting some of these liquidity risk measures to test the effect on bank profitability would be elucidated in the literature review in the chapter two of this study.

Exactly as it is in the case of the puzzle of the capital structure of firms where the optimum mix of debt and equity to maximize profitability is still not answered, many firms particularly commercial banks are faced with the similar challenge of how much liquidity to keep in order to maximize profit and also avoid falling in the liquidity risk trap. According to Iion and Dragos (2006), the management of liquidity risk presents mainly two contrasting views: primarily an inadequate level of liquidity may lead to the need to attract additional sources of funding with its associated higher costs which reduces the profitability and may ultimately result in insolvency. Conversely, an excessive liquidity may lead to a decrease of the return on assets and in consequence poor financial profitability. A bank has a potential of appropriate liquidities when it is in good condition to obtain the funds immediately and at a reasonable cost, as and when necessary.

In practice, achieving and maintaining optimum liquidity is a real art of bank management. According to the BCBS (2000), maintaining an adequate degree of liquidity in the whole banking system is extremely important, because the registration of a liquidity crisis at a single bank can have negative repercussions over the whole banking system thanks to the risk of contagion through interbank settlements. Funding liquidity risk and market liquidity according to Decker (2000) are the two main types of liquidity risk. The researcher defined funding risk as the risk that the bank will not be able to meet efficiently both expected and

unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm while the latter is the risk that banks cannot easily unwind or offset specific exposures without significantly lowering market prices because of inadequate market depth or market disruptions.

1.2 THE GHANAIAN BANKING INDUSTRY

The financial services industry has in recent times witnessed a tremendous growth in all sectors with the commercial banking sector been the busiest, fastest and the most dynamic. According to the Ghana Banking Survey (2011), the financial sector is well capitalized, very liquid, profitable and recording a strong asset growth. Financial sector stability is a priority to the Central Bank and Ghana's financial soundness indicators have all improved in recent years due to prudent policies. Indeed, despite the banking system's rapid growth led by expansion in deposit mobilization and credit (though lower); the system is becoming increasingly sound, due to determined regulation, significant technological advances in the sector, and more prudent risk management by banks.

These trends offer good prospects amidst the persistent challenges like high cost of borrowing, credit risk, market risk, operations risk and liquidity risk to a larger extent. Interest income continues to constitute the most significant component of income derived from operations though in recent years, interest margins are gradually shrinking as competition becomes intense. The Central Bank, Bank of Ghana regulates and supervises all the banks in the Ghanaian commercial banking sector with the number standing at twenty seven (27) as at the end of December, 2012.

The banking system is based on the concept of universal banking where banks offer all banking services though some of them began as specialized banks. The Bank of Ghana has

the overall supervisory and regulatory authority in all matters relating to banking and non-banking financial business with the purpose to achieve a sound, efficient banking system in the interest of depositors and other customers of these institutions and the economy as a whole. The regulatory and legal framework within which banks, non-bank financial institutions as well as forex bureaux operate in Ghana are the following:

- Bank of Ghana Act 2002, Act 612
- Banking Act, 2004 (Act 673)
- Non-Bank Financial Institutions Act, 2008 (Act 774)
- Companies Code Act 179, 1963
- Bank of Ghana Notices /Directives / Circulars / Regulations

The Bank of Ghana is therefore, charged with the responsibility of ensuring that the financial system is stable to ensure that it serves as facilitator for wealth creation, economic growth and development. Consequently, the Central Bank exercises its mandate to ensure:

- Depositors' funds are safe
- The solvency, good quality assets, adequate liquidity and profitability of banks are maintained;
- Adherence to statutory and regulatory requirements is enforced;
- Fair competition among banks
- The maintenance of an efficient payment system

The Ghanaian banking sector has gone through many reforms and restructuring over the years as a result of internal and external economic developments and shocks. Extensive government interventions and public ownership among other pressing issues in the past necessitated the need for several reforms in the banking sector. Central control of interest

rates by the Bank of Ghana, restrictions on sectoral credit allocation (mostly to the public sector), severe financial repressions and high inflation leading to negatively steep real interest rates characterized this period. Recent developments in the banking sector include the adoption of the International Financial Reporting Standards (IFRS) in line with international standards by Bank of Ghana as a way of reducing systemic risk, establishment of a Collateral Registry and Credit Reference Bureaus that seeks to promote transparency and ease credit accessibility, the setting up of the Financial Intelligence Centre (FIC) to address money laundering and counter financing for terrorism, the recapitalization of the banks all of which were fashioned to mitigate risk and stabilise the banking system (Bawumia *et al.*, 2008).

The effect of financial sector reform was to free the financial system from excessive government regulation in order to foster a free market-base system, set prices right, improve regulatory framework, strengthen bank supervision, restructure distressed banks and clean up non-performing loans on banks' balance sheet. Amidst the tight regulation, exposure to varied banking risks, capitalization requirements; the banking sector has immense developments which include an increase in the entry of new private banks into the market, expansion in branch network by both the existing and new banks and the expanded use of branches by the existing and new banks etc. (*Source: Bank of Ghana Website*)

According to the Ghana Banking Survey (2012) by the Price Waterhouse Coopers in collaboration with the Ghana Association of Bankers, the next big thing that banks expect will influence change in the industry is considered to be competition for people (customers, employees and shareholders), reach (technology and branch network) and brand (international, strong/national character or approach) etc. Bank executives acknowledge that with the additional capital that they have procured, there is even more pressure to produce above market average returns to investors. That is, in the near term, banks expect there will

be significant jostling within the industry to secure domestic market with such competition being more aggressive among the domestic banks, rather than from new market entrants.

There are currently thin lines of difference among them as the products and services rendered by the different bank types have converged over time to the extent that emerging non-bank financial institutions now compete with the banks in terms of the provision of similar kind of financial instruments and services. Bank deposits, for example, compete now with other liabilities of financial intermediaries, such as mutual funds. This phenomenon seems to justify the commencement of universal banking in Ghana, whereby banks originally licensed as merchant or development banks can now be issued universal banking licenses with higher paid-up capital. This move was to eliminate the economic costs of maintaining regulatory barriers, which had risen although the barriers had become less effective. The universal banking concept is not only aimed at eliminating the differences due to similarity in bank products/services rendered but also restrictions on branch network of different bank types, as banks become 'universal'.

The annual comparative profitability analysis reported in the Ghana Banking Survey (2012) exhibits that, the Ghanaian banking industry has witnessed gradual increases in profitability in the past years though the degree of profitability vary amongst the individual banks. For example, the industry's profit before tax margin rose from 27.2% in 2010 to 30.6% in 2011 though industry net interest margin (NIM) reduced from 9.3% to 8% in the same period mainly due to the competitive pricing by banks. The reports and surveys also give the evidence that banks depend heavily on customer deposits for their daily operations especially in granting loans to deficit spending units and this is manifested in higher advances to deposits ratios over the years. This gives a clear indication that banks' management of

liquidity risk amongst other risks such as credit risk, market risk, operations risk has greater implications on their profitability, especially on net interest margins.

1.3 STATEMENT OF PROBLEM

Said and Tumin (2011) advice that revising the determinants of the profitability of banks is an essential subject matter which could help in banks' appreciation of the contemporary conditions of the banking industry and the critical factors to be considered in fashioning out plans and policies towards improvement, profitability and growth. .

Until February 2008, though the Basel Committee (1988) had set out regulatory standards for the management of both credit and market risks in the Basel 1 Accord and that for operational risk in the Basel II Accord in 2004, regulatory standards for liquidity risk were seldom mentioned. Landskroner and Paroush (2008) also indicated that there has been extensive academic and regulatory discussion on major banking risks including credit risk, market risk and operations risk while little attention has however been paid to liquidity risk that has also become one of the major risks faced by banks and other financial institutions in recent years.

Under normal circumstances, according to Shen et al.(2009) banks seldom face liquidity crisis, but lately significant attention has been drawn to it by researchers, regulators and financial institutions after the various economic and banking crisis across the globe confirming the feeling that liquidity risk has not been sufficiently covered by the prevailing risk management practices (Crowe, 2009).

Recent times in Ghana has witnessed a tense competition among banks for customer deposits characterised by regular advertisement in both the print and electronic media, attractive promotions and the employment of salesmen who sell to varied customers on daily basis the different banking products offered by them in their quest to maximize customer deposits.

Nonetheless, on the asset side of the balance sheet for these banks, competition is not limited to sister commercial banks alone but non bank financial institutions in reaching out to deficit spending units to help individuals, small, medium and large scale enterprises in their establishment and growth of businesses. This fundamental traditional function of financial intermediation surely exposes these commercial banks to liquidity risk as shared by Jenkinson (2008) due to the inevitable maturity transformation mismatch and the inherent liquidity of the banks' assets (the extent to which an asset can be sold without incurring any significant loss of value under any market condition). The basic mandate of banks in transforming short term liquid liabilities (deposits) into long term illiquid assets (loans) thus goes a long way in determining profitability depending on how it is managed by the treasury department.

However, the business community in Ghana appears not to be benefiting much from this seemingly competitive environment in deposit mobilization and the expansion of credit after Association of Ghana Industries reported in its quarterly business barometer report (last quarter of 2012) that access to credit has overtaken cost of credit as the main challenge facing businesses in Ghana. Literature has it that banks that are able to lend much of their deposits maximize their returns through high net interest incomes, and if that is the case then the rhetorical questions is: why are banks in Ghana still very liquid as reported by the Ghana Banking Survey (2012) when businesses need such funds? Are the banks relying on some new sources of generating their income other than relying heavily on the granting of loans? Are Ghanaian banks vulnerable to liquidity risk depending on their sources of funding and how much of it is lend out?

Furthermore, though the determinants of bank profitability has been fairly covered, only a few studies have gone beyond this to look at the factors determining any of the explanatory variables in a separate study lest to consider both in a single study. The determinants of

liquidity risk and its resultant effects on the profitability trends of banks in Ghana has not been adequately addressed and therefore this study exploits the absence of literature on the relationship between liquidity risk and profitability to test amongst Ghanaian banks what has been done in other parts of the world. The study thus considers liquidity risk as an endogenous variable in the estimation of its effects on bank profitability while controlling for other determinants.

1.4 OBJECTIVES OF THE STUDY

The study is carried out against the background of some objectives to be achieved. This research has the aim and objective of seeking to explain the reasons behind the level or stage when banks find it difficult to meet their obligations by funding increases in assets or decreases in liabilities. The study also seeks to obtain the effects of circumstances on the profit maximization objectives of the banks operating in Ghana among other factors that may also influence the level of profitability. In particular the study seeks to achieve the following objectives:

1. To estimate the determinants of bank liquidity risk in Ghana.
2. To estimate the effects of liquidity risk on the profitability of banks in Ghana.

1.5 RESEARCH QUESTIONS/HYPOTHESES

In order to achieve the objectives listed above, the following questions would be the focus of the research:

- What are the determinants of liquidity risk among the banks in Ghana?
- Does liquidity risk affect the profitability of Ghanaian Banks?

These broad research questions are motivated by the following hypotheses:

H₀: The amount of liquid assets affects the liquidity risk exposure of banks in Ghana.

H₁: The amount of liquid assets does not affect the liquidity risk exposure of banks in Ghana.

H₀: The dependence on non-deposits affects the exposure of banks to liquidity risk.

H₁: The dependence on non-deposits does not affect the exposure of banks to liquidity risk.

H₀: Liquidity risk affects the profitability of banks in Ghana.

H₁: Liquidity risk does not affect the profitability of banks in Ghana.

1.6 SIGNIFICANCE OF THE STUDY

Aside the fact that there is generally scanty literature on liquidity risk relative to other risks faced by banks such as credit risk and market risk, the story of the Ghanaian banking system with respect to this topical issue is nothing to write home about. Though there have been some studies in Ghana on bank profitability where liquidity risk had sometimes been considered as an explanatory variable, little is said about how it is determined. This study however looks at the determinants or causes of liquidity risk in considering its effects on bank profitability by hypothesizing it as an endogenous variable, which is absent in most studies. The financing gap ratio, the difference between the total commercial bank's loan and its deposits as a ratio to its total assets as opposed to the other relatively common liquidity measures like the ratio of liquid assets to total deposits, the ratio of liquid assets to total assets etc is adopted by this study as a measure for liquidity risk. The robustness of the results is however ascertained by using the ratio of net loan to total deposits as an alternative measure for liquidity risk. The results will also help provide recommendations to mitigate the plight of the business community with respect to access to funding in a period when the

Ghanaian banking system is considered to be very liquid while taking into consideration the profit maximization objective of the banks.

1.7 ORGANIZATION OF THE STUDY

This study is divided into five chapters carefully laid out in the following manner. Chapter one, representing the introduction to the study presents an overview of the whole study. It explains the rationale for the study and how its objectives will be achieved. Chapter two presents a review of theoretical and empirical literature on the concept of liquidity risk, measures of liquidity risk and the effect of liquidity risk on bank profitability. The methodology adopted by the study which includes sections such as the sources of data, econometric specifications, justification of variables and the expected relationships with the dependent variables etc are elaborated upon. Chapter four contains the analysis and interpretations of the estimations and findings. Chapter five provides a summary of the content of the whole study and draws out recommendations for policy.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter informs both the theoretical and empirical foundations upon which the ideas and opinions developed in this study are constructed. The chapter reviews literature containing thoughts and ideas shared by various authors and researchers and some regulatory bodies on the determinants or causes of liquidity risk, the determinants of bank profitability and the effects of liquidity risk on bank profitability. The chapter forms the basis for the regression models selected in the next chapter for empirical estimation.

2.1 THE CONCEPT OF LIQUIDITY RISK

According Bonfim and Kim (2012), the complexity of the functions of banks gives rise to an intrinsic risk that lies deep in their core function; their unique intermediation role. Banks use a limited amount of their own resources in granting loans to entrepreneurs and consumers and thus provide them with the liquidity to finance their investment and consumption demands. Much of these resources used by these banks are normally associated with liabilities to third parties traditionally in the form of deposits.

This transformation of liquid liabilities (deposits) into risky liquid (illiquid) assets in the form of loans capitalizing on their maturity mismatch expose them to liquidity risk (Diamond and Dybvig, 1983; Jekinson, 2008). In order to lessen the maturity gap between assets and liabilities or the inherent illiquidity, banks can adequately manage the liquidity risk underlying their balance sheet structure by holding a buffer of liquid assets.

However, aside the high opportunity cost of holding a buffer of liquid assets as compared to the higher returns associated with illiquid assets, it manifests a degree of inefficiency on the part of management as it limits banks' ability to provide liquidity to entrepreneurs and consumers. Hence, even though banks have some incentives to hold a fraction of liquid assets (in the form of cash, short term assets or government bonds), these buffers will hardly ever be sufficient to fully insure against a bank run or liquidity risk (Bonfim and Kim, 2012).

A bank's inability to accommodate decreases in liabilities or to fund increases in assets as definition of liquidity risk as defined by the Basel Committee for Banking and Supervision (1997) can be classified into two forms; funding liquidity risk and market liquidity risk according to Decker (2000). He explained funding liquidity risk as the risk that a bank will be unable to meet its obligations as they come due because of the inability to liquidate assets or inadequate funding sources. Market liquidity risk on the other hand is the risk that a bank cannot easily unwind or offset specific exposures without significantly lowering market prices because of inadequate market depth or market disruptions.

Gomes and Khan (2011) in a research paper on strengthening bank management of liquidity risk through the Basel III liquidity standards made further clarifications on both funding and market liquidity risks. They indicated that funding liquidity risk as the inability of a firm to generate funds by deploying assets held on its balance sheet to meet financial obligations on short notice. The liquidity position of a given bank is determined primarily by its holdings of cash and other readily available marketable assets, as well as by its funding structure and the amount and type of contingent liabilities that may come due over a specified horizon.

They further explained market liquidity risk as the ability of a bank to execute transactions in financial markets without causing a significant movement in prices. On a study on market liquidity risk, the Bank for International Settlements-BIS (1999) considered the several different dimensions by which significant movement in prices in could arise and these include immediacy, breadth, depth and resilience. Immediacy refers to the speed with which trades of a certain size can be executed. Breadth is the divergence in the price of an asset from mid-market prices and is generally measured by the bid-offer spread. Depth refers to either the volume of trades that can be executed without affecting current market prices or the amount of orders on the order books of market-makers. Resilience is the speed with which price fluctuations that occur during the execution of a trade return to former levels. These factors thus go a long way to affect market liquidity risk in diverse ways.

Market and funding liquidity risks compound each other as it is difficult to sell when other investors face funding problems and it is difficult to get funding when the collateral is hard to sell. Gomes and Khan (2011) again made the assertion that interactions between these two types of liquidity risk could lead to devastating liquidity consequences where poor conditions for funding liquidity lead to a decrease in market liquidity and in turn contribute to a further deterioration in funding liquidity. Brunnermeier (2009) gave a strong indication that in the absence of adequate liquidity-risk management, banks that face a liquidity shock often engage in fire sale of assets, hoard liquidity and reduce lending to the real economy. These actions in turn increase the likelihood of market disruptions and liquidity shocks faced by other institutions, resulting in a prolonged deterioration in market liquidity that has a severe impact on real economic growth.

2.2 THEORETICAL LITERATURE ON THE DETERMINANTS OF LIQUIDITY RISK

Reference is made by Toby (2006) to the origin of liquidity risk in the history of American banks with the "shiftability theory" of banking which explained that the liquidity of a bank depended on its ability to shift its assets (short term open market instruments) to someone else at a predictable price. In circumstance where large number of depositors decided to withdraw their money, all the banks needed was to only sell these investments, take the money thus acquired, and pay off its depositors. Moulton, one of the originators of the theory, asserted that "Liquidity is tantamount to shiftability". The shiftability theory redirected the attention of bankers and the banking authorities from loans to investments as a source of bank liquidity. The major flaw of the shiftability theory was that although one bank could obtain needed liquidity by shifting its assets, the same was not true of all banks taken together since obviously all banks cannot gain additional cash reserves by shifting their earning assets to each other. Consequently, between 1929 and 1933, all the banks wanted to be sellers and none of them wanted to buy. What was needed was some agency outside the banking system with the ability to pour massive doses of liquid reserves into all the banks by buying what they all wanted to sell. But the Federal Reserve System could not provide this necessary liquidity, and literally thousands of banks failed throughout the century. (Toby, 2006)

Again, theoretical literature provides two opposing views on bank capital and liquidity creation. Under the first view, bank capital tends to impede liquidity creation through two distinct effects: the "financial fragility structure" and the "crowding-out of deposits". The "financial fragility structure" effect, characterized by lower capital, tends to favour liquidity creation (Diamond and Rajan, 2001), while higher capital ratios might crowd out deposits and thereby reduce liquidity creation (Gorton and Winton, 2000). Roughly described, the "financial fragility structure" effect is the outcome of the financial intermediation process. By

monitoring borrowers, the bank obtains private information that gives it an advantage in assessing the profitability of its borrowers. However, this informational advantage creates an agency problem and the bank might extort rents from its depositors by requiring a greater share of the loan income. If depositors refuse to pay the higher cost, the bank withholds monitoring efforts. As depositors know that the bank might abuse their trust, they become reluctant to deposit their money. As a result, the bank has to win depositors' confidence by adopting a fragile financial structure with a large share of liquid deposits. A contract with depositors mitigates the bank's hold-up problem because depositors can run on the bank if the bank threatens to withhold efforts. Consequently, financial fragility favours liquidity creation since it allows the bank to collect more deposits and grant more loans.

By contrast, higher capital tends to mitigate financial fragility and enhances the bargaining power of the bank hampering the credibility of its commitment to depositors thus, higher capital tends to decrease liquidity creation. Besides, Gorton and Winton (2000) show that a higher capital ratio might reduce liquidity creation through another effect: the "crowding-out of deposits". They consider that deposits are more effective liquidity hedges for agents than investments in bank equity. Indeed, deposits are totally or partially insured and withdrawable at par value. Thus the higher is the bank's capital ratio, the lower is its liquidity creation. Under the second view, higher capital enhances the ability of banks to create liquidity. Liquidity creation increases the bank's exposure to risk as its losses increase with the level of illiquid assets to satisfy the liquidity demands of customers (Allen and Gale, 2004). Bank capital allows the bank to absorb greater risk (Repullo, 2004). Thus, under the second view, the higher is the bank's capital ratio, the higher is its liquidity creation. Berger and Bouwman (2009) empirically test these recent theories of the relationship between capital and liquidity creation. Using a sample of US commercial banks from 1993 to 2003, they find that the relationship is positive for large banks and negative for small banks.

2.3 EMPIRICAL LITERATURE ON THE DETERMINANTS OF LIQUIDITY RISK

Though liquidity risk has always been considered in literature as a major determinant of bank performance, only a few of studies have gone further to take into consideration the various determinants of liquidity risk in the daily operations of a bank. Work done by some few researchers show varied determinants in different banking environments basically categorized under bank specific and macro-economic factors.

For example with the empirical analysis of data based on 5066 European banks over the period between 1998 and 2004, Lucchetta (2007) hypothesized that interest rates affect banks' risk taking and the decision to hold liquidity. The study concluded that across European countries, the interbank interest rate had positive effects on the liquidity retained by banks and the decision of a bank to be a lender in the interbank market. The key variable which influenced the decision to lend in the interbank market was the liquidity price which depends on the demand and supply of liquidity and on the risk-free interest rate. The results also showed a negative relationship between monetary policy interest rate and the decision of a bank to hold liquidity and to lend in the interbank market.

In their study of the bank specific and macroeconomic determinants of liquidity risk among 57 U.K. resident banks within the period 1985 to 2003, using a liquidity ratio (ratio of liquid assets to total assets) as a measure of liquidity risk, Aspachs et al. (2005) made some observations. They indicated that the probability of obtaining support from the lender of last resort, which should lower the incentive for holding liquid assets was positively related to liquidity risk. The desire to achieve higher net interest margins (higher profitability) which serves as a measure of opportunity costs of holding cash positively affected liquidity risk just as loan growth since higher loan growth signals increase in illiquid assets. They further

indicated that while the size of a bank had a non-linear (no definite) effect on liquidity risk, GDP growth as an indicator of business cycle and short term interest rates which captures the monetary policy effect both had positive effects on liquidity risk.

Still with the ratio for liquid assets to total assets as measure of liquidity risk (dependent variable), Bunda and Desquilbet (2008) analyzed the determinants of liquidity risk of banks from emerging economies with panel data regression analysis. The result showed that the size of a bank had a positive effect on liquidity risk, the ratio of equity to assets as a measure of capital adequacy had a negative effect on liquidity risk. Again, the presence of prudential regulation compelling banks to be liquid enough, the share of public expenditure on GDP as a measure of supply of relatively liquid assets and the rate of inflation which increases the vulnerability of banks to nominal values of loans provided to customers all have negative effect on liquidity risk. They also showed that in times of the realization of financial crisis probably caused by poor bank liquidity, the relationship with liquidity risk is positive. With the exchange rate regime factor, banks in countries with extreme regimes (the independently floating exchange rate regime and hard pegs were less likely to face liquidity risk than in countries with intermediate regimes.

Shen et al. (2009) applied panel data instrumental variables regression, using two-stage least squares (2SLS) estimators to estimate bank liquidity risk and a performance model. The study employed an alternative liquidity risk measure besides liquidity ratio; the financing gap ratio and investigated the causes of liquidity risk (causes of liquidity risk model), using an unbalanced panel dataset of commercial banks from 12 advanced over the period 1994-2006. They found that liquidity risk is an endogenous determinant of bank performance with determinants including size, components of liquid assets (risky and less risky) and

dependence on external funding, supervisory and regulatory factors and macroeconomic factors. While the relationship between size and liquidity risk was found to be non-linear, risky liquid assets and external funding dependence had a positive relationship while less risky liquid assets exhibited a negative relationship with liquidity risk.

Rauch et al. (2010) in their study of 457 German state-owned savings banks from 1997 to 2006 analyzed the determinants of their liquidity creation. According to the study, macroeconomic factors such as tight monetary policies had negative effects on bank liquidity creation through their interest rates. The level of unemployment which is connected with demand for loans used as a proxy for the general health of the economy showed a negative influence on liquidity and thus a positive effect on liquidity risk. The negative influence meant that the healthier the economy, (the lower the unemployment rate), the more liquidity the created by banks. They concluded that only macro economic factors had strong association with liquidity risk and that bank specific factors such bank profitability and the size of the bank measured by the total number of bank customers did not have any effect on liquidity creation.

Moore (2010) studied the effects of financial crisis on the liquidity of commercial banks in Latin America and Caribbean countries over the period of 34 years spanning the period 1970 to 2004. The results based on monthly observations revealed that liquidity risk tends to be positively related to the business cycle in half of the countries studied and to the volatility of the cash (withdrawals) to deposit ratio; an indication that commercial banks had the propensity to expand liquidity when the volatility of cash demand by customers rises and vice versa. The results further indicated that the effect of money market interest rate as a measure of the opportunity cost of holding liquidity is mixed. Countries with higher interest rates had

a negative relationship with holding liquidity; thus indicating a positive link with liquidity risk and vice versa. Consequently, the relationship between financial crisis and bank liquidity varied across countries depending on where there was a lending boom before the crisis or where banks were subject to large deposit withdrawals during the crisis; making them more vulnerable to liquidity risk. Others were more liquid during the crisis, especially in countries where the crisis were accompanied by an exchange rate crisis that probably led banks to be more conservative in their liquidity though this practice had the propensity of deepening the crisis if companies could not access credit to finance their operations.

A study on how banks managed the liquidity shock that occurred during the financial crisis between 2007 and 2009 by Cornet et al. (2011) sampled quarterly data of all US commercial banks. This was done by estimating separate regression functions for both small and large banks with explanatory variables such as the share of illiquid assets such as loans, leases, asset-backed securities etc on total assets, the proportion of core deposits in total assets, the bank adequacy ratio, the ratio of unused commitments to commitments plus assets. The results were different according the size of the banks since small banks relied more heavily on stable sources of funding like core deposits capital relative to larger banks. It was further revealed that larger banks have higher proportions of their total assets as illiquid assets as compared to smaller making them more exposed to liquidity risk than small banks across four dimensions including more undrawn commitments, less capital, less reliance on core deposits and lower liquidity of balance sheet assets.

In the study of the determinants of commercial bank's liquidity in Slovakia, Vodova (2011) considered bank specific and macroeconomic data over the period from 2001 to 2010 and analyzed them with panel data regression analysis. The variables included the size of the

bank, bank profitability, realization of financial crisis, rate of GDP, inflation rate, interest rate on interbank transactions, difference between interest rate on loans and interest rate on deposits, and the rate of unemployment.

It was found that bank liquidity dropped mainly as a result of the financial crisis. Again bank liquidity was negatively related to bank profitability, capital adequacy and the size of bank while liquidity measured by lending activity of banks increases with the growth of gross domestic product. It was further established that bank liquidity decreased with higher unemployment. Key interest rates, interest margin, rate of inflation and the level of non-performing loans had no statistically significant effect on the liquidity of Slovak commercial banks. It is thus important to note that aside the variables that had no significant effect on liquidity, the opposite of the relationships of the other variables and bank's liquidity holds for liquidity risk.

2.4 THEORETICAL LITERATURE ON THE DETERMINANTS OF BANK PROFITABILITY

Maintaining a sound economic environment for stability and growth in any economy makes the assessment of a bank's financial condition by management, regulators and other industry watchers very necessary. This emanates from banks playing the basic role of financial intermediation and hence the need for efficiency and effectiveness in their management (Halling and Hading, 2006). Prudent management of the operations of a bank helps in the maximization of profitability which is the prime objective of any business venture. It also serves as an essential prerequisite for a competitive banking institution and the cheapest source of funds.

Anyanwaokoro (1996) made the assertion that profits play a key role in persuading depositors to supply their funds on advantageous terms such as earning interest and the assurance of its security. In addition to minimizing the probability of financial distress, Anyanwaokoro (1996) maintained that impressive profit figures help reassure a bank's stakeholders; investors, borrowers, managers, employees, external product and service suppliers, regulators etc of the fulfillment of their respective expectations. The economics of banking literature acknowledges various determinants of bank profitability; a surrogate for bank performance much of which are discussed subsequently.

2.4.1 The Structure-Conduct-Performance (SCP) Model

Earlier studies into the determinants of bank profitability focused on the structure-conduct-performance (SCP) which highlights on the interpretation of a positive correlation between concentration and profitability. Goddard et al. (2004) referred to the 'collusion' hypothesis as a small number of banks colluding either implicitly or explicitly, manifesting in higher interest rates charged on loans, lower rates paid on deposits, higher fees and commission on other diversifications, etc. Nonetheless, collusion is more difficult according to Baye (2010) as cited by Kutsienyo (2011), while the structure of an industry refers to the factors such as technology, concentration and market conditions, conduct refers to how individual firms behave in the market; their goals, pricing decisions (interest rate, commission and fees), advertising decisions, and decisions to invest in research and development, among others. This conduct of businesses influences their performance resulting in profitability, efficiency and growth. This model however fails to recognize the different reverse causal links among these three pillars of business development.

2.4.2 Efficiency Hypothesis

In a study about the industry structure, market rivalry and public policy, Demsetz (1973) offered an alternative on the explanation of the structure conduct performance, the efficiency hypothesis. He stated that higher profits of banks are not due to their collusive behaviour but because of high efficiency level, which in turn, leads to larger market shares that banks possess. According to the 'efficiency' hypothesis a positive concentration– profitability relationship may reflect a positive relationship between size and efficiency. According to Goddard et al. (2004) it is therefore uncertain whether the high profits of large banks are a consequence of concentrated market structures and collusion, or superior production and management techniques that reduce costs, creating high returns. In a study to resolve this issue, Smirlock (1985) sought to find evidence from the (non) relationship between concentration and profitability in banking and found a positive relationship between market share and profitability; an insignificant relationship between concentration and profit; and a negative relationship between the interaction of concentration and market share with profit thus finally suggesting the rejection of the collusion hypothesis. Again, in a study about market share as a source of market power, Rhoades (1985), on the other hand, suggested that a positive empirical relationship between market share and profit does not reflect differences in efficiency between banks, but rather advantages arising from product differentiation, enabling some banks to raise prices.

2.4.3 The Capital Asset Pricing Model

The varied risks associated with the unique intermediation role played by banks cannot be overlooked in the pricing of both their borrowing and lending rates and thus the expected returns on any venture they undertake. According Brealey & Myers (2003), the capital asset pricing model (CAPM) introduced by three economists William Sharpe, John Lintner and

Jack Treynor in the mid 1960s described the risk and the expected return of an investment. It states that the expected risk premium on each investment is proportional to its beta (a measure of a market/systematic risk). In a competitive market environment, the expected risk premium varies in direct proportion to the beta since the return on a firm's stock is expressed as a function of risk-free rate and a premium based on the systematic risk.

Expected risk premium on an asset = $\text{Beta} \times \text{Expected risk premium on market}$, that is $r - r_f = B(r_m - r_f)$ and this can be rewritten as $r = B(r_m - r_f) + r_f$ where r is the expected return, B is the beta, r_m is the market risk/systematic risk, r_f is the risk free rate while $(r_m - r_f)$ is the risk premium on the market. According to Brealey & Myers (2003) however, the CAPM pictures investors as solely concerned with the level and uncertainty of their future wealth or returns, meanwhile, to most banks and individuals at large, wealth is not an end in itself but whether it can be utilized. Again, the CAPM takes a very simplistic view of the relationship between risk and return neglecting the effects of market imperfections and so does not reflect the reality in the market.

2.4.4 Arbitrage Pricing Model

The arbitrage pricing model assumes that the return on each stock of investment depends partly on pervasive macroeconomic influences or "factors" and partly on "noise"-events that are unique to a particular bank or entity. According to Brealey and Myers (2003) for any individual stock, there are two sources of risk: the risk that stems from the pervasive macroeconomic factors which cannot be eliminated by diversification and the risk arising from possible events that are unique to the company. That is, diversification does not eliminate unique risk and thus diversified investors can therefore ignore it when deciding

whether to buy or sell a stock since the risk premium is affected by factor or macroeconomic risk and not by unique risk (Brealey and Myers, 2003).

2.5 EMPIRICAL LITERATURE ON THE DETERMINANTS OF BANK PROFITABILITY

In the literature, bank performance, typically measured by the return on assets (ROA), the return on equity (ROE) and net interest margin (NIM) is usually expressed as a function of both internal and external determinants. The return on assets (ROA) reflects the ability of a bank's management to generate profits from the bank's assets while the ROE specifies the return to shareholders on their equity. NIM measures the gap between the interest paid to savers/lenders and the interest the bank receives from borrowers/debtors. Several studies have been undertaken by many researchers in different banking environments with these measures of bank profitability and thus achieving different results.

Goddard et al. (2004) for example conducted a study on the profitability of European (Denmark, France, Germany, Italy, Spain and the UK) banks between 1992 and 1998 using a cross-sectional and a dynamic panel analysis. Using the return on equity (ROE) as the dependent variable, the study employed size, business diversification, capital adequacy, credit risk and ownership type as well as dynamic effects as the explanatory variables. The results indicated that despite the intensifying competition among banks, there existed a significant persistence of abnormal profit from year to year.

It was also evident that the relationship between size and profitability was relatively weak. The relationship between the importance of off-balance-sheet businesses (OBS) in a bank's portfolio and profitability was positive for the UK, but either neutral or negative elsewhere where some banks that had diversified rapidly into OBS businesses experienced difficulties in

maintaining their profitability. The relationship between the capital–assets ratio and profitability was positive though this finding did not reflect the expected theoretical relationship between risk and return since a high CAR (capital-asset ratio) signifies that a bank is operating over-cautiously and ignoring potentially profitable trading opportunities. However, it was revealed that high CAR takes care of the cost of insurance against bankruptcy, signaling a higher future profitability, and thus creating a positive association between CAR and ROE. There was no systematic relationship between ownership type and profitability according to the pooled estimation across all countries. In all the countries cross-sectional estimation, cooperative banks were less profitable than commercial and savings banks, though the effect was only significant at the ten per cent level.

Sufian and Chong (2008) conducted a study on the determinants of bank profitability in the Philippines, a developing economy between 1990 and 2005 with the application of a multiple regression analysis. In their linear regression analysis, a measure of profitability; return on assets (ROA) was the dependent variable with bank specific explanatory variables such as size, credit risk, non-interest income to total assets ratio (a measure of diversification and business mix), non-interest expense (efficiency of management), equity to assets ratio while the external explanatory variables used were the growth rate of the GDP, growth of money supply, the rate of inflation and stock of market capitalization. The results indicated a negative relationship between bank size and profitability meaning that bigger banks tend to make lesser profit compared to smaller banks.

Credit risk was negatively related to profitability and statistically significant at one percent level suggesting that Philippines banks with higher credit risk or non-performing loans tend to exhibit lower profitability levels and hence the need to focus on credit management. With

respect to non-interest income, it was positively related and statistically significant at five percent level of significance, an indication that banks that derived a higher proportion of their income from non-interest sources such as fee-based services tend to report a higher level of profitability. As expected, non-interest expense was negatively related to profitability while equity to assets ratio was positively related to the profitability of Philippines banks and was statistically significant at the five percent level. In the case of the macroeconomic conditions and the profitability of the banking industry, all the variables exhibited a positive relationship in all cases with the exception of the rate of inflation.

Aburime (2008) conducted a study which sought to econometrically identify the significant macroeconomic determinants of bank profitability in Nigeria. Using a panel data set comprising 1255 observations of 154 banks over the 1980-2006 period, macroeconomic indices over the same period including real interest rates, inflation, monetary policy, exchange rate regime, banking sector development, stock market development, financial structure and corporate tax policy of Nigeria were incorporated. The results revealed that real interest rates, rates of inflation and monetary policy which influences through liquidity ratio were positive and significant in relation to bank profitability in Nigeria. Again, partial or outright liberalization of the forex market had a significantly negative impact on bank profitability implying that banks significantly profited more during the fixed exchange rate regime in Nigeria. It was further revealed that banking sector development, stock market development and financial structure did not have any significant influence on bank profitability in Nigeria while the empirical relationship between corporate tax policy and bank profitability was inconclusive.

Athanasoglou et al. (2006) examined the profitability behaviour of bank-specific determinants (liquidity, provisioning policy, capital adequacy, expenses management and bank size), industry related (type of ownership, level of competition, deregulation), and macroeconomic determinants (inflation), using an unbalanced panel data set of South Eastern European countries' (Albania, Bosnia-Herzegovina, Bulgaria, Croatia, FYROM, Romania and Serbia-Montenegro) credit institutions over the period 1998-2002.

The estimation results indicated that, with the exception of liquidity, all bank-specific determinants significantly affected bank profitability in the anticipated way. A key result was that the effect of concentration was positive, which provided evidence in support of the structure-conduct performance hypothesis, while at the same time some relevance of the efficient-structure hypothesis could not be rejected. In contrast, a positive relationship between banking reform and profitability was not identified, whilst the picture regarding the macroeconomic determinants was mixed.

Along similar lines, Flamini et al. (2009) sought to understand the determinants of high bank profits in Sub-Saharan Africa (SSA) and explored the relationship between profits and equity in the region's commercial banking sector. The analysis was based on a sample of 389 banks, operating in 41 countries from 1998 through 2006. Using the ROA as a measure of profitability and the dependent variable they employed size, capital, credit risk, cost management, activity mix, market power and ownership type as the bank-specific determinants while wealth (GDP per capita), cyclical output (GDP growth rate), rate of inflation, fuel price, non-fuel commodity price and the regulatory environment as the macroeconomic explanatory variables.

The regression results showed that both capital and credit risk had a positive and significant effect on profitability. This suggests that risk-averse shareholders target risk adjusted returns and sought larger earnings to compensate higher credit risk. With respect to size, the positive and significant coefficient of the variable gave support to the economies of scale market-power hypothesis while the negative coefficient of the square of size, significant at the 10 percent level, indicated that this relation might be non-linear due to possible bureaucratic bottlenecks and managerial inefficiencies suffered by banks as they become “too large.” Again while market concentration had no direct effect on bank profitability in their regression model, the results however showed a positive but insignificant effect of overhead costs on bank profitability suggesting that banks were able to pass on most of the high overhead costs to customers through higher spreads in order to keep profits unaffected depending on the extent of their market power. Bank activity diversification also impacted positively on profitability.

Macroeconomic variables on the other hand significantly affected bank profitability in Africa, for instance the positive effect of inflation on profitability suggested that banks forecasts of future changes in inflation were made correctly and promptly enough to adjust interest rates and margins. As expected, output growth had a positive impact on bank profitability, significant at 10 percent level, while GDP per capita did not significantly affect bank returns. Higher prices of commodities, excluding fuel, also improved bank returns, whereas fuel prices depressed profits. While the former result is widely expected given that SSA countries are essentially commodity exporters, the negative effect of fuel prices was likely due to the fact that the majority of countries in the sample used were oil-importing countries.

In their study of the determinants of bank interest margins and profitability with bank data from 80 countries between 1988 and 1995, Demirguc-Kunt and Huizinga (2000) hypothesized that the differences in interest margins and bank profitability were determined by bank characteristics, macroeconomic conditions, explicit and implicit bank taxes, regulation of deposit insurance, general financial structure and the several underlying legal and institutional indicators. Controlling for differences in bank activity, leverage and micro economic environment, they made some findings.

Banks in countries with a more competitive banking sector where banking assets constituted a larger share of GDP had smaller margins and were thus less profitable. Bank concentration ratio as well as well as well capitalized bank (with lower cost of funding) and probable bankruptcy cost also affects larger banks positively in their net interest margins and profitability. It was also revealed that differences in a bank's activity mix affect spread and profitability; banks with relatively high non-interest earning assets as well as high dependence on deposits make lower profits because of the higher expenditure associated with a higher branching network required. Similarly, variations in overhead and other operation cost reflect in the net interest margins as they pass on their operating cost which includes tax burdens onto their lenders and depositors (in both poor and rich countries). They also found that foreign banks in developing countries made more profit than the domestic banks while the opposite was true for industrial countries. Macroeconomic factors such as the rate of inflation related positively to profitability. Legal and institutional differences revealed that better contract enforcement, efficiency in the legal system, and lack of corruption are associated with lower realize interest margins and lower profitability.

Further on the determinants of bank profitability, Kutsienyo (2011) analyzed a panel data of 26 banks in Ghana over a period of 2000-2009, using a generalized least squares (GLS) technique to estimate fixed effect regression models. With the ROA and ROE as dependent variables, bank-specific factors, incorporated in the regression models were capital adequacy, operating expense, liquidity, asset quality, and bank size while macroeconomic factors included the rate of inflation, Gross Domestic Products (GDP), money supply and banking industry concentration. The results for the ROA model indicated that capital adequacy, bank size, the rate of inflation and GDP were positively significant in relation to bank profitability while asset quality, liquidity, operating expense, money supply and bank concentration were negatively associated with bank profitability. Apart from GDP, banking industry concentration, and asset quality, all the determinants were consistent when bank profitability was measured by Return on Equity (ROE). However, capital adequacy was negatively significant in its relationship with bank profitability in the case of ROE.

2.6 MEASUREMENT OF LIQUIDITY RISK AND BANK PROFITABILITY

According to Ioan and Dragos (2006) the management of liquidity risk presents two main perspectives both of which have an effect on a bank's profitability. They indicated that an inadequate level of liquidity may lead to the need to attract additional sources of funding associated with higher costs that will result in the reduction of the profitability of the bank and ultimately lead to insolvency. On the other hand an excessive liquidity may lead to a fall in net interest margins and in consequence poor financial performance.

Keeping appropriate levels of liquidity is manifested in a bank's ability to obtain with immediacy the needed funds at a reasonable cost as and when necessary. Maintaining an adequate degree of liquidity in the whole banking system is extremely important, because the

registration of a liquidity crisis at a single bank can have negative repercussions over the whole banking system courtesy the risk of contagion through interbank settlements.

Banks may need to borrow from the market even at an exceptionally high rate during a liquidity crisis ultimately causing a decline in the banks' earnings. Moreover, a bank's further borrowing to meet depositors' demand may place the bank's capital at stake leading to rise in the debt equity ratio, affecting the bank's effort to maintain an optimal capital structure (Arif and Anees; 2012).

According to Diamond and Rajan (2001), liquidity risk may cause a fire sale of the assets of the bank which may spill over into an impairment of bank's capital base. If any of the financial institutions faces a situation in which it has to sell a large number of its illiquid assets to meet the funding requirements probably to reduce the leverage in conformity with the requirement of capital adequacy, the fire sale risk may arise.

A bank with liquidity problems loses a number of business opportunities placing it at a competitive disadvantage, in contrast to those of the competitors. Diamond and Rajan (2001) asserted that there are instances when banks refuse lending even to a potential entrepreneur; if it feels that the liquidity need of the bank is quite high; representing an opportunity loss for the bank. They emphasized that a mismatch in depositors demand and production of resources forces a bank to generate the resources at a higher cost and at rare situations when a bank is unable to meet the requirements of demand deposits, there could be a bank run. According to Holmstrom and Tirole (2000), though a bank may invest some of its resources in the long-term projects much of the funding resources are invested in the short term liquid assets to provide a buffer against liquidity shocks.

Liquidity risk of banks can be measured from balance sheet positions particularly by throwing light on liquidity ratios, however, Poorman and Blake (2005) cautioned that adopting just this practice would not be the solution to the liquidity risk menace. This reason stemmed from the fact a large regional bank, Southeast Bank, used over 30 liquidity ratios for liquidity measurement but eventually failed due to liquidity risk. It is therefore imperative that beyond mere liquidity ratios, banks develop new forms of measuring liquidity risk. While the Basel Committee on Banking Supervision (2000) proposed the maturity laddering method for measuring liquidity risk; Saunders and Cornett (2006) gave a strong indication that banks could use sources and uses of liquidity, peer group ratio comparisons, liquidity index, financing gap and the financing requirement, and liquidity planning to measure their liquidity exposure. Besides, Matz and Neu (2007) also indicated that banks could apply balance sheet liquidity analysis, cash capital position and maturity mismatch approach to assess liquidity risk.

The Basel Committee on Banking Supervision (BCBS) in the “Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring,” published in December 2010 (BCBS 2010), proposed some quantitative metrics in analyzing a banks liquidity risk at any point in time. These two quantitative metrics include the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), which were developed to meet two separate, but complementary, objectives. The two indicators were to ensure that banks held an adequate pool of liquid assets, while simultaneously adopting a reasonable and prudent maturity mismatch. The objective of the LCR was to promote short-term resilience by ensuring that a bank had enough high-quality liquid assets to survive an acute stress scenario that lasts for one month.

The NSFR was developed to achieve the second objective of the Basel III liquidity standards: promoting longer-term resilience by encouraging banks to fund their activities with more

stable sources of funding. That is, the NSFR was a longer-term structural ratio designed to address liquidity mismatches and to encourage an increased reliance on medium and long-term funding, thus increasing the average maturity of banks' liabilities. The Liquidity Coverage Ratio (LCR) aimed at increasing banks' resilience to an acute 30-day stress scenario. The LCR is calculated as the stock of high-quality liquid assets/total net cash outflows over the next 30 calendar days ≥ 100 per cent.

In other words, to meet funding obligations and draws on contingent liabilities over the next 30 days, the LCR required banks to hold a stock of unencumbered high-quality liquid assets equal to or greater than stressed net cash outflows. The requirement must be met continuously and reported to supervisors on at least a monthly basis, with an ideal time lag of not more than two weeks.

The LCR was complemented by a structural funding ratio, the Net Stable Funding Ratio (NSFR), which was structured to ensure that long-term assets were funded with a minimum amount of stable long-term funding. The NSFR is calculated as the available amount of stable funding/required amount of stable funding > 100 per cent.

2.7 EMPIRICAL LITERATURE-LIQUIDITY RISK AND BANK PROFITABILITY

Though liquidity risk can be measured by considering a bank's liquidity gap, liquidity risk measures have in the past focused on the use of liquidity ratios and have thus achieved varied results in relation to bank profitability. Among the widely used measures of liquidity risk are the ratio of liquid assets to total assets, the ratio of loans to total assets, the ratio of liquid assets to total deposits, the ratio of liquid assets to customer and short term funding, the ratio of net loans to customer and short term funding etc.

The ratio of liquid assets to total assets normally gives information about the general liquidity shock absorption capacity of a bank. As a general rule, the higher the share of liquid assets in total assets, the higher the capacity of a bank to soak up a probable liquidity shock, given that market liquidity is the same for all banks in the sample. Nonetheless, a higher value of this ratio may be also interpreted as inefficiency, since keeping much liquid assets on the balance sheet results in lower net interest margins hence the need to optimize liquidity and profitability and thus reduce opportunity cost of the bank. Previous studies that used this ratio to determine the relationship between liquidity risk and bank performance include Molyneux and Thornton (1992) and Barth et al.(2003) both of whom established a negative relationship between this liquidity ratio and return on assets (ROA) while Bourke(1989) established a positive relationship between the two. Demirguc-Kunt et al. (2003) concluded that banks that held a high fraction of liquid assets had lower net interest margins and this is consistent with banks receiving lower returns on holding cash or securities but facing competitive market for deposits.

Another widely used liquidity ratio as a measure of liquidity risk is the ratio to liquid assets to deposits (deposits of individuals, enterprises and other financial institutions). This liquidity ratio is more focused on the bank's sensitivity to selected types of funding. The ratio thus captures the bank's vulnerability to liquidity risk in relation to its funding sources. The bank is able to meet its obligations in terms of funding if the volume of liquid assets is high enough to cater for the deposits and this can be signified by a ratio of more than one. Ratios lower than this value signal a bank's vulnerability to liquidity risk with respect to the withdrawal of deposits. Earlier studies that used this ratio as a measure of bank performance include Shen et al. (2001) who established that banks with higher fractions of liquid assets had lower net interest margins. Kosmidou et al. (2005) also found that the ratio of liquid assets to total

deposits (customer and short term funding) had a positive effect on the return on assets (ROA) but a negative effect on net interest margins.

Other studies also relied on the ratio of loans to total assets to assess the correlation between liquidity risk and bank profitability. This liquidity ratio measures the proportion of total assets made up of net loans, thus a relative measure of illiquidity of a bank's total assets. This means that the higher this ratio, the less liquid the bank is and the higher the vulnerability to bank liquidity risk. With this ratio, Demircuc-Kunt and Huizinga (1999) established a negative relationship with return on assets (ROA) but a positive relationship with net interest margins (NIM). However, Athanasoglou et al.(2006) made the conclusion that ratio had no effect on either return on assets (ROA) or return on equity (ROE).

The ratio of net loans to customer (deposits) and short term funding has also been used significantly as a measure of liquidity risk. Kosmidou (2008) indicated that the ratio of net loans to customer and short term funding is negatively related to return on assets (ROA). However Naceur and Kandil (2009) established that the ratio of net loans to customer and short term funding was positively and significantly related to net interest margin (NIM) of domestic banks, indicating a negative relationship between net interest margins (NIM) and the level of liquid assets held by the bank. Nonetheless, they found out that bank's liquidity risk does not determine returns on assets or equity (ROA or ROE) significantly.

2.8 CONCLUSION

As already made clear in the problem statement in the first chapter, the literature on the determinants of bank liquidity risk is very little and this mainly focused on some countries in Europe. Little attention has been paid by researchers on the determinants of liquidity risk in Sub-Saharan Africa of which Ghana is included due to the lack of literature. It is also quite clear from the literature that apart from the study by Shen et. al (2009) in which both the determinants of liquidity risk and bank profitability were both estimated; where liquidity risk was an explanatory variable (endogenous variable) in the profitability equation, most of the studies either considered the determinants of liquidity risk or bank profitability separate studies. This study thus capitalizes on the gaps in the literature to take into consideration the determinants of bank liquidity risk in Ghana and also estimate its effects on bank profitability (ROA & ROE) by controlling for other variables. It is also refreshing to use the financing gap ratio as an alternative measure of bank liquidity risk after most of the studies had focused on the use of liquidity ratios. It is however worth noting that the ratio of net loans to total deposits used to check for the robustness of the results.

In concluding, from the theoretical and empirical literature on the determinants of liquidity risk, determinants of bank profitability, it cannot be overemphasized that liquidity risk management plays a major role in survival and growth or otherwise of any bank. The evidence of the complexity of the nature and causes of liquidity risk is thus revealed by the varying approaches adopted by researchers, regulatory bodies and bank managers in studying it. It is clear however that though the determinants of liquidity risk vary across countries and regions, the effects hypothesized to influence bank performance in conjunction with other factors also varied across countries and regions though the effects of some of the variables on bank profitability remained uniform across the board.

CHAPTER THREE

METHODOLOGY

3.0 INTRODUCTION

In explaining the methodology of this study, the various tools and estimation procedures applied to achieve the set aims and objectives are clearly identified in this chapter. It outlines the scope of the study and sources of data needed for analysis in the quest to achieve the research objectives. The chapter further specifies and justifies the econometric model adopted by the study while giving clear reasons for the variables used in the models. The chapter thus sequentially lays clear emphasis on the scope and sources of data for the study, the conceptual and functional econometric models, the estimation procedures followed in estimating the econometric models, the arguments for the choice and justification of the variables used in the econometric models and finally the conclusion.

3.1 DATA SOURCES AND SCOPE OF THE STUDY

This section considers the scope of the study and the sources of data on the variables used in the econometric models. In a quest to ascertain the determinants of bank liquidity risk and estimate the effects of this liquidity risk on profitability among the banks in Ghana, the study uses a panel data on 22 banks in Ghana spanning the period 2002 to 2011. The time period selected is based on the reason that it provides recent time series observations and it also represents a period of major changes for the Ghanaian banking system; typified by the universal banking principle resulting from the enactment of the Banking Act, 2004 (Act 673). Secondary data based on the annual financial reports of the selected banks is acquired from the Ghana Association of Bankers. Bank specific data on total assets, components of liquid

assets, sources of funding, advances, loan loss provisions, operating expenses, total equity among others was thus obtained from this source. Data on the macroeconomic variables change in GDP and inflation incorporated in this study was sourced from the World Development Indicators (World Bank Online, 2013.) Tabular descriptions of the variables used in the study, their source, units of measurement and expected signs shown in **Tables 1** and **2** respectively.

3.2 ECONOMETRIC SPECIFICATION

In this section, the choice and specification of the econometric models used by the study is considered. In the estimation of the determinants of liquidity risk of banks and its effects on bank profitability, panel data regression techniques are employed. According to Baltagi (2001) cited by Gujarati(2004), by combining time series of cross-section observations, panel data gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency. By studying the repeated cross section of observations, panel data are better suited to study the dynamics of change. Since this panel data relate to firms (banks) over time, there is bound to be heterogeneity in these units. The techniques of panel data estimation can also take the inevitable heterogeneity relating to the study of banks over time explicitly into account by allowing for individual-specific variables. Panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data and thus enrich empirical analysis in ways that may not be possible if only cross-section or time series data is used.

The panel data model is normally estimated with either the fixed effect model (FE) or the random effect model (RE) also known as the error components model. In literature, the fixed effects model is a statistical model that represents the observed quantities in terms of

explanatory variables that are treated as if the quantities were non-random. The fixed effects model allows the partial regression coefficients to be common across cross-sectional units, but the intercepts in the regression model are taken to be distinct among individual banks. This model hinges on the assumption that the individual specific effect is correlated with the independent variables. Gujarati (2004) makes the assumption that the intercept and slope coefficients are constant (time invariant) across time and space and the error term captures differences over time and individuals. Again, the slope coefficients are constant but the intercept varies over individual and time.

On the other hand, the random effects model assumes that a common mean value for the intercepts exists and the cross-sectional differences in the intercept values of each bank are reflected in an error term. The random effects assumption (made in a random effects model) is that the individual specific effects are uncorrelated with the independent variables.

Thus the choice between the FE and the RE hinges around the assumption one makes about the likely correlation between the individual, or cross-section specific, error component ϵ_i and the X regressors. If it is assumed that ϵ_i and the X 's are uncorrelated, RE may be appropriate, whereas if ϵ_i and the X 's are correlated, FE may be appropriate.

Keeping the fundamental differences of the two approaches in mind, Judge et al (1980) cited by Gujarati (2004) make these helpful observations in choosing between the two:

- If T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by FE and the RE. Hence the choice here is based on computational convenience. On this score, FE may be preferable.

- When N is large and T is small, the estimates obtained by the two methods can differ significantly. With the RE, $\beta_{1i} = \beta_1 + \varepsilon_i$, where ε_i is the cross-sectional random component, whereas in FE, it is treated as fixed and not random. In the latter case, statistical inference is conditional on the observed cross-sectional units in the sample and this is appropriate if it is believed strongly that the individual, or cross-sectional, units in the sample are not random drawings from a larger sample, making the FE more preferable in this case.
- However, if the cross-sectional units in the sample are regarded as random drawings, then RE is appropriate, for in that case statistical inference is unconditional.
- If the individual error component ε_i and one or more regressors are correlated, then the RE estimators are biased, whereas those obtained from FE are unbiased.

Consequently, the choice of either the fixed effects model or the random effects model is based on the Hausman tests (Baltagi, 2001). The Hausman test determines whether the estimates of the coefficients, taken as a group, are significantly different from the two regressions (fixed effects and random effects). In simple terms, the null hypothesis in the Hausman tests is that the preferred model is random effects as opposed to the alternative which says the preferred model is the fixed effect.

In this study, the Hausman test for the determinants of liquidity risk equation where the financing gap ratio (FGAPR) represented liquidity risk as the dependent variable produced a test statistic of (Prob>Chi2=0.0806) which is more than 0.05, leading to the failure to reject the null hypothesis and thus preferring the random effect to the alternative, the fixed effect. With the ratio of net loans to total deposits (NLD) as the dependent variable as well, the results also show a test statistic of (Prob>Chi2=0.0634) which is more than 0.05 and also leading to the same conclusion. The outputs from the Hausman test are given in **Appendix II**

and **III** respectively. The Wooldridge test for autocorrelation also proved the existence of no-first order autocorrelation in both equations and this is also shown in appendix IX.

Following the standard linear specification for a panel data regression model, to estimate the determinants of liquidity risk, the model is specified as:

$$L_{it} = \alpha + \beta' X_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

Where L_{it} is the liquidity risk for bank i in time t , with $i=1 \dots N$ (number of observations) and $t=1 \dots T$ (time periods), X_{it} is a vector of explanatory variables for bank i in time t , α is constant, β are coefficients which represents the slope of variables, and ε_i is the error term.

Following Saunders & Cornett (2006), Shen et al.(2009) specified the functional form of the model to estimate the determinants bank liquidity risk and its effect on the bank profitability (through the determinants of bank profitability) between market based and bank based developed economies as:

$$L_{it} = c_i + \lambda_1 SIZE_{it} + \lambda_2 SIZE_{it}^2 + \lambda_3 LRLA_{it} + \lambda_4 RLA_{it} + \lambda_5 EFD_{it} + \delta_1 GDPC_{jt} * OSP_{jt} + \delta_2 GDPC_{jt} * PMI_{jt} + \delta_3 GDPC_{jt} * BAR_{jt} + \gamma_1 GDPC_{jt} + \gamma_2 GDPC_{jt-1} + \lambda_3 INF_{jt} + \lambda_4 INF_{jt-1} + \varepsilon_{it} \dots (2)$$

$$P_{it} = c_i + \varphi_1 L_{it} + \beta_1 SIZE_{it} + \beta_2 SIZE_{it}^2 + \beta_3 ETA_{it} + \beta_4 LLPL_{it} + \omega_1 CONC_{jt} + \nu_1 GDPC_{jt} * OSP_{jt} + \nu_2 GDPC_{jt} * PMI_{jt} + \nu_3 GDPC_{jt} * BAR_{jt} + \eta_1 GDPC_{jt} + \eta_2 GDPC_{jt-1} + \eta_3 INF_{jt} + \eta_4 INF_{jt-1} + \varepsilon_{it} \dots (3)$$

From the equations above, the bank specific variables include liquidity risk (L), bank size (SIZE), size square(SIZE²), risky liquid assets (RLA), less risky liquid assets (LRLA), capital (ETA), credit risk(LLPL) and profitability (P). While market structure is depicted by (CON), Supervisory and regulatory variables include the interactions between change of GDP and official supervisory power index (GDPC×OSP), interactions between change of GDP and

private monitoring index (GDPC×PMI), interactions between change of GDP and overall bank activities and ownership restrictiveness (GDPC×BAR). Macroeconomic variables include change in GDP (GDPC), GDP change of the previous year (GDPCt-1), change in inflation (INF) and inflation change in the previous year (INFt-1). From the equations above, liquidity risk enters the second equation as an endogenous variable.

However, following Aspachs et al. (2005), Saunders and Cornett (2006), Shen et al. (2009), Vodova (2011), the functional forms of the model to estimate the determinants bank liquidity risk and its effect on bank profitability (determinants of bank profitability) are expressed conceptually as:

$$FGAPR_{it} = f(SIZE_{it}, LRLATA_{it}, RLATA_{it}, NDD_{it}, OWN_{it}, CONC_{it}, INF_{it})..(4)$$

$$ROA_{it} = f(FGAPR_{it}, SIZE_{it}, ETA_{it}, LLPL_{it}, NIETA_{it}, NIITA_{it}, CONC_{it}, GDPC_{it})...(5)$$

Though there are several factors that may determine the liquidity risk of banks in Ghana which is represented by the FGAPR, the model is specified to include bank-specific variables such as the size of the bank (SIZE), less risky liquid assets (LRLA), risky liquid assets(RLA), non deposits dependence (NDD) and ownership type (OWN). Bank concentration (CONC) represents the market structure while change in inflation (INF) enters the equation as the only macroeconomic variable

On the other hand, bank profitability which is represented by the ROA and the ROE is conceptualized to be determined by liquidity risk (FGAPR), bank size (SIZE), equity to total assets ratio (ETA), loan loss provision to loans (LLPL), the ratio of non interest expense to total assets (NIETA), the ratio of non-interest income to total assets (NIITA), bank concentration (CONC) and the change in GDP (GDPC). It is important to note that in the

cause of the estimation, the ratio of net loans to total deposit (*NLD*) and the return on equity (*ROE*) replaces the financing gap ratio (*FGAPR*) and the return on assets (*ROA*) as measures for liquidity risk and bank profitability respectively in order to ascertain the robustness of the results.

Extending equations (4) and (5) to reflect the variables and their coefficients, the functional forms are reformulated as:

$$FGAPR_{it} = \beta_1 SIZE_{it} + \beta_2 LRLATA_{it} + \beta_3 RLATA_{it} + \beta_4 NDD_{it} + \beta_5 OWN_{it} + \beta_6 CONC_{it} + \beta_7 INF_{it} + \alpha_i + \varepsilon_{it} \dots (6)$$

$$ROA_{it} = \varphi_1 FGAPR_{it} + \beta_1 SIZE_{it} + \beta_2 ETA_{it} + \beta_3 LLPL_{it} + \beta_4 NIETA_{it} + \beta_5 NIITA_{it} + \beta_6 CONC_{it} + \beta_7 GDPC_{it} + c_i + \omega_{it} \dots (7)$$

The structural equations above are a modification of the econometric specification adopted by Shen et al.(2009) after incorporating the studies from other literature (Aspachs et al. ,2005; Sufian and Chong, 2008; Vodova, 2011). The variables excluded from the model adopted are as a result of unavailable data and their irrelevance in the achievement of the study's objectives. In order to estimate the effects liquidity risk on bank profitability, the model is specified to include other explanatory variables (control variables) that may help in the estimation of bank profitability though they are not the main variables of interest.

The equations above are specified to include an endogenous variable and this endogeneity in econometric models arise as a result of measurement error, auto regression with auto correlated errors, simultaneity, omitted variables, sample selection errors, etc. Thus, liquidity risk which is a dependent variable for the liquidity risk equation is jointly determined in the bank profitability equation with other variables like *bank size* and *industry concentration*, both of which are specified as explanatory variables in the liquidity risk equation. In such a

scenario, the estimates obtained from the ordinary least squares (OLS) regression of the bank profitability equation become inconsistent and biased. In literature, though several ways are proposed to solve the endogeneity problem, either indirect least squares or the two stage least squares (through the use of instrumental variables) is employed to purify the estimates of the correlation between the independent or explanatory variables and the error term. The problem of identification helps to choose between either the indirect least squares or the two stage least squares or to determine whether the coefficients can be estimated at all.

3.2.1 Rules of Identification

According to Gujarati (2004), in the presence of simultaneity, the structural equations containing the endogenous variables are identified properly in order to apply the right estimation procedure. Identification is applied in order to address the problem of whether the parameters of a particular equation can be uniquely estimated. An equation is underidentified or unidentified if the parameters cannot be estimated. If a numerical value can be ascertained for all the parameters in an equation, then the equation is said to be exactly or just identified. However, there are circumstances when there is more than one numerical value for one or more parameters of an equation and this happens when the equation is overidentified. Although the condition of identification is only necessary and not sufficient, in most practical applications, it has been found to be very helpful. The order and rank conditions of identification is well applied by introducing the following notations

m = number of endogenous (or jointly dependent) variables in the model.

k = total number of variables (endogenous and exogenous) excluded from the equation under consideration.

Then,

- If $k < m - 1$, the equation is underidentified or unidentified.

- If $k=m-1$, equation is just or exactly identified.
- If $k>m-1$, the equation is overidentified.

In the first circumstance, the estimates of the parameters cannot be ascertained through any estimation procedure. A just or identified equation can have its parameters estimated through the method of indirect least squares (ILS). In the presence of overidentification, the method of two stage least squares (2SLS) is normally used to ascertain the unique estimates for the parameters.

In this study, with the model for the estimation of the determinants of liquidity risk and its resultant effect on bank profitability, the number of endogenous variables (liquidity risk) is 1 and this is equal to the number of equations with the presence of endogeneity. In the bank profitability equation, there are five variables (LRLATA, RLATA, NDD, OWN and INFL) excluded but are present in the liquidity risk equation. In this case, the profitability equation is overidentified since $k>m-1$, that is $5>1-1$ thus creating a fertile platform for the application of instrumental variable(s) through the use of 2SLS estimation procedure for the parameters. According to Gujarati (2004) it is important to note that this method can be applied to an individual equation in the system without directly taking into account any other equation(s) in the system.

3.2.2 The Method of Two Stage Least Squares (2SLS) and Instrumental Variables

Regression

As the name indicates, this method involves two stages, that is two successive applications of the ordinary least squares (OLS).

In the first stage, to get rid of the likely correlation between liquidity risk and the error term in the bank profitability equation, the endogenous variable (liquidity risk) is first regressed on

all the predetermined variables in the model. The estimates of the endogenous variable equation are thus derived.

In the second stage, the endogenous variable is automatically substituted by the instrumental variable though the name of the variable is maintained in the overidentified equation (profitability) where the endogenous variable is expected to be the explanatory variable. The instrumental variable or surrogate for the endogenous variable although resembling the original variable but is uncorrelated with the error term. That is, as the 2SLS procedure indicates, the basic idea behind 2SLS is to “purify” the stochastic explanatory variable (endogenous) of the influence of the stochastic disturbance or error term and this is achieved at this stage. The regression results at this stage are thus consistent.

The procedure for the application of instrumental variables using the two stage least squares method is however simplified with the use of a statistical package and in this study the *Stata 12.0* statistical package was employed. Since any of the variables included in the liquidity risk equation but excluded in the profitability equation (LRLATA, RLATA, NDD, OWN and INFL) could be used as an instrument, proxy or surrogate for liquidity risk, one or more of these could be used to instrument for liquidity risk. However, the choice of a valid, strong and relevant instrument much depends on the level of correlation with the endogenous variable (the FGAPR or the NLD) as well as the level of significance in the first stage. The z or the t -statistic should be lots bigger than 2 and in this case the rule of thumb should be at least 10.

With respect to correlation, the only variable among the five above which is highly correlated with liquidity risk (FGAPR) is the NDD with the value of 0.5640 while RLATA recording a figure of -0.5113 while the rest of this list of variables produced values less than 0.35 and thus showing very weak correlation. Turning of the level of significance in the first

stage of the two stage least squares approach, apart from the NDD which still recorded the highest level of significance with *z-statistic* of 14.54, the rest of the variables record values less than 10, the value for the rule of thumb.

Nonetheless, looking at the basic rules of thumb, the best instrument for liquidity risk in the profitability equation is the predicted value or the residual for the financing gap ratio (FGAPR). The strength, validity and relevance of this instrument or surrogate stems from the high correlation of 0.8790 while still recording an appreciable level of significance of 20.38 in the first stage regression. The predicted value of liquidity risk in equation 6 was thus used as the instrumental variable for liquidity risk in profitability equation through the two stage least squares approach in order to obtain efficient and consistent estimates. The same process was repeated to estimate the effects of liquidity and bank profitability when the ratio of net loans to total deposits (NLD) was used as an alternative measure for liquidity risk in the quest to ascertain the robustness of the earlier results.

3.3 JUSTIFICATION OF VARIABLES FOR THE DETERMINANTS OF LIQUIDITY RISK

This section of the study's methodology seeks to rationalize the measures of liquidity risk of banks as well as bank-specific, market structure and macroeconomic variables that are hypothesized to determine the liquidity risk exposure of banks in Ghana.

3.3.1 Dependent Variable(s)

Liquidity Risk (FGAPR & NLD)

Liquidity ratios like the ratio of liquid assets to total assets, the ratio of liquid assets to deposits, the ratio of liquid assets to customer and short term funding etc have been used

extensively in literature as the better practices for the measurement of liquidity risk. This study however deviates from this normal practice by adopting the financing gap ratio proposed by Saunders and Cornett (2006) and also used by Shen et al. (2009) as a very good alternative in measuring the liquidity risk exposure of any bank and thus its vulnerability to failure. The financing gap is defined as the difference between a bank's average core loans and its average core deposits. Bank managers often regard average core deposits such as current accounts, savings accounts, fixed time deposit accounts etc as a more stable cheap source of funding compared to wholesale funding (institutional borrowing) which can permanently cater for the bank's average loans. In order to standardize, the financing gap of each bank is divided by its total assets to get the ratio of financing gap to total assets or the financing gap ratio (FGAPR). That is, the financing gap ratio is calculated as

$$FGAPR_{it} = \frac{Advances(Loans)_{it} - Deposits_{it}}{TotalAssets_{it}}$$

Relative values instead of absolute values are taken into consideration in determining the liquidity risk of a bank. A negative value depicts a lower figure and a lower liquidity risk while the bigger or more positive the value, then the higher the liquidity risk. It is expected that banks with higher financing gap ratio will use much of their cash, sell liquid assets and depend much on sources of funding such as borrowings (wholesale funding) other than deposits to finance this gap.

In order to test for the robustness of the results, one of the liquidity ratios normally used as a measure of liquidity risk in the past, the ratio of net loans to total deposits (NLD) is used. This is calculated as the ratio of total loans (advances) less provision for loan loss to deposits and. The higher the ratio, the higher the liquidity risk and vice versa.

This is clearly specified as:

$$NLD_{it} = \frac{NetLoans_{it}}{Deposits_{it}}$$

3.3.2 Explanatory Variables

Bank Size (SIZE)

The size of a bank, calculated by the natural log of the bank's total assets contributes to its liquidity levels since it has an effect on its ability to mobilize funds from different sources as well as the cost associated with it. Bunda and Desquilbet (2008) included the size of a bank in the determinants of liquidity risk of banks from emerging economies with panel data regression analysis. The result showed that the size of a bank had a positive effect on liquidity risk. Shen et al. (2009) considered bank size as one of the major determinants of bank liquidity risk (an endogenous determinant of bank profitability) and the results showed a non-linear relationship between bank size and liquidity risk. That is they found out that liquidity risk was positively related to size but beyond a certain level was negatively related. This was ascertained by also adding the square of bank size as one of the variables. Other studies also suggest that banks face less liquidity risk as they grow in size (economies of scale) and are able to obtain funding at a lower cost due to implicit guarantee but beyond particular levels; they begin to face liquidity risk due to diseconomies of scale. Also associated with the conclusions from such studies are the huge financial commitments associated with several branch openings and thus the vulnerability to liquidity risk. It is thus expected that as banks grow in size, they acquire the inherent capacity to mobilize much deposits with less difficulty and for that matter are able to grant more loans at any point in time coupled with the higher operating cost associated with expansion. Bank size is expected to be positively related with liquidity risk (FGAPR and the NLD).

Liquid Assets Ratio (RLATA & LRLATA)

Another bank specific determinant of liquidity risk is the nature of assets that the bank has in respect of its propensity of transformation to cash or very liquid assets. Shen et al.(2009) indicated that because a bank could sell or collateralize its liquid assets to obtain liquid

funds, holding liquid assets can reduce a bank's liquidity risk. However, this is not the case for all the banks due to the difficulty in selling or collateralizing their liquid assets (due to credit freeze). Consequently, in order to ascertain the degrees of liquidity of each bank's assets, the liquid assets are classified into either risky liquid assets or less risky liquid assets after which each is divided by the bank's total assets for standardization, represented by RLATA and LRLATA respectively. Less risky liquid assets include liquid assets such as cash and balances with bank of Ghana, treasury bills, monies due from other banks and other short term government securities, etc. which could be sold with little prize risk and low transaction cost and easily pass for a collateral as well.

Risky liquid assets include investment in medium and long term securities and other financial products presented on the bank's balance sheet which are relatively difficult to sell or collateralize when the need arises. With respect to the relationship with liquidity risk, it is expected that RLATA has a positive relationship while LRLATA has a negative effect on the liquidity risk of each bank. That is, the higher the proportion of less risky liquid assets to the bank's total assets, the better the position of the bank to finance its obligations as they fall due while the opposite is expected to be true for risky liquid assets.

Non-Deposits Dependence (NDD)

A bank's reliance on external sources of funding other than deposits or wholesale funding cannot be over emphasized in assessing its probability of facing liquidity risk. Shen et al.(2009) considered it as one of the causes of liquidity risk and thus used the ratio of external funding to total liabilities to proxy for non deposit dependence. Banks heavily depending on general (wholesale funding) borrowings and other money market instruments rather on core deposits to fund loans and other financial obligations have the likelihood of facing liquidity risk compared to banks that engage in the practice of the contrary. Shen et al. (2009)

cautions that the larger the funds these banks would need to borrow in the money market, the greater the liquidity risk they would be challenged with. It is thus obvious that non-deposit dependence and bank liquidity risk are expected to have a positive relationship.

Ownership Type (OWN)

Ownership structure of banks can also determine the vulnerability of a bank to liquidity risk. It is normally expected that banks with external affiliations are able to manage their liquidity better than local banks because of the opportunity of getting external help from their foreign partners in times of difficulty which may not be the same for a local bank. This is thus considered a dummy variable, it equals 1 if the bank is Ghanaian owned and equals zero if the bank is foreign owned. Liquidity is thus expected to have a positive relationship with Ghanaian owned banks but a negative relationship with foreign owned banks. That is, banks vulnerability to liquidity risk is expected to be significantly different from the other in line with the type of ownership be it foreign or local.

Bank Concentration (CONC)

In order to measure the level of competition among the banks in Ghana and to a larger extent the structure of the market, bank concentration (CONC) enters the liquidity risk equation. Recent times in Ghana have witnessed a seemingly high level of competition for customer deposits characterized by juicy promotions, extensive advertisements, the employment of sales persons etc. Since deposits represent a stable and cheaper source of funding, banks with higher proportions of deposits are able to cut down cost of funding, minimize liquidity risk and consequently maximize profitability. This is measured by the Hirschman-Herfindahl index (HHI) is calculated by summing the squares of the individual market shares of all the banks with respect to total deposits. Depending on the use of either absolute percentage figures or

proportions, the HHI ranges from 10,000 (1) in the case of a pure monopoly to a number approaching zero in the case of an atomistic market. With respect to the results, the results are divided into three; considered unconcentrated (HHI below 1000 or 0.1), moderately concentrated (HHI between 1000 and 1800 or 0.1 and 0.18), and highly concentrated (HHI above 1800 or 0.18). It is expected that the higher the level of concentration, the lesser the competition and the lesser the vulnerability to liquidity risk. The opposite is true since banks would have to work extra harder in order to mobilize appreciable levels of deposits when there is stern competition in the industry.

Macroeconomic Variable (INFL)

In capturing the macroeconomic determinants of bank liquidity risk, the annual percentage change in inflation (INF) cannot be overlooked. According to Aspachs et al.(2005), it is very characteristic of banks to hold on to high liquidity hoard during period of downturn when lending opportunities may not have picked up. It is thus expected that higher economic growth would inure to the benefit of banks as they cash in on higher net interest margins associated with the ability to lend more to the public while attracting less deposits during the same time.

The monetary and fiscal policies of the central bank also affect the supply of money in the economy and this can also have varied effects on inflation depending on which direction it goes and thus affect the liquidity status of banks. Again on inflation, Vodova (2011) in a study of determinants of liquidity in Slovakian banks though indicated the rate of inflation has no significant effect on liquidity risk, Rauch et al.(2010) concluded on a strong positive effect on liquidity risk. Shen et al. (2009) revealed that the annual percent change in inflation (INF) had a significantly positive correlation with bank's liquidity risk. The study is thus expected to indicate a positive effect of these variables on liquidity risk.

Table 1: Determinants of Liquidity Risk

Category	Variable	Brief description	Source	Exp. Sign
Liquidity Risk	FGAPR	The ratio of financing gap (loans- deposits) to total assets	Annual financial reports of banks	
	NLD	Ratio of net loan to total deposits	Annual financial reports of banks	
Bank Specific	SIZE	Natural logarithm of bank's total assets	Annual financial reports of banks	Positive
	LRLATA	Ratio of less risky liquid assets to the total assets of the bank	Annual financial reports of banks	Negative
	RLATA	Ratio of risky liquid assets to the total assets of the bank	Annual financial reports of banks	Positive
	<i>NDD</i>	The ratio of non-deposits dependence to total liabilities of the bank	Annual financial reports of banks	Positive
	<i>OWN</i>	Dummy for bank ownership	1=Ghanaian Bank 0=Foreign Bank	Indeterminate
Market Structure	<i>CONC</i>	Hirschman-Herfindahl Index of banks' share of deposits	Annual financial reports of banks	Positive
Macro-Economic	<i>INFL_{it}</i>	Change in inflation	World Development Indicators (WDI)	Positive

3.4 JUSTIFICATION OF VARIABLES FOR THE DETERMINANTS OF BANK PROFITABILITY

3.4.1 Dependent Variables

Extensively used as measures of bank profitability throughout the literature reviewed in this study have been the return on asset (ROA) and the return on equity (ROE). The ROA calculated as the net profit after tax divided by average total assets indicates how effectively a bank is managing its assets to generate income. The problem with ROA is that it excludes from the total assets off-balance sheet items (for instance, assets acquired through a lease) thereby understating the value of assets. This can eventually create a positive bias where ROA is overstated in the evaluation of bank profitability; nonetheless, it has always been a very good measure of bank profitability.

The return on equity (ROE), computed as the net profit after tax divided by total equities measures the income earned on each unit of shareholders' capital. This measure has a shortfall of generating higher ratio for banks with high financial leverage which is normally associated with higher risk. This is true because with any level of profit after tax, as banks become highly leveraged or equity falls, the ROE is bound to increase due to the lower denominator (equity).

3.4.2 Explanatory Variables

The determinants of profitability of a bank are broadly classified into internal and external determinants. Internal/bank specific determinants are factors that are mainly influenced by a bank's management decisions and policy objectives. These profitability determinants are the level of liquidity (liquidity risk), bank size credit risk, capital adequacy, operational expense management and non-interest income (a measure of diversification of business mix). On the

other hand, the external determinants are related to both industrial and macroeconomic conditions. These are variables that reflect the economic and legal environments where the financial institution operates. Bank concentration and the change in GDP are used while acknowledging the fact that there are other factors of bank profitability in Ghana.

Liquidity Risk (FGAPR)

Liquidity risk, arising from the possible inability of banks to accommodate decreases in liabilities or to fund increases on the assets' side of the balance sheet, is considered an important determinant of bank profitability. In this study, liquidity risk is considered as an endogenous variable and the ratio of financing gap to total assets and the ratio of net loans to total deposits (FGAPR & NLD) are used as the measures. It is expected that banks with a higher financing gap ratio use much of their cash, sell liquid assets and also depend much on non-deposit funding to make up for the gap; consequently increasing the cost of funding and hence reducing profitability (Shen et al; 2009). If the market for deposits is reasonably competitive, then greater liquidity will tend to be negatively associated with interest margin. Demirgüç-Kunt et al. (2003) indicated that banks with high levels of liquid assets in cash and government securities may receive lower interest income than banks with less liquid assets. It is thus expected that liquidity risk would have a positive relationship with the ROA and ROE.

Bank Size (SIZE)

Normally used as a measure of the economies or diseconomies of scale in the banking sector is the size of a bank. Kosmidou and Zopounidis (2008) indicate that the scale and scope economies of banking have been part of the issues related to the competitiveness and efficiency of banks which have been studied extensively. Short (1979) makes the point that,

size is closely related to the capital adequacy of a bank since relatively large banks have a propensity to raise less expensive capital and, hence, appear more profitable. In their study about the determinants of bank profitability in the South East European Region, Athanasoglou et al.(2006) find evidence for the economies of scale theory that the effect of bank size on profitability (ROAA) is usually positive and statistically significant, while the relationship is linear. Other studies by Altunbas et al. (2001) and Kosmidou (2008) also found scale economies for large banks while Kosmidou et al. (2005) and Pasiouras and Kosmidou, 2007) showed diseconomies of scale for larger banks. Nonetheless, Eichengreen and Gibson (2001) indicate a positive effect on a growing bank's size on profitability up to a particular limit beyond which the effect of size on the bank could be negative due to bureaucracy. In the case of Ghanaian banking system, it appears banks make higher profit as they grow in size and therefore a positive linear relationship is expected.

Capital Adequacy

In literature, the equity to assets ratio (ETA) is normally used to proxy for capital strength which is one of the important internal determinants of bank profitability. Considered relatively safer in the event of loss or liquidation are banks with high capital-asset ratios and vice versa (Shen et al.; 2009). Moreover, an appreciation in a bank's capital enhances the propensity of higher earnings and consequently reduces the cost of financial distress (Berger, 1995). The lower risk of being in financial distress thus increases banks creditworthiness and consequently reduces the cost of receiving external funding. Literature on the relationship between capital and bank profitability or profitability maintains equity to assets ratio as an explanatory variable of bank profitability and thus depicts a positive relationship (Demirgüç-Kunt and Huizinga, 1999; Barth et al., 2003; Kosmidou et al., 2005). This implies that banks with higher equity to assets ratio will thus be less dependent on external funding and

therefore maximize their profitability. Though capital adequacy is expected to have a positive relationship with the ROA, a negative relationship is expected with the ROE since banks with a higher leverage have a smaller proportion of equity and thus as the value of denominator falls, with a given level of profit after tax, the ROE increases.

Credit Risk

The loan loss provisions to loans ratio (LLPL) is used to proxy for credit risk, one of the major internal determinants of bank profitability. Variations in credit risk will possibly reflect changes in the health of a bank's loan portfolio (Cooper et al., 2003), which in turn affects the profitability of the financial institution. Acknowledging that variations in bank profitability are largely attributable to variations in credit risk, Duca and McLaughlin (1990) assert that increased exposure to credit risk is normally associated with decreased firm profitability. There is therefore a great concern about not just the volume of loans made but rather the quality of it. It is from this perspective that Miller and Noulas (1997) suggest that financial institutions heavily exposed to high risk loans increase the accumulation of unpaid loans and thus decrease their profitability.

Nonetheless, agreeing to the fact that riskier loans should produce higher interest income, Maudos and Fernandez (2004) indicate that the risk of non-repayment or default on a credit (credit risk) requires the bank to apply a risk premium implicitly in the interest rates charged for the operation. This supports the argument that banks that assume greater credit risk exhibit higher interest margins. Doliente (2005) also specifies that the impact of credit risk may reflect the additional risk premium charged by banks for the financial costs of forgone interest revenue. Thus, it is expected that LLPL has negative relationship with ROA and ROE.

Operational Expense Management

The ratio of non-interest expense to total assets (NIETA) is expected to be one of the major determinants of bank profitability since a better administration of this cost denotes the efficiency level of a bank's management. This ratio is used to provide information on the variations of banks' operating costs. Bourke (1989) argues that reduced expenses improve the efficiency and raise a financial institution's profitability, thus implying a negative relationship between a bank's operating expenses ratio and profitability. In a sharp contrast, Molyneux and Thornton (1992) have observed positive relationship, suggesting that high profits earned by firms may be appropriated in the form of higher payroll expenditures paid to more productive human capital to serve as inspiration for improvement in future profitability.

This argument however did not find support from Berger and Mester (1997) in a study on what explains the differences in the efficiencies of financial institutions as well as Pasiouras and Kosmidou (2007) in determining the factors influencing the profitability of domestic and foreign banks in the European Union. A study on the determinants of bank profitability on a developing country like Ghana is thus expected not be different from recent literature especially from a study conducted by Sufian and Chong (2008) on the determinants of bank profitability in a developing economy with empirical evidence from the Philippines the high operational expense impedes bank profitability.

Diversification and Business Mix

Rapid generation of income from "off-balance sheet" businesses and fee income necessitates the recognition of the ratio of non-interest income to total assets (NIITA), a proxy for non-traditional activities or a measure of diversification and business mix as a major determinant of bank profitability. Non-interest income consists of commissions, service charges and fees,

guarantee fees, net profit from sale of investment securities, and foreign exchange profit, etc. Canals (1993) suggest that revenues generated from new business units have significantly contributed to improve bank profitability.

However, Stiroh and Rumble (2006) find that diversification benefits gained by US financial holding companies are offset by their increased exposure to non-interest activities, which are much more volatile but not necessarily more profitable than interest-generating activities. Sufian and Chong (2008) conclude that financial institutions in Philippines that derive a higher proportion of their income from non-interest sources such as fee-based services tend to report a higher level of profitability. A positive relationship is thus expected between NIITA and bank profitability.

Bank Concentration

Used as a proxy for the market structure is the bank concentration or the level of competition among banks. It is measured by the Herfindahl index (Herfindahl-Hirschman Index) or the HHI which is the measure of the size of firms in relation to the industry and an indicator of the level of competition among them. The HHI is calculated as the sum of the squared market shares in total assets of the individual banks. While some empirical literature (Short, 1979; Gilbert, 1984, Molyneaux et al; 1996) find support from the Structure Conduct Profitability (SCP) hypothesis that markets with high concentration tend to collude and therefore earn monopoly profits, Naceur (2003) cited by Kutsienyo (2011) does not find support from this theory. The impact of concentration of the banking industry on bank profitability is thus indeterminate.

Gross Domestic Product

Key amongst macroeconomic factors that influence the profitability of a financial institution in any economy is the annual percent change of GDP (GDPC). GDP is expected to influence numerous factors related to the supply and demand for loans and deposit and as its growth slows down particularly during recessions, credit quality deteriorates, and defaults increase, thus reducing bank returns. With GDP as a measure of total economic activity in an economy, higher economic growth encourages banks to lend more and permits them to charge higher margins, and improve the quality of their assets as suggested by previous studies (e.g. Kosmidou et al., 2005; Pasiouras and Kosmidou, 2007; Athanasoglou et al., 2008; Kosmidou, 2008). It is thus expected that GDPC and will have a positive impact on bank profitability.

Table 2: Determinants of Bank Profitability

Category	Variable	Brief description	Source	Expected Sign
Profitability	ROAA	Net Profit after tax divided by average total assets	Annual financial reports of banks	
	ROAE	Net Profit after tax divided by average total equities	Annual financial reports of banks	
Bank-Specific Variables	FGAPR	Ratio of financing gap(Loans-	Annual financial reports of banks	Positive
	NLD	Deposits) to total assets		Positive
		Ratio of net loans to total deposits		Positive
				Positive
	SIZE	Natural logarithm of bank's total assets		Positive
	ETA	Ratio of equity to total assets. A proxy for capital adequacy		Positive
	LLPL	The ratio of loan loss provision to loans; a measure of credit risk.		Negative
		Negative		
	NIETA	Ratio of non-interest expense to total assets(Expense Management)	Annual financial reports of banks	Negative
	NIITA	Ratio of non-interest income to total assets (Bus. Diversification)	Annual financial reports of banks	Positive
			Annual financial reports of banks	Positive
Market Structure	$CONC_t$	Herfindahl-Hirschman Index (HHI) for share of market deposits as a measure of banking industry concentration.	Annual financial reports of banks	Negative
				Negative
Macro-Economic Variables	$GDPC_{it}$	Change in GDP or GDP growth rate	World Development Indicators (WDI)	Positive
				Positive

3.5 CONCLUSION

A panel data on banks in Ghana from various data sources are used to achieve the objectives of estimating the determinants of bank liquidity risk, the effect of liquidity risk on bank profitability (through the effects of bank profitability). The determinants of bank liquidity risk is estimated by the a panel data regression; random effects generalised least squares (GLS) approach after the specification by the Hausman Specification Test while instrumental variables regression using the two Stage Least Squares approach is applied to estimate the effects of liquidity risk on bank profitability due to the endogenous nature o explanatory variable liquidity risk. The *Stata 12.0 Statistical Package* is used to for all the estimations.

CHAPTER FOUR

ESTIMATIONS AND DISCUSSION OF RESULTS

4.0 INTRODUCTION

This chapter presents the results and discussions of econometric estimations of the model specified in chapter three. The chapter is organized into sections on the preliminary analysis of the data used by the study which is basically the descriptive statistics of the regression variables. The analysis of the results and the discussion of the estimates of the determinants of bank liquidity risk in Ghana with both the financing gap ratio and the net loan to deposits as the dependent variables using the random effects model are then focused on. The latter part reveals the estimates and discusses the results of the effects of liquidity risk on bank profitability by applying an instrumental variable regression using the two stage least squares (2SLS). The chapter ends with a conclusion.

Table 3: Descriptive Statistics-Determinants of Liquidity Risk

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
FGAPR	201	-0.2351	0.2181	-0.7643	0.4639
NLD	201	0.6702	0.3325	0.0434	2.6114
SIZE	201	14.6097	1.2308	10.8039	17.0160
LRLATA	201	0.1070	0.0543	0.0122	0.4403
RLATA	201	0.2490	0.1296	0.0411	0.7259
NDD	201	0.2110	0.1438	0.0219	0.7450
OWN	220	0.5455	0.4991	0.0000	1.0000
CONC	220	0.0925	0.0251	0.0570	0.1316
INFL	220	0.1459	0.0507	0.0850	0.2667

4.1 DISCUSSION OF DESCRIPTIVE STATISTICS-DETERMINANTS OF LIQUIDITY RISK

Table 3 reports the mean and standard deviation of all the variables for the determination of liquidity risk over the sample period. It also reports the minimum and maximum score of both the dependent and the independent variables. The mean score for the financing gap ratio (FGAPR) which is the measure of liquidity risk and the dependent variable is -0.2351 with minimum and maximum values of -0.7643 and 0.4639 respectively. The standard deviation of 0.2181 accounted for the variation between the minimum and maximum values noted earlier. This picture suggests that banks kept a considerable amount of liquidity and that faced little liquidity risk during the period under study. This means that banks were able to fund increases in assets or decreases in liabilities without difficulty during the period. The ratio of net loan to total deposits (NLD) which is an alternative for liquidity risk to also show that a mean value of 67.02% of all deposits were given as loans with the minimum score being 4.34% and the maximum being 261.14%. This means that while some banks within this period of study lend an insignificant amount of their deposits, others granted loans worth more than double the value of their deposits indicating that funds other than deposits were given out. Such banks could be regarded as having very strong treasury and credit risk departments.

The size of banks (SIZE) measured by the natural log of banks' total assets registers an average score of 14.6097 with a variation shown by the standard deviation as 1.2308 and a minimum and a maximum score of 10.8039 and 17.0160 respectively. The component of liquid assets as a percentage of total assets which is reclassified into risky and less risky liquid assets also reveals different statistics. The ratio of less risky liquid assets to total assets (RLATAs) shows an average of 0.1070 and registers a minimum score of 0.0122 and a maximum of 0.4403 respectively with the standard deviation being 0.0543. This means that

banks kept about 10.70 % of their assets as very liquid (cash and short term funds) over this period of study. With an average score of 0.2490, bank risky liquid assets to total assets (LRLATAs) recorded a maximum of 0.7259 and a minimum of 0.0411 accompanied with a standard deviation of 0.1296. This means that banks over this period kept an average of 24.90% of their assets in risky liquid assets such as securities and other medium term investment instruments. These assets, though liquid are relatively difficult to easily convert to cash or acquire another party to accept it as collateral compared to treasury bills and other short term financial instruments. However, the higher proportion is motivated by the higher returns associated with such assets while still keeping it relatively liquid in order to meet financial obligations in a real time as and when due.

Banks' dependence on non-deposits sources of funding (NDD) registers an average score of 0.2110 with a minimum of 0.0219 and a maximum of 0.7450 respectively with standard deviation of 0.1438 accounting for this variation. This means about 21.10% of banks' funding in meeting their daily obligations was sourced from borrowings other than customer deposit. Again evidence is given of greater competition in the banking industry (CONC) with an average of 9.25% concentration in a range of 5.70% and 13.16%. Banking concentration has declined over time since the gradual inception of new banking institutions into the Ghanaian financial system. The rate of inflation (INFL), the only macroeconomic variable that enters the estimation of the determinants of liquidity risk recorded an average of 14.59% with a minimum score and a maximum score of 8.5% and 26.67% respectively within the period of study.

Figure 1: Trend of liquidity risk (FGAPR) using the annual mean of the industry sample size

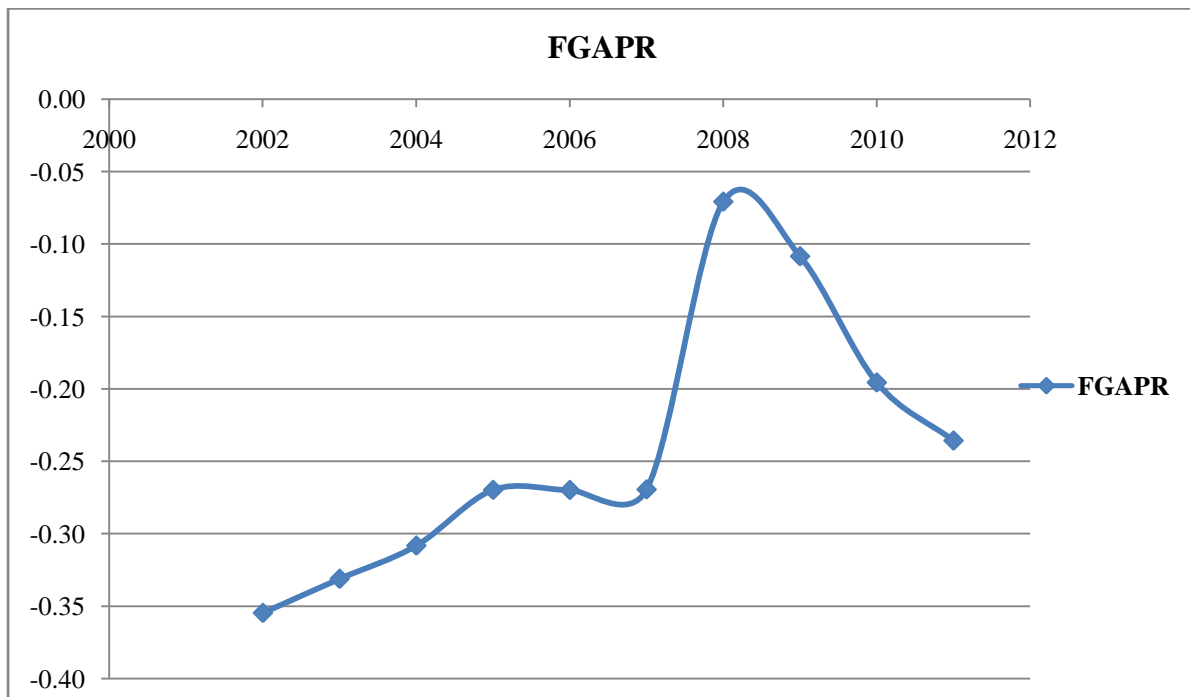
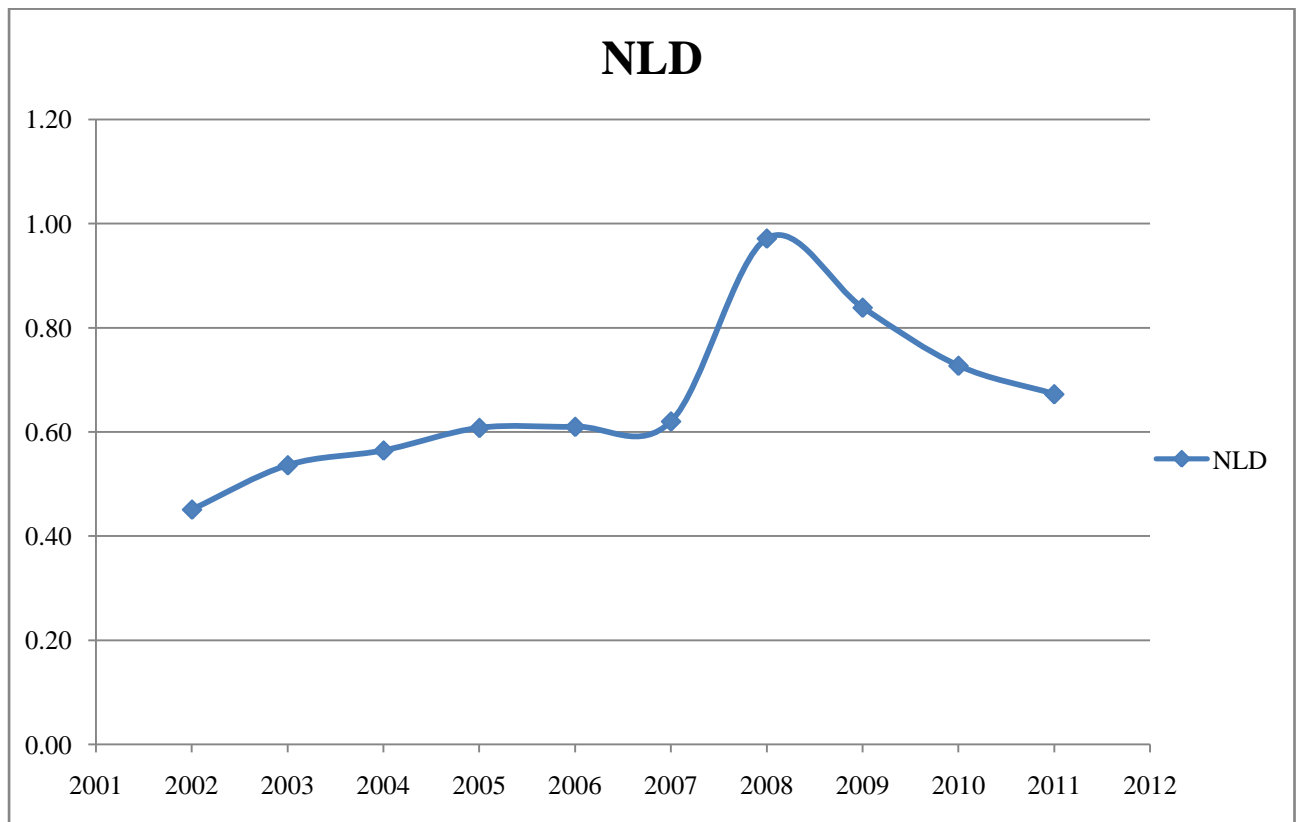


Figure 2: Trend of liquidity risk (NLD) using the annual mean of the industry sample size



The diagrams above (**Fig. 1 & 2**) depict the trend of liquidity risk faced by banks in the Ghanaian banking industry using the financing gap ratio (FGAPR) measured as the ratio of loans less deposits to total assets and the ratio of net loans to total bank deposits (NLD). The charts in both cases give a clear indication that liquidity risk among Ghanaian banks increased gradually until it peaked in the year 2008 which could be much attributed to the global financial crisis after which it began to fall again. The industry average thus shows that banks in Ghana have been reducing the proportion of total deposits given out as loans and thus keeping the remaining relatively liquid.

Figure 3 shows the annual mean of the proportions of liquid assets held by banks over the period of study. The diagram gives the trend of the holding of less risky liquid asset, risky liquid assets and the average liquid assets all as a percentage of total assets for Ghanaian banks sampled for the study. With respect to less risky liquid assets, a fairly stable proportion of about 11% has been maintained throughout the period though this average has been rising gently since the year 2008. The ratio of risky liquid assets to total assets after rising between 2002 and 2003, the proportion fell sharply from 2003 to 2008 when the least percentage was recorded after which it has been rising again. It is worth noting that though both less risky liquid assets and risky liquid assets as proportions of total assets have both been rising, the latter has been rising faster and hence forcing the average liquid assets to also follow the same trend. The implication of this is that, banks are gradually reducing their exposure to liquidity risk by reducing their lending and increasing investment in other assets which meet the liquidity needs of the bank while still making some returns on them though relatively lower compared to loans. This could also be interpreted as not insuring against liquidity risk alone but credit risk which goes a long way to minimize bank profitability.

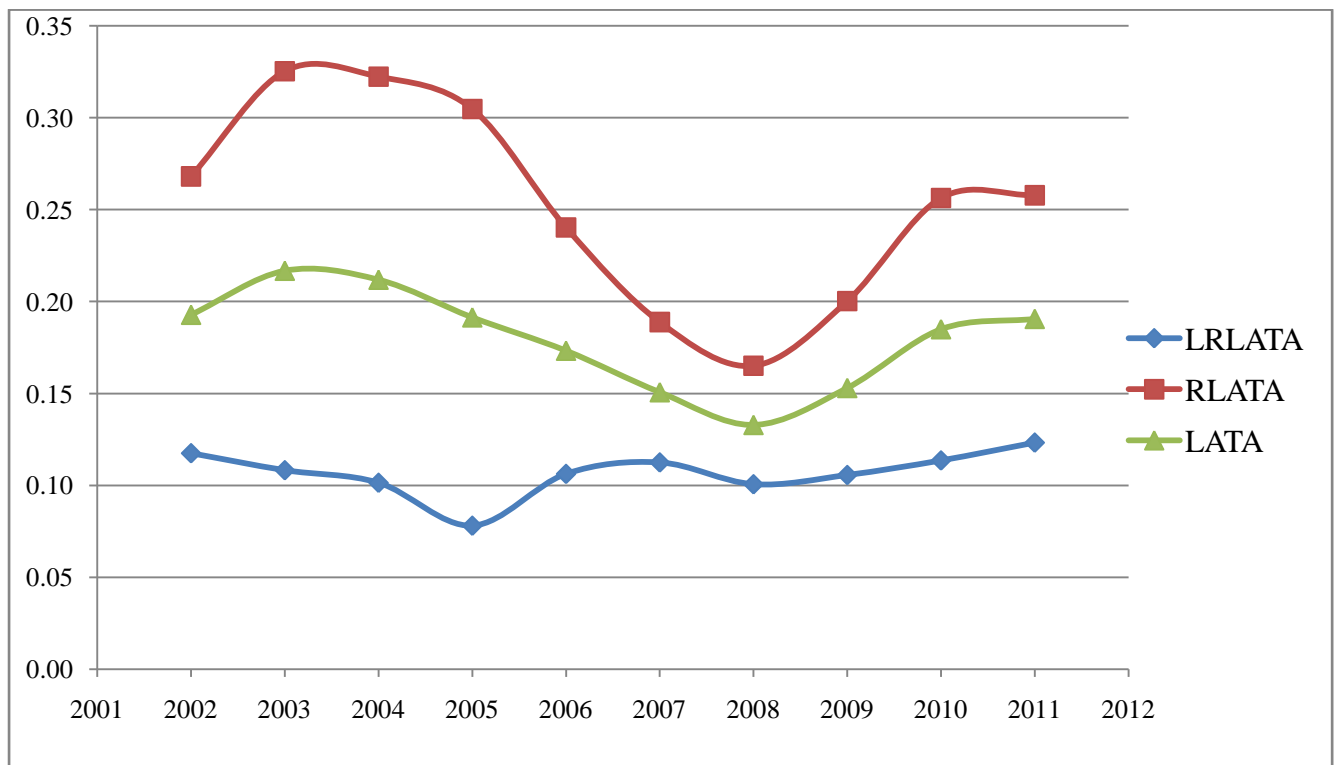
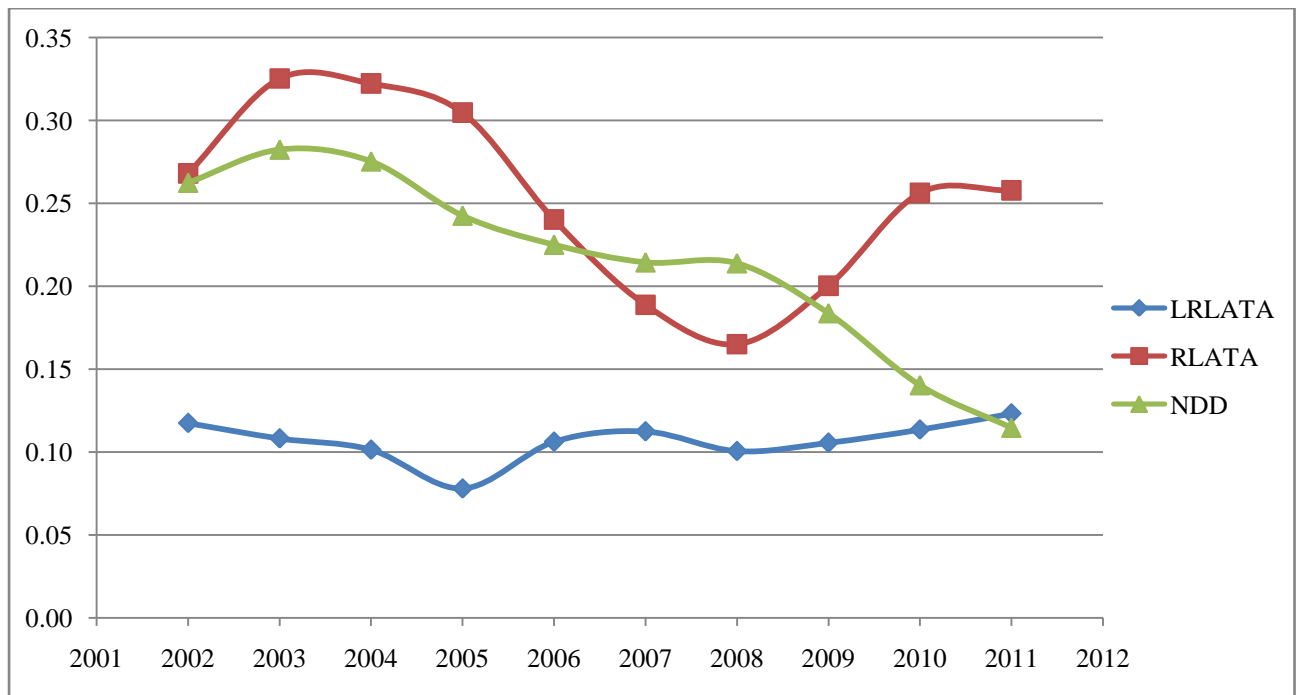
Figure 3: Trend of liquidity proportions of total assets among Ghanaian Banks**Figure 4: Trend of liquidity proportions and non-deposit dependence for the period**

Figure 4 gives a trend analysis of ratios of liquidity and non-deposit dependence for the sample for the period of study. The trend shows a negative relationship or a trade-off between how much liquid assets that banks keep and their dependence on non-deposits. For example, apart from the period between 2006 and 2009 when the industry's average for NDDs exceeded that of RLATAs, banks throughout the period kept much liquid assets (though risky) on their balance sheets and thus depended less on sources of funding (borrowings) other than deposits to fund their activities. The gap between risky liquid assets and non-deposits dependence has widened since the year 2009 clearly giving an indication that, banks are keeping enough liquidity to take care of their financial obligations while relying less on market borrowing or wholesale funding (non-deposits).

4.2 CORRELATION MATRIX

Appendices I and **IV** present the correlation matrix for all the variables incorporated into the models for liquidity risk and bank profitability respectively. The coefficient of correlation provides an index of the direction and the magnitude of the relationship between two sets of scores without implying causality. The sign of the coefficient is an indication of the direction of the relationship. The absolute value of the coefficient indicates the magnitude. Correlation matrix is useful to the extent that it reveals whether there are elements of multicollinearity in the data. Multicollinearity is the situation when some or all of the explanatory variables are highly related making it difficult to tell which of them is influencing the dependent variable. The severity of multicollinearity would be manifested in a situation where all p-values of regression coefficients are insignificant but overall model having significant F statistic. The huge value of the coefficients between the FGAPR and NLD as well as between the ROA and ROE is expected but both are never used in the same regression model. Aside this values, all the coefficients fall within the tolerance level (the variance inflation factor).

4.3 REGRESSION RESULTS-DETERMINANTS OF LIQUIDITY RISK

Table 4: Determinants of Liquidity Risk using the FGAPR as the Dependent Variable

FGAPR	EXP. SIGN	COEFFICIENT	ST. DEV.	Z	P-VALUE
SIZE	+	0.0229**	0.0097	2.36	0.0180
LRLATA	-	-0.6416***	0.1488	-4.31	0.0000
RLATA	+	-0.6961***	0.0630	-11.04	0.0000
NDD	+	0.9339***	0.0639	14.62	0.0000
OWN	?	0.0053	0.0217	0.25	0.8060
CONC	-	-3.4112***	0.4853	-7.03	0.0000
INFL	+	0.4901***	0.1588	3.09	0.0020
cons_	?	-0.2983**	0.1842	-1.62	0.1050
R-Square		0.7726	Wald Chi2(7)	560.60	
Adjusted R-Square		0.7669	Prob>Chi2	0.0000	
No. of Observations		201			

NB: * ** *** means significant at 10%, 5% and 1% level of significance respectively

Table 4 presents the regression results of the determinants of liquidity risk using the financing gap ratio (FGAPR) as the measure for liquidity risk. An adjusted R^2 of 76.69% indicates how well the explanatory variables explain the variations in the liquidity risk (dependent variable) faced by Ghanaian banks while a significant Wald χ^2 (7) of 560.60 shows the validity or the overall fitness of the model.

About bank-specific variables, the relationship between bank size (SIZE) and liquidity risk is significantly positive at 5% and 10% respectively providing the evidence that as banks grow bigger in size, they have the incentive to increase risk-taking and hold more loans and

consequently have larger financing gap ratio. That is, bigger banks have the capacity to mobilize funds (deposits) at a faster pace due to a wider branch network and the enormity of their assets to serve as collateral for funding at a cheaper price. Such banks are thus able to take greater risks by granting more loans to deficit spending units and thus face higher liquidity risk. This supports the findings of Lucchetta (2007), Bunda & Desquilbet (2008), Rauch et al. (2009) that as banks grow in size, their exposure to liquidity risk increases. This conclusion nonetheless deviates from the view held by other studies that as the size of a bank increases through branch network, banks hold on to enough liquidity in order to meet the accompanying higher operational expenditure. In such scenarios where the banks though have grown in size through bigger branch network, because of their inability of such branches to make profit from the commencement of operations, the bank in totality still takes care of such branches and thus curtails its ability to lend massively to the general public and hence face little liquidity problems.

As expected, less risky liquid assets to total assets ratio (LRLATA) is negatively related to liquidity risk and this relationship is very significant. This lends credence to the fact that banks with higher proportions of these types of assets enhance their general liquidity shock absorption capacity and thus minimize their liquidity risk exposure given that market liquidity is the same for all banks in the sample. The results indicate that banks can reduce their liquidity risk by holding much liquid assets such as cash and other short term financial instruments or readily marketable instruments like treasury bills. Though higher proportions of these assets guarantee the ability of banks to meet financial obligations like honouring customer withdrawals, financing increases in assets or meeting other transactionary demands as and when due, it is regarded as inefficiency on the part management because of the lower

returns associated with such assets. This result is in line with the findings of Shen et al.(2009), Pavla (2011) and Gomes & Khan (2011).

Contrary to expectations of a positive relationship, the ratio of risky liquid assets to total assets (RLATA) exhibited a statistically significant negative relationship with liquidity risk. This implies that banks that hold part of their assets in portfolios like securities and other medium to long term investments are able to meet their financial commitments as they fall due because managers' ability able to secure funds from other sources using such assets as collateral though at a relatively higher cost as compared to less risky liquid assets like treasury bills and other short term financial instruments. It is important to note that since risky liquid assets and less risky liquid assets make a up a bank's liquid assets, keeping higher proportions of it insulates a bank from failing in its liquidity requirements such meeting contingent liabilities like substantial withdrawal of deposits and any other unexpected future costs. This indication is supported by other studies from Shen et al.(2009), Vodova (2011) and Gomes & Khan (2011).

The funding structure of a bank is hypothesized to influence its liquidity risk. The dependence on sources funding other than deposits (NDD) such as short term money markets instruments exposes banks to high liquidity risk due to its unstable nature and the relatively expensive costs associated with it. The positive relationship and the strong significance evidenced in the results gives a clear indication that banks that heavily depend on non deposits sources of funding face bigger liquidity problems. The results reveal that a unit change in non deposits dependence increases the financing gap ratio by 0.9339 among the banks studied over the period. That is, the larger funds needed to be borrowed from the

money markets to meet a bank's financial obligations, the greater the liquidity risk it will face from such reliance. The implication of this result is that for banks to minimize their liquidity risk, banks can diversify their funding sources to reduce liquidity risk. This result is consistent with the views expressed by Saunders & Cornett (2006), Iion & Dragos (2006), Shen et al. (2009).

The ownership structure (OWN) of a bank which enters the regression model as a dummy variable shows a positive but a statistically insignificant relationship with liquidity risk. The result shows that the ownership structure of a bank is not a major determinant of bank liquidity risk in Ghana since the mean financing gap ratios (liquidity risk) of both the foreign and local banks are not statistically different from the other at any significance level.

Bank concentration (CONC) also plays an important role in the determination of liquidity risk among the banks in the industry since the greater the industry concentration, the lesser the competition among the players and vice versa. The results from the regression show a statistically significant negative relationship between bank concentration and bank liquidity risk, thus indirectly showing a positive relationship between bank competition and liquidity risk. A bank in a highly concentrated industry finds less difficulty in mobilizing deposits and thus is able to gather enough stable cheap funds as such to meet its obligations as they fall due. However, as concentration minimizes arising from new banks being incorporated into the industry, the players compete fervently for customer deposits as this source of funding forms the basis of banks financing. On the asset side, each bank endeavours to take advantage of good business opportunities in lending to profitable business ventures and hence a high propensity of facing liquidity risk. Competition in the Ghanaian banking system has gradually increased since the Banking Act was enacted in 2004 which allowed hitherto

specialized banks to engage in universal banking coupled with the influx of foreign banks and the establishment of new indigenous banks. Irrespective of the anxious efforts by banks through intense advertisements and promotions to reach the highly unbanked populace of the Ghanaian economy, the response has not been very encouraging as these banks continue to feed on the little banking public. This result supports the view by Landskroner & Paroush (2008) that liquidity risk increases with increases competition in the banking industry.

The rate of inflation (INFL), defined as the general increases in the prices of goods and services in an economy at a given time exhibits positive and a statistically significant effect on bank liquidity risk among Ghanaian banks. The rate of inflation also indirectly reflects the level of economic activity, the level of demand and supply of goods and services within an economy. Increases in the prices of goods and services directly affect the cost of production and hence the increase in demand for loans by business enterprises and individuals. Banks normally take advantage of this opportunity and hence grant loans to ventures they deem to be profitable in order to make their profit through higher margins, and thus improve the quality of their assets. Because of the desire to lend more during periods of high economic activity and the accompanying high inflation, banks are thus exposed to greater liquidity risk as inflation increases. This results corroborates the studies by Kosmidou et al.(2005), Athanasoglou et al.(2006), Pasiouras & Kosmidou (2007). However, this result is different from other studies such as Kosmidou (2008) hinge on the view that banks are not able to lend much during the period of high inflation but rather hoard liquidity due to the high cost associated with obtaining short term funds from the money market in order to meet their financial commitments. This means that according to this view, the change in inflation is negatively related to liquidity risk.

In order to ascertain the sturdiness of the relationships between the liquidity risk and the explanatory variables, the ratio of net loans to customer deposits (NLD) is also used as an alternative measure of liquidity risk (dependent variable). The results obtained from this regression also show almost the same relationships and significance levels as obtained in the first regression with the financing gap ratio (FGAPR) as the dependent variable and thus proving the robustness of the results. From **Table 5** which contains the results where the NLD is used as a measure of liquidity risk, apart from bank size that shows an insignificant relationship with liquidity risk, all the results are highly consistent with the earlier results where the FGAPR is serves as the measure for liquidity risk. The other difference worthy of note is the sign of the coefficients of the constants which are both significant at 5% but show contrasting relationships with bank liquidity risk.

Table 5: Determinants of Liquidity Risk using NLD as the Dependent Variable

NLD	EXP. SIGN	COEFFICIENT	ST. DEV.	Z	P-VALUE
SIZE	+	0.0226	0.0192	1.17	0.2410
LRLATA	-	-0.8628***	0.2681	-3.22	0.0010
RLATA	+	-1.0652***	0.1146	-9.29	0.0000
NDD	+	1.3242***	0.1234	10.73	0.0000
OWN	?	-0.0097	0.0424	-0.23	0.8190
CONC	-	-5.4882***	0.9127	-6.01	0.0000
INFL	+	0.8532***	0.2742	3.11	0.0020
_cons	?	0.7977**	0.3506	2.28	0.0230
R-Square		0.6874	Wald Chi2(7)	364.92	
Adjusted R-Square		0.6793	Prob>Chi2	0.0000	
No. of Observations		201			

NB: * ** *** means significant at 10%, 5% and 1% level of significance respectively

4.4 DISCUSSION OF DESCRIPTIVE STATISTICS-BANK PROFITABILITY

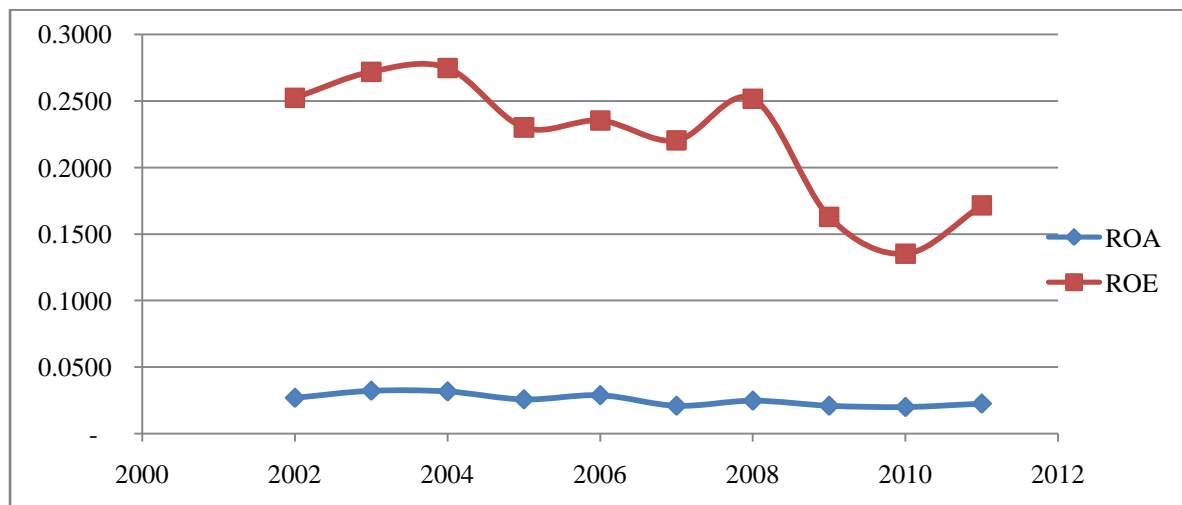
Table 6: Descriptive Statistics-Bank Profitability

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
ROA	201	0.0251	0.0178	-0.0404	0.1264
ROE	201	0.2172	0.1483	-0.4525	0.5776
SIZE	201	14.6097	1.2308	10.8039	17.0160
ETA	201	0.1233	0.0567	0.0089	0.3593
LLPL	201	0.0350	0.0347	0.0006	0.2192
NIETA	201	0.0711	0.0205	0.0055	0.1416
NIITA	201	0.0450	0.0163	0.0038	0.1173
CONC	220	0.0925	0.0251	0.0570	0.1316
GDPC	220	0.0689	0.0283	0.0399	0.1439

Table 6 reports the mean and standard deviation of the study's measures of bank profitability (ROA & ROE) and all the control variables hypothesized to have an influence on it. It also reports the minimum and maximum score of both the dependent and the independent variables. The mean score for dependent variable, the return on assets (ROA) which is the measure of the ability of the management of a bank to generate enough revenue from the bank's assets is 0.0251 with minimum and maximum values of -0.0404 and 0.1264 respectively. The standard deviation of 0.0178 accounted for the variation between the minimum and maximum values observed. This means that banks sampled for this 10-year period made an average profit on assets of 2.5% with the lowest returns of -4.04% and a highest record of 12.64%. The return on equity (ROE) reveals an average of 21.72% in a range of -45.25% and 57.76% respectively. This picture suggests quite a good performance during the period under study. The ROE measures the contribution of net income per Ghana

cedi (local currency) invested by the banks' stockholders; a measure of the efficiency of the owners' invested capital.

Bank size, determined by the natural logarithm of the bank's total assets has a mean of 14.6097. The ratio of stockholders' equity to bank's total assets (ETA) over the period averaged a score of 12.33%, and indication that an average of 87.67% of debt on their balance sheet was deployed. Credit risk, measured by the ratio of loan loss provision to loans (LLPL) recorded a mean score of 3.5% in a range of 0.06% and 21.92%. This could be interpreted as banks anticipating their ability to recover a higher proportion of the loans granted and thus minimize amount of non-performing loans on their balance sheet. With respect to the ratio of non-interest expense to total assets (NIETA), a measure of the operational expenditure records a mean value of 0.0711. This means that an amount worth 7.11% of banks' total assets was expended on the banking operations' cost centre other than the interest expenses over the period of study. Again, within a range of 3.8% and 11.73%, a mean of 4.5% is realized for non-interest income as percentage of the banks' total assets. This gives an indication that banks are able to increase their assets by 4.5% through off-balance sheet activities like fees, commissions and other charges. Bank concentration (CONC), measured by the HHI gives a mean of 9.2% while the change in gross domestic product (GDPC) scores a mean of 6.89% over the period of study.

Figure 5: Trend of bank profitability (ROA&ROE) using the annual industry mean

The diagram above depicts the movement in bank profitability for the Ghanaian banking industry for the period under study. Return on assets remained relatively stable between 1.99% and 3.22% while return on equity remained quite volatile over the period. Since 2004, the ROE had fallen gradually until the 2008 when it boasted of a sharp increase after which it fell sharply. The return on equity has however been on ascendancy since 2010.

4.5 REGRESSION RESULTS FOR BANK PROFITABILITY

Table 7: Bank Profitability (ROA) Determinants with the FGAPR as a measure for LR

ROA	EXP. SIGN	COEFFICIENT	ST. DEV.	Z	P-VALUE
FGAPR	+	0.1146**	0.0570	2.01	0.0460
SIZE	+	0.0024	0.0019	1.27	0.2020
ETA	+	0.1080***	0.0207	5.22	0.0000
LLPL	-	-0.1326***	0.0332	-4.00	0.0000
NIETA	-	-0.0105	0.0635	-0.17	0.8680
NIITA	+	0.1262*	0.0768	1.64	0.1000
CONC	+	0.3207***	0.0837	3.83	0.0000
GDPC	+	0.0274	0.0422	0.65	0.5150
_cons	+	-0.0532	0.0360	-1.48	0.1400
R-Square		0.5327	Wald Chi2(8)	115.14	
Adjusted R-Square		0.5158	Prob>Chi2	0.0000	
No. of Observations		201			

* ** *** means significant at 10%, 5% and 1% level of significance respectively

Tables 7 reports the results obtained from the use of instrumental variables through the two stage least squares approach to estimate the effects of liquidity risk on bank profitability while controlling for other variables. With the ROA as the dependent variable, the estimated equation fits the panel reasonably well as indicated by the Wald Chi2 the percentage of 51.58 represents a appreciable level of the variation in the dependent variable explained by the explanatory variables.

Liquidity risk measured by the financing gap ratio (FGAPR) which was instrumented by the predicted value in the liquidity risk equation exhibits a positive relationship with bank profitability, the ROA and is statistically significant at 5% and 10% respectively. This

confirms findings by Molyneux & Thornton (1992), Barth et al. (2003) that banks with high liquidity risk post higher profits on their balance sheets. That is, Ghanaian banks that lend much of their deposits and thus hold lesser liquid assets on their balance sheets tend to reap higher net interest income resulting in higher return on assets. This arises from the relatively higher interest charged on such loans (incorporating risk premiums) compared to what is paid on deposits serving as a cheap stable funding source in the fulfilment of their core mandate of mobilizing funds from surplus spending units and giving out to deficit spending units. The positive relationship also implies that banks exposed to higher liquidity risk (higher financing gap ratios) and are still able to make higher profits have their managers regarded as very efficient in managing the link between risk and returns.

This finding is however in sharp contrast with conclusions from studies by Bourke (1989), Demirgüç-Kunt and Huizinga (1999), Kosmidou et al. (2005) which established a negative relationship between liquidity risk and bank profitability (ROA). They argue that an inadequate level of liquidity may lead to the need to attract additional sources of funds with higher costs and thus reducing the profitability of the bank. They posit that though a higher amount of liquidity (lower liquidity risk exposure) may not attract higher interest income, the cost associated with attracting enough funds to make up for shortages in times of urgency of meeting financial obligations (withdrawal of deposits, maturity of other debt, and cover additional funding requirements for the loan portfolio and investment) far outweighs the interest earned if such funds are given out as loans. That is, interest income may not necessarily impact bank profitability due to the high interest expense they may incur. It is however important to note that most of these studies were undertaken in different financial systems where most of the sampled banks depended much on expensive unstable wholesale funding (borrowings) instead of relying heavily on stable cheap funding sources; mainly deposits.

The results also fail to confirm the finding by Naceur&Kandil (2009) who with the ratio of net loans to customer and short term funding as a measure of liquidity risk concluded that banks' liquidity risk does not determine returns on assets or equity (ROA or ROE) significantly.

From the table, it is clear that the size of a bank (SIZE) measured by the natural log of a bank's total assets though positively related bank profitability (ROA) is not statistically significant and this gives a clear indication that the size of bank is not a major determinant of bank profitability. That is though an increase in the size of a bank may lead to an increase in its profitability due to the theory of economies of scale as supported by Athanasoglou (2006), Pasiouras & Kosmidou (2007) where banks pay less for their inputs and also benefit from the increasing returns to scale through prioritisation of fixed costs over a higher volume of services rendered, this relationship is very weak in terms of the Ghanaian banking system. This fragile association may not also necessarily support the notion of diseconomies of scale due to bureaucracy as banks expand beyond certain limits. There is thus the indication that though a bank may be small in size, it may still be able to record higher profits due to several factors other than the size of the bank.

The equity to total assets (ETA) ratio is positively related to the profitability of Ghanaian banks and is statistically significant at the five percent level or better in the regression model. The empirical finding is consistent with those found by Berger (1995), Demirguc-Kunt & Huizinga (1999), Goddard et al. (2004), Pasiouras & Kosmidou (2007), and Kosmidou (2008), lending support to the argument that well-capitalised banks face lower risks of going bankrupt, thus reducing their cost of funding. Just like many developing economies, the Ghanaian financial system is far from being characterized as a perfect capital market with asymmetric information, under which the impact of increased capital on profitability would

be negative (Berger, 1995) A strong capital structure is essential for banks in developing economies, since it provides additional strength to withstand financial crises and offers better safety for depositors during unstable macroeconomic conditions.

The ratio of loan loss provision to loans (LLPL) exhibits a negative and a statistically significant relationship with the ROA. This result suggests that banks in Ghana with higher credit risk tend to show lower levels of profitability. As a major determinant of bank profitability, it is imperative that managers of banks focus on credit risk management which has been the bane of the willingness of banks to lend to the risky sectors of the economy such as the agricultural sector. This finding is consistent with previous studies by Athanasoglou et al. (2006) and Athanasoglou et al. (2008) who make the argument that serious banking problems have arisen from the failure of financial institutions to recognize impaired assets and create reserves for writing off these assets. Efforts to smooth these anomalies would be significantly aided by improving the transparency of the financial system, which in turn would assist financial institutions to evaluate credit risk more effectively and to avoid problems associated with risky exposure.

The ratio of non-interest expense to total assets (NIETA) exhibits a negative but an insignificant relationship with profitability (ROA) among the Ghanaian banks studied over the period. The result though could be interpreted as an increase (decrease) in the operational expenses reduces (increases) the profits and the need for efficient management of the cost of operations, the relationship is not a strong one. However, findings from studies undertaken by Athanasoglou et al. (2006), Pasiouras & Kosmidou (2007) and Kosmidou (2008) concluded on a significant positive relationship. Athanasoglou et al. (2006) for example make the assertion that though banks do transfer part of their increased cost of production to their customers and the remaining part from their profits due to the fact that competition does not

allow them to 'overcharge'. The need for banks to bear higher proportions of their costs of operations calls for improvement in managerial practices in order to maximize profitability. The insignificant relationship could also mean that banks that spend much on operational expenses do not necessarily make reduce their profits but rather enjoy marginal gains in profitability with a unit increase in expenditure depending on the specific cost centre.

With respect to the ratio of non-interest income to total assets (NIITA), the coefficient entered the regression model with a positive sign and is statistically significant at 10% significance level. The results imply that financial institutions that derived a higher proportion of their income from non-interest sources such as fee and commission based services tend to report a higher level of profitability. The empirical findings provide support to earlier studies such by Canals (1993) who posits that banks with the ability to generate new business units reap higher revenues and this significantly contributes to the profitability. Stiroh & Rumble (2006) give a passive view on the contribution of non-interest income to bank profitability after an empirical study on the dark side of diversification of US financial holding companies. They concluded that though diversification (off balance sheet activities) contributes to bank profitability, its volatile nature does not make it a dominant determinant of bank profitability and that they are not necessarily more profitable than interest generating activities.

The concentration (CONC) of the Ghanaian banking industry shows a negative association with bank profitability (ROA) and is very significant at 1% significance level. This provides evidence to the fact that as bank competition increases, profitability falls since the higher (lower) the concentration, the lesser (higher) the competition resulting in a higher (lower) profitability. The results thus support the structure conduct performance paradigm that presupposes that a higher banking industry concentration permits the collusion of banks to set

higher prices and consequently gain substantial profits. Bank concentration gradually reduced and thus competition enhanced for the study period as the years went by.

The change in gross domestic product (GDPC) which entered into the regression analysis as a control variable though revealed a positive relationship with bank profitability (ROA) is very insignificant. This means that although a positive change in level of economic activities in the Ghanaian economy has a positive impact on bank profitability, the relationship is very weak.

In order to ensure the robustness of the result obtained from the effects of liquidity risk (FGAPR) on bank profitability (ROA), just as it was done for the determinants of liquidity risk, the ratio for net loans to total deposits (NLD) is also substituted in the profitability equation (ROA). The results obtained as indicated in **Table 8** are also highly consistent with the earlier results obtained by the use of the FGAPR as a measure for liquidity risk with respect to the levels of significance and the signs of the coefficients.

Table 8: Determinants of Bank Profitability (ROA) with NLD as a measure of LR

<i>ROA</i>	<i>EXP. SIGN</i>	<i>COEFFICIENT</i>	<i>ST. DEV.</i>	<i>Z</i>	<i>P-VALUE</i>
NLD	+	0.1145**	0.0464	2.47	0.0180
SIZE	+	0.0025	0.0019	1.32	0.1860
ETA	+	0.1101***	0.0205	5.38	0.0000
LLPL	-	-0.1305***	0.0344	-3.79	0.0000
NIETA	-	-0.0083	0.0640	-0.13	0.8970
NIITA	+	0.1290*	0.0762	1.69	0.0900
CONC	+	0.3227***	0.0843	3.83	0.0000
GDPC	+	0.0262	0.0417	0.63	0.5300
_cons	+	-0.0593*	0.0350	-1.70	0.0900
<i>R-Square</i>		<i>0.5086</i>	<i>Wald Chi2(8)</i>	<i>86.24</i>	
<i>Adjusted R-Square</i>		<i>0.4908</i>	<i>Prob>Chi2</i>	<i>0.0000</i>	
<i>No. of Observations</i>		<i>201</i>			

Furthermore, by employing the return on equity (ROE) as a measure of profitability using the financing gap ratio (FGAPR) and the ratio of net loans to total deposits (NLD) as measure of liquidity risk as shown in **appendices V and VI**, there are some few differences with the results of ROA. Liquidity risk in both cases is significant only at a 10% significance level while 5% is the case of the ROA indicating that the strength of the effect of liquidity risk on ROA is more than that of the ROE. Bank size also shows a 10% level of significance with respect to the positive relationship with the ROE but insignificant with the ROA. The other difference worthy of note is the sign of the coefficient of the equity to assets ratio (ETA) or capital adequacy which shows a negative but a significant relationship with the ROE but a positive relationship with the ROA. This confirms the view that as equity increases is increases, the earning power of each cedi invested in the business by the shareholder is reduced due to the fact that banks will trade with a lower leverage but divide the profit after tax with a bigger denominator in order to ascertain the ROE.

4.6 CONCLUSION

The panel data regression based the random effects GLS results revealed that bank size, the rate of inflation and non-deposit dependence had a positive and a statistically significant relationship with liquidity risk while liquid assets and bank concentration in the industry showed a negatively significant relationship. Applying a panel data instrumental variables regression analysis using the two stage least squares (2SLS), liquidity risk was found to be positive and significantly related with profitability (ROA) among Ghanaian banks and so were other control variables such as capital adequacy, non interest income and bank concentration, but not for credit risk as it revealed otherwise. Other variables such as bank size, operational expenditure and the rate of GDP were all insignificant determinants of bank profitability (ROA). However, with respect to ROE, while bank size was significant at 10%, equity to assets ratio showed a negative but a statistically significant relationship.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter summarizes the whole study, draws out conclusions from the research objectives and provides policy recommendations for the study based on the determinants of liquidity risk among Ghanaian banks and its effect on their profitability. The chapter is organized into sections on the conclusions from the study and the policy recommendations based on the summary and conclusions from the study.

5.1 SUMMARY

Liquidity risk may have diverse effects on a bank's earnings and capital base depending on where it is managed. Under extreme circumstances, it may cause the collapse of an otherwise solvent bank. The study sought to achieve two main objectives of estimating the determinants of bank liquidity risk in Ghana and also estimated the effects of liquidity risk of bank profitability in Ghana by controlling for the other variables. The study depended on data of 22 of banks operating in Ghana for a 10-year period ranging 2003 to 2011.

With the financing gap ratio (FGAPR) and the ratio of net loans to deposits (NLD) as the measures for bank liquidity risk, bank size, the components of bank liquid assets (risky liquid assets and less risky liquid assets), the dependence on non-deposit funding, bank ownership, industry concentration (deposits) and the rate of inflation were hypothesized to be the determinants of liquidity risk among banks in Ghana. The size (SIZE) was established to be positively related with liquidity risk measured by the financing gap ratio (FGAPR) and

statistically significant at 10% and 5% levels respectively and thus validating the hypothesis that bigger banks have the penchant to lend out much of their deposits due to their capacity mobilize funds with less difficulty.

The components of liquid assets which were classified into risky liquid assets (RLAs) and less risky liquid assets (LRLAs) all standardized by each banks total assets were both negatively related to liquidity risk (FGAPR) and were both statistically significant at 1%. The results indicate that a unit increase (decrease) in LRLAs would lead to a decrease (an increase) in liquidity risk by 0.6416 while a unit increase (decrease) would decrease (increase) liquidity risk by 0.6961 all confirming the hypothesis that banks that hold a considerable amount liquid assets are insulated against liquidity risk.

The results also indicated that banks that depend solely on funding sources other deposits (non-deposit dependence) are highly exposed to liquidity risk due to its volatile and expensive nature. The result indicated a positive and a statistically significant relationship between non-deposits dependence and the financing gap ratio. The study also revealed that the type of bank ownership, be it foreign or local has not significant impact on bank liquidity risk. The result depicted a statistically insignificant relationship with in liquidity risk the Ghanaian banking sector.

Bank concentration measured by the HHI using bank deposits also indicated a negative relationship with the financing gap ratio (liquidity risk) and was also statistically significant at 1%. The implication of this result is that as competition among the banks increase, the

exposure to liquidity increases due to the keen contest among banks for the mobilization of funds (deposits) due to its cheap and stable nature as major funding source for the daily operations of banks in Ghana.

The only macroeconomic variable that entered the regression model for the determinants of liquidity risk among Ghanaian banking system, the rate of inflation also showed a positive association with liquidity risk and was statistically significant as well. This means that the general increases in the prices of goods and services in the Ghanaian economy normally requires banks to lend much of their deposits and also charge higher interest rates on the loans granted. On the side of deposit mobilization, individuals and corporate bodies at large spend much their daily activities and other operational expenditure and are thus left with little or nothing to save with the banks that serve as a major source of funding for the banks. It is important to acknowledge that the conclusions inferred from the usage of the financing gap ratio (FGAPR) as the dependent variable the liquidity risk model does not vary significantly with the use of the net loans to deposits (NLD) as a measure for liquidity risk.

The relationship between liquidity risk (FGAPR & NLD) and bank profitability measured by the return on assets (ROA) and return on equity (ROE) showed a positive and a significant relationship liquidity risk. The implication of this result is that Ghanaian banks that increase their exposure to liquidity risk by loaning out much of their deposits are able to maximize their profitability due to the high net interest income that inures to them as a result of the higher interest charged on loans but very little on deposits and other short term funds subject to other risks like credit risk.

With respect to the control variables, apart bank size (SIZE), non-interest expenditure to total assets ratio (NIETA) and gross domestic product (GDP), all other variables such as the equity

to assets ratio (ETA), the ratio loan loss provision to loans (LLPL), the ratio of non-interest income to total assets (NIITA) and bank concentration (CONC) were all statistically significant as far as their relationships with bank profitability are concerned.

The results revealed that bank specific variables are such as bank size and operational expenditure are not major determinants of bank profitability but probably on other inherent factors such as management efficiency and effectiveness in the administration of its assets and liabilities as well as income and expenditure. The effect of rate of GDP on bank profitability depends on how individual banks capitalize on the level of economic activities in the economy accruing from the peculiar opportunities they perceive.

However, capital adequacy, non-interest income and bank concentration showed a positive and a statistically significant relationship between with bank profitability. Banks with higher capital adequacy were able to take on higher risks and thus reaped higher returns while banks that were able to enhance diversion into other operations to generate other sources of income such as fees and commissions had the ability to maximize their profitability. Loan loss provision, a measure of credit risk was negatively related to profitability confirming the hypothesis that banks with higher non performing loan proportions on their balance sheets usually posed lower profits in their books.

5.2 CONCLUSIONS

The study concludes that though there may be other factors that affect the liquidity risk of banks, the size of the bank, the components of liquid assets which may be either risky or less risky liquid assets, non-deposit dependence, industry concentration and the change in

inflation are major determinants due to their high statistical significance. While bank size, non-deposit dependence and the change in inflation revealed a negative relationship liquidity risk measured by the financing gap ratio or the ratio of net loans to total deposits, both risky and less risky liquid asset ratios as well as industry concentration exhibited a negative relationship.

With respect to bank profitability measured by either the ROA or the ROE, liquidity risk was revealed to be a major determinant of bank profitability due to the level of statistical significance. That is, banks with high exposure to liquidity risk made higher profits resulting from higher net interest margins as compared with banks with low liquidity risk exposure.

5.2 POLICY RECOMMENDATIONS

Based on the results derived and the conclusions made, the following recommendations are suggested for consideration:

From the study, taking the various determinants of bank liquidity risk into consideration, and how liquidity risk impacts bank profitability, an efficient management of it would not only inure to the benefit of banks but also to individuals and business entities and thus the whole economy at large.

With respect to the negative relationship between liquid assets (risky and less risky) and liquidity risk as well as the positive relationship between liquidity risk and bank profitability, it would be ideal for banks to reduce the percentage of liquid assets held and rather increase and rather increase the percentage of illiquid assets (loans granted) in order to maximize profit through higher net interest margins. This would greatly support deficit spending units in their businesses with more access to credit.

Again, though banks depend on deposits as the major source of funding, this could be enhanced by making the savings with more attractive. This could be done by giving higher interest on deposits which should vary positively with the length of time of the deposit and also investing in advertisements and juicy promotions that would encourage surplus spending units to leave their funds with these financial institutions. This policy direction should have the enforcement from the parent bank in Ghana, the Central Bank which is mandated with the supervision of all the commercial banks in Ghana.

These factors together with financial education and other efforts should be geared towards gaining the confidence of the highly unbanked Ghanaian population, especially in the informal sector in order boost their deposits. This will go a long way to broaden the funding base of the banks and also help create a buffer to mitigate liquidity risk.

The treasury departments of the Ghanaian banks that are mandated to manage liquidity risk should be strengthened to ensure a sound process for identifying, measuring, monitoring and controlling liquidity risk. This process should include a robust framework for maintaining adequate liquidity through a comprehensive projection of cash flows arising from assets, liabilities and off-balance sheet items over an appropriate set of time horizons.

Strengthened treasury departments for the management of liquidity risk among banks coupled with the efficient management of credit risk should be an enough motivation and insurance for banks to lend much of their deposits out. With increased deposits at their disposal, banks will have the capacity to maximize their profitability through enhanced net interest incomes. This could lead to a win-win situation for both the banks and the deficit spending units especially in times that the Association of Ghana Industries (AGI) has bemoaned that access to finance has become the biggest challenge facing businesses in Ghana today surpassing the cost of finance. That is, if liquidity risk is well managed, bank deposits would gradually

increase and thus grow their funding base due to the incentive of higher interests given to the surplus spending units, much of these liquid liabilities could be loaned out to deficit spending units to grow their businesses and through this the banks could maximize their profitability. The economy at large grows (increase in gross domestic product) due to the higher economic activity stemming from the easy access to operating capital for businesses.

The Central Bank of Ghana could also enforce a contingency funding plan (CFP) that clearly sets out the strategies for addressing liquidity shortfalls in emergency situations. A CFP should outline policies to manage a range of stress environments, establish clear lines of responsibility, include clear invocation and escalation procedures and be regularly tested and updated to ensure that it is operationally robust.

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APPENDICES

Appendix I: Correlation Matrix For Bank Liquidity Risk Determination

	FGAPR	NLD	SIZE	LRLATA	RLATA	NDD	OWN	CONC	INFL
FGAPR	1								
NLD	0.9402	1							
SIZE	0.3707	0.3344	1						
LRLATA	-0.3383	-0.2919	-0.0017	1					
RLATA	-0.5113	-0.4890	-0.2322	0.0183	1				
NDD	0.5640	0.5191	-0.1156	-0.3114	-0.0174	1			
OWN	0.3379	0.2963	-0.1232	-0.2403	-0.1562	0.4103	1		
CONC	-0.2834	-0.2928	-0.6384	-0.0604	0.2165	0.3481	0.0000	1	
INFL	0.0138	0.0198	-0.2516	-0.0609	0.0786	0.1983	0.0000	0.4333	1

Appendix II: Hausman Specification Test-Determinants of Liquidity Risk (FGAPR)

.....Coefficients.....				
	(b)	(B)	(b-B)	Sqrt(diag(V_b-V_B))
FGAPR	Fixed_ effe~s	Random_ eff~s	Difference	S.E.
SIZE	0.0250	0.0229	0.0022	0.0172
LRLATA	-0.7082	-0.6416	-0.0666	0.0893
RLATA	-0.7686	-0.6961	-0.0724	0.0394
NDD	0.8342	0.9339	-0.0997	0.0501
CONC	-3.0688	-3.4112	0.3424	0.6220
INFL	0.4951	0.4901	0.0050	-

b=Consistent under Ho and Ha; obtained from xtreg

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

Test: Ho: difference in coefficients not systematic

$\chi^2(6) = (b-B)[(V_b-V_B)^{-1}](b-B)$

11.26

Prob>chi2 = 0.0806

(V_b-V_B is not positive definite)

Appendix III: Hausman Specification Test-Determinants of Liquidity Risk Estimates

.....Coefficients.....				
	(b)	(B)	(b-B)	Sqrt(diag(V_b- V_B))
NLD	Fixed_eff~s	Random_eff~s	Difference	S.E.
SIZE	0.0510	0.0226	0.0284	0.0278
LRLATA	-1.0132	-0.8628	-0.1504	0.1303
RLATA	-1.1593	-1.0652	-0.0940	0.0563
NDD	1.1799	1.3242	-0.1443	0.0650
CONC	-4.0335	-5.4882	1.4547	1.0019
INFL	0.8339	0.8532	-0.0193	.

b=Consistent under Ho and Ha; obtained from xtreg

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

Test: Ho: difference in coefficients not systematic

$$\chi^2(6) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

11.94

Prob>chi2 = 0.0634

(V_b-V_B is not positive definite)

Appendix IV: Correlation Matrix For Bank Profitability Determination

	ROA	ROE	SIZE	ETA	LLPL	NIETA	NIITA	CONC	GDPC
ROA	1								
ROE	0.7839	1							
SIZE	0.0555	0.1114	1						
ETA	0.3229	0.1662	-0.0070	1					
LLPL	-0.2212	-0.2548	-0.1193	0.0087	1				
NIETA	-0.0455	-0.1591	-0.1713	0.1700	0.0292	1			
NIITA	0.2346	0.1715	-0.0529	0.0848	0.2046	0.2440	1		
CONC	0.1887	0.2673	-0.6384	-0.1574	0.1975	-0.0054	0.2327	1	
GDPC	-0.0723	-0.1131	0.3885	0.0966	-0.1465	-0.0178	-0.0298	-0.617	1

Appendix V: Determinants of Bank Profitability(ROE) with FGAPR as a measure of Liquidity Risk

<i>ROE</i>	<i>EXP. SIGN</i>	<i>COEFFICIENT</i>	<i>ST. DEV.</i>	<i>Z</i>	<i>P-VALUE</i>
FGAPR	+	0.1175	0.0622	1.89	0.0580
SIZE	+	0.0279	0.0163	1.71	0.0870
ETA	-	-0.2895	0.1009	-2.87	0.0010
LLPL	-	-1.0897	0.2826	-3.86	0.0000
NIETA	-	-0.6911	0.5412	-1.28	0.2020
NIITA	+	1.0545	0.6353	1.66	0.1000
CONC	+	3.1587	0.7130	4.43	0.0000
GDPC	+	0.3412	0.3593	0.95	0.3420
_cons	+	-0.3947	0.3068	-1.29	0.1980
<i>R-Square</i>		<i>0.4685</i>	<i>Wald Chi2(8)</i>	<i>101.12</i>	
<i>Adjusted R-Square</i>		<i>0.4492</i>	<i>Prob>Chi2</i>	<i>0.0000</i>	
<i>No. of Observations</i>		<i>201</i>			

Appendix VI: Determinants of Bank Profitability (ROE) with NLD as a measure of Liquidity Risk

<i>ROE</i>	<i>EXP. SIGN</i>	<i>COEFFICIENT</i>	<i>ST. DEV.</i>	<i>Z</i>	<i>P-VALUE</i>
NLD	+	0.0820	0.0418	1.96	0.0540
SIZE	+	0.0293	0.0158	1.85	0.0692
ETA	+	-0.2496	0.1032	-2.42	0.0048
LLPL	-	-1.0538	0.2956	-3.57	0.0000
NIETA	-	-0.6484	0.5490	-1.18	0.2380
NIITA	+	1.1078	0.6539	1.69	0.0900
CONC	+	3.2004	0.7221	4.43	0.0000
GDPC	+	0.3178	0.3584	0.89	0.3750
_cons	+	-0.5109	0.2989	-1.71	0.0870
<i>R-Square</i>		<i>0.4864</i>	<i>Wald Chi2(8)</i>	<i>82.48</i>	
<i>Adjusted R-Square</i>		<i>0.4678</i>	<i>Prob>Chi2</i>	<i>0.0000</i>	
<i>No. of Observations</i>		<i>201</i>			

Appendix VII: Test for Autocorrelation

xtserial FGAPR SIZE LRLATA RLATA NDD OWN CONC INFL

Wooldridge test for autocorrelation in panel data

H0: No first-order autocorrelation

$$F(1, 21) = 3.504$$

$$\text{Prob} > F = 0.0752$$

```
. xtserial NLD SIZE LRLATA RLATA NDD OWN CONC INFL
```

Wooldridge test for autocorrelation in panel data

H0: No first-order autocorrelation

$$F(1, 21) = 3.922$$

$$\text{Prob} > F = 0.0609$$