



**UNIVERSITY OF GOTHENBURG**  
**SCHOOL OF BUSINESS, ECONOMICS AND LAW**

Master Degree Project in Accounting

## **The Information Content of Bank Liquidity**

An evaluation of links between banks' liquidity ratios and financial performance

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Gothenburg, May 27<sup>th</sup> 2014,

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## Abstract

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*Master thesis in Accounting, School of Business, Economics and Law at the University of Gothenburg, Graduate School, spring 2014.*

**Title:** The Information Content of Bank Liquidity: An Evaluation of Links between Banks' Liquidity Ratios and Financial Performance.

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**Background and problem:** Since the financial crisis of 2007-2008, it has been widely argued that part of the banking crisis was due to bad liquidity management by the banks themselves. An example of this ongoing discussion is the new increased liquidity requirements of the upcoming Basel III regulation. This discussion raises the question if accounting data on bank liquidity has any information content, and if it is in fact related to the performance of banks.

**Purpose:** The objective of this study is to evaluate the relation between liquidity accounting ratios and financial performance in the banking sector, and thereby assess the usefulness and information content of said ratios. This will be done by testing whether banks' different liquidity ratios are significantly related to their performance indicators in the same period.

**Coverage:** The study covers accounting data and stock market data from the years of 2005-2012. The study includes listed banks that originate from the US and the EU, with total assets greater than USD 1 billion.

**Method:** The study has been designed as an explanatory, deductive, and positivistic study. The main method used has been multivariate regression analysis, and through this hypotheses have been tested by studying the coefficients from the regression output.

**Findings:** The findings of the study indicate that a bank's liquidity level is significantly related to its stock returns in the same period, in line with the hypotheses. Further, one of the chosen liquidity ratios is related to the return on equity of banks, also in line with the hypotheses. This could indicate some links between liquidity ratios and financial performance.

**Suggestions for further research:** Include more geographical areas. Compare different accounting standards. Apply the study to other industries. Conduct a predictive study testing the predictive ability of liquidity, based on the findings that the variables are indeed related in the same period.

**Limitations:** Findings are only applicable to banking industry. Assumptions on causality and accounting standard similarity made. Control variables are limited.

**Keywords:** Banking, Liquidity, Performance, Accounting information, Stock returns, Profitability

## Abbreviations

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**ASR** - Annual Stock Returns

**BCBS** - Basel Committee of Banking Supervision

**Coef.** - Regression coefficient

**IBIE** - Income Before Interest Expense

**IFRS** - International Financial Reporting Standards

**LADS** - “Liquid Assets / Deposits and Short-term funding” ratio

**NI** - Net Income

**NLTA** - “Net Loans / Total Assets” ratio

**PASR** - Past Annual Stock Returns (Previous period)

**PBT** - Profit Before Tax

**PROA** - Past Return On Assets (Previous period)

**PROE** - Past Return On Equity (Previous period)

**ROA** - Return On Assets

**ROE** - Return On Equity

**RQ** - Research Question

**TA** - Total Assets

**US GAAP** - United States’ Generally Accepted Accounting Principles

## Concepts

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**Bank** - A financial institution working with acceptance of deposits in order to perform lending activities, such as directly by loaning or indirectly through capital markets.

**Illiquid asset** - An asset “...in which the proceeds available from physical liquidation or a sale on some date are less than the present value of its payoff on some future date. In the extreme, a totally illiquid asset is worthless (...) on some date but has a positive value on a later date” (Diamond, 2007)

**Liquid asset** - An asset which does not fit into Diamond’s (2007) definition of illiquid assets as seen above. Examples of liquid assets could be cash, cash equivalents, claims on other banks, and instruments that can be sold easily, such as stock.

**Liquidity** - The ability to pay short-term obligations (i.e. cover current liabilities with liquid or current assets)

**Liquidity level** - The amount of liquid assets available in a firm, sometimes in relation to current or liquid liabilities.

**Liquidity ratio** - A measure calculated from two or more accounting items, used for describing the liquidity level/situation of a firm.

## Table of contents

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|   |    |
|---|----|
| <b>Section 1: Introduction</b> .....                        | 1  |
| 1.1. Problem background .....                               | 1  |
| 1.2. Problem discussion .....                               | 2  |
| 1.3. Purpose .....  | 3  |
| 1.4. Research questions.....                                | 3  |
| 1.5. The coverage of the study .....                        | 4  |
| 1.6. Contribution to accounting theory .....                | 4  |
| <b>Section 2: Literature review</b> .....                   | 5  |
| 2.1. The concept of firm performance .....                  | 5  |
| 2.2. The concept of liquidity .....                         | 5  |
| 2.3. Liquidity in banks .....                               | 6  |
| 2.4. The impact of liquidity on performance indicators..... | 7  |
| 2.4.1. In general .....                                     | 7  |
| 2.4.2. In the banking sector.....                           | 9  |
| 2.5. Summary of literature review .....                     | 11 |
| 2.5.1. Liquidity and stock returns .....                    | 11 |
| 2.5.2. Liquidity and profitability .....                    | 11 |
| <b>Section 3: Hypotheses</b> .....                          | 12 |
| 3.1. Stock return hypothesis.....                           | 12 |
| 3.2. Profitability hypothesis .....                         | 12 |
| <b>Section 4: Research design and methodology</b> .....     | 13 |
| 4.1. Overall research design.....                           | 13 |
| 4.2. Bank selection.....                                    | 13 |
| 4.3. Variable selection .....                               | 15 |
| 4.3.1. Dependent variables.....                             | 15 |
| 4.3.2. Main independent variables.....                      | 16 |
| 4.3.3. Control variables and fixed effects .....            | 17 |
| 4.3.4. Causality .....                                      | 19 |
| 4.4. Data collection and preparation .....                  | 19 |
| 4.5. Tested hypotheses .....                                | 21 |

|   |           |
|---|-----------|
| 4.6. Regression analysis.....                           | 21        |
| 4.6.1. Bivariate analysis.....                          | 21        |
| 4.6.2. Multivariate analysis.....                       | 22        |
| <b>Section 5: Empirical findings and analysis.....</b>  | <b>25</b> |
| 5.1. Bivariate analysis.....                            | 25        |
| 5.2. Multivariate analysis.....                         | 27        |
| 5.2.1. Empirical result regarding RQ1.....              | 27        |
| 5.2.2. Empirical result regarding RQ2.....              | 29        |
| 5.3. Summary of hypothesis evaluation.....              | 31        |
| <b>Section 6: Discussion.....</b>                       | <b>32</b> |
| 6.1. Answers to research questions.....                 | 32        |
| 6.2. Discussion of results.....                         | 32        |
| <b>Section 7: Conclusions.....</b>                      | <b>35</b> |
| <b>Section 8: Suggestions for further research.....</b> | <b>36</b> |
| <b>Section 9: Study limitations.....</b>                | <b>37</b> |
| <b>References.....</b>                                  | <b>38</b> |

## Section 1: Introduction

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*This section introduces the main problem and its background, which serves as the basis for the study. The study's purpose and research questions are then presented, followed by the demarcation of the study. Finally, arguments for how the study contributes to existing theory are brought forward.*

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### 1.1. Problem background

In 2007, the economic cycle started moving towards a global financial crisis. One year later, after the collapse of the investment bank Lehman Brothers in September 2008, the global economy tumbled into a dramatic recession. In this severe crisis and its still ongoing aftermath, a main area of interest and discussion has been the banking sector and the credit market. Important to note is that during the crisis the world's banking sector saw a dramatic decrease in liquidity, in other words the ability to meet short-term obligations. Investors, unable to completely predict the future performance of banks through their financial statements, withdrew their money and instead invested in safer assets. The banks found themselves with a large deficit of cash and other liquid assets which led to severe consequences, not only for the credit market but for the world economy as a whole, initiating a worldwide drop in economic growth. (Hartlage, 2012)

Hartlage (2012) argues that the above example showcases the full effects of a common practice of banks: financing long-term assets, such as loans, with short-term borrowing. When the short-term financing is abruptly withdrawn such as in the case described above, banks are left without sufficient funds. This may even cause bank failure in the worst case scenario. (Hartlage, 2012) Referring back to the 2007-2008 crisis, a large share of banking regulation had up until then focused on the amount of (equity) capital in the banks' balance sheets, such as in the Basel II regulation. Back then, it was argued that banks needed to raise their levels of capital to be able to better withstand shocks and other unexpected events. However, even though the banks managed to achieve sufficient levels of capital in line with the Basel II requirements, they still suffered severely in the 07-08 crisis. It now seems like many did so due to bad liquidity management. Consequently, it has become more and more commonly argued that the banking sector needs to improve its liquidity buffers significantly. (BCBS, 2013)

Because of said discussion, in 2011 the bank supervising Basel Committee<sup>1</sup> proposed a new Basel III regulatory framework for the banking sector, containing among other things new and increased liquidity requirements. According to the new requirements, banks must hold liquid assets equal to the total cash outflow in a 30 day stress scenario, and also hold larger shares of so-called "stable funding"<sup>2</sup>. The Basel Committee argues that the new requirements will improve "...the banking sector's ability to absorb shocks arising from financial and economic stress, whatever the source, thus reducing the risk of spillover from the financial sector to the real economy". (BCBS, 2013) The

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<sup>1</sup> The Basel Committee is a group of senior representatives from different bank supervisory authorities as well as central banks. The purpose of the committee is to achieve world-wide cooperation on bank supervision issues, and to improve the overall quality of said supervision. (BCBS, 2013)

<sup>2</sup> What is defined as "stable funding" is bank-specific, but generally it can be said that long-term liabilities and equity capital are viewed as more stable than short-term liabilities, and that deposits from retail customers and small businesses are more stable than others. (BCBS, 2014)

Basel III liquidity requirements are yet to be implemented in full, but the plan is to have them in effect in 2018. (BCBS, 2014) To sum up, these new banking regulations as well as the ongoing discussion on bank liquidity serves as the general background for this study.

## 1.2. Problem discussion

From the problem background described above, it is clear that liquidity is a much discussed topic in the banking sector at the moment. There has been a large focus on the importance of banks' liquidity in recent years, and it has been argued that banks must raise their liquidity levels substantially. While the liquidity risk and the survival of banks could be seen as mainly a finance and capital structure issue, we argue that this liquidity discussion can be linked to the area of financial accounting as well. While the Basel III regulation's main objective is to improve banks' liquidity management, which is not an accounting issue per se, the changes related to the new regulation will be reflected in the banks' financial statements. Further, cash and other liquid assets already account for a substantial share of banks' balance sheets in their financial statements, and banks themselves have a rather special relationship to the concept of liquidity<sup>3</sup>.

It is essential that all items and numbers presented in the financial statements actually do tell the users of said reports something and convey a message of some sort (i.e., they should have some degree of information content). In the end, one the main purposes of financial accounting is to provide the users with useful and meaningful information to help them in their decision-making. Thus, it is crucial that the accounting information on liquidity can actually influence the users of the banks' financial statements. Previous research has aimed to study this challenging problem related to the prediction of a firm's financial performance and condition, presenting different sets of financial measures and ratios (For instance Altman (1968)). Using different types of accounting information as input for decision-making is of great importance for user groups such as investors and shareholders. However, to us, the recent outbreak of the financial crisis could indicate that the previous business performance prediction models have not been efficient enough to prevent the financial crisis from spreading throughout the world's economy. In all recent banking crises the funding liquidity risk<sup>4</sup> has played a major role in the start of the collapse of the bank markets around the globe, where central banks were forced to intervene in order to try to stabilize the market.(Drehmann and Nikolaou, 2013) Consequently, we find it interesting to investigate this area further. If liquidity is such an important factor for banks and their future performance, or even their survival, can we use the accounting information on liquidity to say something about a bank's performance? Or to put it perhaps a bit more drastically, does bank accounting liquidity information fulfill its purpose? Does it have any information value?

Several studies have shown the possibility of liquidity being a determinant of bank performance (For instance Bourke, 1989; Molyneux and Thornton, 1992; and Gambacorta, 2011; among others). On a general level, studies have also shown a relation between liquidity and performance indicators (Ziebart, 1987; Chen, Wang and Shyu, 2012; among others). However, there seems to be different

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<sup>3</sup> See section 2.3. for more.

<sup>4</sup> Funding liquidity risk can be defined as the risk of not being able to meet obligations with immediacy, thus a bank can be considered as illiquid if it fails to meet the obligations in time. (Drehmann and Nikolaou, 2013)



opinions on the directional nature of this relationship, with some studies (For instance Hu, Xia & Wu , 2013) even arguing that there is in fact no relation at all. Consequently, there seems to be some differing results in this area of research.

To sum up, we find a study on the relation between banks' liquidity information and their performance to be appropriate because of the setting of the ongoing discussion on bank liquidity, and because we wish to evaluate the information content of one of the banking sectors most important accounting aspects. To our knowledge, there have been few studies specializing in liquidity as the single main independent determinant of financial performance. Instead, liquidity is often viewed as one of many affecting factors. We therefore think it is appropriate to study liquidity as a determinant of bank performance exclusively.

### **1.3. Purpose**

*The objective of this study is to evaluate the relation between liquidity accounting ratios and financial performance in the banking sector, and thereby assess the usefulness and information content of said ratios. This will be done by testing whether banks' different liquidity ratios are significantly related to their performance indicators in the same period.*

### **1.4. Research questions**

The above purpose is summarized in an overall research question:

*Does liquidity accounting information have a relation to financial performance in the banking sector?*

To answer this research question, it is split into two sub-questions:

*Is there a relation between the liquidity ratios and the stock returns of firms in the banking sector?  
(RQ1)*

and

*Is there a relation between the liquidity ratios and the profitability of firms in the banking sector?  
(RQ2)*

### 1.5. The coverage of the study

The study will cover accounting data and stock data for all larger<sup>5</sup> listed banks originating in the United States or the European Union. These geographic areas have been chosen to enable inclusion of a large share of the world's largest banks while still ensuring that they apply relatively similar accounting standards (i.e. the US GAAP and the IFRS) (Ampofo and Sellani, 2005).

The study will cover the years 2005-2012. This time period has been chosen as 2005 was the year when the IFRS regulatory framework was first applied in full in the European Union, and 2012 is the last year with complete financial information at the time of the study. A longer time horizon such as this one will allow for collection of more observations, improving the study's generalizability.

More motivations for the choice of which banks to include in the study are presented in section 4.2.

### 1.6. Contribution to accounting theory

What we can tell from the financial crisis beginning in 2007-2008, and the development of the Basel III regulation, is that there is a need for new measures that could efficiently assess a bank's performance. The Basel Committee has put a great deal of focus on preventing banks from failing, and this could indicate that there is a need for new ways to assess the performance of a bank before failure. It may seem like the measures today are not efficient enough, and investors need high quality information in order to make the right decision whether to invest or not.

The current study therefore contributes to accounting theory by helping in evaluating the information content of liquidity ratios in the banking sector. This could help in introducing or rejecting accounting liquidity as an input in somewhat of a "larger package" of tools for determining and predicting the performance of banks, that may be used in the future to assess banks' performance. The current study isolates liquidity as the main independent variable and evaluates possible links to bank performance. To our knowledge, this is something that has not been done to a great extent previously.

The result of the current study shows that liquidity measures can indeed be used in explaining the financial performance of a bank, especially for the bank's stock returns where a positive and significant relation is found to the chosen liquidity measures. Furthermore, the ratio of a bank's net loans to total assets can be used in explaining movements in return on equity as well. This result confirms and strengthens the usefulness of liquidity accounting ratios as providers of information regarding a firm's financial position and performance, especially for the prospective investors who seem to value liquidity information when valuing banks' stock. In practice, this could benefit investors by increasing their accuracy when trying to make the correct investment decisions.

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<sup>5</sup> In this case, with total assets equal to or greater than USD 1 billion.

## Section 2: Literature review

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*This section presents theory in the area of the current study. Central concepts are defined and earlier research is presented, which then serves as the basis for the hypothesis development in later sections.*

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The aim of the literature review is to place the current study in its theoretical context. Earlier studies conducted in the area of bank liquidity that we find to be relevant for our own further research are examined, and concepts that will be used later on are defined.

The literature section will be structured as follows: First, the concepts of “performance” and “liquidity” are defined, as these will be used extensively throughout the thesis, particularly as the main variables in the statistic regression analysis. The literature review then moves on to describing what the literature says about liquidity in banks, and the fundamental and special relationship this sector has to liquidity and liquid assets. Literature on the impact of liquidity on profitability and stock returns is then examined, both on a general level and for the specific industry of banks. The literature review is concluded with a summary before moving on to section 3, where the theory will be used as a basis for the hypothesis development.

### 2.1. The concept of firm performance

In recent years, the most common way for financial accounting research to study the usefulness and relevance (often referred to as ‘value-relevance’) of certain accounting items is to turn to the stock market (Holthausen and Watts, 2001). According to a well-cited study by Ball and Brown (1968), capital-markets are generally viewed upon as being efficient and unbiased. It is commonly argued that the market will adjust the stock prices quickly and fully to any information that it finds useful. Accordingly, it is deemed appropriate to use stock returns as a measure of usefulness for specific accounting items: If the stock returns are related to (i.e. reacting to) a specific item, the item could be viewed as useful. Thus, it is common for financial accounting research to define performance as different measures related to the stock market.

Another common way of measuring firm performance is using profitability ratios. Perhaps the most common profitability ratio to use is the ratio of return on shareholder’s equity (commonly abbreviated as ROE). Investors will only accept investment decisions increasing the value of their own equity; hence ROE can be seen as an essential performance measure for this user group (Arditti, 1967). Further, according to Fraser, Gup and Kolari (1995), the ROE is useful for analyzing a bank’s financial condition as it can indicate how well a bank can get access to new capital, as well as the bank’s growth opportunities. Previous studies on the profitability of commercial banks have also used return on assets (ROA) (See for instance Alper and Anbar, 2011), as an indicator of profitability in their analysis. ROA is a similar measure to ROE, the difference being that ROA relates to the output created by all of the firm’s assets, instead of simply the shareholders’ invested equity.

### 2.2. The concept of liquidity

The term ‘liquidity’ can be interpreted as a firm’s ability to quickly and cheaply convert its assets into cash. It could also be interpreted as how well a firm can obtain cash in order to meet its short-term obligations. (Saunders and Cornett, 2009) A firm has a ‘high liquidity’ level if a large

proportion of its assets are liquid ones. Diamond (2007) defines an **illiquid** asset as “...one in which the proceeds available from physical liquidation or a sale on some date are less than the present value of its payoff on some future date. In the extreme, a totally illiquid asset is worthless (...) on some date but has a positive value on a later date”. Consequently, assets that do not fit into this definition are **liquid** ones.

The level of liquidity varies across companies and industries, but liquidity is still of great importance for all businesses in order for them to continue their operations and meet their obligations. Lack of liquid assets could prevent companies from taking advantage of opportunities such as favorable discounts and investments. In a worst case scenario, a lack of liquidity could force the firm into the state of insolvency and bankruptcy due to the inability to meet its obligations when they mature. Subramanyam and Wild (2009) identifies two highly liquid assets: Cash and cash equivalents. Cash is considered to be the most liquid asset of all. In this case, the term “cash” consists of currency available and funds on deposits. Cash equivalents, which are mostly short-term investments, are considered as highly liquid as well due to the readiness to convert these into cash, and also due to the short time left before maturity time, which reduces the risk of huge fluctuations in price.

A common way of assessing a firm’s liquidity is to construct different ratios using some combination of financial data as inputs. There are several measures suitable for determining a firm’s liquidity, and consequently the determination of liquidity depends on the particular financial data that are being used as input. (Wertheim and Robinson, 1993)

### 2.3. Liquidity in banks

As briefly mentioned in the problem background and discussion, banks have a rather special relationship to liquidity, distinguishing them from other types of firms. In fact, the whole business of banking revolves around the idea of handling cash and other liquid assets through borrowing and lending. A major asset category in the balance sheet of most banking institutions comprise of loans, which are considered to be the least liquid of a bank’s assets. On the other side of the balance sheet, the liabilities of banks consist mainly of different categories of deposit accounts, which are used in order for banks to fund their business activities. These liabilities can be considered very liquid, as they can be withdrawn at basically any time. Thus, these loan assets and deposit accounts liabilities, and in turn the concept of liquidity, are very important parts of a bank’s balance sheet. (Fraser et al., 1995)

Acharya, Shin and Yorulmazer (2011) state that banks hold cash and other liquid assets for several reasons, but that the two most important ones are the ‘precautionary’ motive and the ‘strategic’ motive. The precautionary motive means keeping a reserve of liquid assets to quickly be able to meet (unexpected) claims from depositors, while the strategic motive means keeping it to be able to quickly take advantage of profitable opportunities when they arise, such as buying assets to favorable prices. (Acharya et al., 2011) In most cases, it would not be possible for the bank to unexpectedly raise the needed funds externally; therefore, it needs to keep a liquidity buffer. (Kashyap, Rajan and Stein, 2002)

However, holding liquid assets is not entirely favorable for a bank. Kashyap et al.. (2002) state three reasons for why liquidity holdings may be burdensome and costly for a bank: Firstly, holding certain liquid assets such as cash creates an alternative cost in the form of lost interest. Secondly, even liquid assets that bear market-rate interest are connected to additional costs, as the interest income is subject to double taxation for the shareholders in some legal environments. Thirdly, liquid assets are generally believed to provide managers with a higher degree of discretion, leading to higher agency costs. (Kashyap et al., 2002)

Diamond and Dybvig (1983) discuss banks' special relationship to liquidity and argues that an important characteristic of banks is the way they finance long-term, illiquid assets (i.e. their lending) with short-term, liquid funding (i.e. their borrowing, the deposits). This phenomenon could be referred to as 'Maturity-transformation' (Hartlage, 2012) and, in other words, as the banking system 'creates liquidity' for the depositors, as they are able to withdraw liquid assets at any time. (Thus, it becomes more convenient for investors to invest "via" a bank than directly) (Diamond and Dybvig, 1983).

Although this phenomenon could be argued to be one of the most important and essential functions of banks, it also creates problems for the banks themselves. The mismatch between the liquidity of the bank's assets and funding that arises exposes the bank to so-called bank runs, which occur when too many depositors want to withdraw at the same time. (Diamond and Dybvig, 1983)The banking system is relying heavily upon the depositors trusting the banks in that they will be able to repay their liabilities (i.e. the deposits), but sometimes this trust may be dislodged (McKinney Jr. and McCracken, 1974). If this were to happen, the bank would end up putting substantial pressure on its liquidity reserves as it cannot convert its illiquid assets into cash as easily. This could have severe effects on the bank's performance as well as on the economy as a whole: The bank is forced to liquidate illiquid assets which creates losses for the bank (See Diamond's (2007) definition of illiquid assets in section 2.2. above). Consequently, the bank's performance is worsened. If bank runs are severe, this may even disrupt the whole monetary system and reduce production, as banks are forced to recall loans from borrowers, who use said resources in their production. (Diamond and Dybvig, 1983) This whole line of reasoning is partly the background to the Basel III regulatory framework (BCBS, 2013). To sum up, this theory of bank runs can show us some sort of initial theoretical evidence of a link between liquidity level and bank performance. We will now move on to studies investigating this apparent link specifically.

## **2.4. The impact of liquidity on performance indicators**

Several studies linking liquidity level to different performance indicators have been conducted throughout the years. We will now present a few that we find to be relevant for our study's theoretical context. We begin with studies researching this link in general for all types of firms, and move on to others conducted in a banking setting:

### **2.4.1. In general**

Ziebart (1987) studied the relation between abnormal stock returns (stock returns that differ from the expected) on the one hand, and unexpected changes in several accounting ratios on the other. One of the financial dimensions studied was the dimension of liquidity. In this case, liquidity was measured

as the current ratio and the quick ratio<sup>6</sup>. The study was performed on a random sample of 204 firms listed on the New York Stock Exchange. The study found no significant relation between abnormal stock reactions and unexpected changes in liquidity ratios. Instead, it was concluded that profitability is the main financial dimension affecting stock returns: There was a direct link between unexpected profitability and abnormal stock returns. (Ziebart, 1987)

As part of the study conducted by Martinez (1999), the author aimed to evaluate the relation between abnormal stock returns and the usefulness of financial statement information by examining 50 industrial firms in the French market between the years 1992 to 1996. In order to assess to what extent the financial accounting information is value-relevant in security valuation, the study used a set of 28 different financial ratios as explanatory factors. These different financial ratios were divided into profitability ratios, growth ratios, activity ratios and financial structure ratios. As part of the financial structure ratios, the researcher included the current ratio, similar to Ziebart (1987). The empirical result extracted from the regression model showed a statistically positive significant relation between the stock returns and the different financial accounting ratios. This result could indicate that liquidity could be value-relevant for explaining the stock returns. (Martinez, 1999)

Alexakis, Patra and Poshakwale (2010) launched a study similar to Martinez (1999). Instead of simply examining the relation between stock returns and accounting information, the authors aimed to evaluate the predictive abilities of accounting information in explaining the stock returns. The study examines 47 Greek firms listed on the Athens Stock Exchange between the years 1993 to 2006. Another difference from Martinez (1999) is that this study tested another set of financial ratios, which were divided into profitability ratios, asset utilization ratios, debt ratios, investment ratios and one liquidity ratio. The empirical results stated that there was a significant positive relation between the liquidity ratio (current ratio) and the stock returns, indicating that liquidity has a predictive ability in explaining the stock returns.

The study by Shumway (2001) takes a different aim at firm performance. The author constructed a hazard model for predicting firm bankruptcy. While doing so, he evaluated the ability of several accounting ratios to predict future failure of firms. The author found that the current ratio, which was chosen to represent the concept of liquidity in this study, was not significantly associated with bankruptcy and had thus no predictive ability for this aspect. One could argue that this could be linked to firm performance as well, as bankruptcy is indeed a sign of bad “performance”.

A concept closely related to liquidity is cash (Cash being an important part of ‘liquid assets’). It is generally accepted in the literature that there is a firm-specific optimal level of cash holdings. Both Chen, Wang and Shyu (2012) and Oler and Picconi (2014) find that deviations from this optimal level, whether positive or negative, have a negative effects on firm profitability as well as stock returns. Accordingly, since cash seem to affect profitability and stock returns and cash account for a large part of liquid assets, one could perhaps draw the conclusion that there could be a relation

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<sup>6</sup> The current ratio measures the firm’s ability to meet its short-term obligations, by putting the current assets in relation to the current liabilities. The quick ratio is similar to the current ratio, the difference being that this ratio only includes the most liquid assets, by removing the inventory from the current asset. (Plenborg and Petersen, 2011)

between liquidity and these performance factors as well. However, it is hard to draw any conclusion on the directional nature of this relation, as these two studies cited above states that performance measures react negatively regardless of the direction of the deviation from optimal cash holdings. On the other hand, Simutin (2010) studied *levels* of cash holdings and found that firms with excess cash holdings have higher stock returns than other firms, indicating a positive relation between cash and stock returns. Sodjahnin (2013), instead studied *changes* in cash holdings and reached a similar conclusion.

#### 2.4.2. In the banking sector

Bourke (1989) conducted a study on the banking sector and the determinants of profitability in this particular industry. The study was performed on 90 large banks from the US, Western Europe, Australia and Canada. The study tested the relation between ROA and ROE and several aspects, one of which was liquidity (In this study measured as the ratio of liquid assets to total assets). It was shown that there is a significant positive relation between this liquidity measure and the ROA of a bank. Bourke states that this relation is surprising as it is generally believed that holding high liquidity levels is linked to expenses for the bank, something that would naturally reduce profitability.

Molyneux and Thornton (1992) build their study upon Bourke (1989), but instead focus solely on European banks. Using a much larger sample, they tested the same aspects to find relations to ROA and ROE. Regarding the aspect of liquidity (measured in the same way as in Bourke, 1989), they found a significant relation with profitability. However, on the contrary to Bourke (1989), the authors found this relation to be negative. The authors state that this is in line with the common assumption that holding liquidity is costly, particularly when firms are forced to do so by authorities.

Pasiouras and Kosmidou (2007) build further upon Bourke (1989) and Molyneux and Thornton (1992) by studying determinants of bank profitability in the European Union. Their study distinguishes between domestic banks and foreign banks (i.e. banks that are owned by foreigners to more than 50 %). They do find a significant negative relation between liquidity and profitability (in line with Molyneux and Thornton, 1992) for domestic banks, while they also find a positive relation (in line with Bourke, 1989) for foreign banks. The authors do not present any theory on why this is the case.

Hu, Xia & Wu (2013) performed a study on the liquidity of commercial banks in China. Among other things, they aimed to find a relation between liquidity levels and ROA among China's listed commercial banks. The hypothesis was that there would be a negative relation between the two, as a high level of assets reduces profitability, consistent with the profitability formulas. However, the study's result indicated that there was no significant relation between the two variables for the Chinese banks.

A study conducted by Bell (1997) aimed to compare the predictive abilities of the logistic regression method and the neural network computing<sup>7</sup> on the failures of commercial banks. Additionally, as a

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<sup>7</sup> For definitions, see Bell (1997).

part of the study, he found that there were a significant difference in the liquidity ratio net loans to total assets (NLTA) between the failed banks and the non-failed banks. The non-failed banks had a significant negative difference compared to the failed banks, indicating that the lower NLTA ratio (i.e. the higher the liquidity) the more likely the banks are to survive; hence the NLTA ratio could contain predictive information of bank failures.

Building upon Bell (1997), Alali and Romero (2013) look at the characteristics of failed commercial banks in the US. In their research, they used the Cox regression analysis<sup>8</sup> in order to test the predictive ability of different variables. In contrast to the study conducted by Bell (1997), they found a significant result stating that banks with higher NLTA ratio (a low liquidity) are more likely to survive. However, they also found that firms with high loans to deposits ratio (a low liquidity) are more likely to bankrupt.

A study by Gambacorta (2011) evaluated the proposed Basel III requirements and tried to find effects on real world economic activity. The article studies both the capital requirements and the liquidity requirements of Basel III. The researcher finds that the requirements of Basel III would have sizeable negative effects on banks' ROE, indicating a negative relation between liquidity levels and profitability (On a side note, Gambacorta argues that said negative effects would be outweighed by the positive effects on bank stability).

Berger and Bouwman (2009) performed a study of liquidity creation of US banks and found among other things that the level of liquidity creation was positively linked to valuation by investors. The researchers argue that this could be due to liquidity creation generating a surplus which is to be shared between the bank, its depositors and its borrowers, something which investors would value. According to the authors, liquidity creation stems from illiquid assets on the debit side of the balance sheet and liquid liabilities on the credit side. (Berger and Bouwman, 2009) Thus, in accordance with the article, high liquidity creation would mean that the bank in question has a large amount of liquid liabilities and/or illiquid assets, indicating a low 'liquidity level'. Consequently, as liquidity creation is positively linked to value, one could from the contrary draw the conclusion that liquidity level is negatively linked to value.

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<sup>8</sup> Statistical model for predicting the probability of an event. See Alali and Romero (2013) for more.



## 2.5. Summary of literature review

If one were to summarize the articles presented in our literature review and their results, it becomes evident that there seems to be quite different results on whether there is a relation between liquidity level and performance indicators in banks or not, and if so, of what direction the relation is. However, looking at our literature as a whole, it seems like many studies argue that there should at least be some type of connection between liquidity and performance indicators. For instance, Bourke (1989), Molyneaux and Thornton (1992), Gambacorta (2011), and Chen et al. (2012) all argue that there is a link between liquidity and a bank's performance. Furthermore, studies such as Bell (1997) and Alali and Romero (2013) find a relation between liquidity and bank failure rate, which can certainly be seen as an aspect of a bank's performance. Because there seems to be some connection according to these studies, we take this fact with us when we now move on to developing our hypotheses.

### 2.5.1. Liquidity and stock returns

As part of the findings of the study performed by Ziebart (1987), the author presented a result stating that there was no significant relation between abnormal stock returns and unexpected changes in liquidity levels. This would lead to the assumption that there is no relation between liquidity levels and stock returns. However, the studies conducted by Martinez (1999) and Alexakis et al. (2010) indicated that there would in fact exist a relation between liquidity levels and stock returns. Martinez (1999) highlighted that there could possibly be a positive relation between liquidity and stock returns; while Alexakis et al. (2010) presented statistically significant results that there is a positive relation between liquidity level and stock returns.

Studies performed by Simutin (2010), Sodjahin (2013), Chen et al. (2012) and Oler and Picconi (2014) conducted research on the relation between cash level and stock returns, and how deviations from an optimal cash level would have an effect on the stock returns. The studies performed both by Chen et al. (2012) and Oler and Picconi (2014) found that there were a significant relation between the deviation from the optimal cash levels and the stock returns, but they did not conclude the direction of the relation between these two variables. However, authors such as Simutin (2010) and Sodjahin (2013), who also studied the levels of cash holding, presented results that indicated a positive relation between cash levels and stock returns. Since cash is an important part of liquidity, this could indicate that liquidity levels and cash levels could have a similar relation to stock returns.

### 2.5.2. Liquidity and profitability

The studies focusing on the liquidity level and its relation to profitability have mostly showed contrary results on what kind of relation these two variables could have. Hu et al. (2013) found in their study that there were no significant relation between the liquidity level and the profitability. On the other hand, the study conducted by Bourke (1989) showed a significant positive relation between the liquidity level and the profitability, leading to the assumption that a bank with higher levels of liquidity has a higher profitability. In contrast to Bourke, other studies such as Gambacorta (2011), Molyneaux and Thornton (1992) and Pasiouras and Kosmidou (2007) stated the opposite direction of the relation, where higher liquidity levels would lead to a lower profitability, partly explained by liquidity holdings being costly for the bank (like explained in Kashyap et al. (2002)).

## Section 3: Hypotheses

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*This section introduces the study's main hypotheses. The hypotheses are developed based upon the theoretical evidence presented throughout section 2. Two main hypotheses are constructed, one for each sub-research question.*

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### 3.1. Stock return hypothesis

As seen in the summary section 2.5.1., there have been several studies indicating an apparent link between liquidity and stock returns, both for banks and other types of firms. The majority of the studies in the literature review indicate a positive relation between liquidity levels and stock returns. This leads to the generation of the stock return hypothesis: **Any increasing change in the liquidity levels will lead to an increase in the stock returns, thus displaying a positive and significant relation between liquidity levels and stock returns.**

*H1: There is a positive relation between liquidity levels and stock returns<sup>9</sup>. (RQ1)*

### 3.2. Profitability hypothesis

There seems to be ambiguous evidence on the nature of the relation between liquidity and bank profitability. The contrary findings of the studies mentioned in our literature review and summarized in section 2.5.2. indicate that liquidity levels could have different relations to profitability. However since the majority of them, as well as the studies conducted more recently, indicate a negative relation between liquidity levels and the profitability, the profitability hypothesis will be: **Any increasing change in the liquidity levels will lead to a decrease in the profitability, thus displaying a negative and significant relation between liquidity levels and profitability.**

*H2: There is a negative relation between liquidity levels and profitability<sup>10</sup>. (RQ2)*

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<sup>9</sup> See section 4.3.1. for definitions.

<sup>10</sup> See section 4.3.1. for definitions.

## Section 4: Research design and methodology

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*This section describes the overall research design and the methodology which have been applied in the study. The criteria for the selected banks are presented, followed by motivations and definitions of the study's main variables. The data collection process is then described. The hypotheses from section 3 are then further developed to fit with the chosen variables. Finally, the statistical analysis methods are described.*

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### 4.1. Overall research design

The methodology section will begin by presenting the chosen overall research design. In all academic research it is important to critically reflect upon the research design of the study, as the research design provides an important framework and guidelines for how to collect and later analyze the collected data. The choice of research design will support the researcher in finding the evidence that is suited for answering the research questions that the investigator is interested in. It is therefore essential that this part of the research process is properly evaluated and considered before conducting the study. (Bryman and Bell, 2011)

Since the purpose of the current study is to analyze what kind of relation exists between banks' liquidity levels and their performance indicators, it is appropriate to conduct an *explanatory* research. This would enable us to identify and obtain knowledge about the research phenomenon in order to define what kind of relationship lies between the variables. (Collis and Hussey, 2009)

Moving on to the logic of the research, in the current study a *deductive* research approach has been applied. The deductive approach has allowed us to test our hypotheses, constructed from theory, against reality. (Collis and Hussey, 2009)

Regarding research paradigm, the current study has been leaning towards the *positivist* side of the paradigm scale. We found this to be the most suitable as the aim of the study has been to draw rather broad, general, statistical conclusions based on numerical financial data. (Collis and Hussey, 2009) If one looks at the previous research presented in the literature review, most studies use a *quantitative* research design leaning towards positivism. This could indicate that this is indeed an efficient approach to this research area. On the other hand, it could also mean another approach could perhaps contribute with more new insights to theory. However, we chose to believe the former is true and have thus applied this paradigm in the study.

### 4.2. Bank selection

The purpose of this study has been to draw conclusions for the banking industry as a whole, but for several reasons the global population of banks had to be narrowed down. This has mainly been done to exclude different types of banks which may bias the final results. Therefore, the following selection criteria have been used for banks to be included in our study:

**Activity:** All banks that have been active in any of the years of the sample period (2005-2012) have been included in the study, no matter if they are still active or inactive at today's date. If the study was to include only banks that are active today, the study would risk being biased as banks that are today inactive due to for instance bank failure would have been excluded.

**Stock market data:** As the study has partly been focusing on studying effects of liquidity on a bank's stock returns, naturally the sample had to be narrowed down to just include listed banks. To ensure the validity of our study, the sample has not been extended to include non-listed banks when testing for profitability although there has not been any direct need for stock market data for these tests. To allow for comparison between the two different aspects of performance, the same sample has been used for both.

**Accounting standard:** The bank selection has also been limited further to only include banks listed on the stock market in the US and in the EU. These banks apply accounting standards (US GAAP and IFRS, respectively), which are frameworks that are internationally accepted as providers of guidance for preparing the financial statements. By limiting the sample to only including banks that apply US GAAP and IFRS, we argue that it is ensured that the firms in the study can provide financial information with high quality. This has then enabled investigation of banks providing a relatively similar level of quality in their financial statements (Ampofo and Sellani, 2005). We argue that this has improved the study's results as differences between the accounting standards of the banks have been minimized. Other countries outside the US and the EU apply the US GAAP and the IFRS as well, but for simplicity reasons the bank selection was limited to the main user areas of said accounting regimes. Furthermore, many of said external countries apply modified local versions of the standard, like for instance Australia. (Nobes, 2011) Thus, we argue that limiting the bank selection to the main user areas has improved the comparability of the selected banks.

**Total assets:** The bank selection has also been limited to include only banks with total assets in their accounts equal to or greater than USD 1 billion for at least one of the following years 2005-2012, in order to exclude the smallest banks. The reason for those being excluded has been to improve comparability between the firms in the sample, by avoiding biased influence from minor firms. The reason for not applying this criterion for all of the years between 2005 and 2012 was to include both active and inactive banks in the sample in orders to take both growing banks and declining banks into our consideration when doing the regression analysis. Another reason was that any missing value of the total assets in one of the years would then automatically exclude the bank from the sample, even though the bank in question had total assets greater than USD 1 billion the remaining years.

The initial bank population consisted of all banks available in the databases, a total of 31 632 banks. When applying the selection criteria above, the banks were narrowed down to 440, the new population. From that population, a new sample was not drawn but instead all remaining banks were analyzed.

### 4.3. Variable selection

#### 4.3.1. Dependent variables

The dependent variable in the study has been one measuring firm performance. In the study's purpose and research questions, the concept of performance has been defined in two different ways: *Stock returns* and *profitability*. For stock returns, this has been calculated and measured as a bank's *annual stock returns* (ASR). The aspect of profitability has included testing for both *ROA* and *ROE* to include both commonly used variations of this concept. Accordingly, these three variables have been tested separately against liquidity measures to find any possible relations to each performance measure. The study therefore contains three different dependent variables. The reasons for using stock returns, ROA and ROE as proxies for performance are discussed below, as well as definitions of these concepts.

##### 4.3.1.1. Stock returns

As seen the literature review, Ball and Brown (1968) argue that the most efficient way for analyzing the usefulness of an accounting item is to study the reactions from the stock market. Therefore, the value-relevance of liquidity measures in banks has been assessed by studying the reaction in the banks' annual stock returns.

The dependent variable of stock returns has been defined as the annual return of a listed bank's stock. This data has been acquired by annualizing daily stock prices through the following formula, which will be defined as the annual change in the stock price:

**Dependent variable 1: Annual stock return =  $ASR_t = (\text{End price} - \text{Beginning price}) / \text{Beginning price}$**

where End price = the adjusted closing price in the last day of period "t"

and Beginning price = the adjusted closing price in the first day of period "t"

##### 4.3.1.2. Profitability

For testing the relation between liquidity and profitability, the return on assets (ROA), and the return on equity (ROE) have been used. This data is calculated from year-end values from the financial statements for the respective period.

ROA has been calculated by the commonly used formula of

**Dependent variable 2:  $ROA_t = IBIE_t / TA_t$**

where  $IBIE_t$  = the income before interest expense in period t

and  $TA_t$  = the total assets in period t

ROE has been calculated by the commonly used formula of

**Dependent variable 3:**  $ROE_t = NI_t / E_t$

where  $NI_t$  = the net income in period t

and  $E_t$  = the equity capital in period t

#### 4.3.2. Main independent variables

The main independent variables in the model have naturally been different measures of liquidity. Since there are several aspects of a firm's liquidity, it would be hard to reflect all such aspects using one single measure. It should therefore be noted that the results of the study could be affected by the use of different measures. In order to take this into consideration, two liquidity measures have been tested instead of simply one single measure. This has enabled assessment of two relevant aspects<sup>11</sup> of the banks' liquidity. In addition, as shown in the literature review, banks have a rather special relationship to liquidity. Therefore, we argue that for our study to be more relevant it is more valid to apply more specific liquidity measures fitted for this special relation, rather than just using the most commonly used liquidity ratios<sup>12</sup>.

Accordingly, liquidity has been measured in ways which we argue capture said bank-specific aspects of the concept, and these measures have then been tested separately. Because the measures are highly correlated with each other<sup>13</sup>, as they reflect somewhat similar aspects of the same phenomenon, they have not been able to be tested jointly. The liquidity ratios which have been used as independent variables are described below. For these ratios, annual year-end data from the banks' financial statements has been used.

**Independent variable 1:**  $LADS = \text{Liquid Assets} / \text{Deposits and Short-term funding}$

This measure relates the amount of liquid assets to the most liquid liabilities, i.e. customers' deposits and other short-term funding. As the deposits and the short-term funding are able to be withdrawn at basically any time, they play an important part in a bank's liquidity position. The bank must be able to cover a sufficient amount of the liquid liabilities with liquid assets, to be able to fully meet its short-term obligations. A high LADS-ratio would indicate that the liquid assets cover more of the illiquid liabilities, i.e. a higher liquidity level, and vice versa. We argue that this ratio could be seen as a more bank-specific variant of the commonly used current ratio (Used in for instance Ziebart (1987), Martinez (1999), Shumway (2001), among others), taking the important deposits and short-term funding into consideration.

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<sup>11</sup>See section 2.3.

<sup>12</sup> Such as for instance the current ratio and the quick ratio.

<sup>13</sup> See section 5.1. and table 5.1.

### **Independent variable 2: NLTA = Net Loans<sup>14</sup> / Total Assets**

The NLTA ratio is used as a proxy for liquidity in the studies by Bell (1997) and Alali and Romero (2013). This measure shows the proportion of loans of a bank's total assets. As loans are relatively illiquid assets and account for a large part of a bank's business, this ratio can be used to get a view of the liquidity level of the bank. A high NLTA-ratio would indicate a lower liquidity level and vice versa. Worth noting for further understanding is that NLTA is consequently an "inverse" liquidity measure, or an "illiquidity measure".

#### **4.3.3. Control variables and fixed effects**

Naturally, liquidity is not the only aspect affecting a firm's performance. In fact, basically everything a firm does and all of its operations will affect this. Variables for such effects had to be included in the model as well, to control for other factors affecting the dependent variable. Since it would be difficult to take all factors affecting a bank's performance into consideration, control variables have been limited to some main factors we argue could affect the final result of the study.

To begin with, three aspects have been controlled for by using them as input variables in the regression: **Firm size, earnings, and past performance**. Proxies for said aspects are described below. For these proxies, annual year-end data from the banks' financial statements has been used, or, in the case of past stock return, annualized stock data in line with the formula in section 4.3.1.1.

#### **Control variable 1: Firm size = Natural logarithm of the bank's total assets**

Firm size has been controlled for to reduce differences in performance due to size-differences between firms. The variable has been recalculated as logarithmic to reduce the size of the largest data. Theoretical evidence for this can be found in several articles: One example could be the study performed by Karathanassis and Philippas (1988). This study had the purpose of attempting to develop stock valuation models by conducting research on the Greek banking sector. The authors aimed to test the relation between different independent variables and share price (dependent), where one of the independent variables being firm size. According to the empirical findings, the firm size had a significant positive influence on stock prices.

The study conducted by Serrasquerio and Macas Nunes (2008) aimed to analyze the relationship between firm size and the performance (measured by profitability) for firms in Portugal. Their empirical evidence concludes that the performance of a firm is positively related to size.

#### **Control variable 2: Earnings = Profit before taxes / Total assets**

Differences in stock returns (and profitability) will most likely be affected by a firm's earnings. Theoretical evidence can be found in Modigliani and Miller (1958), where it is stated that the return of a firm's stock is dependent on the firm's earnings (irrespective of dividends and financing). In a more recent study, one can also find evidence of this as a part of the study conducted by Al-Troudi and Milhem (2013). The authors aimed to examine the relation between earnings and the stock prices

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<sup>14</sup> Net Loans = Total loans - Loan impairments

by studying Jordanian listed industrial firms. Their findings showed a significant and positive relation between both current earnings (measured by earnings per share) and the retained earnings (measured by retained earnings per share) with the firms' share price.

The reason for choosing profit before tax (PBT) in favor of other earnings measures is because of its ability to capture financial revenue and expenses, something affecting banks' profits substantially through investments. In addition, PBT at the same time excludes tax, something which is to a large extent outside of the banks' control, allowing for comparisons over time and in the cross-section. PBT has then been scaled by total assets to improve comparability between firms. This scaling makes the measure very similar to that of ROA. Because of this similarity, this variable will cover the same aspects as ROA and ROE. Due to this, when testing for profitability as the dependent variable, the earnings control variable has been excluded.

### **Control variable 3: Past performance = The ASR / ROA / ROE in the previous time period**

According to Grinblatt and Moskowitz (2004), studies have within the two last decades discovered that historical returns holds information about the future expected returns. Grinblatt and Moskowitz's own empirical findings also support this claim, but also add that the consistency of previously successful stocks has a substantial impact on future average returns.

Further evidence can be found in the study conducted by McDonald (1999). The authors studied the determinants of the profitability of manufacturing companies in Australia, and one of the main findings in this study is that the lagged (past) profitability had a significant relation to the current profits.

The control variables above are controlling time series data from the banks' financial statements and have been added as independent control variables in the regression model itself. In addition to these, fixed effects and indicators have also been used to control for two other aspects, namely **firm (and country)** and **year**:

**Fixed effects: Firm (and country):** In the regression analysis, fixed effects<sup>15</sup> have been used to control for differences between firms. Firms will naturally differ from one another, by applying fixed effects this has been controlled for. As a "*firm*" is on a lower fixed effects level than the firm's *country*, this has also enabled to control for such. This is especially important due to large differences in for instance enforcement or accounting tradition between different countries. (Joos and Lang, 1994) Such differences could affect the results, and thus the fixed effects allows for controlling for this.

**Indicator: Year:** As is commonly known, and has been described in the introduction to this thesis, the banking sector was at the center of the financial crisis starting in 2007-2008. The crisis had severe effects on both the performance and the liquidity levels of the world's banks. Therefore, this factor had to be taken into consideration when performing the statistical analysis; this in order to find out if the financial crisis had significant effects on the results. Each year has therefore been added as

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<sup>15</sup> See section 4.6.2.



an indicator in our regression model. (With the first year of 2005 as starting point) This has made it possible to compare the different years in the time period between each other to see if the macroeconomic movements had a significant impact on the results.

Table 4.1. below is a summary of the chosen variables for the study:

Table 4.1.

| <b>Data</b> | <b>Variable</b> | <b>Period</b> | <b>Measuring</b> |
|-------------|-----------------|---------------|------------------|
| ASR         | Dependent       | 2005-2012     | Performance      |
| ROA         | Dependent       | 2005-2012     | Performance      |
| ROE         | Dependent       | 2005-2012     | Performance      |
| LADS        | Independent     | 2005-2012     | Liquidity        |
| NLTA        | Independent     | 2005-2012     | Liquidity        |
| Firm size   | Control         | 2005-2012     | Size             |
| Earnings    | Control         | 2005-2012     | Earnings         |
| PASR        | Control         | 2005-2012     | Past performance |
| PROA        | Control         | 2005-2012     | Past performance |
| PROE        | Control         | 2005-2012     | Past performance |

#### 4.3.4. Causality

A shortcoming of the choice of method is the fact that we do not know for sure the nature of the possible causality between the dependent and independent variables. In other words, we do not know whether liquidity affects performance or the other way around. As seen in the literature review, previous studies conducted within this area have assumed that performance depends on liquidity. To be able to continue with the regression analysis, we have intuitively assumed that performance depends on liquidity, and not the opposite.

#### 4.4. Data collection and preparation

The data collected for the study has been secondary in nature. This means the data has already been prepared by external organizations, namely the banks themselves, in their everyday business. Such data has been in the form of annual financial data collected from the banks' financial statements and reports, and stock data available from the financial markets. Advantages of secondary data are, among others, that it is cost- and time-saving, the fact that secondary data is often of very high quality, and that it enables for dividing populations and samples further into subgroups (Bryman & Bell, 2007). Because of these advantages, secondary data has been chosen for this study. It would basically be impossible for us to collect such a large amount of quantitative accounting data by ourselves. Since the main data collected for the study consist of secondary data and many of the chosen measures consist of standardized data retrieved from databases, we argue that this has increased the stability of the study since repeating the measurement process would most likely lead to the same result.

The aforementioned secondary data has been collected from various databases. In particular, the database of Bankscope has been used. The main advantage of using Bankscope in the data collection instead of other databases is the fact that it is specialized on the banking industry. Thus, this database has allowed for more detailed and specific data exclusive to banking, such as data on loans, deposits etc. Through Bankscope, data on basically every bank in our population has been provided, including data on firm characteristics, annual financial data and stock prices. When Bankscope has not been able to provide complete data, Datastream has been used to fill in missing values to as large extent as possible. (Datastream is another commonly used database however not specialized on banks) One particular area for which Datastream has been used exclusively was for stock price data, which was found to be lacking in Bankscope. To ensure the reliability and validity of the study, stock market variables have been collected exclusively from Datastream. Furthermore, the data was checked thoroughly so that there was no mismatch between the data collected from Bankscope and the data collected from Datastream.

All data in the study has been extracted in the same currency, USD, to enable comparability between firms from different countries.

As mentioned in section 4.2., the global population of banks has been narrowed down based on several criteria, to fit better with the research questions and purpose of this study. After limiting the population of banks based on those criteria, all remaining banks have been included in the study. As the study is quantitative and involves statistical analysis, a large sample has not been a problem. On the contrary, this has ensured the reliability and validity of the study, in line with commonly known statistical theory. If any banks were missing data for a particular item/year even after a complementary search in Datastream were made, this has been noted as a missing value. The statistical software has then excluded this observation<sup>16</sup> from tests using this particular variable, but the observation may still have been included in other tests including other variables.

In the study the panel data approach, also known as the longitudinal approach, has been adopted. The panel data approach has enabled the study to achieve the benefits of both cross-sectional data and time series data, since this approach combines them both, enabling analysis of data consisting of multiple entities that are being observed over a longer time period, in line with the study's aim. (Wooldridge, 2008) Thus, after entering the data into the statistical software, the data has then been restructured to panel data format.

The data has also been checked for extreme outliers. In the case of the variables **ROA**, **ROE**, **LADS** and **earnings**, there were several outliers possibly affecting the study's results. To avoid this, these variables have been winsorized<sup>17</sup> to reduce such effects. When studying the data set, a 95 % winsorization was deemed appropriate to handle the existing outliers. The variable of ROA has been winsorized by 90 % and only in the right tail, to reduce the effects of some extremely high values. The other variables have not been winsorized as they were not deemed to contain extreme outliers.

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<sup>16</sup> One observation = One year's financial information for one specific bank, one "row" in the statistical software

<sup>17</sup> Winsorization is a method for excluding extreme observations from a dataset. A set percentage of the highest and lowest values are replaced with their closest non-extreme values. (Statacorp, 2009)

## 4.5. Tested hypotheses

In Section 3, two main hypotheses were presented:

*H1: There is a positive relation between liquidity levels and stock returns. (RQ1)*

*H2: There is a negative relation between liquidity levels and profitability. (RQ2)*

As the study concerns three dependent variables, and two main independent variables, six different tests have been performed, each with an individual hypothesis. The main hypotheses have thus been split into new ones:

*H1a: There is a positive relation between LADS and ASR. (RQ1)*

*H1b: There is a negative<sup>18</sup> relation between NLTA and ASR. (RQ1)*

*H2a: There is a negative relation between LADS and ROA. (RQ2)*

*H2b: There is a positive relation between NLTA and ROA. (RQ2)*

*H2c: There is a negative relation between LADS and ROE. (RQ2)*

*H2d: There is a positive<sup>18</sup> relation between NLTA and ROE. (RQ2)*

These six hypotheses have consequently been tested in the regression analysis. The alternative hypothesis to all of these hypotheses has been summarized as:

*H0: There is not a positive/negative<sup>19</sup> relation between the liquidity measure and the performance indicator.*

## 4.6. Regression analysis

### 4.6.1. Bivariate analysis

The statistical analysis began by conducting a correlation analysis with the purpose of grasping some general notions on the possible relation between the variables, before moving on to more advanced analysis. The bivariate correlation analysis is often used in the attempt to explore the relationship between variables (Edling and Hedström, 2003). A correlation analysis can be a part of a bivariate correlation analysis, where the objective is to use a correlation coefficient as empirical indications to describe the magnitude and direction of a relationship between two variables (Blumberg et al., 2011).

Since the study is investigating ratio variables and interval variables, the appropriate way to conduct such correlation analysis is applying the Pearson correlation coefficient<sup>20</sup>, and this method has thus

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<sup>18</sup> As NLTA is measuring the share of illiquid assets, a high NLTA means a low liquidity. The relation will thus be the inverse.

<sup>19</sup> Depending on the direction of the alternative hypothesis

been used. Scatterplots have also been used as a complementary tool to the Pearson correlation coefficient as they enable a visual assessment of the relationship, and by improving the visuality it helps the study detect extreme values among the observations. (Blumberg et al., 2011) Finally, important to note is that applying the Pearson correlation analysis has also enabled to check for multicollinearity<sup>21</sup>. This made it possible to check whether some variables were to be omitted due to high correlation with each other, something which may have affected the results. According to Wooldridge (2008), there is no absolute number when correlated independent variables become a problem. However, we have found it appropriate to define “highly correlated” as above 0.5. No far too high levels of correlation were found between any of the variables, and thus no variable has been omitted (Except for the special case of earnings when testing for profitability, which was known beforehand, as seen in section 4.3.3.).

A bivariate regression has also been initiated in order to check the fundamental nature of the relation between the main dependent and independent variables. The study then moved forward to a multivariate analysis, in order to check if the relation between our main dependent and independent variables would change when adding a few control variables.

#### 4.6.2. Multivariate analysis

The main statistical analysis method of the study has been the multivariate analysis. The reason for this is that the multivariate statistical tools are used when the problems become too complex for the bivariate models. (Blumberg et al., 2011) The bivariate analysis is unable to explain the relationship between variables when there are three or more variables involved. Therefore, the multivariate statistical regression can be used as an alternative due to their ability to explain the relationship between the dependent variables and several other independent variables. (Bryman and Bell, 2007) To be more specific, a multiple regression analysis enables the users to gain knowledge of how the value of a dependent variable can alter when the value of one of the independent variable changes, while keeping the other independent variables as a constant level. (Blumberg et al., 2011)

Since the objective of the study has been to investigate whether different liquidity measures (independent variables) are related to a firm's performance (dependent variables), taking into consideration other relevant factors (control variables), a multivariate regression analysis has been the appropriate method to use. The multivariate regression has enabled further knowledge of how well the set of liquidity measures are related to the particular outcome of the stock returns or the profitability, as well as provided insight of the relative strength of each liquidity measure. (Blumberg et al., 2011).

The fixed-effects regression model has been applied in the analysis since this approach is an appropriate way for controlling for omitted variables when working with hypothesis testing related to panel data. (Stock and Watson, 2012) Applying the fixed-effects regression on the panel data has enabled pooling the firm-specific data and the time data together and thereby neglecting the nature of

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<sup>20</sup> The measure uses a scale between -1 through 0 to +1 where a positive correlation indicates a positive relationship and a negative indicates a negative relationship between the two variables. (Blumberg et al., 2011)

<sup>21</sup> Multicollinearity is when at least two of the independent variables are highly correlated with each other. This could decrease the reliability of the outcome of the multivariate regression (Andersson, Jorner and Ågren, 2007)

cross-sections and time-series data. (Baltagi, 2011) Another important feature of this model is that it applies two types of fixed-effects into our analysis: Firstly, the “entity fixed-effects” where the model controls for variables which vary across entities but do not vary over time (Such as for instance firm and country, see section 4.3.3.). The second fixed-effects are the “time fixed effects”; this feature has enabled to control for variables which are constant across entities but differ over time (Such as for instance year). (Stock and Watson, 2012) Another concern regarding the statistical regression is that the fixed-effect regression could generate faulty results in the presence of heteroskedasticity<sup>22</sup>, and one suggested method of controlling for this is to apply the heteroskedasticity-robust standard errors in all the regressions. (Wooldridge, 2008) Thus, this method has been applied to avoid faulty results.

#### 4.6.2.1. Regression model

The following regression model has been used in the study:

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$$\begin{aligned} \text{Performance measure}_t = & \\ \beta_0 + \beta_1 * \text{Liquidity measure}_t + \beta_2 * \text{Performance measure}_{t-1} + \beta_3 * \text{Earnings}_t & \\ + \beta_4 * \text{Firm size}_t + E & \end{aligned}$$


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Where:

*Performance measure<sub>t</sub>* = The ASR, the ROA or the ROE in period t (Dependent variable)

*Liquidity measure<sub>t</sub>* = The LADS or NLTA in period t (Main independent variable)

*Performance measure<sub>t-1</sub>* = The ASR, the ROA or the ROE in period t-1 (Control variable)

*Earnings<sub>t</sub>* = The profit before tax divided by total assets in period t (Control variable)<sup>23</sup>

*Firm size<sub>t</sub>* = The natural logarithm of the total assets in period t (Control variable)

*E* = The error term

The beta values (i.e. the regression coefficients) have naturally been of particular interest in the study, as these values are able to tell something about the possible relation between liquidity and the performance measure. The beta values have been tested to differ significantly from 0 by conducting t-tests. The main significance level of choice has been 5%, but the test has been performed with significance level of 1% as well. If the betas have been shown to differ significantly from 0 at the 5% level or lower, it has been concluded that there is a relation between the performance indicator and the liquidity measure in question, H<sub>0</sub> has been rejected and the hypothesis in question has been accepted. In other cases, H<sub>0</sub> has not been able to be rejected, and it has been concluded that there is no significant relation between the liquidity measure and the performance indicator.

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<sup>22</sup> The concept of heteroskedasticity could be simplified as differences in variance between several sub-groups of the population. (Wooldridge, 2008)

<sup>23</sup> When testing for ROA and ROE, this term has been excluded, as motivated in section 4.3.3.

One way to ensure the stability of the statistical analysis is to apply the test-retest method (Bryman and Bell, 2011). In line with this method, the statistical analysis has been performed at several different occasions in order to find out if the result of the analyses are highly correlated, and thus improve the study's reliability<sup>24</sup>.

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<sup>24</sup> Reliability can be defined as the extent of consistency which the study possesses and refers to whether or not the study's result could be repeated again. A prominent factor to achieve reliability is to have stability. A study obtains stability when the result of the measures yields the same or similar scores when repeating the study, leading to consistent over time. (Bryman and Bell, 2011).

## Section 5: Empirical findings and analysis

*This section presents the empirical findings of the study, and their implications for the tested hypotheses. Based on the results from the regression analysis, the hypotheses are evaluated and eventually rejected or accepted. This constitutes the study's results, which are then elaborated upon and discussed in later sections. The section begins with a basic bivariate analysis before moving on to the main multivariate analysis.*

### 5.1. Bivariate analysis

Initially, as mentioned in section 4.6.1., the statistical analysis started with a calculation of the Pearson correlation, in order to enable initial analysis of the relation between the chosen variables. By calculating the Pearson correlation it has been possible to remove variables that are highly correlated<sup>25</sup> with each other in order to avoid the bias of multicollinearity. As seen in table 5.1. below, almost all of the variables were found not to be highly correlated with each other showing that the regression coefficients calculated later on in the multivariate analysis would not be biased due to multicollinearity. The profitability variables ROE and ROA are highly correlated with their respective past performance, which is natural. However, to us it seems reasonable to still control for the past performance since this is commonly known to have a great impact on the current performance of the firm (see section 4.3.3). Note that some other variables in the table may appear highly correlated, but none of these variables have been used in the same regression. For instance the LADS and the NLTA indicate a highly correlated relation, but these variables were not tested in the same statistical tests.

Table 5.1.

|           | ASR    | NLTA   | PASR   | Firm size | Earnings | LADS   | ROE    | PROE   | ROA    | PROA   |
|-----------|--------|--------|--------|-----------|----------|--------|--------|--------|--------|--------|
| ASR       | 1.0000 |        |        |           |          |        |        |        |        |        |
| NLTA      | 0.0973 | 1.0000 |        |           |          |        |        |        |        |        |
| PASR      | 0.0633 | 0.0772 | 1.0000 |           |          |        |        |        |        |        |
| Firm size | 0.0438 | 0.1299 | 0.0416 | 1.0000    |          |        |        |        |        |        |
| Earnings  | 0.1975 | 0.1563 | 0.2353 | 0.1181    | 1.0000   |        |        |        |        |        |
| LADS      | 0.0766 | 0.6158 | 0.0732 | 0.2346    | 0.1650   | 1.0000 |        |        |        |        |
| ROE       | 0.0494 | 0.0497 | 0.1477 | 0.0049    | 0.3473   | 0.0607 | 1.0000 |        |        |        |
| PROE      | 0.0119 | 0.0299 | 0.0493 | 0.0178    | 0.1760   | 0.0492 | 0.5097 | 1.0000 |        |        |
| ROA       | 0.0488 | 0.0832 | 0.0739 | 0.3113    | 0.2920   | 0.0531 | 0.1297 | 0.0997 | 1.0000 |        |
| PROA      | 0.0074 | 0.0518 | 0.0494 | 0.3039    | 0.1498   | 0.0473 | 0.0382 | 0.1300 | 0.8227 | 1.0000 |

<sup>25</sup> As seen in section 4.6.1., we have found it appropriate to define “highly correlated” as above 0.5.

Also mentioned in section 4.6., a bivariate regression analysis was initiated in order to check the fundamental nature of the relation between the main dependent and the main independent variables, before moving on to the main multivariate regression analysis. The results from this bivariate regression are presented in table 5.2. below:

Table 5.2.

| <b>Dependent variable</b> | <b>Independent variable</b> | <b>Coefficient estimate</b> |
|---------------------------|-----------------------------|-----------------------------|
| ASR                       | LADS                        | 0.004 **                    |
| ASR                       | NLTA                        | -0.009 **                   |
| ROA                       | LADS                        | 0.000                       |
| ROA                       | NLTA                        | -0.000                      |
| ROE                       | LADS                        | 0.001 **                    |
| ROE                       | NLTA                        | 0.001 *                     |

\*\* significant at 1% level

\* significant at 5% level

As seen in table 5.2. above, both the LADS and the NLTA ratios have a significant relation to the ASR. Both the estimated coefficients of the liquidity variables show weak coefficients but are significant at the significance level of 1 %. The directions of both coefficients are also in line with hypotheses H1a and H1b. This initial analysis indicates that banks' liquidity level could help in explaining the movement of their stock returns.

The results of the regressions between the ROA variable and the liquidity variables are however insignificant, in contrast to the ASR. This result indicates that the chosen liquidity variables do not affect the movement of banks' ROA.

In contrast to the results from the regressions performed on ROA as the dependent variable, the regressions related to the ROE both showed significant results. Both the estimated coefficients of LADS and NLTA showed weak and positive signs, significant at the level of 1% and 5% respectively. This is in line with H2d but however not with H2c.



## 5.2. Multivariate analysis

We now move on to the results from the main statistical analysis performed on the data. Tables for each hypothesis are presented with data on the regression coefficients, the significance level, and the number of included observations. The regressions have been calculated as shown in section 4 on a sample of 440 banks x 9 years = 3520 observations. However, there were some missing values (as previously discussed in section 4.4.), leading to a decrease in the number of observations in each of the different regression analyses (see “No of observations included” in the tables below).

### 5.2.1. Empirical result regarding RQ1

Table 5.3. below presents the results from the regressions regarding RQ1, where the regressions have been performed using the fixed-effects model, and the clustered standard errors<sup>26</sup>. Each independent variable (or in the case of the years, indicator) has a calculated coefficient, indicating the direction and the strength of the relation between the independent and the dependent variable in question. The P-values indicating the significance of the coefficient are then presented. The asterisks indicate which coefficients are significant at what levels.

Table 5.3.

| Research question 1              |        |    |       |                                  |        |          |
|----------------------------------|--------|----|-------|----------------------------------|--------|----------|
| Hypothesis 1A                    |        |    |       | Hypothesis 1B                    |        |          |
| Dependent variable               |        |    |       | Dependent variable               |        |          |
| ASR                              |        |    |       | ASR                              |        |          |
| Independent variables            | Coef.  |    | P>  t | Independent variables            | Coef.  | P>  t    |
| LADS                             | 0.003  | ** | 0.008 | NLTA                             | -0.005 | * 0.038  |
| PASR                             | -0.158 | ** | 0.006 | PASR                             | -0.151 | ** 0.001 |
| Earnings                         | 10.960 | ** | 0.000 | Earnings                         | 11.968 | ** 0.000 |
| Firm Size                        | -0.177 | ** | 0.005 | Firm Size                        | -0.194 | ** 0.003 |
| 2006                             | 0.151  | ** | 0.000 | 2006                             | 0.158  | ** 0.000 |
| 2007                             | -0.123 | ** | 0.000 | 2007                             | -0.103 | ** 0.003 |
| 2008                             | -0.410 | ** | 0.000 | 2008                             | -0.382 | ** 0.000 |
| 2009                             | 0.160  | ** | 0.004 | 2009                             | 0.204  | ** 0.002 |
| 2010                             | 0.107  | *  | 0.042 | 2010                             | 0.142  | * 0.013  |
| 2011                             | -0.140 | ** | 0.008 | 2011                             | -0.133 | ** 0.009 |
| 2012                             | 0.275  | ** | 0.001 | 2012                             | 0.293  | ** 0.000 |
| No of observations included 2586 |        |    |       | No of observations included 2556 |        |          |

\*\*significant at 1% level, \* significant at 5% level

<sup>26</sup> This is the commando in the statistical software for applying the heteroskedasticity-robust standard errors mentioned in section 4.6.2

### **H1a: There is a positive relation between LADS and ASR.**

As seen in table 5.3., the coefficient for LADS has a positive sign and a value of 0.003, significant at the level of 1%. The result also shows that the majority of the control variables are significantly related to the stock returns. The coefficient of the PASR<sup>27</sup> has a negative sign (-0.158), while the earnings shows a positive sign (+ 10.960), both significant at the significance level of 1%. The table also shows that the firm size has a small and negative coefficient (-0.177) as well, also significant. The years 2007, 2008 and 2011 show negative and significant coefficient while the remaining years show positive and significant signs in their coefficients.

The results do correspond with the hypothesis of a positive relation between LADS and ASR, where the estimated coefficient of LADS is positive (although close to zero). The result is significant, which leads us to the conclusion that **the null hypothesis is rejected in favor of H1a**. This result indicates that a bank's liquidity level can help in explaining the movement of its stock returns if measured by LADS. The control variables also indicate that that the past stock returns have a negative impact on the current stock return. Earnings have a positive impact on the stock returns, while firm size has a negative impact. When controlling for the years, the output of the regression indicates that the outbreak of the financial crisis did indeed affect the banks' stock returns negatively, seeing that the years 2007 and 2008 both have had significant negative impact on the banks' stock returns.

### **H1b: There is a negative relation between NLTA and ASR.**

The coefficient for the main independent variable, NLTA, is small and negative (-0.005), significant at the level of 5%. The estimated coefficient of PASR shows a negative sign (-0.151) and is significant at the 1% significance level. The earnings have a large positive (+11.968) coefficient significant at the 1% level. The coefficient of firm size shows a similar result as for H1a, with a small negative sign (-0.194), significant at 1%. The estimated coefficient for the years 2007, 2008 and 2011 are negative and significant at 1%. In contrast, the years 2006 and 2012 show a positive and significant relation.

The result of the regression is in line with the hypothesis, stating that there is a (however small) negative relation between NLTA and ASR, which is significant. Accordingly, **the null hypothesis is rejected in favor of H1b**, leading to the same conclusion as for H1a that the liquidity level of a bank does in fact have a significant impact on its stock returns. The control variables show that the past stock returns are negatively related to the present ones, that earnings have a positive impact on stock returns, and that larger banks have lower stock returns. The coefficients for the years indicate that the outbreak financial crisis as well as the year of 2011 had a negative impact the on the banks annual stock returns, while recovering in 2012.

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<sup>27</sup> Past Annual Stock Returns

### 5.2.2. Empirical result regarding RQ2

Table 5.4. below presents the results from the regression regarding RQ2, where the regression has been performed using the fixed-effects model, and the clustered standard errors. The structure of the table is the same as for table 5.3.

Table 5.4.

| Research question 2          |              |                   |                              |              |                   |
|------------------------------|--------------|-------------------|------------------------------|--------------|-------------------|
| Hypothesis 2A                |              |                   | Hypothesis 2B                |              |                   |
| <b>Dependent variable</b>    |              |                   | <b>Dependent variable</b>    |              |                   |
| ROA                          |              |                   | ROA                          |              |                   |
| <b>Independent variables</b> | <b>Coef.</b> | <b>P&gt;  t  </b> | <b>Independent variables</b> | <b>Coef.</b> | <b>P&gt;  t  </b> |
| LADS                         | -0.000       | 0.921             | NLTA                         | -0.000       | 0.489             |
| PROA                         | 0.099 **     | 0.005             | PROA                         | 0.157 **     | 0.000             |
| Firm Size                    | -0.015 *     | 0.016             | Firm Size                    | -0.017 *     | 0.032             |
| 2006                         | 0.005 *      | 0.011             | 2006                         | 0.005 *      | 0.015             |
| 2007                         | 0.009 **     | 0.003             | 2007                         | 0.008 **     | 0.001             |
| 2008                         | -0.000       | 0.908             | 2008                         | -0.003       | 0.491             |
| 2009                         | -0.010 **    | 0.008             | 2009                         | -0.008 *     | 0.041             |
| 2010                         | -0.009 **    | 0.007             | 2010                         | -0.009 *     | 0.030             |
| 2011                         | -0.011 **    | 0.002             | 2011                         | -0.010 *     | 0.018             |
| 2012                         | -0.009 *     | 0.017             | 2012                         | -0.008       | 0.089             |
| No of observations included  | 2304         |                   | No of observations included  | 2290         |                   |
| Hypothesis 2C                |              |                   | Hypothesis 2D                |              |                   |
| <b>Dependent variable</b>    |              |                   | <b>Dependent variable</b>    |              |                   |
| ROE                          |              |                   | ROE                          |              |                   |
| <b>Independent variables</b> | <b>Coef.</b> | <b>P&gt;  t  </b> | <b>Independent variables</b> | <b>Coef.</b> | <b>P&gt;  t  </b> |
| LADS                         | 0.000        | 0.073             | NLTA                         | 0.001 *      | 0.012             |
| PROE                         | 0.151 **     | 0.000             | PROE                         | 0.158 **     | 0.000             |
| Firm Size                    | 0.012        | 0.244             | Firm Size                    | 0.009        | 0.000             |
| 2006                         | -0.017 **    | 0.001             | 2006                         | -0.017 **    | 0.288             |
| 2007                         | -0.033 **    | 0.000             | 2007                         | -0.035 **    | 0.000             |
| 2008                         | -0.099 **    | 0.000             | 2008                         | -0.102 **    | 0.000             |
| 2009                         | -0.105 **    | 0.000             | 2009                         | -0.105 **    | 0.000             |
| 2010                         | -0.080 **    | 0.000             | 2010                         | -0.081 **    | 0.000             |
| 2011                         | -0.089 **    | 0.000             | 2011                         | -0.088 **    | 0.000             |
| 2012                         | -0.080 **    | 0.000             | 2012                         | -0.080 **    | 0.000             |
| No of observations included  | 2396         |                   | No of observations included  | 2382         |                   |

\*\*significant at 1% level, \* significant at 5% level

### **H2a: There is a negative relation between LADS and ROA.**

The coefficient for LADS is extremely close to zero, and is because of this deemed insignificant. The estimated coefficient of the PROA points out a small positive correlation (+0.099) between the past profitability and the current profitability, and this coefficient is significant at the significance level of 1%. The output of the regression also indicates a relation between firm size and profitability, where firm size has a significant negative impact (-0.015) on the profitability at the significance level of 5%. When controlling for the years, the result shows that 2006 and 2007 have small positive signs on their coefficients. However, the years 2009, 2010, 2011 and 2012 all show significantly negative coefficients.

Although the coefficient of LADS is in line with the hypothesis, the relation between LADS and ROA is insignificant, indicating that the chosen liquidity variable cannot reliably explain the movement of the ROA. Accordingly, **the null hypothesis is not rejected**. The results also show relations with past profitability and firm size. The positive coefficients of the years 2006-2007 indicate that the outbreak of the financial crisis did not affect the profitability negatively to begin with. However, the following years all show negative and significant coefficients.

### **H2b: There is a positive relation between NLTA and ROA.**

The coefficient for NLTA is very small and close to zero, and is thus not significant at any level. Similar to H2a, the coefficient of PROA shows a small and positive correlation (+0.157) with ROA at a significance level of 1%, and the estimated coefficient of firm size shows a small and negative sign (-0.017) at the significance level of 5%. The controlled years also show similar results as for H2a where the years 2006 and 2007 show small and positive relations with ROA, while the years 2009, 2010, 2011 and 2012 show significant negative relations, leading us to similar conclusions regarding the outbreak of the financial crisis.

The negative coefficient for NLTA from the regression output is not in line with the hypothesis. However, this result is insignificant, and thus **the null hypothesis is not rejected**. The coefficients of the control variables past performance and firm size are similar to the result in H2a, indicating that a high past performance leads to a higher profitability, while the size of the bank has a negative effect on the profitability. When controlling for the years the results are also similar to H2a, indicating that the outbreak of the financial crisis did not affect the profitability negatively initially.

### **H2c: There is a negative relation between LADS and ROE.**

The coefficient for LADS is essentially zero, and thus insignificant at all levels. The PROE variable has a positive and significant sign (+0.151) at the significance level of 1%. The relation with the firm size is in contrast to H2a and H2b insignificant, meaning that firm size is not able to explain the movement of the ROE. The estimated coefficients for all the years 2006-2012 shows a negative sign and are all significant at the level of 1%.

Although very small, the LADS coefficient shows a weak and positive sign which is not in line with the hypothesis. This result is however insignificant which leads to a similar conclusion as in H2a and

H2b: that the chosen liquidity ratio of the bank cannot reliably explain the movement of the chosen profitability variable. Thus, **the null hypothesis is not rejected**. The control variables indicate that the past profitability has a positive impact on the current profitability, and that the financial crisis and the following years have had a negative impact on the banks' ROE.

**H2d: There is a positive relation between NLTA and ROE.**

The estimated coefficient of the NLTA is positive (+0.001), and the result is significant at the significance level of 5%. The estimated coefficient of the PROE indicates that there is a weak positive (+0.159) and significant relation between the past profitability and the current profitability. The estimated coefficients for all of the controlled years show negative signs and are all significant.

The regression shows a result that is in line with the hypothesis, where the estimated coefficient of the NLTA is positive. The result is significant at the significance level of 5%. This significant result states that NLTA can help in explaining the banks' ROE, and thus **the null hypothesis is rejected in favor of H2d**. The result for the control variables is similar to the conclusion drawn in H2c that the past profitability can help explain the movement of the current profitability. The firm size coefficient is also similar to the H2c, showing an insignificant result. The estimated coefficients for all of the controlled years show negative signs. This result has the same indications as the H2c: that the financial crisis and the following years have had a negative impact on the banks' profitability.

**5.3. Summary of hypothesis evaluation**

To sum up, from the empirical results of the multivariate analysis and the subsequent hypothesis evaluation seen above in section 5.2., the following conclusions can be drawn:

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*H1a: There is a positive relation between LADS and ASR - **H0 rejected***

*H1b: There is a negative relation between NLTA and ASR - **H0 rejected***

*H2a: There is a negative relation between LADS and ROA - **H0 not rejected***

*H2b: There is a positive relation between NLTA and ROA - **H0 not rejected***

*H2c: There is a negative relation between LADS and ROE - **H0 not rejected***

*H2d: There is a positive relation between NLTA and ROE - **H0 rejected***

**Thus, we can assume H1a, H1b and H2d to hold.**

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## Section 6: Discussion

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*This section answers the research questions based upon the findings in section 5. This result is then analyzed and discussed, as well as linked to earlier research as presented in section 2.*

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### 6.1. Answers to research questions

Regarding RQ1, the null hypothesis was rejected in favor of both H1a and H1b. Consequently, this enables us to answer the first research question:

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***RQ1: Is there a relation between the liquidity ratios and the stock returns of firms in the banking sector?***

***Answer: Yes, there is a relation between a bank's liquidity ratios and its stock returns. The study's results indicate that high liquidity is positively related to the bank's stock returns.***

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Regarding RQ2, the null hypothesis was not rejected in the cases of H2a, H2b and H2c. However, the null hypothesis was rejected in favor of H2d. Thus, this makes us able to answer the second research question:

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***RQ2: Is there a relation between the liquidity ratios and the profitability of firms in the banking sector?***

***Answer: In most cases, there is no clear or significant relation between a bank's liquidity ratios and its profitability. However, according to the study's results there seems to be a positive relation between a bank's share of net loans to its total assets, and its return on equity.***

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These conclusions enable us to answer the overall research question:

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***Does liquidity accounting information have a relation to financial performance in the banking sector?***

***Answer: Yes. If performance is defined as the annual returns of a bank's stock, liquidity is positively related to performance. There are also indications of some liquidity measures being related to a bank's profitability.***

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### 6.2. Discussion of results

Based on the empirical results, a number of implications can be drawn on the aggregated level. Firstly, the result from the multivariate regression shows that both the LADS and NLTA ratios are variables with significant relations to banks' stock returns. According to our findings, these significant liquidity measures can indeed help in explaining the movement of banks' stock prices, indicated by the positive relation between a bank's liquidity level and its stock returns. This empirical result is in line with previous research such as Martinez (1999) and Alexakis et al. (2010), as well as our own hypotheses. This leads us to the conclusion that liquidity information does in fact contain useful information for the investors in the current accounting period (As mentioned earlier, Ball and Brown (1968) do state that reactions in the stock market can be used for determining whether an accounting item or ratio is deemed useful or not by the user group of investors). Consequently, the

positive and significant relation between liquidity level and stock returns could indicate that the investors seem to value a higher liquidity level.

Secondly, the empirical results drawn from the regressions also indicate that the LADS and NLTA are unable to significantly explain variance in the ROA. The interpretation of this result indicates that the variance in banks' ROA is in fact not dependent on any of the chosen liquidity measures, at least one cannot say for sure from the empirical results as the relations are insignificant. The conclusion drawn from these regressions is that a bank's liquidity level cannot explain the variance in the profitability if measured by ROA. This conclusion is in line with studies such as Hu et al. (2013), which concluded that there was indeed no significant relation between liquidity level and ROA.

In addition to the regression between the liquidity ratios and ROA, analysis was also performed on those ratios and ROE. This result on the other hand indicates that there could be some relation between the liquidity level and the profitability of a bank, since one of the tested liquidity variables, the NLTA, showed a positive significant relation to the ROE. This result leads to the conclusion that the liquidity level measured by NLTA can be useful in trying to explain the variance of ROE. This result is in line with the studies performed by Gambacorta (2011), Molyneux and Thornton (1992) and Pasiouras and Kosmidou (2007), who all state that profitability is affected negatively by high liquidity levels. As noted earlier, the NLTA ratio is in fact a measure of the 'illiquidity' of a bank, which leads us to the same conclusion: A low liquidity means a higher ROE, which gives a negative relation.

To sum up, high liquidity measured by our chosen liquidity accounting ratios seems to affect a bank's stock returns positively, as seen in the results regarding H1a and H1b. High liquidity can also somewhat affect banks' ROE negatively, as seen in H2d. We have shown that these results are in line with several previous studies conducted in the area, but they may seem a bit conflicting at first sight. The fact that high liquidity may have a negative effect on a bank's profitability is theorized, by for instance Molyneux and Thornton (1992), to be due to the costs associated with holding liquid assets, which are elaborated upon in Kashyap et al. (2002). However, in contrast to this, high liquidity seems to be positively associated with high stock returns, in other words a higher valuation by investors. Thus, the implication of this seems to be that the investors seem to value other aspects of high liquidity levels which are offsetting the (possible) negative impacts on profitability.

Explanation for this could perhaps be found in the research conducted by Acharya et al. (2011), stating several important reasons for why a bank might want to hold cash and other liquid assets beyond simply creating income directly for the firm itself. Could it be that investors might positively value the precautionary and the strategic motives for holding liquid assets? Higher liquidity levels will protect banks from the negative effects of sudden withdrawals, but also create the advantage of quickly utilizing favorable opportunities, such as profitable investments or buying assets to favorable prices. Such advantages would indeed most likely be very desirable for investors.

Further explanations for investors valuing high liquidity, despite negative effects on profitability, could perhaps be found when linking the results to the study performed by Bell (1997), where the empirical results indicate that banks with a higher liquidity level are more likely to survive in the

long term. This could certainly be something that would make investors value banks with higher liquidity levels, as their invested equity would be safer there. Perhaps this could indicate that investors in the banking sector are averse when it comes to liquidity risk, as they seem to value a high-liquidity bank higher than a low-liquidity bank with the possibility of a higher ROE.

However, important to note is the causality of the found relations. Briefly noted in section 4.3.4., we have assumed performance to be dependent upon liquidity, in line with previous research. This was done for us to be able to move further with the study, but may not be the case in reality. We have assumed that firms with high liquidity perform better, but it is quite possible that the reality is the other way around: That better performing firms acquire higher levels of liquidity due to performing well and gaining profits and positive cash flows. We still argue that the conclusions drawn from our study are relevant, but this fact may still be important to keep in mind, and it's possible that this is an area which could benefit from further investigation and research.



## Section 7: Conclusions

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*This section presents some general and summarizing conclusions that can be drawn from the results and the following discussion.*

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The current study aims to evaluate the value-relevance of the information content of liquidity ratios in the banking sector, by assessing the relation between chosen liquidity ratios and performance measures.

The main method for examining the relation between banks liquidity level and the performance measures was to perform a multivariate analysis. The empirical results derived from the statistical analysis indicate that banks' liquidity information could in fact be useful and value-relevant, in the sense that the statistical analysis showed a positive significant relation between the liquidity level and the stock returns. This would indicate that the stock market's investors seem to value banks with a higher liquidity. The findings regarding the liquidity ratios and banks' profitability indicate that there is no clear or significant relation between these two variables, since simply one of the four hypotheses tested regarding liquidity and profitability showed a significant and positive relation. The inference one could draw here, is that the liquidity might not be value-relevant in determining the profitability of banks.

At first sight, it may seem surprising that investors seem to value high liquidity in banks, while at the same time liquidity seems to have no significant or even negative effect on a bank's profitability. We discuss if this may be due to high liquidity information signaling something beyond simply its effect on profitability ratios, perhaps sound risk-taking and long term survival of a bank. However, such analysis is beyond the scope of this study.

As the empirical findings of this study show that liquidity information is value-relevant, through an equity investor's perspective, this can point out a direction for future studies to focus more on the liquidity information when aiming to assess the value-relevance of banks' financial statements, thus enables for more accurate decisions based on the accounting information derived from said statements. In other words, this could help introducing liquidity accounting ratios as tools in a 'larger package' for predicting banks' performance more accurately. It could also be interesting to test whether liquidity information is value-relevant in other industries, which could contribute to a more uniform model in assessing the value-relevance of the financial statements of firms in general.

## Section 8: Suggestions for further research

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*In this section, we present our own suggestions for further research building upon the current study, based on its results and limitations.*

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There are several opportunities for further research building upon the current study. To begin with, one of these could be to include more geographical areas into the sample. Although most large global banks originate from the EU and the US, including additional areas would expand the sample significantly to include more banks, and thus most likely improve the study's generalizability and validity on a global level.

Another possible research opportunity is to compare if the relation between liquidity and performance differs between different regulatory settings. In the current study, we have assumed the US GAAP and the IFRS to be roughly similar, and that differences in accounting standard would not have significant influence on our results. However, this may perhaps not be the case. Further research could strengthen or dismiss our assumption, making such a comparison a suitable topic for upcoming studies.

A third potential development of the current study is to include other types of measures in the analysis. For instance, the two liquidity measures tested in this study most likely won't capture every single aspect of the term "liquidity", if even close. Including more or different measures could expand our findings and perhaps even reevaluate the hypotheses that we were not able to accept due to insignificance. Perhaps other liquidity measures could even better explain movements in stock prices and profitability. In addition, due to limitation in time, we have only been able to control for a few important aspects in our statistical analysis. Adding more control variables or using other proxies from this study could perhaps strengthen the reliability and validity of the results.

Conducting similar studies covering other industries could also contribute to the current study and to theory. Although liquidity is an especially important aspect in the banking sector, it is essential for many other industries as well. It is hard to think of industries where it is not essential to be able to finance short-term obligations with liquid assets. Modifications of the current study could thus fit well for other industrial settings, and such results could perhaps lead theory towards gaining more general conclusions for the usefulness of liquidity as an accounting item.

Finally, and perhaps most importantly, a potential research area could be to test the predictive power of the liquidity information. This can be done by assessing the relation between the current period's stock returns and the liquidity ratios of previous periods. The current study is testing relations in the same period, and building upon this it would be possible to enhance its results and perhaps contribute with accurate models for predicting bank performance using accounting data on liquidity as input.

## **Section 9: Study limitations**

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*This section presents a few limitations of the study.*

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One limitation of the current study is, naturally, the fact that the findings are most likely only applicable to the banking industry alone, and no other industrial settings. The fact that the measures used as variables are in many cases bank-specific makes it hard to use the results in other settings and therefore restricts the findings of the study.

The geographical areas used also hinders the results from being applied on a global level, although most of the world's largest banks are already included in the firm selection.

Another limitation of the study is the causality assumption discussed in sections 4.3.4. and 6.2., which does not dismiss the fact that relations do exist, but rather which variable is dependent on the other.

A second assumption made is that the US GAAP and the IFRS regulatory frameworks are similar enough to not affect the results in this particular area. Whether this assumption holds or not, it could indeed be seen as a limitation of the study as assumptions may reduce the validity.

Additionally, due to time limitations, the study includes simply a few fundamental control variables. This is a study limitation as some aspects may not be captured by those control variables.

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