THE BASEL III LIQUIDITY REQUIREMENTS AND BANKS’ STOCK RETURNS

A quantitative study of the impact of the Basel III liquidity requirements on the banks’ stock returns

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ABSTRACT

The 2008 financial crisis highlighted the critical need for more liquidity regulation in the financial sector, in particular among the banking industry. In November 2010, the Basel Committee on Banking Supervision introduced two new liquidity requirements, based on the liquidity coverage ratio (LCR) and on the net stable fund ratio (NSFR). In the European Union, the Basel III liquidity requirements became mandatory to fulfill for all banks in 2013. The implementation on those requirements has started in 2015 and is not yet finished.

This research project will investigate the impact of the Basel III liquidity requirements on the banks’ stock returns. Our research question aims at establishing how the introduction of the Basel III liquidity requirements affects banks’ stock returns. The existing literature on the subject is very scarce, as the implementation of the liquidity requirements dates back from only 2015 and is still not complete. However, there are previous research works focusing on the impact of the liquidity requirements on profitability which we will use as the foundation of our project.

To answer to our research question, we conducted a quantitative analysis on a sample comprising 28 banks from the European Union and from the European Economic Area. These banks were selected from the 2018 EU-wide stress test results of the European Banking Authority. The quantitative study is using as main variables the Basel III liquidity requirements, the deposits-to-assets ratio and the return-on-assets ratio. The time frame of the research comprises the years between 2011 and 2018.

The findings of our work establish a significant negative effect of the implementation of the Basel III liquidity requirements on the banks’ stock returns.
ACRONYMS

BCBS: Basel Committee on Banking Supervision
CAPM: Capital Asset Pricing Model
CMA: Conservative Minus Aggressive
CRR: Capital Requirements Regulation
DTA: Deposits To Assets
EBA: European Banking Authority
FSB: Financial Stability Board
G-SIBS: Global Systemically Important Banks
HML: High Minus Low
HQLA: High-Quality Liquid Assets
LCR: Liquidity Coverage Ratio
NSFR: Net Stable Funding Ratio
RMW: Robust Minus Weak
ROA: Return On Assets
SMB: Small Minus Big
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1.0 INTRODUCTION

The purpose of this chapter is to give an overview of its theoretical framework and to identify a theoretical gap. We will also give basic definitions and theories about our main objects, the Basel III liquidity requirements, liquidity, and stock returns. We will argue why we choose to use numerical data of banks and to conduct a quantitative study. We will also state our research question and the limitations of this work. Finally, we will present the reasons we chose this subject.

1.1. PROBLEM BACKGROUND

- The aftermath of the 2008 crisis pave the way to the Basel III Accords

The business model of banks is based on the liquidity transformation, which is the process of using short-term deposits to finance long-term investments, for instance, loans. Liquidity is defined by the Basel Committee on Banking Supervision (BCBS) as the bank’s ability to fund assets increases and to meet upcoming obligations (Basel Committee on Banking Supervision, 2010). Given the differences in maturity of the different assets, banks can be very sensitive to liquidity risk.

The most recent financial crisis highlighted banks’ vulnerability, especially concerning liquidity risk. Many banks were poorly managed and conducted irresponsible lending as well as unreasonable risk-taking (Basel Committee on Banking Supervision, 2010). The crisis called for an increase in regulation, which was designed by the BCBS in 2010. The Basel III agreements aimed at improving the banking industry’s resilience by requiring high-quality capital and introducing a global liquidity standard (Basel Committee on Banking Supervision, 2018). Two ratios were created by the BCBS to this effect.

The liquid coverage ratio (LCR) should “ensures that banks have an adequate stock of unencumbered high-quality liquid assets (HQLA) that can be converted easily and immediately into cash to meet their liquidity needs for a 30 calendar day liquidity stress scenario” (Basel Committee on Banking Supervision, 2013). It aims at promoting the short-term resilience of the banks when faced with liquidity risk. The second indicator created by the BCBS is the Net Stable Funding Ratio (NSFR), which measures the available amount of funding to exceed the required amount of funding to undergo a period of acute stress of one year (Bank for International Settlement, 2018).

- Liquidity in the banking system, an asset and a constraint

A high liquidity ratio can be seen as a sign of good financial health (Chandra, 2001, p. 72), and hence be interpreted as a positive signal for investors. However, high liquidity can only be achieved by holding very liquid assets (cash or bonds for instance), which are associated with low returns. The generally low returns associated with highly liquid instruments, typically cash or government securities, means they are not profitable investments and have a significant impact on the cost of liquidity regulation for banks (Hoerova et al., 2018). In consequence, increasing the mandatory liquidity levels through ratios like the LCR tends to decrease banks profitability.

Holding high-quality liquid assets instead of higher-yielding assets leads to an opportunity cost. In the precise case of holding cash, the opportunity cost is even higher. Indeed, the amount of cash blocked could be used to invest in higher return instruments and projects. Here, liquidity requirements can hinder banks in their expansion strategies by limiting their
possibility of investment (Bordeleau & Graham, 2010). Even though capital markets do reward a bank for holding liquid assets and cutting down its liquidity risk, those benefits are outweighed by the opportunity cost of holding these low yielding assets.

According to Fama and French (2005), stock returns depend on three variables: expected investment, book-to-market equity ratio, and expected profitability. All things equal, profitability alone has a positive impact on stock returns; a more profitable firm will have higher stock returns (Fama & French, 2005). As we argued that increasing the amounts of liquidity blocked for compliance has a negative impact on the profitability of a bank, the decrease in profitability should be mirrored by a decrease in stock returns.

- The potential effects of the Basel III liquidity requirements on banks

The Basel III liquidity requirements, namely the LCR and the NSFR, were designed to prevent banks from insolvency. The LCR aims at forcing the banks to have a large liquidity buffer, which means that they should have at all time a reserve of highly liquid assets. An highly liquid asset is an asset that can be exchange for cash easily and in a very short time period (for instance, cash itself or government bonds). When faced with an economic shock (for instance the 2008 financial crisis), banks have to find available liquidities in order to be able to fulfill their financial commitment, in a word: their debts. The LCR should help them, because it will obligate the banks to hold highly liquid assets specially for that purpose. The NSFR concerns more the stability of the banks. It aims at ensuring that the financial fundings of a bank’s assets is stable. In case of an economic shock, the assets have to be financed in a stable manner so that banks can continue their activity. Stable fundings consists of long-term customer deposits, long-term interbank loans and equity. Both liquidity requirements aim at protecting the solvency of the banks in the case of a crisis.

However, these requirements can be costly to implement in banks. Liquid assets are generally lower yielding than other investments. Highly liquid assets include government bonds and guaranteed securities, which carry low returns. To comply with the Basel III requirements, banks have to invest in those assets, when they could use their capital to finance more profitable investments (for instance, real estate investment or real investment). From this dilemma rises an opportunity cost.

This opportunity costs can cause a decrease in profits. Instead of investing in profitable investments, the banks have to hold on to their liquidities. In consequence, there will be a shortage in the profits. But the profitability of a firm is generally impacting its stock prices. Indeed, profits are a signal to investors of the good financial health of a company. It can lead to new investments or to higher dividends. So stock returns should be positively impact by high profits. On the contrary, if the liquidity requirements of Basel III lower profits, it could have a negative impact on the stock returns of the banks.

1.2. THEORETICAL AND EMPIRICAL GAP

To our knowledge, there is not yet any literature studying directly the link between liquidity regulation and stock returns. There is, however, ample research concerning the concept of liquidity as well as its impact on profitability. Similarly, the interactions between profitability and stock returns have also been studied by several researchers.

The relation between liquidity and profitability was studied by Bordeleau & Graham (2010), who used a sample of large banks from the U.S. and Canada. They found that profitability is higher for banks holding liquid assets up to a certain point, after which further liquidity
leads to a decrease in profits. Similarly, Tran & Nguyen (2016) found that banks with highly liquid assets tend to have lower profitability. Indeed, liquid assets generally have lower yields, because the supply of sufficiently liquid assets is limited, so the increasing demand leads to higher prices and lower yields (Hoerova et al., 2018). This also means that an opportunity cost can appear for the banks (Fraser & Rose., 1973) when it could be more profitable for them to invest in less liquid but higher yielding assets.

The existing literature on banking regulations mainly addresses the question of capital requirements. The liquidity requirements have not yet been thoroughly researched. Nevertheless, Hoerova et al. (2018) researched the effects of the LCR and of the NSFR in terms of costs for the banks, which were found to be noticeable but low. In particular, the expenditure resulting from the implementation of the liquidity requirements is significantly smaller to the costs arising from the Basel III capital requirements. Köning (2015) studied liquidity regulation in the light of the solvency effect. This happens when a bank increases its liquidity buffer to a point where its profits are affected, enhancing its insolvency risk. The researcher concluded that liquidity regulation strengthens the resilience of banks only if their default risk is sufficiently low.

Fama & French (2005) state that in valuation theory, expected stock returns are linked to the expected profitability, expected investment and the book-to-market ratio. By controlling the last two variables, they showed that all else equal, more profitable companies have higher stock returns. In the same way, Novy-Marx (2013) researched the predictive nature of the profitability of a firm regarding its stock returns. He demonstrated that profitability leads to significantly higher stock returns when compared to similar firms with lower profitability.

However, our research will directly address the relation between liquidity requirements, more precisely the implementation of the LCR, and stock returns. To our knowledge, no studies have been done on this subject yet. Moreover, our work will focus on EU banks, which we found to be less researched than American banks. In consequence, we can clearly identify a theoretical gap in the literature concerning our subject.

1.3. RESEARCH QUESTION

How does the introduction of the Basel III liquidity requirements affect banks’ stock returns?

1.4. RESEARCH PURPOSE

The primary purpose of our work aims at analyzing the relation between the Basel III liquidity requirements and stock returns. Indeed, the purpose of our degree project is to investigate whether the relation between those variables is significant. The following variables will be researched: the deposits-to-asset ratio, the liquidity coverage ratio, the return on assets and the stock returns, we are taking into accounts. By studying the Basel III liquidity requirements as a whole, deposits-to-assets and the LCR at the same time, we are analyzing liquidity as well as liquidity requirements. Moreover, our work will focus on the EU banking industry, shedding some light on the particular case of the implementation of Basel III within the union. Finally, our study will be useful to bankers and regulators by expanding the usual span of research concerning these regulations not only to profitability but to stock returns.
1.5. RESEARCH LIMITATIONS

Our degree project investigates the year from 2011 to 2018, to compare four years without the implementation of Basel III and four years with it. However, this period was characterized by specific events on the financial markets, especially within the EU: the aftermath of the 2008 financial crisis and the European sovereign debt crisis. These crises unquestionably affected the stock returns, which means our results are also impacted.

Furthermore, our sampling process was hindered by the fact that several banks are not fully transparent yet or have not been fully transparent, in the sense that they don’t disclose the liquidity ratios, for the whole period from 2011 to 2018 concerning their LCR levels, which means we could not access all the data we would have needed to study the whole sample of banks covered by the EBA EU-wide stress test of 2018. As a result, our final sample is more limited than we planned when first designing our project.

1.6. SUBJECT CHOICE

We are two finance students enrolled in the Master’s degree in Financial Management at Umea University. We studied banking regulation in the first semester during our risk management module and became interested in the Basel Accords. In the last decade, the banking industry went through a severe crisis, which led to an increase in the regulation, especially concerning liquidity levels. More specifically, we chose to focus on the liquidity requirements of Basel III and the introduction of the liquidity coverage ratio (LCR). The impact of this regulation has already been studied on profitability, but we could not find any literature regarding its effect on stock returns of the banks. Thus, we thought it would be interesting to study the relations between liquidity regulation and stock returns.

We made the decision to focus on the European Union (EU) banks early on since the implementation of the Basel III requirements is mandatory to all banks within the EU. More precisely, we selected banks for our sample from the EU-wide stress test of the European Banking Authority (EBA) of 2018.
2.0 SCIENTIFIC METHOD

This chapter will present our philosophical point of view concerning our ontological and epistemological stances. We will also discuss our research approach and research design. Finally, we will explain how we conducted our literature search and how the key concepts and theories were chosen and used.

2.1 ONTOLOGY

According to Saunders et al. (2009, p. 510), ontology is a “branch of philosophy that studies the nature of reality or being.” Bryman et al. (2011, p.23) further explain that ontology studies whether social entities should be considered as objective entities which have a real existence, external to the social participants, or if they are constructions based on the perceptions and actions of different actors. Ontology can take two main positions: objectivism or constructionism (Bryman et al., 2011, p. 36). Objectivism refers to the idea that the nature of social entities is independent of social actors. This means that social phenomenon is also unrelated to the researchers. On the contrary, constructionism suggests that social phenomena are created by perception, which means that social reality is subjective and changing (Bryman et al., 2011, p. 37).

This research work is adopting objectivism as an ontological assumption. Indeed, we are using quantitative methods and more precise data that is quantifiable and objective. All the ratios we are analyzing can be calculated in a reliable manner and are independent of the social actors, which means that our conclusions will not be influenced by any social actor.

2.2 EPISTEMOLOGY

Epistemology describes what can be accepted as valid knowledge in a given field of study (Saunders et al., 2009, p. 112). One of the main issues of epistemology is to evaluate whether the same method can be applied when researching natural sciences and social sciences (Bryman et al., 2011, p. 29). There are three main positions concerning epistemology: positivism, realism, and interpretivism.

Positivism can be described as “an epistemological position that advocates the application of the methods of natural science to the study of social reality” (Bryman et al., 2011, p.28). This philosophy assumes that the researcher is distant from the phenomena studied, which means that the research is only based on observable facts. Realism also suggests that social phenomenon exists externally to social perceptions (Saunders et al., 2012, p. 136). Interpretivism is defined as “an epistemological position that requires the social scientist to grasp the subjective meaning of social action” (Bryman et al., 2015, p. 724). According to interpretivism, our perception of reality is created through social constructions, and social reality is too complex to be explained through scientific methods. In that case, it is up to the researcher to give its own understanding or the phenomena.

Our research will focus on the links between liquidity requirements and stock returns between 2011 and 2018, which are objective and independent entities, and will use the STATA software to analyze them, which means that our analysis will also be unrelated to our subjective understanding. In consequence, we are using positivism as our epistemology position.

2.3 RESEARCH APPROACH
There are two possible approaches when conducting research: induction or deduction. Induction refers to “collecting data to explore a phenomenon and you generate or build theory” (Saunders et al., 2012, p. 145). Using the inductive approach, researchers will create a theory according to their observations. The induction allows researchers to “draw general conclusions from a finite number of observations” according to Blaikie (2009, p. 83). Deduction consists of testing hypotheses against reality. More precisely, Adams et al. (2007, p. 29) define deduction as following: “universal laws are hypotheses to be ‘tested’ against predictions implied by these laws”.

For our degree project, we will use deduction as our research approach. Deduction follows six steps, which will be here as follows. First, the theory research on liquidity, stock returns, and the Basel Accords. Second, the hypothesis linking liquidity requirements to stock returns. Third, the data collection using the EU-wide stress-test of the EBA and Eikon. Fourth, the analysis and findings using Stata. Fifth, the confirmation or rejection of the hypothesis. Sixth, the revision of theories according to the results, which will either be supported or revised.

2.4 RESEARCH DESIGN

According to Creswell (2009, p. 3), research design corresponds to “plans and procedures for research that span the decisions from broad assumptions to detailed planning regarding methods of data collection and analysis”.

Two main approaches are possible concerning research design: quantitative or qualitative research. The quantitative approach tests theories through the analysis of the relations between different variables using statistical tools (Saunders et al., 2012, p. 473). Bryman et al. (2015, p. 727) explain that “quantitative research usually emphasizes quantification in the collection and analysis of data”. On the contrary, “qualitative research usually emphasizes words rather than quantification in the collection and analysis of data” (Bryman et al., 2015, p. 727). Indeed, the qualitative approach focuses on creating theories through the observations of researchers, which can be influenced by their ideological positions.

In our work, we will use quantitative research to answer our research question. Indeed, we aim to investigate the relation between different variables and to test a set of hypotheses, which means the quantitative approach is more relevant in this case.

2.5 LITERATURE SEARCH

The literature review is essential to be aware of what has already been researched in a specific field or to be aware of the main questions that remain to be answered. Researchers must identify the existing literature surrounding their research field to be able to design their work in the most relevant manner (Hart, 2001, p.3). Saunders et al. (2009, p.69) state that there are different kinds of literature sources. Primary literature covers a large set of published or unpublished articles, reports, thesis, government publications, etc. Secondary literature comprises sources like newspapers or books. Finally, tertiary literature corresponds to the search tools used by researchers to find relevant primary or secondary literature (Saunders et al., 2009, p. 69).

In our literature review, we used literature from various sources, mainly accessed through Google Scholar, the University Library portal or Diva. We used the following keywords: “Basel Committee”, “Liquidity Coverage Ratio”, “liquidity requirements”, “banking regulation”, “European Banking Authority”, “Stock returns” and “Fama French model”.
2.5 CHOICE OF THEORIES AND CONCEPTS

Our literature review helped us in designing the theoretical framework of our degree project. As our approach is deductive, it was one of the first steps of our work. According to Bickman et al. (1998, p. 78), relevant theories can help researchers organize their research questions and observations.

In our work, there are three key concepts: liquidity, liquidity requirements and stock returns. Liquidity is defined as the firm’s “capacity to liquidate maturing short-term debt (within one year)” by Shim & Siegel., 2000, p. 46-47. In our quantitative research, we aimed at assessing the influence of the Basel III liquidity requirements. However, we could only study directly the LCR and not the NSFR because of a lack of available data concerning this ratio. Thus, we chose to replace this ratio, which measures the available amount of funding to exceed the required amount of funding to undergo a period of acute stress of one year (BCBS, 2011), by the deposits-to-assets ratio, which measures the available amount of stable funding to meet the funding requirements. Both ratios assess the stability of the fundings of the banks’ assets. Lastly, we discussed stock returns using the Fama French five-factor model.
3.0 THEORETICAL FRAMEWORK

In this chapter, we review the existing literature and the theoretical framework of our work. It will be divided according to our key concepts: liquidity, the Basel Accords and the liquidity requirements, stock returns and the Fama-French model. At the end of this chapter, we present our conceptual model and the hypothesis that we will test during our quantitative research.

3.1.1 CONCEPT OF LIQUIDITY

Liquidity is the ability of assets to be converted into cash quickly and very cheaply (Moffatt, 2017). It shows “the degree to which an asset or security can be quickly bought or sold in the market at a price reflecting its intrinsic value” (Chen, 2019). Money in general or cash is the most liquid asset. On the other side, we have illiquid assets such as real estate, rare works of art, expensive jewelry. Some of the complex derivatives can be also classified as illiquid assets under certain circumstances. For instance, collateralized debt obligation can be extremely hard to exchange for cash in some situations. These securities became illiquid in 2008, which was one of the main reasons for the financial crisis.

“Liquidity at a bank is a measure of its ability to readily find the cash it may need to meet demands upon it” (Elliott, 2014). Liquid assets are main resource that can be converted to the cash very fast to cover the financial obligations. The most liquid assets include cash, central bank reserves, and government debt (FED, 2019). Banks liquidity is very important for the financial system in general. The financial crisis of 2008 has shown that the liquidity buffer is the necessary part for the stable functioning of the banking system, which is highly related to financial system. As the result, in 2013 the implementation of the Basel III liquidity requirements is announced the rules for the bank’s liquidity.

3.1.2 THEORIES OF LIQUIDITY

- **Liquidity preference theory**

To begin with, the liquidity preference theory was developed by Keynes in 1936. According to this theory, demand for money depends on three main motives: transactions, precautionary and speculative. All these motives answer one question: “Why do people hold money?”. First, the transaction motive includes people’s necessity to hold some amount of money to carry out everyday transactions. Second, the precautionary motive explains that individuals prefer to have the amount for unexpected expenses besides the transaction costs. Third, the speculative motive shows that people prefer to hold money as a store of wealth. In addition, they want to retain liquidity (Mishkin et al., 2013, p 480). To satisfy all motives, individuals prefer short-term securities with low returns (or even cash) instead of long-term securities. Long-term securities have greater uncertainty and risk. That is why, if an individual decides to take this type of investment, they will expects a higher return from it.

- **Shiftability theory**

The shiftability theory comes from the work of Mitchell (1923, p 356), the bank’s liquidity determines by how quickly it can “shift” its assets for cash. This theory is highly relevant when banks are faced with economic shocks and need to convert easily their assets into cash. This theory is directly connected with LCR implementation because it makes the availability of the high liquid assets mandatory for all banks. To deepen this theory, Dodds (1982) explained that banks could not only hold liquidity through marketable assets but
could also find liquidity by borrowing. In consequence, it could be less essential for banks to hold a high level of highly liquid assets.

### 3.2.1 THE BASEL ACCORDS: FROM BASEL I TO BASEL III

The Basel Committee on Banking Supervision was established in 1974. Its purpose was to set global supervisory standards and guidelines for the banking system. The BCBS does not have any legal power, which means its recommendations are not binding. It falls to each national relevant authority to choose to implement them or not and how to implement them.

In 1988, the committee disclosed the first set of regulatory framework: Basel I. It focused mainly on credit risk and established minimum capital requirements (Eun & Resnick., 2008). In 2004, Basel II introduced the concept of the three pillars. This new framework was more risk sensitive, taking into account market and operational risk in addition to credit risk. The BCBS also set stricter and more precise capital requirements.

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**Figure 1: Chronology of the Basel agreements since the creation of the BCBS**

In November 2010, the Basel Committee on Banking Supervision (BCBS) reunited to reexamine its regulatory framework for banks. The 2008 crisis highlighted the need for broader and further regulation. While Basel I and Basel II focused on capital requirements, the Basel III Accords introduced more diverse control tools: the leverage ratio, the countercyclical buffer, the LCR, and the NSFR were created to complete the capital adequacy ratios.

### 3.2.2 BASEL III LIQUIDITY REQUIREMENTS

The 2008 crisis showed deficiencies in global financial regulation. In particular, many banks suffered from a liquidity shortage and were unable to roll over their debts. Because a number of them were funding long-term assets with short-term debt, they became insolvable and could not have made it through the crisis without public support. As Hull (2012, p. 292) noted, the crisis highlighted that the only problem was not the capital level of the banks, but also the liquidity risk they were taking. To compensate for these deficiencies, the Basel III accords introduced new rules concerning liquidity (Basel Committee on Banking
According to Rochet (2008), there are two main reasons for liquidity regulation. Micro-economically, it prevents bankruptcy and protects the deposits by establishing a liquidity buffer. Macroeconomically, it maintains the financial system stable. In the case of the Basel III liquidity requirements, they aim at setting a global liquidity standard to protect banks against financial crisis and other types of economic shocks.

The Committee introduced two ratios to assess liquidity in banks and to establish a minimum level to comply with. The ratios are addressing different but complementary objectives. The first and main ratio is the Liquidity Coverage Ratio (LCR), which measures short-term resilience in terms of liquidity and evaluates whether a bank has enough high-quality liquid assets to face a significant stress scenario for 30 calendar days (Basel Committee on Banking Supervision, 2011). The LCR calculation is as follows:

$$ LCR = \frac{\text{Stock of high quality liquid assets}}{\text{Total net cash outflows}} \geq 100\% $$

The second ratio is the Net Stable Funding Ratio (NSFR), which measures the available amount of funding to exceed the required amount of funding to undergo a period of acute stress of one year (Basel Committee on Banking Supervision, 2011, p.8). The NSFR calculation is as follows:

$$ \text{NSFR} = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\% $$

To comply with Basel III regulation, both ratios should be over 100% (Hull, 2012, p. 293). These rules were supposed to be implemented between 2013 and 2015, but the implementation was postponed to 2019 and then to the 1st January of 2022 (Basel Committee on Banking Supervision, 2019). Within the EU, the implementation of Basel III requirements was made binding in 2013 by the legislative package comprising the Directive 2013/36/EU (CRD IV) and Regulation (EU) No. 575/2013 on prudential requirements for credit institutions and investment firms (CRR).

### 3.3 CONCEPT AND THEORIES OF STOCK RETURNS

- The portfolio theory

There are several theories concerning stock returns that try to predict or explain stock prices. Markowitz (1952) generated the discussion on that subject with his work on portfolio theory. According to his work, investors want to maximize the return for a given level of risk. It is possible to estimate an “efficient frontier” (see Figure 2), constituted by optimal portfolios, which have maximized returns considering a given level of risk. The contrary can also be evaluated, with optimal portfolios offering a minimized risk for a given level of return. Markowitz’s research proved that to reduce the total risk of a portfolio, an investor should diversify and invest in multiple diverse securities. To deepen the model, Tobin (1958) included risk-free assets in Markowitz’s portfolio theory.
The Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is based on Markowitz’s portfolio theory. The model, established by William Sharpe, John Linter and Jan Mossin (1964), links the return of individual securities or portfolios to the return of the whole market (Bodie et al., 2015, p.292). Where the portfolio theory was evaluating every portfolio in comparison to all the other portfolios, the CAPM simplifies the model, comparing the portfolio to the market as a whole. This model also introduced the distinction between systematic risk and specific risk, showing that investors can only diversify specific risk (Bodie et al., 2015, p. 328). In the CAPM, the rate of return is defined as a combination of the risk-free rate and the market risk premium, as described in this equation:

\[ R = R_f + \beta (R_m - R_f) \]

Where:
- \( R \): the stock rate of return
- \( R_m \): the rate of market return
- \( \beta \): cov (\( R_i, R_m \)) / var (\( R_m \))
- \( R_f \): risk-free rate

The return of the stock is strongly dependent to the beta, which expresses the sensitivity of the asset to the market prices, which means to the systematic risk (Bodie et al., 2015, p. 297). The CAPM is one of the most popular models to explain stock returns, as it is both easily applicable and reliable.

3.4 THE FAMA-FRENCH THREE-FACTOR MODEL

To obtain the objective of the research, we used the Fama and French three-factor model (or the Fama-French model). It was developed by Nobel Laureate Eugene Fama and researcher Kenneth French, who are both former professors at the University of Chicago Booth School of Business. The model is used for estimation of the return of the portfolio. It
is based on the capital asset pricing model (CAPM), which is using the market beta as the main risk factor for the portfolio. However, it also considers the size and value of the stocks in the portfolio (Fama & French, 1993).

The Fama-French three factors formula looks like:

\[ r = r_f + \beta_1(r_m - r_f) + \beta_2(SMB) + \beta_3(HML) + e \]

where \( r \) - total returns of the stock or portfolio
\( r_f \) - risk-free rate;
\( r_m \) - market risk;
SMB - size factor;
HML - value factor;
\( \beta_{1,2,3} \) - coefficient of the factors
\( e \) - standard error

Nevertheless, the Fama-French model also includes the two other indicators – “Small minus Big” (SMB) and “High minus Low” (HML). SMB is the difference between the return of the smallest stocks portfolios and the biggest stock portfolios. HML is the difference between the average returns of the highest book-to-market (BTM) ratio portfolios and the lowest book-to-market ratio portfolios (Fama & French, 1993, p. 9). SMB show that the companies with small capitalization, which surpass big one, have higher return during a long time period than the others. HML is the factor that illustrates the pattern of the high stock returns of the high-value companies than growth companies in long term (CFI, 2019).

### 3.5 A FIVE-FACTOR ASSETS PRICING MODEL

Fama and French (2015) modified their three-factor model by adding two new factors: profitability and investments. In that way, the model aims at bringing out patterns in size, value, profitability, and investment in the average stock returns. Fama and French chose to deepen their previous model to compensate for the unexplained variation of stock returns that the three-factor model left (1993). Moreover, research from Novy-Marx (2013) demonstrated a strong relation between expected profitability and average return, which they aimed to demonstrate in this enhanced model.

The SMB and HML factors are the same as in the previous three-factor model. Profitability is incorporated through the RMW (Robust Minus Weak) factor, which is the difference between the average return of the stocks of the most profitable firms and the average return of the stocks of the less profitable firms. CMA (Conservative Minus Aggressive) corresponds to the investment factors. It is calculated similarly, by subtracting the average returns of the stocks of the most conservative firms to the average stock returns of the most aggressive firms (Fama & French, 2015). The main equation of the five-factor model is as follows:

\[ r = r_f + \beta_1(r_m - r_f) + \beta_2(SMB) + \beta_3(HML) + \beta_4(RMW) + \beta_5(CMA) + e \]

where RMW is profitability factor, CMA – investment factor, \( \beta_{1,2,3,4,5} \) - coefficient of the factors and \( e \) - standard error.

The five-factor model led to a more thorough explanation of the average stock returns, with the five factors accounting for up to 94% of the stock returns. Thus, patterns related to size,
book to market ratio, profitability and investment were clearly highlighted in the average stock returns.

3.6 EMPIRICAL RESEARCHES LINKING LIQUIDITY AND STOCK RETURNS

The Basel III liquidity requirements started to be implemented only four years ago. For this reason, the literature studying directly their influence on stock returns is nonexistent. Similarly, there is no research investigating precisely the relation between accounting liquidity and stock returns. However, there are works focusing on the link between liquidity and profitability in banks, as well as research analyzing the effect of profitability on stock returns.

Bordeleau & Graham (2010) studied the effect of liquidity on profitability, using a sample of large banks from the U.S. and Canada. According to their work, holding highly liquid assets leads to a decrease in liquidity risk, hence inducing a reduction of risk management costs. Yet, there is an optimal level of liquidity beyond which the opportunity cost of holding liquid assets rather than investing in higher yielding securities becomes too important. After this threshold, an increase in liquidity will lead to lower profits. The opportunity cost of a large liquidity buffer is more precisely investigated by Hoerova et al (2018). Highly liquid assets tend to have high prices, because their supply is limited, while their demand increases due to the increasing liquidity regulation. In consequence, they offer increasingly low yields. Considering this, banks are faced with an important opportunity cost when they invest in these kinds of securities rather than in higher-yielding assets.

The main theory linking profitability to stock returns originates from the works of Fama and French (2005). They use valuation theory, which links “the book to market equity ratio, expected profitability, and expected investment” and point out the influence of expected profitability by controlling for the impact of the two other variables. In this way, they show that all else equal, higher expected profitability tends to intensify the average stock returns of a company. Moreover, in their five factors model (2014), they bring to light patterns in stock returns according to the size, book to market ratio, profitability and investment of a company, which accounts for 71% to 94% of the average stock returns.

3.7 CONCEPTUAL MODEL AND HYPOTHESIS

The main concepts we are using in our research are the Basel III liquidity requirements, the liquidity coverage ratio, liquidity, and stock returns. We chose to use the deposits-to-assets ratio to measure liquidity and to replace the NSFR and the logarithmic returns to estimate the annual stock returns. Our research aims at showing a relation between the liquidity requirements of Basel III and the stock returns of the European banks. We will also investigate the effect of the DTA ratio on stock returns, to be able to account for the influence of liquidity on stock returns throughout the whole period and not only after 2015 and the implementation of the liquidity requirements. We will also incorporate profitability in our model, in an attempt to explain most of the average stock returns. We chose to measure profitability with a return on assets or ROA. Finally, we will control for exterior effects with a control variable, the mean capitalization of each bank. We designed a conceptual model to research the influence of the liquidity coverage ratio on stock returns, shown in figure 3.
We expect the implementation of the liquidity requirements to have a small reverse association to the stock returns. Indeed, the introduction of the LCR in particular should increase the liquidity level (observable through the DTA ratio), which we suppose to have a reverse connection to the stock returns. Moreover, the LCR should lessen the profitability (observable through the ROA ratio), which we expect to have a positive connection with the stock returns. From our conceptual model and from these concepts, we infer several hypotheses. The following table states our four hypotheses:

Table 1: Hypotheses

<table>
<thead>
<tr>
<th>H1</th>
<th>Liquidity (DTA) has a small reverse association to stock returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2</td>
<td>Profitability (ROA) has a positive association to stock returns</td>
</tr>
<tr>
<td>H3</td>
<td>Basel III has a small reverse association to stock returns</td>
</tr>
</tbody>
</table>
4.0 PRACTICAL METHOD

This chapter will explain how we conducted our research practically. We will discuss our data collection method, which variables we defined as dependent or independent, as well as the way we established our sample. We will also clarify the statistical tools and analysis we are using. Finally, we will discuss the ethical considerations that arose during our work.

4.1 DATA COLLECTION

Two types of data can be used for research. Primary data is data that was specifically collected by the researchers to conduct the research. For instance, they can conduct surveys, interviews, experiments, etc (Sachdeva, 2008, p. 111). The main advantage of primary data is that it is reliable since there are no intermediaries between the researchers and the data. However, collecting primary data can be difficult and can take a long time depending on the type of data needed. In contrast, secondary data involves data that was already existing (Blaikie, 2009, p. 161). More specifically, it can be raw data or already published data, which makes it more accessible for researchers to work with a large data set. It can include both qualitative and quantitative. It is easier and quicker to access than primary data (Greener, 2008, p.75). But secondary data can be unsuitable for some research as it has been collected in the specific purpose to answer to a different kind of research question (Saunders et al., 2009, p. 269). Moreover, the data has to be reliable, which can be hard to verify, and also accessible, which can be costly (Saunders et al., 2009, p. 269).

To answer our research question, we chose to use secondary data. We considered and discuss the advantages and disadvantages of both sources of data, but we concluded that our research question would be most relevantly answered with secondary data. Furthermore, we had already chosen to adopt a quantitative method, which means we needed a substantial set of data to be able to generalize our results. If we had collected the data through primary sources, we would not have been able to have a significant array of data and it would have been too time-consuming. Collecting data from reliable secondary sources was also more time efficient for us.

4.1.1 QUANTITATIVE DATA COLLECTION

We used two main sources of data for this degree project. For the LCR data, we used the annual reports or the risk reports, which we downloaded from the banks' websites for the whole period between 2011 and 2015. These reports are carefully audited and are fulfilling the international accounting standards, thus constituting a reliable secondary source of information. All the other data used in our research was collected from Thomson Reuters Eikon, which can be accessed through a computer at Umeå University Library. Thomson Reuters Eikon is one of the most commonly used financial databases, beside Bloomberg, and is considered as highly reliable.

4.1.2 SAMPLING

To carry out a research project, it is essential to outline the population studied and to construct a sample from it. There are two methods to sample according to Saunders et al. (2009, p. 213), which are random sampling and non-random sampling. A random sample refers to “an unbiased subset of a population that is representative of the population because every member had an equal chance of being selected”, as explained by Collis & Hussey (2014, p. 197). On the contrary, a non-random sample is the opposite. It can be designed using judgemental criteria, on the basis of volunteering, etc. (Saunders et al., 2009, p. 213).
In our research, we used non-random sampling. We used banks from the EU-wide stress test of 2018 to construct our sample. The EU-wide stress test is based on a sample of 48 banks, but due to a lack of information and due to the fact that some of them are not listed, we had to downsize our research sample to 28 banks. These banks are spread over 13 countries of the EU (27 banks) and the European Economic Area (1 bank). A number of them are part of the Single Supervisory Mechanism (17 banks) and some are outside of the Eurozone (11 banks). Moreover, we studied the banks on a timeframe of 8 years, from 2011 to 2018.

4.2 QUANTITATIVE DATA ANALYSIS

After completion of the data collection using Thomson Reuters Eikon and the banks’ annual reports from 2011 to 2018, we used statistical methods to test our hypothesis. Statistical software package STATA was used to analyze the data. This analysis includes descriptive statistics, correlation and multiple regression analysis using the five-factor asset pricing model.

4.2.1 DESCRIPTIVE STATISTIC

Descriptive statistics are the summaries measurements that describe and compare the samples or the whole population. During the analysis, statistic focus on two main aspects:

1. the central tendency;
2. the dispersion.

In most business researches, the central tendency includes three main measures: mode, median and mean. The mode is the most frequently occurring number in the whole analyzing group. The next measurement shows the middle value of the population (or samples). The mean is the average value of the set of data (Saunders et al., 2004, pp. 351-352).

When we determined the central values of the data, the next step is to measure how values spread around it. In that case, we use the dispersion analysis. According to Goos et al. (2015, p. 65), it includes:

- range - the difference between the largest and smallest value in the set of data;
- interquartile range - the difference between the third and the first quartile;
- standard deviation - the square root of variance;
- coefficient of the variation - comparison between the spread of data from different dimensions.

4.2.2. CORRELATION

Correlation is widely spread in statistic analysis. According to Saunders et. al. (2004, p. 363), correlation is a measurement that “enables you to quantify the strength of the relationship between two ranked or quantifiable variables”. It is used to measure the linear relationship between two variables (Kothari, 2004, p. 138). The result can take both positive and negative values but ranges from -1 to +1. The perfect positive correlation is achieved when the value is +1 and it means that two variables have a totally straight connection. In that case, if one variable increases, the other will also increase. Negative values have the opposite mechanism. If one variable increases, the other will decrease.
To measure the correlation coefficients are used two statistical methods. Pearson’s correlation coefficient is used to determine relationships between quantifiable data. In the case of the rank values, Spearman’s rank correlation coefficient is one of the most commonly used methods in estimation.

### 4.2.3. MULTIPLE REGRESSION ANALYSIS TESTING THE EFFECT OF BASEL III ON STOCK RETURNS

To investigate the link between the Basel III requirements and the stock returns, we chose to use the Fama-French five-factor model. This model aims at explaining the stock returns by a set of five factors, which were previously described in our theoretical framework. These factors are the market returns, SMB, HML, RMW and CMA. The last two variables, RMW (probability factor) and CMA (investment factor), were not appropriate for our research. For this reason, we chose to abandon them and to replace them with more suitable variables.

- **Regression model testing the impact of Basel III and liquidity**

As we aim at testing the impact of Basel III on the stock returns, we chose to use a dummy variable, BASEL, to represent the implementation of the Basel III liquidity requirements. Since they were implemented starting from 2015, we chose to define BASEL as shown in Table 2:

#### Table 2: Definition of the BASEL variable

<table>
<thead>
<tr>
<th>Years</th>
<th>Value of the BASEL variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011 to 2014</td>
<td>0</td>
</tr>
<tr>
<td>2015 to 2018</td>
<td>1</td>
</tr>
</tbody>
</table>

This way, we are sure to isolate the effect of Basel III on the dependent variable, which is the stock returns (R).

In addition, we designed a DTA variable to test the impact of the deposits-to-assets ratio. The DTA variable was designed in accordance with the works of Fama and French (1992). First, we ranked the banks based on their deposits-to-assets ratios. Then, we deducted the average stock returns of the banks with the lowest DTA ratios to the average stock returns of the banks with the highest DTA ratios. The DTA variable was then used as an independent variable of our model.

Finally, we created a control variable to control for the effects of exterior variables. The control variable is the mean capitalization (MeanCap) of each bank throughout the period (2011-2018).
The modified French-Fama 5 factors equation with the LCR and DTA is:

\[ r = \alpha + \beta_1 r_m + \beta_2 (SMB) + \beta_3 (HML) + \beta_4 (BASEL) + \beta_5 (DTA) + \gamma \text{Meancap} + e \]

with \( R = \) dependent variable, \( \alpha = \) constant, \( \beta_{1,2,3,4,5} = \) regression coefficient, \( \gamma \text{Meancap} = \) control variable regressor, \( e = \) error term.

We expect this first regression model to assess a small negative relation between the Basel III liquidity requirements and the stock returns. We also expect to estimate a slight negative association between the DTA ratio and the stock returns.

- **Regression model testing the impact of Basel III, liquidity and profitability**

In addition, the influence of the return on assets (ROA) was also estimated in an attempt to make our model more representative of the actual stock returns. We created a ROA variable with the same method we used to define the DTA. We ranked the banks according to their return-on-assets ratio, and then deducted the average of the stock returns of the banks with the highest ROA to the average stock returns of the banks with the lowest ROA.

The modified Fama-French 5 factors equation with the BASEL, DTA and ROA is:

\[ r = \alpha + \beta_1 r_m + \beta_2 (SMB) + \beta_3 (HML) + \beta_4 (BASEL) + \beta_5 (DTA) + \beta_6 (ROA) + \gamma \text{Meancap} + e \]

with \( R = \) dependent variable, \( \alpha = \) constant, \( \beta_{1,2,3,4,5,6} = \) regression coefficient, \( \gamma \text{Meancap} = \) control variable regressor, \( e = \) error term

We expect this second regression model to estimate more closely the actual stock returns. Indeed, we expect to establish a positive association between the ROA ratio and the stock returns.

**4.3 Ethical Considerations**

In research, ethical considerations must be a concern for the researchers throughout their work. They must be taken into account in the data collection process, but also in its analysis and in the presentation of the results (Saunders et al., 2009, p. 184). In qualitative research, it is essential that the participants are not harmed, that their privacy should not be violated, and that they should not be deceived (Bryman & Bell, 2015, p. 134). In all types of research, the researcher should remain objective and should not distort the data and results of the analysis (Saunders et al., 2009, p. 186). Ethical considerations guarantee the quality and reliability of research work.

In our project degree, we used data from annual financial reports, annual risk reports and from Thomson Reuters Eikon. This data was publicly disclosed by the banks studied, which are required to comply with the international accounting standards and are also obligated to disclose information about the Basel requirements. This means that there was no lack of informed consent to divulge the information we are using. Concerning our approach as researchers, we have stayed objective throughout our work, using data that was transparently collected and explaining our data as to avoid any misconceptions of our research. Using the STATA software is also a guarantee of objectivity and reliability, as it prevents from calculations mistakes and misleading results.
5.0 EMPIRICAL FINDINGS AND ANALYSIS

In this chapter, we will discuss the empirical findings of our research. To begin with, we explain the segmentation of our sample. Then, we will present the analysis of the descriptive statistics, of the correlations and finally of our multiple regression model using the modified five-factor model. To conclude this chapter, we will propose our revised conceptual model depending on whether our hypotheses were supported or not.

5.1. SEGMENTATION

In our research, we used data of 48 banks, which were involved in The European Banking Authority’s EU-wide stress test. The list of the banks is attached in Appendix 1. These banks cover mostly 70% of the banking assets in Europe (EBA, 2018). The time frame includes 8 years in our analysis from 2011 to 2018. We analyzed the stock returns of the banks for 4 years before the implementation of the liquidity requirements, in 2015, and 4 years after.

During the analysis, we had faced with the problem that we could not use all banks from the list. Some of these banks are private or do not contain LCR in their annual reports. As a result, we collected data for 28 banks from 13 countries. All of them are situated in Europe and the highest number of banks from one country is four (Spain and the United Kingdom). The location of the banks is presented in figure 5. According to figure 5, there are three banks from Sweden, Italy, and France. Austria, Germany, and Denmark are presented by two banks from each country. The rest of the countries have one bank in our analysis.

![Figure 5: Geographical location of the banks](image)

After geographical location, we ranged banks with their sizes. As the main measurement of the bank’s size, we chose to use the market capitalization. This choice of this indicator is due to the Fama-French model.
According to figure 6, the market capitalization has grown to 2015 since 2011. Only PKO showed a small decline of the indicator. In 2018, we see the opposite situations. The highest recession has been presented by Lloyds Banking Group, The Royal Bank of Scotland, Intesa Sanpaolo, Barclays and BNP Paribas. Only Raiffeisen and PKO Banks have a positive trend in 2018 in comparison with 2015.

However, twelve of the banks have been included in the list of the global systemically important banks (G-SIBs) since 2011. These banks are The Royal Bank of Scotland, Lloyds Banking Group, HSBC, Barclays, Nordea, Banco Santander, Banco Bilbao Vizcaya Argentaria, Deutsche Bank, Commerzbank, Société Générale, Groupe Crédit Agricole and BNP Paribas. According to the Financial stability board, at the end of 2018 seven of the banks are avowed as G-SIBs at the end of 2018 (FSB, 2018).

5.2. DESCRIPTIVE STATISTICS

5.2.1 DESCRIPTIVE STATISTICS OF THE LIQUIDITY COVERAGE RATIO
The main measure we aimed at investigating was the liquidity coverage ratio. As the LCR was only implemented starting from 2015, we only had four years of observations and 112 observations. For all the other variables, we have eight years of observations and 224 observations. Because of this lack of available data, we decided not to use LCR in our regression analysis but to make a thorough analysis nonetheless of this ratio, through descriptive statistics and correlations.

First, the LCR varies greatly from banks to banks. Figure 7 shows the annual LCR for each of the banks of the sample, for the years 2015 to 2018. Some banks maintained high LCR throughout the period, like Caixa Bank or Jyske Bank. We can also remark that the LCR can be very stable all along the period (for instance for Svenska Handelsbanken group) or be very volatile (for instance for Banco BPM). Overall, most of the banks are slowly increasing their LCR ratios.
Table 3 presents the descriptive statistics of the LCR for its implementation period (2015 to 2018). For the complete sample, the mean of the LCR is of 139.63%, which is well above the Basel III requirements, set at 100%. However, the differences in LCR in the different banks and in the different years is very large, as the LCR of the sample go from 100% to 219.9%. As a matter of fact, the standard deviation of the LCR is quite high (26.85), which means the values are quite spread around the mean value.

*Figure 7: Yearly LCR of the banks from 2015 to 2018*
Table 3: Descriptive statistics of the liquidity coverage ratio on its implementation period (2015 to 2018)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCR</td>
<td>112</td>
<td>139.6271</td>
<td>26.83789</td>
<td>100</td>
<td>219.88</td>
</tr>
</tbody>
</table>

Figure 8 presents the annual mean of the liquidity coverage ratio among our sample. It is visible that the banks are, in general, increasing their LCR ratio to a high level, reaching a mean of 142.5% in 2018. Hence, they are largely fulfilling the Basel III requirements.

![Figure 8: Mean LCR for the complete sample](image)

Table 4 presents the distribution of the percentiles of the LCR of the sample. There are a substantial number of banks years, at least 10% of the sample, which have a LCR of exactly 100. The median value is 137%, which is smaller than the mean (139.63%). Indeed, there are a small number of bank years with very high ratios, visible in the 95% percentile, that have a LCR ratio superior or equal to 189%.

Table 4: Percentiles decomposition of the LCR for its implementation period (2015 to 2018)

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCR</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>123.5</td>
<td>137</td>
<td>155.1</td>
<td>172</td>
<td>189</td>
<td>219</td>
</tr>
</tbody>
</table>

5.2.1 DESCRIPTIVE STATISTICS OF ALL THE VARIABLES

Our descriptive statistical analysis is focused on the measurements of the central tendency. It includes the median and the mean. The mode is not used in our research because the statistical software package STATA does not support this estimation. Also, maximum and minimum values and standard deviation are calculated. All calculations are made for the
whole group of banks. The following descriptive statistics concerns the complete period researched (2015 to 2018).

Table 5: Descriptive statistics of all the banks for the complete period of research (2011-2018)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Returns</td>
<td>224</td>
<td>-0.039278</td>
<td>0.3525581</td>
<td>-1.465907</td>
<td>0.9544452</td>
<td>0.0105248</td>
</tr>
<tr>
<td>Market returns</td>
<td>224</td>
<td>0.0217147</td>
<td>0.1094087</td>
<td>-0.1662299</td>
<td>0.1599435</td>
<td>0.0577914</td>
</tr>
<tr>
<td>SMB</td>
<td>224</td>
<td>-0.0383885</td>
<td>0.108709</td>
<td>-0.2042709</td>
<td>0.1208689</td>
<td>-0.0225872</td>
</tr>
<tr>
<td>HML</td>
<td>224</td>
<td>0.0553016</td>
<td>0.1194824</td>
<td>-0.1728577</td>
<td>0.2960001</td>
<td>0.046603</td>
</tr>
<tr>
<td>LCR</td>
<td>224</td>
<td>0.6981357</td>
<td>0.7248663</td>
<td>0</td>
<td>2.1988</td>
<td>0.5</td>
</tr>
<tr>
<td>DTA</td>
<td>224</td>
<td>0.5199667</td>
<td>0.1422014</td>
<td>0.275041</td>
<td>0.8019077</td>
<td>0.4866103</td>
</tr>
<tr>
<td>ROA</td>
<td>224</td>
<td>0.3445927</td>
<td>0.5119016</td>
<td>-1.673877</td>
<td>2.113148</td>
<td>0.3860106</td>
</tr>
<tr>
<td>BASEL</td>
<td>224</td>
<td>0.5</td>
<td>0.5014265</td>
<td>0</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Meancap</td>
<td>224</td>
<td>3.15e+10</td>
<td>3.11e+10</td>
<td>2.87e+09</td>
<td>1.44e+11</td>
<td>2.75e+10</td>
</tr>
</tbody>
</table>

Source: Calculations in the table are based on data from Thomson Reuters Eikon and bank’s annual reports.

The annual market returns have a mean of 2.17% throughout the period, with a minimum of -16.62% and a maximum of 15.99%. The standard deviation value is 0.1094, which is quite high in comparison with the mean. It suggests a well-spread distribution of the annual market returns. The median of the variable is 5.78%, meaning that the distribution is skewed to the left: a few years must carry extremely low results.

The DTA has a mean of 0.5199, meaning that on average, the deposits of the banks cover 51.99% of their assets. The ratio ranges from 27.5% to 80.19%, showing that the DTA can vary greatly from bank years to bank years. The mean of the ROA is 34.46%, but the measure is not so relevant as the distribution of the values is extremely spread. Indeed, the standard deviation, at 0.5119, is very high. The values are distributed between -1.6739 and 2.1131.

The Meancap variable is very well spread, with a standard deviation of 31,100,000,000. The median is at 27,500,000,000 and the mean at 31,500,000,000, showing that the distribution is skewed to the right: some banks have extremely large market capitalization. Indeed the maximum of the maximum capitalization is 144,000,000,000 and the minimum 2,870,000,000.
The LCR descriptive statistics are not relevant from the period 2011 to 2018, since the LCR measure was implemented only in 2015. For this reason, we analyzed the LCR individually in the previous section.

Concerning the Fama-French variables (SMB and HML), the descriptive statistics are more difficult to interpret, because the variables are constructed (as explained previously in the theoretical framework). The SMB, the descriptive statistics are contradicting the idea behind the Fama-French model, which is that small-cap companies tend to have higher stock returns than large-cap companies. Indeed, the mean SMB is negative (-0.010), meaning that on average, the stock returns of large-cap banks were higher than the stock returns of small-cap banks. The mean HML is also inconsistent with the Fama-French theory since it is negative (-0.072). Thus, the stock returns of the banks with the highest BTM ratios are lower than the stock returns of the banks with the lowest BTM ratios. Their median is also negative in both cases, which means that more than 50% of the observations are incompatible with the Fama-French conclusions.

5.3. CORRELATIONS

In our analysis of the relationship between main variables, we used Pearson’s product moment correlation coefficient. The choice of the method is due to variables’ content of only quantifiable data. All calculations are made for the whole group of banks and for the different types of banks according to their market capitalization.

Table 6: Correlations factors for all the banks.

<table>
<thead>
<tr>
<th></th>
<th>Stock Returns</th>
<th>Market returns</th>
<th>SMB</th>
<th>HML</th>
<th>LCR</th>
<th>DTA</th>
<th>ROA</th>
<th>BASEL</th>
<th>Meancap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Returns</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market returns</td>
<td>0.704</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMB</td>
<td>0.629</td>
<td>0.7309</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HML</td>
<td>-0.5742</td>
<td>-0.6015</td>
<td>-0.6961</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCR</td>
<td>-0.1085</td>
<td>-0.2965</td>
<td>0.0025</td>
<td>-0.0438</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTA</td>
<td>-0.0024</td>
<td>-0.0369</td>
<td>0.0268</td>
<td>-0.0065</td>
<td>0.0874</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>0.2247</td>
<td>-0.0761</td>
<td>0.1168</td>
<td>-0.0462</td>
<td>0.3235</td>
<td>0.2591</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASEL</td>
<td>-0.1001</td>
<td>-0.2771</td>
<td>-0.0205</td>
<td>-0.0426</td>
<td>0.9594</td>
<td>0.1113</td>
<td>0.3452</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>Meancap</td>
<td>0.0149</td>
<td>0.0000</td>
<td>0.0000</td>
<td>-0.0439</td>
<td>-0.0642</td>
<td>-0.0071</td>
<td>0.0000</td>
<td>1.0000</td>
<td></td>
</tr>
</tbody>
</table>

25
According to table 3, banks’ stock returns are most affected by the market returns and SMB. The correction coefficient comprise 0.704 and 0.629 basis points respectively and indicate strong positive link. Furthermore, stock returns are influenced by the HML. However, this connection is reverse (-0.5742), which means that if HML increases, it will cause the diminishing of the banks’ stocks returns. Small correlation coefficients are presented by LCR, ROA and BASEL variables. The ROA has positive relationships with stock returns and contain 0.2247 basis point, which proves our hypothesis. LCR and BASEL variables comprise -0.1085 and -0.1001 respectively. It means that higher LCR will cause small decreasing of the banks’ stock returns. These results indicate the small negative effect on the stock returns. It also confirms our hypothesis of LCR and its small reverse association with the stock returns. The correlation between DTA (-0.0024) and Meancap (0.0149) is less the 0, 1 and it can be considered this measures do not influence the stock returns.

The correlation coefficients of the market returns designate on the strong dependence of it from SMB (0.7309) and HML (-0.6015). However, SMB has positive link and its increasing causes the market reruns decreasing, HML has the opposite effect. LCR and BASEL have negative influence on the describing variable. The correlation coefficients comprise -0.2965 and -0.2771 respectively. DTA (-0.0369) and ROA (-0.0761) contain values of the correlation less than 0.1 basis points and are considered as independent from market returns. SMB is strongly related to only one variable - HML. The correlation coefficient comprise -0.6961 basis point and indicate negative relationships between these variables. Moreover, ROA has small positive impact on SMB, but the rest measures are mostly do not have influence on it. According to HML, LCR, DTA, ROA and BASEL have correlation coefficients bigger than -0.1 but smaller than 0 with this variable. It means that the changes of these measures mostly will not affect the value of the HML.

As regards to LCR, it is highly correlated with BASEL (0.9594). This result is explained by the fact that the LCR is the part of the Basel III. Small positive correlation coefficient between ROA and LCR (0.3235) indicates that the increasing of the second measure will cause a little diminishing of the first one. According the results, DTA and Meancap (0.0874 and -0.0642 respectively) are considered to be independent from LCR. DTA has positive correlation with ROA and BASEL, which means that its growth will lead to small increasing of the return on assets. But, in case of ROA, it is more sensitive to the BASEL’s changes than the DTA. The higher correlation coefficients confirms it. (0.1113 and 0.3452 respectively).

5.4. GRAPHICAL ANALYSIS

The graphical analysis enables to highlight relations that may not be noticeable in the raw data. It illustrates the relationship between two variables. Here, the links between stock returns and the key independent variables are studied. As our conceptual model and hypothesis focus on LCR, DTA, and ROA, we chose to investigate only these variables graphically, as a complementary analysis.
Figure 9: Scatterplot of stock returns and DTA  
*Source: STATA using data from Eikon*

Figure 10: Scatterplot of stock returns and LCR  
*Source: STATA using data from Eikon*

Figure 11: Scatterplot of stock returns and ROA  
*Source: STATA using data from Eikon*
Figure 9 shows that there seems to be a slight negative relationship between DTA and stock returns, even though the points are quite well spread. The most visible connection is visible in figure 10, with the LCR and the stock returns. If we exclude the null LCRs, corresponds to the period before 2015, a clear negative association appears. Concerning the ROA, figure 11 clearly presents a cluster comprising banks with ROA ranging from 0 to 1 and annual stock returns of roughly -5% to 5%, which represents most of the population. The link between ROA and stock returns is positive, it can be seen with the fitted values line.

5.5. REGRESSION ANALYSIS: FIVE-FACTOR MODEL FOR BASEL III AND DTA

To analyze the effect of the liquidity requirements on stock return, we used a multiple regression analysis using a modified five-factors model. The first regression includes the stock returns as the dependent variable, and market returns, SMB, HML, BASEL, and DTA as independent variables. We also added a control variable, the mean market capitalization during the 2011 to 2018 period.

We ran a first regression in STATA using these variables, but it appeared that multicollinearity between some variables was interfering with the results. Consequently, we chose to run a second regression to minimize multicollinearity by abandoning our market returns variable, which was problematic. The section 5.5.1 presents our first regression, using our main model, and the section 5.5.2 displays our second regression, with the omission of the market returns.

5.5.1 REGRESSION ANALYSIS USING OUR MAIN MODEL

The first regression is testing the impact of the markets returns, the SMB and the HML factor, Basel III and the DTA.

The modified French-Fama 5 factors equation we used for this regression is the following:

\[ r = \alpha + \beta_1 r_m + \beta_2 (SMB) + \beta_3 (HML) + \beta_4 (BASEL) + \beta_5 (DTA_f) + \gamma \text{Meancap} + e \]

with \( R \) = dependent variable, \( \alpha \) = constant, \( \beta_{1,2,3,4,5} \) = regression coefficient, \( \gamma \text{Meancap} \) = control variable regressor, \( e \) = error term.

- Regression results

Tables 7 and 8 present the overall model fit of the second regression and its Anova table.

*Table 7: Overall model fit of the first regression*

<table>
<thead>
<tr>
<th>Number of obs</th>
<th>224</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(6, 217)</td>
<td>39.13</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.5197</td>
</tr>
</tbody>
</table>
The adjusted R-squared of our model is 50.64%, which shows that our independent variables (market returns, SMB, HML, BASEL, and DTA) explain 50.64% of the variation of the dependent variable (stock returns). Furthermore, STATA conducted an F-test to test the null hypothesis, which is that all the coefficients of the regressions are equal to zero. As Prob > F = 0.0000, it shows that the null hypothesis is rejected with a confidence level of more than 99.99%.

Table 9 presents the output of the first regression. This table shows the regression coefficients (Coef.), but also the statistical significance of all the coefficients (P>|t|). We are using a confidence level of 95%, inducing that we will only take into account the variables with a P>|t| level inferior to 0.05. Thus, we can conclude that the market returns, HML and...
BASEL are significant statistically. Indeed, given that the P>|t| value is superior to 0.05 for SMB and DTA, we cannot infer anything about their influence on stock returns. Regarding the Meancap, it is only relevant in controlling exterior factors.

According to this regression, market returns are economically significant with a coefficient of 1.52, HML with a coefficient of 1.28 and BASEL with a coefficient of -0.15. Thus, the impact of Basel III on the stock returns is negative.

- Multicollinearity testing

We made a multicollinearity test using the VIF (Variance Inflation Factor) on STATA. Multicollinearity happens when the independent variables of a regression model are highly correlated. It is a serious hinder to the reliability and validity of a research. Table 10 displays the VIF value of all our independent variables. BASEL had the higher VIF, but as it is our main variable, we chose to abandon market returns, which had the second highest VIF.

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASEL</td>
<td>5.10</td>
<td>0.196177</td>
</tr>
<tr>
<td>Market returns</td>
<td>3.78</td>
<td>0.264714</td>
</tr>
<tr>
<td>SMB</td>
<td>3.32</td>
<td>0.301401</td>
</tr>
<tr>
<td>HML</td>
<td>3.21</td>
<td>0.311057</td>
</tr>
<tr>
<td>DTA</td>
<td>1.72</td>
<td>0.580342</td>
</tr>
<tr>
<td>Meancap</td>
<td>1.00</td>
<td>1.000000</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>3.02</td>
<td></td>
</tr>
</tbody>
</table>

5.5.2 REGRESSION ANALYSIS MINIMIZING COLLINEARITY BY ABandoning MARKET RETURNS

- Regression results

For our second regression, we ignored the effects of the market returns. This regression is testing the impact of the SMB and the HML factor, Basel III and the DTA. The modified French-Fama 5 factors equation we used for this regression is the following:

\[ r = \alpha + \beta_2(SMB) + \beta_3(HML) + \beta_4(BASEL) + \beta_5(DTA) + \gamma\text{Meancap} + e \]

with R = dependent variable, \( \alpha \) = constant, \( \beta_{2,3,4,5} \) = regression coefficient, \( \gamma\text{Meancap} \) = control variable regressor, e = error term.

Tables 11 and 12 present the overall model fit of the second regression and its Anova table.
Table 1: Overall model fit of the second regression

<table>
<thead>
<tr>
<th>Number of obs</th>
<th>224</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(7, 216)</td>
<td>37.21</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.4605</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.4481</td>
</tr>
<tr>
<td>Root MSE</td>
<td>0.26191</td>
</tr>
</tbody>
</table>

Table 2: Anova table of the second regression

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>12.7636593</td>
<td>5</td>
<td>2.55273186</td>
</tr>
<tr>
<td>Residual</td>
<td>14.9546268</td>
<td>218</td>
<td>0.068599206</td>
</tr>
<tr>
<td>Total</td>
<td>27.7182861</td>
<td>223</td>
<td>0.124297247</td>
</tr>
</tbody>
</table>

The adjusted R-squared of our second regression model is 44.81%, which shows that our independent variables (SMB, HML, BASEL, and DTAf) explain 44.81% of the variation of the dependent variable (stock returns). As Prob > F = 0.0000, it shows that the null hypothesis is also rejected for this regression with a confidence level of more than 99.99%.

Table 3: Second regression

| Stock Returns | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------------|--------|-----------|-------|-----|---------------------|
| SMB           | 1,421164| 0,169736  | 8,37  | 0   | 1,08663 - 1,755698  |
| HML           | 2,513704| 0,246943  | 10,18 | 0   | 2,027003 - 3,000405 |
| DTAf          | 0,754076| 0,160899  | 4,69  | 0   | 0,43696 - 1,071192  |
| BASEL         | -0,46435| 0,045717  | -10,16| 0   | -0,55446 - 0,37425  |
| Meancap       | 4,62E-13| 6,18E-13  | 0,75  | 0,456| -7,6E-13 - 1,68E-12 |
Table 13 shows the output of the second regression. Given that we are using a 95% level of significance, we can state that all our independent variables are statistically significant. Actually, they are significant to a 99.99% level. The $P>|t|$ value is superior to 0.05 for the Meancap. But as a control variable, it is only relevant to control for exterior effects.

The economic significance of BASEL, at -0.46, shows that Basel III had a substantial negative impact on the stock returns. But DTA$f$ has a positive association with the stock returns of 0.75, which is conflicting with our hypotheses.

- Multicollinearity testing

To check that the results of this second regression were applicable, we ran a second multicollinearity test. All the VIF values are inferior or equal to 1.71, which is totally appropriate. The VIF results are presented in table 14.

### Table 14: Multicollinearity test with the VIF

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASEL</td>
<td>1.71</td>
<td>0.586102</td>
</tr>
<tr>
<td>HML</td>
<td>1.58</td>
<td>0.634426</td>
</tr>
<tr>
<td>SMB</td>
<td>1.35</td>
<td>0.742447</td>
</tr>
<tr>
<td>DTA$f$</td>
<td>1.24</td>
<td>0.804280</td>
</tr>
<tr>
<td>Meancap</td>
<td>1.00</td>
<td>1.000000</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>1.37</td>
<td></td>
</tr>
</tbody>
</table>

### 5.6. REGRESSION ANALYSIS: FIVE-FACTOR MODEL FOR BASEL III, DTA AND ROA

In addition to our first model, we chose to test a model including the return-on-assets ratio. The purpose of this model was to get a better estimate the actual stock returns. This model comprises the ROA$f$. The modified Fama-French 5 factors equation with BASEL, DTA$f$ and ROA$f$ is:

$$ r = \alpha + \beta_1 r_m + \beta_2 (SMB) + \beta_3 (HML) + \beta_4 (BASEL) + \beta_5 (DTA_f) + \beta_6 (ROA_f) + \gamma Meancap + \epsilon $$

with $R =$ dependent variable, $\alpha =$ constant, $\beta_{1,2,3,4,5,6} =$ regression coefficient, $\gamma Meancap =$ control variable regressor, $\epsilon =$ error term
5.6.1 REGRESSION ANALYSIS USING OUR MAIN MODEL

- Regression results

Tables 15 and 16 present the overall model fit of the third regression and its Anova table.

*Table 15: Overall model fit of the third regression*

<table>
<thead>
<tr>
<th>Number of obs</th>
<th>224</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(7, 216)</td>
<td>33.50</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.5206</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.5050</td>
</tr>
<tr>
<td>Root MSE</td>
<td>0.24804</td>
</tr>
</tbody>
</table>

*Table 16: Anova table of the third regression*

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>14.4289108</td>
<td>7</td>
<td>2.06127297</td>
</tr>
<tr>
<td>Residual</td>
<td>13.2893753</td>
<td>216</td>
<td>0.061524886</td>
</tr>
<tr>
<td>Total</td>
<td>27.7182861</td>
<td>223</td>
<td>0.124297247</td>
</tr>
</tbody>
</table>

The adjusted R-squared of our third regression model is 50.50%, so our independent variables (market returns, SMB, HML, BASEL, and DTA) explain 50.50% of the variation of the dependent variable (stock returns). Moreover, STATA conducted an F-test to test the null hypothesis, which is that all the coefficients of the regressions are equal to zero. As Prob > F = 0.0000, the null hypothesis is rejected with a confidence level of more than 99.99%.

*Table 17: Third regression*

| Stock Returns | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------------|-------|-----------|------|------|---------------------|
| Market return | 1.87229 | 0.633961 | 2.95 | 0.003 | 0.622749, 3.121832 |
| SMB           | 0.242655 | 0.377348 | 0.64 | 0.521 | -0.5011, 0.986411 |
Table 17 shows the results of the third regression. Given that use a significance level of 95%, we can conclude that only the market returns and HML are significant statistically. Indeed, given that the P>|t| value is superior to 0.05 for SMB, DTA<sub>f</sub>, ROA<sub>f</sub> and BASEL we cannot conclude anything about their influence on stock returns.

According to the third regression, market returns are economically significant with a coefficient of 1.87 and HML with a coefficient of 1.29.

- Multicollinearity testing

Table 18 displays the VIF value of all our independent variables. Market returns has an extremely high VIF (17.44). For this reason, we chose to abandon it to run our fourth regression.

Table 18: Multicollinearity test with the VIF

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market return</td>
<td>17.44</td>
<td>0.057348</td>
</tr>
<tr>
<td>ROA&lt;sub&gt;f&lt;/sub&gt;</td>
<td>12.82</td>
<td>0.077977</td>
</tr>
<tr>
<td>SMB</td>
<td>7.42</td>
<td>0.134729</td>
</tr>
<tr>
<td>BASEL</td>
<td>7.34</td>
<td>0.136185</td>
</tr>
<tr>
<td>HML</td>
<td>3.22</td>
<td>0.310792</td>
</tr>
<tr>
<td>DTA&lt;sub&gt;f&lt;/sub&gt;</td>
<td>1.76</td>
<td>0.567221</td>
</tr>
<tr>
<td>Meancap</td>
<td>1.00</td>
<td>1.000000</td>
</tr>
</tbody>
</table>
### 5.6.2 Regression Analysis Minimizing Collinearity by Abandoning Market Returns

- **Regression results**

For our fourth regression, we ignored the effects of the market returns. This regression is testing the impact of the SMB and the HML factor, Basel III, the DTA and the ROA ratios. The modified French-Fama 5 factors equation we used for this regression is the following:

\[
r = \alpha + \beta_2(SMB) + \beta_3(HML) + \beta_4(BASEL) + \beta_5(DTA_f) + \beta_6(ROA_f) + \gamma\text{Mean cap} + e
\]

with \( R = \) dependent variable, \( \alpha = \) constant, \( \beta_{2,3,4,5,6} = \) regression coefficient, \( \gamma\text{Mean cap} = \) control variable regressor, \( e = \) error term.

Tables 19 and 20 present the overall model fit of the fourth regression and its Anova table.

**Table 19: Overall model fit of the fourth regression**

<table>
<thead>
<tr>
<th>Number of obs</th>
<th>224</th>
</tr>
</thead>
<tbody>
<tr>
<td>F(6, 217)</td>
<td>36.34</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.5012</td>
</tr>
<tr>
<td>Adj R-squared</td>
<td>0.4874</td>
</tr>
<tr>
<td>Root MSE</td>
<td>.25242</td>
</tr>
</tbody>
</table>

**Table 20: Anova table for the fourth regression**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>13.8922838</td>
<td>6</td>
<td>2.31538064</td>
</tr>
<tr>
<td>Residual</td>
<td>13.8260023</td>
<td>217</td>
<td>0.063714296</td>
</tr>
<tr>
<td>Total</td>
<td>27.7182861</td>
<td>223</td>
<td>0.124297247</td>
</tr>
</tbody>
</table>

For our fourth regression model, the adjusted R-squared is 48.74%. It means that our independent variables account for 48.74% of the variation of the dependent variable. Since Prob > F = 0.0000, we can reject the null hypothesis with a confidence level of more than 99.99%.
The output of the fourth regression is shown in Table 21. We use a significance level of 95%, so all our independent are statistically significant except for DTA\(_{f}\). Indeed, the P>|t| value is superior to 0.05 for DTA\(_{f}\).

The BASEL variable has a coefficient of -0.33, meaning that the implementation of Basel III had a negative effect on the stock returns. However, the link between ROA\(_{f}\) and the stock returns is also negative, contrary to our hypotheses.

- Multicollinearity testing

Table 22 displays the VIF value of all our independent variables. The highest value of the VIF is at 2.92, which testify for the reliability of the fourth regression output.

<table>
<thead>
<tr>
<th>Table 21: Fourth regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Returns</td>
</tr>
<tr>
<td>SMB</td>
</tr>
<tr>
<td>HML</td>
</tr>
<tr>
<td>DTA(_{f})</td>
</tr>
<tr>
<td>ROA(_{f})</td>
</tr>
<tr>
<td>BASEL</td>
</tr>
<tr>
<td>Meancap</td>
</tr>
<tr>
<td>_cons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 22: Multicollinearity test with the VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>HML</td>
</tr>
<tr>
<td>ROA(_{f})</td>
</tr>
<tr>
<td>BASEL</td>
</tr>
<tr>
<td>DTA(_{f})</td>
</tr>
</tbody>
</table>
5.7. REVISED CONCEPTUAL MODEL

Our conceptual model links the Basel III requirements to the stock returns. To verify this model, we used descriptive statistics, correlations, and two multiple regression analyses. The purpose of the multiple regression analysis was to test the relation between our dependent variable, stock returns, and our independent variables (market returns, SMB, HML, BASEL, $\text{DTA}_t$, $\text{ROA}_t$).

According to the results of our regressions, it appears that BASEL, accounting for Basel III, and the ROA have a significant impact on stock returns. We could not verify that the DTA had an effect, as it was not significant in all regressions. In both multicollinearity-corrected regressions (second and fourth), the statistical significance level of BASEL was over 99.99%. The regression output shows a negative relationship between the implementation of Basel III and the stock returns (-0.46 for the second regression and -0.33 for the fourth). The regression also presents a significant negative association between $\text{ROA}_t$ and the stock returns, which is contrary to our second hypothesis.

Taking into account these results, we present a revised conceptual model as well as a summary of the status of our hypotheses.
Figure 12: Revised conceptual model

Table 23: Revised hypotheses

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Significance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 Liquidity (DTA) has a small reverse association to stock returns</td>
<td>0 0.065</td>
<td>Not supported</td>
</tr>
<tr>
<td>H2 Profitability (ROA) has a positive association to stock returns</td>
<td>0</td>
<td>Not supported</td>
</tr>
<tr>
<td>H3 Basel III has a small reverse association to stock returns</td>
<td>0 0</td>
<td>Supported</td>
</tr>
</tbody>
</table>
6.0. DISCUSSION

In this chapter, we present our analysis and discussion of our research. First, descriptive statistics and correlations results will be developed. Second, the regression analysis findings will be submitted. The discussion will take into account the theoretical framework which was previously presented. We will connect our results with existing literature on the subject.

6.1. DISCUSSION FRAMEWORK

Our research project was to assess the relation between the Basel III requirements and the stock returns in the European banking industry. To this end, we used data from 28 European banks on the basis of the 2018 EU-wide stress test. We gathered this data for 8 consecutive years, from 2011 to 2018. We carried out a quantitative research, comprising descriptive statistics, correlations and two multiple regression analyses based on the Fama-French five-factor model.

Our conceptual model included an independent variable, the stock returns, and three independent variables, the Basel III requirements, the DTA ratio (accounting for liquidity by replacing the NSFR), and the ROA (accounting for profitability). We controlled for exterior variables by introducing a control variable, mean capitalization.

6.2. DESCRIPTIVE STATISTICS ANALYSIS

Descriptive analysis is essential in the discussion, as they can bring out patterns that are not easily identifiable in the raw data (Collis & Hussey, 2014, p. 226). In our research, we could indeed notice some trends according to our descriptive statistics. In regards to the LCR, the mean of the variable showed us that on average, the banks largely fulfilled the Basel liquidity requirements. Moreover, there is a trend of increasing LCR years after years. We also found that the standard deviation of the LCR variable was rather high, suggesting that the differences in LCR of the banks are important. The liquidity requirement has a negative impact of stock returns according to the correlations, which is confirming our expectations. This means that banks with the largest liquidity buffers will have lower stock returns. But the correlations between LCR and the profitability (ROA) is positive. In consequence, larger liquidity reserve will not cause a decrease in profitability as we expected it.

With respect to DTA, the mean indicated that the mean showed that on average, banks were funding more than half of their assets with deposits, which attests for the stability of the fundings. However, the descriptive statistics also presented substantial differences in this measure, showing that the stability of the assets’ fundings differs greatly from banks to banks. The NSFR ratio, which is second liquidity requirement measure of Basel III, will only be mandatory to implement starting from January 2020. The approaching deadline should encourage the banks to raise their deposits. Indeed, the NSFR ratio asks for the banks to have at least equal available amount of stable funding to the required amount of stable funding. These stable fundings include deposits, but also equity and long term wholesale funding (funding from the interbank lending market). The DTA had a negative correlation with stock returns, as we were expecting it. But this correlation is almost null, so the link between the stability of the assets’ fundings and the banks’ stock returns is not clearly established.

The ROA descriptive statistics shows that the ROA is erratic from banks to banks. The standard deviation of the variable is very high, and the range of values is also very large,
with negative as well as positive values. The correlation of the ROA with the stock returns was positive, showing that profitability boosts stock returns to an important level. This findings confirms the Fama and French findings (1992), which explains a part of the stock returns with the expected profitability of a firm. However, we found the ROA to be positively correlated to the LCR and the DTA, meaning that banks with the highest LCR and with the most stable funding tend to be more profitable. This contradicts the idea that the liquidity requirements should carry a cost for the banks that was developed by Hoerova et al. (2018). An explanation can be that the most profitable banks can have a large margin to build up their liquidity buffers. Indeed, the opportunity cost arising from it could be less important for such banks, as they are already highly profitable. Hence, they could sacrifice more funding for liquidity requirements (cash or bonds for instance), when less profitable banks could choose to invest in higher yieldings assets (for instance stocks).

6.3.1. REGRESSION ANALYSIS: FIRST AND SECOND REGRESSION, TESTING THE IMPACT OF THE BASEL REQUIREMENTS OF THE DTA RATIO

For the first and second regression, we chose to focus on the effects of the Basel III requirements and of the DTA ratio. We chose to study the effect of Basel III through a dummy variable, BASEL. The DTA was chosen to assess the effect of the stability of the banks assets’ fundings. It can also be seen as a substitute for the NSFR, which was not possible to research due to a lack of available data.

- First hypothesis

Our first hypothesis was that liquidity had a small reverse connection with stock returns. To test this hypothesis, we chose to use deposits-to-assets as a liquidity measure throughout the period and to test its impact on stock returns. The DTA is statistically significant in these first and second regression. The DTA has a positive coefficient, which would mean that DTA has a positive impact on the banks’ stock returns. However, the DTA variable was found to be non significant in our third and fourth regression analyses, so we could not support our first hypothesis.

- Second hypothesis

Our second hypothesis was that profitability (measured with the return on asset, ROA) has a positive connection to stock returns. However, we decided to exclude ROA from the first regression, to be able to really isolate the effects of the Basel III requirements and of the DTA ratio. The results of the multiple regression analysis taking into account ROA as an independent variable are presented in the next section. In consequence, we could not infer anything from our first and second regression regarding our second hypothesis.

- Third hypothesis

The third hypothesis was that the Basel III requirements have a small reverse connection to stock returns. The results of the multiple regression analysis relating to the Basel III requirements were statistically significant. This means that the third hypothesis is supported. The regression coefficient of Basel III on stock returns was found to be negative and quite high. Consequently, our third hypothesis is supported. It appears that the banks were negatively impacted by the implementation of Basel III.

For the third and fourth regressions, we included the Basel III requirements, the DTA and the ROA as independent variables. After having studied the impact of the liquidity requirements from Basel III with the first regression, we chose to incorporate the ROA. Through this second regression, we aimed at getting a better estimate of the actual stock returns by using the Fama French five-factor model.

- First hypothesis

Our first hypothesis stated that liquidity had a reverse connection with the stock returns. The multiple regression results showed DTA is not statistically significant on a 95% level. This means that the hypothesis that liquidity has a negative relation with stock returns cannot be supported. In particular, in the case of the DTA, it would suggest that a bank can increase its increase or decrease its available amount of stable funding, namely deposits, without altering its stock returns.

These results concerning the effect of liquidity and stock returns being statistically nonsignificant relatively to the stock returns are contradictory with the work of Boualam & Cororaton (2018), which shows that banks with higher measures of liquidity risk have lower yielding stocks.

- Second hypothesis

Our second hypothesis was that profitability (measured with the ROA) has a positive connection to stock returns. The results of the fourth regression showed that the ROA variable had a significant negative impact on the stock returns (-0.85). In consequence, we could not support our hypothesis, since our ROA variable had a negative coefficient.

In addition, we also add trouble drawing conclusions from our ROA variable. The ROA variable is a constructed variable, which does not account exactly for ROA. Indeed, the ROA variable is a measure of the difference of stock returns between the banks with the highest ROA ratios and the banks with the lowest ROA ratios. Consequently, the negative coefficient of the ROA variable does not mean that the profitability (which ROA is measuring) has a negative impact on the stock returns. The variable is only relevant when studying a portfolio. It shows that in a portfolio, the range of the difference in the assets’ ROA will have an impact on the global stock returns of the portfolio. The larger is the difference in the assets’ ROA, the larger will be its negative impact on the global stock returns of the portfolio. In consequence, we cannot conclude on the specific effect of the ROA, especially when dealing with a single bank and not a portfolio of banks.

- Third hypothesis

Our third hypothesis was that the Basel III requirements have a small negative association to stock returns. The results of the fourth multiple regression analysis relating to the Basel III requirements were statistically significant. Our third hypothesis is therefore supported. The Banks’ stock returns were negatively affected by the implementation of the Basel III Accords, starting from 2015.
7.0 CONCLUSION

This chapter includes the conclusions of the research and answer the main research question. The general conclusion, theoretical and practical contributions reflect the main results of our analysis while the quality of the research and suggestions for further research describe the reliability and validity of the research and possible in-depth study of the thesis subject.

7.1 GENERAL CONCLUSION

The research purpose of our thesis is to assess the effect of Basel III liquidity requirements on the stock returns. To this end, we focused on the following variables: the BASEL dummy variable, the deposits-to-asset ratio, the liquidity coverage ratio, the return on assets and the stock returns. Using the Fama-French five-factor asset pricing model, we have answered the main research question: How does the introduction of the main Basel III liquidity requirements, the liquidity coverage ratio, affect banks’ stock returns?

The first part of the analysis has included the estimation of the correlation coefficients. The results have approved our hypothesis that LCR has a reverse connection with stock returns, which is more important than expected. The correlation coefficients also supported the assumption that DTA has a small reverse connection with stock returns, although not substantial. The hypothesis of a positive association between ROA and average stock returns was not confirmed with the result of the correlation.

The second part of the analysis was based on the multiple regression analysis of the Fama-French five-factor asset pricing model. The results have revealed that the only hypothesis of the effect of the Basel III requirements on stock returns was significant. The reverse relationship between the two variables was proven. According to the results of multiple regression analysis, the implementation of Basel III has a strong negative effect on the stock return which supports our expectations.

7.2 THEORETICAL CONTRIBUTIONS

This research contributes to the existing theoretical literature about the influence of Basel III on the stock return of the banks. Applying the five-factor asset pricing model allows us to investigate the effect of the Basel III requirements on stock returns in terms of size, value, and profitability of the banks. The implementation of the Basel III main measure, the LCR, was only four years ago, which explains the gap in the existing literature about the results of its impact. Hoerova et al. (2018) have analyzed the influence of the LCR and NSFR in terms of the costs of the banks, which considered to be very low.

In addition, our research has been expanded by the analysis of the influence of the liquidity and profitability on the stock returns. Fama and French (2005) have ascertained that higher profitability leads to higher expected stock returns. However, according to multiple regression analysis in our research, the DTA and ROA were not statistically significant.

7.3 PRACTICAL CONTRIBUTIONS

Not only does our project degree fills in a gap in the literature it will also be useful in practice. As a matter of fact, our results, which unveil the positive effect of the Basel III liquidity requirements on stock returns, could urge banks to build up their liquidity buffers. The internal liquidity management could be influenced by the knowledge of this research.
During the 2008 crisis, liquidity issues led to catastrophic results. Many banks suffered from liquidity shortages and faced insolvency in consequence (Congdon et al., 2009, p. 195). More than 10 years after the financial crisis, liquidity management could still be improved in the banking industry. Our study, by enlightening bankers on the positive aspects of the LCR, could help them in managing liquidity risk.

7.4. SUGGESTIONS FOR FURTHER RESEARCH

The Basel III liquidity requirements were established to prevent liquidity shortages in banks during economic shocks, which could lead to insolvency. We could only test the effect of Basel III in general rather than the individual effect of each liquidity measure (the LCR and the NSFR). The subject is still very new, with only four years to study for the LCR, and maybe it will be easier to establish patterns if a few years, thanks to supplementary data. Of course, a complement of our work would be to study in particular the effect of the NSFR, which is currently hardly possible due to the lack of available information. Moreover, we chose to focus mainly on the European Union (with the exception of one bank from Norway). It could be interesting to see the impact of the Basel III liquidity requirements in other geographical locations. In particular, its effect on the banking system of developing countries could be interesting to study.

7.5. QUALITY OF THE RESEARCH

7.5.1. RESEARCH LIMITATIONS

The research is based on the list of 40 banks covered by the EBA EU-wide stress test of 2018. During the data collection, we have excluded all private and bank’s, which did not disclose the values of LCR. After we got 28 banks for the analysis. All of these banks are situated in Europe and, according to Basel III, should include LCR in their annual reports. Based on this observation we can state that not all of the banks are fully transparent. Furthermore, the research is limited within one economic region. Almost all the banks are from the European Union (excepting one bank from Norway) and regulated by European banking authority. The short-term period of the LCR analysis is due to the implementation of the requirements four years ago, which has limited us in the timeframe.

Furthermore, we chose to use the Fama-French five-factor model, which is not easily interpretable. The model is based on constructed variables as opposed to the actual variables. For instance, our DTAf is not equal to the actual DTA. It is the difference between the average stock returns of the banks with the highest and the lowest liquidity cover ratio. The results of our correlations and regressions can thus be quite difficult to clarify. However, we have tried to distinguish between constructed variables (DTAf, LCRf, ROAf) and actual variables (DTAx, LCRx, ROAx) all along our thesis.

7.5.2. RELIABILITY

The reliability of a research is based on the possibility to repeat it and to get the same results. For this purpose, the measures used in the model should be relevant (Bryman & Bell, 2011, p. 80). In the case of our degree project, we used the Fama-French five-factor model and designed our variables according to Fama and French explication of their model (2014), which is itself based on their three-factor model (1993). An extensive set of research work used this model, proving its reliability. Moreover, we gathered most of our data from Thomson Reuters Eikon, which is an high-quality financial information database. The other source of information we used was the annual financial reports and annual risk reports,
which are subject to the international accounting standards and which are thoroughly audited. Finally, we used the STATA software to get the results of our descriptive statistics, correlations, and regressions, which is a guarantee of the calculations included in our work. As we worked on publicly available information and on the basis of an already existing model, other researchers investigating the same research question as we did should get similar results.

7.5.3 VALIDITY

In order for a research work to be valid, three conditions need to be met: face, construct and internal validity. Face validity means that the research should appear to be valid. Common sense should validate the selected method of research. It is not sufficient to assess full validity but it is the first step. Construct validity checks that the model is indeed doing what it intends to do. In our case, construct validity assesses that our model is accurately representing the impacts of the liquidity coverage ratio on the stock returns. Internal validity occurs when there is an actual causal relationship between the variables analyzed. Indeed, changes in the dependent variables could be caused by external factors. Internal validity controls that the independent variables are in fact explaining the variations of the dependent variables. Globally, validity deals with the accuracy of the measures chosen to investigate the research questions. In our degree project, we used the LCR, the DTA ratio and the ROA ratio, which are used in the existing literature to study liquidity and profitability. We thus recognize our research as valid.
REFERENCES


Corporate Finance Institute. (2019). *Fama-French Three-Factor Model - Components, Formula & Uses*. Available at: https://corporatefinanceinstitute.com/resources/knowledge/finance/fama-french-three-factor-model/?fbclid=IwAR3f0dx94sxZfXaJnSAf1erZTcwy0yWea0hhdXLq9-XiQ-dfdQcE-QWwSU [Accessed 22 May 2019].


APPENDIX

Appendix 1: List of banks from the EU stress test of the EBA.

1. Raiffeisen Bank International AG
2. Erste Group Bank AG
3. KBC Group NV
4. Belfius Banque SA
5. DZ BANK AG Deutsche ZentralGenossenschaftsbank
6. Landesbank Baden-Württemberg
7. Deutsche Bank AG
8. Commerzbank AG
9. Norddeutsche Landesbank - Girozentrale
10. Bayerische Landesbank
11. Landesbank Hessen-Thüringen Girozentrale AdöR
12. NRW.BANK
13. Danske Bank
14. Jyske Bank
15. Nykredit Realkredit
16. Banco Santander S.A.
17. Banco Bilbao Vizcaya Argentaria S.A.
18. CaixaBank, S.A.
19. Banco de Sabadell S.A.
20. OP Financial Group
21. BNP Paribas
22. Groupe Crédit Agricole
23. Société Générale S.A.
24. Group Crédit Mutuel
25. Groupe BPCE
26. La Banque Postale
27. Barclays Plc
28. Lloyds Banking Group Plc
29. HSBC Holdings Plc
30. The Royal Bank of Scotland Group Plc
31. OTP Bank Nyrt.
32. Bank of Ireland Group plc
33. Allied Irish Banks Group plc
34. UniCredit S.p.A.
35. Intesa Sanpaolo S.p.A.
36. Banco BPM S.p.A.
37. Unione di Banche Italiane Società Per Azioni
38. N.V. Bank Nederlandse Gemeenten
39. ABN AMRO Group N.V.
40. ING Groep N.V.
41. Coöperatieve Rabobank U.A.
42. DNB Bank Group
43. Powszechna Kasa Oszczedności Bank Polski SA
44. Bank Polska Kasa Opieki SA
45. Skandinaviska Enskilda Banken - group
46. Nordea Bank - group
47. Swedbank - group
48. Svenska Handelsbanken - group