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SCHOOL OF BUSINESS, ECONOMICS AND LAW

Banks' reactions to the Basel III regulations

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Tutor:

Gudrun Baldvinsdottir

Authors:

Sinéad Mooney, 880729

Camilla Rasmussen, 880509

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Sinéad Mooney

Camilla Rasmussen

Abstract

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Authors: Sinéad Mooney and Camilla Rasmussen

Tutor: Gudrun Baldvinsdottir

Title: Banks' reaction to the Basel III regulations

Background and problem discussion: In the aftermath of the 2008 financial crisis, regulators agreed upon new capital requirements in order to avoid a new crisis and to strengthen the stability within the banking industry.

Purpose of study: The main purpose of this thesis is to find out how the stability of banks within Europe have changed due to regulations.

Methodology: The thesis will use quantitative methods to gain an understanding of the stability in banks. Financial data from the database Bankscope, which provides data from banks' annual reports, is collected and analysed. Annual developments are investigated as well as differences between countries. Correlation analysis and regression analysis is performed.

Empirical findings and analysis: In general banks have raised their equity ratios and their Tier 1 ratio. There seems to be a positive relationship between equity to total assets and net interest margin. For some periods the NIM-model holds for some countries. Net interest margin seems to be dependent on equity to total assets as well as other variables. This suggests that regulating equity will also affect other variables.

Conclusion: The Basel III regulations seem to have the effect of making banks raise their equity ratios, whether this effect also means that banks are more stable is unclear. The differences found between the investigated countries suggests that further studies would be useful to ensure how the regulations are affecting banks in different countries differently, and if banks really are more stable.

Keywords: banks, Basel III, equity to total assets, net interest margin, regulations, correlation, financial crisis, stability.

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1 Introduction

1.1 Background

1.1.1 Links between banks and crisis

Since the existence of paper money there have been a number of financial bubbles and crises ranging from for instance the Dutch tulip bubble in 1637 (Rider, 2007), to the Kreuger crash in 1930, to the recent crisis associated with the collapse of Lehman Brothers in 2008. Some crisis have been rather similar others not. One thing all crises have in common is the existence of a loser, or one who has to pay for the loss of money. In the recent financial crisis several banks collapsed and the impact of the crisis caused states to suffer severe financial problems, which means that the real losers were the taxpayers (Torfason, 2014).

During the years leading up to 2008, when the recent financial crisis began, households around the world rapidly increased their debt in relation to disposable income (Torfason, 2014). The increased borrowing was made possible mainly by financial institutions that simply created more credit in order to lend more (Keen, 2011). The financial crisis did not happen overnight and the underlying causes are complex. What is clear is that liquidity in banks gained a crucial role, and liquidity is closely linked to debt and equity measures. That many banks prioritized debt over equity showed since most banks continued to pay out dividends throughout the crisis; during times when they more than ever were in need of securing their own equity (Achraya, 2011).

1.1.2 Liquidity and equity

In an interview for the Guardian made 5 years after the bankruptcy of Lehman Brothers, Alistair Darling, Britain's former Chancellor of the Exchequer, recalls a phone call from Sir Tom McKillop, chairman of Royal Bank of Scotland, which demonstrates the severity of the liquidity situation back in October 2008:

"The message was brief: 'We are haemorrhaging cash. What are you going to do about it?' The chancellor knew that Britain's biggest bank was in trouble even before McKillop came on the line, yet even the normally phlegmatic Darling was surprised at the size and immediacy of the crisis. 'I asked how long he could last, expecting him to say that we had 24 hours. Instead, McKillop said RBS's cash would last for only two or three hours.'" (Elliott, 2013)

From a short-term perspective liquidity is crucial for the daily operation of a bank, as for most other corporations. Some argue that liquidity problems were the main cause of the recent crisis, but what shouldn't be forgotten is to look at *why* the

liquidity problems occurred (Admati & Hellwig, 2013). In order to maintain liquidity balance in their systems banks borrow from other banks. This is mainly short-term debt, which can be due within days or even overnight. The system is built on confidence that debts will be renewed when needed to. When the crisis arose the lack of confidence for other institutions to pay back their debts was shown by the unwillingness for lenders to renew short-term debt agreements. This caused immediate liquidation problems for the borrowing institutions. Except of taking on short-term debt, a bank with liquidity shortage could try to raise new capital or liquidate assets. Since the confidence for banks was on the verge of collapsing, raising new equity would be nevertheless harder than renewing short-term debt agreements. Banking assets are normally to a large degree constituted by long term lending and other long-term agreements, the type of assets that are not traded on an active market and would not easily be liquidated. Pushing to sell assets in this situation, when also they are most likely unattractive investments for others, would imply selling to a loss (Admati & Hellwig, 2013).

This type of action would perhaps solve a temporary liquidity issue, but would not be a solution in the long term; in fact, selling assets at a loss would, due to the state of most banks balance sheets, trigger a disaster. The reason for this is the low equity ratios pervading the banking sector the last decades. The consequence of financing assets mainly with debts is that you take on a higher risk. This leads to major implications if the assets have to be sold at a loss; not only would possibly the whole original equity invested in the asset be lost, there might be additional interest-bearing debt left as well. Since the 1990s equity within banks have generally been 5-10%, and, especially before the crisis hit, the levels were even lower in many European banks. Compared to corporations in other sectors, where equity levels considered healthy are normally above 30 %, the equity levels within banks are extremely low. This behaviour of taking on risk is relatively new, up until the middle of the 19th century 40-50 % of equity was a normal equity level for banks, and during the first half of the 20th century equity levels of 25 % were still common. Back then, banks were more cautious of taking on risk since they themselves were responsible for fulfilling their commitments (Admati & Hellwig, 2013).

1.1.3 How banks make money

The conditions to conduct banking have changed in several ways the last century. Borrowing and lending is still most bank's primary source of income, but other services provided by banks can today make up for almost half of the generated operational income. Many services provided are traditional banking services that generate income through paid fees. This can be different types of transaction services, including both checks and cash, safe-keeping and deposit services, advisory services regarding savings and investments, or insurance services such as annuity contracts. The last decades improvement, regarding financial processes and

pricing methods, have enabled higher incomes for retail payments and consumer lending. In recent years nontraditional banking activities have also lead to substantial increases in income. This has mainly become possible due to banks taking advantage of many deregulations. These fairly new activities include investment banking, mutual fund sales, securities brokerage and insurance agency and underwriting (Rice, 2004).

In spite of all these new ways to generate income, the interest margins on which banks make a profit, by lending and borrowing, are still highly important; both from the banks perspective and for the society. The way banks make money through lending and borrowing is to charge higher interest on loans than they pay on saving deposits (Torfason, 2014). That banks take on the role of being the middle hand, and moving money, is, together with the convenience of not having to look for lenders or borrowers for themselves, what customers are willing to pay for.

In the last few years the repo interest rate has been lowered (repo is the interest rate which banks borrow at from the national bank). The reason is that the national banks are trying to promote consumption in times after a financial crisis (Wilkinson, 2014). This holds for some states in the USA as well as some countries in Europe (N.M., 2013). The trend for most European banks is a decline in net income, but for some Swedish banks the net income have increased even in harder times. For example Swedbank had an income growth of 13% between the third quarter of 2012 and 2011. Furthermore it is stated that the largest banks in Sweden have doubled their net interest margin on 5-year loans over period of four years (Villaägarna, 2012). The interest for mortgages has been lowered for the customers, but the repo interest rate has been lowered much more. This means that the banks have actually raised their net interest margin with 0.07 percentage units up to 0.64% in the last quarter of 2012 (Gustafsson, 2013). Furthermore SEB raised their net interest margin on mortgage loans between 2008-2009 from 0,5 - 0,6 %, the same action was taken by Nordea during the same time period, raising from 0,79 - 0,91 % (Åkesson, 2010). The fact that some Swedish banks have raised their net interest margin raises a lot of opinions, including from the former Swedish finance minister Anders Borg. He thinks it is provoking that the banks continue making a high profit through their high interest margins, which only strike the costumers, and he continues saying that the society's economy would become a lot better if the banks lowered their interest to their customers (Neurath, 2012). On the contrary, Mats Andersson, an independent bank analyst, finds it great that banks raised their net interest margins, since he considered that they were too low, and did not reflect the risk good enough. With the rise in net interest margin, banks now reflect the risk even better (Lejland, 2009). The same trend holds true for the business interest rates. Since 2008 the average interest for a business loan has doubled in Sweden, even though the repo interest has dropped. It is furthermore stated that low interest rates have not made it easier to take a business loan and those affected the most are the smaller businesses (Klingbert, 2014).

1.2 Problem Statement

In order to diminish underlying problems that caused the financial crisis, and to prevent a similar incident to happen again, authorities have tried to tighten regulations of banks and other financial institutions (Torfason 2014, pp. 2-11). One institution that regulates banks is the BIS, abbreviation for *Bank for International Settlements*. BIS have implemented three major regulations called Basel I, II and III. Basel III was introduced in the footsteps of the financial crisis. Its main purpose is to strengthen the ability of banks to withstand losses, and thereby prevent future crises. Basel III will not be fully implemented until 2019, by then part of the goal is that banks should have at least 4,5% core Tier Capital and 8% total equity capital (BIS, 2014d). These good intended regulations have received praise but also been subject for criticism. For instance Admati & Hellwig suggests that the levels required by Basel III is not enough, they call for a 25 % criteria instead (Torfason 2014). Another source of criticism, Susan Krause-Bell, states that high capital requirements does not necessarily solve the problem, and that the financial market have always made financial innovations to avoid regulation to gain higher returns (Krause-Bell 2009).

1.3 Purpose

Six years have now passed from the outbreak of the most recent financial crisis. The main purpose of this thesis is to find out how the stability within banks in Europe has changed due to regulations. This thesis will, by looking into certain variables, investigate if the work to regain stability in the banking sector has paid off and if the financial security within banks has improved.

1.4 Research questions

The main research question of this study is whether banks have regained stability after the 2008 financial crisis, and if the Basel III regulations are contributing to regaining stability.

To achieve the purpose of this thesis and answer the main research question two different aspects of stability will be investigated. One aspect is the equity levels within banks; higher equity levels could indicate a more stable bank. Two different equity measures will be investigated; equity-to-total-assets and Tier 1 capital.

The second aspect is to look at the Net interest margin (NIM), which is historically the main income source for banks and closely linked to several different variables.

To be able to make conclusions the following questions will be investigated:

1. Has equity to total capital ratio increased after 2008?
2. Has Tier 1 capital increased after 2008?
3. How has NIM developed 2005-2013?
4. How has Total assets developed 2005-2013?
5. Is there a relationship between equity-to-total-assets and NIM?
6. Is there a relationship between Tier 1 capital and NIM?
7. Is there a relationship between equity-to-total-assets and Total assets?
8. Is there a relationship between Tier 1 capital and Total Assets?
9. Is there a difference between Germany, Great Britain, France, Italy and Sweden concerning question 1-9?
10. Are there indications of an optimal level of equity-to-total-assets?
11. Is it possible to regulate, i.e. change, the equity-to-total-assets ratio without influencing other variables?

2 Research Methodology

2.1 Research design

The research questions explore the differences and similarities between banks' financial positions. To gain a deeper understanding it is relevant to compare banks from different countries within the same geographical region. The reason why the thesis will be built on this design is to achieve a comparative understanding to gain insight of how the implementation of the Basel III regulation is going and what impact Basel III has had so far, thus it is needed to explore the background and reason for the regulation as well.

To answer the questions above a number of banks financial data will be studied and their equity to total asset ratios will be analysed to make an evaluation of their financial stability.

2.2 Research method

The financial data have been collected from the database Bankscope, which is accessible through the library of the University of Gothenburg. The theoretical framework is based on articles and research, which have been collected from trustworthy internet sources through the library of University of Gothenburg.

2.3 Approach

The questions above will be explored from a quantitative approach, which enables the use of statistical tools, for instance correlation analysis. This has certain advantages and disadvantages. When using statistical tools you have the opportunity to explore if there is a relationship between variables, which is calculable through statistical formulas. One disadvantage can be the time frame and the fact that statistics are based on historical values. For forecasting, the relevance of historical values can be questioned since it's not sure that future outcomes are based on previous events (Cortinhas, 2012).

2.4 How the study was conducted in practice

Data was downloaded through Bankscope with all limitations mentioned in 2.5.1-2.5.5 set as search criteria. The retrieved data was exported to Excel, where it was sorted and reductions to the sample were made due to missing data for some years. Attempts were made to find missing data in associated financial reports, but the underlying causes for the missing data was justified due to reasons such as change in accounting standards. When the sample was complete the data was exported from Excel to SPSS. In SPSS we conducted our tests and the results were generated in tables and graphs. Some graphs could be constructed directly in Excel. All graphs and tables from SPSS and Excel were copied into Word.

2.5 Limitations

2.5.1 Accounting standard

Obviously there are some differences in the balance sheet reports when using different accounting standards (Admati & Hellwig (2013) p. 84). In the GAAP (general accepted accounting principles) there are some limitations to whether a bank needs to show "trading and other assets" compared to IFRS (International Financial Reporting Standards). For instance when JP Morgan reports a balance sheet for 2011, where the total assets amount to 2,27 trillion dollars according to GAAP, it will at the same time amount to 4,06 trillion dollars when using IFRS (Admati & Hellwig, 2013). This affects the use of the equity to total assets ratio, since the GAAP standard will show a higher quote and signalling that the bank is more stable. On the contrary, IFRS takes more into consideration in the balance sheet, and will show a smaller quote thus signalling a relatively less stable balance sheet. To insure that the data is comparable, the data that is being exported from Bankscope will be from annual reports using IFRS. It is also known that IFRS is more frequently used in Europe whereas GAAP is mainly used in North America.

2.5.2 Geographical region

Since the economy is very interconnected across countries it will be more interesting to view a region compared to in-depth analysis of a specific country, therefore this study will cover a specific geographical and political region. The chosen region to focus on is the member countries of the EU, partly because we can strongly relate to, and have a greater understanding of this area. Another reason is that many large banks, several of which struggled during the financial crisis, are based in the EU, and they are therefore relevant to include in this examination. As inhabitants of the EU we have a better recognition of this area's banks in general compared to other regions, and a better understanding of the culture of the organization's countries, which might be helpful in understanding the development. As noted above IFRS is the accounting standard most frequently used in the EU, which enables comparable studies on the region.

2.5.3 Selection of banks

2.5.3.1 For investigation of stability in the EU

The starting point was the 200 largest banks in the EU, which match the criteria, and had sufficient data available. The reason why the thesis looks into large banks, is because they can cause more harm to the economy if they fail compared to smaller ones (Admati & Hellwig, 2013). All holding companies have been excluded from the sample.

Since some countries are home to several banks, this study will cover a broader selection of banks in some countries compared to others. First step was to look at all banks from all countries represented within our first selection of all largest banks in Europe. Next step was to see if it is possible to find any differences between some countries in the EU. The countries chosen for individual comparison is Sweden, France, Great Britain, Germany and Italy. Sweden is where this study originated, and Swedish banks have fared well during the recent crisis relative to most other countries banks, which is why it is an interesting country to include in this study. The other four countries make up the largest economies in Europe. The similarity of these countries differs, quite large differences is expected to be found between for example Germany and Italy, therefore it should be possible to find interesting and comparable results looking at this group of countries.

To be able to study the above specific countries data was collected again, this time all banks in these countries were included, as long as data was available.

2.5.3.2 Selection of banks for investigation of NIM-model

The investigation of the NIM model will only consider 4 countries; these are the 4 biggest economies in Europe, which are France, Italy, Germany and Great Britain (World Bank, 2013). All banks for in these countries, with sufficient data available according to our search criteria, were included in the samples.

2.5.4 Selected time range

2.5.4.1 Selected time range for investigation of stability in the EU

To give a better understanding of the capital development, this report will investigate the bank's financial positions in the time range 2005-2013. As noted this time range covers the financial crisis of 2007-2008, thus it is expected to see this reflected in the data.

2.5.4.2 Selection of time range for investigation of NIM-model

The investigation of the NIM model will be divided into 2 time periods, before and after the financial crisis. In the time before the financial crisis data was collected from 2005 and 2006, which will be considered together. In the time period after the financial crisis data was collected from 2012 and 2013, which will be considered together as well.

2.5.5 Investigated ratios and variables

2.5.5.1 Ratios for stability investigation within EU

Equity to total assets

As stated in the problem formulation this thesis investigates the development of the equity to total assets ratio, which is calculated in the following way:

$$\frac{\text{Equity}}{\text{Total Assets}} * 100$$

Total assets

Total assets are defined as the amount of which the balance sheet amounts to. Equity is defined as the amount that the bank owes to it's owners (Admati & Hellwig, 2013).

Net interest margin

Furthermore, to investigate how banks have financed a greater equity to total asset ratio (if they have had an increase in the ratio) we will look into Net Interest Margin (NIM). The NIM is calculated as:

$$\frac{\text{Interest earning} - \text{Interest expenses}}{\text{Interest earning assets}} * 100$$

This ratio tells the percentage difference between banks' borrowing and lending rates, thus their profit margin on lending and interest rates.

Tier 1 capital

Tier 1 capital is calculated individually by each bank within the limits of the Basel III regulations, which states all criteria that has to be fulfilled for capital to be counted as Tier 1 (see detailed information in theory section). Tier 1 capital ratio is the Tier 1 capital in relation to its risk-weighted assets. The size of a bank's Tier 1 capital and risk-weighted assets can be calculated differently depending on which regulations have been applied, and if transitional regulations have been taken into account. The banks' Tier 1 capital has to be approved by financial authorities from each bank's country (Riksbanken, 2013). It is not possible to get information regarding how different banks have calculated their ratios, therefore we have to assume that Tier 1 ratio reported in BankScope is correct.

2.5.5.2 Variables for the NIM model

In the study of the NIM model, several variables are necessary for conducting the regression formula:

$$NIM_{it} = C_i + \beta_1 BANKHI_{it} + \beta_2 NIEAA_{it} + \beta_3 ETA_{it} + \beta_4 LACSTF_{it} + \beta_5 LLRGL_{it} + \beta_6 Cov_{it} + \beta_7 LNTA_{it} + \beta_8 LNLO_{it} + \beta_9 CFTA_{it} + \varepsilon_{it}$$

The variables are as follows:

1. Market structure, *BANKHI*, is the bank's total deposits divided with the total amount of deposits in the same country in which the bank is active the ratio is subsequently squared.
2. *NIEAA*, is the non interest expense divided with total assets and is used as a proxy for operating costs.
3. *ETA*, is the level of risk aversion. The equity to total asset ratio is a proxy for *ETA*.
4. *LACSTF*, is the ratio of liquid assets divided with customer and short term fundings, and is used as a proxy for the inverse interest rate risk.
5. *LLRGL* is a proxy for credit risk and consists of the ratio of loan loss reserve to gross loans.
6. The covariance of credit risk and interest risk, *COV*, is the product of the two previous key figures (*LACSTF* * *LLRGL*).
7. *LNTA*, is the proxy for the size of operation and is found by taking the logarithm of total assets.
8. *LNLO*, is the logarithm of gross loans.
9. Capital adequacy, *CFTA*, is expressed as capital funds divided by total assets. (Nguyen, 2012)

2.6 Reduction of banks in the sample

2.6.1 Sample of largest banks in the EU for investigation of stability

The starting point was as earlier stated 200 banks. For each financial ratio some banks had to be removed from the sample because data was not available for all years. For equity to total asset ratio especially data from 2005 and 2006 was missing in several cases, which reduced the sample by 60 banks. After the first downscaling missing data for NIM and Total Assets reduced the sample a bit more, but not with a large number. For Tier 1 ratio, data was missing for a large number of banks over several years, and many did not have any data at all available for Tier 1 ratio. After adjusting for missing data in Tier 1 ratio around 100 banks were left in the sample. The last scaledown was done by removing 5 holding companies which were still in the sample. The final sample consists of 94 banks, meaning the original sample was reduced by more than 50%.

In order to keep a larger sample a possibility would have been to exclude the year of 2005 in the study, this action would result in a sample of approximately 120 banks. The tradeoff would have been that only two years from the time before the recent crisis would be taken into account, which would limit the ability to identify changes before and after the financial crisis. Therefore this action was decided against, and the sample of 94 banks has been used.

Two different datasets

When investigating correlations and testing hypotheses two different datasets were used. Dataset 1 simply consisted of the values for each year for each variable. Dataset 2 was constituted of the changes between the years.

Samples for individual countries

From the sample of the 94 banks a filter was set to find the banks from the selected countries. This resulted in a total of 53 banks, France 15, Germany 8, Great Britain 13, Italy 11 and Sweden 6.

2.6.2 Sample of 4 countries for investigation of NIM-model

All banks within the 4 countries were selected in Bankscope and their financial data was downloaded to Excel. If one bank missed a value for a given variable in a given year the bank was taken out of the investigation, this resulted in a great loss of banks in the samples for the 4 countries. France had 43 banks left, Great Britain 40 banks, Germany 16 banks and Italy 16 banks left.

2.7 Statistical tools and analysis

To get an overview of the development of the chosen ratios the data will be presented in a trend graph. From these diagrams it is possible to investigate the average to get a first impression of the development.

2.7.1 Simple linear regression

The correlation between the development of net interest margin and the equity to total assets will be investigated as well as the correlation between Net interest Margin and Tier 1 ratio. Simple linear regression will be used to detect if NIM and Total assets have significant impact on equity to total asset and Tier 1 capital ratio. Using simple linear regression means only one single independent variable will be used in each regression. The dependent variables will be equity to total assets ratio and Tier 1 Ratio. The regressions are as follows:

$$\begin{aligned}ETA &= \beta_1 NIM + e \\ETA &= \beta_1 Total Assets + e \\Tier\ 1\ Ratio &= \beta_1 NIM + e \\Tier\ 1\ Ratio &= \beta_1 Total Assets + e\end{aligned}$$

The investigation will then continue to compare differences between countries and to determine if some countries are better at developing their equity to total assets than others. The countries we look into are; Sweden, Germany, Great Britain, France and Italy.

2.7.2 Pearsons coefficient

To test whether there is a correlation Pearson product moment correlation coefficient will be used. This test gives a coefficient, “r”, which describes how well the correlation is. The coefficient “r” can range from -1 to +1, where -1 signals perfectly inverse correlation and +1 signals perfect correlation (Cortinhas, 2012).

A similar and correlated coefficient is the R-square, which is simply the square of the “r” as defined above. One advantage to use r-square is that one can convert it directly into percentage. For example a r-square on 0,7 could be interpreted like 70% of the variation in y is explained by the regression model. In this study an acceptable r-square level is 0,5.

If there is a relatively perfect correlation it is reasonable to determine the equation of the regression model, to make it possible to forecast a given NIM-value when the other variable is known.

2.7.3 Multicollinearity and heterogeneity

When applying statistical tools one must assume that the data satisfy certain assumptions, for example that the data is normally distributed, which often is achieved if the sample size is above 30 observations. Another assumption, which has to be met, is that the sample size needs to be randomly collected. A third assumption is that the variables have to be independent from each other; otherwise this would result in the problematic condition of multicollinearity. If any of these criteria are not met it might give a wrong regression line, which then cannot be applied to the whole population (the main purpose of statistics is to take a small sample from the population to make assumptions on the population as a whole). One way to check for the phenomena of multicollinearity and skewness of the distribution are for example to look at the variances, which are the differences between the predicted values (\hat{y}) and the real values (y) (the predicted values are found by plotting the observed x-values into the regression formula). Usually the variances are plotted into a graph to better determine how the variances relate to each other. If the variances are constant, e.g. almost the same, then the regression line could be applied for the whole population. If the variances follow a pattern, for instance they might become larger and larger as the x-values go up, then it is a sign of a bad regression formula, and it cannot be applied to the whole population (Cortinhas, 2012).

2.8 Currency conversion

When the total assets data was downloaded it appeared that some of the banks had reported in their local currencies. To make the data comparable, it was necessary to find currency rates for each year in the time period 2005-2013 at the balance date. Often 1th of January was closer to balance date than 27th of December, and in those instances the currency stated at 1th of January was used instead of the one at 27th of December. The source used for exchange rates was <http://www.xe.com> which provides exchange rates back to at least 2005.

2.9 Source criticism

In this work both primary and secondary sources have been used. The theoretical framework section looks into contemporary research and doctoral theses, secondary sources. In the empirical finding section most of the data comes from a database, called Bankscope; a primary source for this thesis. The data in Bankscope comes from annual reports and contains detailed data, which has been manually entered by the providers of the database. The advantage is readily accessible data that covers many years and over 29 000 banks from all over the world. On the contrary the disadvantage could for instance be enter-errors, biases and perception differences,

and that the annual reports in some cases perhaps have been manipulated (BIS, 2014a). When presenting the theoretical framework it seems reasonable to be as objective as possible, and at the same time present the latest research on the topic. Therefore the latest research has been divided into two categories - for and against Basel regulations.

Another point of critique is the calculation of Tier 1 capital. As an analyst you have no idea how the banks calculate this ratio, the only thing you can be sure about is that the financial supervisory authorities have approved the ratios.

3 Framework

3.1 Why control the bank industry?

3.1.1 Banks solvency

A bank's balance sheet is in short a combination of cash and loans on the asset side, and of deposits, short and long term debt, and equity on the liability side. The balance sheet works as an explanation, since you could ask which assets the bank is controlling, and how these are financed. Banks have an important service function in the economy, for example checking accounts that make it possible for customers to transfer money and payments. The bank is also more or less responsible for the infrastructure of debit and credit cards. An efficient system makes it cheaper for the customer. Another important task is to provide all different types of loans; consumer, car, and house loans. In this way the bank is an intermediary and creating channels for the money flow. (Admati & Hellwig, 2013)

The reason why banks have a cash reserve is for the daily outflow of money, it would be a rather impossible task if the bank should convert for example a 30-year-old loan into cash to satisfy the daily money outflow. If all customers wanted to take out their money from the bank, it would not be possible since their money are converted into long term loans or other investments. There is actually a constant mismatch between the two sides of the balance sheet, since the bank holds long-term loans which is financed through short-term debt, thus banks renew their short-term debts often and they are highly dependent on the renewal of their loans. If people get suspicious that the bank does not have their money, then the bank could be exposed to a bank run, which is the event of all customers wanting to withdraw their money from the bank at the same time. It is argued that this is like a self-fulfilling prophecy and is born out of rumours, since it is obvious that all people cannot have their money at the same time since their money are converted into other funds which will at least take some time to convert back, if at all possible, thus:

“The risk of a run or an insolvency depends on how the banks use their funds, how risky their investments are, and how much equity there is to absorb potential losses.” (Admati & Hellwig, 2013)

Regarding equity and banks’ opportunity to absorb potential losses it is stated that some European banks have debt up to 97 % of their assets leading up to the financial crisis in 2008. Compared to other corporations than banks, this is quite a lot, since other corporations have loans for up to 50 % of their assets (Rudolph, 2013). One reason for this trend could for example be the way bankers are compensated. It is stated that the return on equity ratio (ROE) is used as measurement for compensation, and the easiest way to raise this ratio is to minimize the equity and maximize loans (Economist, 2013b).

3.1.2 Why regulation is needed

It is stated that: “...*in any industry, regulation is important when the individual actions of people and companies can cause significant harm to others*” (Admati & Hellwig, 2013).

This follows more or less the argument that “...*all externalities are at the root of all kinds of policy issues...*” (Wheelan, 2002).

These arguments could be used on all externalities, for instance: smoking, CO2 emissions, speed limits etc. What these externalities have in common is that they influence the common health and the risk of which people and the society are exposed to. The way a bank’s externalities impact the society can for example be through the risks they take when they gain too much debt and are forced into a default and causing their customers harm. The larger a bank is, the more interconnected it might be and the worse the situation can turn out if it defaults. Some researcher thinks that the incentives of banks with respect to the risks they take and to their borrowing are perversely conflicted with those of society (Admati & Hellwig, 2013), and the debate about how to regulate banks has been furious. On the one end of the equilibrium there are those who think that the bank industry should be restricted with more regulations, and in the other end there are those who complain about the regulations.

If society wants to control some of the “harm” or risks which it is exposed to, then it might find it persuasive to regulate for example the amount of money a bank can borrow or the minimum equity a bank must have. What is paramount though is that no one has the right answer, it is all about what society prefers, and that good government actually matters (Wheelan, 2012).

3.1.3 Why equity regulation is needed

As stated above, regulations are basically needed on externalities, but why is equity regulation needed? Equity requirements for banks have been one of the major regulations since 1990, and if a bank follows these requirement and several other rules they are for example allowed to do business across borders (Admati & Hellwig, 2013). Equity requirements could be compared with the upfront payment you need to pay if you want to borrow money for buying for example a house. One of the arguments for such an upfront payment is due to the solvency risk, which is connected to the market value of the house. If you want to sell your house after a year, and the house is valued below the price you have paid, then you might end up with a greater debt, which you can not pay back by selling the house alone. The greater amount you pay upfront, the more variation in the house price is possible before you end up owing more than what you can pay. This also means that the lender can be more confident to get all the money back when the upfront payment is greater. In this way the equity requirement can erase some solvency risk, which is connected to variation of the asset's value. This scenario is more or less the same for banks, since a small drop in the value of the assets could endanger the bank's solvency if it is low on equity (Admati & Hellwig, 2013).

3.2 Going from Basel II to Basel III

3.2.1 History of the Basel committee

The Basel acts are developed by the Bank for international settlements (BIS). This organization emerged in 1930 with the aim to act like a bank for central banks. The organization has several functions; encourage discussions and collaborations, support communication between institutions, foster research and analysis on financial stability and more. There are 60 members from different central banks, which represent 95% of the worlds GDP (BIS, 2014b).

In the aftermath of the Latin American debt crisis in the 1980's there were growing concerns about the risks of failing banks. The concerns emerged into a paper of regulations which where approved in July 1988 by the G10 governors. Basel I was born, and required a capital ratio of 8 % on capital to risk weighted assets (BIS, 2014c).

Sequentially the need for improvements of risk and control management arose which were the foundation of the 1999 proposal. The new regulation, Basel II, was first passed in 2004, almost 6 years under production. The fine-tuned Basel II tried to create harder requirements, which meant better fit for risk-sensitive capital structures. The three pillars were also developed. The first pillar required minimum capital levels, the second pillar dealt with supervisory review and the third pillar

required effective use of disclosure as a lever to strengthen market discipline (BIS, 2014c).

The same month as Lehman Brothers collapsed, September 2008, the BIS organization issued a new paper for strengthening the former framework of Basel II, and in July 2009 a new paper was published to support the paper of 2008. In September 2010 the organization agreed upon higher global minimum capital standards for commercial banks. This resulted in Basel III, which was finally agreed on in December 2010. The aim is to have Basel III completely implemented by 2019 (BIS, 2014c).

3.2.2 Major differences and developments in Basel III compared to Basel II

In the tracks of the financial crisis the Basel committee had to review what had gone wrong and how improvements of their regulations could contribute to regain stability in the banking sector. A first issue to address was how the financial crisis became so severe and gained such depth. The weakness of the banking sector is believed to have been the weakest link. Most banks were heavily leveraged, had inadequate and low-quality capital, and their liquidity buffers were not sufficient (BIS, 2010a). The amount of risk that was taken on by banks, compared to their low capital ratios, was the main concern when the work began in order to develop the new regulation, Basel III (Chorafas, 2012, p. 60).

Authorities at the BIS put forward several building blocks which formed the basis of Basel III, the principal means of those were :

- Raising the quality and consistency of capital so that banks are more able to absorb losses
- Increasing the risk coverage of the capital framework
- Raising the minimum level of capital required
- Avoiding excesses of leverage
- Raising standards when comes the supervisory review process (pillar 2) and public disclosures (pillar 3)
- Introducing minimum liquidity requirements; standards both for short-term and long-term liquidity coverage ratios
- Promoting the importance of building up capital buffers when times are good to be able to cope with difficult times ahead

(BIS, 2010a)

When introducing Basel III, part of the plan was to make right where the implementation of Basel II had previously failed. The failures of Basel II can according to experts be summed up in four main reasons:

- The time it took to implement Basel II was too long
- Commercial banks were given a free reign to make modifications

- Basel II was based too much on creditworthiness defined by independent rating agencies
- The rules set did not benefit from strict supervisory control, this led to the banking industry benefitting from their own slackness

(Chorafas, 2012)

Many critics argue that Basel III is following Basel II too closely, and therefore will not be as effective as it could be. The original outlines of the Basel III regulations have been watered down due to pressure from the banking industry and authorities, this has led to the regulations not being as strict as the BIS originally intended. Also the time frame for Basel III have been extended and the final implementation deadlines have been pushed forward, which was not desired by the BIS (Chorafas, 2012).

3.2.3 The three pillars, Basel III

The basic structure with the three pillars of Basel II was kept and taken on to Basel III. The three Pillars work together forming the structure of the Basel regulations and all three deals with issues and regulations regarding capital. In Basel III the three Pillars have been revised and improved, but also a new framework regarding liquidity have been added in form of a Global liquidity Standard with associated supervisory monitoring. This was added as a direct response to the recent financial crisis, and is a separate section in addition to the three Pillars (BIS, 2013b; BIS, 2011,a; BIS, 2013a). Banks who do not live up to the Basel III requirements will be punished with restrictions on dividends and bonus payments (Jönsson, 2010).

The first Pillar

The first pillar is the one which most closely coincides with our research questions; it deals with minimum capital requirements based on three different types of risks that a bank faces; credit risk, operational risk and market risk (Gatzert, 2012). Focus is on the quality and level of capital, and especially common equity has gained more importance in Basel III. Under Basel III a capital conservation buffer and a countercyclical buffer is required in order to strengthen the equity base and to avoid the building up of unacceptable systematic risk (BIS, 2013b). The countercyclical buffer is accumulated during times with high credit growth, and serves as an additional pool of capital (King, 2011).

Risk coverage is dealt with through stronger capital requirements for securitisation and trading and derivative activities. The framework of counterparty credit risk is strengthened and exposure to central counterparties will be capitalised through a risk-based method. In pillar one a non-risk based leverage ratio is presented, which also takes off-balance sheet exposures into account. This will work as a backstop to the risk-based capital requirement, and will help contain leverage built up in the system (BIS, 2013b).

The second Pillar

Pillar two is a regulatory response to Pillar one and describes a supervisory review process in order to manage risk. Pillar 2 gives supervisors and regulators tools to live up to an universally acceptable level of sound supervisory practices, and provides a framework of how to deal with different types of risk. 29 core principles are presented which make up the minimum standard for “*sound prudential regulation and supervision of banks and banking systems*” (BIS, 2012a).

The third Pillar

Pillar 3 recognizes the impact of market discipline and its aim is to complement the minimum capital requirements (Pillar 1) and the supervisory review process (Pillar 2). A set of disclosure requirements is presented which will enable market participants to assess the quality and level of banks’ capital adequacy and compensation practices (BIS, 2001; BIS, 2011b).

Liquidity coverage ratio (LCR)

The LCR aim is to ensure that banks have enough unencumbered high quality liquid assets to cope during a one month acute stress scenario with pressure from both systemic and institution-specific shocks. Based on this requirement the LCR states that the stock of high liquid assets should be equal to the total net cash outflows for the next 30 days (King, 2001).

3.2.4 Basel III Capital requirements

After many objections from the banking industry and governments, followed by long discussions and compromises, the capital requirements for Basel III was decided to be as follows in the table below, comparison with Basel II can also be seen (Chorafas, 2012):

| Differences in capital requirements between Basell III and Basel II | | |
|---|-----------|--------------------|
| | Basel III | Basel II |
| Core Tier 1 | | |
| Common equity, retained earnings | 4,50% | 2% |
| Additional Tier 1 | | |
| Preferred shares, subordinated instruments | 1,50% | 2% |
| Tier 2 | | |
| Subordinated debt | 2% | 4% |
| Tier 3 | | |
| Reserve for market risk | Abolished | Unclear definition |
| Total | 8% | 8% |

(Chorafas, 2012)

Tier 1 Capital

Tier 1 Capital is divided in *Core Tier 1* (or Common equity capital) and *Additional Tier 1*. Core Tier 1 should be constituted of assets that are the most secure types of capital (Chorafas, 2012). This mainly includes common stock, retained earnings and other comprehensive income. Regulatory adjustments are made, such as reductions for goodwill, and dividends are not to be included (Chorafas, 2012; BIS, 2011a). A company's core capital is what most people would think of as the company's *equity* (Chorafas, 2012). To be classified as Core Tier 1 capital there are strict criteria that have to be met. The criteria outline for Core Tier 1 capital says that the instrument at issue must:

- represent the most subordinated claim in the liquidation of a bank;
- have a perpetual principal and never be repaid outside of liquidation;
- never be bought back, redeemed, or cancelled;
- have dividend features that are entirely discretionary at the option of the bank;
- be recognized as equity under applicable accounting standards
- be presented separately clearly disclosed in the banks balance sheet and;
- be issued as part of an arms-length transaction with a third party.

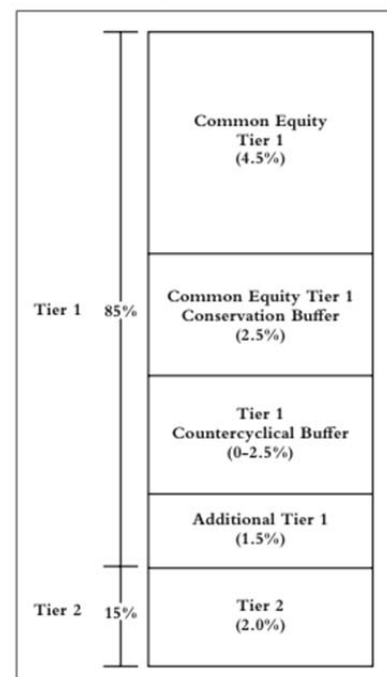
(King, 2011; BIS, 2010b)

Additional Tier 1 includes preferred shares and other financial instruments that meet the criteria for being included in Additional Tier 1. There are many criteria that have to be met since in order to limit risk exposure the types of financial instruments allowed are restricted (Chorafas, 2012). Additional Tier 1 has to be able to absorb losses while the bank is still going concern (BIS, 2011a).

Tier 2 Capital

Tier 2 Capital is supplementary capital and is basically constituted of marketable debt instruments (Chorafas, 2012). Also here there is several criteria that have to be fulfilled in order for the capital to be counted as Tier 2, for example the instruments have to have a minimum maturity of 5 years and they cannot have credit sensitive dividend features. (BIS, 2011a). Tier 2 Capital is aimed to absorb losses on a going-concern basis, meaning when the bank has failed (BIS, 2011a).

Potential 13% Capital Ratio (with Buffers)



(King, 2011)

3.3 Previous research

3.3.1 Response on Basel III

Basel III have received criticism mainly from two different groups with different angles of what they consider to be problematic. The banking industry itself is one group, who have argued that regulation causes disadvantages in competition and that the rules have been implemented too hastily (AFP 2012). The other group includes everyone who is not in the banking industry, but who are affected by the stability and survival of banks; the banks stakeholders. The debate is also about how capital should be defined and what amount of capital is enough to stabilize the banks; if this at all will help to stabilize the bransch. Often scientists and researchers accuse bankers of delaying proposals for tighter control, and on the contrary scientists and researchers are accused by bankers for not understanding the complexity of the regulations and how it will affect the industry (Admati & Hellwig, 2013). The industry has also claimed that banks' lending activity would be limited due to the new regulations and that this would in turn damage the global economy. Some banks have also stated that they will have to increase their fees for deposits in order to live up to new capital levels, which has been highly criticised by counterparts (Chorafas, 2012).

Large global manufacturing and merchandising companies can issue bonds on the capital markets, which is why they are not as dependent on banks as small and medium sized firms and consumers. For consumers and small and medium sized companies the liquidity and solvency of banks are very important since they don't have the same options as large firms, and therefore they can be considered main stakeholders of banks (Chorafas, 2012). The main concern for stakeholders is if they can't trust the banks to supply financial funds and guarantee the safety of deposits. Stakeholders are therefore generally willing to tighten regulations in order to secure the financial market and thereby ensure their own interests. At the same time competition is to advantage also for stakeholders since a freer market contributes to fairer pricing. This complexity has lead to many different views of how tight the regulation of banks should be. (Admati & Hellwig, 2013)

3.3.2 Arguing for a higher equity ratios

A relatively radical opinion regarding how much equity to total assets a bank should hold comes from Admati and Hellwig. Admati is professor of finance and economics at graduate school of business Stanford University and Hellwig is director of Max Planck Society (a research institute) and professor of economics at Bonn University. They argue that banks should at least have 20-30 % equity saying that this will make the financial system much safer and healthier (Admati & Hellwig, 2013). They continue saying that requiring banks to have more equity will directly counteract

distortions, and higher equity requirements directly constrains the risk that banks may become distressed. All this risk is borne by the way the government helps banks, as a lender of last resort. This encourages the banks to make risky loans and thereby ignoring eventual harm they will cause if the loan will not be paid back. This is supported by awarded Nobel Prize Laureate 2013, Eugene Fama, also recognized as a finance theory pioneer. He states that at least 25% equity to total assets will eliminate moral hazard and will constrain some of the risk for bailout, and if 25% equity does not work it should be raised even more. Furthermore, with more equity the debt will become more or less riskless, because the equity will cover up (Fisher, 2012; Fama, 2012). Merton Miller, recognized economist and Nobel Prize laureate 1990, states that equity to total assets requirements is one of the cheapest forms to regulate banks, although it is no panacea. Furthermore he raises the irony that banks have always imposed higher equity requirements on its customers than they want to recognize themselves (Miller, 1995).

Another critical thought of the low equity comes from Josh Rudolph, who is a former investment banker and income strategist as well as a 2014 master student from the John F Kennedy School of government at Harvard University. He is arguing for 50% equity to total asset, arguing that banks should have at least as much equity as non-financial firms, but also because of the banks riskier business model. Although he favors a much higher equity to total assets ratio, he is well aware of the arguments against higher requirements. He discusses five arguments against higher equity requirements and then eliminates them. One argument against equity requirements is that it will slow down economic growth, but this argument is refused by the fact that nobody knows how higher equity requirements will affect the world economy. Another argument against raised equity is that credit is a public good and if banks restricted the amount they lend, this would, every things being equal, lead to fewer people taking on loans. This argument is flawed since loans should be provided for those whose creditworthiness is good, and should not be provided for citizens who cannot pay their loans back. A third argument is that governments should provide credit in times of stress, but Rudolph contradicts this by arguing that it should be the national banks job to be the lenders of last resort, and not the job of politicians. A fourth myth about raising equity requirements is that it will push intermediations into shadow banks and foreign banks, making it even harder to regulate. This is a possibility, but the society needs to be even better to control the industry, instead of "giving up" regulations. The last and fifth argument is that transition costs could be very high, but the solution for this could for example be a transition period lasting 2-3 decades. (Rudolph, 2013)

3.3.3 Arguing against a equity ratios and Basel III

The equity regulations have met some critic as well, for example from Susan Krause Bell. She is managing director of Promontory, an advisory firm and she also holds a PhD in economics from the university of Southern California. In her view it was not only the low amounts of equity that caused the financial crisis. An equally important problem was the mismeasurement of risk, and she calls for a strengthening of Pillar 2 in the Basel III regulation. Besides that, banks are obligated to their investors to give them an acceptable return, and with the higher equity requirements, banks are more or less forced to eliminate risk-free assets, since the return are low on risk-free assets. They might invest in high-risk assets to satisfy the demanded return. The effect of that would be that borrowing will become expensive, and new financial instruments will be invented out of the sight of regulators. If requirements are hard to implement, it might be easier to evade them. Furthermore, the politicians want to make regulations better in the eye of the public, which only make regulations worse, since they are made from a short time perspective. If regulations are created to prevent another financial crisis, equity requirements alone is not enough, for example forward looking provisioning, sound risk measurement and significant improvements in risk and equity management practices are all necessary. (Krause Bell, 2009)

One reason why banks hold little equity is because of the way Basel II and Basel III are constructed but the main reason is the risk-weighting calculation (N.M., 2010). In short, the risk weighting means that the riskier an asset is, the more equity the bank needs to hold. Together with the argument that banks strive to raise their ROE they will try to minimize the equity, and therefore they might find it unattractive to have risky assets, which requires more equity (Economist, 2013b) (Economist 2013c). The risk weighted calculations might have encouraged bankers to search for risk free assets, and with the former crisis some risky assets were pooled into almost risk free objects, and therefore it did not require that much equity in the banks balance sheets (N.M., 2010). So, instead of higher equity requirements, there was called upon better regulations.

3.3.4 Other Critique

Today small and medium sized banks are being confronted by similar rules as large banks, although the terms and conditions can be very different depending on the size of a company, which is why current regulations can favour some banks more than others (Chorafas, 2012). The work of raising equity to meet the new levels is also something that has been seen as an unfair process; equity is typically easy to raise for those who doesn't need it. This means that large and well-performing banks have smaller issues to raise their equity levels than smaller banks or those that are poorly managed (Chorafas, 2012).

The fact that smaller and larger banks have different conditions and resources in access, have also shown in how they tackle the task of calculating equity ratios. Larger banks tend to use internal risk models based on their own borrowers (internal ratings-based (IRB) approach) whereas smaller banks tend to use the standardised approach, which is a simpler model. That smaller banks use the standardised approach is normally due to the lack of resources that are required to develop IRB models. The problem with different approaches is that they don't give equivalent results; banks reporting Tier 1 capital through IRB tend to show lower ratios than those using standardised approach, and there are indications that financial strength is often overestimated when using IRB (Andersen, 2011). The consequence of this is that the comparability between banks is not adequate, which is a major disadvantage of the regulation. Efforts from outsiders in trying to recalculate capital ratios, such as the Tier 1 ratio, have resulted in large deviations from the reported figures. Whether this is due to the lack of access to non-public data and information or other reasons is questionable, either how it makes the comparability less reliable (Andersen, 2011). A lot of data is public, but in order to not reveal company secrets and strategies banks are not obliged to be totally transparent. With this comes that they don't have to report openly how they calculate their capital ratios. Instead each country have to develop a system that enables them to guarantee the capital ratios are calculated properly. In Sweden Finansinspektionen are the ones who approve how banks have calculated their ratios, and they cooperate with financial authorities from other countries in order to coordinate supervision across borders (FI, 2014). Critics argue that the calculations sometimes are so complicated and firm-specific that the approvers hardly know what they approve. This also adds to the uncertainty of how reliable the reported capital ratios really are. An illustrating example that shows the complexity of which the approving authorities have to familiarize themselves with, is that the Basel rules have grown from 30 pages in the 1980s to 616 pages in the Basel III version of 2010 (Masters, 2012).

Going back to one of the main reasons for oppositions to regulations by the banking industry, the claim that competition is impeded through tight regulation because equity is more costly than debt, there has been research that directly contradicts this claim. The claim suggests that lower capital levels should be of more advantage, but leaves no explanation to why before the financial crisis capital levels were significantly higher than minimum requirements in many banks, and that there was considerable variation across countries. Another finding is that competition raises a bank's capital ratio by 3.9% in terms of economic magnitude. The effect was studied on European banks, and was stronger for larger banks at 4,2% compared to 3,6 % for an average small bank (Schaeck, 2012).

3.4 Net interest margin and the correlation to capital ratio and risk

3.4.1 Net interest margin

The purpose of Basel is to change certain financial ratios so that banks become more stable. The question that arises is whether the regulations will influence other financial ratios which are not being regulated. As shown below, a model to predict the level in net interest margin contains the equity to total assets ratio, thus how much will a change in equity to total assets affect the level in NIM?

3.4.2 Ho and Saunder's model

In 1981 Ho and Saunders developed a model to determine the net interest margin of banks. Their model have since then been the fundament of other papers, where scientists aim to explain the net interest margin with more variables (see for example Nguyen). Scientists have since then added several new variables to the regression model, and they strive to explain the net interest margin even better than the original model did.

In their paper "The determinants of bank interest margins", Ho and Saunder developed a model from two already known models: the first had a "hedging" approach and the second one had a "expected utility" approach. With their model they show that the optimal margin will depend on four factors:

1. the degree of bank management risk aversion
2. the market structure in which the bank operate
3. the average size of bank transactions
4. the variance of interest rates

Moreover it was proven that the interest margin cannot become negative, even in highly competitive markets, as long as transaction uncertainties exist (Ho, 1981).

3.4.3 Extensions of Ho and Saunders model

It is stated that increased competition in the bank industry have affected the NIM negatively, meaning that banks interest income have declined, which has been compensated through higher non-traditional banking activities (NII) (Nguyen, 2012). NII is more specifically *income generated by non-traditional off-balance-sheet services* (OBS), such as trading gains and fees, net servicing fees, service charges on deposit accounts etc. On the other hand a positive relationship was found in many countries for NII and NIM, meaning that high performing banks can maintain a high level of NIM and at the same time they maintain a high level of NII (Davis, 2002). A third study concludes that under certain assumptions there is a negative

relationship between NII and NIM (Valverde, 2007). This shows that the empirical evidence for the relationship between NIM and NII is to certain extent contradictory and therefore weak.

Based on several former studies Nguyen (2012) have collected variables to determine one of the latest models to predict the net interest margin (NIM). In the latest version of the model other earning assets to total assets (OEATA) was added to capture diversification towards OBS activities.

$$NIM_{it} = C_i + \beta_1 BANKHI_{it} + \beta_2 NIEAA_{it} + \beta_3 ETA_{it} + \beta_4 LACSTF_{it} + \beta_5 LLRGL_{it} + \beta_6 Cov_{it} + \beta_7 LNNTA_{it} + \beta_8 LNLO_{it} + \beta_9 CFTA_{it} + \beta_{10} OEATA_{it} + \varepsilon_{it}$$

Nguyen (2012) finds several statistically significant results, such as the relationship between operating costs and NIM, suggesting that high operating costs leads to high NIM. Overall Nguyen finds that the NII have a negative effect on NIM in the time between 1997-2002, but the same could not be said about the latter period 2003-2004 (Nguyen, 2012).

3.4.4 The magnitude of the decrease in NIM and increase in NII

In the last several years the banks net interest margin have been on a decline in Europe (see also the findings below), and this development is found in Australia as well, where the changes in bank income are shifting from net interest margins to fee income.

It is not clear whether the banks have actively shifted their focus from traditional bank services to “non-traditional services” such as insurance products, funds management and securitisation. It might also be true that banks experienced a decline in their net interest margins and counteracted this by raising their income fees and extending their range of services. (Williams, 2012)

Furthermore it was found that the magnitude in fee increase was smaller than the decline in interest margins, suggesting that the banks’ customers got a net wealth transfer. The shift in income source have some influence on shareholder and stakeholder behavior as well, for example it is argued that the fee income generates more risk, since it increases profit variability and will worsen the banks risk-return trade-off. There is also a relationship between increased income diversification and value reduction. It has been proved that there is a relationship between changes in income and in the nature of financial intermedia. It might be so that the changes in income sources reflect the disintermediation of banks. (Williams, 2012)

4 Empirical findings

4.1 Average of the investigated ratios

Below are the average developments of each key figure between 2005 and 2013, which cover 94 banks in 17 countries. A list of the investigated banks and countries is available in appendix.

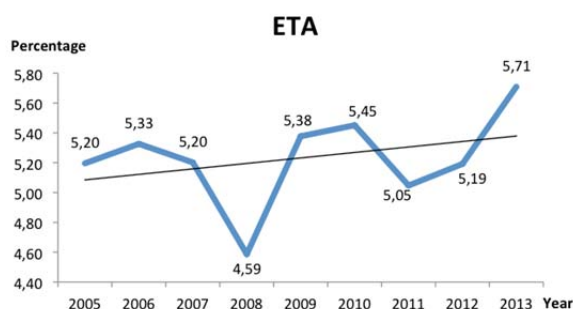


figure 1 (source: bankscope data and own elaboration)

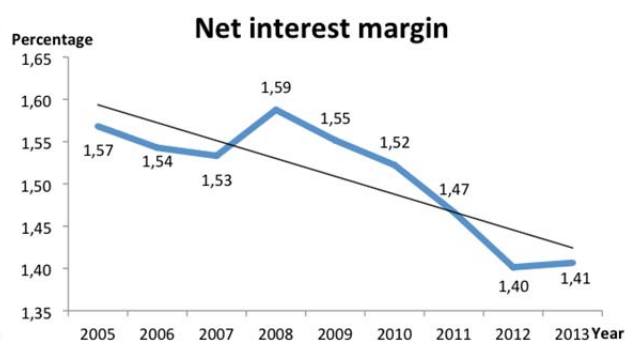


figure 2(source: bankscope data and own elaboration)

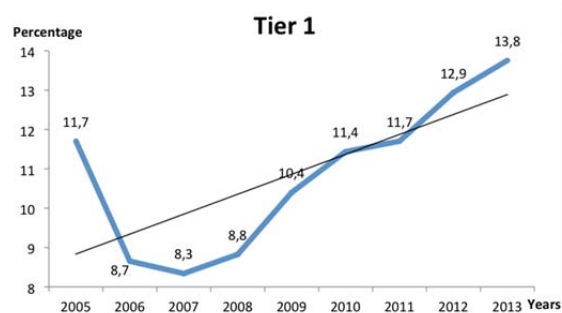


figure 3 (source: bankscope data and own elaboration)

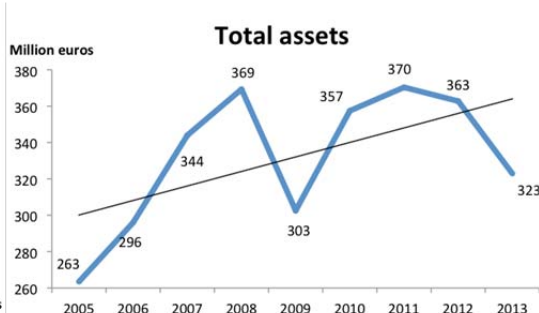


figure 4 (source: bankscope data and own elaboration)

4.1.1 Equity to total assets Ratio

As shown in the graph above the development in the average of equity to total assets (ETA) has been somewhat fluctuating. The starting point is year 2005 at a level around 5,20 % and in year 2013 it has raised to approx 5,71 %, which is also the highest observed point. The trend is somewhat rising. In 2008 and 2011 there was a decline, the lowest point observed was in 2008 when the equity to total assets was around 4,60 %.

4.1.2 Net Interest Margin

The average of the 94 banks net interest margin has a negative development, starting at 1,57 % in year 2005 and falling to 1,41 % in year 2013. In 2008 the NIM peaked at a level of approximately 1,59 %, which was the highest observed point. The trend of the net interest margin is falling.

4.1.3 Tier 1

The tier 1 average has also been rather fluctuating, with a great downturn in the time range 2005-2007. The starting point was at almost 12 %, falling to 8,3 % in year 2007, and then raising to almost 14% in year 2013. The trend for tier 1 over the years is rising.

4.1.4 Total assets

The average of total assets for the 94 banks has a rising trend. The starting point in year 2005 is 263 million euro and ends at a point around 323 million euro in year 2013, which gives a difference on 60 million euro. There is a great decline in total assets between 2008 and 2009 on 67 million euro (369 - 302 million euro).

4.1.5 Partial conclusion

As the graphs show above, the equity to total asset ratio, total assets, and the tier 1 ratio all have rising trends. On the contrary the net interest margin have a falling trend. It seems like the banks on average have raised their equity and tier 1 capital and in the same time reduce their net interest margin.

4.2 Country results

Below are 4 graphs showing data of the key figures from 5 different countries (Germany, France, Great Britain, Italy and Sweden), which cover 53 banks and are in the same time range as earlier (2005 -2013).

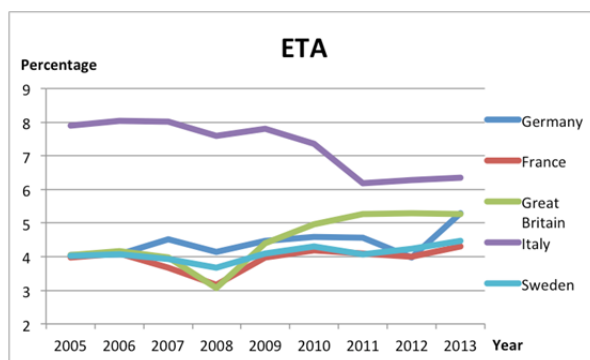


figure 5 (source: bankscope data and own elaboration)

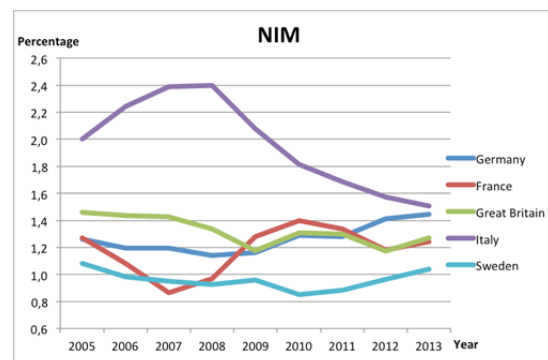


figure 6 (source: bankscope data and own

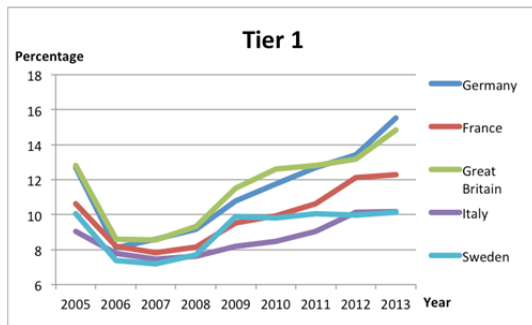


figure 7 (source: bankscope data and own elaboration)

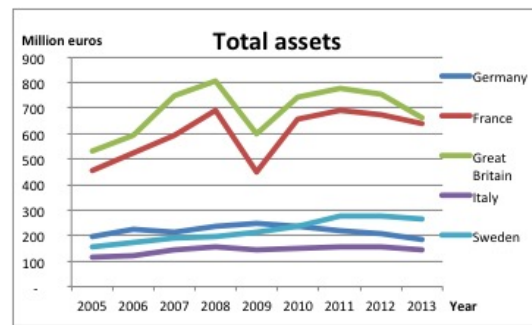


figure 8 (source: bankscope data and own elaboration)

4.2.1 Equity to total assets ratio

Italy is rather particular when it comes to equity to total assets. In 2005 a relatively high level, at around 8 %, can be observed, which is almost the double of the level for the rest of the investigated countries that year. Italy's capital ratio have a negative trend until 2013, and the rest of the countries have a slightly positive trend, resulting in a smaller gap in 2013 between Italy and the rest of the countries.

4.2.2 NIM

Italy is once again particular when it comes to net interest margin. The starting point, in 2005, is for Italy at 2 %, peaking in 2008 at a level around 2,4 %, and ending at a level closer to the other investigated countries in 2013 at around 1,5%. Sweden seems to be the least fluctuating country, in 2005 the level is just above 1%, after a slight decline the NIM is back at just above 1% in 2013. The same can be said about France, which starts and ends at almost the same level at around 1,3 %.

4.2.3 Tier 1

Between 2005 and 2006 all countries have a decline in their Tier 1 ratio, and thereafter all countries experience a rise, the rise escalades around 2008. The lowest point was reached by Sweden in 2007 at 7,2 % and the highest point by Germany at 15,5 % in 2013.

4.2.4 Total assets

As observed in graph 8 the total assets have 2 different trends depending on country. France and Great Britain are both at a high level in 2005 and ending at a slightly higher level in 2013. Around the end of 2008 both countries experience a huge decline in their level of total assets which might be due to the financial crisis, but they are back at a high level again in 2009. In the rest of the investigated

countries the level of total assets are low and are without any particular declines or increases.

4.2.5 Partial conclusion

Italy had a rather particular development of their equity to total assets and NIM compared against the other countries. All countries have more or less the same development in their tier 1 ratio. France and Great Britain had a higher total assets level than the rest of the investigated countries, which were at a huge decline in 2008 but recovered in 2009.

4.3 Correlation

There are two sets of data from which the tests are conducted. The first dataset is constituted of the original data that shows each investigated ratios for each year, meaning that it will give a picture of what the situation was for each year. In the second data set the differences from year to year have been calculated, in order to see if any connection can be detected regarding increases or decreases in the different variables.

- For dataset 1 some relationships were found. A positive relationship was found between NIM and equity to total assets, suggesting that a high capital ratio comes with a high NIM. (See Appendix 3)
- For dataset 2 no relationships could be found. This suggests that it is not possible to answer whether an increase in one of the variable entails an increase in the other variable. (See Appendix 6-8)
- No relationship was found between Total assets and ETA or Total Assets and Tier 1 ratio, neither was any relationship detected between Tier 1 ratio and NIM. (See Appendix 4-5)

4.4 Results from linear regressions

When running the regression analysis the first data set will show each investigated ratios for each year, meaning that the regression will give us a picture of what the situation was for each year. In the second data set the aim is to see if downturns or upturns in the independent variable have had the same effect on the dependent variable.

The first performed regression analysis had ETA as dependent variable (y), first NIM was used as independent variable and later Total assets was used as independent variable (x). Afterwards regressions were performed again using the same independent variables, but with Tier 1 ratio as dependent variable (y).

No statistically significant results could be found for any regressions with dataset 2. For data set 1 no statistically significant results were found with Total Assets as independent variable. For dataset 1 there was a statistically significant result with NIM as independent variable. The result for NIM as independent variable and Tier 1 ratio respectively equity to total assets (ETA) as dependent variable can be seen below:

| Simple Linear Regression | | | | | | | | | |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
| Predictor: NIM, Dependent variable: Tier 1 | | | | | | | | | |
| R-square | 0,134 | 0,171 | 0,143 | 0,059 | 0,038 | 0,046 | 0,019 | 0,008 | 0,122 |
| NIM Sig. | 0,000*** | 0,000*** | 0,000*** | 0,019** | 0,061* | 0,038** | 0,190 | 0,402 | 0,001*** |
| t | (-3,776) | (-4,358) | (-3,923) | (-2,396) | (-1,898) | (-2,104) | (-1,321) | (-0,842) | (-3,582) |
| Predictor: NIM, Dependent variable: ETA | | | | | | | | | |
| R-square | 0,448 | 0,191 | 0,283 | 0,592 | 0,587 | 0,608 | 0,572 | 0,478 | 0,375 |
| NIM Sig. | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** | 0,000*** |
| t | (8,632) | (4,657) | (6,022) | (11,552) | (11,445) | (11,943) | (11,077) | (9,173) | 7,422 |
| observations | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |

***P<0.01, **P<0.05, *P<0.10

The table above shows that with Tier 1 ratio as dependent variable NIM is highly significant for most years but the R-square is low, suggesting that NIM is a weak explanatory variable for explaining Tier 1 ratio.

When equity to total assets is set as dependent variable NIM is highly significant for all years and the r-square is higher than for the previous regression, although not high enough for the model to hold statistically for all years. The model seems to have best fit for the years 2007-2010.

The result from the regression analysis confirms and clarifies the relationships that were found through the correlation analysis.

For the most significant regression model found, separate regression analyses were made for each of the following countries: Sweden, France, Germany, Great Britain and Italy. The sample for each country was derived from the 94 banks included in the original sample. These are the results when looking at the five countries separately:

Simple linear regression, Dependent variable(Y)=equity-to-total-assets, Independent variable(x)=NIM

| | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| France, observations=15 | | | | | | | | | |
| R-square | 0,575 | 0,514 | 0,815 | 0,805 | 0,607 | 0,619 | 0,604 | 0,621 | 0,516 |
| Sig. NIM | 0,001*** | 0,003*** | 0,000*** | 0,000*** | 0,001*** | 0,001*** | 0,001*** | 0,000*** | 0,003*** |
| t | (4,197) | (3,708) | (7,560) | (7,336) | (4,478) | (4,596) | (4,454) | (4,614) | (3,721) |
| Germany, observations=8 | | | | | | | | | |
| R-square | 0,651 | 0,721 | 0,802 | 0,810 | 0,817 | 0,876 | 0,747 | 0,755 | 0,890 |
| Sig. NIM | 0,015** | 0,008*** | 0,003*** | 0,002*** | 0,002*** | 0,001*** | 0,006*** | 0,005*** | 0,000*** |
| t | (3,346) | (3,939) | (4,929) | (5,060) | (5,167) | (6,521) | (4,214) | (4,303) | (6,985) |
| Great Britain, observations=13 | | | | | | | | | |
| R-square | 0,273 | 0,248 | 0,262 | 0,532 | 0,113 | 0,393 | 0,485 | 0,480 | 0,398 |
| Sig. NIM | 0,067* | 0,083* | 0,073* | 0,005*** | 0,261 | 0,022** | 0,008*** | 0,009*** | 0,021** |
| t | (2,031) | (1,906) | (1,979) | (3,538) | (1,186) | (2,668) | (3,218) | (3,184) | (2,697) |
| Italy, observations=11 | | | | | | | | | |
| R-square | 0,494 | 0,568 | 0,692 | 0,531 | 0,544 | 0,627 | 0,319 | 0,120 | 0,151 |
| Sig. NIM | 0,016** | 0,007*** | 0,002*** | 0,011** | 0,010*** | 0,004*** | 0,070** | 0,298 | 0,238 |
| t | (2,962) | (3,443) | (4,493) | (3,193) | (3,276) | (3,886) | (2,053) | (1,105) | (1,264) |
| Sweden, observations= 6 | | | | | | | | | |
| R-square | 0,188 | 0,294 | 0,104 | 0,091 | 0,267 | 0,471 | 0,543 | 0,388 | 0,574 |
| Sig. NIM | 0,391 | 0,266 | 0,534 | 0,560 | 0,293 | 0,132 | 0,095* | 0,187 | 0,081* |
| t | (0,961) | (1,292) | (0,680) | (0,635) | (1,209) | (1,886) | (2,181) | (1,592) | (2,323) |

***P<0.01, **P<0.05, *P<0.10

For France and Germany the results are highly significant and the R-square is high suggesting that the model fits well and that NIM is a good predictor for equity to total assets. For Italy the model fits well for the years 2008-2012. For Great Britain the variables are statistically significant at 5 % level or more for the years 2005-2008 and also for year 2010. For these years the r-square is quite high although not as high as for France and Germany. For the years 2009 and 2011-2013 the r-square is lower and the variables less significant, suggesting that the model only holds for certain years when comes to Great Britain. Also for Italy the model only holds for some years and the fit is not as good as for France and Germany. For Italy during 2008-2012 the model fits good with high r-square and highly significant variables. For 2013 and 2007 the fit is quite good, but for 2005-2006 r-square is low and the variables are not statistically significant, which means that the model does not fit well.

4.5 Findings from the Net interest Margin model

In the table below the results from testing the NIM model are presented for the 4 largest economies in Europe. Generally the r-squares are above 0,5 which indicates that the model fits well, and that the variables together are good predictors for the level of NIM. The model fits very well for Germany where the r-squares before and after the financial crisis are around 0,95, which indicates a very good fit. Only NIEAA is a variable that is significant before the crisis for Germany, whereas after the financial crisis there are 5 significant variables.

Another country for which the model fits very well is France, where the R-squares are above 0,791. Before the crisis there are 8 highly significant variables with p-

values below 0,01 and after the crisis there are only 4 significant variables. The third best fit is Great Britain and the country for which the model fits the least is Italy with R-square as low as 0,562.

The best variable to predict the NIM-level is NIEAA, which in 5 instances have a significant level below 0,000 and a single instance with a significant level below 0,1. The second best variable to predict the NIM level is the LLRGL variable, in 3 instances the p-value is below 0,00 and in two other instances the p-value is below 0,1. The worst predictor is LACSTF with only one p-value below 0,00.

Worth noting is that ETA is significant in only 3 instances, 2 of them with a high p-value. It might be so that ETA does not influence a bank's income source, since the majority of the countries don't have a significant ETA variable.

| Results from testing the NIM-model | | | | | | | | | |
|---|--------|---------------------|----------------------|---------------------|---------------------|----------------------|----------------------|---------------------|---------------------|
| Country | | France | | Germany | | Great Britain | | Italy | |
| Variable | | after | before | after | before | after | before | after | before |
| Model summary | | | | | | | | | |
| R-square | | 0,857 | 0,791 | 0,954 | 0,949 | 0,666 | 0,825 | 0,562 | 0,616 |
| F-value | | 50,671 | 31,97 | 50,518 | 45,572 | 15,484 | 36,645 | 3,135 | 3,916 |
| Sig. | | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,014 | 0,004 |
| Predictors | | | | | | | | | |
| BANKHI | Sig. t | 0,475 (-0,719) | 0,450 (-0,759) | 0,007*** (7,641) | 0,303 (-1,054) | 0,259 (1,138) | 0,927 (-0,092) | 0,037** (-2,222) | 0,964 (0,046) |
| NIEAA | Sig. t | 0,052* (1,974) | 0,000*** (5,007) | 0,000*** (7,641) | 0,000*** (8,247) | 0,000*** (7,751) | 0,945 (-0,069) | 0,165 (-1,438) | 0,000*** (4,102) |
| ETA | Sig. t | 0,959 (-0,051) | 0,000*** (-5,151) | 0,113 1,653 | 0,173 (1,409) | 0,005*** (2,899) | 0,018** (2,426) | 0,966 (-0,043) | 0,867 (0,169) |
| LACSTF | Sig. t | 0,623 (0,494) | 0,001*** (3,563) | 0,117 (1,631) | 0,479 (0,720) | 0,272 (1,108) | 0,397 (0,852) | 0,737 (0,340) | 0,793 (-0,265) |
| LLRGL | Sig. t | 0,000*** (6,970) | 0,006*** (-2,847) | 0,063* (1,955) | 0,303 (1,055) | 0,093* (1,703) | 0,000*** (10,226) | 0,263 (1,150) | 0,545 (-0,615) |
| COV | Sig. t | 0,268 (-1,117) | 0,004*** (2,969) | 0,780 (-0,283) | 0,640 (-0,474) | 0,078* (-1,788) | 0,000*** (-3,738) | 0,368 (-0,919) | 0,707 (0,381) |
| LNTA | Sig. t | 0,041** (-2,079) | 0,000*** (-7,840) | 0,014** (-2,655) | 0,920 (-0,102) | 0,099* (-1,670) | 0,492 (-0,692) | 0,124 (-1,601) | 0,164 (-1,441) |
| LNLO | Sig. t | 0,014** (2,523) | 0,000*** (8,066) | 0,000*** (6,356) | 0,113 (1,653) | 0,204 (1,283) | 0,325 (0,992) | 0,078* (1,851) | 0,159 (1,456) |
| CFTA | Sig. t | 0,579 (0,557) | 0,000*** -5,407 | 0,116 (-1,637) | 0,749 -0,325 | 0,009*** (-2,676) | 0,601 -0,526 | 0,932 (0,086) | 0,885 (-0,146) |
| Observat | | 86 | 86 | 32 | 32 | 80 | 80 | 32 | 32 |
| ***P<0.01, **P<0.05, *P<0.10 after=year 2012-2013 before=year 2005-2006 | | | | | | | | | |

4.5.1 The regression line

Below are the coefficients for the regression formula for each country and one for each studied time period.

| Coefficients to predict the level of NIM | | | | | | | | |
|--|--------|-------|---------|--------|---------------|-------|--------|--------|
| Country | France | | Germany | | Great Britain | | Italy | |
| | Before | After | Before | After | Before | After | Before | After |
| CONSTANT | 1,92 | -0,79 | -9,73 | -10,41 | -0,02 | 1,88 | 0,79 | 0,77 |
| BANKIHI | -2,55 | -1,20 | -3,40 | -12,21 | -0,09 | 1,94 | 0,84 | -26,63 |
| NIEAA | 29,20 | 11,24 | 161,57 | 135,67 | -0,30 | 70,99 | 63,06 | -46,75 |
| ETA | -0,63 | -0,01 | 0,38 | 0,33 | 0,15 | 0,34 | 0,02 | -0,01 |
| LACSTF | 0,02 | 0,01 | 0,01 | 0,03 | 0,00 | 0,01 | -0,01 | 0,01 |
| LLRGL | -0,15 | 0,35 | 0,23 | 0,74 | 0,81 | 0,18 | -0,17 | 0,07 |
| COV | 0,00 | 0,00 | 0,00 | 0,00 | -0,01 | 0,00 | 0,00 | 0,00 |
| LNTA | -7,63 | -1,67 | -0,17 | -3,36 | -0,35 | -1,00 | -5,28 | -3,26 |
| LNLO | 7,45 | 1,93 | 1,72 | 5,42 | 0,42 | 0,67 | 5,65 | 3,94 |
| CFTA | 0,69 | 0,06 | 0,05 | -0,19 | 0,02 | -0,28 | -0,01 | 0,01 |

Before: 2005+2006

After: 2012+2013

The way to interpret this is for example:

- The greater value a bank has in non-interest expenses through total assets (NIEAA), the greater level in NIM, at least for France and Germany. The same holds true for Great Britain after the crisis and for Italy before the crisis.
- The greater value for equity to total assets (ETA) the greater level in NIM, at least this holds for Germany and Great Britain. This holds for Italy before the crisis, but the trend is the opposite in France, where the level in NIM will decrease when the value of ETA rises (but the significant level still states that the correlation is non-significant in 5 instances as seen above, section 4.6).
- It seems like COV does not contribute to the decrease or increase in the level of NIM, the same is true for LACSTF.
- The greater value of LNTA the smaller value in NIM, which might imply that larger banks have a lower level in NIM. This holds for all countries for all studied time periods.
- The greater value of LNLO the greater value in NIM, the greater loan a bank have the greater level in NIM, this trend holds for all time periods as well.

5 Analysis

5.1 Analysis of average changes for the EU-sample

Worth noting from the graphs above is the downward trend for NIM and at the same time raised level in equity-to-total-assets, tier 1 and total assets. It seems like the banks have managed to raise their capital buffer based on another income source than NIM, which for example could be the non-interest income (mentioned in section 3.4.3). Whether the shift in income source depends on actively re-focusing or counteracting their reduced income source, it might indicate that the bank industry is changing, from traditional banking to “modern” banking.

5.1.1 Country analysis

There are two observations to be made between the countries development in total assets. The first one being that Great Britain and France on average have banks with a greater amount in total assets compared to Germany, Italy and Sweden. The second observation is that the banks with a greater amount in total asset (Great Britain and France) are more affected in 2008 of the financial crisis than the rest of the banks in the sample. This indicates that larger banks, measured by total assets, were more exposed to the financial crisis in 2008 than smaller banks.

All of the banks have more or less the same tier 1 development, with a great decline until 2006, which were improved around two years later. Since 2009 Sweden have had a permanent level in their tier 1 level at around 10 %, which Italy converge in 2013, this might indicate that the Swedish and Italian banks don't see any point in increase their tier 1 capital more than necessary. Another remark is that Germany, in average, is one of the countries that have the greatest percentage in tier 1, even though German banks were not having the biggest amount in total assets. It seems like the German banks are more stable than the rest of the banks in the studied countries as measured by tier 1 capital together with their smaller total asset. A critique to this is, as mentioned earlier, that the tier 1 capital requirement is calculated by the banks themselves (the calculations are not available for the public) and then approved by the financial authorities, which means that comparison between banks should be done with cautions.

The difference that can be observed between the five different countries, were Italy differs the most from the others, are most likely due to many different underlying causes. Suggestion for what might contribute to Italys ETA and NIM to be considerably higher than the other countries, are for example; cultural differences, economic conditions, and the financial stability in the country. Cultural differences could refer to such as risk behaviour or historical traditions of banking or their political position. To answer the question of why differences can be found, possible underlying reasons would have to be investigated further in order to differentiate country specific behaviour.

5.2 Correlation analysis

The correlation analysis shows a positive relationship between ETA and NIM, but it is not possible to determine a causal relationship. This means that it is not possible to see whether one of the variables is causing the effect in the other. There could be unknown variables affecting the known variables so that there seems to be a relationship. Simply put; correlation does not imply causation, but gives reason to investigate the relationship further.

That no relationship was found between Tier 1 ratio and NIM suggest that the variables are not affecting each other. This could in turn mean that a high NIM could not be justified by the argument that it is crucial for raising the Tier 1 ratio, which due to the Basel III regulations has to be at least 6%.

No relationship was found between Total Assets and ETA or Tier 1 ratio. This suggests that the size of a bank does not matter for what level of ETA or Tier 1 ratio the bank will have.

It would have been interesting if any relationships could be found when looking at dataset 2, since finding correlations between increases or decreases would more likely imply that causality would exist.

5.3 Analysis of Simple regression results

5.3.1 Simple regression for sample of 94 banks

The results from performing simple linear regression analysis coincide with the results from the correlation analysis. For the regression analysis with Tier 1 ratio as dependent variable NIM is a bad predictor. For the regression with analysis with ETA as dependent variable the results suggest that NIM is a good predictor of ETA for some of the years. This suggests that banks with high NIM also tend to have high ETA at least with this regression model, but it still cannot be concluded whether an increase in one of the variables is causing the increase in the other. Normally there are several factors explaining a variable, which implies that this model suffers from omitted variables.

If it could be ensured that increases in ETA was dependent on increases in NIM, then a high NIM could be justifiable in order to increase the stability of banks through higher ETA.

5.3.2 Simple regression analysis on separate countries

For France and Germany the results suggests that NIM is a good explanatory variable for ETA. In the two countries we can conclude that banks with high NIM also have high ETA. It is still not possible to say whether an increase in ETA is caused due to an increase in NIM. Suppose it was possible to see that a change in NIM was causing a change in ETA, in this case it still could not be ruled out that other variables would not be able to cause the same effect. Based on the results it seems like banking in Germany and France have many similarities. This could for example have to do with the fact that they are two large countries based next to each other, so they have many similarities and are most likely more interconnected with each other than countries that are not in the same position.

For Great Britain NIM seems to be not as good at predicting ETA as for France and Germany. The years before the crisis the model holds better and the results are a bit closer to those of France and Germany. This could imply that Great Britain was strongly affected by the crisis, and that the conditions and behaviour of banks in Great Britain changed due to the crisis. Many underlying reasons would have to be investigated and tested for in order to conclude something specific.

For Italy the outcome of the model differs from all the previous countries. The model seems to have a fairly good fit for the years 2008-2013, but for the years 2005-2007, the years leading up to the crisis, the r-square is lower and the significance of the variables is not as good. This suggests that for Italy NIM only seems to be explaining ETA for the years 2008-2013.

The results for Sweden are basically the opposite of the results for Italy, they suggest that NIM is not a very good predictor for ETA, especially not for the years 2009-2013 when the r-squares are quite low and the variables are not statistically significant. This suggests that for the years 2009-2013 a high ETA in Sweden can not be explained by a high NIM, neither for the earlier years can any highly significant results be detected. What should be remembered is that the sample for Sweden is a lot smaller than for the other countries, which can cause the model to be less valid.

5.3.3 Analysis from putting the different results together

Putting together what has been detected so far, the results suggest that the same pattern does not show in each of the five countries. This indicates that country specific behaviours might be crucial for determining the investigated variables, and also that there might be other factors affecting the investigated variables that have not been controlled for.

5.4 Analysis of NIM model

As noted above in the findings for the NIM model, the high R-square indicates that there is a fairly good possibility to predict the level of NIM with the 9 variables. When there is a relationship between the NIM level and the 9 variables, it indicates that when one variable is changed it will automatically change the level of NIM. This could imply that the Basel regulations cannot be implemented without changing some of the variables or changing the level of NIM.

In France the NIM model results were very good, with a high level in R-square and at the same time many highly significant variables before the crisis. This could indicate that bank managers are acting rationally and that their decisions are based on logic

rather than on random thoughts. The R-square in all studied countries was above 0,5.

If the same test was conducted on Swedish banks and the result would be the same as in the studied countries, then the argument as stated in the introduction from the financial minister Anders Borg would be seriously flawed. Borg found it provocative that the banks raised their NIM level at the same time as the repo interests were lowered, resulting in a rise in profits. But with the NIM findings the rise in NIM could be defended by changes in 1 of the 9 variables, for example the Swedish banks could have had higher non-interest expenses.

One of the best predictors was NIEAA (non interest expense / total assets), which actually seems logical, since a higher level in non-interest expenses would have to be covered by higher income.

Another remark to make is that the sign for every coefficient change except of LNLO and LNTA. That the coefficients have different signs could imply that the bank management are dependent on factors such as for example culture, where caution and conservatism might influence.

5.4.1 Variables that might be correlated

There might be a minor problem with the NIM model since the occurrence of multicollinearity and heterogeneity could exist.

At first thought it is most likely to find correlations between variables that are based on the same underlying variables. In the model these 2 groups of variables could be correlated:

- COV and LLRGL + LACSTF
- ETA, CFTA, NIEAA and LNTA

The correlation between LLRGL and LACSTF are obvious since COV is a product of the two other variables. COV will become lower when LLRGL or LACSTF becomes low and vice versa, and in this way they are not independent, thus violating one of the assumptions when applying statistical tools.

Similar correlations can be suspected for all variables that are somehow depending on Total Assets, for example between ETA and LNTA. ETA is the equity to total asset and LNTA is the logarithm of total asset. If equity is held constant then the two variables would be inversely correlated, since a decline in total assets would be associated with a reduction in LNTA but at the same time ETA would rise. All variables that are depending on Total Assets should be suspected of being correlated with each other in some way.

Another reason for suspecting multicollinearity is that for several of the performed regression, for example for the period before the crisis in Germany, the r-square for the model is very high although only one of the predicting variables is statistically significant. When looking at estimates from a regression analysis, low t values for the regression coefficients together with a highly significant F-value for the model is a warning that there might be multicollinearity. This happens because when multicollinearity is present t-values tend to be under-representative, which is due to overestimation of the standard deviation of the regression coefficients.

There is no simple way to reduce variances of estimators in a model. The easiest way would be to collect more data to increase the sample and hopefully this will reduce the multicollinearity. Another way would be to try to drop explanatory variables so that no correlated variables would be included in the model. Unfortunately this could instead bring the problem of a biased model. It is important to remember that in a model variables are often correlated, it is only when the correlation is high that there might be multicollinearity. There is not a certain limit for correlation to qualify as multicollinearity; it depends on what is investigated. (Wooldridge, 2009; Cortinhas, 2012)

6 Conclusions and discussion

6.1 Contribution to the science field

We can conclude that there are differences between countries when comes to ETA and how strong the relationship is between NIM and ETA. The study shows that the level of ETA cannot be changed without affecting other variables, such as NIM. A change in ETA, would imply a change in NIM, as long as the other variables are held constant.

The variables affecting NIM is not equally significant in all investigated countries, which again indicates that there are country specific differences that have not been controlled for. One main finding is that the variable that affects NIM, and is the most significant variable for all countries, is NIEAA (non interest expenses / total assets).

Since NIEAA is a variable that is important to consider, it means that non-interest expenses is a factor that affects banking a lot. This factor is likely to be depending on several external factors such as for example the price level of the country and the present economic and political situation. This means that the ETA level, and the level for the Tier 1 ratio, are complex to regulate without creating disadvantages.

The findings suggest that the conditions for banks are different depending on country. This indicates that the Basel III regulations will affect different countries differently, and that the regulations therefore are likely to be easier to apply in some countries.

In summary we have arrived at the conclusion that on average banks seem to have reacted to the Basel III regulations when comes to raising their equity ratios and Tier 1 ratios. Whether this have caused a more stable banking system is harder to ascertain, since it seems that regulating equity ratios will in turn influence other variables. The impact of changing those other variables would most likely need to be investigated in order to answer the question whether banks are more stable today.

6.2 Recommendations for further research

6.2.1 NIM and non interest expenses

NIM has declined in several years, but how have the non-interest expenses developed next to it? Have the non-interest expense been equally declining/increasing? Since the NIEAA is the strongest predicting variable to predict the level of NIM, would NIEAA still be as important to explain the level in non-interest expenses?

6.2.2 Country differences

As found in the study, there were many country differences, but further research is necessary to determine where these come from.

6.2.3 The desirable level of ETA and Tier 1

A bank that has met its desired level of ETA or Tier 1 would most likely behave differently than a bank trying to increase its equity levels. If a bank that has met its desired level of equity can be assumed to be more stable, perhaps then the approach towards the level of NIM would be different. A stable bank could take the risk of lending to a lower NIM than a bank that cannot afford as much losses. It would be interesting to investigate whether taking into account if a bank is on a stable level, or still working to increase its equity levels, would make a difference for our results.

6.2.4 NIM from a competition point of view

A strategic decision from a bank could be to keep a lower net interest margin in order to attract more customers, which could in turn generate a higher net interest spread. This suggests that not only the interest margin, but also the interest spread, could be an interesting variable to include in a study like this.

6.2.5 Check for multicollinearity in the NIM model

There might be great knowledge to gain to investigate the NIM model's variances from a statistical point of view. It might be interesting to have a greater sample size as well and to execute the nim model regression test.

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8 Appendix

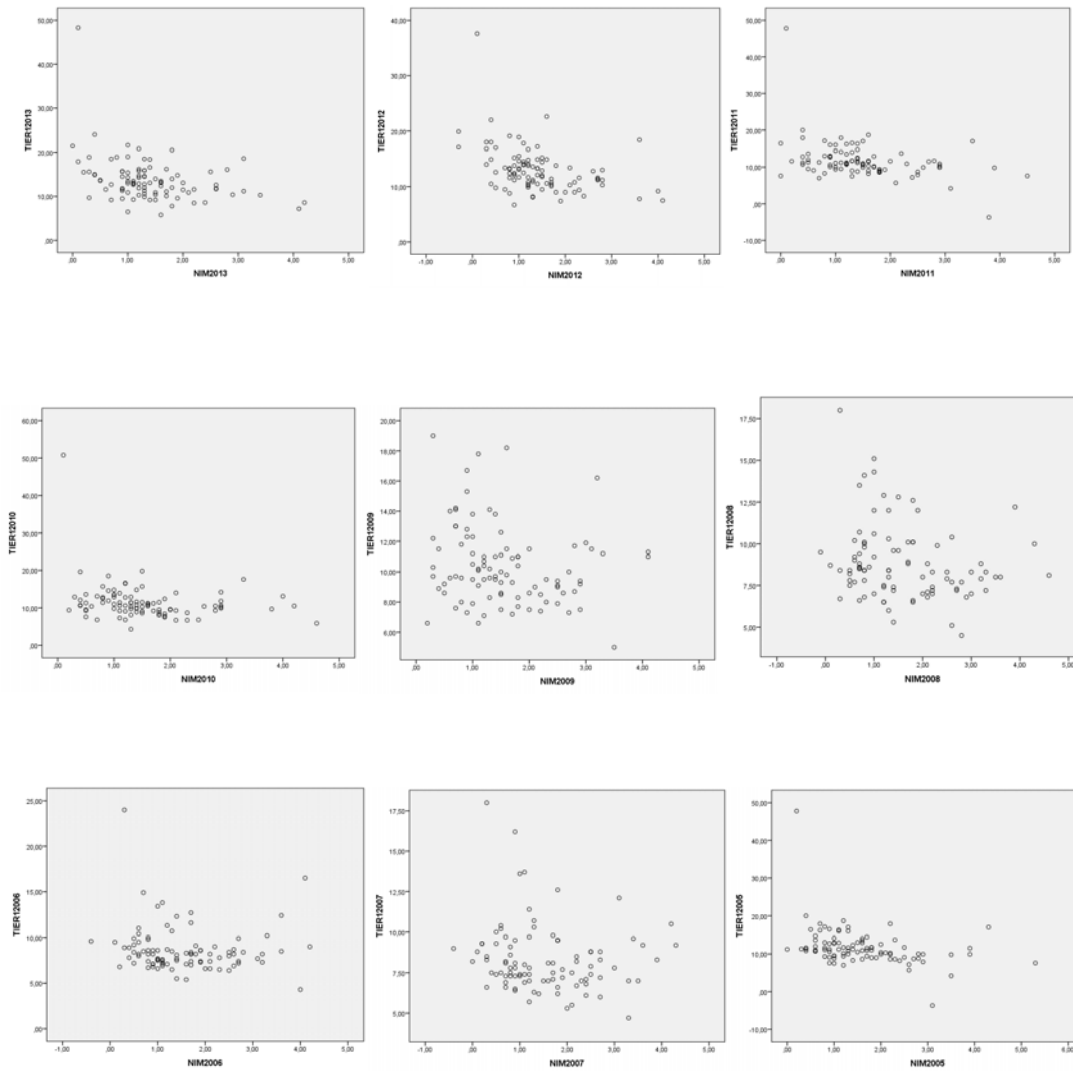
8.1 Appendix 1

| Bank | Country | Bank | Country |
|--|---------|---|---------|
| Aareal Bank AG | DE | Erste Group Bank AG | AT |
| Allied Irish Banks plc | IE | Espirito Santo Financial Group S.A. | LU |
| Alpha Bank AE | GR | Eurobank Ergasias SA | GR |
| Banca Carige SpA | IT | Fédération du Crédit Mutuel | FR |
| Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena | IT | HBOS Plc | GB |
| Banca popolare dell'Emilia Romagna | IT | HSBC Bank plc | GB |
| Banca Popolare di Milano SCaRL | IT | HSBC France | FR |
| Banca Popolare di Vicenza Societa cooperativa per azioni | IT | Hypothesenbank Frankfurt AG | DE |
| Banco Bilbao Vizcaya Argentaria SA | ES | ICCREA Banca SpA - Istituto Centrale del Credito Cooperativo | IT |
| Banco BPI SA | PT | ING Bank NV | NL |
| Banco Comercial Português, SA-Millennium bcp | PT | ING Belgium SA/NV-ING | BE |
| Banco de Sabadell SA | ES | Instituto de Crédito Oficial | ES |
| Banco Espirito Santo SA | PT | KBC Bank NV | BE |
| Banco Popular Espanol SA | ES | Le Crédit Lyonnais (LCL) | FR |
| Banco Santander SA | ES | Lloyds Banking Group Plc | GB |
| Bank Nederlandse Gemeenten NV, BNG | NL | Mediobanca SpA - Banca di Credito Finanziario Società per Azioni | IT |
| Bank of Ireland-Governor and Company of the Bank of Ireland | IE | Monte dei Paschi di Siena Capital Services Banca per le Imprese SpA | IT |
| Bank of Scotland Plc | GB | National Bank of Greece SA | GR |
| Bank Polska Kasa Opieki SA-Bank Pekao SA | PL | Nationwide Building Society | GB |
| Bankinter SA | ES | Natixis | FR |
| Barclays Bank Plc | GB | Nordea Bank AB (publ) | SE |
| Barclays Plc | GB | Nordea Bank Danmark Group-Nordea Bank Danmark A/S | DK |
| Belfius Banque SA/NV-Belfius Bank SA/NV | BE | Nordea Bank Finland Plc | FI |
| BNP Paribas | FR | Nykredit Realkredit A/S | DK |

| | | | |
|--|----|---|----|
| BNP Paribas Fortis SA/ NV | BE | OP-Pohjola Group | FI |
| CA Consumer Finance | FR | Permanent TSB Plc | IE |
| Caixa Geral de Depositos | PT | Pohjola Bank plc-Pohjola Pankki Oyj | FI |
| Caja de Ahorros y Monte de Piedad de Zaragoza, Aragon y Rioja-Ibercaja | ES | Raiffeisen Bank International AG | AT |
| Caja de Ahorros y Pensiones de Barcelona-LA CAIXA | ES | Raiffeisen Zentralbank Oesterreich AG - RZB | AT |
| Cassa di Risparmio di Parma e Piacenza SpA | IT | Royal Bank of Scotland Group Plc (The) | GB |
| Ceskoslovenska Obchodni Banka A.S.- CSOB | CZ | Santander Totta SGPS | PT |
| Co-operative Bank Plc (The) | GB | Santander UK Plc | GB |
| Commerzbank AG | DE | Skandinaviska Enskilda Banken AB | SE |
| Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A-Rabobank Nederland | NL | Société Générale | FR |
| Credit Agricole Corporate and Investment Bank- Credit Agricole CIB | FR | Stadshypotek AB | SE |
| Crédit Agricole S.A. | FR | Standard Chartered Plc | GB |
| Crédit Agricole-Crédit Agricole Group | FR | Svenska Handelsbanken | SE |
| Crédit du Nord | FR | Swedbank AB | SE |
| Crédit Foncier de France | FR | Swedbank Hypotek AB-Swedbank Mortgage AB | SE |
| Crédit Industriel et Commercial - CIC | FR | Ulster Bank Limited | GB |
| Credit Mutuel (Combined - IFRS) | FR | UniCredit Bank AG | DE |
| Danske Bank A/S | DK | UniCredit Bank Austria AG-Bank Austria | AT |
| DekaBank Deutsche Girozentrale | DE | UniCredit SpA | IT |
| Depfa Bank Plc | IE | Unione di Banche Italiane Scpa-UBI Banca | IT |
| Deutsche Postbank AG | DE | Volkswagen Financial Services AG | DE |
| Dexia | BE | Wüstenrot & Württembergische | DE |
| Dexia Crédit Local SA | FR | Yorkshire Building Society | GB |

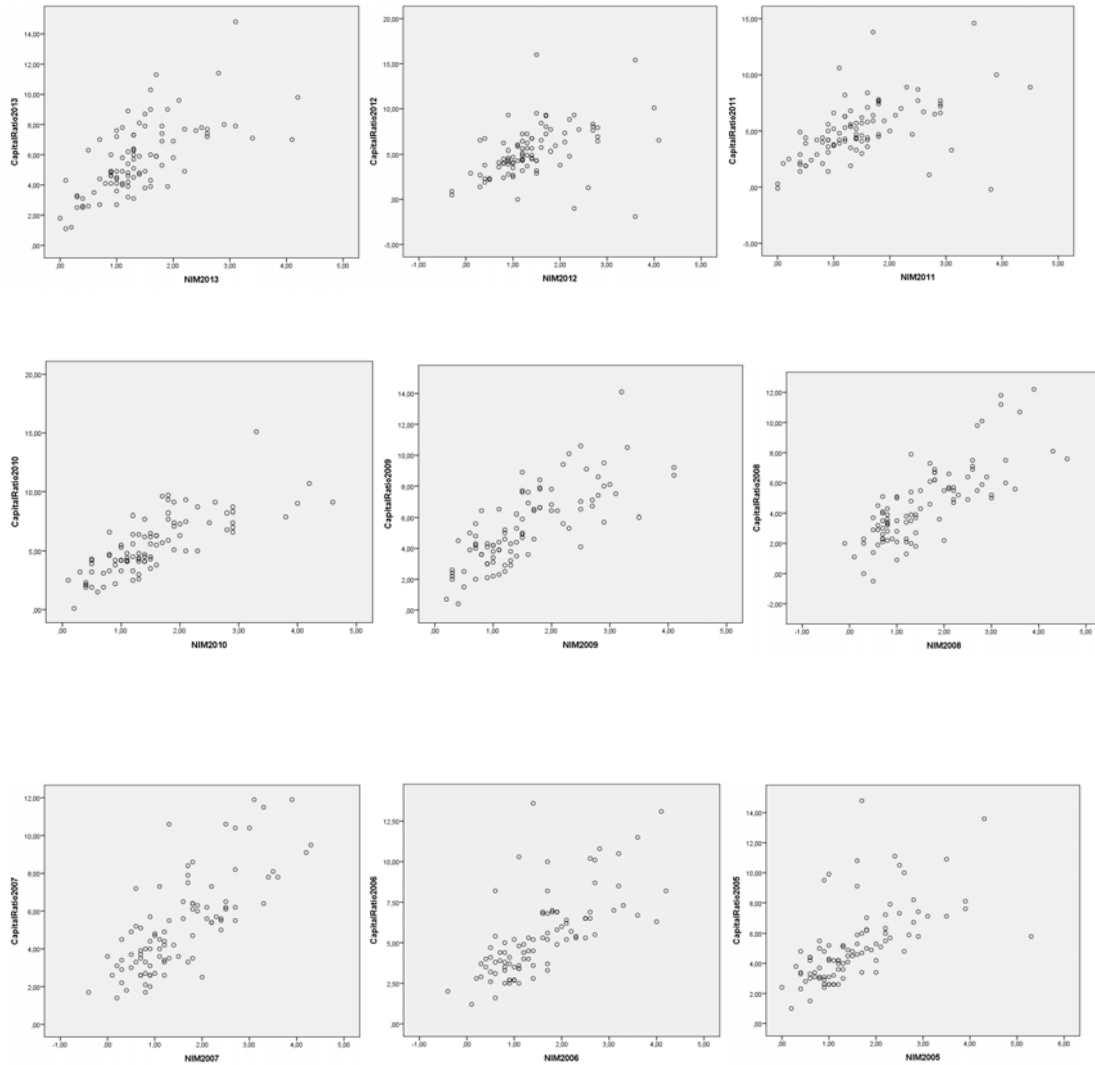
8.2 Appendix 2

Correlation between Tier 1 ratio and NIM, for each year



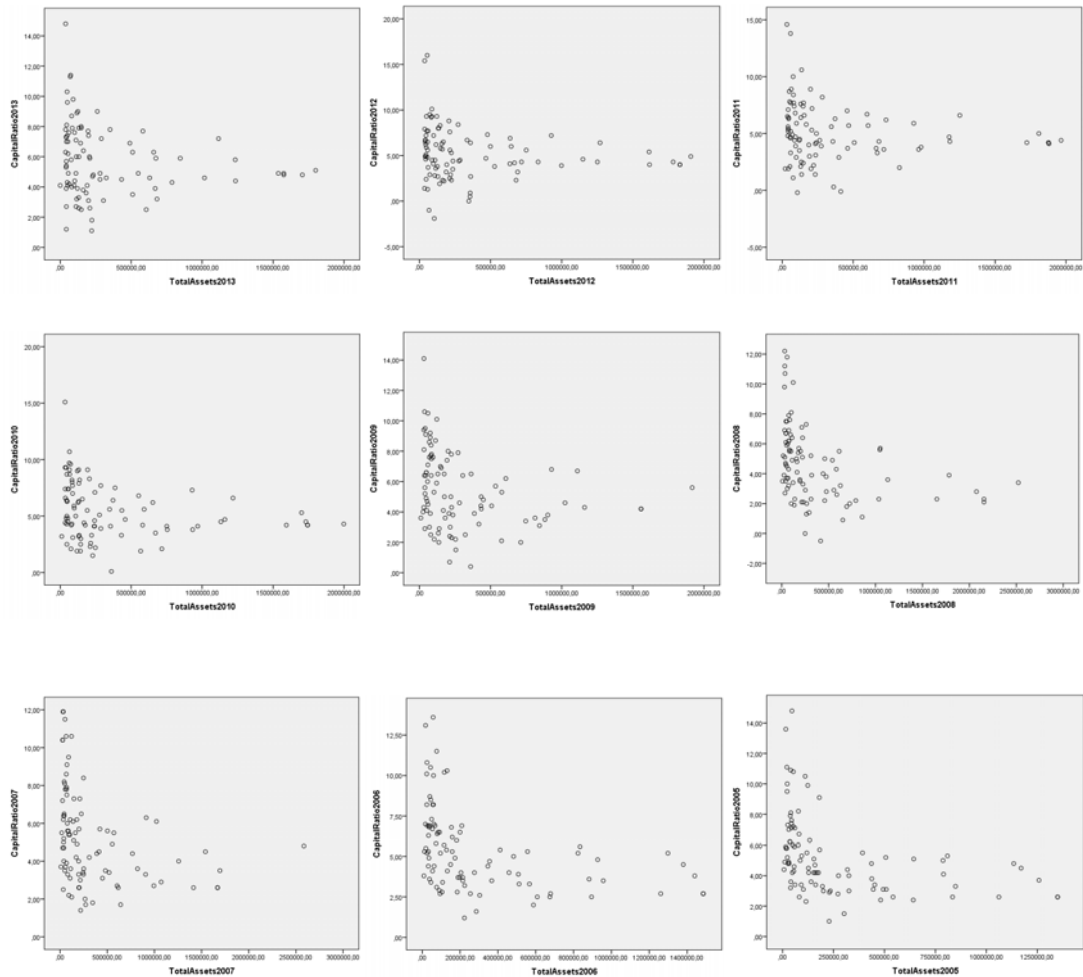
8.3 Appendix 3

Correlation ETA and NIM, for each year



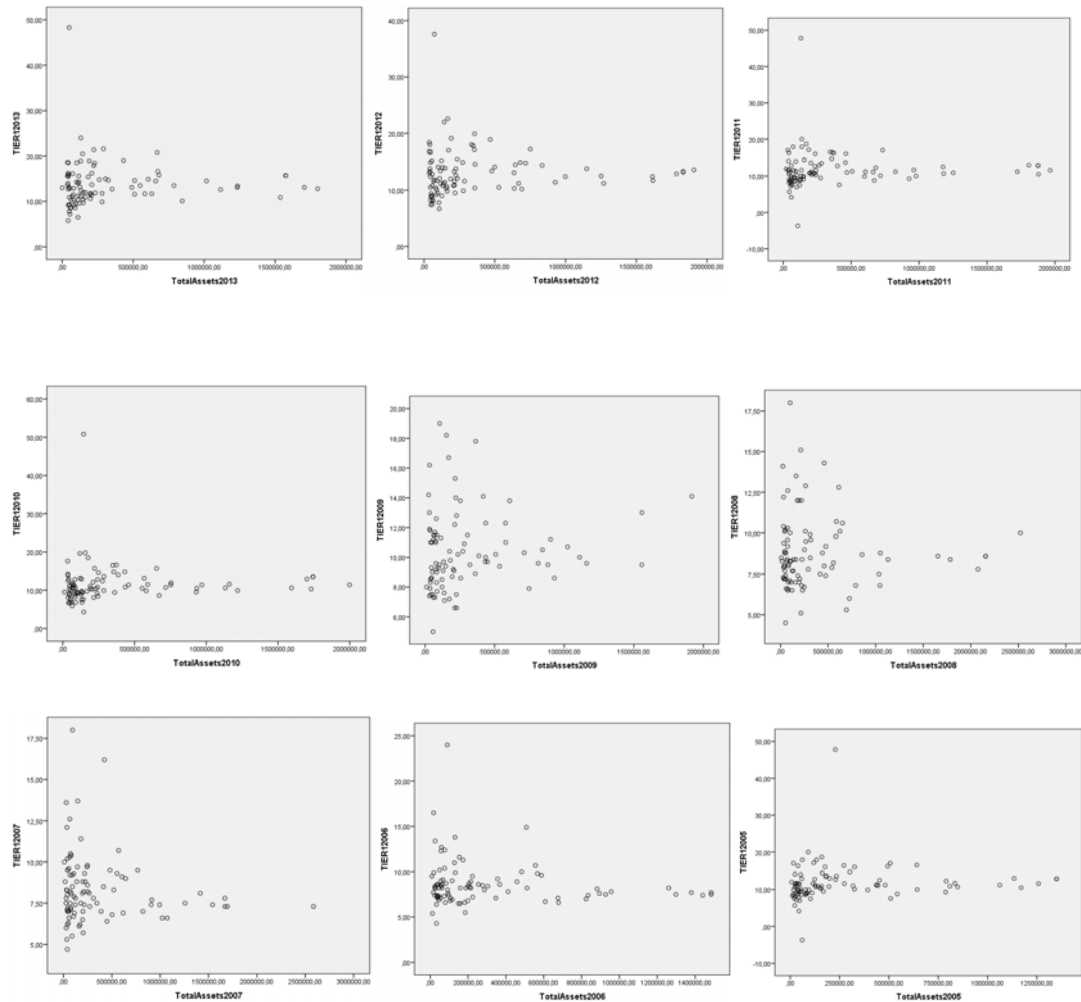
8.4 Appendix 4

Correlation ETA and Total Assets, each year



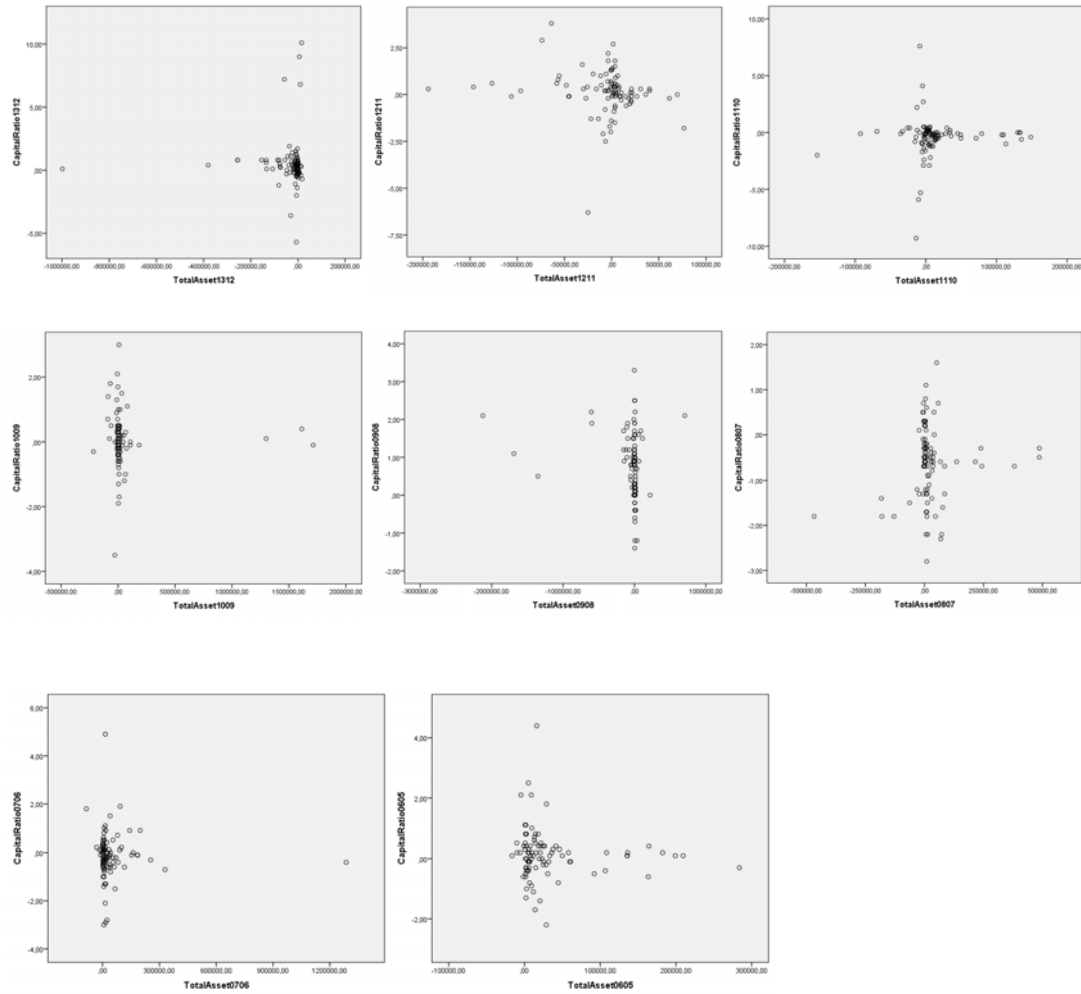
8.5 Appendix 5

Correlation Tier 1 and Total Assets, each year



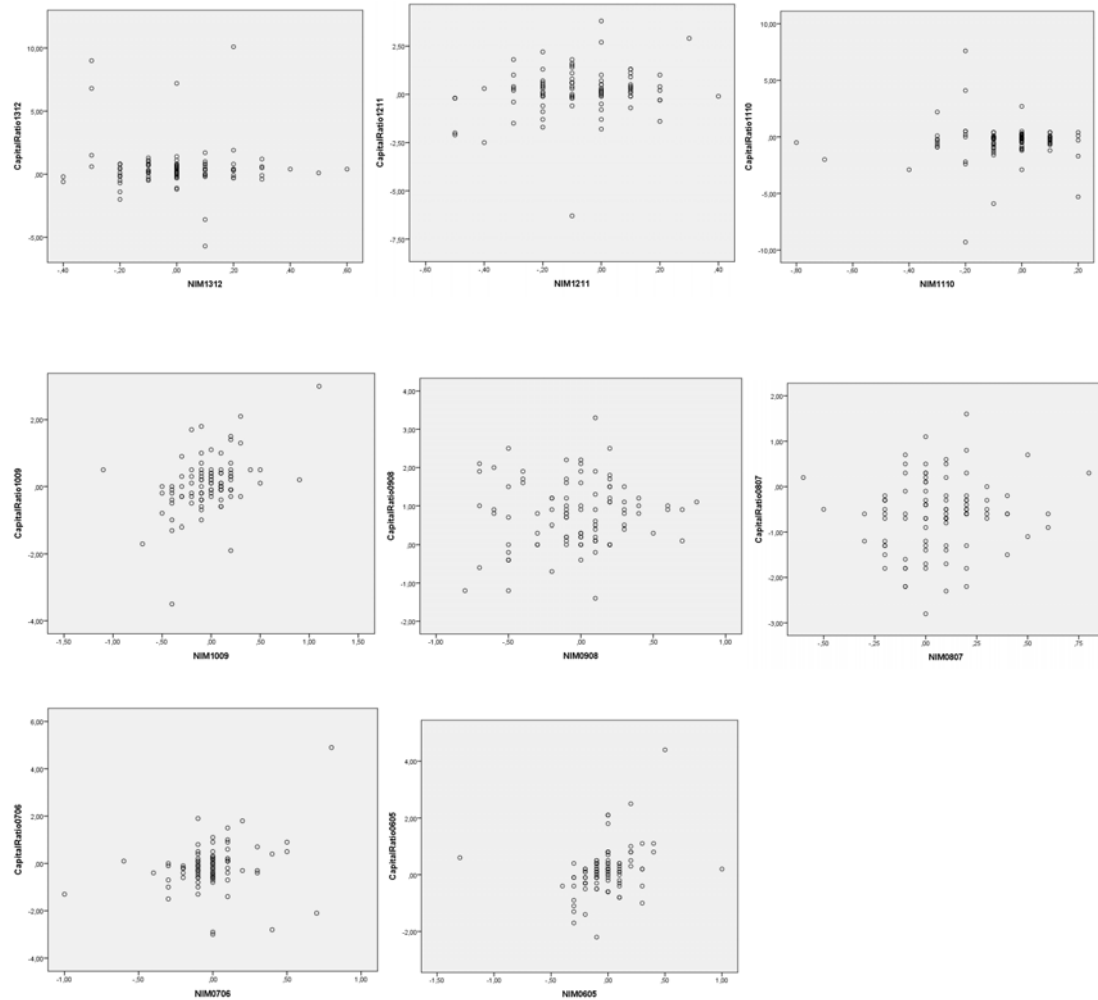
8.6 Appendix 6

Correlation ETA and Total Assets, change between years



8.7 Appendix 7

Correlation capital Ratio and NIM, change between years



8.8 Appendix 8

Correlation Tier 1 Capital and NIM, change between years

