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Basel III Net Stable Funding ratio: Euro area developments

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ABSTRACT

In this thesis The Net Stable Funding Ratio (NSFR) levels for Euro-Area countries are investigated. NSFR is a part of Basel III Liquidity framework, which aims to promote more sustainable funding structure in relation to their assets and off-balance sheet activities. This area of banking regulation is highly debated but specific studies about the subject are limited. This study uses methods from a study conducted by King 2013 in estimating the NSFR but develops them further for additional accuracy. NSFR levels are calculated using the original 2010 specification as well as the new 2014 specifications. The sample for the study includes 2836 banks from 18 countries and the data consists from income statements and balance sheet items gathered from Bankscope and ECB Statistical Data Warehouse for end of 2014.

The results show that the weighted average country level NSFR with 2010 specification falls below the minimum requirement of 1,00 with an average of 0,974. The variability between countries is high from 0,65 for Greece to 1,299 for Italy. Eight countries out of 18 are below the minimum requirement, which indicates that there is still lot of work to be done in this area for the sample countries. For the 2014 specification the average NSFR level increases to 1,026. The variability is still large from 0,69 for Greece to 1,37 for Italy. There are still seven countries below the minimum requirement for the new specification. This shows that the new specifications are not that demanding to banks but there is still lot of changes to balance sheets of banks that have to be implemented. These changes could have significant affects to bank profitability and net interest margin. Additionally the results show that the concentration of funding and assets play an integral role in NSFR levels.

Results give new information about the development of NSFR levels in the Euro-Area and particularly it looks at country specific NSFR levels. Findings show high variation between countries in NSFR levels and that although the area is geographically and financially integrated, for NSFR the differences are significant.

KEYWORDS: Bank regulation, Net Stable Funding Ratio, liquidity, euro area

1. INTRODUCTION

Banking regulation has gained more interest from the general public since the financial crisis of 2008. In the aftermath of the crisis a new regulation framework Basel III was introduced to promote more resilient banking sector. The implementation for the new regulations began in 2013 and is set to end in 2018. In the new regulation there is a capital adequacy reform and one of the measures is the Net Stable Funding Ratio (NSFR). This measure was developed to make sure that in a stressful market environment banks would be able to fund their losses occurring from the asset side of the balance sheet if there would be non-performing loans for example. Also in this liquidity framework is the Leverage Capital Ratio (LCR) and between these two measures banks are urged to raise higher quality capital and to have more of this regulatory capital on their balance sheet. The two main reasons for the financial crises were excessive leverage and low quality of the capital base in banks. These two measures address the reasons for the crises head on and thus the development regarding these measures is an interesting topic to examine. I chose the NSFR to focus on because it is more complex and difficult for banks to meet and the impact to banks ability to do business. Also the LCR calculation requires bank specific data, which is not available at this time so in order to have results that are accurate, it's left out from the study. Additionally I chose to focus on the euro area as this part of the global financial markets is still struggling to cope with crisis and the recovery has been slow if not no existent in this area.

The NSFR focuses on the funding and asset structures of banks and aims to promote more long-term funding to cover liquidity profiles for assets. The minimum requirement for this measure is 100 %, which means that all the assets weighted by the inclusion factor assigned by the NSFR specification should be funded from liabilities weighted by similar inclusion factor from the NSFR. There are monitoring exercises done for the NSFR levels globally by the Bank of International Settlements (BIS) as well as the European Banking Authority (EBA) but these exercises use quite limited samples from the countries in the studies and thus a more specific estimation of NSFR levels is called for. In 2013 Michael R. King published his study "The Basel III Net Stable Funding Ratio and bank net interest margins" and I will use much of the same methodology and theory in my study to

make my results comparable. This study used data from 2009 whereas I used data from 2014 so between studies there are five years of banks trying to meet the required funding and asset compositions. I will calculate the NSFR level for my sample countries using the original 2010 specifications and the new specification revised in October 2014 to see whether these revisions have positive or negative affects to the NSFR levels. I will also compare my 2010 results to the ones King obtained in his study to see whether time has helped bank to cope with the regulation.

2. KEY DEFINITIONS

ASF — Available Stable Funding. Balance sheet liabilities weighted weighted by inclusion factor. Numerator in the NSFR calculations.

BCBS — Basel Committee on Banking Supervision. Authority behind Basel regulations and the most influential banking regulation trend setter globally.

EBA — European Banking Authority. Independent EU regulation and supervision party which monitors European banking sector.

HQLA — High quality liquid assets. In the center of LCR and NSFR calculations as HQLA assets are the ones, which are easily and immediately converted into cash at no loss to the convertor.

LCR — Leverage capital ratio. Second part of the Basel III liquidity framework reform

NSFR — Net Stable Funding Ratio. Part of the Basel III liquidity framework reform. Measures the maturity mismatches in the asset and liabilities in the long-term. Definition is ASF/RSF and minimum requirement is 100%.

SME — Small and medium size enterprises. Treated as retail loans in NSFR.

RSF — Required Stable Funding. Balance sheet assets weighted by inclusion factors from the NSFR specification. Denominator in the NSFR calculations**.**

HHI — Herfindahl-Hirschmann-index. Common tool for looking at market concentration.

NIM — Net Interest Margin, performance metric wich tells how successful company's investments are compared to its debt situation

3. OBJECTIVES OF THE STUDY

In this chapter I will present the goals and purpose of my study. The goal of the study can be divided into two sections, which are very closely connected to each other. First goal is to calculate the Net Stable Funding Ratio to my sample countries with the older NSFR specifications and then do the same calculations with the new amendments taken in count for. This would give me a picture of how the changes will affect the NSFR levels and how these changes in levels will effect the banking sectors reactions to regulations in the future. I will also look at the countries, which exist in both King's article and mine and try to look at the differences between these two estimations. Comparing the calculations made with the same 2010 specifications and for the same countries gives me an idea on how the five years between the data points have effected the balance sheet compositions for the countries. After this my second goal is to try to find some correlations between the NSFR levels and the specific funding structures of the sample countries. For the overall purpose of the study I aim to get a comprehensive picture of the state and stableness of the banking sector in Europe and especially look at the specific funding and asset classes which contribute the most to the NSFR levels and then discuss what those results in indicate for banks in the future and how they could develop their risk management.

4. LITERATURE REWIEW

In this section I will present and discuss the literature regarding important subjects regarding my thesis. It will cover bank liquidity, bank regulation, NSFR and LCR. Bank liquidity covers wide range of topics from general market liquidity to bank liquidity and liquidity creation of banks. This is why in the first section I will cover all the topics regarding bank liquidity in order to get a comprehensive picture of what exactly bank liquidity means. This will help with further analysis about the subject later on.

The second part discusses important literature regarding Bank regulation and focuses on the Basel accords in particular. I will go through the development of these accords and their effects on the banking sector. My main focus will be on the liquidity regulation as it's in the center of my analysis later on. Bank liquidity regulation is crucial because liquidity is a pivotal part of efficient financial markets. Recent crises have shown that failure in regulating bank liquidity can have significant effects on both macro and micro economic levels.

The interesting question proposed through out history is one of correct level of bank regulation. If the regulation is too mild this may cause the banks to take on too much risk and thus have too low liquidity levels. Evidence from such chain of events can be seen in the recent financial crises where banks took on too much risk and had far too low levels of liquidity to survive the stresses they faced. Ultimately in many cases the cost was carried on the public when these banks where forced to bailout to prevent an even larger financial catastrophe. If on the other hand the regulation is too harsh it will cause too big of a economic burden to banks and then they will transfer these costs to consumers in form of higher interest rates and other services banks provide for the public. It can be then said that the correct level of regulation is compromise between the regulating bodies and the banks, but what is still up for debate is what exactly the right level is.

In the next section I will go through the Liquidity Coverage Ratio (LCR), which is an important part of Basel III accord and in the center of my analysis. The LCR promotes the short-term resilience of a bank's liquidity risk profile. It does this by ensuring that a bank has an adequate stock of unencumbered high-quality liquid assets (HQLA) that can be converted into cash easily and immediately in private

markets to meet its liquidity needs for a 30 calendar day liquidity stress scenario (BCBS 2013). More accurate descriptions of what the LCR actually entails will be presented in this section as well as some scenarios where this measure could be tested.

The fourth section will discuss the net stable funding ratio (NSFR). This is also a important part of the Basel Accords and in the center of my analysis. It requires banks to maintain a stable funding profile in relation to their on-and off-balance sheet activities, thus reducing the likelihood that disruptions to a bank's regular sources of funding will erode its liquidity position in a way that could increase the risk of its failure and potentially lead to broader systemic stress (BCBS 2014). I will present the relevant estimates of NSFR levels in the countries within my scope. After this I will present some strategies on how to increase the NSFR levels and some responses from other academic authors to the NSFR and Basel III liquidity regulation.

4.1 Bank Liquidity

Bank liquidity is in the heart of banking and providing liquidity to the market is one of their key roles. Banks traditionally produce credit and thus provide liquidity. This liquidity creation happens when resources from entities with excess funds (savers) are channeled to entities with a scarcity of funds (investors) (Strahan 2008).

Defining liquidity is a more complex scenario. It can be divided into three subsections and in this section I will present the relevant academic literature regarding banking liquidity and its different parts. The three main components of bank liquidity are liquidity creation, funding liquidity and market liquidity. According to Strahan (2008) market liquidity can be seen as the cost of selling assets. In other words market liquidity is high when you can sell an asset quickly with low transaction costs and near its fundamental value. Funding liquidity is defined by Brunnemeier and Pederson (2009), as " the ability to raise cash on short notice" (Brunnemeier and Pedersen 2009). It basically means funding illiquid loans with liquid deposits. Here we come to the third part of bank liquidity,

liquidity creation. By funding illiquid loans with liquid deposits banks are actually creating liquidity.

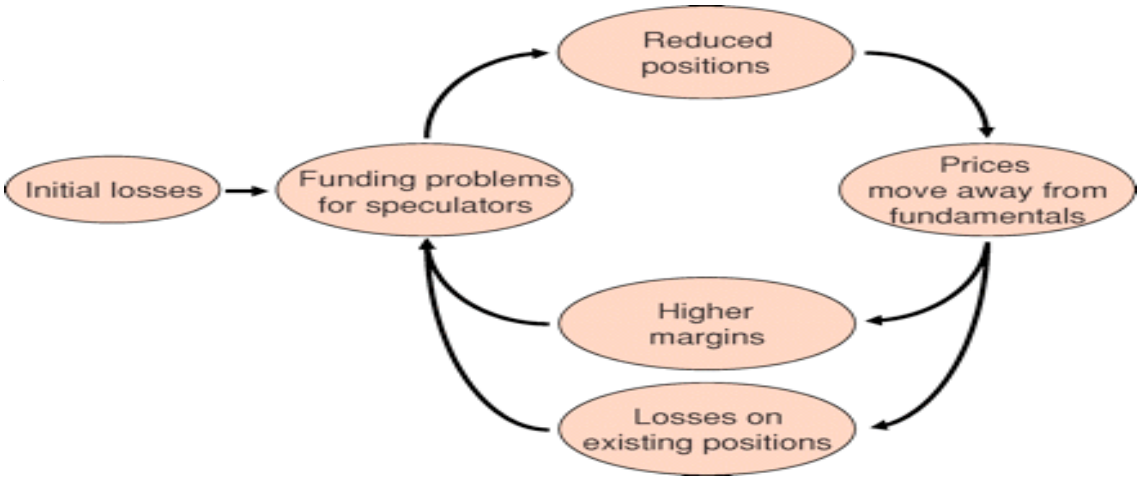
As banks provide funding liquidity and market liquidity the changes of Basel III relate to them directly. In this section I will look at the Basel III relationship to these different forms of bank liquidity and especially the LCR and NSFR ratios.

4.2 Funding Liquidity

In a traditional sense banks provide funding liquidity to customers by issuing transactions deposits that act as a close substitute for currency (Strahan 2010). The deposits allow account holders to take cash on demand from the bank. These deposits can be invested onwards to businesses and households. This business model has been called "asset transformation" because banks "transform" illiquid and high-yielding assets to liquid and low-yielding assets. This yield spread is what creates the positive net value for banks from this business model.

Early theories about this subject focused on information and monitoring to solve financial contracting problems in bank lending (Brealey, Leland & Pyle 1977). As the intermediary, the bank pools funds from small and uniformed depositors and lends on their behalf. Given the relatively limited information of these investors, banks tend to be financed with debt (Townsend 1979). This debt can be seen as the funding risk for banks, which refers to a bank's ability to raise funds in the desired amounts on an ongoing basis (CGFS 2010). Brunnemeier and Pedersen (2009) illustrate that funding liquidity is highly attached to market liquidity through liquidity spirals (Brunnemeier 2009). Below is the illustration from the article. Source: Brunnmeier & Pedersen 2009

Figure 1 Liquidity Spiral: Bank Liquidity Creation



margins of speculators positions and thus affects the asset side of banks portfolio. Therefore funding risk relates closely to liquidity risk, which is the ability to finance cash outflows at any point in time. Liquidity risk is the fundamental part of the Leverage Capital Ratio (LCR), which I will address later on more carefully. As Michael R. King notes in his article, if liquidity risk refers to the asset side of the balance sheet, then funding risk refers to the liability side. (King 2013).

It is also worth noting that besides affecting banks, funding liquidity also affects other involved parties in the financial markets. As the funding liquidity affects the ability acquire funding this has a clear relationship to corporations and other entities in the markets. Basel III reforms have also an affect on funding liquidity in the sense that it prefers other liabilities over other and thus will affect the funding liquidity directly.

4.3 Market Liquidity

In this section I will cover the relevant academic literature about market liquidity and what it means in the financial markets. It is a very broad subject and it has been given a number of different definitions but the key point is assets and their tradability.

As noted above market liquidity refers to the tradability of an asset that the bank is holding. Because according to Strahan 2010 many of the changes in banking over the past twenty years reflect moving from a model of “originate and hold” to “originate and sell “banks tend to create market liquidity rather than funding liquidity (Strahan 2010). This means transforming an illiquid asset like a loan for example, which is hard to sell to an asset that is easier to sell like a bond for example. In doing so banks can then provide new loans with this freed capital to be sold. Another way of defining market liquidity is a situation where an asset can be sold without causing a significant price movement. When the market is liquid the right price for a specific asset can be found in the market and there are enough sellers and buyers to do a transaction on that fair price which is close to the assets fundamentals. This asset pricing near its fair value and fundamentals, is a definition used by Amihud and Mendelson (1986) for market liquidity. If the markets are illiquid the price of an asset can vary greatly from the fundamental value of the asset. Because the asset has fewer buyers in illiquid markets the seller

has to sell the asset at a discount. On the other end of the scale if the markets are too hot, as is the case when real-estate bubbles form in the markets the seller can ask a far greater price from the asset than would be fair or the price that would reflect the fundamentals of the asset. This then brings us to an interesting fact about different asset classes and the way these asset classes have their own market liquidity. This is important for my thesis as bank capital is consisted of different kinds of asset classes, which then have various different market liquidity levels. For example government bonds and stock of S&P 500 companies do not fluctuate in price in a normal scenario. This means that the buyer of such asset can be sure that the price is the fair value of that asset at the time of the trade. On the other hand real estate and rare collectable cars for example can be very difficult to price and so can have larger price changes.

Some research view market liquidity from a perspective of intermediary relationship as a market maker between the seller and buyer. One way too look at market liquidity this way is presented by Grossman and Miller (1988), they specify market liquidity as a determinant of the demand and supply immediacy. Supply immediacy in this case means that the time needed to make a trade with an asset should be insignificant obstacle and transaction costs low as well as known beforehand for there to be market liquidity.

The interesting part of market liquidity for my thesis is that it can rapidly decrease and cause major problems for the financial markets. In 2009 Brunnmeier concluded “a relatively small shock can cause liquidity to dry up suddenly and carry the potential for a full-blown financial crisis” (Brunnmeier 2009). This was the case with Bear Stearns and Lehmann Brothers during the financial crises where their assets became virtually worthless due to the illiquid markets at the time. This brought up the need for regulation in the financial markets and the Basel Accords. In his article about the subject King (2013) concludes “the Basel III liquidity requirements do not target market liquidity, although they affect it by increasing the cost of intermediation and changing the demand for assets with specific characteristics (i.e. high credit quality, longer maturity) “ (King 2013).

4.4 Liquidity Creation

In this section I will go through bank liquidity creation and its role regarding my thesis. Liquidity creation tightly ties into market liquidity and funding liquidity, as they all are integral parts of banking.

According to Berger and Bowman (2009) Banks exist because they perform two central roles in the economy – they create liquidity and the transform risk. Brunnemeier and Pedersen (2009) argue that although the reason why banks hold capital is motivated by there risk transformation role, recent theories suggest that bank capital may also affect banks ability to create liquidity. Gorton and Winton (2014) address this issue by showing how higher capital ratio may reduce liquidity creation through the crowding out of deposits. Their argument is that deposits are more effective liquidity hedges for investors than investments in equity capital and higher capital ratios shift investors' funds from deposits to bank capital. Since deposits are liquid and bank equity is illiquid, there is a reduction in overall liquidity for investors when the capital ratio is higher. (Gorton & Winton 2014).

The Basel III accord has a clear affect on liquidity creation. In their paper Howarth, Seidler and Weill (2012) conclude that Basel III might lead to banks reduced liquidity creation by introducing tighter capital requirements. This supports the Gorton and Winton crowding out of deposits theory. They also conclude interestingly that greater liquidity creation might hamper bank solvency. In other words there is a trade-off between liquidity creation and bank solvency and as the authors note this should be taken into consideration when implementing the Basel III reform. (Howarth, Seidler and Weill 2012).

5. THE BASEL COMMITTEE AND BASEL ACCORDS

In this section I will go through the history of Basel Committee on Banking Supervision (BCBS) as well as the evolution of the Basel Accords. I think it´s important to go through the history of the accords, not just the current situation because the changes that have been made over time reflect what was needed in the financial sector in order to prevent it from collapsing. The structure of the chapter is as follows, First I will introduce the birth of Basel Committee and its history briefly, then I will move on to the Basel Accords starting from the oldest and working my way up to the newest and for my thesis the most important accord Basel III. Lastly I will look more closely to the parts of Basel III, which relate to my study the most, namely the Basel III Liquidity framework.

5.1 Basel Committee on Banking Supervision (BCBS)

The Basel Committee on Banking Supervision has its origin in the financial market turmoil that followed the breakdown of the Bretton Woods system of managed exchange rates in 1973. After the collapse of Bretton Woods, many banks incurred large foreign currency losses (BCBS 2014). In response to these and other disruptions in the international financial markets, the central bank governors of the G10 countries established a Committee on Banking Regulations and Supervisory Practices at the end of 1974. This was later renamed Committee on Banking Supervision. The purpose of the committee was to be a forum of regulatory cooperation between its member countries on banking supervisory matters. Its aim was to enhance financial stability by improving supervisory knowhow and the quality of banking supervision worldwide (BCBS 2014). Main tools of the Committee for achieving its goal include setting minimum standards for the regulation and supervision of banks as well as improving cross-border cooperation and identifying current and emerging risks for the global financial system. It does this by issuing the Basel Accords, which I will go through later on in this section as well as having meeting between the member jurisdiction Central Bank Governors and Heads of Supervision (GHOS) from the now 28 member countries (BCBS 2014).

It is important to note that Committee's decisions have no legal force. Committee formulates supervisory standards and guidelines and recommends sound practices in the expectation that individual national authorities will implement them. Also in 2012 the Committee began also monitoring the implementation of its standards in order to improve the resilience of the global banking system and encourage a regulatory level playing field for internationally active banks.

5.2 Basel I Accord

After Committee had laid out the principals for supervision in internationally active banks it soon realized that capital adequacy was the main focus point in its activities. This was even more heightened by the Latin American debt crisis in the early 1980's. To stop the capital standards from deteriorating in the banking system the Committee published the so-called Basel Capital Accord in 1988. Its main contribution relied on the risk-weighted assets of 8 % of minimum capital for banks to hold on their balance sheet in order to protect them from possible losses. The focus here was particularly on the credit risk of banks; it therefore did not include any major liquidity regulations in the beginning. The accord was amended later on in 1996 to also include market risk by including both on- and off-balance sheet positions that banks could face from market price fluctuations (BCBS 2014). Balthazar has concluded about the Basel I Accord that its main focus was to differentiate the assets held to maturity from those that were purposed for short-term sale and the introduction of internal value-at-risk capital requirement calculation models, commonly known as VAR models (Balthazar 2006: 31).

Despite its obvious merits in developing bank regulation and supervision Basel Accord has criticism. Balthazar concludes that the greatest problem with the accord is its approach on securitization, followed by the lack of risk sensitivity, the limited recognition of collateral, one-size-fits-all approach and no recognition of diversification. Another way of looking at the problems that Basel Accords are facing is explained by Jones (2000). He states that the accords are facing difficulties as banks are using securitization and other financial innovation to reduce the risks. Due to the aforementioned concerns, the development of the Basel accords was seen as necessary (Jones 2000).

5.3 Basel II: The New Capital Framework

In June 1999, The Committee issued a proposal for a new capital adequacy framework to replace the 1988 Accord. This led to the release of the Revised Capital Framework in June 2004. Generally known as "Basel II", the revised framework comprised three pillars, namely (BCBS 2014):

1. Minimum capital requirements, which sought to develop and expand the standardized rules set out in the 1988 Accord;
2. Supervisory review of an institution's capital adequacy and internal assessment process; and
3. Effective use of disclosure as a lever to strengthen market discipline and encourage sound banking practices.

(BCBCS 2014)

This new framework aimed to address the financial innovations that had occurred in recent years. Also the goal was to improve regulatory requirements in order to reflect the underlying risks banks have. All in all the main focus in the Basel Accord II was still the credit risk and capital adequacy but it was much more complicated and comprehensive than the first accord.

The first pillar of the Basel Accord II addressed the solvency ratio already in the first accord. The main difference between the new capital adequacy requirement ratio and the previous one is that it firstly contained minimum capital requirements to all risk classes that banks face: operational risk, credit risk and market risk. The approach was simpler in regarding the credit risk because it relied on banks own risk methods and therefore there would be much less difficulties in calculating between economic capital of banks and regulatory capital. Similar approach was also partly taken to address the market risk part of the capital requirements. The second pillar was introduces in order to give the regulators better tools to work with as well as improving the internal risk management of the institutions regulated. The third pillar aimed to give market participants better understanding about the riskiness of financial institutions and enhance transparency in the markets.

Despite the introduction and implementation of Basel II the world went through the worst financial crisis since the Great Depression. The reasons why Basel II

couldn't prevent the crisis are complicated but some clear weaknesses stood out from it. According to Brunnermeier 2009 two main trends that lead to the financial crisis were not addressed properly in the Basel II accord. Firstly the risks involving securitization was recognized in the already in the first accord but it wasn't addressed with proper even in the Basel II. Secondly many investment and commercial banks faced severe maturity mismatches during the crisis and this wasn't either addressed with the severity it needed in the Basel II accord (Brunnermeier 2009).

In BCBS own publishing it is stated, "Even before Lehman Brothers collapsed in September 2008, the need for a fundamental strengthening of the Basel II framework had become apparent. The banking sector had entered the financial crisis with too much leverage and inadequate liquidity buffers"(BCBS 2014). In response to the clear need for revision of the regulatory framework, began the preparation for the Basel III.

5.4 Basel III

The recent financial crises can be seen as the catalyst for Basel III development and the accord was developed to address the flaws that were uncovered during the financial crisis. The new set of rules was agreed in 2010 and the implementation began in 2013. The implementations will be completed in 2018. In their own publication the BSBC states, "One of the main reasons the economic and financial crisis, which began in 2007, became so severe was that the banking sectors of many countries had built up excessive on and off-balance sheet leverage. This was accompanied by a gradual erosion of the level and quality of the capital base" To address these failures the Committee introduced a number of fundamental reforms to the international regulatory framework. The reform aims to strengthen bank-level, or micro prudential, regulation, in order to raise the resilience of individual banking institutions to periods of stress.

In the new capital framework there are two different parts in it. The first one is pretty similar to the Basel II framework and addresses capital regulations. It builds on the three pillars introduced in the Basel II framework. These pillars are capital adequacy, risk management and supervision as well as market discipline. They raise both the quantity and quality of the regulatory capital base. According

to BCBS the capital framework is created in order to ensure that the regulatory capital levels are sufficient to prevent the excessive on-and off-balance sheet leverage, which was one of the reasons for the financial crisis (BCBS 2011). Below is the timetable for the different phases in Basel III regarding the capital side of the regulatory framework (BSBC 2011).

The more important part of the new regulatory framework is new liquidity framework, which is new to the Basel III. In the liquidity framework the regulation focuses on preventing bank insolvency and improving bank liquidity overall. This part of the regulatory framework is particularly motivated by the recent financial crisis, as the liquidity of the banking sector was a major cause of concern during the crisis. What makes this liquidity framework even more interesting from my thesis and the analysis is first of all that this liquidity framework is the first set of global liquidity standards that focus on liquidity and thus they can be expected to have a real impact on bank balance sheet and bank profitability. These effects are the ones I will be focusing in the thesis, and the next chapters will be dedicated firstly to go through the regulatory tools and later on really dig into the changes they might have on bank profitability and the risk of insolvency.

The two key regulatory tools introduces in the Basel III regulatory framework are the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR). In addition to these major regulatory tools the framework has some additional metrics for measuring and monitoring liquidity. These tools focus on available unencumbered assets, concentration of funding and contractual maturity mismatches. Significant currency and market-related monitoring tools are the focus on the LCR. Its target is to have banks hold liquidity under short-term liquidity stress scenario lasting 30 days. The banks should have enough high quality liquid assets (HQLA) to cover net cash outflows over simulated stress period. This tool is phased in starting in 2016 with 50% ratio required from banks and ends in 100% ratio requirement in 2019. The NFSR on the other hand is focused on longer-term liquidity and requires a minimum amount of stable sources of funding to exceed the relative liquidity of assets and off-balance sheet commitments calculated over a one-year time period. As we can see the LCR and The NFSR focus on different aspects in bank liquidity and their goals are quite different, however they can be seen complementing each other. I will leave the LCR from further inspection as this study focuses on the Net Stable Funding Ratio and including a comprehensive analysis for both measurements is out of the scope of the study.

6. THE NET STABLE FUNDING RATIO (NSFR)

In this section I will go through the definition and purpose of the NSFR followed by various findings about the NSFR levels globally and from Europe. These estimations are made by official organizations and academics.

Maturity transformation performed by banks is a crucial part of financial intermediation that contributes to efficient resource allocation and credit creation (BCBS 2014). Although pivotal to banks role in the financial markets, problem in the maturity transformation is that limiting excessive reliance on leverage as cheap but unstable funding has weal incentives to individuals because of the upside they offer. This leads to often unstable funding of core (often illiquid) assets. Banks have private interests to increase leverage and expand their balance sheet; they often do this using relatively cheap and abundant short-term wholesale funding. This rapid expansion of the balance sheet can and usually does weaken the banks ability to cope with liquidity and solvency shocks. Due to the interconnectedness of the financial markets these problems facing individual banks can have systemic implications and cause spillover effects (BCBS 2014). This is the key element in the banks business that the Net Stable Funding ratio aims to address. The ratio was first published in 2009 and the measure was included in the December 2010 Basel III agreement. At the time, the Committee put in place a rigorous process to review the standard and its implications for financial market functioning and the economy (BCBS 2014). The standards remained unchanged until the beginning of 2014 when the Committee issued a revised set of standards which focused more on the riskiest types of funding in the banks risk profile. During the revision the Committee also enhanced the alignment with the other monitoring tool pivotal in my thesis, the Leverage capital ratio (LCR) (BCBS 2014). Although the Committee stated that all banks with international operations should be required to operate under Basel III regulations, the final decision regarding the implementation is in the hands of the highest authority in the region, EBA in Europe for example (BCBS 2014).

As was introduced before, the NFSR aims to make sure that banks have stable funding profile in relation to the composition of their assets and off-balance sheet activities. A sustainable funding structure is intended to reduce the likelihood that disruptions to a bank's regular sources of funding will erode its liquidity position in a way that would increase the risk of its failure and potentially lead to broader

systemic stress. The ratio focuses medium and long-term funding in regards to activities of banking organizations (BCBS 2010). Basically this means that long-term assets should fund long-term liabilities over one year horizon. In real terms this would mean that the liabilities will become more mature and thus their risk profile would decrease and on the other hand the risk/maturity profile of the assets will decrease. Below is the basic definition of the NFSR from the BCBS document published in January 2014.

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

(BCBS 2014)

The definition basically means that long-term assets should be funded with long-term liabilities. The available stable funding in the NFSR is defined as the portion of capital and liabilities expected to be reliable over the time horizon considered by the NFSR, meaning basically one year. The required amount of stable funding id defined by the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its off-balance sheet (OBS) exposures (BCBS 2014). In the following chapters I will go through these definitions more precisely and sum them up in the end.

6.1 Definition of ASF and RSF

In the following sections I will go through more precisely what entails the available stable funding and required stable funding, which comprise he Net Stable Funding Ratio. I will focus on the specifications in these two components and I aim to answer the question how are these two components calculated exactly and also what improvements have been made to the two after the initial introduction of the ratio.

6.1.1 Definition of available stable funding

In the document published in 2014 BCBS the available stable funding is defined very carefully. It states that "The amount of available stable funding (ASF) is measured based on the broad characteristics of the relative stability of an institution's funding sources, including the contractual maturity of its liabilities

and the differences in the propensity of different types of funding providers to withdraw their funding". First the institutions capital and liabilities are assigned to one of five categories, which have an intrinsic carrying value. Carrying value means the amount at which each liability exists in institutions balance sheet for example before any regulatory deductions or filters have been applied. The amount from institution's capital and liabilities is then multiplied by a ASF factor, and thus the total amount ASF is the sum these weighted amounts. It is noted in the BCBS document of January 2014 that in determining the maturity of an equity or liability instrument, investors are assumed to redeem call option at the earliest possible date (BCBS 2014). Whereas with funding involving options that are exercisable when ever the banks chooses to do so, supervisors should take into the fact that bank's facing insolvency problems for example are likely to have reputational problems as well, thus possibly limiting the banks ability to exercise those options.

6.1.2 Definition of Required Stable Funding

Here I will again rely heavily to the BCBS published paper about Net Stable Funding Ratio in defining how required stable funding is calculated. The paper states, "The amount of required stable funding is measured based on the broad characteristics of the liquidity risk profile of an institution's assets and off balance sheet exposures" (BCBS 2014). In calculating the amount of required stable funding there are very similar basic principles in comparison to calculating the amount of available stable fund, which I covered earlier. Similarly, the amount of required stable funding is first calculated by assigning the carrying value of an institution's assets to the categories listed. Each assigned amount is then multiplied by its own required stable funding factor (RSF), and the total sum of the weighted amounts are then added up with the off balance sheet activity (or potential liquidity exposures) to have the total amount of RSF (BCBS 2014). The intention in approximating these assets is to have them reflect a situation where they have to be funded because it could not be monetized by selling it, used as collateral or where it would be rolled over. If these actions cannot be done within a time period of one year without significant cost, these assets are expected to be funded by stable funding after that. Below are summaries of ASF and RSF from the BCBS document regarding Net Stable Funding Ratio.

Table 1 and 2 Summaries of the composition of ASF and RSF from the BCBS document for Net Stable Funding Ratio

Summary of asset categories and associated RSF factors — Table 2

RSF factor	Components of RSF category
0%	• Coins and banknotes • All central bank reserves • All claims on central banks with residual maturities of less than six months • "Trade date" receivables arising from sales of financial instruments, foreign currencies and commodities.
5%	• Unencumbered Level 1 assets, excluding coins, banknotes and central bank reserves
10%	• Unencumbered loans to financial institutions with residual maturities of less than six months, where the loan is secured against Level 1 assets as defined in LCR paragraph 50, and where the bank has the ability to freely rehypothecate the received collateral for the life of the loan
15%	• All other unencumbered loans to financial institutions with residual maturities of less than six months not included in the above categories • Unencumbered Level 2A assets
50%	• Unencumbered Level 2B assets • HQLA encumbered for a period of six months or more and less than one year • Loans to financial institutions and central banks with residual maturities between six months and less than one year • Deposits held at other financial institutions for operational purposes • All other assets not included in the above categories with residual maturity of less than one year, including loans to non-financial corporate clients, loans to retail and small business customers, and loans to sovereigns and PSEs
65%	• Unencumbered residential mortgages with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the Standardised Approach • Other unencumbered loans not included in the above categories, excluding loans to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach
85%	• Cash, securities or other assets posted as initial margin for derivative contracts and cash or other assets provided to contribute to the default fund of a CCP • Other unencumbered performing loans with risk weights greater than 35% under the standardised approach and residual maturities of one year or more, excluding loans to financial institutions • Unencumbered securities that are not in default and do not qualify as HQLA with a remaining maturity of one year or more and exchange-traded equities • Physical traded commodities, including gold
100%	• All assets that are encumbered for a period of one year or more • NSFR derivative assets net of NSFR derivative liabilities if NSFR derivative assets are greater than NSFR derivative liabilities • 20% of derivative liabilities as calculated according to paragraph 19 • All other assets not included in the above categories, including non-performing loans, loans to financial institutions with a residual maturity of one year or more, non-exchange-traded equities, fixed assets, items deducted from regulatory capital, retained interest, insurance assets, subsidiary interests and defaulted securities

Source: BCBS; Net Stable Funding Ratio 2014

Summary of liability categories and associated ASF factors — Table 1

ASF factor	Components of ASF category
100%	• Total regulatory capital (excluding Tier 2 instruments with residual maturity of less than one year) • Other capital instruments and liabilities with effective residual maturity of one year or more
95%	• Stable non-maturity (demand) deposits and term deposits with residual maturity of less than one year provided by retail and small business customers
90%	• Less stable non-maturity deposits and term deposits with residual maturity of less than one year provided by retail and small business customers
50%	• Funding with residual maturity of less than one year provided by non-financial corporate customers • Operational deposits • Funding with residual maturity of less than one year from sovereigns, PSEs, and multilateral and national development banks • Other funding with residual maturity between six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions
0%	• All other liabilities and equity not included in the above categories, including liabilities without a stated maturity (with a specific treatment for deferred tax liabilities and minority interests) • NSFR derivative liabilities net of NSFR derivative assets if NSFR derivative liabilities are greater than NSFR derivative assets • "Trade date" payables arising from purchases of financial instruments, foreign currencies and commodities

Source: BCBS; Net Stable Funding Ratio 2014

6.1.3 Changes to The NSFR in recent years

As discussed before the NSFR was first introduced in 2010 and it was then revised in January 2014. After this revision the NSFR was again revised in October 2014 and these latest standards are the one's I'm going to use in my calculations. Below are all the changes from 2010 to October 2014 summed up. It is worth noting that in the next chapter I will use the January 2014 standards in comparing estimations of NSFR levels in order to give a more comprehensive view of the changes to NSFR levels of banks in recent years but the 2010 NSFR standards are not included because of the quite significant changes to the framework January 2014 onward.

Figure 2. NSFR changes Since 2010

Figure 1. NSFR Changes Since 2010[1]

ASF	Dec 2010	Jan 2014	Effect
Capital, hybrid, and long term wholesale funding	100%	100%	⇔
Stable deposits	90%	95%	↑
Less stable deposits	80%	90%	↑
Operational deposits	0%	50%	↑
Wholesale funding 6m-1y	0%	50%	↑

RSF	Dec 2010	Jan 2014	Effect
Central bank reserves, cash, banknotes, and unencumbered loans to banks< 6m	0%	0%	⇔
Unencumbered HQLA securities < 1y	0%	5%	↑
Unencumbered Level 2a and 2b securities ≥1y	20/50%	15/50%	⇔
Encumbered HQLAs 6m - 1y	0%	50%	↓
Non HQLA securities and non renewable loans to NBFIs with RM < 1y	0%	50%	↓
Wholesale lending (6m-1y)	0%	50%	↓
Unencumbered loans to retail and SMEs (with RW ≤ 35% under SA and RM of < 1y)	65%	50%	↑
Unencumbered loans to retail and SMEs (with RW > 35% under SA and RM of < 1y)	85%	50%	↑
Unencumbered loans to large corporates, government, PSEs with RM of < 1y	50%	50%	⇔
Unencumbered loans with RW≤ 35% under SA with RM ≥ 1y)	65%	65%	⇔
Unencumbered residential mortgages (with RW≤ 35% under SA with RM ≥ 1y)	65%	65%	⇔
Other unencumbered performing loans (with RW> 35% under SA with RM ≥ 1y)	100%	85%	↑
Encumbered assets for 1 year or more	100%	100%	⇔
Encumbered Non HQLA securities with RM ≥ 1y	100%	100%	⇔

Source: BCBS (2010 and 2014) and staff estimates.
[1] The sign of the NSFR effect is an assessment of the impact of a change in one factor, while holding all else constant. For instance, an increase in the ASF factor for stable deposits from 90 to 95 percent, with all other components and factors of a bank's balance sheet unchanged, should help improve a bank's NSFR.

Source: IMF Working Paper 2014, BCBS 2014, 2010

7. ESTIMATES OF NSFR LEVELS IN RELEVANT LITERATURE

In this section I will go through the relevant findings regarding the Net Stable Funding Ratio from the most relevant institutions monitoring them. These include the BCBS, European Banking Authority (EBA), IMF and the author I'm referring my thesis the most King's publications. The results from these monitoring exercises and studies are based on the revised NFSR calculations form 2014 onward.

We start looking for the estimations from the two most relevant sources, the BCBS and the EBA. The BCBS published its semiannual monitoring report in September 2015 and it uses data as of December 2014. The data includes 221 banks, 100 them being categorized as Group 1 banks. These banks are those that have Tier 1 capital of more than €3 billion and are internationally active by BCBS definition. The other 121 banks belong to the Group 2, which include all other banks included in the monitoring exercise. This publication is the eighth monitoring exercise and it summarizes the aggregate results using the data as of December 2014(BCBS 2015).

The Committee revised the Net Stable Funding Ratio in October 2014. As such the results from the December 2014 period are not entirely comparable to the previous results from the monitoring exercise but as the new implementations in the October 2014 revision aren't substantial, I will present them also in order to give a more comprehensive picture about the development in the levels of NSFR for banks in recent years. I will use the last three monitoring exercises and their results to look at developments regarding the NSFR levels of banks. These three monitoring exercises were published in September 2014, March 2015 and the newest September 2015.

First I will look at the results from September 2014 monitoring report. This monitoring exercise is the first data collection using the revised NSFR and so this is the starting point for me as well in looking at the changes in NSFR levels of banks. The NSFR sample consists from 208 banks of which 101 belonged to Group 1 and 107 to Group 2. Average NSFR level for the Group 1 banks in this sample was 111% and for Group 2 the average was 112%. In this sample from December 2013

78% of the 208 banks in the NSFR sample met or exceeded 100% in their NSFR ratio and 88% of the banks reported an NSFR at or above 90 %(BCBS 2014). The aggregate NSFR shortfall for this sample was 817 billion EUR at the end of December 2103. This represents the aggregate shortfall for banks that are below the minimum 100% NSFR requirements and does not reflect any surplus table funding some banks above the minimum NSFR requirement might have.

The next monitoring report I will look at is the one published in March 2015. It is worth noting that the data for this monitoring report was collected before the final revision of the NSFR standards in October 2014 so this monitoring report uses the January 2014 consultative paper standards in its results. As such they are not entirely comparable in every aspect but will serve their purpose, as the standards are very similar. In the March 2015 monitoring report there were total of 212 banks monitored, 94 of which were Group 1 banks and 118 were Group 2 banks from end of June 2014 period. The weighted average NSFR for Group 1 banks was 110% and the same for Group 2 banks was 114%. In the monitoring report 80% of the 212 banks met or exceeded 100% NSFR ratio and 92% of banks reported NSFR at or above 90%. The aggregate NSFR shortfall was 641 billion EUR for this sample period.

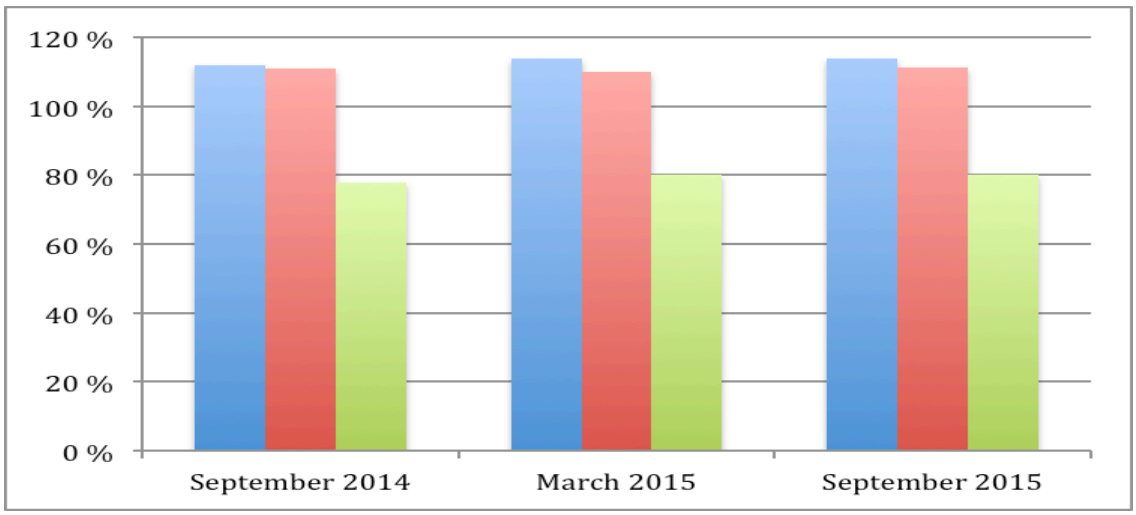
The final monitoring report I will look at was published in September 2015 and it's the most recent one at that. It uses data from end-December 2014 and is the first monitoring report to use the new revised standards in their entirety and therefore give a useful insight to the changes that the revisions have on the NFRS levels of banks. In the September 2015 monitoring report there wore 201 banks in the sample of which 97 were Group 1 banks and 104 were Group 2 banks (BCBS 2015). The weighted average NFSR for the Group 1 bank sample was 111, 2% while for Group 2 banks the average was 113.8 %(BCBS 2015). From the 97 Group 1 banks 75% exceeded the 100% minimum NSFR requirement and from the 104 Group 2 banks 85% exceeded the same threshold. 92% of Group 1 banks reported an NSFR of 90% or higher and 93% of Group 2 banks these levels. The aggregate NSFR shortfall was 576 billion EUR for this sample period.

Below there is a summary of the levels reported in the most recent Basel III monitoring exercises. As the revisions to the NSFR standard make dictate that the levels are not entirely comparable more precise analysis isn't called for but they give a good general indication about the direction of changes in the NSFR levels of

banks in recent times. The blue pillar represents the weighted average NSFR levels for Group 1 banks; the red pillar represents the weighted average Group 2 banks NSFR levels. Finally the green pillar represents the share of banks in the sample, which exceeded or met the 100% NSFR ratio. Overall the levels of each estimation from the BCBS monitoring reports have been quite stable for the last three reports which is not that surprising since changing these levels would require a major crises in the financial sector or some other very drastic change in the funding and liability structure of the banks in the sample. What is most telling in the results the overall levels of NSFR in the banks from this sample. The weighted average levels of NSFR are very high for both Group 1 and 2 banks but perhaps the most interesting estimate regarding my thesis is the share of banks that exceed the minimum 100% NSFR level. This is high at around 80% in all the monitoring reports but it still means that one in five of the banks in the sample do not meet the 100% minimum requirement. Looking at thee results it is good to also keep in mind that the sample size is quite small and includes only the biggest banks from each country. In the capital shortfall table there are good news in the development in recent years as the capital shortfall has fallen almost 30% since September 2014.

Figure 3 Summary of BCBS monitoring report results for NSFR levels

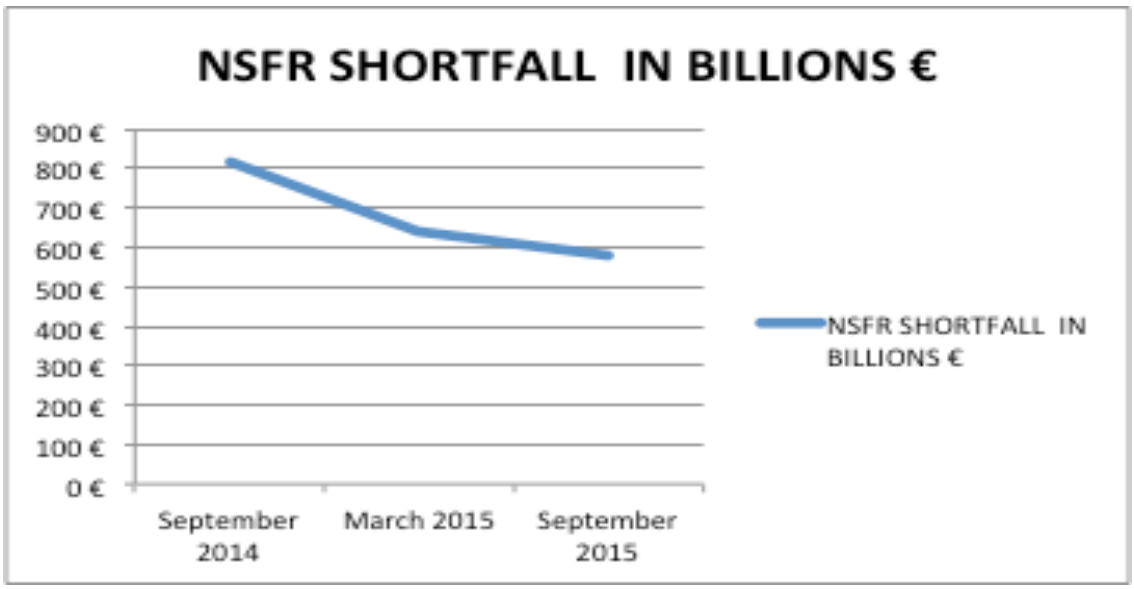
The blue pillar represents the weighted average NSFR levels for Group 2 banks and the red pillar is the Group 1 weighted average NSFR level. The green pillar is the share of banks that exceeded the minimum NSFR level from the sample.



Source: BCBS 2014, 2015

Figure 4 Summary of BCBS monitoring report results for Capital Shortfall

The table presents the capital shortfalls for the three BCBS monitoring reports in billion of euros.



Source: BCBS 2014, 2015

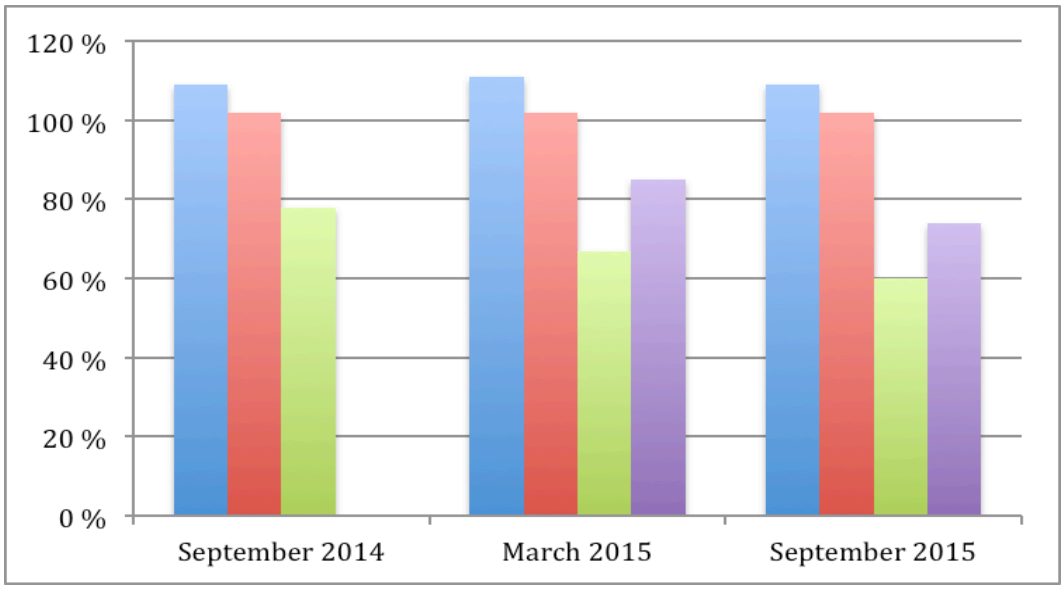
In a similar way to BCBS studies on the impact of NFSR revisions and implementation the EBA has studied these effects since June 2011. Its focus is on European banks and thus gives a good comparison data to the BCBS studies and my own. I'm going to look at the monitoring exercise reports from EBA from the same time period to the BCBS monitoring exercises in order to make them as comparable as possible. The first monitoring exercise I'm going to look at is from September 2014 and it uses data as of December 2013. The sample data comprised from 151 banks of which 42 were Group 1 banks and 109 Group 2 banks. In this exercise the weighted average of NSFR level for Group 2 was 109% and for Group 1 banks 102% (EBA 2014). Total of 78% of the banks in the sample period met the minimum NSFR requirements of 100%. The total overall shortfall in stable funding for this sample was 473 billion EUR (EBA 2014). In the next report from EBA from March 2015 the sample data consisted from 146 banks of which 40 were Group 1 banks and 106 were Group 2 banks. The weighted average NSFR level of Group 1 banks was again 102% and Group 2 had slight rise in these weighted average NSFR levels with 111% in this sample. Regarding the minimum NSFR requirement 67% of Group 1 met the requirement and 85% of Group 2 banks reached the minimum required NSFR levels (EBA 2015). The total overall shortfall in stable funding for

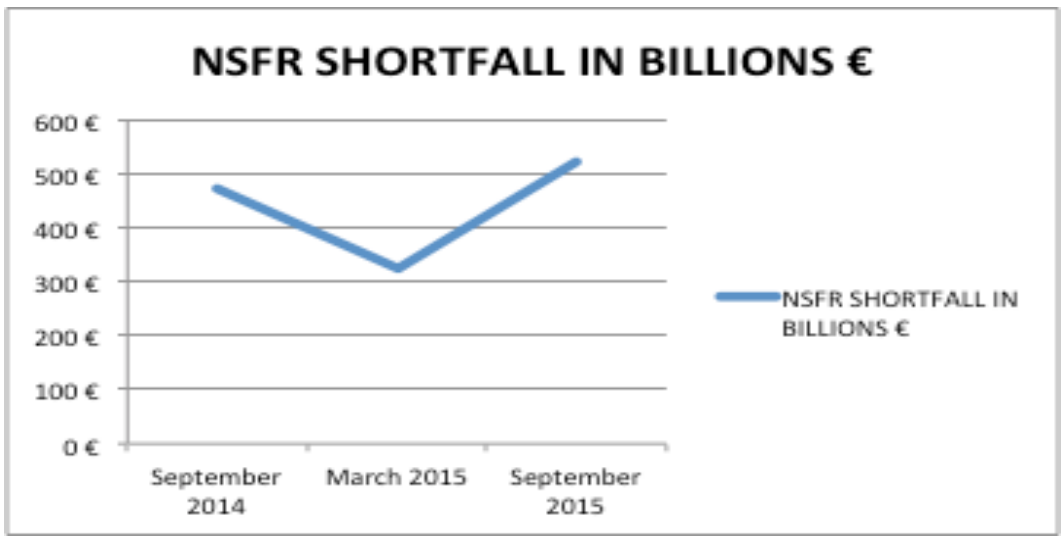
this sample was 324 billion EUR, a significant decline comparing to the earlier sample period. The most recent EBA monitoring exercise report is from September 2015 and it contains 364 banks sample data, of which 53 were Group 1 banks and 311 were Group 2 banks. There is no significant change in the weighted average NSFR levels from the last sample periods, for Group 1 the level is the same 102% as earlier and for Group 2 there is only a slight decline in the level of 109%. From Group 1 banks 60% met the minimum NSFR requirement and 74% of Group 2 did as well. The most significant change comparing these results to the previous sample data is in the total overall shortfall in stable funding which rises to 523 billion EUR (EBA 2015). In the EBA monitoring report it is stated that the rise in the shortfall is contributed to four Group 2 banks, which had a significant rise in the CET1 shortfall and decreases to CET1 levels (EBA 2015).

Below there is a summary of the three most recent EBA monitoring exercises and their results. Comparing the EBA and BCBS some comparisons can be made. The levels of weighted average NSFR levels for Group 1 banks are pretty similar for both BCBS and EBA monitoring reports at approximately 110% for all the reports. In the EBA reports the Group 2 banks have lower weighted average NSFR levels at around 100% for all the monitoring reports whereas this estimation is around 10% higher in the BCBS reports. The share of banks exceeding or meeting the minimum NSFR level is also higher in the BCBS reports and in the EBA reports this level has fallen almost 20% between September 2014 and September 2015. This would indicate that European banks fare less well with the regulation than the global sample BCBS uses in its monitoring reports. Looking at the capital shortfall there some interesting results as well. The capital shortfall spiked in the last EBA monitoring report but still on average this estimation is lower fro the European banks comparing to the global sample of BCBS.

Figures 5 and 6 Summary of EBA monitoring reports for NSFR levels

In this table the blue pillar represents the weighted average NSFR levels for Group 2 banks and the red pillar represents the weighted average NSFR levels for Group 1 banks. The green pillar is the overall share of the banks that met or exceeded the minimum NSFR requirement in the first September 2014 data. In the last two 2015 reports this estimation was divided by bank groups so in the last two pillar groups the green means the share Group 1 banks that met or exceeded the NSFR requirement and the purple is the same estimation for Group 2 banks. In the lower table there are the capital shortfall levels for each of the EBA reports calculated in billions of euros.



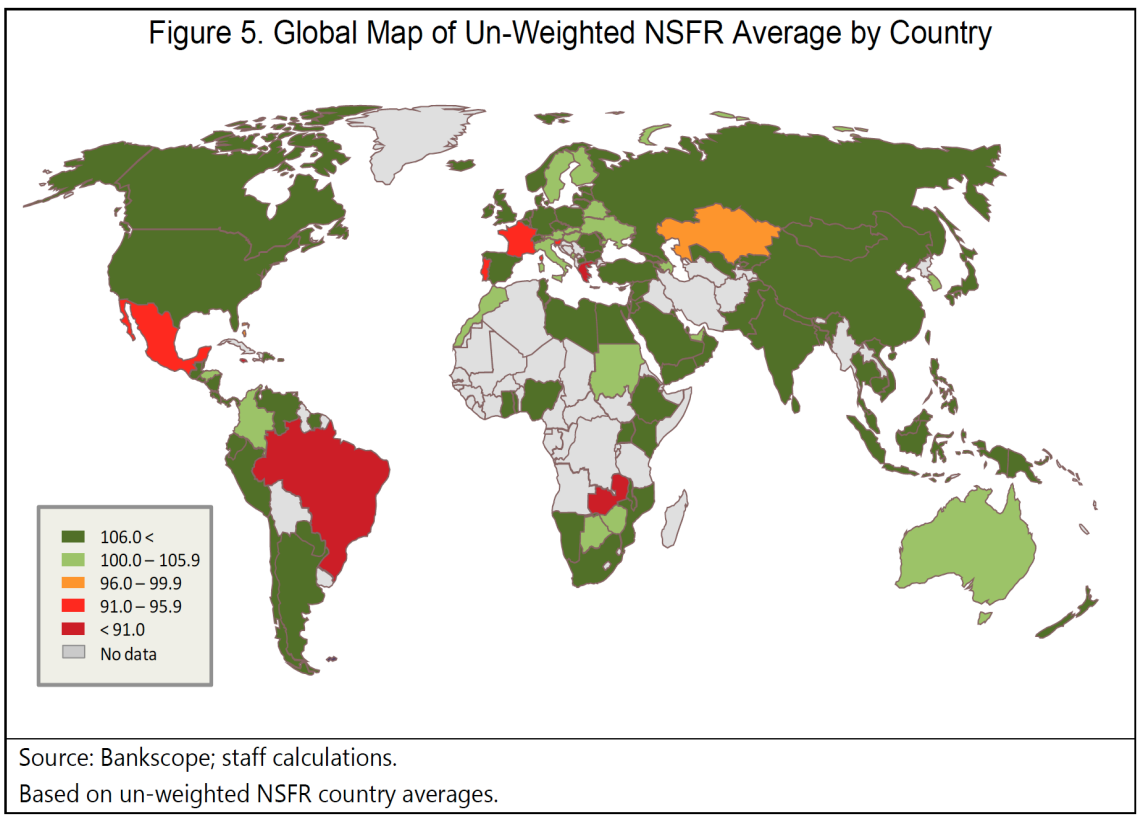


Source: EBA, Bankscope

Another source of NSFR estimates are IMF Global Financial Reports, which are released every six months. The reports focus on the issues that come up in global finance and banking and liquidity in the banking sector is also frequently discussed. There however hasn't been a measurement of NSFR levels in these reports since 2011 so the data I'm going to use here is from IMF working paper from 2014 published by Jeanne Gobat, Mamoru Yanase and Joseph Maloney. In their working paper called " The Net Stable Funding Ratio: Impact and Issues or Consideration" the authors map the changes that have been done to NSFR measure since 2010 and also look at some results of the NSFR levels divided by countries and regions. In the first figure below there is a map of the world divided by the un-

Figure 7 global NSFR levels in the world

In this table taken from the IMF working paper there is a map of the world that's divided through the levels of non- weighted NSFR levels. It shows how globally the areas that have the biggest issues are the less developed parts of the world in Africa and South America whereas the levels of NSFR are looking quite good in Europe and America with few exceptions.



Source: Bankscope, IMF working paper 2014

Weighted NSFR average on each country at end-2012. The results were calculated for 128 countries and included only countries where bank data covered minimum of 50% or more of system-wide bank lending (IMF Working Paper 2014). It firstly shows that NSFR levels are higher in developed countries in general although there are some exceptions also (France, Greece Portugal and Slovenia) (IMF Working Paper 2014). Secondly only ten countries from the 128 studied had un-weighted average NSFR below the threshold 100%. This is true in bank level also as 86% of the 2,079 banks in the countries reached at least the minimum level of 100% at end-2012 (IMF working paper 2014). Next I will look at NSFR ratio distributions in these different regions. In their working paper the authors conclude that in some countries NSFR is much higher than 100%. This can be contributed to the fact countries, which have abnormally high NSFR could be suffering from banking sectors inability to do its role in maturity transformation according to the authors (IMF working paper 2014). In other word these countries (Lebanon, Egypt, Indonesia and the Philippines) have experienced periods of heightened country risk and financial disintermediation resulting in decline of investments in the country. Another conclusion from the authors is that larger banks tend to have lower NSFR levels compared to small and mid-sized banks. Also in countries where there is Domestic-Systematically important banks with disproportionately large stake in the banking system the dollar amount shortfall can be particularly large and could have significant effect when these countries (Australia, France or Sweden) try to meet the threshold by end-2017 according to the authors (IMF Working paper 2014). The authors summarize their findings in that most banks in Asia and some advanced countries such as United States appear to have sufficient funding buffers to meet the NSFR minimum threshold by early 2018. On the other hand the authors state that countries with larger gaps, particularly in their Systematically important banks have a shortfall will face higher transitional costs in trying to reach the required standards (IMF Working paper 2014). All in all the working paper concludes that NSFR seems to be a relatively good tool in identifying banks and banking systems exposed to excessive mismatch risk and is in the author's opinion a better tool than LTD and core funding ratios. Reason for this is that it takes into account banks capital market funding capacity as well as other sources of liquidity risk (IMF Working Paper 2014).

All these three sources with NSFR estimations have some interesting results in them. For example comparing the results from the BCBS global report and EBA

report, which looks at European banks one can see that European banks have slightly lower NFSR levels than the global average. This is inline with data from the IMF Working Paper. Although it uses older data there can be seen an interesting result regarding European countries. Counter to general view it would seem that European banks could have the largest transitional costs in implementing the new NSFR ratio to their balance sheet. Also in the Global sample the differences between NSFR levels for Group 2 and Group 1 banks are smaller than in the European bank sample. In his article from Michael R. King "The Basel III Net Stable Funding Ratio and bank net interest margins" the author notes that these results could be due to the fact that universal banking model is more common in Europe than globally (King 2013). Universal Banking model refers to banks, which are carrying out all sorts of activities ranging from retail banking insurance, leasing and investment banking (Ötker-Robe & Pazarbasioglu 2010). This banking model leads to highly diversity in funding and thus makes the NSFR adjustments more complicated to these banks (King 2013). This can also be seen in the IMF Working Paper from 2013 where the authors specifically point out those countries with Domestically Systematically Important Banks or D-SIB's are facing larger transitional costs compared to other countries (IMF Working Paper 2014). All in all although there have been significant improvements in the NSFR levels globally and also in the European scope there still is a significant aggregate shortfall in NSFR which in fact has risen in the last EBA report for European banks. Also despite the improved results there is still approximately one quarter of banks both globally and in European banking sector, which don't meet the NSFR levels required so there is still work to be done in meeting the regulation standards. Later on in this thesis I will look at the correlation between funding and asset diversification and the level of NSFR in my sample of European banks. These results from the reports would indicate that those countries with the most diversified funding would have the lowest average NSFR levels but this will be addressed later on in the thesis as stated before.

8. DISCUSSIONS IN ACADEMIC LITERATURE REGARDING BASEL III LIQUIDITY FRAMEWORK

In this Chapter I will go through some discussion and publications in response to the Basel III Liquidity Framework. This is important for my study because the response to the Basel III as a whole as well as the Liquidity Framework has been quite mixed and so looking at some points of view before delving into my own study is a important step in my opinion. There are three significant parts of discussion that have been brought up regarding this issue. Firstly there is the issue of systematic liquidity risk and maturity transformation risk, which is in the center of the Liquidity Framework naturally. Secondly the Basel III has two different areas where its influence can be seen in the real-world, no doubt there will be bank level impacts when the new framework requires adaptation from the banks itself but just as important and interesting are the macro economical effects of regulations. First subsection will discuss the maturity transformation risk and systematic liquidity risk and the effect of the framework to these and then I will move on to macro economic level and finally look at some discussion and results from bank-level impacts.

8.1 Systematic Liquidity Risk and Maturity Transformation Risk

As discussed earlier the 2007-2008 global financial crisis was no small part due to mismanagement of liquidity risk and funding risk in banks. Banks relied on short-term wholesale funding as means to grow their balance sheets for the past 20 years and this exposed them to market shocks, investor runs and fluctuations on the wholesale funding markets (IMF Working Paper 2014). In response Basel III Liquidity framework was created to promote more resilient banking sector and to prevent similar crises in the future. In 2011 the IMF concluded that this new liquidity framework should increase the stability of the financial sector through liquidity management and funding structure of individual banks. Although there is no doubt that the intentions and goals of the new liquidity framework are right and just there have been discussions about some concerns, especially regarding maturity transformation risk and systematic liquidity risk.

First let's focus on the systematic liquidity risk. This is the risk that multiple financial institutions face similar difficulties in rolling over their short-term

funding under abnormal market conditions simultaneously. Although it is clear that higher amount of better quality assets demanded in the framework will mitigate this risk the underlying problem of interconnectedness of the global banking sector and the frameworks ability to tackle this problem has been questioned. Because the framework targets only individual banks it will not directly affect the systematic liquidity risk, it will do so only second-hand by reducing maturity mismatches and larger liquidity buffers. The risk coming from one financial institutions liquidity shortfall spreading through the financial sector is less in focus in the framework. Some changes wore made to Basel III with this in mind, Arregui. et al 2013 state in their IMF paper that higher capital requirements for trading and derivative activities as well as intra financial sector exposures will reduce bilateral trading among financial institutions and thereby reducing interconnectedness within financial sector(Arregui et al. 2013). They also state in the same paper that the G-SIB (Globally systematically important banks) framework addresses directly systemic risk in the financial sector. This framework requires these large banks to hold additional buffers and thus could lead to smaller and less interconnected banks. They too however state that the liquidity requirements, especially the LCR and NFSR have no clear-cut effect on financial network concentration and could potentially transfer the risk to the lightly regulated shadow banking system. (Arregui et al. 2013). In their working paper from 2014 IMF states that one concern that has risen from introduction of NSFR is that it might cause maturity transformation activities to migrate to the "shadow banking" sector and hence not address systemic risk (IMF Working Paper 2014). IMF sees that Basel III liquidity framework is more focused on bank-level risks and that some macro prudential framework to mitigate systemic liquidity risk could in call for.

Another source of pushback regarding the Basel III liquidity framework is the maturity transformation risk. Banks are inherently exposed to funding liquidity risk arising from the funding structures and the maturity mismatch in their balance sheet. Banks play a central role in liquidity and maturity transformation in the financial system (IMF Working Paper 2014). The main argument presented in this discussion is that regulation could be potentially intrusive to the role of traditional banking in liquidity/maturity transformation. It could impair banks ability to support financial intermediation and harm investment activity an economic growth (IMF Working Paper 2014). It has also been argued that banks facing a large NSFR gap; meaning shortage of stable funding sources, could cut

back on long-term financing or shorten the maturity of their loans to less than one year. This would have consequences for financial stability (IMF Working Paper 2014). One concern regarding the maturity transformation risk is also that supervisors should not rely excessively on the NSFR, as it only captures excessive maturity transformation risk up to one year. The NSFR for instance, does no assign more punitive RSF factors to banks loans or other illiquid assets with residual maturity of 20 or 30 years relative to 1 year. Both are given the same RSF weight.

8.2 Macroeconomic impact

One very interesting and perhaps the most influential effect the new Liquidity Framework could have are in the macro economical side. There have been many studies about the subject and here I'm going to go through some of the publications regarding this discussion. The two sides of the affects of the Liquidity Framework on aggregate supply are on the other hand economic benefits from decreasing probability of crisis and on the other hand economic costs from changes in the balance sheet. Studies made by regulators and academies have showed quite small macro economical impacts from the new Liquidity Framework. Slovik and Cournede (2011) analyzed the medium-term impact of GDP growth in relation to Basel III implementation and their results were that the growth of GDP would decline between -0.05 and -0.15 percent per annum due to rising funding costs for banks. In this study they also accounted for the capital regulatory requirements; meaning Tier 1 capital ratio and common equity requirements, and state that they are the main reason for the increase in lending spread and thus the decrease in GDP growth. It would seem that liquidity regulations would then have minimal effect on the GDP growth according to this study. They also conclude that the negative effect of Basel III on economic output could be offset by a reduction (or delayed increase) in monetary policy rates by about 30 to 80 basis points. (Slovik & Cournede 2011). Off course this study used older regulations to map the effects on GDP growth but nonetheless it gives a good indication to the magnitude of change the liquidity regulation might have in macro economical level. Another study published in 2009 by Barrell et al studied optimal regulation of bank capital and liquidity and found that " a 1 percentage point rise in the capital adequacy target reduces output by at most 0.08 percent in the long-run" (Barrell et al 2009). This can be seen as quite a moderate impact on aggregate output by regulatory reform. Similar results were obtained in BCBS published study 2010, which

suggest that median steady state output would decline by 0.25% with majority of the effect again coming from higher equity levels. Liquidity reforms are not seen as having a large impact on macroeconomic level (BCBS 2010).

Interestingly studies conducted by the banking sector show significantly different results in the way Basel III regulations would affect the economy. Study made by one of the largest banks in the world BNP Paribas in 2011 suggested that official estimates undervalue the amount bank balance sheet modification will put economic benefits in doubt and the negative effect will be far greater than in the official estimates (BNP Paribas 2011). Also a study conducted by Institute of International Finance in 2011 found that Basel III regulations would decrease the level of real GDP in five years by 3.2% (0.7% per annum) compared to scenario with no new regulations. Looking at these results its good to keep in mind though that there are conducted by the banking industry itself and thus have a strong incentive to minimize new regulation because the regulation becomes costly to the banks themselves. This brings up an obvious but an interesting point about banking regulation, if there would be no need for regulation one could ask why does it get such strong pushback from the banking sector? The answer is that banks are by design expected to show as much profit as possible for the shareholders and this is done by leveraging and with exotic derivatives not costly high quality assets on the balance in the modern financial sector. Below there is a interesting summary of different projections regarding Basel III impact on Credit and GDP Growth. As we can see there are very significant differences in the magnitude of effects the Basel III is seen to have on these macro economical measures.

All in all as Allen et al conclude in their paper published in 2012 that although the economic magnitude of the benefits is uncertain, it is worth pursuing the regulations because the macroeconomic impact will not be seriously adverse (Allen et al. 2012). In the same paper they also interestingly point out that the transition period is where the supply of credit in the economy might be disrupted even if the long-term effects are seen rather limited (Allen et al. 2012).. This disruption to the credit supply might be most detrimental to small businesses, which rely on the credit supply heavily. It is because of this that the Basel Committee should keep on eye on the behavioral changes from the financial institutions and adjust their liquidity regulation if needed in order to mitigate the possible adverse effects during the transition period to the economy.

8.3 Bank Level Impact

Here I will present the relevant literature regarding the bank-level impact of Basel III and the NSFR in particular. As noted before there are some clear areas where the liquidity regulation and NSFR would have an affect especially on bank level. Firstly, as we went through before in the NSFR estimate section there are going to be very different effects to banks depending how large they are, especially very large G-SIB'S and other financial institutions with complex operations will be effected more the smaller financial institutions. Secondly there will be transitional effects, which we covered briefly earlier and lastly the cost of bank balance sheet modification and to that point finally the cost to the customer of the bank.

First let's look at the G-SIB banks and the affects of NSFR on their operations. In the IMF Working Paper from 2014 the authors find that from 28 globally systematically important banks at mid-2013 the average NSFR was 117%. This is a significant raise from end-2007 when the average was 97% and end-2012 113 % (IMF Working Paper 2014). This was mainly done by strengthening deposit mobilization, raising capital and long-term funding according to the authors. Their calculations also revealed that G-SIB's with certain business models or from certain regions are more likely to cope better with the new regulation. The paper suggested that more specialized banks with less complex business models are less likely to face excessive maturity mismatch risk. This is in line with the estimates presented earlier regarding for example Sweden where there are D-SIB banks with wide array on businesses an thus are more likely have NASFR under the 100% threshold (IMF Working Paper 2014). Also Ötker-Robe and Pazarbasioglu published a study that focused on the impact of Basel III to large and complex financial institutions (LCFI). The abovementioned study was released in 2010. Their findings go inline with previous results presented here. They found that these LCFI's have wide variation in their NSFR levels. LCFI's from Europe with high reliance on wholesale funding and high loan-to-deposit margins tend to have lower NSFR levels and so are affected by the regulations more (Ötker-Robe and Pazarbasioglu 2010). These authors present three ways for banks to improve funding profiles in order to meet the minimum requirements. These are issuing term funding, raising more customer deposits and reducing the amount of assets. As was noted before the IMF study found that these banks had raised their NSFR levels by raising more customer deposits, raising capital and long-term funding. In other words the one thing these banks haven't done in order to improve their

funding profile is to reduce the amount of assets. This is off course natural since shrinking the asset side of the balance sheet may be costly due to lost market share and profitability. Naturally there are possible drawbacks in the means banks have chosen to improve their funding profile. Ötker-Robe and Pazarbasioglu note that increasing the maturity structure of liabilities will require banks to pay the term premium and so it becomes costly to banks. Also filling the shortfall by increasing deposits is very challenging due to competition in local deposit markets and costs related to adding new branches (Ötker-Robe and Pazarbasioglu 2010). Because all of these measures clearly have their own downside it is critical that regulators make sure the adjustments banks make do not create systemic risk in the lightly regulated shadow banking system (IMF 2013, Ötker-Robe and Pazarbasioglu 2010).

Now let's look at the transitional cost that Basel III could have on the economy. Referring to the article published in 2012 by Allen et al. find that although the possibility of severe shortage of funding exists, the long-term impact on banks should be less severe than generally expected, and that the real problem lies in the ensuring a cohesive adaptation to the new rules to the whole financial industry. In the paper the authors state that a important fact to recognize is that even though there is time to the full implementation of the new regulatory rules, markets are expecting to see the balance sheet modification in banks and penalize banks if they fall significantly short of the targets (Allen et al. 2012). In their study from 2010 BCBS provides an extensive analysis on liquidity regulation to steady state output. Across 13 different models they find median decline of 0.25% as the ratio of core equity to risk weighted assets is increased by 2% and 0.59% decline as the ratio is increased by 6%(BCBS 2010B). This supports the view that in a longer perspective there should not be significant effects on banks due to liquidity regulations. It is worth noting that the revision made to the Liquidity Framework in 2014 will mitigate this even further. This is because the changes made include the adoption of similar asset classes to the LCR so every balance sheet modification banks make should also increase the LCR and NSFR levels and thus mitigate the transitional costs for banks.

Allen et al. also address the issue of liquidity regulations possible consequences to customers of banks and for bank profitability. First Allen et al. state that there are several reasons for concern about the permanent impact of liquidity regulation to

liquidity management in banks (Allen et al. 2012). The problem stems from the fact that liquid assets are seen as largely comprising of government bond and other public sector liabilities such as deposits from central banks. Some private sector claims are included but there is a very tight haircut on these in order for them to be seen as liquid assets. These securities are not very liquid once banks are forced to stockpile them on their balance sheet and the market will distort as a consequence of this. So what happens is that the liquidity for these assets would actually decline and these government securities will be locked away from the markets in banks balance sheet (Allen et al. 2012). They go further in discussing the possible scenario that a government would lose its creditworthiness and its debt lost its 0% weighting for Basel III purposes, this would then become ineligible liquid assets. Banks holding large amounts of these securities would lose both the market value as well as liquidity at the same time. This would have a multiplying affect on the financial stability as deteriorating government credit is a catalyst for financial stability itself but now also the banks holding abnormally large amounts of government securities would also be drawn into trouble. Because of these possible negative consequences the author's demand that the regulators should broaden the range assets seen as liquid for Basel III purposes in order for banks to create claims from the private sector as well (Allen et al. 2012).

Another issue that Allen et al. address in their publication is the possible affect of Basel III regulation on banks profitability and specifically to the Net interest margins of banks. The large balance sheet modification that is required by banks in order to meet the liquidity regulation requirements could end up reducing available banks credit in short term. The new regulation will give banks strong incentives to lend short and borrow long because of the risk weights these different maturities are given in Basel III liquidity framework. This will lead to costs from both sides of the balance sheet for banks. On the asset side there will be lower interest income for banks as the risk level of securities is lowered and on the liability side the interest expenses will rise as the on demand long-term debt has a higher interest expenses than short–term debt. According to Allen et al. though this might not be so substantial than expected. The reason for this is that as the banks switch from short-term debt to long-term debt the long-term debt is bearing less risk than previously, and so rates of interest on long-term debt may fall somewhat. Hence the total impact on funding cost and therefore banks profitability could be less than if calculated assuming that interest rates remain unchanged (Allen et al. 2012). Authors are expecting a maximum of 40 basis point increases to cost of

funding to corporate loan portfolio because of this offsetting factor of long-term debt interest rates declining with the balance sheet modification (Allen et al. 2012).

There are other factors as well to point out which indicate that the negative impact of Basel III liquidity framework will not be so substantial. Earlier we pointed out the issue of too narrow definition of liquid assets, which could lead to banks relying too much on government securities. This has been addressed on the new NSFR reform and the Required Stable Funding (RSF) was made more consistent and some categories were recalibrated with this in mind. Also the longer transition period which was introduced for the reform makes the transitional period less stressing on banks as their modification don't have to be done in a way that it effects the economic activity drastically.

Earlier in the thesis I mentioned that study made by King 2013 is one of the academic studies I'm going refer heavily as it is one of the major studies made about the subject. He studied the Basel III liquidity regulations affect on profitability of banks as well as on the balance sheet. It is particularly important to my subject because it focuses on the levels and effects of NSFR, as do I. In the study King analyses banks, which are below the minimum NSFR threshold and its impact on the Net Interest Margin of the banks in question. He's findings is that the banks below the ratio need to increase stable sources of funding and to reduce assets requiring funding. The most cost-effective strategies to meet the NSFR are to increase holdings of Higher-rated securities and to extend the maturity of wholesale funding according to the author. These changes reduce net interest margins by 70–88 basis points on average, or around 40 % of their year-end 2009 values (King 2013). There different ways of increasing the NSFR are discussed in the paper extensively and the next section will go through these strategies.

9. DIFFERENT STRATEGIES ON INCREASING NSFR LEVEL

Earlier I introduced a paper from Ötker-Robe and Pazarbasioglu 2010 where the authors stated that there are three ways for banks to improve their funding structure in order to meet the NSFR threshold. These were issuing term funding, raising more customer deposits and reducing the amount of assets on the balance sheet (Ötker-Robe and Pazarbbasioglu 2010). In his article King continues this line of thought and identifies two major strategies for banks to improve their NSFR levels. Strategies are divided into ones involving increasing Available Stable Funding (ASF) and the ones decreasing Required Stable Funding (RSF) (King 2013). In the paper King goes through the pros and cons of these strategies and in the following subsections I will do so as well by referring King's study.

9.1 Strategies to increase Available Stable Funding (ASF)

By definition to meet the NSFR threshold banks have to have larger Available Stable Funding (ASF) than Required Stable Funding (RSF). One strategy in order to achieve this is to raise the share of funding from deposits. In the new regulation reform there are some changes encouraging banks to do this. Firstly in the reform all operational deposits are now included to have 50 % ASF weight compared to 0 % they were given in the earlier version of the NSFR (except operational deposits from non-financial institutions which were given the 50 % weight earlier also). Also, stable deposits are now given higher ASF weight and are now factored at 95 % instead of 90 %. Similarly non-stable deposits are given 90 % factor comparing the earlier 80 % in the calculation of the ASF. All of these changes are meant to push banks to increase the amount of deposits in their balance sheet in order to increase their ASF but as King points out this incentive should increase the competition for such deposits and thus increase their cost at the margin. This means that the ability to raise ASF by increasing deposits is likely limited and depends on local competition (King 2013). Ötker-Robe and Pazarbasioglu also

addressed this problem and stated that increasing the amount of deposits is very challenging due to competition in local deposit markets and costs related adding new branches (Ötker-Robe and Pazarbasioglu 2010).

Another way that banks could raise the amount of ASF is to extend the maturity of wholesale funding beyond 1 year. Liabilities with effective maturity of more than 1 year are given 100 % ASF factor and wholesale funding with maturity less than 1 year is given 50 % ASF factor. Here also the new reform introduced on October 2014 has given slight leeway on the factoring of these wholesale funding liabilities as some funding sources with maturity of no less than 6 months but less than 1 year are now given 50 % ASF factor instead of 0 % earlier. Interbank lending is given 50 % factor for interbank borrowing with maturity between 6 months and 1 year and these are treated similarly on the Required Stable Funding side. As King states in his paper while debt maturity extension increases the numerator of the NSF, it also raises interest expense, as the cost of longer-term wholesale funding is higher than short-term funding in most yield-curve environments (King 2013). This was addressed before as Allen et al. stated that this rise in interest expenses would be some what mitigated by the fact that long-term debt would bear less risk and therefore the interest rates would go down. Despite this the fact is that higher interest rate expenses mean lower Net Interest Margins (NIM), even if this would be mitigated by the fall in long-term funding interest rates.

Third way of increasing Available Stable Funding (ASF) according to King is to increase the share of Tier 1 capital. As King notes “under Basel III the predominant form of Tier 1 capital must be tangible common equity or instruments that are subordinated, have fully discretionary non-cumulative dividends and have neither a maturity date or incentive to redeem “(King 2013). Also innovative hybrid capital instruments are phased out. Because of this very strict definition the Tier 1 capital increasing the share of this kind of equity would also increase shareholder’s equity and thus reduce return on equity. King states that theoretically a bank’s equity is the most expensive kind of equity due to the fact that it has high risk and high residual claim. It’s also known from empirical studies that the amount of Tier 1 equity on bank balance sheet in relation to total assets is quite small so increasing this kind of equity is very expensive and undesirable for banks in order to improve their NSFR levels (King 2013).

9.2 Strategies to decrease Required Stable Funding (RSF)

Compared to the strategies for increasing Available Stable Funding (ASF) there are more strategies that banks can use in order to decrease their Requires Stable Funding (RSF). This is because the asset side of the balance sheet is more complex and so there are more possible places to find the decreasing of RSF.

One quite simple strategy to decrease the amount of RSF would be to shrink the balance sheet by either reducing the size of the loan portfolio or sell other assets. King states that "When deciding whether to shrink their balance sheets, banks should rationally conduct a cost-benefit analysis that compares the rate earned on an asset against the bank's cost of capital. Given the regulation will increase the cost of some assets, businesses that were NPV (Net Present Value) positive may become uneconomic" (King 2013). First let's look at the option of selling other assets. This would in practice mean selling first the assets with the highest RSF factor (100 %) than the next highest (85 %) and so on. Reduction of these trading assets would lead to reduction in non-interest income and profitability. So what about reducing the size of the loan portfolio by selling loans and mortgages which are high yielding but riskier. This is problematic because these kinds of assets tend to have the highest yields for banks and also these kinds of loan customers bring in other sources of income for banks not just the yield from the loan so banks would lose that income also. Also as King points out, if the whole banking sector would start avoiding these kind of high yield/high risk weight loans, this would mean restrictions on credit availability and could have adverse macroeconomic impacts (King 2013). Allen et al. also discuss this issue and they state that this kind of balance sheet shirking could have negative effects on low net worth individuals and small companies, which rely heavily on bank credit and cannot find other alternative sources of credit. Restricting the availability of credit to these customers could have negative impacts on general output through decreasing in investment, labor demand and innovations (Allen et al. 2012). This partly I would assume is the reason why in the NSFR reform of 2014 these is lower RSF weight on unencumbered loans to retail and small business customers. The RSF weight was lowered from 85 % to 50 % for the loans that did not meet the criteria in order to be included in the lower 35 % RSF factor category, in other words the riskier loans

to small businesses and retail customers. Despite this modification in the NSFR reform, shirking the balance sheet is likely to be less attractive option than others because of the high cost it would bear for banks.

Next option for banks to decrease their RSF is to change the composition of investments. There are two ways this could be done according to King, either by selling illiquid investments and holding more cash or holding investments with lower credit risk (King 2013). The drawback of this kind of strategies are pretty obvious as cash and other liquid assets will return lower yields and cost more so for banks the cost of carry is likely to be negative. Also as King states lowering RSF by shifting composition of investments is limited by the quantity if investments relative to total assets. In other words if investments only account for small share of total assets, changing the composition of these assets won't have the desired effect on lowering RSF (King 2013).

The third strategy for lowering the RSF is to change the composition of the loan book. As was stated earlier loans to retail and small businesses were factored at 85 % earlier but were moved to 50 % category. This will automatically lower the RSF by changing the composition of he loan book. Banks could favor other lower RSF factor loans but it is uncertain how easy it is for banks to switch between loan types and by favoring these lower RSF factor loans with shorter maturities banks would impose constant refinancing cost to customers and greater risk as the customers would bear the rollover risk on their borrowing. King states that one solution would be for banks to offer contingent credit lines to their customers that would extend the maturity of the loan effectively. This extension to the loans has a very low RSF factor of 5 % and would bring the total RSF weight of the short maturity loan to 55 % (50 %+5 %). This how ever is likely to be on the regulators radar and if it would become very popular there would likely be some kind of re-calibration to these kinds of lines of credit (King 2013).

The final option King addresses is that banks could substitute assets with 100 % with lower rated assets. This is again contingent on how well banks can do this without compromising their trading or retail operations and similar problems with the cost of this strategy are likely.

10. DATA AND METHOLOGY

In this chapter I will go through the methodology of how my sample has been gathered, how the NSFR levels have been calculated and what restrictions and conditions I have put in place for my calculations. In the first chapter I will go through the creation of the sample I'm using in my empirical part of the thesis and presents the composition of the sample. In the composition of the sample and in the calculation methods I will follow King's 2013 paper, as it's looking at country NSFR levels, similarly to my study. To make my results comparable to King's, it's useful to use many of the methods he did in his paper.

10.1 Sample for empirical analysis: Composition and Remarks

For my sample I'm using data obtained from Bankscope as it is the most widely used database in this kind of studies and seems to have the best banking data available. I narrow my scope of countries partly to match the countries in King's paper as well as looking at the region that interests me most. King´s paper looks at 15 countries and their NSFR levels included the five biggest economies of Europe. As I'm coming from Europe myself and the euro area is currently going through some very interesting phases in its economic development I choose my countries from the euro area. Addition to these euro countries I included Sweden from the Nordic countries, as I'm interested to know how its banking sector is coping with the new regulatory requirements. In King's paper the author uses a number of assumptions in calculating the NSFR levels for different countries but I'm going to use bank and country level numbers instead, for better accuracy in the estimates. This will be done where it´s possible as banks don't publish all the necessary detailed information.

In the Bankscope database the newest available information is from end-2014 so there is a 5 year gap between my and King's thesis in terms of the data. In his paper King uses end-2009 data, which is the most recent data available at the time. The sample used in this thesis was gathered on 11th of February 2016 and it includes 2 836 banks from 18 countries.

The narrowing down of the sample started with choosing the countries for my sample. I decided to study European countries and chose 17 Euro-area countries

for my sample and also included Sweden for some interesting comparison, as it is not in the euro monetary union but otherwise highly integrated in Europe. Next I decided to follow King's paper and narrowed the sample down by taking out some other financial intermediaries such as leasing companies, securities companies and so forth. After this I used consolidation codes to prevent calculating some NSFR levels twice in the cases of large mother companies with smaller subsidiaries. Consolidation codes U1, C1 and C2 make sure that double counting would not happen. U1 consolidation code means that the financial statement is one that is not integrating the statements of possible controlled subsidiaries or branches of the bank in question and that the bank has no consolidated companion. C1 refers to financial statement of a mother bank integrating the statements of its controlled subsidiaries or braches with no unconsolidated companion. C2 is a financial statement of a mother bank integrating the statement of its subsidiaries or branches of with unconsolidated companion. Next I followed King's paper by narrowing down the sample by searching for banks that had minimum 100 million in total assets for the latest year available (2014). Below are the search criteria listed that I used in Bankscope to obtain my sample:

- World region is euro area (Sweden included from Nordic countries as well)
- Total assets for year 2014 minimum 100 million euros
- Consolidation codes U1, C2 and C1 were accepted
- All banks in the sample are active
- The bank type was one of six bank types: bank holding and holdings companies, investment banks, mortgage & real estate banks, cooperative banks, savings banks or commercial banks.

The total amount of banks in my sample is 2 836 and the table below gives a presentation of its composition. A few key observations can be made from the composition of sample at this point. First the whole sample is heavily biased towards Germany as it covers more than half (50,9 %) of the banks in the sample. The countries with most weight in the sample after Germany in the sample are Italy (16,6 %) and France (7,7 %) as well as Austria (6,8 %). The overwhelming majority of the banks in the sample are either cooperative or savings banks (72,9 %) and this is particularly pronounced in Germany, Italy and Austria where these kinds of banks cover approximately 90 %, 80 % and 65 % of the sample in each country. These kinds of banks offer commercial and retail operations and are organized in a cooperative model. The second largest type of bank model in the

sample is commercial banks and bank holding companies followed by investment banks and mortgage banks.

All these different bank types can be divided into two subgroups based on their business models. First there are the more specialized mortgage banks and investment banks, which as the names give clues to specialize in particular part of banking services. Real estate & Mortgage banks service and originate mortgage loans. A good example from this kind of bank is the Hypoteekkiyhditys in Finland. There are interesting differences between countries on how common such banking model is. For example in Sweden, Finland, France and especially in Ireland these kinds of specialized mortgage banks are quite common whereas in countries such as Greece, Luxembourg, Estonia and Spain such specialized banking is non existent. Particularly interesting is that Finland, Sweden and Estonia are neighboring countries but there are such distinctive differences in this part of the banking sector between these countries. Largest mortgage bank in the sample is the French Credit Foncier de France, a subsidiary branch to one of Europe's largest banking groups BPCE and almost as big is the Swedish Standshypotek AB, a subsidiary to Svensk Handelsbanken.

Another kind of specialized banks is the investment banks, which offer a wide selection of services to their customers. They do brokerage, underwriting and act as intermediaries in the financial markets among other activities. As with mortgage banks there are stark differences in the commonality of investment banks between different countries and their banking sectors. There are no such banks in Finland and very few in Germany but for the banking sector of Ireland this is the most common kind of bank, this could be partly due to the tax-free zone in Ireland Kearns. Also in Greece and Estonia investment banks are common. The largest investment bank by total assets in the sample is the German FMS Wertmanagement, which was created in 2010 as the government nationalized the HRE Group in Germany and created the bank. Almost as large is the Banca IMI in Italy, which is a product of a merger in 2007 between Banca Caboto and Banca IMI. There are also some interesting names in the sample for investment banks such as JP Morgan in Germany, Merrill Lynch in Ireland and Morgan Stanley in Netherlands.

The other subgroup, which differs from these specialized banks are the banks that operate under the universal banking model. These include the most common types

of banks, cooperative banks, which include such famous names as Credit Agricole in France and DZ Bank in Germany. A Finnish example of this type of bank is the OP-Pohjola Bank. This type of bank is very dominant in the largest banking sectors in the sample with some interesting exceptions. There are no these types of banks in Ireland, Greece or Estonia as these three countries and their banking sectors seem to be concentrated on either more specialized banks such as mortgage banks and investment banks (Ireland) or the banking sector is almost entirely consistent of commercial banks (Greece, Estonia).

There are also bank holding companies that are companies controlling one or more banks and the amount of these kinds of banks has been increasing in recent years. This is due to the fact that many investment banks transformed themselves into bank holding companies after the financial crisis of 2008 in order to access liquidity and funding from the markets. The biggest such banks in this category are also famous companies such as the ING Group in Netherlands and Nordea Bank in Sweden.

The third universal banking model group is the commercial banks and some of the biggest banks in the sample are included in this category. The largest bank in the whole sample by total assets is the BNP Paribas in France with over 2 trillion euros in assets for 2014 and is among the top 5 largest banks in the world measured by assets. Commercial banks are very common in some countries and it could be said that the bulk of each country's banking sector consists of either commercial banks or cooperative/savings banks. Finally there are savings banks, which are closely related to the cooperative banks and commercial banks when looking at their operations. These kinds of banks are slightly smaller on average and maybe don't include such high profile names as the other types.

Table 3 Composition of the Sample by Country and Bank type

This table provides composition of the sample used in this study. Data is from Bankscope and it's from year-end 2014. The first column in the table shows the country and column 2 shows the total number of banks in the sample from each country and the next four columns divide that total to different bank types. In the final column there is a percentage of the whole sample calculated for each country.

Country	Number of banks	Commercial and Bank Holding Companies	Investment Banks	Cooperative and Savings Banks	Mortagage Banks	% of Sample
Austria	193	27,4 %	1,7 %	64,3 %	6,6 %	6,8 %
Belgium	33	66,6 %	5,7 %	27,7 %	0,0 %	1,2 %
Cyprus	15	80,0 %	6,7 %	13,3 %	0,0 %	0,5 %
Germany	1442	7,6 %	0,7 %	89,0 %	2,7 %	50,9 %
Estonia	10	80,0 %	20,0 %	0,0 %	0,0 %	0,4 %
Spain	101	39,2 %	7,4 %	53,4 %	0,0 %	3,6 %
Finland	32	50,0 %	0,0 %	40,6 %	9,4 %	1,1 %
France	218	42,2 %	6,5 %	39,9 %	11,4 %	7,7 %
Greece	8	87,5 %	12,5 %	0,0 %	0,0 %	0,3 %
Ireland	17	47,1 %	29,4 %	0,0 %	23,5 %	0,6 %
Italy	470	14,9 %	3,0 %	81,9 %	0,2 %	16,6 %
Luxembourg	58	93,1 %	3,5 %	3,5 %	0,0 %	2,1 %
Malta	9	77,8 %	11,1 %	11,1 %	0,0 %	0,3 %
Netherlands	38	84,2 %	5,3 %	5,3 %	5,3 %	1,3 %
Portugal	79	25,3 %	5,1 %	67,1 %	2,5 %	2,8 %
Slovenia	16	75,0 %	6,3 %	18,8 %	0,0 %	0,6 %
Slovakia	13	76,9 %	7,7 %	7,7 %	7,7 %	0,5 %
Sweden	84	33,2 %	3,7 %	53,5 %	9,6 %	3,0 %
Total	**2836**	**597**	**73**	**2068**	**98**	
% of Sample	**100 %**	**21,1 %**	**2,6 %**	**72,9 %**	**3,5 %**	

Source: Bankscope, own calculation

10.2 Representative income statement and balance sheet for sample countries

In this subsection I will present the income statement and balance sheet items for the sample countries. Here I again follow King's article as he also presented similar statistics in his article. The income statement and balance sheet items are first consolidated into country specific weighted average balance sheets and income statements for each country. After this the country values are weighted averages of the banks in each country in relation to the total income statements and balance

sheets for that country. All the values are shown as percentage of total assets as it is done in the King's article. This helps the comparison with the results later on in the thesis. This is done partly to see if there are differences between countries in the composition of their balance sheets or income statements and also some of the calculations will be later on used for the calculations of the NSFR levels for each country. The difference in composition if the balance sheet and income statements gives us information about how and where are the biggest shortfalls regarding compliance with the Basel III regulations for each country.

10.2.1 Income Statements

The net interest income is the difference between interest income (interbank claims, investments and net loans) and interest expenses (deposits, interbank funding and wholesale funding). First let's look at the results obtained for interest income and compare them to King's results. In the sample the average interest income is 3,3 % compared to King's 3,7 %. This might be due to the sample countries or simply implies that bank interest margins have fallen since 2009 when King's sample was taken. Interestingly the highest interest income can be found from banks in Cyprus and Slovakia with both countries averaging 5,1 % interest income. On the other end of the spectrum there are countries like Finland with interest income at 2,0 % followed by Ireland at 2,2 % and Luxembourgh at 2,5 %. Interest expenses average at 1,4 % for the whole sample which is in turn lower than the King's 1,9 % and could indicate that as my data has been taken after the financial crisis, the government subsidies and little bit calmer markets have had and effect on the interest expenses. In the sample this leaves the net interest income at average 1,9 % which is almost the same as King's 1,8 %. Highest net interest incomes are found from the countries with the highest interest incomes, Cyprus (2,8 %) and Slovakia (3,9 %) but also surprisingly from Estonia where the net interest income is at 3,1 %. The worst net interest income results also have the countries with the lowest interest incomes, Finland (1,3 %) and Ireland (1,0 %) but surprisingly the worst net interest income is found from Malta with only 0,2 % of average net interest income.

Non-interest income has average of 1,8 % in the sample, which is higher than the 1,3 % in the King's sample. This brings the average revenue of the sample to 3,7 % which is also higher than the 3,1 % in the King's sample. The highest revenue in the

sample is surprisingly found for Greece and Cyprus with average revenues of 7,7 % and 7,4 %. It is worth noting that if both these countries have negative net incomes, the revenues even out in the operating expenses. The operating expenses in general go inline with the revenues and leave the bottom line, net income average at 0,2 % which is lower than the 0,5 % in the King's sample. This gives an indication that the profitability of European banks was low at the time when the sample was taken. The highest net income margins are in Slovakia with 1,2 %, which is quite surprising, followed by Germany, Estonia and Sweden with net incomes if 1,0 -1,1 %. Five countries in the sample had negative net income margins, the worst being Cyprus and Greece with -1,7 % and -1,6 % net income margins. Both of these countries have the highest operating expenses and as we know today either country isn't in a very healthy situation when it comes to their banking sectors.

Table 4 Representative Income Statement and Balance sheet for sample countries

REPRESENTATIVE INCOME STATEMENT AND BALANCE SHEET ITEM FOR SAMPLE COUNTRIES

Country	**Avg.**	**AT**	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**	**GR**	**IE**	**IT**	**LU**	**MT**	**NL**	**PT**	**SE**	**SI**	**SK**
income statement (% of total assets)																			
Interest Income	3,3 %	2,6 %	3,6 %	5,1 %	3,2 %	3,8 %	2,7 %	2,0 %	3,3 %	3,3 %	2,2 %	3,1 %	2,5 %	2,9 %	3,7 %	3,7 %	3,1 %	3,9 %	5,1 %
-Interest Expense	1,4 %	0,9 %	1,7 %	2,3 %	1,0 %	0,7 %	1,0 %	0,7 %	1,7 %	1,8 %	1,2 %	1,1 %	1,0 %	2,8 %	1,9 %	1,5 %	0,9 %	1,7 %	1,2 %
Net interest income	1,9 %	1,7 %	1,9 %	2,8 %	2,2 %	3,1 %	1,7 %	1,3 %	1,6 %	1,5 %	1,0 %	2,0 %	1,5 %	0,2 %	1,8 %	2,2 %	2,2 %	2,2 %	3,9 %
+Non-interest income	1,8 %	1,2 %	1,5 %	4,6 %	1,0 %	1,4 %	1,7 %	1,4 %	2,0 %	6,2 %	0,5 %	1,7 %	1,1 %	1,2 %	1,2 %	1,3 %	1,8 %	1,5 %	1,2 %
=Revenue	3,7 %	2,9 %	3,4 %	7,4 %	3,2 %	4,5 %	3,3 %	2,6 %	3,5 %	7,7 %	1,5 %	3,7 %	2,6 %	1,4 %	3,0 %	3,5 %	4,0 %	3,7 %	5,1 %
-Operating Expenses	3,4 %	2,7 %	2,6 %	9,0 %	2,0 %	3,4 %	2,5 %	1,9 %	2,7 %	10,0 %	0,5 %	3,6 %	1,7 %	1,8 %	2,6 %	3,7 %	2,7 %	4,2 %	3,6 %
-Taxes	0,1 %	0,1 %	0,2 %	0,1 %	0,3 %	0,0 %	0,2 %	0,1 %	0,3 %	-0,7 %	0,1 %	0,1 %	0,2 %	0,4 %	0,2 %	0,2 %	0,2 %	0,1 %	0,4 %
=Net Income	0,2 %	0,1 %	0,6 %	-1,7 %	1,0 %	1,1 %	0,7 %	0,6 %	0,6 %	-1,6 %	0,9 %	0,1 %	0,8 %	-0,8 %	0,3 %	-0,4 %	1,1 %	-0,6 %	1,2 %
Assets (% total assets)																			
Cash	3,4 %	2,1 %	1,9 %	7,6 %	1,8 %	9,1 %	1,0 %	2,5 %	2,2 %	3,9 %	2,4 %	0,9 %	3,5 %	1,9 %	5,0 %	1,1 %	1,7 %	8,8 %	3,9 %
interbank claims	15,3 %	21,1 %	14,5 %	14,0 %	9,2 %	23,2 %	16,1 %	8,0 %	17,6 %	4,4 %	19,2 %	8,8 %	45,8 %	21,4 %	11,5 %	26,2 %	8,9 %	3,2 %	3,1 %
Trading assets	19,9 %	14,1 %	29,5 %	20,0 %	28,0 %	9,1 %	26,4 %	16,0 %	12,6 %	12,7 %	24,6 %	29,8 %	20,9 %	31,3 %	21,9 %	15,0 %	17,0 %	16,5 %	13,2 %
Net loans	53,6 %	59,9 %	44,8 %	50,6 %	59,0 %	54,2 %	48,0 %	69,1 %	59,6 %	52,3 %	49,3 %	55,3 %	26,7 %	39,0 %	50,9 %	50,2 %	68,3 %	62,5 %	65,4 %
investments	2,9 %	0,6 %	2,0 %	3,9 %	0,1 %	1,4 %	4,4 %	2,4 %	2,9 %	2,6 %	2,9 %	1,1 %	0,9 %	3,8 %	1,8 %	1,9 %	1,7 %	5,5 %	12,1 %
other assets	4,8 %	2,2 %	7,4 %	4,0 %	2,0 %	3,1 %	4,2 %	1,9 %	5,1 %	24,1 %	1,6 %	4,2 %	2,2 %	2,7 %	8,9 %	5,7 %	2,3 %	3,5 %	2,4 %
Total	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**
Liabilities and Equity (% total assets)																			
Deposits	58,5 %	64,6 %	51,5 %	56,3 %	73,2 %	67,8 %	59,0 %	61,3 %	42,7 %	51,5 %	33,5 %	49,5 %	56,8 %	68,8 %	51,1 %	67,7 %	66,6 %	60,7 %	70,0 %
interbank loans	14,0 %	13,2 %	13,6 %	19,7 %	13,9 %	5,8 %	20,2 %	7,1 %	30,3 %	9,1 %	27,5 %	17,4 %	19,5 %	15,1 %	8,2 %	11,4 %	3,8 %	10,3 %	5,7 %
Trading liabilities	2,2 %	1,4 %	3,5 %	3,2 %	0,2 %	0,2 %	2,2 %	2,6 %	2,1 %	1,6 %	9,5 %	0,8 %	2,7 %	0,5 %	7,3 %	1,2 %	0,8 %	0,3 %	0,5 %
Wholesale Funding	10,5 %	9,9 %	11,3 %	5,3 %	1,6 %	7,8 %	4,5 %	15,9 %	9,3 %	14,1 %	16,7 %	19,0 %	10,4 %	1,3 %	15,5 %	3,8 %	11,3 %	19,0 %	12,5 %
Other Liabilities	3,7 %	2,4 %	7,2 %	1,9 %	1,8 %	2,2 %	3,8 %	5,1 %	5,2 %	7,0 %	2,4 %	3,0 %	1,9 %	4,4 %	8,4 %	4,3 %	3,4 %	1,9 %	1,3 %
Total Liabilites	88,9 %	91,5 %	87,0 %	86,4 %	90,6 %	83,6 %	89,7 %	91,9 %	89,5 %	83,2 %	89,5 %	89,7 %	91,3 %	90,1 %	90,6 %	88,4 %	85,8 %	92,2 %	90,0 %
Equity	11,1 %	8,5 %	13,0 %	13,6 %	9,4 %	16,4 %	10,3 %	8,1 %	10,5 %	16,8 %	10,5 %	10,3 %	8,7 %	9,9 %	9,4 %	11,6 %	14,2 %	7,8 %	10,1 %
Total	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**	**100,0 %**

10.2.2 Balance Sheet

Looking at the asset side of the balance sheet in the sample we see that net loans represent the largest share with average of 53,6 % of assets in the sample being these. The highest individual country averages are in Finland and Sweden with 69,1 % and 68,3 % if assets in net loans. The lowest value is by far in Luxembourg with only 26,7 % of assets on average in net loans. On the other hand Luxembourg has by far the highest average amount of interbank claims in the sample with 45.8 %, this is almost exactly three times time sample average, which is 15,3 %. Comparing the results to King's results there are couple differences that stand out. The average amount of investments in King's sample is 15 % whereas in my sample it's a lot lower at 2,9 %. At the same time the interbank claims and trading assets have risen in comparison to King's results so it can be said that the bulk of the change is away from investments to trading assets and interbank claims.

On the liability side of the balance sheet the largest share is in the deposits with average sample weight of 58,5 %. Interbank loans and wholesale funding are the second largest shares in the liability side. The amount of shareholder equity is on average 11,1 % in the sample, with highest averages in Estonia and surprisingly Greece. It could be that the high equity average in Greece is due to the bailouts the country has received in recent years. Comparing the equity average to King's 6,4 % there is a significant difference to be seen. Also trading liabilities are significantly lower than in King's result with the sample average of 2,2 % versus King's 15,6 %. Similarly other liabilities were lower in the sample with 3,7 % versus King's 7,7 %.

These can all be seen as signs that even though the income statement revealed lower profitability in this sample than that of King's sample the balance sheets look stronger than King's sample to cope with the Basel III regulation. The results are however not conclusive because for example wholesale funding is lower on the liability side, in this sample 10,5 % versus 15,0 % then King's sample. This means lower average of long-term funding could be due to the fact, that extending the maturity of wholesale funding would most likely increase the interest expenses and affect the Net Interest Margin (NIM) negatively. As was discussed on the earlier chapters the new regulation changes encourage banks to raise the amount of available stable funding (ASF) by relying more on deposits and particularly increasing the amount of stable deposits, increasing the maturity of wholesale

funding or increasing the amount of shareholder equity for the funding side. These results would indicate that in the funding side banks have chosen to focus on deposits and equity rather than extending the maturity but this is not a definitive analysis on the subject.

All in all it could be said that banks are paying the price for changing their balance sheets to the regulation standards by giving up some profitability on the income statement side. The main point of this exercise was to give a presentation on the differences between banking sectors between the countries in the sample and it has given a good starting point for the NSFR analysis in the next chapters as well.

11. NSFR ESTIMATION: METHODOLOGY AND ANALYSIS

In this chapter I will go through the methodology used for the NSFR estimations. First I outline some problematic parts of the estimation and my solutions to them and then I go through the methods for calculating the two part of NSFR; required stable funding (RSF) and available stable funding (ASF). After this there are some discussion about the obtained results and comparison to King's (2013) results as was done earlier.

The NSFR ratio consists various assets and liabilities and their factor weights. These have been presented earlier in the thesis so I will not go them over again here. Here we however stumble upon the first major issue with accurately calculating the NSFR levels. Individual banks don't disclose all the needed financial information in order to calculate the NSFR levels on bank level. This is why I use some country level estimates in order to keep the data quality as high as possible. Even with some estimates on country level rather than bank level the result give a very comprehensive view of the NSFR levels in European countries. In addition to this I will not use the same universal assumption that King did in his own study regarding deposits, wholesale funding, investments etc. I will use country level assumptions rather than the same assumption to the whole sample in order to get more accurate results. I will go to more details about this in the following sections.

The thesis estimates the NSFR level with the original 2010 rules, January 2014 revisions and with the newest October 2014 final amendments in place. The differences between these two are reported earlier in the thesis. The NSFR levels are calculated similarly, just using the correct weights and items included in each time series.

11.1 Required Stable Funding (RSF)

First let's look at the required stable funding side of the NSFR ratio and the methodology used in this thesis to calculate it. This side of the NSFR is trickier to estimate, as here are securities that are not reported accurately and reliable enough for a complete estimate of the RSF. So let's first look at what on the RSF

side of the balance sheet as well as of off-balance sheet that is included in the RSF calculation.

The RSF consist of securities with maturity less and more than one year, cash, government debt, interbank loans with maturity of less than one year, investments with maturity of less than one year, corporate and retail loans with various maturities, residual mortgages and finally all other assets and of balance sheet items. The maturity distribution cannot be calculated on a bank level from Bankscope data so the loan book data is gathered from the ECB Data Warehouse for Money, Banking and Investments and consists of loan and deposit book compositions on a country level. Gathering this data I have calculated the lending book distributions for the countries, which I'm using here to calculate the RSF and deposit book distributions to calculate the ASF later on.

Coins and banknotes, central bank reserves and all claims on central banks with maturity of less than six months as well as "Trade date" receivables that arise from sales of financial instruments, foreign currencies and commodities have a RSF factor of 0 % so they are not included in the calculation of the RSF.

The next components receiving 5 % RSF factor are unencumbered Level 1 assets, which are not included in the 0 % weight assets. Level 1 asset is defined as assets with minimum AA-credit rating. According to the BCBS October 2014 publication on NSFR these assets receiving 5 % RSF factor may include securities guaranteed by sovereigns, central banks, PSEs, BIS, IMF, ECB, MDBs or the EU. Here we have to make a small adjustment to the calculating which admittedly will cause a small error on the final estimate. Because there are no data regarding the credit quality of these kinds of securities a more simple approach has to be taken. Estimation is done by calculating from Bankscope data the total government debt for each bank and the applying a 5 % factor to that amount. This off course is not the perfect solution because banks have some government debt on their balance sheet, which is not eligible to the 0 % RSF factor as they have lower than AA-credit ratings. However the estimation error is quite small here because BCBS themselves state that because of the 5 % inclusion factor to these higher risk government bonds banks see the lower risk/better credit rating government bonds as very desirable, and the majority of these kind of securities are in fact 0 % government bonds (BCBS 2013). Also because the inclusion factor is very low on these kinds of securities the estimation error won't affect the end outcome too heavily. After

these small adjustments the final equation for the RSF 5 % assets comes down to the following:

GOVERNMENT DEBT TAKEN INTO ACCOUNT *= GOVERNMENT DEBT * 5 %*

Next we move on to the assets with 10 % and 15 % RSF factors. In the group of assets receiving 10 % factor and was not included in the previous amendments there are unencumbered loans to financial institutions with residual maturity of less than six months. The loan has to be also secured against Level 1 asset and the bank has to have the ability to freely hypothecate the received collateral for the life of the loan (BCBS 2014). There is no data regarding these kinds of specific loans so a compromise has to be made here and move them to the asset basket receiving 50 % RSF factor. This might sound like a large leap 10 % vs. 50 % but as the BCBS states these kinds of assets are going to be very marginal so the estimation error that inevitably occurs is not too severe. Similarly the assets assigned 15 % RSF factor has to be moved to the basket that receives the 50 % RSF factor. These assets are Level 2A assets and basically means government debt with credit between A+ to A- and corporate bonds and covered bonds with a credit rating of at least AA-. Here we have the same problem, as with the earlier assets that there are no data on the credit quality of these particular assets so we must move them to the 50 % bracket.

After these admittedly unfortunate adjustments we move on to the assets receiving 50 % RSF factors. This group of assets basically consists of lending and investments and securities. First let's look at the investment part of this group of assets. These include eligible investments and securities meaning securities, which have maturity of one year or more. The lending part of this asset basket receiving 50 % RSF factor includes lending to retail and corporate clients with maturity less than one year. This was included in the 2011 calculations with 85 % RSF factor but is now dropped down to 50 % in the new amendment. New categories include interbank lending and operational deposits, which were not specified in the 2011 calculations. Using the ECB lending profile data and Bankscope data we calculate these asset bucket with the following formula.

INVESTMENTS & SECURITIES INTO NSFR = *(Equity securities + Corporate debt securities) *0,50*

And

CORPORATE LENDING <1Y = *(Net Lending * Short Term Corporate Lending from ECB) *0,50*

RETAIL LENDING <1Y = *(Net Lending * Short Term Retail Lending from ECB) *0,50*

INTERBANK LENDING <1Y = *(Interbank lending * Short Term Interbank Lending from ECB) *0,50*

Interbank lending is not included in the result comparison with King´s results, as it would distort the results slightly. This is then calculated only to the new 2014 NSFR calculations.

Next are the assets receiving 65 % RSF factor are long term loans to corporate clients as well as unencumbered residential mortgages. Due to the fact that my goal in this thesis is to look at the differences in the balance sheets of the countries as well as the actual NSFR levels, this asset basket is divided into two different sections: corporate loans and residential mortgages. Long term corporate lending is calculated with the same method as the short term lending earlier but using the long-term estimate from the ECB and the residential mortgages with net lending and then the eligible proportion of residential mortgage lending from the ECB data gathered for the calculations.

CORPORATE LENDING >1Y = *(Net Lending * Long Term Corporate Lending from ECB) * 0,65*

RESIDENTIAL MORTGAGES = *(Net Lending * Proportion of residential mortgage lending from ECB) * 0,65*

Assets assigned with 85 % RSF factor include other loans not qualifying to the groups calculated above as well as all physically traded commodities. Here we encounter same data problems as these loans and commodities are not reported in the data with necessary granularity, so here I decided to include only the long term retail lending with maturity of more then a year. This ~~is~~ off course is another compromise but in this category the overwhelming majority of assets are these kind of loans, so this should not compromise the results too much. So in my thesis

this part of the RSF is calculated as follows again using data from Bankscope and ECB. This asset group is assigned 100 % RSF factor in the original 2011 specification.

RETAIL LENDING >1Y = *(Net Lending * Long Term Retail lending from ECB)*0,85*

Rest of the assets, which are not included in any of the previous calculations are calculated by deducting everything calculated before from total assets as well as derivatives if the receivables are greater than payables and only then as this is the correct way according to the NSFR specifications. In King´s study contingent credit lines and undrawn credit lines are assumed to count for 6 % of total assets but these items are calculated with other small items to an own "off balance sheet" section and given the 5 RSF weight. The specific calculations are seen below.

OTHER ASSETS = *(Total assets-all items calculated before)*1,00*

OFF BALANCE SHEET = *(Guarantees + Other off-balance sheet exposures to securitization + Acceptances and documentary credits reported off-balance sheet + Committed credit lines + Other Contingent Liabilities)* 0,05*

11.2 Available Stable Funding (ASF)

Comparing to the required stable funding items the available stable funding items are simpler to calculate from the data in hand. The ASF items can be seen as the portion of capital and liabilities, which are seen as stable during a one-year estimation period. Off course there are inclusion factors taken into account also. The ASF estimate comprises of equity, wholesale funding with long and short maturities and stable as well as less-stable deposits.

One important obstacle in calculating the ASF is that the proportion of stable and less-stable deposits as this cannot be found directly from the Bankscope data I'm using. In the tables I have gathered the deposit book composition for the countries in question using the ECB Data Warehouse reports for Money, Banking and Investments. In the dataset I'm using, there is a country breakdown of loans and deposits for the euro area I'm studying as well as Sweden. The data I'm using is from 2014 as my Bankscope data is from there as well. For the proportion of stable

and less-stable deposits I'm using an ECB published study from 2015, which studied the proportion of deposit insurances in the euro area (ECB 2015). These levels are quite stable so even using a different year data should not bring a big problem to the estimations.

The Liabilities and equity receiving 100 % ASF factor includes Total Regulatory Capital as well as other capital instruments and liabilities with maturity of a year or more. Total Regulatory Capital includes the Tier 1 and Tier 2 capital of the bank. The definition of these Tier 1 and Tier 2 capital instruments are very complicated and because Bankscope provides the Total Regulatory Capital already calculated I'm going to use that for this ASF assets group.

Total Regulatory Capital = *Total Regulatory Capital From Bankscope *1,00*

The next group, also receiving the 100 % ASF inclusion factor are long-term liabilities and long term wholesale funding with maturity of more than one year. These include Total Long-term funding from Bankscope, interbank deposits with the maturity that makes it eligible, long-term customer deposits with maturity of more than one year as well as preferred shares and hybrid capital accounted as debt. These items should all have their maturity more than a year in order to be eligible. The country specific portion of deposits with eligible maturity is gathered from the ECB data and presented in the tables and the correct level of deposits is gathered from Bankscope data. The final Long-term funding calculation comes down to the following.

FUNDING >1Y *= (Total Long-term Funding + Other Long-Term Liabilities + Long Term Deposits)* 1,00*

Next we have the short term funding receiving 50 % ASF inclusion factor. These liabilities are made up from all short term funding minus short-term deposits to retail or SMB's. Here we have first of the differences between the 2011 and 2014 specifications. In the 2011 specification there were no short-term interbank lending included but in the 2014 there is. For the data the maturity levels of the deposits for each country are again gathered from the ECB Data Warehouse and the rest of the data comes from Bankscope. Off course as the inclusion factor in this assets group is only 50 % only half of the value will be taken into account. The calculation for the short term funding goes as follows.

***FUNDING <1Y** = (Total Deposits, Money Market and Short-Term Funding - Total Deposits + Short Term Interbank Deposits + Short Term Corporate Deposits) * 0,50*

The next part of the ASF calculation is the deposit base of the banks. This part is divided into two subsections by stable and less stable deposits. For the levels of stable and less stable deposits in each country I'm using an ECB publication from 2015 called "Towards Deposits Insurance Scheme" (ECB 2015), which estimates the amount of deposit insurances in relation to the total deposits in that country. The data for euro area countries is from 2012, but as I could not find any newer data and the levels should be pretty sticky over time, this estimate will serve my purpose well.

The deposits that are covered by deposit insurance and are calculated as the stable deposits include the non-maturity and or term deposits with maturity of less than a year and are provided by retail and SME customers. This data is gathered from Bankscope. The deposit maturity estimation is again taken from ECB reports and the level of deposits covered by deposit insurance is taken from the publication noted above. This liability class gets a 95 % inclusion in the 2014 specification for the NSFR as opposed to the 90 % inclusion in the 2011 specification. The calculation for the stable deposits is.

***STABLE DEPOSITS** = (Household Deposit Proportion * Part of the deposits covered by deposit insurance * Total Short Term Customer Deposits) * 0.95*

Next we have the less stable deposits which are calculated similarly to the stable deposits except using different estimation for the deposit insurance and inclusion factor. In the 2011 specification these liabilities are subject to 80 % inclusion factor were as in the 2014 specification they receive 90 % inclusion factor. The calculation for the less stable deposits is written as follows.

***LESS STABLE DEPOSITS** = (Household Deposit Proportion * Part of the deposits not covered by deposit insurance * Total Short Term Customer Deposits) * 0.90*

So now we have the calculations for the RSF and ASF levels for each country. Although some compromises had to be made, the overall estimation should give a comprehensive picture about the levels and above all differences between

countries and between the specifications as well. In the next section I will go through some additional notes about the calculation and also I go through some differences between my study and the study published by King in 2013 to which I will be comparing my results and methods.

11.3 Additional notes for NSFR estimations

In his study King makes a number of assumptions which may well serve the purpose of his study but as my own thesis also focuses on the differences between countries in the NSFR levels it is not ideal to make assumptions that give the same level for each country. In the table below there is a summary of the differences between King´s assumptions and the results I have obtained.

Table 5 Differences between thesis and King´s study regarding estimation methods

In this table there are six categories where the King's study uses assumptions and my own calculations. The methods I used are told in the text.

COUNTRY	Stable deposits of retail deposits (70%)	Goverment securities of total securities (20%)	Short term wholesale funding of total wholesale funding (50%)	Corporate loans to retail loans (50%)	Short term retail loans of total retail loans (20%)	Short term corporate loans to corporate loans (20%)
	Study	Study	Study	Study	Study	Study
AT	53 %	35 %	66 %	52 %	14 %	21 %
BE	43 %	30 %	58 %	44 %	6 %	33 %
CY	50 %	47 %	67 %	52 %	13 %	24 %
DE	50 %	23 %	79 %	37 %	12 %	15 %
EE	49 %	28 %	53 %	49 %	9 %	9 %
ES	43 %	36 %	59 %	43 %	8 %	19 %
FI	57 %	28 %	52 %	37 %	11 %	13 %
FR	70 %	22 %	61 %	45 %	14 %	20 %
GR	60 %	27 %	72 %	47 %	24 %	34 %
IE	41 %	30 %	80 %	42 %	12 %	33 %
IT	32 %	47 %	71 %	58 %	10 %	37 %
LU	14 %	21 %	75 %	56 %	6 %	32 %
MT	25 %	41 %	46 %	53 %	9 %	24 %
NL	52 %	25 %	63 %	48 %	5 %	41 %
PT	50 %	28 %	43 %	41 %	10 %	26 %
SE	53 %	27 %	40 %	39 %	6 %	22 %
SI	63 %	55 %	71 %	56 %	24 %	20 %
SK	53 %	52 %	59 %	41 %	19 %	34 %
Avg.	48 %	34 %	62 %	47 %	12 %	25 %

Source: King 2013, ECB, Own calculations

In the first column is the estimate from my study for the amount of stable deposits out of retail deposits. In King´s study he used a presumption of 70 % of stable deposits out of retail deposits. As we can see from the table above the estimates

that I obtained have a much lower average at 48 %. Another interesting fact is that there is a huge variety in the amounts of stable deposits between countries from 70 % in France to only 14 % in Luxembourg. This is a clear indication that using the single assumption for all the countries in the sample is not the ideal way to calculate this part of the NSFR and my calculation should enhance the results and makes them more accurate. There are some simple explanations to the difference between estimation in my study and King's study. He bases his assumption on the US bank deposit markets and there the amounts of stable deposits are higher due to the different deposit insurance system as the amount possible to insure is 2,5 times higher in US than in Europe. This estimate of course refers to the ASF calculation, as does the third column where I have calculated the amount of short term wholesale funding out of total wholesale funding. In the King study he used an assumption of 50 % throughout the sample. In the King´s study the amount of short term wholesale funding is based on US data so my higher estimation would indicate that European banks use more short term wholesale funding that the ones in the US. The estimates are based on the ECB short-term corporate deposits and Bankscope data for eligible short-term liabilities. The average estimate in the sample comes up to 62 %, which is 12 % higher than the one King used. The estimates range from 80 % in Ireland to 40 % in Sweden.

So what does these estimation differences mean in regards to the NSFR estimation? The amount of stable deposits is higher in King's sample, which means that the ASF factor for stable and less stable deposits should be larger than in my study. However the difference shouldn't be that significant because the inclusion factor between these two items is 10 % in the 2011 specification and only 5 % in the 2014 specification. The difference regarding short-term wholesale funding levels can be seen as a significant difference between the studies. As short term wholesale funding is calculated with only 50 % ASF factor into NSFR whereas the longer term wholesale funding has inclusion factor of 100 % this will affect the ASF calculation positively in a significant way in King's study compared to my own.

The rest of the estimates are RSF related and I will go through them here one by one. The first is the amount of government debt securities out of all securities. The estimation in King's study uses an assumption of 20 % across the sample. In my study this estimation comes up to average of 34 % in the sample with values ranging from 21 % in Luxembourg to 55 % in Slovenia. This higher value is backed up by ECB bank structure report released in 2014 where they state that

approximately one-third of the debt securities in euro area banking sector in government debt (ECB 2014). The next three RSF factors where King used assumptions area all related to the lending books of the banks with estimates of the amount of short term retail loans in relation to total retail loans, similarly estimate of short term corporate loans in relation to total corporate loans and the split between corporate loans and retail loans as a whole.

For the split between corporate and retail lending King used a even split of 50 % for his study and the estimate in this study obtained from the ECB Statistical Data Warehouse gives an average of 47 % of corporate loans to retail lending. This is close to the assumption used by King in his study but more importantly there are some significant country variations in the level of corporate loans in the sample. In Italy the estimate is 58 %, which is significantly above the King´s estimate whereas in countries like Finland and Germany the estimate is 38 %, a significantly lower value. This means that this estimate takes into account the difference between countries corporate lending book sizes more accurately. The next estimations are the amount of short term corporate and retail loans in relation to the whole lending with the aforementioned lending type. King uses an assumption of 20 % of short term lending in both cases. For the corporate lending this seems to underestimate the amount of short term corporate lending because the ECB data used in this study gives an average of 25 % in this estimation. Again importantly the values have a large variability from 41 % in Netherlands to only 9 % in Estonia giving a good case for using the country specific estimations rather than an assumption across the whole sample. For the short term retail loan estimate the 20 % assumption King uses seems to be overestimating the amount of short term lending in retail lending. The estimation in this study has an average of only 12 % with again large differences between countries with 24 % Slovenia to only 5 % in Netherlands.

So how are these estimation differences going to affect the overall calculation of the RSF on the NSFR estimation? Well in the government securities the difference between my study and King's study is the widest but as this RSF item has only an inclusion factor of 5 % the overall estimation difference shouldn't be that significant. For the RSF factors regarding the lending book items the differences are not that large but the inclusion factors have a bigger difference so the changes in estimates are notable. Especially interesting is the Difference between the 2011

specification and 2014-revised specification and how these estimation differences are affected by these changes.

For the short-term retail lending the 2011 specification has an inclusion factor of 85 % whereas in the 2014 specification it was brought down to 50 %. Long term retail lending has an inclusion factor of 100 % in the 2011 specification and 85 % in the 2014 revision. As the estimation in my study finds lower levels of short term retail lending on average than King's study, this can be seen as punishing some countries more on the 2011 specification calculations than in the revised one. The countries who get a favorable estimation error in the King's study regarding retail lending maturity are Greece and Slovenia who actually have more of short-term retail loans then King assumes. On the other end of the spectrum countries like Sweden, Belgium and Netherlands are punished because they have significantly lower amounts of short term lending than King study assumes.

Similarly the estimations for the short term corporate lending can be seen as favorable for some countries whereas some countries are estimated unfavorably by using the King´s study assumptions. Long term corporate lending gets an inclusion factor of 65 % in both 2011 and 2014 specifications and short-term corporate lending gets a 50 % inclusion factor in both specifications. In my study this means that King´s 20 % assumption hurts countries like Estonia, Germany and Finland as they all have lower levels of short term corporate loans than the 20 % assumption and favors countries like Netherlands, Greece and Italy which have significantly higher amount of this kind of lending on their balance sheet.

Overall the main idea of not using the same assumptions across the whole sample but calculating the estimates on a country basis turns out to be a very useful decision as there are large differences between countries in the estimates that King used assumptions on. This should make the estimates in this study more accurate and bring out the differences between countries more accurately. Later on I will compare my NSFR calculations with the 2011 specifications to some of the same countries found in both my and King's sample and off course these estimation differences mean that the NSFR levels changes cannot be attributed solely to the changes in the bank balance sheet between my data from 2014 and King's from 2009. In addition as King's study doesn't have enough specific data on how the calculations were derived in the study, I cannot replicate the calculations in order to see how the balance sheet structures have changed. In the comparison I will

however try to take into account the estimation differences as accurately as possible.

As I will go through in the next chapter my results from the calculation I think it's important to discuss some limitations and tools I have decided to use in my interpretation of the results. First of all it is worth noting that the aim of the study is to see how the banking sector has responded to the Basel III regulation and in particular to the balance sheet changes required meeting the NSFR minimum level of 1,00. King uses in his study regression analysis to see how the regulation will affect the net interest margins of banks and how some countries should change their balance sheet composition in order to meet the NSFR regulation minimum. In his study the regression turn out to not yield significant results because in order to do a regression analysis on the data one would have to have bank specific data instead of country level data in order to have a sample that yields significant results in a regression analysis. If I would conduct a regression analysis with the country level data it would not work, or it would deteriorate the results too much.

A part from using the regression analysis I will follow the King's article in using the same tools to try to see correlations between different funding and asset structures and NSFR values as well as looking at the developments in the regulation and their affects on the NSFR values in the euro area and Sweden. Similarly to King's study I will calculate the ASF rank, RSF rank, concentration of funding rank and concentration of assets rank. I will use the same template as King does in the part of he's study where he explains the low NSFR levels for some countries. The ASF rank in simply done by arraigning the ASF values from the largest to the smallest because the higher the ASF value is the better it is for the country. The RSF value rank is done similarly but in reverse so that the smallest value gets the rank 1 because the smaller the RSF value the better it is for the country. Using the Herfindahl-Hirschmann-Index as it is done in the King´s study, funding concentration rank and asset concentration rank are calculated using the same methods as in the King's study.

These descriptive statistics are done to see if there are some correlations to be found between low or high ASF values and their respective NSFR value and similarly high or low RSF values and their respective NSFR values. The funding concentration rank is done to see if there is a connection between the funding composition and NSFR values. This is interesting because in the King's study he

concludes that one reason for the low NSFR values for European countries is that the NSFR specifications punish countries with less concentrated funding compositions and I want to see if this hypothesis is true for my data as well. The asset concentration rank is also done by following the guidelines of the King's study and using the Herfindahl-Hirschmann-Index to see if there are correlations between high ASF values and high concentration in assets or vice versa.

11.3.1 Herfindahl-Hirschmann Index

The Herfindahl-Hirschmann-Index is a commonly accepted measure of market concentration and here I´m using it to look at the concentration in country level banking balance sheet items. The formula and explanatory notes are written below.

Figure 8 Herfindahl-Hirschmann Index Function

$$HHI = \sum_{i=1}^{N} S_i^2$$

Source: King 2013

In the formula N is the number of sources and the S_i refers to the share of the balance sheet items from the balance sheet. The asset concentration consists of six balance sheet items: cash, interbank claims, trading assets, net loans, investments and other assets. Funding concentration is also calculated using six different balance sheet items: deposits, interbank loans, trading liabilities, wholesale funding, other liabilities and finally equity. These items are calculated by using the square of each balance sheet items share from the balance sheet. The higher the funding or asset concentration result is the more concentrated this side of the balance sheet is for the country in question. Following the King's study again the results are ranked so that lower values get the lowest ranks, i.e. country with rank one is the one with the least concentrated funding or assets composition. The results from these descriptive statistics are presented in the next chapter where I will present all of my calculations and results as well as some discussions about them.

12. RESULTS

In this section I will present the results from my calculations and discuss them in detail. In the first section of this chapter I will present my calculations for the NSFR levels in the sample for the 2010 and then for 2014 specifications. These are both calculated using the same 2014 principal data and sample, although there are differences between the calculations between the specifications. The next section discusses the difference between some countries that can be found in the King´s paper as well as in my study. The results are not entirely comparable because of the aforementioned differences in the methods and the assumptions King used in his study, but nonetheless comparing the results of these same countries with a 5-year gap between the used data is interesting. After this I will look at the results from the calculations using the Herfindahl-Hirschmann-Index for both specifications. Numbers of estimations are done to see if there are connections in the different parts of the NSFR calculations and the NSFR levels as well as the country specific changes that the different specifications have brought about. These results are made with several assumptions and only tell us the average country level results so no definite conclusions can be made from them. The purpose is to simply try to find some indicators for what could be the reasons behind the NSFR levels for the sample countries.

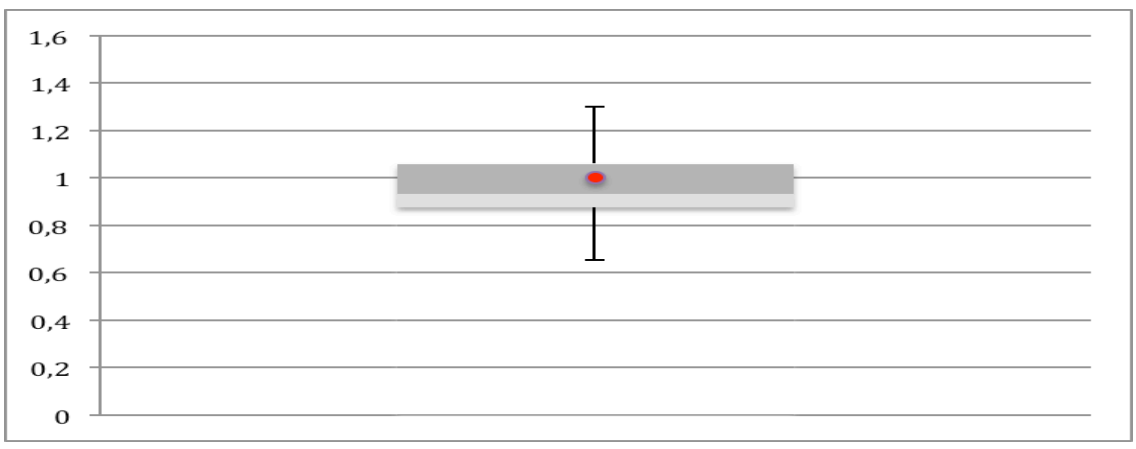
12.1 NSFR calculations for 2010 specification

First results from the NSFR calculations using the 2010 specifications are presented. The calculations are presented using the 2014 values and the NSFR values are presented as the weighted averages for each country in the sample. All the calculations are made with specifications that were gone through earlier. In the following tables there are the descriptive statistics that break down the NSFR estimations. There also a figure presenting some statistical estimations from the NSFR calculations including median, third quartile, first quartile, distribution of the results and lower and upper end of the results. As we can see from the tables below the weighted average estimate for the NSFR using 2010 specifications is 0,974. The weighted average NSFR level is then below the 1,00 minimum requirement for the NSFR level for banks so at least in the old specification banks have some work to do. The mean is higher at 1,001; this would indicate that larger banks have slightly lower NSFR levels. This was also true in the EBA monitoring

reports that I went through earlier in the thesis. In those reports all of the NSFR level indicators showed lower levels of NSFR for Group 1 banks than Group 2 banks and in that sample Group 1 banks were the largest from the sample. Looking at the results more closely we see that 8 countries have NSFR levels below the minimum required 1,00. These are Slovenia, Slovakia, Netherlands, Greece, France, Germany, Cyprus and Belgium. This is interesting and somewhat alarming because there are countries with very large financial sectors among the countries with NSFR level under the minimum requirement. Highest NSFR level using 2010 specification is obtained for Italy at 1,299 meaning the percentage of assets requiring stable funding are covered 130 % on average for the Italian banks in the sample. What is quite surprising is the variation in the NSFR levels from Greece's 0,653 to the Italy's 1,299. This is surprising because one would assume that with all the integration and single currency in the euro area the banking sectors would also be quite similarly structured across the sample. The weighted average NSFR levels in my calculations are lower than the ones EBA reported in its latest September 2015 report where they were 102 % for the Group 1 banks and 109 % for the Group 2 banks. The difference in estimations can be tributed to two things. The sample used in the EBA monitoring report is nearly eight times smaller than the one I used as well as these are calculations made with the 2010 specifications rather then the newer ones. The capital shortfall for the 2010 specification is at 3,2 trillion in my sample, which is considerably larger than the one reported in the EBA report from September 2015 at 523 million euros. This difference can also be attributed to the larger sample size in my study. Below is a similar figure for the NSFR level distribution from the 2010 specification results as was used in the IMF working paper.

Figure 9 NSFR level distribution for 2010 specification

This figure is constructed as follows. There are the first quartile represented by the lower pale grey box and third quartile represented by the darker grey box. Mean value is presented by the red dot in the box and the so-called whiskers are the distribution maximum and minimum values. Source: Own calculations; Table 10



In the distribution figure from the next page we gain some knowledge of the overall sample distribution of the NSFR levels for 2010 specifications. The mean is near perfectly in line with the NSFR minimum requirement at 1,001 and is presented as the red dot in the middle. The third quartile representing the best 25 % values from the NSFR values is 1,059 and he first quartile representing the 25 % worst NSFR values is 0,876. Finally the maximum and minimum values are shown as the "whiskers" and they are 1,299 for the maximum and 0,653 for the minimum.

There are more specific descriptive statistics in the Table 6 and they are discussed here. Although the average value of 0,974 seems quite good there are some concerning aspects in the results. There are very large differences between countries in the NSFR levels and six countries have levels that are below 0,90. This would indicate that at least a third of the countries have some deficiencies in their balance sheet items regarding the NSFR. Probably most alarming is the situation in Greece where the NSFR level is very low at 0,653. Considering the data in the sample is from 2014 this is however not that surprising as Greece almost defaulted on their debt at the same time. Another alarming fact is that two of the largest financial sectors in the sample countries, France and Germany are both below the minimum level. In Germany's case the value is only 0,02 below the threshold but for France the deficit is 0,135, which is quite considerable. The magnitude of these two countries for the euro area is so large that it affects the whole geographical financial area. On other end of the scale the highest NSFR value belongs to Italy with Austria following as second before Luxembourg and Estonia. All of these countries have NSFR levels above or close to 110 % or 1,10 which means that at least with the 2010 specification these countries are well off regarding the NSFR levels of their banking sectors on average at least. Of course this doesn't mean that there are no banks in these countries with low NSFR levels and vice versa for the low NSFR level countries, but bank specific estimation is left out from this study.

Table 6 Descriptive results from 2010 specification

In the first column is the sample countries ranked by the NSFR from largest (best) to the smallest (worst). In the next three columns the ASF and RSF levels are presented. The next column shows the NSFR values ranked so that number 1 has the highest NSFR value. Similar ranking is done to ASF values in the next column and for the RSF values except in this case the lowest RSF is given the ranking 1. In the next column I have calculated the funding concentration of the sample countries using the Herfindahl-Hirschmann-index. It is done to the asset side of the balance sheet in the next column. Both rankings are done so that the lowest value; meaning low level of concentration is given the rank 1. In the last column there is the net interest margins for the sample countries.

Country	NSFR 2010	Gap if below	ASF	RSF	NSFR Rank (High=1)	ASF Rank (High=1)	RSF Rank (Low=1)	Herf. Funding rank (Low=1)	Herf.Asset rank (Low=1)	Net interest margin (%)
IT	**1,299**		0,707	0,544	1	1	9	18	5	1,03
AT	**1,131**		0,538	0,475	2	10	2	16	1	2,17
LU	**1,095**		0,517	0,472	3	15	1	12	6	2,11
EE	**1,086**		0,526	0,485	4	14	3	3	8	2,32
IE	**1,063**		0,594	0,559	5	4	12	15	11	2,16
SE	**1,055**		0,586	0,555	6	5	11	10	13	2,41
MT	**1,016**		0,532	0,523	7	12	4	13	4	1,61
ES	**1,011**		0,537	0,531	8	11	7	7	2	3,61
PT	**1,008**		0,530	0,526	9	13	5	4	7	2,17
FI	**1,001**		0,584	0,583	10	6	14	11	15	1,86
DE	**0,980**	0,020	0,551	0,562	11	8	13	8	12	3,30
SK	**0,903**	0,097	0,552	0,612	12	7	15	6	14	2,66
SI	**0,887**	0,113	0,657	0,740	13	2	17	17	17	2,30
FR	**0,865**	0,135	0,475	0,549	14	16	10	14	9	1,35
BE	**0,839**	0,161	0,443	0,527	15	17	6	2	3	1,83
CY	**0,834**	0,166	0,540	0,648	16	9	16	5	16	2,17
NL	**0,811**	0,189	0,437	0,539	17	18	8	1	10	0,18
GR	**0,653**	0,347	0,598	0,916	18	3	18	9	18	1,77
Mean	***0,974***	***0,153***	***0,550***	***0,575***						***2,06***

Source : Own calculations

The country with highest level of NSFR also has the highest level of ASF in the results. This brings the question up whether the ASF value is a good predictor of the NSFR value for banks. The average ASF estimate for the sample is 0,55 and the highest value is the Italy's 0,707. This is then head and shoulders above the average value. The lowest value for the ASF can be found for Netherlands with 0,437, which has the second lowest NSFR value as well at 0,811. This would indicate that ASF and NSFR levels have a strong positive connection but the connection between the ASF value and NSFR value is 0,39 so although positive, definite relationship between a high ASF value and a high NSFR value cannot be drawn from the sample. This is pronounced by looking at the ASF levels more

closely. After Italy the three next countries with the highest NSFR values are Austria, Luxembourg and Estonia, which all have ASF values below the average ASF value for the sample. The country with the lowest NSFR value Greece has the third highest ASF value. This would indicate that the actual level of ASF doesn't predict the NSFR levels very well. So what about the HHI funding rank, which tells us how, concentrated the liability side of the balance sheet is for the banks in each of the countries in the sample, could it predict NSFR levels better? As was mentioned before the lower HHI funding rank means low concentration in funding for the representative country. Right away looking at the rankings we can see that the three countries with the highest NSFR values also have high concentrations of funding. Moreover on the other end of the scale the countries with low NSFR values also have low concentration of funding. This would indicate that the concentration level of funding would have a strong relationship with the NSFR levels for the countries and by association to the ASF levels as well. The correlation coefficient between the NSFR levels and the HHI funding concentration score is highly positive at 0,535 but what is even stronger is the link between high concentration of funding and high ASF levels which has positive correlation coefficient of 0,738. This would indicate that for banks concentrating the funding sources is beneficial for both NSFR and especially ASF levels.

From the sample similar connections and estimations regarding the RSF levels can be drawn. As the RSF values are basically the amount of assets the banks should fund with the funding instruments, the fewer banks have these kinds of assets on their balance sheet the better. This is why the RSF values are ranked in a reverse manner compared to the ASF value ranking. It is quite apparent that lower RSF values tend to have positive affects on the NSFR by looking at the results. Although the country with the highest NSFR Italy has quite mediocre RSF, the next three countries with the highest NSFR values hold RSF values that are significantly lower than the median value at 0,575 for the RSF value. The lowest value can be found for Luxembourg with 0,472 and the highest RSF value belongs to Greece with a very high RSF value of 0,916. This is unusually high and 0,341 higher than the median. Greece banking sector was in turmoil in 2014 when the data was gathered and the results also point to this although these results only capture the liquidity risk on average level for the country. The correlation between RSF value and NSFR value is highly negative at -0,669. The fact that the correlation is negative is not surprising but the fact that it's higher than the one estimated for ASF values and NSFR values is somewhat surprising. As the ASF Herfindahl-Hirschmann-index for

funding concentration was a better predictor to the NSFR value than the actual ASF level for each country, it's interesting to look at whether this is true for HHI index for assets as well. The correlation coefficient between the concentration of assets score and the NSFR levels is highly negative as well coming up to -0,632. This would indicate that higher concentration of assets would lead to lower NSFR values. The HHI index asset score and the RSF values have almost perfect correlation coefficient at 0,96. This means clearly that there is a strong relationship between RSF values and concentration of assets. It would seem that high concentration of assets and high amount of assets required for funding have very strong affects on the NSFR values. In other words it seems to be beneficial for banks to keep their RSF levels as low as possible and moreover to use as much distribution in their assets as possible in order to obtain high NSFR values. These connections are of course just indications of the relationship between the NSFR levels and the asset and liability compositions and no clear conclusions can be drawn from these connections.

In the last column of the table we have the net interest margin for each country. The mean for the sample is 1,93 and there are large differences between countries here as well. Estonia has the largest Net Interest Margin at 3,13 % and the lowest Net Interest Margin belongs to Spain at only 0,17%. The correlation between NSFR values and Net Interest Margin is only 0,11 so it would seem that as the banks reform their balance sheet in order to meet the NSFR minimum requirement is does not mean that this automatically reflects positively to the banks ability to gain interest income from its assets.

To sum up the findings from the 2010 specification results there are some clear findings to be made. The overall sample shows that there is some work to do regarding the NSFR minimum requirement for euro area banks at least calculated with 2010 specifications. There is wide variation in the levels of NSFR between countries from Italy, Austria and Luxembourg which all have very high country average NSFR levels to countries like Netherlands, Cyprus and Greece with very low NSFR levels. In explaining these differences ASF and RSF both have significant effects to the NSFR levels but in a different ways. For the ASF there is a moderate positive connection between ASF values and NSFR estimations but what seems to be more important in predicting the NSFR levels from the liability or funding side is that the concentration of funding is very tightly connected to both NSFR levels and moreover to ASF levels. On the asset side of the balance sheet the RSF has a

tight connection with the NSFR and it would seem more pronounced than the connection between ASF and NSFR. High RSF values have very negative affect on the NSFR values and also concentration of assets seems to coincide with high RSF levels and low NSFR levels as well. This would indicate that for banks it would be beneficial to concentrate their funding and diversify their asset structure in order to obtain higher NSFR levels. High NSFR levels do not seem to enhance the banks Net Interest Margin which makes sense because the regulations are expected to have some costs to banks and so it is not clear, in a short time period at least, that modifying the balance sheet in order to meet the NSFR minimum requirement would help bank to obtain profits from its operations for the sample countries.

In the next chapter I will go through the similar results for the 2014 specifications and after this a discussion about the differences between the two specifications is presented on country specific level as well as overall.

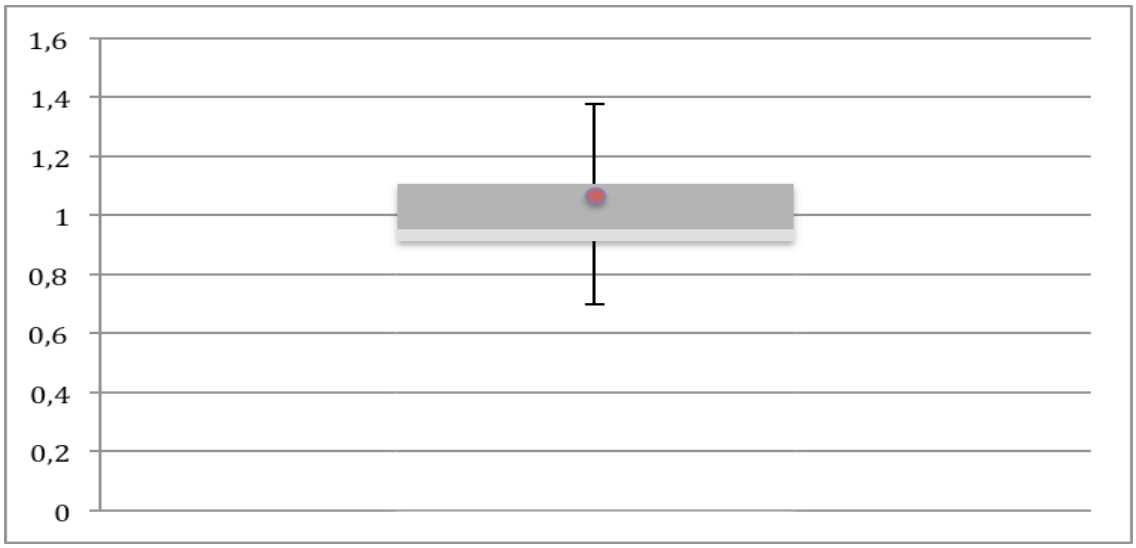
12.2 NSFR Calculations for 2014 specification

In this section the results from the sample using the newest 2104 specifications is presented and discussed before comparing them to the older specification results. The results are made with the specifications outlined in the earlier chapters and there are similar descriptive statistics from the results and a table of from the NSFR distribution presenting first quartile, third quartile, median and the maximum and minimum values of the NSFR distribution.

In the table below the average weighted NSFR value calculated with the 2014 specification is 1,026. This means that at least with these estimation methods and the data used here the average NSFR level meets the minimum requirement. The mean is slightly higher at 1,068 again indicating that larger banks have slightly lower NSFR levels. This is backed up by the EBA reports as stated earlier. Although the average is above the minimum the picture is not quite that rosy when looking at the NSFR levels more closely. There are still seven countries with NSFR level under the minimum requirement and the variation is still very large between the countries. The highest value is obtained for Italy at 1,377 and the lowest value is found for Greece at 0,699. The gap between these two countries is very large at 0,678. Below is a figure depicting the NSFR level distribution for the sample using 2014 specifications.

Figure 10 NSFR Distribution for 2014 specification

This figure is constructed as follows. There are the first quartile represented by the lower pale grey box and third quartile represented by the darker grey box. Mean value is presented by the red dot in the box and the so-called whiskers are the distribution maximum and minimum values.



Source : Own Calculations

The first quartile of the distribution is 0,91 and the third quartile has a value of 1,10. The mean is at 1,068 and the maximum at 1.377, minimum is 0,699. Comparison to 2010 specification is done in length in the following chapter but some indications can be seen here as well. All the estimations regarding the NSFR distribution suggest that the new amendments have a positive affect on the NSFR levels on banks. The maximum and minimum are both higher in the newer specifications and the mean is as well as both quartiles are higher in the 2014 specification results. This is encouraging in that it would indicate that the new amendments capture the actual levels of available stable funding and required stable funding better than the older specifications. This conclusion can be drawn because the requirements are hardly done to artificially inflate the NSFR levels so the amendments made to the specifications give a more accurate picture of the NSFR levels. In the next page there are descriptive statistics from the 2014 specifications and discussion about the results.

Table 7 Descriptive results from 2014 specification

In the first column are the sample countries ranked by the NSFR from largest (best) to the smallest (worst). In the next three columns the ASF and RSF levels are presented. The next column shows the NSFR values ranked so that number 1 has the highest NSFR value. Similar ranking is done to ASF values in the next column and for the RSF values except in this case the lowest RSF is given the ranking 1. In the next column I have calculated the funding concentration of the sample countries using the Herfindahl-Hirschmann-index. It is done to the asset side of the balance sheet in the next column. Both rankings are done so that the lowest value, meaning low level of concentration, is given the rank 1. In the last column there are the net interest margins for the sample countries.

Country	NSFR 2014	Gap if below	ASF	RSF	NSFR Rank (High=1)	ASF Rank (High=1)	RSF Rank (Low=1)	Herf. Funding rank (low=1)	Herf.Asset rank (Low=1)	Net interest margin (%)
IT	**1,377**		0,748	0,543	1	1	6	5	3	1,98
AT	**1,193**		0,562	0,471	2	14	1	12	1	1,74
EE	**1,165**		0,565	0,485	3	13	2	15	6	3,13
SE	**1,116**		0,618	0,554	4	6	10	13	13	2,17
IE	**1,113**		0,639	0,574	5	3	14	1	8	0,96
FI	**1,089**		0,620	0,570	6	5	12	10	15	1,26
ES	**1,084**		0,574	0,529	7	12	3	9	2	1,68
MT	**1,074**		0,580	0,540	8	9	5	16	5	0,17
LU	**1,073**		0,578	0,539	9	10	4	8	10	1,51
DE	**1,063**		0,588	0,553	10	7	9	18	11	2,23
SK	**1,021**		0,583	0,571	11	8	13	17	12	3,91
SI	**0,973**	0,027	0,694	0,714	12	2	17	11	17	2,19
FR	**0,918**	0,082	0,501	0,545	13	16	7	2	7	1,59
PT	**0,912**	0,088	0,559	0,613	14	15	15	14	14	2,2
CY	**0,892**	0,108	0,577	0,648	15	11	16	7	16	2,79
BE	**0,864**	0,136	0,471	0,546	16	17	8	4	4	1,93
NL	**0,840**	0,160	0,468	0,557	17	18	11	3	9	1,83
GR	**0,699**	0,301	0,628	0,898	18	4	18	6	18	1,5
Mean	***1,026***	***0,129***	***0,586***	***0,580***						***1,93***

Source: Own calculations

From the descriptive statistics we can see that there are four countries that have NSFR levels below 0,90, which can be considered a threshold for NSFR level that requires very substantial reform from the banks in order to meet the required minimum. The countries with the NSFR levels under the minimum requirement are in ascending order Greece, Netherlands, Belgium, Cyprus, Portugal, France and Slovenia. As was noted before Greece has a worryingly low NSFR level at 0,699, this reflects the country's dire financial state at 2014 when the data was gathered. There are smaller financial markets in that group but also worryingly countries like France and Netherlands, which have quite large financial sectors, especially in France's case. On the other hand above the required minimum there are countries

such as Italy, Spain and Germany, this can be considered a good sign for the stability of the euro area. The highest NSFR value is for Italy followed by Austria, Estonia and Sweden. Sweden was taken into the sample to see if there is a difference in a country that is very much a part of the EU but is not a part of the European Monetary Union. It would seem that this has no negative effect on the banking sector at least looking at the NSFR. All of the four countries and Ireland have NSFR level above 1,10 or 110 % which can be considered a threshold for NSFR that is comfortably above the minimum requirement. Again it´s worth reminding that high or low weighted country average NSFR level doesn't mean that there are no individual banks with low or high NSFR levels. This however is left out from this study, as the estimation is too inaccurate for the methods in hand.

From the descriptive statistics we can see the average ASF value for the sample is 0,586 and the highest ASF value belongs to the country with the highest ASF value Italy. Its value of 0,748 is well above the average and again indicates that ASF and NSFR would have a strong connection. The lowest value for ASF can be found for Netherlands, which has the second lowest NSFR level as well. Looking at the correlation between ASF and NSFR values we have a significant positive correlation at 0,50. The relationship is not very strong but it`s significant enough to state a clear connection between the two estimates. Looking at the ASF levels more closely there are some interesting results obtained. After Italy the next two countries with the highest NSFR value Austria and Estonia both have below average ASF values and the next two countries after them Sweden and Ireland have well above ASF values compared to the average. This tells us that although ASF values clearly have a positive affect on NSFR values it is by far not the only explaining component in the NSFR values for the sample countries. Similarly on the other end of the scale Greece with the lowest NSFR value has the fourth highest ASF value of the entire sample and Netherlands with the second worst NSFR value has the lowest ASF of all the countries. This is a similar result that was obtain for the 2010 specification and shows that the actual ASF value for the representative country doesn't indicate NSFR value enough to draw clear conclusion. Could the Herfindahl-Hirschmann-Index concentration of funding scores give more information about the relationship between funding side of the balance sheet and NSFR level? It would seem so because the HHI funding score and NSFR have stronger positive connection at 0,58. Moreover the relationship between ASF values and HHI funding concentration score has a very strong positive correlation coefficient at 0,78. This means that again concentration of funding has a very

positive effect on the ASF values and NSFR levels. This can be seen in the results as well. The four countries with the lowest NSFR levels have low HHI funding concentration scores and out of four of the countries with the highest NSFR levels three have very high HHI funding concentration scores. Italy doesn't have a particularly high HHI Funding score but a very high ASF so this relationship does not explain the ASF level in this case but country specific discussion is saved for later in the thesis.

Similarly to the relationship between ASF and NSFR levels the descriptive statistics show some interesting results for the relationship between RSF and NSFR values. The RSF values are ranked in a reverse manner compared to ASF because the lower this value is the better for the banks in that country. The lowest and by that best RSF value can be found for Austria 0,471 for the sample and first six countries that have the highest NSFR values also have RSF under the sample average of 0,580. The highest RSF value is found for Greece at 0,898, which is very high and alarming for the banking sector in that country. The first three countries with the highest NSFR levels all have very low RSF values and almost all countries with NSFR values under the minimum requirement have high RSF values, excluding France and Belgium which have RSF values below average. This would point out to a very high negative correlation between RSF values and NSFR level and the correlation coefficient -0,65 obtained backs this finding up. This is a more pronounced relationship than the one found for ASF and NSFR values and indicate that RSF values play a key role in the NSFR level estimations. The relationships between Herfindahl-Hirschmann-Index concentration for asset scores and NSFR levels have also a high negative correlation at -0,58 meaning that in assets it is more beneficial to have more distribution in the balance sheet for assets contrasting the results obtained for funding concentration and NSFR levels. The correlation coefficient between RSF levels and HHI concentration of assets have near perfect correlation at 0,96 which only adds on the finding that concentrated assets and RSF levels go hand in hand and by that affect the NSFR negatively. These findings are also quite clear looking at the actual results from the table. The four countries with the highest NSFR levels have very high HHI assets ranks and the bottom four is in the lower end of the HHI asset ranking scale.

To sum up the results from the 2014 specifications the overall results are encouraging in that the average NSFR value is above the minimum requirement. What is not that encouraging is that there is still almost one third of the countries

with weighted average NSFR levels below the minimum requirement and the variation is very large between the countries. The RSF values seem to explain NSFR values slightly better than the ASF value although both have significant affect on the NSFR. It is worth noting that these are just indicative connections. The strong connections are however perhaps expected although in King's study the ASF values had more significant relationship than RSF values. What is interesting is the very strong relationship between the NSFR values and the composition of the balance sheet in both liabilities and assets. It would seem that for banks to obtain high NSFR values it would be beneficial for banks to have highly concentrated funding sources and diverse assets. King also states in his study that the explanation for low NSFR levels in European banks in his results is explained by the universal banking model used in European banks and the diversification of funding this means. (King 2013). King doesn't find such a pronounced relationship between RSF values and NSFR values but in this study the relationship is very clear. Looking at the RSF and ASF value variations themselves RSF has nearly twice as much variation in the sample compared to the ASF value. This could be one explaining factor for the RSF strong relationship to NSFR values, as this would indicate that in the asset side the countries with low NSFR values have some deficiencies. The relationship between net interest margins and NSFR levels are also interesting as there is no relationship between high net interest margin and high NSFR level. This would suggest that at least from this perspective banks have not yet found a way to make the implementations needed to meet the requirement profitable at the same time. This could off course take a few more years, as it would require a significant change in the overall profit pattern for banks. The BIS states in its own document about the Net Stable Funding Ratio that its aim is to "promote resilience over longer time horizon by creating additional incentives for banks to fund their activities with more stable sources of funding on an ongoing basis" (BCBS 2010). As the NSFR clearly drives banks to use more concentrated stable funding this can been seen as somewhat accomplished by the regulation. On the asset side the required changes are more complicated as the structure is more diversified and the result obtained that assets should be diversified could mean that reliance on trading assets is the key, and banks should use more diversified asset structure. IN the next chapter some more precise explanations for the low or high levels of NSFR are given in order to underline some of the issues among countries in the sample.

12.3 Differences between 2010 and 2014 specifications

In this chapter I will compare the results obtained from the 2010 and 2014 specification calculations for the NSFR levels from the sample. In the chapter there is also some discussion about individual countries divided by the NSFR levels they have from the calculations. First I will look at the overall changes in the NSFR values as well as individual ASF and RSF values. The most significant changes to the NSFR that were included in the 2014 amendment are raised factors to stable and less-stable deposits and inclusion of short-term interbank borrowing with a factor of 50 %. This is included in the tables below to the ASF row named "Funding <1y". These changes will have a positive affect on the ASF and hence to the NSFR levels. On the other side of the balance sheet there are some changes with positive affects to the NSFR values and some that could have highly negative effect to the levels as well. Retail and SME lending has lower inclusion factor in the 2014 specification and short-term interbank lending is included with 50 % inclusion factor. The first of these changes should help the NSFR levels but the latter could have significant negative affect on the values if the country is heavily reliant of short-term interbank lending. After looking at the overall changes I will go through some individual countries with interesting changes between the two specifications and look at the country level results more closely as well.

I have decided to divide the sample countries into three subgroups by the NSFR levels in order to see if there are similarities between the countries that have similar NSFR values or is the NSFR value of each country just a combination of country specific attributes.

On the next page we have the changes to ASF, RSF and NSFR levels for each country presented in a column chart. From the results we can see that a part from Portugal and Luxembourg have higher NSFR levels in the 2014 specifications compared with the 2010 specifications. The NSFR value has an average change of 0,053, which is moderate but still definitive in that the NSFR values are positively affected by the amendments. The fist quartile for the changes gets value of 0,048 and the third quartile for the changes have a healthy increase of 0,078. The largest change in the NSFR value belongs to Slovakia with 0,118 increases and the minimum change is obtained for Belgium at 0,024. An interesting change is obtained for Portugal, which has a NSFR level decrease of -0,09. This is addressed

in more detail in the following text. A small decrease in NSFR value is also recorded for Luxembourg at -0,02.

For the ASF values there are no negative changes in the values, as was to be expected. The average change is 0,036. This is surprisingly low considering the positive changes that the new specification brought about. The first quartile for the changes gets the value of 0,03 and the third quartile of changes gets a value of 0,037. The maximum value for the change in ASF is found for Luxembourg at 0,06 and the minimum change is found for Austria at 0,024. It would seem that there is not much variation on the changes to ASF for the sample. All countries experience a modest increase on their ASF values for the new specification. This is understandable because the inclusion factor changes are quite small at 10 % and 5 %, also interbank claims represent a very small part of short-term funding and moreover they are included with a 50 % inclusion factor as well.

For the RSF values the desired changes would of course be negative as this would be beneficial to banks. The average change for the RSF values is positive but very small 0,005. The first quartile for the RSF changes gets a value of -0,006 and the third quartile for the RSF changes gets a value of -0,016. These are all very limited changes but there is a large variation between countries on the RSF changes. The maximum change is found for Portugal at significant increase 0,08 and the smallest change is recorded for Estonia at -0,0001, a very insignificant decrease. There are six countries in the sample, which get a higher RSF value from the 2014 specification. These countries are Portugal, Netherlands, Luxembourg, Belgium, Malta and Ireland. These same six countries also have the highest interbank lending estimations in the calculations so some connections can be found here.

Looking more closely to the changes in the amendments and their effects to the NSFR levels we can try to see some explanations to the better average NSFR level in the 2014 amendment. Below there is a table which shows first the balance sheet item that has a change between the two amendments then the change in the factor weight or the inclusion factor of a new balance sheet item. In the last column there is the average change between the amendments regarding these changes.

Table 8 Differences between amendments and subsequent change in NSFR values

Differences between amendments and subsequent differences in NSFR values

ASF	Balance sheet item	Factor change/new factor		average change between 2010/2014 NSFR value
Funding <1y	Short term interbank deposits included	N.A	50 %	0,014
Stable Deposits	Raised inclusion factor	5 %		0,008
Less Stable Deposits	Raised inclusion factor	10 %		0,016
Total averge change				**0,038**
RSF				
Retail Lending <1y	Lowered inclusion factor	-35 %		-0,013
Interbank Lending <1y	Short term interbank loans included	N.A	50 %	0,025
Retail Lending >1y	Lowered inclusion factor	-15 %		-0,006
Total average change				**0,006**

Source: Own Calculations

From the table above we can see that the most significant individual change is caused by the inclusion of the short term interbank loans to the RSF. At the same time the short-term interbank deposits are included in the ASF calculations with equal inclusion factor of 50%. If we look at these two inclusions we see that the effect of interbank loans is almost twice as large compared to interbank deposits. Moreover on a country level only four countries have positive effect when comparing the raised ASF values from inclusion of short-term interbank deposits and the increase in RSF due to the inclusion of short-term interbank lending. This would indicate that perhaps the inclusion of short-term interbank loans and deposits is not the reason behind the raise in average NSFR levels. The lowered inclusion factors to short and long-term retail lending have a significant decreasing effect. This is quite obvious but what is more interesting is to look at whether the short-term lending inclusion factor drop has more significance compared to the long-term retail lending. As the inclusion factor decrease to short-term lending is 2,33 times the decrease to long-term lending we can compare the actual change in relation to the magnitude of the actual average change. There are no significant differences to be found here, as the change to short-term lending is 2,15 times the change to long-term lending. What is also worth noting is that as we can see from the Table 10 descriptive statistics the average lending base seems to still be focused on long-term corporate lending and residential mortgages more then

residential loans. This could be due to these loans being more profitable for banks or there could be some effect with the still lower inclusion factors for corporate lending. More accurate testing of this would require more detailed data on banks level.

The raised inclusion factors for deposits also have a clear increasing effect on ASF an as on average deposits cover 58,5% of the liabilities and equity banks have on their balance sheet this can be seen as one of the most significant reasons for the increase in average NSFR level for the new amendment. Overall the changes could be due to banks reacting to the financial environment but simply looking at the differences between the two amendments the resulting rise in average NSFR level seems to be coming from the lower inclusion factors for retail lending on asset side and raised inclusion factors for deposits in the liability side. This is perhaps not surprising as these two balance sheet item groups are the core assets and liabilities for the majority of banks and changes to their inclusion factors are significant for banks in the NSFR calculation for the sample of this study.

Overall the changes are positive but quite small and significant nonetheless. The changes in RSF are somewhat surprising but are explained by the short-term interbank lending in some countries. The ASF changes are quite limited but there is some positive change in every country in the new specifications. What is perhaps most important is the positive change in 16 out of 18 countries regarding the change to NSFR. As the regulation amendments are not made to artificially increase NSFR values but to capture the actual funding and asset risks that banks have on their balance sheets this can be seen as a positive development for the regulation. It is however important to point out that these calculations capture only a small part of banks liquidity and that the changes are a sum of many things including the situation in the market place, profitability and country specific properties that are not shown in the calculations. This exercise only looks at the difference between the two amendments from 2010 and 2014.

Figure 11 Changes between 2010 and 2014 specifications

In this table we have the changes to NSFR, ASF and RSF level calculated from the 2010 and 2014 results. The black columns show the change in NSFR values between the two specifications and the red columns show this same information about the ASF levels for each country. Finally the turquoise columns show the changes in RSF levels for each country.

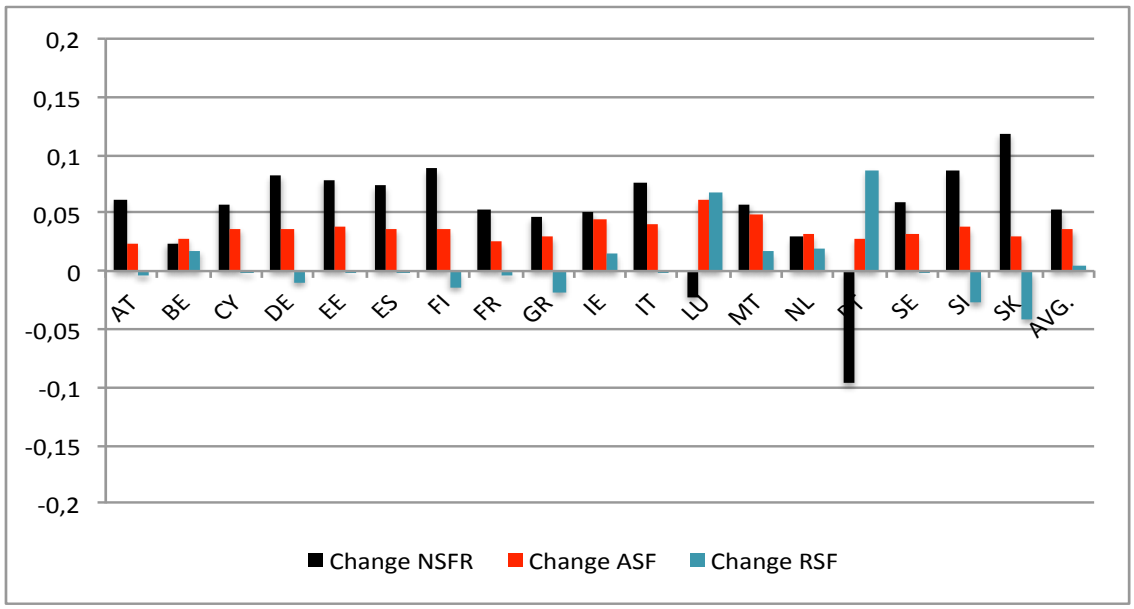
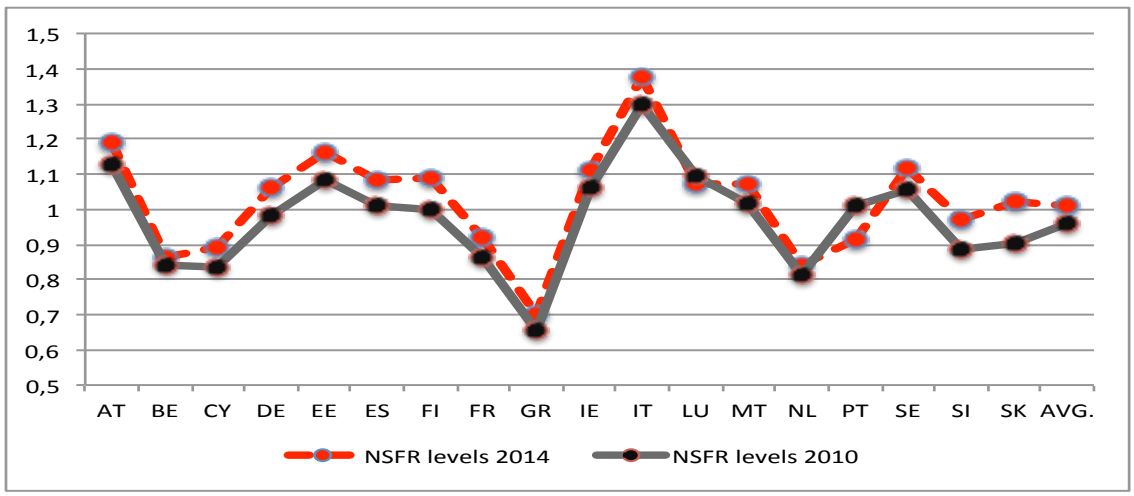


Figure 12 NSFR levels for 2010 and 2014 specifications

In this table we have line chart depicting the NSFR values for each specifications. The gray line with the black dots on every country value shows the NSFR values for the 2010 specifications and the dotted line with red dots on each country value does the same for the 2014 specification.



Source: Own calculations

Table 9 country level changes between Specifications

Most significant country level chnages between specifications by individual countries explained

Country	Change	Balance sheet	Reason
Slovakia	0,11843794	ASF/RSF	Raised inclusion factors for deposits as Slovakia has high deposit estimates. Also lower short-term retail lending inclusion factor raises NSFR value by lowering RSF.
Finland	0,08768486	ASF	Raise in deposit inclusion factors as Finland's ASF is highly concentrated on deposit base
Slovenia	0,08574733	ASF/RSF	Raised inclusion factors for deposits as Slovenia has high deposit estimates. Also lower short-term retail lending inclusion factor raises NSFR value by lowering RSF.
Germany	0,08246489	ASF	Raise in deposit inclusion factors as Germany's ASF is highly concentrated on deposit base
Luxembourgl	-0,0217732	ASF/RSF	ASF is effected very positively by the raised inclusion factor for deposits as well as the inclusion of short-term interbank lending to short-term funding. This is however entirely offset by the inclusion of Interbank lending to RSF which is second highest for the sample.
Portugal	-0,0962901	RSF	Portugal has the highest interbank lending for the whole sample. This raises the RSF significantly and causes the negative effect on the new specification.

Sources: Own calculations, mapchart.net

Figure 13 Sample country NSFR Levels map 2014 specification

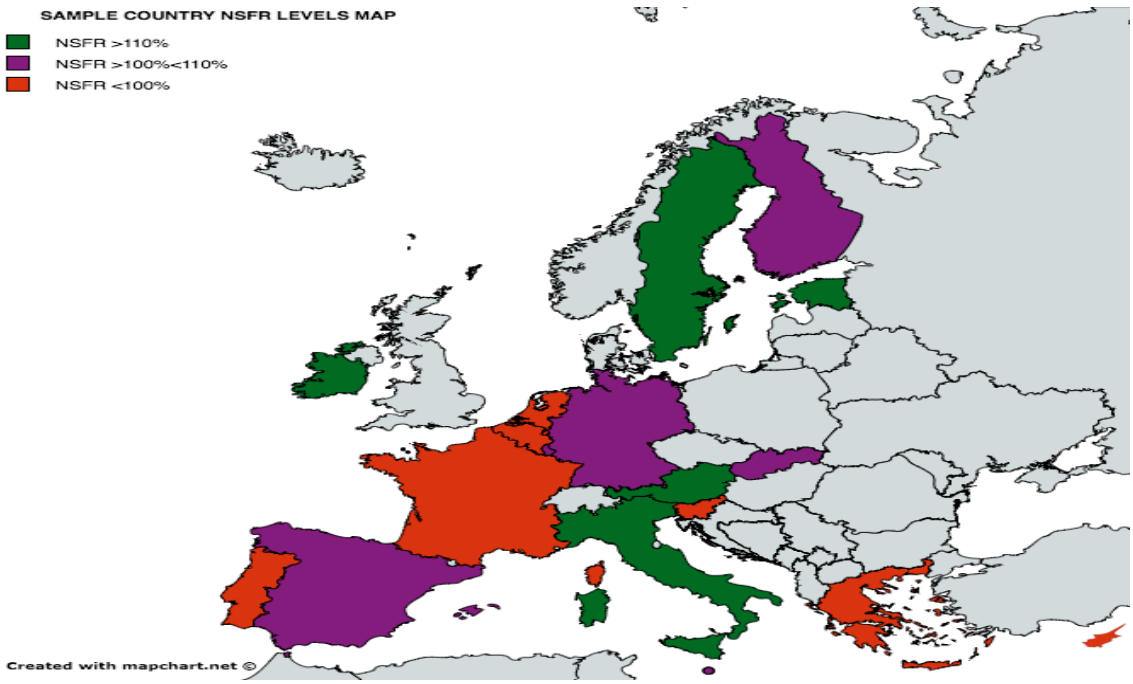


Table 10 and 11 Representative Calculations for NSFR 2010 and 2014

Source: Bankscope, ECB, Own calculations

REPRESENTATIVE CALCULATIONS FOR NSFR 2010

In this table there are all the individual calculations for the 2010 NSFR estimates, all the methodology is discussed in the earlier chapters.

		AT	BE	CY	DE	EE	ES	FI	FR	GR	IE	IT	LU	MT	NL	PT	SE	SI	SK	AVG.
AVAILABLE STABLE FUNDING (ASF)	***FACTOR***																			
Total regulatory capital	100 %	0,048	0,022	0,057	0,077	0,129	0,040	0,075	0,019	0,085	0,084	0,094	0,026	0,046	0,101	0,093	0,110	0,069	0,079	0,070
Funding >1Y	100 %	0,293	0,192	0,154	0,159	0,103	0,176	0,126	0,293	0,109	0,273	0,248	0,188	0,120	0,171	0,151	0,120	0,159	0,127	0,176
Funding <1Y	50 %	0,011	0,025	0,034	0,001	0,004	0,025	0,027	0,024	0,057	0,055	0,043	0,022	0,001	0,024	0,009	0,010	0,056	0,029	0,025
Stable Deposits	90 %	0,103	0,107	0,156	0,148	0,147	0,135	0,212	0,101	0,217	0,079	0,122	0,043	0,099	0,078	0,146	0,192	0,244	0,177	0,139
Less Stable Deposits	80 %	0,082	0,096	0,140	0,166	0,143	0,161	0,144	0,039	0,130	0,102	0,201	0,237	0,266	0,063	0,131	0,153	0,128	0,141	0,140
	TOTAL ASF	**0,538**	**0,443**	**0,540**	**0,551**	**0,526**	**0,537**	**0,584**	**0,475**	**0,598**	**0,594**	**0,707**	**0,517**	**0,532**	**0,437**	**0,530**	**0,586**	**0,657**	**0,552**	**0,550**
REQUIRED STABLE FUNDING (RSF)	***FACTOR***																			
Cash	0 %																			
Securities <1y	0 %																			
Interbank lending >1y	0 %																			
Goverment debt taken into account	5 %	0,001	0,004	0,002	0,001	0,000	0,003	0,001	0,001	0,000	0,006	0,013	0,003	0,007	0,002	0,002	0,001	0,008	0,006	0,003
Investments & securities into NSFR	50 %	0,055	0,099	0,100	0,117	0,047	0,113	0,067	0,068	0,068	0,081	0,020	0,078	0,106	0,086	0,041	0,074	0,030	0,061	0,073
Corporate Lending <1Y	50 %	0,033	0,037	0,029	0,016	0,012	0,020	0,017	0,026	0,050	0,036	0,059	0,025	0,025	0,050	0,027	0,104	0,035	0,046	0,036
Retail lending <1y	85 %	0,035	0,014	0,027	0,038	0,021	0,019	0,041	0,038	0,068	0,030	0,020	0,006	0,014	0,012	0,026	0,021	0,056	0,095	0,032
Corporate lending >1y	65 %	0,124	0,097	0,116	0,121	0,157	0,108	0,146	0,136	0,126	0,094	0,131	0,069	0,102	0,093	0,101	0,038	0,182	0,115	0,114
Residential mortgages	65 %	0,119	0,155	0,084	0,169	0,156	0,138	0,217	0,163	0,136	0,157	0,090	0,052	0,093	0,162	0,160	0,207	0,109	0,191	0,142
Retail lending >1y	100 %	0,065	0,028	0,083	0,067	0,011	0,038	0,057	0,026	0,047	0,021	0,069	0,035	0,024	0,011	0,024	0,054	0,041	0,035	0,041
Other assets	100 %	0,037	0,085	0,202	0,030	0,076	0,085	0,035	0,078	0,411	0,128	0,139	0,197	0,148	0,118	0,132	0,048	0,272	0,057	0,127
Off Balance sheet	5 %	0,006	0,007	0,006	0,003	0,004	0,008	0,003	0,014	0,010	0,007	0,003	0,007	0,005	0,005	0,013	0,007	0,006	0,005	0,007
	TOTAL RSF	**0,475**	**0,527**	**0,648**	**0,562**	**0,485**	**0,531**	**0,583**	**0,549**	**0,916**	**0,559**	**0,544**	**0,472**	**0,523**	**0,539**	**0,526**	**0,555**	**0,740**	**0,612**	**0,575**
	ESTIMATE (ASF/RSF)	**1,131**	**0,839**	**0,834**	**0,980**	**1,086**	**1,011**	**1,001**	**0,865**	**0,653**	**1,063**	**1,299**	**1,095**	**1,016**	**0,811**	**1,008**	**1,055**	**0,887**	**0,903**	**0,974**

REPRESENTATIVE CALCULATIONS FOR NSFR 2014

In this table there are all the individual calculations for the 2014 NSFR estimates, all the methodology is discussed in the earlier chapters.

		AT	BE	CY	DE	EE	ES	FI	FR	GR	IE	IT	LU	MT	NL	PT	SE	SI	SK	AVG.
AVAILABLE STABLE FUNDING (ASF)	***FACTOR***																			
Total regulatory capital	100 %	0,048	0,022	0,057	0,077	0,129	0,040	0,075	0,019	0,085	0,084	0,094	0,026	0,046	0,101	0,093	0,110	0,069	0,079	0,070
Funding >1Y	100 %	0,293	0,192	0,154	0,159	0,103	0,176	0,126	0,293	0,109	0,273	0,248	0,188	0,120	0,171	0,151	0,120	0,159	0,127	0,176
Funding <1Y	50 %	0,021	0,037	0,047	0,011	0,016	0,037	0,037	0,040	0,061	0,085	0,057	0,055	0,014	0,044	0,015	0,015	0,066	0,035	0,039
Stable Deposits	95 %	0,109	0,113	0,164	0,156	0,155	0,142	0,223	0,106	0,228	0,084	0,128	0,045	0,104	0,082	0,153	0,202	0,257	0,186	0,147
Less Stable Deposits	90 %	0,091	0,107	0,156	0,184	0,161	0,178	0,160	0,043	0,144	0,114	0,221	0,263	0,296	0,070	0,145	0,170	0,143	0,156	0,156
	TOTAL ASF	**0,562**	**0,471**	**0,577**	**0,588**	**0,565**	**0,574**	**0,620**	**0,501**	**0,628**	**0,639**	**0,748**	**0,578**	**0,580**	**0,468**	**0,559**	**0,618**	**0,694**	**0,583**	**0,586**
REQUIRED STABLE FUNDING (RSF)	***FACTOR***																			
Cash	0 %																			
Securities <1y	0 %																			
Interbank lending >1y	0 %																			
Goverment debt taken into account	5 %	0,001	0,004	0,002	0,001	0,000	0,003	0,001	0,001	0,000	0,006	0,013	0,003	0,007	0,002	0,002	0,001	0,008	0,006	0,003
Investments & securities into NSFR	50 %	0,055	0,099	0,100	0,117	0,047	0,113	0,067	0,068	0,068	0,081	0,020	0,078	0,106	0,086	0,041	0,074	0,030	0,061	0,073
Corporate Lending <1Y	50 %	0,033	0,037	0,029	0,016	0,012	0,020	0,017	0,026	0,050	0,036	0,059	0,025	0,025	0,050	0,027	0,104	0,035	0,046	0,036
Retail lending <1y	50 %	0,021	0,009	0,016	0,022	0,012	0,011	0,024	0,022	0,040	0,018	0,012	0,004	0,008	0,007	0,015	0,013	0,033	0,06	0,019
Interbank lending <1y	50 %	0,020	0,028	0,023	0,016	0,010	0,011	0,012	0,016	0,017	0,031	0,018	0,075	0,026	0,025	0,101	0,016	0,003	0,004	0,025
Corporate lending >1y	65 %	0,124	0,097	0,116	0,121	0,157	0,108	0,146	0,136	0,126	0,094	0,131	0,069	0,102	0,093	0,101	0,038	0,182	0,115	0,114
Residential mortgages	65 %	0,119	0,155	0,084	0,169	0,156	0,138	0,217	0,163	0,136	0,157	0,090	0,052	0,093	0,162	0,160	0,207	0,109	0,191	0,142
Retail lending >1y	85 %	0,055	0,024	0,070	0,057	0,009	0,032	0,048	0,022	0,040	0,018	0,059	0,030	0,020	0,009	0,020	0,046	0,035	0,030	0,035
Other assets	100 %	0,037	0,085	0,202	0,030	0,076	0,085	0,035	0,078	0,411	0,128	0,139	0,197	0,148	0,118	0,132	0,048	0,272	0,057	0,127
Off Balance sheet	5 %	0,006	0,007	0,006	0,003	0,004	0,008	0,003	0,014	0,010	0,007	0,003	0,007	0,005	0,005	0,013	0,007	0,006	0,005	0,007
	TOTAL RSF	**0,471**	**0,546**	**0,648**	**0,553**	**0,485**	**0,529**	**0,570**	**0,545**	**0,898**	**0,574**	**0,543**	**0,539**	**0,540**	**0,557**	**0,613**	**0,554**	**0,714**	**0,571**	**0,580**
	ESTIMATE (ASF/RSF)	**1,193**	**0,864**	**0,892**	**1,063**	**1,165**	**1,084**	**1,089**	**0,918**	**0,699**	**1,113**	**1,377**	**1,073**	**1,074**	**0,840**	**0,912**	**1,116**	**0,973**	**1,021**	**1,026**

12.4 Country Specific Results

In this subsection is have divided the sample to three subsamples according to how well each country fared in the NSFR calculations. The first group consists of the five countries with the highest NSFR level for the 2014 specifications. The second subsample consists of six countries with the second highest NSFR levels, and also NSFR levels above the minimum. The last subsample is formed from the seven countries that didn't meet the NSFR minimum requirement for the 2014 specifications. I the discussion I will also look at the development between specifications.

12.4.1 High NSFR level countries

This subsample consists of five countries, Italy, Austria, Estonia, Sweden and Ireland. They all have NSFR levels over 110 %. What causes these countries to have such high NSFR levels and can a common nominator even be found among these countries? Italy is the country with the highest NSFR levels in both specifications by a quite large margin so let's look at it more carefully. Italy's high NSFR level can be contributed to the very high ASF level in this study so let's look at the liability side first. From the table above we can see that Italy has above average levels of long-term funding at 0,248 in the 2014 specification compared to the average of 0,176. Also, the less stable deposits are clearly above average but the long-term funding is the key to the NSFR level here. More detailed discussion about Italy is presented in the following chapter when I compare some countries to King's results from the same countries. Also in this group are Estonia and Austria, which have very low levels of RSF and slightly below average levels of ASF on their balance sheet. Their liability sides are similar in that both countries have above average values for deposits out of total liabilities. In the ASF calculations this shows clearly for Estonia as its ASF contains above average stable and less stable deposits. Austria on the other hand has mediocre deposit values but it has the highest long term funding value of all the countries in the sample. The common nominator to these countries having such high NSFR levels is however in the asset side of the NSFR calculations. Both have very low levels of required stable funding, the two lowest values in fact. Both of these countries have low rankings in the HHI asset rankings meaning that their asset composition is diverse rather than concentrated. Asset values are below the average or slightly above it in all asset

categories of the RSF for both countries. Moreover, both countries have below average amounts of other assets, which are given an inclusion factor of 100 % in the RSF calculations and thus have a negative affect to the NSFR. Last two countries in the group are Sweden and Ireland. Both countries have high ASF values and slightly below average RSF values from the calculations. In Ireland's case the high ASF value could be explained by the second highest long-term funding value, and for Sweden by the very high deposit values on the liability side. This raises the question if there is a connection between long-term funding value and NSFR level and what is the possible meaning of it. The correlation between long-term funding and NSFR level is positive at 0,28 but not robust enough to make conclusions. This is perhaps quite expected as the NSFR value for each country is a sum of many things so one asset or liability group is unlikely to be the sole explanation for NSFR levels. Overall what is interesting is that the group is very diverse in that there are no clear similarities between them. This tells us that each bank in each country makes the changes required for that particular country to meet the minimum requirement for the NSFR and there is no universal recipe on how to manage the implementation. Moreover the NSFR is just a small part of bank balance sheet management and focuses on only to the liquidity risk so the changes are not made only to meet the minimum requirement for NSFR. What is encouraging is that there is a large economy such as Italy among these countries that fared well in this study and a country with past difficulties in the banking sector such as Ireland.

12.4.2 Medium NSFR level countries

In this group we have six countries that managed well enough to meet and exceed the minimum requirement for the NSFR but were below 110 % threshold in the 2014 specification NSFR levels. This group includes Finland, Spain, Malta, Luxembourg, Germany and Slovakia. It is first of all encouraging that in this group, which has NSFR levels that meet and exceed the NSFR required minimum we find two of the big economies and financial sectors from Europe. These are of course Germany and Spain. Spain has a NSFR level over the 100 % minimum in both samples 1,011 and 1,084 respectively. In the 2014 specification it has the third lowest RSF value and is very similar in both sides of the NSFR calculation than Estonia only with higher securities and investments on the RSF side and slightly lower NSFR for that. Similarly Finland is nearly identical in its asset and liability

composition to Sweden. Both rely heavily on deposits and loans and the only major difference between them is that Sweden has a shorter maturity in its corporate lending compared to Finland. The next two countries in this group also have a lot in common. Malta and Luxembourg both have low RSF levels and high values for less stable deposits. What is interesting is that both of these countries have near identical NSFR levels in 2014 specification but in the 2010 specification Luxembourg is significantly higher the Malta. This is due to the inclusion of interbank lending which is high in Luxembourg's results. Again we see that the new amendments are working, as they should in capturing the true levels of required funding. Both countries have highly concentrated funding compositions, this helps the ASF values as the funding concentration and ASF have a very high positive correlation as was noted earlier. On the other hand both countries are penalized for having high amounts of other assets on their RSF estimations. This is highly unbeneficial to countries because these assets are given 100 % inclusion factor. Next we have Germany, which has the largest financial sector from the sample by far and over half of the sample consists of banks from this country. Looking at the results for this country is seems that these results represent the median in many ways. ASF and RSF factor levels are near the average for the whole sample and so are the HHI asset score as well as the HHI score for funding. Germany's financial sector is so large that some of the particularities even out because there are so many banks in the sample and the anomalies even out in a way. In the Next chapter I will go through the 2010 specification results more closely and compare them to King's results. One thing worth noting is that Germany was one of the countries that benefitted most from the new amendments because of the raised inclusion factors on deposits as the ASF estimation for Germany is quite heavily concentrated on deposits. The last country in this group is Slovakia, which experienced the largest positive change between the two specifications in the NSFR calculations. The difference of 0,11 or 11 % is a significant positive change. There are two main reasons for this change. First Slovakia has high amounts of stable and less-stable deposits, which benefit from the raised inclusion factor for these ASF items. Secondly Slovakia has the highest amount of short-term retail lending. This RSF asset group had its inclusion factor decreased from 85 % to 50 %. These two changes benefit this country significantly and actually lift the country NSFR level from below the minimum requirement to above it. All in all these countries have lots of similarities to the countries that managed better in the calculations as well as each other and it's good to keep in

mind that all the countries in this sucsection were above the minimum requirement in the 2014 specification.

12.4.3 Low NSFR level countries

In the last subgroup we have the countries that didn't meet the NSFR minimum requirement in the 2014 specifications. There are seven countries in the group and the NSFR levels vary between them from Slovenia's 0,973 to Greece's very low 0,699. I will divide this subgroup into three smaller subgroups by the NSFR levels they obtained in the 2014 specification. First group consists of three countries, which had NSFR levels above 90 % or 0,90 in the 2014 specifications. These are Slovenia, France and Portugal. For Portugal it is worth noting that in the 2010 specification calculations it had NSFR estimate of 1,008, which is above the minimum requirement but was negatively affected by the inclusion of interbank lending in the 2014 specification. In the 2014 calculations Portugal receives a below average ASF factor and above average RSF factor. This can be partly at least explained by the low concentration of funding and high concentration of assets, both of which are noted to affect the ASF and RSF negatively in this study. The interbank lending estimate from the RSF is the highest for Portugal out of the whole sample, which could be a threat to the banking sector in a crisis situation, as this would raise the risk of spillover effect in this country. The next country in this group is France, one of the biggest financial sectors for Europe. This is of course alarming that such a prominent financial sector is struggling to meet the requirements and this could have adverse effects on the euro area financial sector. It is good to keep in mind that this study doesn't tell the whole story about the banking sector in this country but in the scope of this study there's cause for concern at least. The problem for France's banking sector seems to be low level of available stable funding rather than high required stable funding in this study. The low level of NSFR funding is due to very low deposit levels for both stable and less stable deposits. As it was stated earlier in the study the NSFR specifications reward banks for relaying on deposit based funding. On the other hand the estimation for long-term funding for France is the highest for the whole sample so this compensates the low deposits values somewhat but not enough it seems. The last country and the country with the NSFR estimate closest to minimum is Slovenia. It has the second highest ASF value but also the second highest RSF value so the problem lies on the asset side in this study. Again we see that concentrated funding

sources have a positive affect on the ASF value for the country as Slovenia has the second highest concentration of funding from the entire sample. We also see the correlation between the high concentration of assets and high RSF in Slovenia's case as it has the second highest concentration of assets from the entire sample. The assets are concentrated on two asset groups in Slovenia's case. The country has very high values of other assets, which are given 100 % inclusion factor and long-term corporate lending with also quite high inclusion factor of 65 %.

For the next group there are also three countries with NSFR estimates below 0,90 or 90 %. These are Cyprus, Belgium and Netherlands. Again it is quite worrying that such a large financial sector as Netherlands is having problems with meeting the required minimum NSFR level. Similarly to France, which also has a very large financial sector, the reason for Netherlands low NSFR estimation stems from the lowest ASF value from the entire sample in this study. It has the most diversified funding compositions for the whole sample, indicating to the possible correlation between diverse funding structures and low ASF levels. As with France there are very low levels of deposits both stable and less stable. The RSF value is below average for Netherlands so the problem clearly lies in the funding structures of some banks in the country. Belgium presents similar problems in its funding structure as Netherlands and France. Although not necessarily significant in an explanatory sense these three countries are also very close to each other geographically and share some language so some similarity across the countries could be due to high interconnectedness, this is however out of the scope of this study. Belgium has the second lowest ASF value from all the countries in the sample as well as second most diversified funding structure from the entire sample. It is also similar in relation to Netherlands in that the asset side is below average and quite heavily diversified. The only anomaly comparing this country to the whole sample is that it's lending seems to be abnormally strongly concentrated in residential mortgages. This is also found for Netherlands but not. The last of these three countries is Cyprus with the highest NSFR estimate at 0,892. For this country we find that the problems are not related to low ASF level but on the third highest RSF level in this country. More accurately Cyprus is penalized by the very high amount of other assets on the asset side. These assets are given 100 % inclusion factor in the calculations are thus have very negative affect for NSFR. In fact calculating the correlation coefficient for other assets and NSFR levels we get -0,50, which is significant enough to state that this asset group has significant negative correlation to NSFR levels for the sample countries in this study.

The last country I'm going to look into is Greece. The reason the discussion about this country is left separately is because of the very low estimation for NSFR in both specifications. Greece has the highest RSF value by far from the whole sample 0,916 for the 2010 specification and 0,898 for the 2014 specification. The issues with Greece are very similar to the ones Cyprus and Slovenia face in that the RSF assets group other assets is 3,5 times the average value for this particular asset group for Greece. Greece also has the most diversified asset composition, which is inline with the other countries that suffer from high RSF values. The ASF value is the fourth highest for all the countries in the sample and Greece has very high deposit values in the ASF calculations. The more important than any individual factor estimate is that the NSFR value for Greece is alarmingly low and is a good indication of the severity of the Greece debt crises. The other asset group is so high because there is a very high level of non-performing loans in bank balance sheet for this country. In a IMF interview about Greece IMF head of Greece Paul Thompson states the following: "A major concern is the very high level of loans that are not performing – over 40 percent, including restructured loans that are considered to have a very high risk of becoming non performing again" (IMF.org 2014). This would indicate that my calculations have captured these problematic loans at least on some level.

Overall the results for the 2014 show some possible patterns between countries in the composition of assets and funding and the subsequent NSFR values. In the lower end of the NSFR values we have countries with problems on the RSF side Greece, Portugal, Slovenia and Cyprus for example. These countries either have large amounts of other assets or high interbank lending, both of which indicate that there are some problems with asset performance like or that there is high level of interconnectedness between the banking sector thus raising the risk for spillover effects in hard times. Other possible pattern in the low NSFR level countries is the very low ASF levels for some of these countries. These are France, Belgium and Netherlands which all have among the lowest shares of deposits out of funding. This indicates that the share of deposits out of funding and ASF would have a positive relation. The correlation coefficient for these two parameters is 0,32 so it's positive but not definite.

On the other end of the scale the higher NSFR value countries can also be divided to two patterns. There are countries with high ASF values and very concentrated

funding. These are Italy, Sweden, Ireland and Finland. Italy and Ireland are concentrated into long-term funding and Finland and Sweden have their funding concentrated on deposits.

The other pattern is countries with low levels of RSF on their balance sheet. These are Austria and Estonia. These countries have low level of RSF factors across the board and their asset concentration is highly diversified. There are clear relations and patterns that come up in the results and they will be summed up in the conclusions.

12.5 Changes to meet the NSFR and effects to Net Interest Margin (NIM)

In this chapter I go through the possible changes that countries with NSFR levels under the minimum requirement could make to meet the required NSFR level. As was discussed in Chapter 6 there are different ways for banks to increase ASF and decrease RSF. In my proposed changes I use mainly the tool of extending the maturity of the wholesale funding as it should be plausible for banks but of course has its drawbacks regarding the net interest income and by that the Net interest Margin. For the RSF side the main tools I use are selling the assets funded at 100% and replacing them with securities cash, which have RSF factor of 0%. Also with some countries extending the maturity of corporate lending is used where its plausible. Finally the quality of investments enhanced from illiquid investments and holding more cash or holding investments with lower credit risk. In my estimations of the possible effects of the changes banks should make I use the same assumptions than King did in his study in order to make them somewhat comparable. The assumptions are:

1. The yield curve is upward sloping and the cost of wholesale funding greater than 1 year has a 100 basis points (1%) higher cost in relation to wholesale funding with maturity of less then 1 year.
2. The opportunity cost between lower –rated less liquid investments and high-quality liquid investments is 200 basis points.
3. The excess return earned on investments over government securities is 100 basis points. This is used to estimate the cost of increasing investments and reducing other assets. *Source: King 2013*

In the Appendix 3 there are the suggested changes for all the countries that didn't meet the minimum required NSFR level. I will go through the changes in the text and later I will present a approximation of the effects on the net interest margin for these countries. The country with the biggest gap to meet the NSFR minimum requirement is Greece and the representative average bank here could extend it wholesale funding by shifting from short-term wholesale funding to long-term wholesale funding. The main changes to Greece banking sector on average must however be done on the asset side of the balance sheet. There the main change would be to sell other assets and substitute them with investments as a share of total assets. There is plenty of room for this because Greece had the highest quantity if other assets at 24,1 % and below average amount of investments at 2,6%. Finally, the quality of the investments is enhanced by selling lower-quality investments and holding higher-quality bonds. For Netherlands the changes are similar but smaller in magnitude as the gap is not that large. Netherlands also had well above average amount of other assets at 8,9% compared to 4,8% and lower then average investments at 1,8% compared to 2,9% so there room for such switch in asset classes. For Belgium there could be some benefits in extending the maturity of the wholesale funding as Belgium has a above average levels of it but the changes are not enough to cover the gap. Belgium also has high level of other assets and below average level of investments so raising the share of investments out of total assets, holding more cash and reducing the amount of other assets is a possible way of reducing the level of RSF for Belgium. This however is not enough so reducing the maturity of corporate lending could be one option. This would mean that contingent liabilities would increase because as King states banks would have to open contingent credit lines for customers to effectively extend the maturity of the loans. Finally the quality of investments is increased. These combined measures raise the NSFR above the minimum required level for the country. For Cyprus extending the maturity of wholesale funding, reducing maturity of corporate loans and increasing investments by reducing other assets similar to Belgium would bring the NSFR to required level. Portugal has similar changes done to its balance sheet to raise the NSFR level but there on particular point to be made for Portugal. The country has high level of interbank lending and claims but as King states in his thesis under a stressful scenario these assets and liabilities are likely to be unstable during stressed times so they are not considered in these suggestions. For France there extending the maturity of wholesale funding is not enough so the quality of investments is raised, maturity of corporate

lending is reduced, and cash holdings and investments are increased, while other assets decline in turn. There are plenty of changes made to the representative French bank but the combined effect brings the NSFR level to the required level. Finally Slovenia has only 0,027 NSFR gap to the required level so extending the maturity of wholesale funding and increasing the investments while lower the subsequent amount of other assets is sufficient to raise the NSFR to required minimum. There little room for these changes as Slovenia has quite high amount of investments and low amount of other assets but the required change is small as well so this is sufficient. These changes are all just suggestive and as the representative bank is the average of the whole sample for each country in reality the changes each bank makes is up to its individual businesses that its in and the market situation in that country. Banks have to make a cost-benefit analysis on what kind of changes are possible and most efficient for them in order to meet the NSFR level required. This was just an exercise to see what options they might use to achieve this.

12.5.1 Effects on Net Interest Margin (NIM)

Here I will discuss the effects of the changes made in Appendix 3 to the balance sheets of the banks to the Net Interest Margin (NIM) for the representative bank. For Greece the substantial amount of which the investment are increased and other assets are reduced the effects on interest income is significant. As other assets are assumed to have 100 basis points higher excess return compared to investments lower this amount and increasing investments will raise the interest earning assets and thereby has a substantial negative effect on the interest income. Moreover the change from lower quality less liquid investments lower-rated investments and liquid high-quality investments is presumed to be 200 basis points. These two changes affect the interest income highly negatively. Greece had interest income of 3,3% in the base calculation and above average interest expenses with 1,8%. With significant negative effect on interest income due to the lower excess returns for investments and raise in interest expenses due to the 100 basis point higher cost of longer term wholesale funding it is clear that if the banks in Greece would want to alter their balance sheets in order to meet the NSFR minimum requirement this would mean drastically lower Net interest income and probably negative Net Interest Margins for the banks in this country. The baseline

Net Interest Margin average is 1,5 for Greece and these changes would almost certainly see this margin disappear for most of the banks in the country.

For Netherlands there are similar effects to be seen from the changes to meet the NSFR minimum requirement. Interest expenses would rise as the maturity of wholesale funding is extended. Netherlands has above average interest expenses at 1,9% of total assets and this would increase. Interest earning assets would increase and interest income would decrease, as banks would sell other assets and replace them with investments as well as substitute lower-rated less liquid investments with higher quality liquid investments. Netherlands has above average interest income at 3,7 % of total assets and this would be reduced significantly due to these changes. These combined effects would have negative effect on Net interest income and Net Interest Margin, the effect would not be perhaps as drastic as with banks in Greece but still significant. Netherlands had NIM of 1,83 in the baseline calculation and these changes would lower this bu approximately 50-70 basis points and bring the average Net Interest Margin to significantly below the average of the sample. With Belgium there are similar but smaller effect on interest expenses with the maturity extension of wholesale funding. Belgium had above average interest expenses at 1,7 % already and these changes would see these rise even further. For Belgium the scenario also would also suggest selling other assets for investments and improving the quality of investments. As we know earlier these changes are presumed to have negative effects on interest income. Also in the scenario for Belgium from appendix 3 the maturity of corporate lending is decreased. Assuming that banks would then have to compensate the increased rollover risk to customers by offering contingent credit lines we can hypothesize the cost of this change. If we would assume that higher haircuts would be required for such credit lines the cost of this strategy can be assumed to be 50 basis points for banks. For Belgium the baseline calculation gave interest income of 3,6 % of total assets which is above average and these combined change would lower this significantly. The combined effect of increased interest expenses and lower interest income would have approximately 50-70 basis point effect on average NIM for Belgium which was average at 1,93 on the baseline calculation. In Cyprus case similar changes to those made to Belgium are made but with more weight on the liability side of the balance sheet. Also in Cyprus case there is no substitution between lower rated less-liquid investments and higher-quality liquid investments. Cyprus had the highest interest income from the sample at 5,1% of total assets but also the highest interest expenses at

2,3%. If the changes in appendix 3 would be implemented the Net Interest Margin would decrease by approximately 30-50 basis points. Cyprus had a high NIM on the baseline calculations with 2,8 but the net income was already negative at -1,7% do to high operating expenses. This would tell us that these changes would make it more difficult for banks in Cyprus to meet the yield requirements for banks. Portugal has also similar changes done to the RSF and ASF with less impact on ASF compared to Cyprus. It had near average interest expenses at 1,5% on average and the minor adjustment to extending the wholesale funding should not increase this significantly. On the asset side the changes to corporate lending maturity and substituting other assets with investments lowers the interest income and has a overall negative effect of 30-50 basis point to the Net Interest Margin for the representative bank for this country. Portugal has above average NIM of 2,2 in the baseline calculation so the changes would bring it close to the average. It is worth noting that the country has negative net income in the baseline calculation due to high operating expenses so these changes would make meeting the yield requirements ever tougher. In the scenario for France there's three changes done to the asset side of the balance sheet, extending the maturity of corporate lending, substituting lower-rated investments with higher-quality ones and selling other assets and buying investments. These changes combined with a modest extension to wholesale funding maturity could have approximately 20-30 basis point effect to the NIM for the representative bank for the country. France has NIM below average in the base calculation with 1,6 and these changes would lower it even further. The last country in this exercise is Slovenia with only a small gap between the required minimum NSFR level on average. With extending the wholesale funding and selling other assets and substituting them with investments the level is reach for the representative bank in appendix 3. This would lower the NIM for the country by approximately 10-20 basis points still leaving it above average for the sample. The problem for Slovenia as is with many of these countries is that they have high operating expenses and thus their net income is negative in the baseline calculation. This tells us that even a modest drop to Net Interest Margin for banks in this country would make it even tougher to meet the yield requirements.

It is important to remember that these scenarios where changes were made to the average representative banks are only suggestions and each individual bank in each country has to make their own cost-benefit analysis on what changes they should implement. Secondly the basis point effects on NIM are only

approximations and their aim is not to calculate the exact cost to banks but to show the mechanisms that are related to this part of the regulations.

12.6 Comparison with King's Results

Here I will compare the results from my own 2010 specification calculations with the results from King's study for the countries that can be found for both studies. These are Italy, Germany, France, Netherlands and Spain. Below there is a summary of the differences between my results and King's.

Table 12 differences between King's and my study results

	NSFR		ASF		RSF		HHI ASSET SCORE		HHI FUNDING SCORE	
	King	*Study*	*King*	*Study*	*King*	*Study*	*King*	*Study*	*King*	*Study*
Germany	0,78	0,98	0,5	0,551	0,64	0,562	0,11	0,06	0,06	0,09
France	0,79	0,865	0,55	0,475	0,69	0,549	0,11	0,06	0,04	0,1
Italy	0,91	1,299	0,65	0,707	0,72	0,544	0,3	0,05	0,1	0,14
Spain	0,96	1,011	0,67	0,537	0,7	0,531	0,33	0,05	0,13	0,09
Netherlands	0,96	0,811	0,65	0,437	0,68	0,539	0,24	0,06	0,09	0,05

Source: Own calculations, King 2013

King reports in his study a weighted average NSFR level of 0,99, which is higher than the results obtained for this study at 0,974. It is worth noting that my study used 2 836 banks compared to the 549 banks in King's study. Moreover King´s study has a global sample whereas my study looks at the euro area and Sweden. Also the data for King's sample is gathered from 2009 and my study uses 2014 data so there is room for some interesting comparison to be made in that sense. The lower level of average NSFR in my study is explained by the fact that IMF reports that European banks have lower NSFR levels in general. This shows up also in the monitoring reports discussed earlier from BCBS using a global sample compared to EBA using European sample in their report. There are some methodology differences between the studies so it's hard to pin point the changes

caused by these differences and the changes that five years have brought about to the balance sheets of the countries compared here. All the countries that are in both samples are countries with large financial sectors so that increases significance of the comparisons. In King's study none of the countries reached the minimum requirement for NSFR whereas for the 2014 data two countries are above it. Italy and Spain are above the minimum requirement and have significant increases to the NSFR level between the two data points. Germany and France also have increases to their NSFR values whereas Netherlands actually experiences and decrease between the to data points. In the following paragraphs there is more detailed discussion about the differences between estimations where it can be drawn and pointed out.

12.6.1 Germany

Comparing King´s study and my one it seems that the former underestimates the ASF value slightly and underestimates the RSF also for Germany. The bigger difference is in the RSF value so let's look at it first. There are four categories in which the RSF calculation methods are different for the two studies. First king uses assumption of 20 % government securities out of total securities for the whole sample. My study calculates the share to be 23 % so no large difference can be found here. Secondly King assumes in his study that short term lending is 20 % for both corporate loans and retail loans, whereas my study estimates that these loans account for 15 % out of retail loans and 12 % out of corporate loans. Last assumption King uses is the amount of corporate loans representing 50 % of retail lending whereas my study estimates this at 37 % for Germany. The amount of Government securities is not significant for the overall results as these only have an inclusion factor 5 % in the final estimation. The higher amount of corporate loans is favorable to banks because they receive lower inclusion factor for both maturities in the RSF estimation. This should lower the RSF estimate for King´s study compared to my study. Also the higher amounts of short-term retail and corporate lending estimations in King's study work the RSF in the same direction because they are given a lower inclusion factor in the RSF calculation. Overall these differences should amount to slight underestimation for the RSF value in King's study compared to this study.

On the funding side there are two assumptions that King uses that affect the ASF value compared to my study. The amount of stable deposits he uses is higher the estimation is this study (70 % vs. 50 %) and the amount of short term wholesale funding is lower than the estimation for this sample (50 % vs. 79 %). The stable funding amount overestimates this part of ASF slightly, but as less stable and stable deposits have only 10 % difference between the inclusion factors the overall impact is not significant. The lower amount of short term wholesale funding should also impact the ASF for the King´s study positively as this funding is only included with 50 % of its value compared to the 100 % that's given to given to long-term funding in the ASF calculations. These differences should mean an overestimation of ASF values compared to this study.

From the summary above we can see that the ASF factor is actually lower in the King's study compared to this study and the RSF factor is higher compared to this study. This indicates that there has been significant positive development in the balance sheet compositions for Germany between 2009 and 2014 when the datasets were taken for the studies. To see if this is true we can use the representative income statement and balance sheet information presented earlier and compare the results to King´s same information.

The liability side sees a significant increase in deposits from 25,3 % to 73,2 % in this sample. Wholesale funding and trading liabilities also experience a very significant decline from 23,3 % and 25,3 % to very low levels of 0,2 % and 1,6 % for the new sample. Interbank loan and other liabilities decline also from 17,6 % and 5,5 % to 13,9 % and 1,8 %. These changes help to explain the higher ASF value in this study as deposits are included with a high inclusion factors in the ASF and as the equity has also increased from 3,1 % to 9,4 % it's easy to understand why the ASF value is higher for this study compared to King's results.

On the asset side the cash (0,7 % vs. 1,8 %) has increased as well as the net loans (38,2 % vs. 59 %). The interbank claims have declined (16 % vs. 9,2 %) as has investments (16,7 % vs. 0,1 %). There is also a slight decline in interbank claims from 16 % to 9,2 %. The lower RSF level can be explained by the move away from investments and interbank claims to loans and trading assets. In general there are better quality assets on the balance sheet, the interest income would decline as these assets are more secure and both have the downside of lower interest rates. This is true for Germany as its interest income is slightly lower for the new sample

at 3,2 % compared to 3,5 % in King's sample. The same can be observed for interest expense as moving towards shorter-term funding causes a decline in interest expenses from 2,7 % to 1,0 %. Net income is only slightly affected from -0,1 % to 1,0 %, which tells us these changes, are not cheap for banks to make and don't necessarily affect the bottom line positively for all cases.

12.6.2 France

For France the NSFR level is higher in this study than in King's study similar to Germany but in this case the difference comes from lower level of required stable funding rather than available stable funding as its lower in this study compared to King's.

On the ASF side the assumptions King makes overestimate the amount of stable deposits (70 % vs. 43 %) and underestimates the amount of short-term wholesale funding (50 % vs. 59 %). As it was with Germany these differences should overestimate the ASF value in the King's study.

On the RSF side government securities are slightly underestimated (22 % vs. 20 %). The amount of corporate loans, and short-term lending in retail and corporate lending are all slightly overestimated (50 % vs. 45 %), (20 % vs. 14 %) and (20 % vs. 19 %). These changes are however so small that the significantly lower RSF level for this study cannot be credited to these differences. The RSF factor for King's study is 0,69 whereas the value for this study is 0,55. The ASF value is higher in the King study at 0,55 compared to 0,475 in this study. The ASF factor difference could be partly due to the overestimation caused by the assumptions King uses but the lower level of RSF in this study cannot be contributed to the methodological differences so we turn our focus on the income statement and balance sheet for answers.

For the liability side of the balance sheet for France we see that deposits have increased from 27,4 % to 42,7 %, which is a good thing for the ASF value. What is not good is that interbank loans have increased from 13,5 % to 30,3 %. Trading liabilities have declined from 23 % to 2,1 % and wholesale funding also declined from 19,9 % to 9,3 % as well as other liabilities from 12,5 % to 5,2 %. Equity has increased from 3,8 % to 10,5 % which is a good thing. As the King study doesn't

have the specific ASF or RSF factor compositions included the simple explanation for the decline in ASF value is that the liability structure has moved from long-term funding to short-term funding, especially short-term interbank loans. This is backed up by the decline in interest expense from 1,9 % to 1,7 %.

For the asset side we see a decrease in RSF that is more significant than the decrease in ASF, resulting in a higher NSFR value. For the Balance sheet items we see a cash increase from 1,9 % to 2,2 %. Interbank claims have also increased from 11,7 % to 17,6 % as has the net loans from 36,5 % to 59,6 %. Trading assets are down from 29,6 % to 12,6 % and investment have declined from 13,4 % to 2,9 %. Other assets also experience a modest decline from 6,8 % to 5,9 %. Here the decline in RSF value could be due to the decline in investments and trading assets but on the other hand interbank claims have risen. Amount of net loans has a very significant increase with could be the answer for the lower RSF value but it seems that some asset groups have a better value in the NSFR estimation. The interest income has actually increased from 2,9 % to 3,3 % which would indicate mixed results from the asset side of the balance sheet. The net income has also increased from 0,2 % to 0,6 % giving clues to the mixed development in France's banking sector.

Although France has concentrated their funding profiles to more on deposits it's quite low still and the funding structure is diversified. Also on the asset side the high concentration on loan books can be seen as a problem for the country and although the RSF factor is lower in this study it doesn't balance out the NSFR levels enough to lift the country average above the minimum requirement.

12.6.3 Italy

For Italy we notice an increase in ASF value and a very large decline in RSF value, which have a very large positive affect on the NSFR value for the country.

On the ASF side the King's study again overestimates the amount of stable deposits (50 % vs. 32 %) but as stated before this effect is limited due to the inclusion factors being very close to each other for deposits. King underestimates the amount of short-term wholesale funding (50 % vs. 71 %). This would cause the

ASF to be lower than in this study but probably the explanation lies in the funding itself.

On the RSF side we notice a significant decline in the RSF value in this study. King underestimates the amount of government debt securities (20 % vs. 47 %). The estimation are also smaller compared to this study for the amount of corporate loans (50 % vs. 58 %) and the share of these loans which are short-term (20 % vs. 37 %). All of these differences would support the large difference between the RSF values and might explain why King's study has such high value for RSF at least up to some point. On the other hand the inclusion factors for these different maturities and loans are quite small so the real explanation probably lies in the balance sheet items of the country. The amount of short term retail funding is overestimated in King's study, which would underline this assumption, as it would lower the RSF value instead of raising it.

From the balance sheet items we notice that on the asset side that cash and inter bank claims have declined from 1 % and 11 % to 0,9 % and 8,8 %. Trading assets have increased (13,9 % vs. 29,8 %) whereas net loans have declined from 61,7 % to 55,3 %. So have other assets (4,8 % vs. 6,8 %) and investments from 5,7 % to 1,1 %. These changes would indicate that the maturity of the funding has been moved towards long-term funding and the decline in interest income from 3,5 % to 3,1 % supports this notion. This combined with the difference in methodology explain the higher RSF value in King's study quite well.

On the liability side deposits have increased from 36,9 % to 49,5 %. Modest increase is also obtained for interbank loans (13,4 % vs. 17,4 %). Trading liabilities declined from 9,8 % to 0,8 % and so did net loans from 28,1 % to 19 %. Equity rose (7,4 % vs. 10,3 %) and other assets had modest decline (4,9 % vs. 3 %). Again we don't have the particular ASF or RSF estimation calculations so the increase in ASF value must be due to the fact that asset quality has been increased and the decline in interest expense from 1,6 % to 1,1 % supports this notion. The net income has also declined from 0,3 % to 0,1 % again suggesting transitional costs for banks in meeting the requirements. Italy's somewhat surprising results indicate that by concentrating their funding more on deposits and diversifying their assets away from loan books, they have been able to increase the NSFR level quite substantially. This goes in line with the results obtained earlier in this study.

12.6.4 Spain

For Spain we notice that both ASF and RSF levels are lower in this study. The difference between the RSF values is higher resulting in a higher NSFR level in this study than in the one King conducted.

For the RSF related assumptions King's study underestimates the amount of government securities out of total securities (20 % vs. 36 %). It also overestimates the amount corporate lending and the portions of short-term lending in both corporate and retail lending (50 %, 20 %, 20 % vs. 43 %, 8 %, 19 %). The differences indicate too high level of RSF for the King study so the difference between the two studies would be even larger have it not for the assumptions King used in his study.

For the ASF side King's assumption for stable deposits overestimates the value significantly (70 % vs. 43 %), but as was stated earlier, this has quite marginal effect due to the small difference between inclusion factors. King's study also underestimates the amount of short-term wholesale funding (50 % vs. 59 %) This would mean a too high ASF value for the Kin's study but the difference is quite small and doesn't explain the large difference between estimations entirely at least.

From the balance sheet changes we find more information about the transition Spanish banks have gone through during the five years that the datasets were taken apart. For the liability side the deposit have increased from 42,8 % to 59 % and interbank loans from 5,4 % to 20,2 %. Trading liabilities and wholesale funding are down from 23,7 % and 16,4 % to 2,2 % and 4,5 %. Modest decline is obtained for other liabilities from 5,4 % to 3,8 % and equity is up 3,9 % from 6,4 % to 10,3 %. These changes are companied by a significant decline in interest expenses from 2,1 % to 1 %. The rise in interbank lending is worrying and could explain the decline in ASF value with the difference in King's methodology.

The main difference in the NSFR value for Spain comes from the asset side, so looking at it could give interesting information. The amount of net loans is down from very high level of 64,3 % to 48 % and so are investments from 12.3 % to

4,4 %. This is transferred to Trading assets with an increase from 8,8 % to 26,4 % and into interbank claims with an increase from 6,4 % to 16,4 %. Other assets and cash are both also down from King's sample with cash declining from 2,4 % to 1 % and other assets down from 5,9 % to 4,2 %. This transformation could indicate that Spanish banks have dropped the bad loans from their balance sheet in the subsequent five years and have focused on higher quality assets, again reminding us about the correlation between diversified asset structures and low RSF levels.

12.6.5 Netherlands

Netherlands is the only country compared with the King's study that has lower NSFR level in my study. The difference is in the significantly lower ASF level for this study and the lower RSF level for this study isn't enough to balance that out.

The liability side is the one that makes the difference here so let's start there. King's assumptions again overestimate the level of stable deposits (70 % vs. 52 %) and underestimates short term wholesale funding (50 % vs. 63 %). These explain some of the difference between the ASF values as the one estimated by King is slightly overestimated but the difference is so large that these quite marginal effects do not explain it entirely.

On the RSF side King's study slightly overestimates the amount of government securities but only by 5 % (20 % vs. 25 %). The study also overestimates the proportion of corporate loans (63 % vs. 50 %), which should mean too low RSF value for King's study. Short-term corporate loans also have too high value at 20 % versus 5 % for this study. On the other hand short term retail lending is quite significantly under estimated in the study (41 % vs. 20 %), which means that some of these affects are reduced by the too high values for retail lending maturities.

On the balance sheet for liabilities where the more significant changes lie, we see that deposits increase from 39,2 % to 50,1 %, which is quite high. Interbank loans also have modest increase from 7,9 % to 8,4 %. At the same time Trading liabilities, wholesale funding and other assets decline (17,7 %, 17,1 %, 13,9 % vs. 7,3 %, 15,5 %, 8,4 %). Equity is more than doubled from 4,2 % to 9,4 %. This lower ASF is not reflected in the interest expense as one would according the theory assume because this decreases to 1,9 % from 2,3 %. It would seem that there has

been a change towards deposit based funding in the country but the deposit structure is not having the wanted results on a country level at least.

On the asset side net loan and investments are down from 13,7 % and 57,1 % to 1,8 % and 50,9 %. At the same time cash, trading assets, interbank claims and other assets are up (2,9 %, 10,9 %, 7,4 %, 8,0 % vs. 5 %, 21,9 %, 11,5 %, 8,9 %) this would indicate that there is more diversification in the assets now than in the King's sample. This is backed up by lower RSF level. This positive change however is not enough to balance out the large negative change in ASF value. What is encouraging is that net income is up from -0,1 % to 0,3 %. It seems that although Netherland's banks are doing the right moves there still is a long way to go before they meet the minimum requirement for NSFR.

So what kind of conclusion can be drawn from this exercise? One clear one is that most of the countries are going in the right direction and that there is no specific pattern for raising the NSFR levels a part from concentration of funding which is higher every time the ASF is higher regardless of which study we are looking at. Diversification of assets also seems to have positive affect on RSF value by lowering it but in some countries in the exercise the effect is not robust enough to lower the RSF level enough.

From different researches conducted on country level we get some clues to the reasons why some countries experience significant increase or decrease on their NSFR levels. For Italy a research conducted by BBVA states the following about Italy's financial stability: "Italian banks have solid deposit base and relatively reduced funding gaps which place them in a better position to deal with potential liquidity squeezes" (BBVA 2015). The study also points out that Italy has severe problems with its economy as a whole but regarding liquidity, which is the measure NSFR focuses on, the countries banking sector seems to be in a relatively good state. This is interesting as Italy had the most significant increase to its NSFR value between the studies and this could be explained by the stable funding structure found in the study and in the research above.

On the other end of the scale Netherlands is the only country that experienced a decline in its NSFR value between the studies. In a study published 2015 by the Netherland banking supervisory authority De Nederlandsche Bank (DNB) it states the following for the country: "Dutch banks cannot fund their extensive loan books

from deposits and are therefore dependent on market funding to a greater extent than banks in other countries". This would explain the low ASF value for the country to some extent and the subsequent low NSFR value as well.

The changes for the other three countries can be partly due to the improved balance sheet composition and to some extent to the different methodologies King used in his study. In the next chapter I will conclude all the results from the study and make discuss the overall development in the sample countries.

13. CONCLUSIONS

In this section I will conclude my research and present the limitations of the study as well as some thoughts for future research.

13.1 Summary

In this section I'm going to summarize the study and link my results to the literature review and discussions earlier. Purpose of my study was to examine the development of euro area country banking sectors from the perspective of NSFR. The liquidity framework that includes the NSFR estimate was introduced in 2010 and later revised on October 2014. Since the introduction of this liquidity framework and NSFR there has been wide interest in the banking sector for the development of the estimations. This is natural because in 2018 banks are required to meet the minimum requirement for NSFR, and not succeeding to do so could mean significant problems for the banks. There have been reports about the NSFR levels from BCBS globally and EBA for the European banks but these reports doesn't report country level results and as such there is a need for this kind of examination. The study published by King uses country level estimations, but that study used data from 2009 and there are some general assumptions that were used in the study so at least a updated look at this subject was long overdue.

One of the objectives of the study was to see whether the changes made to the NSFR specifications between 2010 and 2014 have positive or negative effects to the NSFR levels in banks. Second main subject was to compare the results obtained with 2014 data and 2010 specifications with the results from King's study that were calculated with the same specifications but with older data. This gives us information about the changes in banks balance sheets keeping other aspects somewhat similar.

The methodology of the study was largely taken from King's study as it had similar objectives than this study and the similar methodology would make the results comparable. Some additional methodology was used in place of the general assumptions that King used to make the results more accurate, but the basic construction of the NSFR estimates are close to the ones King used.

Main findings of the study can be divided into two sections based on the specific objectives and to the general purpose of the study. The NSFR estimates calculated with the 2010 specifications revealed that the weighted average NSFR level for the sample countries was under the minimum required level of 1,00 at 0,974. This is of course worrying and moreover the variation between countries was very high between 1,299 for Italy to only 0,653 for Greece. What is more encouraging is that these results improve when calculated with the 2014 revised specifications as the weighted average NSFR level for the sample countries rises above the minimum requirement to 1.026. Also the capital shortfall falls significantly from 3,2 trillion to 1,1 trillion. This would indicate that the new rules are less demanding to banks and also could possibly capture the maturity mismatches more accurately than the older specifications. Of course the difference between the specifications can be contributed to banks reacting to the changes in the banking sector but in the limited scope of this study the signs are positive. Overall the new amendments should help banks reach the minimum requirement before the 2018 deadline. More detailed country results can be found in the results chapter.

Comparison with results obtained in King's study reveal that some countries have been able to at least improve the liquidity in the banking sector in the five years between the datasets for the two studies. Also it seems that concentration of funding and diversification of assets has significant positive affects to the ASF and RSF levels and by that to the NSFR levels for banks. This is one of the most interesting results from this study, as it seems that both liabilities and assets have significant effects on the NSFR levels but what is particularly pronounced is the balance sheet composition in relation to NSFR levels.

This brings up an interesting discussion. Earlier in the study, following King's study different methods to increase NSFR level were discussed. In King's study he outlines different options for increasing the NSFR levels. On the liability side there are three options: raising share of deposits, increasing Tier 1 capital and extending the maturity of wholesale funding beyond one year. On the asset side the options are shrinking the balance sheet, changing composition of investments, changing loan composition and reducing assets funded at 100 %. From the results we can see that on the liability side many countries with high levels of NSFR also have concentrated funding structures, either towards high shares of deposits or to long-term wholesale funding. This could indicate that despite it being somewhat limited and difficult means for banks to increase their available stable funding, many

banks in the sample countries have chosen to go this route. As deposits are more stable sources of funding compared to wholesale funding or hybrid capital instruments in the NSFR, this increase in the deposit bases could suggest that the NSFR regulations may have had some success in steering the liability side towards more liquid and stable sources of funding in some banks in the sample, as it should in addressing the maturity mismatches between assets and liabilities. For the asset side the main means of reducing the RSF levels for the sample countries seems to be shedding of the assets receiving 100% inclusion factors as the countries with high RSF values tend to have high amount of these kind of assets as well as reducing the overall balance sheet size from both sides as is evident from countries like Austria, Estonia and Spain. All of these countries have below average ASF levels but very low RSF levels. Moreover all of these countries have highly diversified asset structures enhancing this connection. Loan book compositions and investment compositions also have a role in lowering RSF levels but as King states in his own study this could be very costly to banks as these kind of assets (cash, AAA-rated securities) would likely have negative cost-to-carry for banks. Loan book composition changes from retail lending to corporate lending have reduced effect on the new specification as retail lending has lower inclusion factors. This combined with the fact that loans are one of the more profitable assets in bank balance sheets may explain why there is no clear concentration away from retail lending for the sample countries.

Looking at the effects of the regulation to the Net interest Margin for sample countries that were below the minimum requirement for NSFR in this study the results suggest that banks that have problems in meeting the required minimum the changes required would have adverse effect on the NIM for those banks. My scenarios were of course made with average values for each country so bank specific effects cannot be estimated due to the insufficient data. What can be speculated however is that there are clear mechanisms in the changes banks would have to make if they are below the minimum requirement and these changes would most likely have a negative effect on the banks net interest margin.

Summing up the findings from the study three main ones stand out. First, the NSFR levels for the sample countries in this study experience a increase. This could be because banks are reacting to changes in the financial markets in general but from the perspective of this study the development in positive. There are however seven countries with weighted average NSFR levels below the minimum requirement

and the variation between countries are high. As the deadline for the implementation is four years away from the data point of the study this is quite alarming.

Second observation that stands out in the study is that both sides of the balance sheet have a significant affect on the NSFR levels and more particularly the composition of liabilities and assets has an effect also on the final NSFR level. Concentrated funding and even more so diversification in assets seems to be very beneficial for improving NSFR levels. Again these observations are not unequivocal because in this study there are no specific tests done to see the causal relationships between these estimations and the NSFR level keeping all other aspects constant due to the insufficient data, but the strong correlations obtained between the composition of the balance sheet items and the NSFR level would suggest that these aspects could have a significant effect on the overall NSFR level in the sample countries for this study.

Finally looking at the possible effects on the Net Interest Margin (NIM) for countries below the minimum requirement we see negative effects from the regulations to the NIM for these countries. As these countries would have to make changes to their balance sheet to meet the required minimum the scenarios creatd would suggest that banks would experience a decrease in interest income and increase in interest expenses lowering the NIM. The scenarios rely on assumptions from King's study and thus are only estimations of the effects on the NIM for the sample banks. Moreover in this study there are no specific calculations on how many basis points the implementations would cost for the banks because the idea in the scenarios was to show the overall mechanisms that would have negative effects on the Net Interest Margin. It can be said however that meeting the NSFR required minimum will have costs to banks that need to change their balance sheet composition significantly.

Overall the results indicate that there is no golden recipe for increasing the NSFR level but that the improvement should and are made in relation to the specific maturity mismatches that seem to vary extensively between countries and banks. As the Basel III regulations aim to promote more resilient and stable banking sector during stressed times the results from this study indicate that there is still some work to be done in order to achieve this and the changes could have adverse effects on bank profitability and liquidity creation.

13.2 Limitations of the study and future research

There is clear limitation in this study and that is the data available. Due to the fact that the data is mostly country level specified, some methods are out of question is interpreting the results. For example doing a regression analysis from the results would be for no avail because the sample of the results is 18 instead of the almost 3 000 banks that were in the sample. Moreover some of the data used in the study is not optimal for the accuracy of the results. Firstly the securities held by banks have no available database in terms of their accurate maturity composition. Similarly the loan book and deposit book maturity compositions had to be taken from ECB data warehouse on a country level to keep the quality of the estimations as high as possible.

Despite these obvious set backs the results are quite well inline with the BCBS and EBA reports from the same time period and compared to the results and methods King used, there are no general assumptions in the methodology which improves the quality and accuracy of the results significantly.

For future studies the ideas are also related to the data available. With bank specific data a great deal of new angles could be studied from specific bank type and NSFR levels to the size effect of banks and their representative NSFR levels. With bank specific data the options for future development in this research area are almost endless, as it would bring such variability to the data. This could be possible in the future as possibly banks would be obliged to report more specific data about their NSFR compositions when the implementation deadline grows closer at 2018.

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Appendixes

Appedix 1. Lending distribution for sample countries

In this table we have the lending distributions for the sample countries. The data is taken from the ECB Statistical Data Warehouse for December 2014. In the first column there is the total lending for each country divided into household lending and lending to non-financial corporations. Then in the second column the household is divided into long-term and short-term lending and to mortgage lending. In the third column the non-financial corporations lending is divided by maturity to short and long-term lending.

LENDING DISTRIBUTION FOR SAMPLE COUNTRIES

	Net Lending		**Retail Lending**			**Non-financial corporations**	
	Household	Non-financial corporations	Mortgage lending	Household short	Household long	Corporate short-term	Corporate long-term
AT	48 %	52 %	62 %	14 %	24 %	22 %	78 %
BE	56 %	44 %	84 %	6 %	10 %	33 %	67 %
CY	48 %	52 %	53 %	13 %	34 %	24 %	76 %
DE	63 %	37 %	70 %	12 %	18 %	15 %	85 %
EE	51 %	49 %	87 %	9 %	4 %	9 %	91 %
ES	57 %	43 %	78 %	8 %	14 %	19 %	81 %
FI	63 %	37 %	76 %	11 %	13 %	13 %	87 %
FR	55 %	45 %	78 %	14 %	8 %	20 %	80 %
GR	53 %	47 %	63 %	24 %	13 %	34 %	66 %
IE	58 %	42 %	81 %	12 %	7 %	33 %	67 %
IT	42 %	58 %	60 %	10 %	30 %	37 %	63 %
LU	44 %	56 %	65 %	6 %	29 %	32 %	68 %
MT	47 %	53 %	78 %	9 %	13 %	24 %	76 %
NL	52 %	48 %	91 %	5 %	4 %	41 %	59 %
PT	59 %	41 %	82 %	10 %	8 %	26 %	74 %
SE	61 %	39 %	81 %	6 %	13 %	79 %	21 %
SI	44 %	56 %	61 %	24 %	15 %	20 %	80 %
SK	59 %	41 %	76 %	19 %	5 %	34 %	66 %

Source: ECB Statistical Data Warehouse 2014

Appendix 2 Deposit distribution for sample countries

In this table we have the deposit distribution for the sample countries. Data is gathered from the ECB Statistical Data Warehouse for 2014 December. For the share of Stable and Less-Stable deposits the estimations are gathered from the European Political Strategy Center (EPSC) publication. In the first column there are total customer deposits divided to short and long-term deposits. In the second column household deposits are divided to stable and less-stable deposits and also the share of household deposits out of total deposits. In the third column there is the share of non-financial deposits out of total deposits and then to the deposits eligible for NSFR calculations and to short-term deposits.

DEPOSIT DISTRIBUTION FOR SAMPLE COUNTRIES

	CUSTOMER DEPOSITS		HOUSEHOLDS			NON-FINANCIAL CORPORATIONS		
	Long term	Short term	% of total	Less Stable deposits	Stable deposits	% of total	NSFR deposits	Short term
AT	17 %	83 %	79 %	47 %	53 %	21 %	97 %	17 %
BE	5 %	96 %	78 %	57 %	43 %	22 %	98 %	21 %
CY	4 %	96 %	77 %	50 %	50 %	23 %	96 %	17 %
DE	12 %	88 %	80 %	50 %	50 %	20 %	96 %	16 %
EE	4 %	96 %	54 %	51 %	49 %	46 %	100 %	42 %
ES	15 %	85 %	79 %	57 %	43 %	21 %	95 %	16 %
FI	2 %	98 %	69 %	43 %	57 %	31 %	99 %	25 %
FR	24 %	76 %	71 %	30 %	70 %	29 %	81 %	16 %
GR	1 %	99 %	90 %	40 %	60 %	10 %	98 %	12 %
IE	4 %	96 %	67 %	59 %	41 %	33 %	99 %	26 %
IT	1 %	99 %	82 %	68 %	32 %	18 %	99 %	17 %
LU	5 %	95 %	65 %	86 %	14 %	35 %	98 %	35 %
MT	15 %	85 %	75 %	75 %	25 %	25 %	89 %	21 %
NL	11 %	89 %	58 %	48 %	52 %	42 %	99 %	31 %
PT	31 %	69 %	82 %	50 %	50 %	18 %	97 %	12 %
SE	1 %	99 %	61 %	47 %	53 %	39 %	99 %	26 %
SI	7 %	93 %	76 %	37 %	63 %	24 %	98 %	20 %
SK	18 %	83 %	73 %	47 %	53 %	27 %	97 %	21 %

Source: ECB Statistical Data Warehouse 2014, EPSC 2015

Appendix 3 Changes to meet the NSFR requirement

	GR			NL			BE			CY			PT			FR			SI		
ASF	**Before**	**After**	**change**	**Before**	**After**	**change**	**Before**	**After**	**change**	**Before**	**After**	**change**	**Before**	**After**	**change**	**Before**	**After**	**change**	**Before**	**After**	**change**
Total regulatory capital	0,085	0,085		0,101	0,101		0,022	0,022		0,057	0,057		0,093			0,019			0,069		
Funding >1Y	0,109	0,149	0,040	0,171	0,223	0,052	0,192	0,212	0,020	0,154	0,201	0,047	0,151	0,162	0,011	0,293	0,304	0,011	0,159	0,20	0,04
Funding <1Y	0,061	0,041	-0,02	0,044	0,018	-0,03	0,037	0,027	-0,01	0,047	0,024	-0,02	0,015	0,010	-0,01	0,040	0,035	-0,01	0,066	0,05	-0,02
Stable Deposits	0,228	0,228		0,082	0,082		0,113	0,113		0,164	0,164		0,153			0,106			0,257		
Less Stable Deposits	0,144	0,144		0,070	0,070		0,107	0,107		0,156	0,156		0,145			0,043			0,143		
Total ASF	**0,628**	**0,648**	**0,020**	**0,468**	**0,494**	**0,026**	**0,471**	**0,481**	**0,010**	**0,577**	**0,601**	**0,024**	**0,559**	**0,564**	**0,006**	**0,501**	**0,507**	**0,006**	**0,694**	**0,71**	**0,02**
RSF																					
Goverment debt taken into account	0,000	0,002	0,002	0,002	0,003	0,001	0,004	0,005	0,001	0,002	0,002		0,002	0,002		0,001	0,002	0,001	0,008	0,008	
Investments & securities into NSFR	0,068	0,03	-0,03	0,086	0,081	-0,01	0,099	0,074	-0,03	0,100	0,100		0,041	0,041		0,068	0,053	-0,02	0,030	0,030	
Corporate Lending <1Y	0,050	0,050		0,050	0,050		0,037	0,055	0,018	0,029	0,038	0,009	0,027	0,035	0,008	0,026	0,039	0,013	0,035	0,035	
Retail lending <1y	0,040	0,040		0,007	0,007		0,009	0,009		0,016	0,016		0,015	0,015		0,022	0,022		0,033	0,033	
Interbank lending <1y	0,017	0,017		0,025	0,025		0,028	0,028		0,023	0,023		0,101	0,101		0,016	0,016		0,003	0,003	
Corporate lending >1y	0,126	0,126		0,093	0,093		0,097	0,053	-0,04	0,116	0,095	-0,02	0,101	0,080	-0,02	0,136	0,106	-0,03	0,182	0,182	
Residential mortgages	0,136	0,136		0,162	0,162		0,155	0,155		0,084	0,084		0,160	0,160		0,163	0,163		0,109	0,109	
Retail lending >1y	0,040	0,040		0,009	0,009		0,024	0,024		0,070	0,070		0,020	0,020		0,022	0,022		0,035	0,035	
Other assets	0,411	0,193	-0,22	0,118	0,058	-0,06	0,085	0,069	-0,02	0,202	0,167	-0,04	0,132	0,096	-0,04	0,078	0,070	-0,01	0,272	0,268	-0,004
Off Balance sheet	0,010	0,010		0,005	0,005		0,007	0,008	0,001	0,006	0,006		0,013	0,014	0,001	0,014	0,015	0,001	0,006		
Total RSF	***0,898***	***0,648***	***-0,251***	***0,557***	***0,493***	***-0,064***	***0,546***	***0,481***	***-0,065***	***0,648***	***0,601***	***-0,047***	***0,613***	***0,565***	***-0,048***	***0,545***	***0,507***	***-0,038***	***0,714***	***0,71***	***-0,004***
NSFR	***0,699***	***1,000***	***0,301***	***0,840***	***1,000***	***0,160***	***0,864***	***1,000***	***0,136***	***0,892***	***1,000***	***0,108***	***0,912***	***1,000***	***0,088***	***0,918***	***1,000***	***0,082***	***0,973***	***1,00***	***0,03***