Norwegian Banks and Borrowing - Firms: How they were Affected - by the 2008 Financial Crisis

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Supervisor: Charlotte Østergaard

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Abstract

This thesis is a study of the short and long term effects of the 2008 financial crisis on Norwegian banks and the transmission of the shock to their respective borrowing firms. This thesis documents significant negative abnormal returns in the window surrounding the bankruptcy of Lehman Brothers. Furthermore, it is found that there was a negative change in bank and firm performance from the period before the crisis and during the crisis. Higher bank leverage generally reduces bank performance while high bank leverage at the onset of the crisis enhances bank performance. Bank performance generally comes at the expense of firm return on assets and investment growth, while in the crisis this relationship becomes positive. We believe that our findings are valuable in the ongoing debate regarding regulation of banks.
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Introduction

The objective of this thesis is to study the short and long term effects of the 2008 financial crisis on Norwegian banks and their respective borrowing firms.

The financial crisis of 2008 caused significant adverse effects and negative growth in several economies. The crisis came as a result of several causes, e.g. housing boom, monetary excess and inflation caused by consistently low interest rates (Taylor, 2009). The crisis was triggered by the bursting of the real estate bubble in the US and market by the default of Lehman Brothers. At the time of the default, the interbank money market froze. This led to a liquidity crisis with huge strains on bank’s capital reserves. Due to asymmetric information, the different financial institutions had little knowledge about which bank was sitting on what share of the huge amount of previously considered top rated assets, which caused further distrust in the money market. With a fresh memory of the Scandinavian bank crisis in the 90s and the 2008 financial crisis, regulators are trying to limit the probability - and the extent of future crises. Having learned from the Scandinavian bank crisis, Norwegian banks were better equipped to handle the crisis relative to comparable economies.

This is a study of how the financial crisis affected Norwegian banks and how this effect is transferred to the banks’ respective borrowing firms. In order to provide a better understanding of exogenous shocks on banks, our thesis explores the financial crisis and the factors contributing to bank performance. Our thesis will explore both short and long-term effects, with a main focus on the long long-term effects. Our thesis explores a highly important subject in economics. Because banks are key players in providing liquidity, bank distress has enormous implications for the economy. Our motivation is to better understand the link between negative shocks on banks and the implications on firm performance with regards to the firms return on assets and investment growth. More importantly, our thesis documents the underlying factors affecting bank performance in Norway during the crisis.

We have collected data from Datastream, Centre for Corporate Governance Research and Brønnøysundsregisteret. We wrote a program in Stata in order to tie firms to their respective main bank. In our analysis, we analyze the whole sample
and separate banks into low, medium and high performance groups. Firms are
grouped into categories dependent on whether their main bank has a low, medium
or high performance. All subgroups contains roughly one third of all observations.

We have defined the following hypotheses in order to study the effects of the
2008 financial crisis:

1. Norwegian banks suffered significant and negative abnormal returns in the
days surrounding the demise of Lehman Brothers.
2. The financial crisis caused higher performance losses for banks that
entered the crisis being less capitalized.
3. Firm performance was affected by the firm’s respective main lender
bank’s performance prior to and during the crisis.

In order to answer our hypotheses, we are using an event study approach to
measure the immediate market responses to the collapse of Lehman Brothers. The
long-term effects on banks are measured by a univariate multifactor regression.
We use the same approach to measure the long-term effect on Norwegian firm
performance, where we include main lender bank’s performance as an explanatory
variable.

Our findings can be summarized as follows: First off, our findings show evidence
of Norwegian banks suffering significant and negative abnormal returns in the
days around the demise of Lehman Brothers. This negative effect is not surprising
due to the huge economic turmoil in the international money markets.

Secondly, the crisis variable shows a negative structural change in bank
performance due to the crisis. However, the banks in the low performance group
increased their return on assets in the years superseding the 2008 crisis. This
thesis find that an increase in leverage is generally negatively related to return on
assets, except for low performing banks where leverage had a significant positive
relationship. The findings are consistent with previous literature (See Diamond
Surprisingly and contrary to our expectations, we find that banks that had higher
initial leverage at the onset of the crisis generally had better performance than
banks with lower initial leverage. However, the results finds that the medium
performing firms did experience a negative effect from increased leverage. This is not consistent with previous literature (see, Calomiris and Nissim, 2012). However, we believe this is the case because of Norway’s unique position to mitigate the crisis of 2008. One explanation could be offered that the best performing banks had the capacity to increase leverage by either absorbing losses without needing to raise new equity or increase loan supply. Furthermore, we see that in general large banks outperforms small banks. We believe the positive size effect can be explained by economies of scales and that large banks could afford to develop more accurate and better risk assessment models (Balin, 2008). The results show that only high performing banks have significant positive effect from size.

Thirdly, we find that firms had a general reduction in return on assets in the years after the financial crisis, which is not surprising. More surprisingly however, we find that bank performance generally comes at the expense of firm performance (return on assets and investment growth) before the crisis, but is positive for firm performance during the crisis. We offer an explanation where banks on average earns money on the fees and margins charged on firm loans, causing interest cost for the firms. The positive effect during the crisis is believed to be caused by the better performing banks not having to reduce lending or increase interest rates. This means that the borrowing firms of the better performing banks were less credit constrained. The economic stimulus packages contributed to this positive effect due to a combination of low key policy rates and making short term market financing more available (Midthjell, 2010). Additional findings are a negative relationship between firm size and return on assets and a positive relationship with investments. There’s also a general positive relationship between leverage and firm performance.

Norwegian banks entered the 2008 crisis by being better capitalized and subject to more regulation than banks in comparable countries (FS¹ 2009-2). When the crisis hit Norway, the Norwegian banks were able to withdraw funds from The Norwegian Banks’ Guarantee Fund. In the proposed changes on bank regulations

¹ FS, short for Financial Stability report.
through Basel 3\(^2\), banks are to have a counter-cyclical buffer which to some extent has a similar purpose as the Guarantee Fund. When we relate our findings to Basel 3, we find that being able to increase leverage was positive for bank performance during the crisis. Furthermore, our data shows that a buffer during the recent crisis could help mitigate the effect of the crisis and perhaps even the need for costly government intervention. These changes are important as we can observe that Norwegian banks are getting bigger and smaller banks enter strategic alliances in the pursuit of economies of scales (i.e. Sparebank1 Gruppen and Eika Gruppen). Therefore, capital requirements will be imposed on strategically important financial institutions. The idea is to reduce the problem of “too big to fail”, “too many to fail” and “too interconnected to fail”.

Our contribution to the current literature will be to show how important the financial health of banks is for the Norwegian economy and for Norwegian firm performance. We believe that our thesis will contribute to the ongoing debate and implementation of new capital regulations on the banking sector. Furthermore our findings offer valuable information regarding the firms decision about the main bank connection.

The rest of our thesis is organized into the following parts. First, we will discuss the background and the existing literature on our subject. This includes a Discussion of the financial crisis, the Basel Accords, a theory section where we discuss moral hazard and information asymmetry and review of the existing literature. The literature review will be discussed in two parts. First, we discuss banks and bank capital before we move on to the transmission of shocks from banks to firms. After the literature discussion, we proceed to our empirical methodology. This section is broken up into three separate parts where each part discusses the different hypotheses as well as describing our expected findings. After this section, we will proceed to a data section followed by a discussion of our empirical results. Lastly, we have a section with some concluding remarks where we also suggest areas for future study.

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\(^2\) The new module for capital regulations on banks is known as Basel 3 and will be discussed in the background section of our thesis
Background

The Financial Crisis

The classical explanation for financial crises is that crises are caused by excess in money, leading to boom and bust cycles (Taylor, 2009). The financial crisis of 2008 superseded a period of huge economic growth. In 2008, there were conditions present that created a cyclical crisis. Because of excess money, growing imbalances between sectors and increased inflation, the boom lost stability. The first indications of a crisis came in August of 2007 when the first losses started to appear on mortgages, and spread to financial instruments increased (Grigor’ev and Salikhov 2009). The losses on mortgages were a result of the government designed home ownership program; The Sub-Prime mortgages, in a combination with excessive risk-taking by banks (Taylor, 2009). The financial crisis was marked by the default of Lehman Brothers the 15th of September 2008 that led to the interbank money market freeze. To the present day, several countries like Spain, Greece and Portugal etc. are still struggling with the aftermath of the crisis; the debt crisis (Midthjell, 2010).

A result of the financial crisis was massive write downs on mortgages, mortgage backed securities and financial investment tools on these securities like i.e. CDS’s (Credit Default Swaps). The loss incurred by the financial system is estimated to be approximately $800b (Grigor’ev and Salikhov 2009). According to the same author, the next stage of the crisis was the liquidity crisis. The bankruptcy of Lehman Brothers caused the interbank market to freeze due to information asymmetry. In this sense, banks had little overview of whether their competitors was sitting on the bad loans which led to distrust in the market (Grigor’ev and Salikhov 2009).

There was a direct effect on US banks from the financial crisis. This was due to significant exposure to structured finance products like CLOs (collateralized loan obligations) and ABCP (asset backed commercial paper) etc. These were assets that suffered from huge write downs and losses due to the sub-prime mortgage crisis (Midthjell, 2010 and Ivashina and Scharfstein, 2010). Acharya et. Al, (2012) identifies three direct consequences of the real estate market failure: The first consequence is that the declining market value of the asset which is funded by
high leverage, forces the borrowers to sell. Being forced to sell an asset will further deflate the price of the asset. Secondly, the fall in the market value of the collateralized asset has consequences for the lender. The lender will implicitly incur losses. Thirdly, this can create a negative spiral, where the decrease in asset values can prompt further fire sales that decrease the asset values even more. The subsequent performance loss occurred in all bank size groups where the most significant losses occurred in the largest banks (Cornetta et al, 2010). Beltratti and Stulz (2009) finds that banks with more shareholder friendly boards performed worse during the crisis. We assume shareholder friendly boards focus on shareholder wealth, which could be an indication of moral hazard. This is to some extent different from Norwegian banks, where some of them are organized as foundations.

The implications and the extent of the financial crisis varied between the different countries. In general, the crisis was characterized by negative economic growth, high unemployment and a poor macroeconomic outlook of the future (Midthjell, 2010). The real implications for firms were a contraction of credit supply, The reduction of credit supply caused lower rate of investments and a higher cost of capital which in turn leads to worsening of firm performance. Some of the countries that suffered most from the crisis were USA, UK, Ireland and Spain due to a high exposure to the real estate market (Midthjell, 2010). Other countries that were greatly affected by the crisis like Greece, Italy and Portugal, suffered from a debt crisis following the financial crisis.

Norway can be considered a special case, due to being affected less by the crisis as compared to other countries. The effect was a weak reduction in economic growth and a small reduction in unemployment (Midthjell, 2010). One of the main reasons was that Norwegian banks were not as exposed to the risky real estate market as banks in other countries. Some important factors which enabled Norway to mitigate the worst effects of the financial crisis were a combination of the Norwegian welfare system, low interest rates, no dramatic decrease in domestic demand and that Norwegian banks were better capitalized compared to banks in other countries (Midthjell, 2010). Later in our thesis, we will show that there were performance losses in Norwegian banks and firms in general as a result
of the crisis. We also show that there were immediate market reactions to the default of Lehman Brothers.

When other measures failed, there were developed financial packages to contribute to economic stimulus to counter the crisis. The financial stimulus package in Norway consisted of 20 billion NOK. This was 0.84% of the 2009 GDP and 1.08% of mainland GDP. When looking at two comparable countries, Sweden had a financial stimulus package equaling 1.45% of 2009 BNP, and Britain 2.2% of 2009 GDP. The relative size of the financial stimulus packages indicates that the financial crisis caused a smaller adverse effect on the Norwegian economy. In Norway, the stimulus went to increased public expenses, cutting taxes and support for the municipalities. The Swedish and UK stimulus packages were directed at similar measures (Midthjell, 2010). The economic stimulus packages contributed to a positive effect through a combination of low key policy rates and making short term market financing more available (Midthjell, 2010).

The financial crisis has been a driver of the ongoing political and economic debate regarding the coming changes in the regulation of the financial sector.

**The Basel Committee and the Basel Accords**

Capital regulation on banks is important as a response to the fractional reserve banking. The basic idea is that a standard minimum of regulatory capital is to be held in order to decrease the risk of a bank distress and bankruptcy. Capital regulation is also a tool to limit risk taking, improve governance and increase banks’ transparency. Because financial institutions are of great importance as a liquidity creators, financial institutions needs regulation to maintain stability in the general economy. As could be seen from the previous financial crisis, a breakdown of the financial industry has enormous implications for the general economy.

The Basel Committee is responsible for developing the Basel Accords. Basel 1 was the first module, which basically enforced a flat 8% regulatory capital requirement imposing a top limit on bank leverage. However, through the flat capital requirements and contrary to the goal of regulators, banks had an incentive
to increase the riskiness of assets in order to increase earnings and use securitization to remove assets from the balance sheet to reduce leverage.

The second Basel Accord was developed in response to the criticism of the first Basel Accord and the banking crisis of the 1990s (Balin, 2008). Basel 2 introduced risk weighting of assets through new approaches to credit risk, operational risk and market risk. Risk weighting of assets means that if banks only lend to top quality borrowers, they will be able to have a larger loan portfolio, while keeping their regulatory capital at the same nominal value. The module offers three different tools to rate the risk of assets where one tool allow banks to model their own risk through the IRB model. The internally developed IRB model is subject to regulatory approval. The larger and more complex the bank is, the easier it is for the bank to create its own model (Balin, 2008). The first draft of the Basel 2 accord was published in 1999, with the final draft in 2006. Basel 2 was introduced in Norway in 2006 (Mydske, 2011) by “directive 2006/48/EF”, with enforcement from 01.01.2007 (Finanstilsynet 2007).

Current literature agrees on a competitive advantage between banks which are using the IRB (internal rating based) as compared to banks which use the standardized approach to rate assets (Hakenes and Schnabel, 2011). The reason why IRB is desirable is that banks could achieve lower capital requirements in the new Basel environment as a result of using their own developed models (Norges Bank, 2012). Lower capital requirements means that a bank can achieve higher leverage, which translates to the bank being able to issue more loans. Developing an IRB approach to price the risk of assets is costly. Banks that can afford to develop their own model gains a competitive advantage. In our thesis, this means that we can expect a significant and positive size effect on return on assets. As a majority of Norwegian banks are smaller saving banks, our results could provide important information to the ongoing debate regarding capital regulation.

Another aspect of Basel 2 is that when the market fails and the “true risk is revealed” the banks are faced with several consequences. Firstly, bank capital adequacy is reduced and the assets of the banks becomes more risky. Secondly, regulators could as a consequence increase capital requirements as a result of the

3 Internal ratings based model.
change in market risk. Thirdly, through the market discipline enforcements, banks can be penalized (or fail to be awarded) for their risk levels. The consequence is pro-cyclical, which means that banks must obtain more regulatory capital in a market in distress.

As a response to the weaknesses that became evident during the recent financial crisis and to improve upon the critique of Basel 2, Basel 3 was presented. Basel 2 focused more on the individual bank, while Basel 3 tries to have a more macro prudential view (Schwerter, 2011). For a table of the differences between the modules and a table where the solutions to the main critiques of Basel 2 is presented, please see appendix 1. The goal of Basel 3 was to strengthen capital and liquidity rules to decrease the chance of future crises by creating a more robust banking sector (Basel Committee, 2011). The main goal of Basel 3 was to improve the capital quality of banks to make them more able to handle situations of stress. Basel 3 introduces a minimum of leverage ratio and liquidity ratio. As a final precaution, systematically important financial institutions are to have an increase ability to absorb losses beyond the minimum standard set by Basel 3. Furthermore, Basel 3 also includes a countercyclical buffer, which is to increase capital requirements in good times and decrease capital requirements in bad times, and to increase the minimum equity ratio. Our findings greatly supports the transition from Basel 2 to Basel 3, as we find that decrease in bank leverage generally enhances return on assets and increase in bank leverage during crises generally boosts return on assets. We will not research this topic further\(^4\), but mention it because of the contributing factor of the financial crisis and due to the introduction of a countercyclical buffer with Basel 3.

Regarding the bank’s lending spreads, Slovik and Cournède (2011) argues that increased capital requirements will cause higher cost of capital for the banks. As a result, banks are likely to respond by increasing interest rate spreads and subsequently passing on the higher costs to their customers. On this basis, it is estimated by Slovik and Cournède (2011) a small reduction in GDP due to higher funding costs. Our thesis will show that a reduction in leverage increases the bank’s return on assets. Furthermore, we will show that increased bank

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\(^4\) For more information regarding Basel 2 and pro-cyclicality, see Suarez and Repullo (2013)
performance decreases firm performance. Relating our findings to Slovik and Cournède (2011), Basel 3 can may cause an adverse effect on the Norwegian GDP. One could view this reduction of GDP as the cost of insuring against future crises.

Models and Theory

The Bank and the Asymmetric Information Problem:

Greenbaum and Thakor (2007) illustrate the asymmetric information problem as: “The better informed economic agents have a natural incentive to exploit their informational advantage”. In the borrower and lender situation, it’s the borrower that has the informational advantage. Accordingly, it is in the banks’ interest to develop tools to reduce their informational disadvantage, in order to limit the possibility of lending to “lemons” (Akerlof, 1970). These insights are vital in order to understand counterparty risk in the borrower and lender situation.

In the symmetrical information theory, both the bank and the lender have the same information about the lender’s quality. The bank will therefore be able to lend to the top quality lenders first. In the asymmetric information framework, the lender knows more about its ability to repay than the bank. Accordingly, as the bank is unable to separate between those types, a larger portion of the credit is rationed to the poor quality lenders than in the symmetric information environment (Sharpe, 1990). In the aftermath of the previous financial crisis, counterparty risk has become more important for the bank. By this, we mean that the bank is not only obtaining information on the borrower, but also the borrower’s investors, stakeholders and shareholders. The economical implication is lower riskiness of the bank’s assets and a more correct pricing of loans and risk. This leads to the bank being required to hold less regulatory capital causing increased leverage, which in turn increases the banks return on assets. In the empirical section of our thesis, we will show the positive relationship between leverage and return on assets.

5 See Akerlof (1970) for the model of information asymmetry
A long-term relationship between the firm and the bank lets the bank build up a history with the firm through monitoring. This would reduce the firm’s cost of capital and the bank’s risk since a good history would be able to minimize the information gap between the borrower and lender. Current business practice is that a firm’s loan is up for revision once every year. This lets the banks revise the riskiness of its loan portfolio and get rid of loans that have become too risky. The data from the revision is used for rating purposes, risk weighting of assets and calculating minimum capital requirements.

In the framework of Stieglitz and Weiss (1981), collateral can signal the quality of the lender. Once the firm has established a good relationship with a bank, the bank going bankrupt should be a major source of concern for the borrowing firm. This is due to the possibility of bankruptcy destroying information and reintroducing information asymmetry. When the borrower has to approach a new bank, it would be charged a higher premium by the new lender. This would be particularly evident in crises, and is an argument for regulation of bank leverage. Sharpe (1990) argues that information destruction was a major reason for the depth and length of the Great Depression. In a recent study of US banks by Berger and Bouwman (2012) it is found that large and medium sized banks performance is enhanced by a larger degree of capitalization in times of economic downturn. Regarding small banks, higher capitalization mainly increased the probability of staying in business during economic downturns.

Regarding the bank and depositor relationship, regulatory capital requirements can be seen as an important tool to alleviate the information asymmetry. Santos (2001) explains this by the fact that depositors have an inability to monitor banks, thus requiring regulation.

**Banks and Moral Hazard**

Moral hazard is a well-studied topic in economics, especially with regards to insurance. Pauly (1968) defines moral hazard as «the intangible loss-producing propensities of the individual assured». We explain moral hazard as an agency issue, namely that one party can be tempted to increase the riskiness of a project, because the negative consequences will not be felt by the risk taker. Information asymmetry is a common reason for moral hazard, with insider trading as the best
example. Cordella and Yeyati (2002) suggests that in an asymmetric information environment, information based moral hazard is present. Theoretically, moral hazard is only non-existent in a market with perfect information.

In banking, moral hazard arises more easily in a situation where the borrower experiences financial distress. In such a situation, managers in the borrowing firm could be tempted to use the borrowed funds to invest in high-risk short-term projects even though it has a negative NPV. In a crisis period, this could essentially magnify the distress of the lender. Our paper shows that there is a shift in the profitability of the banks following the crisis. However, due to limitations in our data we were unable to explore this point any further.

In the run up to the financial crisis, banks circumvented regulatory capital by securitization of mortgages, including subprime loans and holding the securities as off-balance sheet items. This means that mortgages were issued without having the required capital to support the mortgages. According to Acharya et. Al, (2012), these mortgages and securities received AAA rating due to modeling failures of rating agencies. The authors also suggest a possible moral hazard and conflict of interest due to the fees earned by the rating agencies. Securitization could be an important factor contributing to the crisis due to information asymmetry. Very few actors fully comprehended the complex structure and the true risk of the investment securities Acharya et. Al, (2012).

**Literature Review**

We divide our literature review in two sections. In the first section, we will elaborate on the role of banks, bank capitalization and shocks on banks. The second section will focus on the lending relationship between banks and the banks’ respective borrowing firms. We will emphasize on the transmission of shocks from banks to the borrowing firms. We will connect the current literature to findings and observations made by Norges Bank.
**Bank capitalization**

We define a bank as a financial intermediary, with the main source of value creation as providing liquidity to the market, reducing asymmetric information and reducing cost of capital, Santos (2001). Banks are very valuable for the market in order to avoid duplication of monitoring, Diamond (1984). In sum, the bank effectively reduces transaction costs and increases money supply.

Over the past decades, bank’s capitalization has declined. This trend is twofold in its consequences. Firstly, when one increases the leverage, the likelihood of financial distress increases. Secondly, increased leverage enables the bank to create more liquidity (Diamond and Rajan 2000). In the case of banks as a main source of liquidity creator in the market, such distress can have widespread consequences. Examples are the Great Depression, the Scandinavian Bank Crisis in the early 90s and the Financial Crisis of 2008. In Norway before the crisis banks were using more and more market financing. This type of financing were more short term and therefore more influenced by market volatilities (FS, 2009-1).

It is shown in a recent study by Stulz and Beltratti (2009) that stricter capital regulations during the most recent financial crisis, meaning a higher minimum level of regulatory capital was beneficial on a macro level. Additionally, countries with a higher degree of independent supervision and restrictions on banking activities performed relatively better. Banks with higher capital are better buffered against the shocks of the crisis, and may thus gain a competitive advantage over their lower capital counterparts (Berger and Bouwman 2009). This was evident in the Norwegian case, since Norway had higher capital requirements as a result of the 1990 banking crisis. The definitions of what is approved as core capital are also much stricter than in other countries. Norway had better governance and The Norwegian Bank Guarantee Fund to mediate the crisis (FS, 2009-2).

Meh and Moran (2008) shows that the banks’ capital co-moves with the general economy’s ability to absorb adverse shocks. Logically, banks with low capital levels has to cut down their lending during negative growth periods. However, in an economy where banks have a higher level of capitalization, there are lower reductions in lending and economic growth. From Financial Stability reports, we
find that Norwegian banks were better capitalized than comparable foreign banks. This could be part of the explanation why Norway suffered less from the 2008 crisis than other comparable countries. However there where losses great enough to warrant significant measures from the government, to ensure the survival of the banking sector. This was because they financed long-term lending with short term market financing. (FS, 2010-1) Our logic is supported by Hyun and Rhee (2011), which developed a model where it is shown that banks prefer to cut lending rather than issue new equity due to the high cost of equity. In the post-crisis financial stability reports from Norges Bank, it is confirmed that the cost of market financing increased and Norwegian banks cut their lending.

Ivashina and Scharfstein (2010) shows that banks with a larger rate of funding from deposits, had to cut their lending less than banks with a lower rate of depository funding. In addition, these banks relied less on short term funding and were implicitly hit less hard by the crisis. Another explanation is offered where it’s the stability of deposits through the deposit insurance that contributed to a lower shock on the bank. In Norway, most banks are savings banks. This means that they have a high degree of depository financing and benefits from deposit insurance. However the current trend is that the banking sector in Norway rely less on deposit financing and more on short term market financing. Logically, since the crisis originated with a contraction in the market for short-term funds, a bank with a lower degree of funding through short-term debt would experience a smaller adverse effect.

**The transmission of shocks from banks to the borrowing firms**

For our hypothesis regarding the link between bank and firm performance to be relevant, one first need to study whether there exist any correlation between firm performance and bank performance. If this should not be the case, then our study would show spurious results. In the paper by Carvalho et al. (2011) there was found evidence of correlation between firm performance and the firm’s respective bank. This effect was closely tied to the financial health of the economy in general as well as the degree of information asymmetry between the borrower and the lender. In addition, the authors found a correlation between unexpected shocks on banks and a following decline in the market value of their borrowing firm. These
effects were more evident in larger firms. Furthermore, Carvalho et al. shows that medium levered banks have the most positive effect on firm performance during crises. Popov and Udell (2012) find that both positive and negative effects from shocks on banks’ balance sheets also affected firms in central and Eastern Europe.

During recessions, when business opportunities are in short supply, and there is a higher degree of credit rationing it is shown by authors such as Braun and Lorrain (2005), Dell’Ariccia et. al, (2005) and Rajan and Zingales (1998) that firms and industries which are more dependent on external funding is more likely to suffer losses and reduced earnings. We believe that this is to some extent evident in our empirical study, as we show a link between bank performance and firm performance. We will show that during crises the banks distress is transferred to its customers. Adjei (2012) presents a study where debt dependence is examined during the recent crisis. It is found that there is a negative correlation between firm performance and debt dependence.

Stulz and Kang (2000) support this study by proving a link between firm performance and exogenous shocks on banks. They argue that if the firm has to obtain funds through other channels than their main bank, this could impose an adverse effect on the price of the loan. The financial stability reports explain that larger companies can use money markets and financial institutions while the smaller companies have to rely mostly on the financial institutions for funding. Adjei (2012) and Kroszner et. al, (2007), finds that the degree of performance reduction of the firm increases as the dependency on external funding increases. If one assume that a bank with lower performance impose external finance constraints on their borrowing firms, Adjei’s findings shows the importance of healthy banks. We use these findings to argue that the more closely tied a firm is to its respective bank, the more exposed a firm is to an exogenous shock on the bank. However, firms that are not dependent upon external financing will always retain some exposure to the shock through shifts in the demand curve.

Hetland and Mjøs (2012) find that investments made by unconstrained firms are more affected by an adverse change in the credit channel than financially constrained firms. Consequently, the investment levels of financially unconstrained firms declines more than for constrained firms. Financial
constraints give firms an incentive to hedge their future cash flows against credit shortfalls to make themselves less reliant on external finance. For the bank, this might imply the following: If the bank experiences an exogenous shock and has to cut back lending, having highly debt dependent firms as borrowers will magnify the distress faced by the bank. Norwegian evidence from the financial crisis showed that the rate of bankruptcy increased mainly for smaller firms. Furthermore, the bankruptcies are mainly in low debt industries, which implies a low level of losses for the banks (FS, 2009-1).

Studies by Lins et. al, (2010) and Campello et. al, (2010) find that cash reserves were used as a management tool to hedge liquidity risk in bad times. The line of credit was therefore used as a funding tool in good times, while cash reserves were used in bad times\(^6\). Additionally when firms are afraid of liquidity shortfalls they draw heavily on their lines of credit. Implicitly, this contributed to the negative shock experienced by banks. Lower access to credit and low cash reserves is likely to cause a decrease in investments which in turn lowers the market value of the firm (Koller et. Al, 2010). Cohen-Cole et al. (2008) argues total credit outstanding remained close to the same level as before the financial crisis for the following reason: New bank loans issued fell, but this decline was to some extent offset by firms drawing on their pre-existing credit lines.

\(^6\) This is consistent with the pecking order theory, see Rasiah and Kim (2011)
Empirical Methods

Hypothesis 1

Our first hypothesis is; Norwegian banks suffered significant negative abnormal returns following the demise of Lehman Brothers. To answer our hypothesis, we will use an event study approach. We will use CAPM (Capital Asset Pricing Model) to try to explain the abnormal return of common stock of Norwegian banks. Our methodology is as follows:

We set:

\[ \text{Cumulative Abnormal return}_t(T_{1j} - T_{2j}) = \sum_{i=T_{1j}}^{T_{2j}} \text{Abnormal Return}_{it} \]

Where: \((T_2 - T_1)\) is the size of the event window with \(T_{1j}\) as the lower limit and \(T_{2j}\) as the upper limit for each of the event windows. This can be shown:

\[
\begin{align*}
(T_1, T_2) & \quad (-10,10) \\
(-10,-1) & \quad (0,10) \\
(-3,3) & \quad (-1,1)
\end{align*}
\]

We define Abnormal returns as the deviation from the expected returns:

\[ \text{Abnormal Return}_{it} = \text{Actual Return}_{it} - \text{Expected Return}_{it} \]

Expected returns are predicted using the CAPM:

\[ R_{it} = \alpha_{it} + \beta_{it}R_{Mt} + \varepsilon_{it} \]

Expected returns are calculated over an estimation window of 250 trading days prior to the event window as suggested by MacKinlay (1997). We expect to find significant negative abnormal returns for the period surround the bankruptcy of Lehman brothers. Furthermore, we expect there to be additional “jumps” in abnormal returns due to September 2008 being a very volatile period for the market.

Hypothesis 2

Our second hypothesis is that the financial crisis caused higher performance losses for banks that entered the crisis being less capitalized. Due to the illiquid
stock market of Norwegian banks, we expand our dataset to include non-traded banks and use yearly accounting data. The regressions we perform takes the following form:

\[ ROA_{it} = \alpha_0 + \beta_1 I_t + \beta_2 \text{Leverage}_{i(t-1)} + \delta X_{i(t-1)} + \omega_{it} \]

Where \( \omega_{it} = \epsilon_i + \nu_{it} \)

The above regression measures the general relationship between bank performance and leverage. The Below regression measure the impact initial leverage at the onset of the crisis had on bank performance.

\[ ROA_{it} = \alpha_0 + \beta_1 I_t + \beta_2 \text{Crisisdebt} \cdot I_t + \delta X_{i(t-1)} + F_i + \epsilon_{it} \]

\( \alpha_0 \) is the constant, \( \beta \) is the beta coefficient of each of the independent variables, \( X \) is the one period lagged explanatory control-variables and \( \omega_{it} \) is an error term.

\( I_t \) is a dummy variable that is an indicator of the crisis and is active for the years of 2008, 2009 and 2010. Crisisdebt is a constant, which is set equal to the 2007 leverage. This variable catches the effect of the initial leverage at the onset of the crisis. The explanatory variables are: Size, financial assets, profitability, dividend payer, dividend payer during the crisis, short term debt and cash and cash equivalents. We scale all variables with total assets (except for our profitability and size measures) to reduce the impact of large banks dominating our regression. We split our dataset into 3 parts containing the banks with low, medium and high leverage.

We use a random effects model to measure the general relationship between bank performance and leverage, see appendix 3. For this, we use a GLS model (Generalized Least Squares) that also solves any issues with autocorrelation and heteroscedasticity. However, when we estimate the effect of leverage at the onset of the crisis, we use a fixed effects GLS model as we have found evidence of a fixed effect (see appendix 3).

We expect to find significant and negative leverage effect during the crisis. This would prove that better capitalized banks were hit less hard than poorly capitalized banks. Furthermore, due to the crisis posing a lot of stress on the
banks, we expect our crisis dummy variable to be negative. We also believe due to our previous discussion that leverage in general is negatively related to bank return on assets.

**Hypothesis 3**

Our third hypothesis is that firm performance was affected by the firm’s respective main lender bank’s performance both prior to and during the crisis. We have two different measures for firm performance. These measures are return on assets and investments growth. In order to give answer to our hypothesis, we tie the firms to their respective bank and perform the following regressions.

\[
ROA_{\text{Firm}_{it}} = \alpha_t + \beta_1 I_t + \beta_2 ROA_{\text{Bank}_{it}} + \beta_{12} I_t \times ROA_{\text{Bank}_{it}} + \delta X_{\text{Firm}_{it}} + F_t + \epsilon_{it}
\]

\[
ROI_{\text{Firm}_{it}} = \alpha_t + \beta_1 I_t + \beta_2 ROA_{\text{Bank}_{it}} + \beta_{12} I_t \times ROA_{\text{Bank}_{it}} + \delta X_{\text{Firm}_{it}} + F_t + \epsilon_{it}
\]

\(\alpha_0\) is the constant, \(\delta\) is the beta coefficient of each of the independent variables, \(X\) is the one period lagged explanatory control-variables, \(F\) is a fixed factor and \(\epsilon\) is an error term. \(I_t\) is a dummy variable that is an indicator of the crisis and is active for the years of 2008, 2009 and 2010. ROA is the return on assets and ROI is the investments growth. The explanatory variables are: Leverage, size, profitability, profitability during crisis, cash and cash equivalents and cash and cash equivalents during the crisis. Additionally, we have split the data into three subsets where each subset is categorized by the performance of the firm’s main bank. We use a fixed effects model for both regressions as we have found evidence of a fixed effect, see appendix 3. For this, we use a GLS model (Generalized Least Squares) that also solves any issues with autocorrelation and heteroscedasticity.

We expect to find a significant and positive relationship between firm performance and bank performance during the crisis. Furthermore we believe the crisis to be negatively affecting firm performance and that during normal times, bank performance is adversely affecting firm performance. The latter is based on our expectations are based upon the previous literature as discussed in the above sections.
**Data Description**

We will use the data from the database called CCGR (Centre for Corporate Governance Research). There, we will find the accounting data for both banks and firm. CCGR provides us with data that is tailored to our thesis. CCGR focus on high quality Norwegian data, which give us access to non-listed firms in addition to listed firms. We use CCGR to find the data on the different firms and industries. To suit our hypotheses, the data is separated into financial and non-financial firms. In addition, we will use Datastream to find daily stock returns and stock indices. Brønnøysundsregisteret is used to find information of the firms main bank. When running the data preparation and regressions, we use a combination of STATA and Excel. We write a separate program in Stata that lets us connect each firm to their respective bank. Submitting information regarding main bank is optional and this is therefore not available for all firms.

For our first hypothesis, we use the daily change in the Oslo Børs Benchmark Index (OSEBX) as our market return. The daily stock returns of the public listed banks are obtained from Datastream. We use an estimation window of 250 days prior to the event and have a 21 day event window. The event window is separated into 4 “sub-windows”. The predicted returns are estimated using a simple market model, CAPM (Capital Asset Pricing Model). The Abnormal returns are obtained by subtracting the predicted returns from the actual returns.

For our second and third hypothesis, our data is collected through the CCGR database and Brønnøysundsregisteret and is in the period 2005 - 2010. The data obtained from CCGR are first split into 2 subsets, where one set contains the banks and the other set contains the firms. We have removed the observations containing the top and bottom percentiles. This is done to remove “noise”. With noise, we mean observations that are incorrectly reported or has not reported a bank connection. The second hypothesis regression uses only the bank dataset. The third hypothesis uses both sets, where the firms are tied to their respective bank. The variables we use in all regressions are defined and sorted alphabetically in Appendix 2.
Table 1 - Descriptive Statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return On Assets</td>
<td>1.2235</td>
<td>1.01</td>
<td>-0.66</td>
<td>17.22</td>
</tr>
<tr>
<td>Crisis Dummy</td>
<td>0.4135</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.8628</td>
<td>0.09</td>
<td>0.0064</td>
<td>1</td>
</tr>
<tr>
<td>Leverage at Crisis</td>
<td>0.8974</td>
<td>0.0779</td>
<td>0.3457</td>
<td>1</td>
</tr>
<tr>
<td>Size</td>
<td>21.8491</td>
<td>1.45</td>
<td>15.51</td>
<td>27.4316</td>
</tr>
<tr>
<td>Financial Assets</td>
<td>0.0617</td>
<td>0.49</td>
<td>0</td>
<td>0.8727</td>
</tr>
<tr>
<td>Profitability</td>
<td>0.0078</td>
<td>0.01</td>
<td>-0.736</td>
<td>0.1439</td>
</tr>
<tr>
<td>Dividends</td>
<td>0.1451</td>
<td>0.35</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cash and Cash Equivalents</td>
<td>0.0284</td>
<td>0.03</td>
<td>0</td>
<td>0.3263</td>
</tr>
<tr>
<td>Short Term Debt</td>
<td>0.8781</td>
<td>0.10</td>
<td>0.0103</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1 shows the means and the standard deviations of all bank level variables. Only banks are included in this table. The average return on assets is 1.22 which show that banks on average, increased their size. The crisis dummy which is less than 0.5 indicates that there were more mergers, acquisitions and bankruptcies than new bank entrants during the second half of our regression period. Bank leverage was on average 86.3%, where the remainder 13.7% was equity. 14.5% of banks were dividend payers and 87.8% of liabilities was short term debt. The fractions of financial assets held by the banks were low (6.2%) which could be explained by a large number of Norwegian banks being savings banks. Furthermore, this was a period of relatively low profitability for banks with roughly 0.8% net income of total assets. The average cash and cash equivalents held by the banks are 2.8%.

Table 2 - Descriptive Statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on Assets</td>
<td>0.0272</td>
<td>0.3692</td>
<td>-4.2351</td>
<td>10.5051</td>
</tr>
<tr>
<td>Crisis</td>
<td>0.4591</td>
<td>0.4983</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bank Performance</td>
<td>1.3313</td>
<td>1.8415</td>
<td>0.16</td>
<td>17.22</td>
</tr>
<tr>
<td>Bank Performance in Crisis</td>
<td>1.3841</td>
<td>1.9733</td>
<td>0</td>
<td>17.22</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.6193</td>
<td>0.4018</td>
<td>0</td>
<td>33.5</td>
</tr>
<tr>
<td>Size</td>
<td>15.6012</td>
<td>1.4319</td>
<td>7.6009</td>
<td>19.45</td>
</tr>
<tr>
<td>Profitability</td>
<td>0.0724</td>
<td>0.2722</td>
<td>-17.25</td>
<td>13.7333</td>
</tr>
<tr>
<td>Profitability During Crisis</td>
<td>0.0306</td>
<td>0.2278</td>
<td>-17.25</td>
<td>13.7333</td>
</tr>
<tr>
<td>Cash and Cash Equivalents</td>
<td>0.2294</td>
<td>0.2376</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cash and Cash Equivalents in Crisis</td>
<td>0.1119</td>
<td>0.2067</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 shows descriptive statistics for firm level variables. The return on assets for the individual firms were lower than banks, but still positive for the regression period. As with the banks, firms had more mergers, acquisitions and bankruptcies.
in the post-crisis period than they had newly established firms indicated by the crisis dummy. Bank performance measured as bank return on assets is higher in the firms Table 2 than Table 1. This indicates that more profitable banks were able to serve a higher proportion of the firms. Furthermore, banks increased their average return on assets during the crisis. Firm leverage was around 62% and firms were more profitable than banks (7.2%). Furthermore, firms held substantially larger cash and cash equivalents as a portion of total assets than banks. Finally, when comparing Table 2 and Table 1, one can see that banks are much larger than the average firm.

Empirical Results

Hypothesis 1
Our first hypothesis is that Norwegian banks suffered significant and negative abnormal returns in the days around the demise of Lehman Brothers. Our results are summarized in Table 5

Table 3 – Cumulative Abnormal Returns
Cumulative abnormal returns surrounding the default of Lehman Brothers. The numbers in parenthesis are t-stats.

<table>
<thead>
<tr>
<th>Banks</th>
<th>Event window</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-10,10)</td>
<td>(-10,-1)</td>
</tr>
<tr>
<td>Sample Average</td>
<td>-0.0738***</td>
<td>-0.0537***</td>
</tr>
<tr>
<td></td>
<td>(3.69)</td>
<td>(4.32)</td>
</tr>
</tbody>
</table>

As we can see from Table 3, there were significant negative abnormal returns following the demise of Lehman brothers. On average, banks underperformed by 7.38% relative to the market. As can be seen from the table, most of the underperformance takes place before the crisis (5.37% before the crisis and 2.01% after the crisis). At the time nearest the crisis, there were positive abnormal returns but insignificant.

To attempt to further analyze the development of the abnormal returns, we have visualized the event in figure 1.
We can see a significant drop in the abnormal returns eight trading days prior to the default event. This is the day where Ospraie hedge fund went bankrupt in which Lehman Brothers had roughly 20% ownership. As can be seen, there were negative abnormal returns for all trading days until the crisis, where the market tried to revert to equilibrium. We interpret this spike as illiquidity in the banks stocks. In other words that the effect of the bankruptcy reached the market index first, then the banks. It can also be shown that some of the Norwegian banks does not trade at all during this date. This is a sign of illiquidity. In the days after the bankruptcy, there were also significant negative abnormal returns.
**Hypothesis 2**

Our second hypothesis is that the financial crisis caused higher performance losses for banks that entered the crisis being less capitalized. Our results are summarized in Table 6 below.

**Table 4 – Bank performance 2005 – 2010**

This table shows the general relationship between bank performance and the explanatory variables. The numbers in parenthesis is the t-stats, while the numbers in brackets are the economic magnitude of the coefficient variable. The economic magnitude is calculated as the coefficient of the independent variable divided by the mean of the dependent variable. All variable definitions are defined in appendix 2. All variables have robust standard errors. ***, **, * indicates significance at the 1%, 5% and 10% respectively.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Full Sample</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return On Assets</td>
<td>-0.1499**</td>
<td>0.2430***</td>
<td>-0.0232***</td>
<td>-1.0679*</td>
</tr>
<tr>
<td></td>
<td>(-2.19)</td>
<td>(11.07)</td>
<td>(-7.32)</td>
<td>(-1.78)</td>
</tr>
<tr>
<td>Crisis</td>
<td>-0.1225</td>
<td>0.1986</td>
<td>-0.0190</td>
<td>-0.8728</td>
</tr>
<tr>
<td></td>
<td>(-3.2028)</td>
<td>(0.8306)</td>
<td>(-0.2224)</td>
<td>(-11.1501)</td>
</tr>
<tr>
<td>Leverage</td>
<td>-3.9186***</td>
<td>1.0163***</td>
<td>-0.2721***</td>
<td>-13.6422</td>
</tr>
<tr>
<td></td>
<td>(-4.36)</td>
<td>(3.14)</td>
<td>(-3.82)</td>
<td>(-1.56)</td>
</tr>
<tr>
<td>Size</td>
<td>0.1223***</td>
<td>-0.1726</td>
<td>-0.0013</td>
<td>0.364***</td>
</tr>
<tr>
<td></td>
<td>(3.86)</td>
<td>(-1.25)</td>
<td>(-0.79)</td>
<td>(2.56)</td>
</tr>
<tr>
<td></td>
<td>(0.1000)</td>
<td>(-0.1411)</td>
<td>(-0.0011)</td>
<td>(0.2975)</td>
</tr>
<tr>
<td>Financial Assets</td>
<td>-0.6478</td>
<td>0.0968</td>
<td>0.0459</td>
<td>-2.0071</td>
</tr>
<tr>
<td></td>
<td>(-0.86)</td>
<td>(0.56)</td>
<td>(1.12)</td>
<td>(-0.29)</td>
</tr>
<tr>
<td></td>
<td>(-0.5295)</td>
<td>(0.0791)</td>
<td>(0.0375)</td>
<td>(-1.6405)</td>
</tr>
<tr>
<td>Profitability</td>
<td>15.0761***</td>
<td>2.8043**</td>
<td>-0.0717</td>
<td>43.0334***</td>
</tr>
<tr>
<td></td>
<td>(2.99)</td>
<td>(2.24)</td>
<td>(-0.23)</td>
<td>(3.72)</td>
</tr>
<tr>
<td></td>
<td>(12.3221)</td>
<td>(2.2920)</td>
<td>(-0.0586)</td>
<td>(35.1724)</td>
</tr>
<tr>
<td>Dividends</td>
<td>-0.2189**</td>
<td>0.0298</td>
<td>0.0080</td>
<td>-0.1505</td>
</tr>
<tr>
<td></td>
<td>(-1.97)</td>
<td>(0.88)</td>
<td>(1.64)</td>
<td>(-0.33)</td>
</tr>
<tr>
<td></td>
<td>(-0.1789)</td>
<td>(0.0244)</td>
<td>(0.0065)</td>
<td>(-0.1230)</td>
</tr>
<tr>
<td>Cash and Cash Equivalents</td>
<td>-0.9364</td>
<td>-1.7932***</td>
<td>0.0466</td>
<td>-0.5614</td>
</tr>
<tr>
<td></td>
<td>(-0.74)</td>
<td>(-4.52)</td>
<td>(0.97)</td>
<td>(-0.08)</td>
</tr>
<tr>
<td></td>
<td>(-0.7653)</td>
<td>(-1.4656)</td>
<td>(0.0381)</td>
<td>(-0.4588)</td>
</tr>
<tr>
<td>Short Term Debt</td>
<td>-0.5203</td>
<td>0.1161</td>
<td>-0.0007</td>
<td>7.6950</td>
</tr>
<tr>
<td></td>
<td>(-0.95)</td>
<td>(0.75)</td>
<td>(-0.03)</td>
<td>(0.98)</td>
</tr>
<tr>
<td></td>
<td>(-0.4253)</td>
<td>(0.0949)</td>
<td>(-0.0006)</td>
<td>(6.2893)</td>
</tr>
<tr>
<td>Constant</td>
<td>2.5203***</td>
<td>0.1600***</td>
<td>1.3804</td>
<td>-1.2108</td>
</tr>
<tr>
<td></td>
<td>(2.97)</td>
<td>(0.44)</td>
<td>(24.15)</td>
<td>(-0.33)</td>
</tr>
</tbody>
</table>

Crisis is a dummy variable that show the effect of the crisis. It’s not surprising to see that this effect is negative due to the nature of the financial crisis. However, the banks in the low performance group increased their return on assets in the
years superseding the 2008 crisis. After talking to several bank managers and according to several articles like Ivashina and Scharfstein (2010) shows an almost 50% decrease in loans. Grigor’ev and Salikhov (2009) who tells us that the banks did trade own money, but used the money they got from central banks creating a liquidity crisis. Midthjell (2010) also mention that because of the big uncertainty many banks did not want to issue new loans. In sum, there were a wide variety of bank responses to the crisis such as limiting new loans, change of risk preference and larger interest margins.

We observe that leverage generally has a negative relationship with return on assets (ROA). The magnitude of a 1% increase in leverage is an 3.21% reduction of return on assets for the average bank. This is consistent with the findings of Rajan and Zingales (1995) that finds a negative relationship between profitability and leverage. Even though they focus on non-financial firms we find the same relationship in our sample. Berger and Bouwman (2009), that finds that during the crisis the banks with higher capital are better buffered against shocks of the crisis, this supports our findings as well. The regression tells us that an increase in leverage is related to a decrease in ROA. This is supported by Diamond and Rajan (2010) that tells us that external debt is needed to insure against default, but at the expense of performance. This is not unexpected, the more you are dependent on debt the more you will need to pay in interests and installments. Banks in the low performance group is inconsistent with the above discussion. This could be due to the low performing banks having less than the optimal leverage level. In comparison, the banks in the better performance groups has a greater than the optimal leverage. Accordingly, it should be in the interest of the low performing bank to increase leverage.

We find that large banks perform better than smaller banks. The magnitude of a size change in bank size is 0.1%. This relationship could be explained by several factors. Firstly, large banks have the benefits of economies of scale (FS 2008-2). By economies of scale, we mean that larger banks has the means to develop and maintain their own and better types of risk assessment models. As previously explained in the section regarding the Basel rules, this can reduce the regulatory capital level held by the bank. Additionally larger banks have greater access to external capital, making them more liquid and make it easier to roll over short
term debt. On the other hand, this shows that smaller banks indeed have an incentive to merge or form strategic alliances to realize such economies of scale (FS, 2008-2). Across the performance groups, only best performing banks has a significant size effect. In order to reduce the moral hazard of “too big to fail”, “too many to fail” and “too interconnected to fail”, strategically important institutions will be expected to have loss absorbing capability (Basel Committee, 2011). This is done through more disclosure of capital, liquidity requirements and leverage ratio.

Statistically, we do not find significant evidence of financial assets affecting return on assets although our result indicates a positive relationship. However, the sign of the coefficient is economically intuitive. Norwegian banks was exposed to volatility in the international money market and sequentially experience losses as a result of the financial crisis although the losses were limited (FS, 2008). It is possible to assume that the limited losses are the cause of insignificance.

Profitability is positively associated with return on assets but statistically significant. This is consistent amongst all performance groups, but insignificant with the medium performing banks. The positive effect could be due to Norwegian banks retaining earnings (i.e. rather than paying dividends) to build up their reserves in the run up and during the crisis (FS, 2009 -2). This is confirmed by a financial manager in DnB and Nordea as well as required by the Basel 2 environment from the start of 2007. Additionally, a number of Norwegian banks are organized as foundations, which makes it plausible that earnings are retained rather than paid to shareholders.

Our regression suggests that dividend paying banks has lower return on assets than non-payers. Our variable is a binary variable and only measure whether a bank is paying dividends or not. Our findings can be related to the study by Brav et al, (2005) which offers findings consistent with Lintner’s earlier work. Brav et al (2005) shows that earnings outlook is the main concern of manager’s payout policy decisions thus offering a reason for dividends being evident in profitable firms (or banks in our case). As dividends can be seen as the distribution of assets to from the bank to the shareholders, it is intuitive that dividends are paid at the expense of assets. Our statistically significant variable for dividend payouts is
aligned to current literature. Jagannathan et. al. (2000) shows that there are very negative market reactions following reduction in dividend payments. This could explain why banks continue to pay out dividends during the crisis at the expense of return on assets and is a reason for our negative dividends variable.

Furthermore, Stulz and Beltratti (2009) showed that banks with more shareholder friendly boards performed worse during the crisis, which is consistent with our finding. Our dividends variable is insignificant for each of the performance groups and negative for only the high performers. In the high performance group, dividends have a higher economic impact on return on assets than for medium and low performing groups.

Our cash variable is insignificant but has economically intuitive negative effect on return on assets. We interpret excess cash having negative effect for the following reasons: increases cost of capital and is value destroying through inflation and simply not being used. The trade-off when managed correctly can be the reduction of liquidity risk (Lins et al. 2010). Because cash is significant and negative only in the low performance group, we are unable to compare with the better performing banks.

Having access and being able to increase short term debt provides liquidity for the bank. Before the financial crisis, short term loans became more short term and a larger portion of the funding side of the banks business model (FS 2008-1). When the crisis hit Norway, the Norwegian banks were able to withdraw funds from The Norwegian Banks’ Guarantee Fund (FS 2009-2). In the proposed changes on bank regulations through Basel 3, banks are to have a counter-cyclical buffer which to some extent has a similar purpose as the Guarantee Fund. This fund would help reduce liquidity risk for the banks. Our findings suggest that if a bank had to cut their short term funding, then the bank experienced negative return on assets. However, this result is statistically insignificant both generally and across all performance groups. The Norwegian economic stimulus packages alleviated the liquidity constraints and made short term market financing more available (Midthjell, 2010). This could be a source of insignificance.
Table 5 – Bank Performance in 2005 – 2010

This table shows the effect of leverage on bank performance at the onset of the crisis. The numbers in parenthesis is the t-stats, while the numbers in brackets are the economic magnitude of the coefficient variable. The economic magnitude is calculated as the coefficient of the independent variable divided by the mean of the dependent variable. All variable definitions are defined in appendix 2. All variables have robust standard errors. ***, **, * indicates significance at the 1%, 5% and 10% respectively.

<table>
<thead>
<tr>
<th>Return On Assets</th>
<th>Full Sample</th>
<th>Bank Performance</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis</td>
<td>-10,8503***</td>
<td>-3,0073***</td>
<td>0,3636**</td>
<td>-25,2995</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-8,20)</td>
<td>(-4,11)</td>
<td>(2,21)</td>
<td>(-1,35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{-8,8682}</td>
<td>{-2,4579}</td>
<td>{0,2972}</td>
<td>{-20,6780}</td>
<td></td>
</tr>
<tr>
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<td>3,5078***</td>
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<td></td>
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<td>(4,42)</td>
<td>(-2,37)</td>
<td>(1,40)</td>
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<tr>
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<td>{9,7225}</td>
<td>{2,8670}</td>
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<tr>
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<td>(0,10)</td>
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<td>(2,46)</td>
<td>(0,83)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{0,0405}</td>
<td>{-0,2166}</td>
<td>{0,0206}</td>
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<td>0,2142</td>
<td>0,0210</td>
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<td>(1,32)</td>
<td>(0,53)</td>
<td>(0,68)</td>
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</tr>
<tr>
<td></td>
<td>(0,17)</td>
<td>(2,09)</td>
<td>(1,52)</td>
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<td>{1,5741}</td>
<td>{0,2397}</td>
<td>{-35,5343}</td>
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<td>0,048*</td>
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<td>-0,3132</td>
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<td></td>
<td>(1,77)</td>
<td>(1,86)</td>
<td>(0,85)</td>
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<tr>
<td></td>
<td>{0,1167}</td>
<td>{0,0392}</td>
<td>{0,0045}</td>
<td>{-0,2560}</td>
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<td>(-2,60)</td>
<td>(-1,08)</td>
<td>(1,35)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{-0,8141}</td>
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<td>{-0,0593}</td>
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<td>Short Term Debt</td>
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<td>Constant</td>
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<td>1,2162</td>
<td>0,5667***</td>
<td>26,2692</td>
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<td></td>
<td>(0,00)</td>
<td>(0,93)</td>
<td>(2,61)</td>
<td>(1,90)</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows the effect of leverage on bank performance at the onset of the crisis. Calomiris and Nissim (2012) shows that in normal times, leverage boosts market values, while in crisis leverage decrease market values. If one assumes that return on assets correlates with changes in market values, our results indicate the
opposite. Leverage has a general negative relationship with return on assets (see table 4) but has a positive effect on return on assets after the crisis. The magnitude of a leverage change at the onset of the crisis is more positive than the magnitude of a general change in leverage is negative. We think that this has to do with the fact that Norway was not hit so hard by the financial crisis as comparable countries. Furthermore, this can indicate effective bailout packages from the Norwegian government to the most highly levered banks. Additionally one can speculate that if the banks knew there was a high risk of distress, the banks performed better if they had capacity to increase leverage before the crisis to mitigate a liquidity shock. If the banks had to decrease leverage as a result of the minimum capital requirements constraint caused by the transition to the Basel 2 environment. The economic significance of this result is contrary to our expectations but important nonetheless. This factor shows the importance of developing flexible capital requirements. In other words, to allow banks temporary leverage increases in the case of market failure and economic downturn. With our data we can speculate that a buffer during the recent crisis could have helped to mitigate the effect of the crisis and perhaps even the need for costly government intervention. This would act as a countercyclical buffer. The financial stability report from Norges Bank (2010-2) supports this by expressing desire for fast accommodation to the Basel 3 rules.

**Hypothesis 3**

Table 6 shows the impact of several factors on the firm’s return on assets. This offers an explanation of our hypothesis that firm performance was affected by the firm’s respective main lender bank’s performance prior to and during the crisis.
Table 6 – Firm Performance in 2005 – 2010

The numbers in parenthesis is the standard errors of the coefficients, while the numbers in brackets are the economic magnitude of the coefficient variable. The economic magnitude is calculated as the coefficient of the independent variable divided by the mean of the dependent variable. All variable definitions are defined in appendix 2. All variables have robust standard errors. ***, **, * indicates significance at the 1%, 5% and 10% respectively.

<table>
<thead>
<tr>
<th>Return on Assets</th>
<th>Full Sample</th>
<th>Investments</th>
<th>ROA</th>
<th>Low Investments</th>
<th>Medium Investments</th>
<th>High Investments</th>
<th>ROA</th>
</tr>
</thead>
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<tr>
<td>Crisis</td>
<td>-0.153***</td>
<td>-0.2065</td>
<td>(0.0221)</td>
<td>(0.1584)</td>
<td>ROA</td>
<td>Investments</td>
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<td></td>
<td>(5.8205)</td>
<td>(7.9888)</td>
<td></td>
<td></td>
<td>(11.2163)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank Performance</td>
<td>-0.1219***</td>
<td>-0.2199***</td>
<td>(0.0173)</td>
<td>0.1255</td>
<td>(0.0253)</td>
<td>(0.4593)</td>
<td>(0.3878)</td>
</tr>
<tr>
<td></td>
<td>(4.8416)</td>
<td>(10.5478)</td>
<td></td>
<td></td>
<td>(1.3285)</td>
<td>(1.8255)</td>
<td>(2.3162)</td>
</tr>
<tr>
<td>Bank Performance in Crisis</td>
<td>0.1256***</td>
<td>0.3090***</td>
<td>(0.0178)</td>
<td>0.1285</td>
<td>(0.0261)</td>
<td>(0.5406)</td>
<td>(0.0701)</td>
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<tr>
<td></td>
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<td></td>
<td>(1.8787)</td>
<td>(2.6988)</td>
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<tr>
<td>Leverage</td>
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<td></td>
<td>(2.7647)</td>
<td>(9.9412)</td>
<td></td>
<td></td>
<td>(1.1140)</td>
<td>(24.4191)</td>
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<td>Size</td>
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<td>0.1957***</td>
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<td>(0.1946)</td>
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<tr>
<td></td>
<td>(20.3161)</td>
<td>(0.1949)</td>
<td></td>
<td></td>
<td>(20.6079)</td>
<td>(24.1434)</td>
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<tr>
<td>Profitability</td>
<td>-0.6711***</td>
<td>-0.0743</td>
<td>(0.0549)</td>
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<td>(0.1183)</td>
<td>(0.4935)</td>
<td>(0.0599)</td>
</tr>
<tr>
<td></td>
<td>(2.6103)</td>
<td>(2.7316)</td>
<td></td>
<td></td>
<td>(2.7500)</td>
<td>(18.4265)</td>
<td>(5.6397)</td>
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<td>Profitability in Crisis</td>
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<td>0.4941**</td>
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<td>(0.0946)</td>
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<tr>
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<td>(4.2647)</td>
<td>(10.1654)</td>
<td></td>
<td></td>
<td>(10.3557)</td>
<td>(21.8417)</td>
<td>(16.5221)</td>
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<td></td>
<td>(4.5566)</td>
<td>(40.5583)</td>
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<td></td>
<td>(3.0101)</td>
<td>(45.9495)</td>
<td>(5.2610)</td>
</tr>
<tr>
<td>Cash and Cash Equivalents in Crisis</td>
<td>-0.0110</td>
<td>0.0999</td>
<td>(0.0258)</td>
<td>0.1599</td>
<td>(0.0579)</td>
<td>(0.3280)</td>
<td>(0.0728)</td>
</tr>
<tr>
<td></td>
<td>(0.4245)</td>
<td>(3.0278)</td>
<td></td>
<td></td>
<td>(8.5041)</td>
<td>(21.2684)</td>
<td>(2.3824)</td>
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<tr>
<td>Intercept</td>
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<td>2.7207**</td>
<td>(0.2774)</td>
<td>(1.3227)</td>
<td>8.9506***</td>
<td>(0.6048)</td>
<td>(3.2011)</td>
</tr>
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</table>

From Table 6, we can see that Norwegian firms on average suffered negative performance during the crisis. Our crisis variable is statistically significant. This finding is consistent for firm performance across all bank performance groups. However, in the medium performing bank group this variable is insignificant. This indicates a long term adverse effect from the crisis on the firms return on assets. The negative impact of the financial crisis is not surprising and is extensively covered by the financial stability reports from Norges Bank. Amongst
other things, they mention lower profitability, ability to service debt and a rise in the number of bankruptcies. We cannot prove that the crisis caused a general effect on the firm’s investment level. However, our results shows that in the medium performing bank group, there was significant and negative investments growth for the borrowing firms. Speaking to bank managers, the negative investments growth can be explained through increased credit rationing and more risk aversion by bankers. Another reason could be less investment opportunities because of the crisis. This relationship is positive for firms that are customers of low performing banks.

We provide evidence of the banks performance adversely affecting their respective Norwegian customer firms. This is inconsistent with authors such as Carvalho et. al, (2011) which finds that bank performance is positively correlated with firm performance. The general economic impact of a 1% increase in bank performance is -4.48% for the average firm’s return on assets. The negative relationship is present across all bank performance groups and shows that the better a bank performs, the lower return on assets their borrowing firms has. Our reasoning is that a source of bank performance is from the fees and margin charged from the bank to the firm. The same relationship is evident on firm investments where the economic impact is larger, -10.55%. Due to insignificance, we are unable to separate the effect of bank performance on firm investments between the bank performance groups.

During the crisis, our data shows that there was a structural change in the relationship between bank and firm performance. It now became positive for the firm’s performance that its main lender bank had positive return on assets. The same structural change also applies to the firm’s investments. Consistently, all significant variables in the bank performance groups are positive and shows either a positive relationship or that the negative relationship became less pronounced. This evidence is important because it shows the importance of the banks role as a liquidity creator in the market. A bank that has higher return on assets during a crisis is more able to provide liquidity. In turn this makes the bank able to lend more money causing its corporate customers to be less constrained than otherwise. Lower external finance constraints will in turn enable the firm to make more investments and/or run its business “as usual”. Our findings are therefore
consistent with previous literature (see for instance Carvalho et al. 2011) as explained in the literature review section of our paper. An important factor contributing to these results are believe to be the declining Norwegian key policy rate in the second half of 2008 (see appendix 4) and the stimulus packages. Midthjell (2010) said that the stimulus packages had a large positive effect due to a combination of low key policy rates and that the stimulus packages eased the access to market financing.

Another interesting result is that the individual firm’s leverage is generally positively associated with both the firm’s return on assets and investments. We interpret this relationship that if the firm has access to external finance during our research period, the firm will increase its return on assets. This comes as a result of being able to invest more capital in profitable projects. The economic impact of a 1% leverage increase is 2,76% increase in return on assets and 9,94% increase in investments growth for the average firm. Our data does not offer any evidence of whether increase in leverage is more positive for the return on assets of a borrowing firm that use a low performing bank than a borrowing firm which that use a high performing bank. However, with an increase in leverage, a customer of a low performing bank has a more positive change in investments growth than a borrowing firm of a medium performing bank. This is consistent with the discussion above, where we argue that a better performing bank is able to keep a larger portion of the profits at the expense of their borrowing firms.

We find significant evidence of larger firms having lower return on assets during our research period. The size effect is large. The magnitude is a -20,23% change in return on assets for a 1% increase in size compared to the average firm. The negative size effect on return on assets increases as the performance of the firm’s main lender bank increases, which is consistent with our previous discussion. This is closely tied to the research by Kroznser et al. (2007), which showed a negative relationship between size and growth in sales. Economically, the larger portion of high growth firms being smaller firms could explain this. As Mueller (1972) suggests, a growth-oriented management undertakes more investments and grows at a faster rate than a management that seeks to maximize shareholder value. A shareholder friendly management pays more dividends. By extension, our findings indicate that a smaller firm has more growth-oriented management than a
large firm. In a report from Norges Bank (FS 2009-2) it is stated that smaller firms has a larger portion of bank financing than bigger firms. This can indicate that smaller firms have higher investment intensity relative to size. Relating this to Mueller (1972) we can show that small firms are generally higher growth firms. Furthermore there has been a decline in the bond market and the money market in general which the large and medium large firms use as a source of funds (FS 2009-2), which supports the adverse relationship between return on assets and size.

Contradicting our above discussion is investments growth. Our data shows that larger firms has higher investments growth than smaller firms. The economic impact of size on investments growth is 7.19%. Furthermore, our results shows that if a firm borrows funds from a bank with lower performance, the firm would experience a greater increase in investments growth. One can assume that a bank with lower performance does not have sufficient competences in screening and monitoring, thus implying that the bank is subject to a higher degree of information asymmetry and therefore lends to a greater amount of “lemons” (Akerlof, 1970 and Sharpe, 1990).

Our profitability measure shows a significant negative effect on the return on assets of the firm. The economic impact of a 1% increase profitability on return on assets is -2.61% We interpret this as very profitable firms gets pressure from shareholders to pay out dividends or repurchase shares, thus reducing return on assets. However, a more interesting causality is that during a crisis, profitability has a positive effect on return on assets with a magnitude of 4.26%. This could be a cause of liquidity risk management, namely that profitable firms retains a larger part of their earnings, rather than paying dividends etc. During the crisis years, the economy suffered a contraction of credit availability and banks became more cautious as to whom they lent money. This could mean that in addition to firms retaining earnings, firms had easier access to external finance if they were more profitable and vice versa. Speaking to several bankers, we have been told that the increased credit rationing was used as a reason of ridding themselves of or denying new loans to the lower quality borrowers. Consistently, investment growth were higher for more profitable firms during the crisis.
The cash variable for firms generally statistically insignificant and negative. However for the firms with a medium or high performing bank as its main lender, the magnitude of a 1% increase in cash is -0.14% and -0.15% respectively on return on assets. This means as the firm increases its cash and cash equivalents it does so at the expense of return on assets. This performance loss is traded off with reduction in liquidity risk (Lins et al. 2010). Contradicting our expectations, there is an indication of a negative relationship between cash and return on assets during the crisis. This is however statistically insignificant. We cannot justify the tradeoff between liquidity risk management and return on assets. According to all the financial stability reports from Norges Bank, there were an increase in credit rationing following the crisis was not as great as predicted. Retrospectively one could see that firms in general got more than expected of the external funding needed for investments, operations etc. Accordingly, having a lot of cash was not beneficial due to higher cost of capital and lower return.

We see the similar relationship between investments and cash and cash equivalents. We see that during the crisis, the relationship become positive for firms with a medium performing bank. We speculate that this is due to the positive effect the stimulus package had on the market financing. Easier access to market financing for firms with medium performance banks makes the excess cash of the firms easier to use for investments. We find that firms with low performance banks have a negative relationship between investments and cash. This may indicate that their cash is used for payments to the bank or since the bank have a low performance there is a need for the firm to retain more of their earnings to safe guard against the credit constraints.
Conclusion

This thesis has studied the effects of the financial crisis on banks and the banks respective borrowing firms. Furthermore, we have explored the link between firm and bank performance in the pre and post crisis period. Our results show that there were significant and negative abnormal returns following the bankruptcy of Lehman Brothers. The bankruptcy triggered two separate negative market reactions. The first reaction was on 3rd of September 2008, when the 3bn dollar worth Ospraie hedge fund collapsed. The second reaction was to the bankruptcy of Lehman brother on the 15th of September 2008.

The thesis prove that the crisis had a negative long term effect on bank performance. Surprisingly and contradicting our hypothesis, banks with higher leverage at the onset of the crisis had higher return on assets than banks with low initial leverage. We relate this finding to the too big to fail dilemma, effective bailout packages and that Norwegian banks entered the recent crisis by being better capitalized and subject to more regulation than banks in comparable countries (FS 2009-2). Consistently, bank size positively affects return on assets. This is related to larger banks developing their own risk assessment models and economies of scale.

The thesis shows that firm performance declined as a result of the crisis. We show that bank performance in general adversely affects firm performance. However, our most important finding supports our hypothesis; Bank performance positively affects the respective borrowing firm performance during the crisis. This could be important information for the firms choice of which bank to use as a main lender.

As we are limited in the detail of our data, we propose the following areas for further study. As there is a tradeoff between optimal debt level, credit constraints and firm performance to what degree of debt dependence adversely affect firm performance during the crisis? Additionally we question how foreign market financing affects bank performance. We believe that the Norwegian case indicates the potential positive effects of implementing the Basel 3 Framework. The financial stability report (2010-2) recommends a quick implementation of Basel 3 and states Norway as a good example of the potential benefits of Basel 3. However, further studies should be done when enough reliable data is available.
Bibliography

Books


Articles


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Norges Bank (2013), Key Policy Rate http://www.norges-bank.no/no/prisstabilitet/rentemoter/styringsrenten/
Appendices

Appendix 1

This table shows the main differences between Basel 2 and Basel 3:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Basel 2</th>
<th>Basel 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Ratio of Total Capital</td>
<td>8%</td>
<td>10,5%</td>
</tr>
<tr>
<td>Minimum Ratio of Common Equity</td>
<td>2%</td>
<td>4,5%</td>
</tr>
<tr>
<td>Tier I capital</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Core Tier I capital</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Capital Conservation Buffers</td>
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</tr>
<tr>
<td>Leverage Ratio</td>
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<td>3%</td>
</tr>
<tr>
<td>Countercyclical Buffer</td>
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<td>0% to 2,5%</td>
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This table shows the main differences between Basel 2 and 3:

<table>
<thead>
<tr>
<th>Basel II’s drawbacks</th>
<th>Basel III response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macro prudential view</td>
<td>Conservation and countercyclical capital buffer</td>
</tr>
<tr>
<td>International coordination</td>
<td>At least the 27 members of the Committee will implement the approach</td>
</tr>
<tr>
<td>Systemic (liquidity) risk:</td>
<td>I) Build-up of additional capital buffer</td>
</tr>
<tr>
<td>Procyclicality</td>
<td>II) Avoid excessive credit growth</td>
</tr>
<tr>
<td></td>
<td>III) Usage of stressed data for the calculation of counterparty credit risk</td>
</tr>
<tr>
<td>TBTF, TMTF and TITF</td>
<td>I) Intensified disclosure of capital and liquidity requirements</td>
</tr>
<tr>
<td>Transparency</td>
<td>II) Disclosure of the leverage ratio and nationals countercyclical buffer</td>
</tr>
<tr>
<td></td>
<td>III) Implementation of CCP</td>
</tr>
<tr>
<td>Sustainability</td>
<td>I) Enhanced capital base</td>
</tr>
<tr>
<td></td>
<td>II) Widened risk base</td>
</tr>
<tr>
<td></td>
<td>III) Liquidity standards (esp. the NSFR)</td>
</tr>
</tbody>
</table>

TBTF = “to big to fail”, TMTF = “to many to fail”, TITF = “to interconnected to fail”. Source of the table is Schwerter (2011).
Appendix 2

**Bank:** A financial intermediary who issues loans to firms.

**CAR:** Cumulative abnormal returns, excess returns from the predicted returns.

**Cash and Cash equivalents:** The bank or firms cash and cash equivalents scaled by total assets

**Crisis:** A dummy variable that takes the value of 1 if the years are 2008, 2009 or 2010.

**Crisisdebt:** A constant variable that takes the value of the bank’s debt in 2007

**Dividends:** A dummy variable that takes the value of 1 if the bank (in hypothesis 2) or firm (in hypothesis 3) is paying dividends to its shareholders.

**Dividends at crisis:** A dummy variable that takes the value of 1 if the bank (in hypothesis 2) or firm (in hypothesis 3) is paying dividends to its shareholders during the crisis.

**Firm:** A customer of a bank. This includes non-financial institutions and financial institutions that are not themselves a bank.

**Financial assets:** Total financial assets scaled by total assets.

**Leverage:** Total debt scaled by total assets.

**Leverage at crisis:** A variable that takes the value of total debt scaled by total assets for the years of 2008, 2009 and 2010. For all other years, this variable is 0.

**Loan:** Total loans to customers scaled by total assets.

**Performance:** Bank or firm performance defined as ROA, return on assets.

**Profitability:** Net income scaled by total assets.

**Short Term Debt:** Total short term liabilities scaled by total assets.

**Size:** Our proxy for firm and bank size is the natural logarithm of total assets

**Profitability:** Net income scaled by total assets.

**ROA:** Return on assets, calculated as log returns.

**ROI:** Return on investments (investments growth), calculated as log returns.
Appendix 3

Hausman tests:
This tests whether a fixed or random effects model is appropriate for our second hypothesis. The results implies that a random effects model is better than a fixed effects model when we examine the general relationship between banks return on assets and the explanatory variables, where leverage varies with time.

On the other hand, when we study the impact leverage has on return on assets due to the crisis, a fixed model is better.

<table>
<thead>
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<th>Coefficients</th>
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<td></td>
<td>(b)</td>
<td>(B)</td>
<td>(b-B)</td>
<td>sqrt(diag(V_b-V_B))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>fixed</td>
<td>random</td>
<td>Difference</td>
<td>S.E.</td>
<td></td>
</tr>
<tr>
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<td>-6.830577</td>
<td>-4.019719</td>
<td>2.875629</td>
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<tr>
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<td>7.536438</td>
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<tr>
<td>LNTA_log</td>
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<td>0.0755377</td>
<td>-0.026049</td>
<td>2.281719</td>
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<tr>
<td>financial_eq</td>
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<tr>
<td>profitable_g</td>
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<td>div_dummy_g</td>
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<tr>
<td>cash_TA_lag</td>
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<td>-1.924335</td>
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<tr>
<td>current_li_g</td>
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<td>-3.108849</td>
<td>3.260208</td>
<td>3.213831</td>
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</tr>
</tbody>
</table>

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

Test: Ho: difference in coefficients not systematic

\[
\text{chi}^2(B) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 107.60
\]

Prob>\text{chi}^2 = 0.0000

(V_b-V_B is not positive definite)
This tests whether the regression in hypothesis 3 regarding the firm’s return on assets is best explained by a fixed effects or random effects model. We find that a fixed effects model is better.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>(B)</th>
<th>(B)</th>
<th>(b-B)</th>
<th>(\sqrt{\text{diag}(V_{b-B-V_B})})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fixed</td>
<td>random</td>
<td>Difference</td>
<td>S.E.</td>
</tr>
<tr>
<td>crisis</td>
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<tr>
<td>ROA_bank_lag</td>
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<tr>
<td>ROA_bank_l&lt;sup&gt;-1&lt;/sup&gt;</td>
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<tr>
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<tr>
<td>profitabili&lt;sup&gt;-g&lt;/sup&gt;</td>
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<td>-.1729612</td>
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<td>profitabili&lt;sup&gt;-s&lt;/sup&gt;</td>
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<td>.0714077</td>
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<tr>
<td>cash_to_TA&lt;sup&gt;-q&lt;/sup&gt;</td>
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<td>-.1082068</td>
<td>.0624476</td>
<td>.0340505</td>
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</tbody>
</table>
| cash_to_TA<sup>-s</sup> | .0336474 | .0374543 | -.0038069 | .

\(b\) = consistent under \(H_0\) and \(H_a\); obtained from \textit{xtreg}
\(B\) = inconsistent under \(H_a\), efficient under \(H_0\); obtained from \textit{xtreg}

Test: \(H_0\): difference in coefficients not systematic

\[
\chi^2(9) = (b-B)'[\{(V_{b-B-V_B})^{-1}\}] (b-B)
= 756.87
\]

Prob>\chi^2 = 0.0000

\((V_{b-B-V_B} is not positive definite)\)

This tests whether the regression in hypothesis 3 regarding the firm’s investment growth is best explained by a fixed effects or random effects model. We find that a fixed effects model is better.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>(B)</th>
<th>(B)</th>
<th>(b-B)</th>
<th>(\sqrt{\text{diag}(V_{b-B-V_B})})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fixed</td>
<td>random</td>
<td>Difference</td>
<td>S.E.</td>
</tr>
<tr>
<td>crisis</td>
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<td>ROA_bank_l&lt;sup&gt;-1&lt;/sup&gt;</td>
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<td>cash_to_TA&lt;sup&gt;-q&lt;/sup&gt;</td>
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<td>-.0998867</td>
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</tr>
</tbody>
</table>

\(b\) = consistent under \(H_0\) and \(H_a\); obtained from \textit{xtreg}
\(B\) = inconsistent under \(H_a\), efficient under \(H_0\); obtained from \textit{xtreg}

Test: \(H_0\): difference in coefficients not systematic

\[
\chi^2(9) = (b-B)'[\{(V_{b-B-V_B})^{-1}\}] (b-B)
= 60.78
\]

Prob>\chi^2 = 0.0000