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„Banks and their capital structure“

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1 Introduction

The analyses conducted in this paper are based on the topic “Banks and their capital structure”. Banks can finance themselves with deposits. This is unique and can not be done by other institutions or firms. Moreover, regulation requires banks to follow compulsory rules when deciding about the capital structure.

The paper is organized the following way.

First, different theories of bank capital in the literature are described. The discussion touches the irrelevance of financing by Modigliani and Miller (1958), market theories (competition) by Allen, Carletti and Marquez (2006), capital structure under asymmetric information by Diamond and Rajan (2000), capital structure and deposit insurance by Gangopadhyay and Singh (2000), and capital structure and liquidity by Peck and Shell (2010). Furthermore, if available in the literature, the theories are supported with empirical evidence.

Second, the capital structure is under scrutiny. It is analysed which components do influence the equity to total asset ratio. Additionally, the amount of deposits is interesting. The influence of different variables on deposits is examined.

Third, a short part on capital regulation is written. Furthermore, the influence of regulation on the capital buffer held is analysed.

Fourth, the paper looks at the capital buffers of banks. Of special interest are factors that influence the amount of capital buffer held.

The last section consists of an empirical part. The theory and the methods explained in the paper are applied to the data that consists of European banks. Since regulation does not seem to be the only constraint or influence on the capital structure of banks, the questions are whether and how do variables influence the equity ratio, the capital buffer and the amount of deposits held by banks. The research is conducted with regressions that are applied to the data set. It is attempted to find variables other than regulation that actually do define the capital structure of banks.

2 Bank financing

2.1 The Irrelevance of Capital Structure

2.1.1 The Theory

According to Modigliani and Miller (1958) the value of a firm is independent of whether it is debt or equity financed.¹ It seems to be rather intuitive that this model might not be applicable for banks since they operate in a different environment than corporations. Additionally, the existence of deposits and bank runs is rather unique for the banking industry.

However, Merton (1995) points out that the Modigliani and Miller theorem can not just be dismissed because of the simple fact that the underlying business is banking. Additionally, the model does talk about the existing equity and about how costly raising new equity is. Furthermore, it seems that demand deposits are not so different from other securities, since most companies could issue bonds with similar characteristics. Therefore, demand deposits do not represent a financing advantage for banks. Moreover, the existence of deposit insurance is treated as a net subsidy. However, it is argued that the costs of insurance premiums often outweigh the benefits. Therefore, insurance must not have a positive net influence.²

Additionally, Miller (1995) argues that a 100% equity financed bank could exist due to the fact that the return on equity is variable and not fixed. It depends on the assets' risks but also on the amount of leverage a bank has. Therefore, a bank's costs of equity are lower if it holds less debt. The author talks about a bank which has costs of equity of 6% and is supposed to have a return on asset of 8%. Although the book value of the equity might not reflect the higher return, the bank's shares will sell at a premium. This will make up for the lower return on equity. This works also the other way, in the case that, the bank is underpriced on the market. Additional leverage would not change that mispricing. At some point additional debt does no longer carry net benefits. The higher leverage would be reflected in a higher cost of equity.³

¹ Modigliani and Miller (1958) p.268

² Miller (1995) p.484-486

³ Miller (1995) p.486-487

These explanations state that the capital structure does not matter and Modigliani and Miller (1958) is a valid concept, even in banking.⁴

2.1.2 The Empirical Evidence

DeYoung and Yom (2008) analyse the change of the asset and liability management over the years. They blame a maturity mismatch of the active and passive side of the balance sheet for the crisis in 2007-2008.⁵ They argue that over time, the development of new financial products has helped banks to become less depended on asset and liability management. Furthermore, deregulation and an increased share of non-interest based income have also contributed to a decrease of its importance. This means that insuring against interest rate is no longer exclusively done by matching maturities of the asset and the liability side. The natural hedge of assets and liabilities has declined in importance for banks. These facts lead to the assumption that assets and liabilities are no longer strongly correlated.⁶ The authors explore the following question: “have bank assets and liabilities become measurably more independent over time?”⁷. Moreover, they want to know if all the new interest derivatives and products are responsible for a measurably independence. They use canonical correlation in order to detect the relationship between assets and liabilities.⁸

The sample under scrutiny consists of US commercial banks from the years 1990-2005. The data is provided on a yearly basis and analyses are conducted with five years subsamples in order to detect any changes in the relationship. Additionally, the banks are put in different groups based on their size of assets. Furthermore, the asset side is split up into six subgroups and the liability side in five subgroups. These analyses already reveal some trends. Banks seem to have less cash and short term securities on their balance sheets. It is assumed that due to higher competition banks are forced to better manage their assets and invest into assets that provide them higher returns. Another explanation can be that advanced clearing systems make it unnecessary to hold as much cash as before. Furthermore, better excess to the liquidity market could have led to the decrease in cash. Moreover, the maturities have shifted from short term to more long term horizons on the balance sheets. This is the result of a better capital

⁴ Miller (1995) p.487

⁵ DeYoung and Yom (2008) p.275-276

⁶ DeYoung and Yom (2008) p.278

⁷ DeYoung and Yom (2008) p.276

⁸ DeYoung and Yom (2008) p.276, 283

market access for business owners and the higher engagement of commercial banks in the mortgages sector. The change in maturities would have an impact on the interest risk for banks. This means that longer maturities on the asset side also require longer maturities on the liability side. It could turn out difficult to find a natural hedge on the liability side for the asset. Nowadays, due to the existence of new financial products the severity of this problem has significantly declined.⁹

The changes of the liability side of the balance sheet reveal how diverse banks of different sizes have become. Smaller banks lost core deposits whereas demand deposits experienced significant growth. This proves that small business clients are the key element in the daily life of small banks. Furthermore, it reveals the increased competition between banks for core deposits. Nowadays, smaller banks find it more difficult to attract consumer deposits than their larger competitors. The effect is of course vice versa with larger banks. They have growing core deposits on their balance sheets. These outcomes indicate that the maturity of core deposits is now higher for larger banks and lower for smaller banks. There is no difference in the development of purchased funds in smallest or largest banks. These funds follow an upward path. Furthermore, the amount of equity held has significantly increased. This is due to tighter regulations but is also a result of high retained earning when the industry has been booming.¹⁰

DeYoung and Yom (2008) only report correlations that are at least 0.3 and are so-called strong correlations. It can be seen that the strong correlations between assets and liabilities are more obvious in the larger bank analyses. One explanation can be that larger banks are indeed more engaged in asset and liability management. On the other hand, a non homogeneous small group or noise can create that outcome. Last, it can just mean that the model implied is just better suited for larger than for smaller banks.¹¹

Comparing the asset and the liability side pair-wise already reveals interesting results. 32 strong correlations can be observed between cash and demand deposits. Out of those 11 are positively correlated. Simultaneously three have a negative cash and core deposit relationship. Furthermore, seven strong correlations show a positive relationship between long term loans and core deposits. Last, equity is assumed to have a positive correlation with long term securities in five cases. These findings are interesting because they indicate that retained earnings are not held in cash or short term

⁹ DeYoung and Yom (2008) p.283-285

¹⁰ DeYoung and Yom (2008) p.286-287

¹¹ DeYoung and Yom (2008) p.287

investments. Instead they are invested into liquid but highly profitable assets. However, it can also be interpreted as banks becoming even more risk averse, since they have higher capital and at the same time less risky investments for their profits. These results support the observations mentioned above.¹²

The fact that the correlation of assets and liabilities is stronger for larger banks is also true for the canonical correlations. The canonical variables associated with the liability side are responsible for 7% of the diversification of the asset side. The result is much higher when conducted vice versa. In that case the asset side explains 12% of the accounts on the liability side. This can lead to the conclusion that banks find an investment project first and then look for financing.¹³ Furthermore, the redundancy coefficient indicates that the canonical correlation is determined by a low amount of individual relationships between the asset and the liability side. A strong and significant relationship between assets and liabilities is discovered. In the first panel (based on the first loading) the most obviously correlated variables are long term loans and core deposits. The results point into a positive direction, which indicates that those two accounts do move in the same direction. Such a relationship is not in conflict with the maturity mismatch assumption since more deposits make it possible to invest long term without taking on a significant interest rate risk. The same relationship is discovered for short term loans and purchased funds. That kind of investment can be critical due to interest risk. Therefore, purchased funds are best invested into short term products, preferable with high returns.¹⁴

The second panel (based on second loadings) reveals that long term securities and equity are strongly positively correlated. This relationship is not unexpected because it has been already detected by pair wise correlations. Moreover, a positive relationship of cash holding and demand deposits is shown.¹⁵

In order to be able to actually find the development of asset and liability dependence or independence the authors look at the annual redundancy coefficients. These are measured for the period of 1990-2005 and once split up in asset size quartiles and once in asset size deciles.¹⁶ The first analyses, where it is tested how much “the liability canonical correlations explain the variation of the actual asset account data”¹⁷, does not

¹² DeYoung and Yom (2008) p.287

¹³ DeYoung and Yom (2008) p.290

¹⁴ DeYoung and Yom (2008) p.275-290

¹⁵ DeYoung and Yom (2008) p.290-293

¹⁶ DeYoung and Yom (2008) p.294

¹⁷ DeYoung and Yom (2008) p.294

reveal a significant pattern.¹⁸ However, when testing how much “the asset canonical correlations explain the variation of the actual liability account data”¹⁹ the results gain more importance.²⁰ The redundancy coefficient is higher. Furthermore, the dependence of asset and liabilities is obviously depended on the bank’s size. Last, it can be seen that over time the coefficient gets smaller for larger banks, which means that the asset and the liability side get more independent. This can be explained with the existence of the financial innovations. However, the findings for smaller banks are the other way round. The redundancy coefficient is gaining importance. Assets and liabilities are becoming more dependent. The result could be driven by the fact that small banks have increased in size along the sample period. Therefore, the redundancy coefficient indicates that small banks and large banks have moved closer together, at least as far as the level of the redundancy coefficient is concerned.²¹

DeYoung and Yom (2008) find that indeed the existence of financial innovations related to interest rate risk has a negative impact on the banks’ asset management. The results indicate that the Modigliani and Miller (1958) concept seems to be more applicable to banks nowadays. Moreover, it can be concluded that asset and liability management is no longer the only tool of interest risk management.²²

2.2 The optimal Capital Structure under Asymmetric Information

The following theory assumes that the kind of financing matters. An important assumption is the one related to asymmetric information. A bank or intermediary can create value if it knows more than another investor who joins the project at a later point in time.²³ In that case the theory of Modigliani and Miller (1958) does not seem applicable anymore.

2.2.1 The business model in banking

Banks do differ from regular firms. In order to understand the reasons behind their financing decisions their business model has to be known. The core activities are the

¹⁸ DeYoung and Yom (2008) p.294

¹⁹ DeYoung and Yom (2008) p.294

²⁰ DeYoung and Yom (2008) p.294

²¹ DeYoung and Yom (2008) p.293-296

²² DeYoung and Yom (2008) p.296

²³ Diamond and Rajan (2000) p.2431

provision of liquidity and credits to other business agents. Diamond and Rajan (2000) describe the environment as follows: there are agents, who have a business with which they can generate additional profits due to their private skills. There is a need for outside funding. Furthermore, an investor has always the possibility to either proceed with the project or to liquidate it. This means that the agent can be replaced by another agent who is only slightly less skilled than the previous. On the other side, the business agent's bargaining power is his ability to generate the highest rents possible with this business. The earlier in the business cycle a lender starts to invest his money, the better he is informed about the business itself and the related activities. So an earlier investment has a higher payout than an investment made at a later point of time. Moreover, the better informed an investor is, the higher is the amount he can lend and the greater is his bargain power towards the agent. However, the funds he is able to raise from outside investors are smaller than the original loan since the new investors are missing that information advantage.²⁴ It can be seen that the problem lies in the fact that human factors are attached to the original project. The project and the skills to run it are necessary to be able to sell the business and to create liquidity.²⁵

2.2.2 Banks financed by deposits and equity

If a bank issues deposits it is obligated to pay the investors back on a first come, first served basis. In the worst case scenario, investors who come last do not receive back their initial investment. Therefore, depositors will always run and demand their investment back when they feel insecure about the future performance of the bank. Moreover, depositors are not willing to renegotiate lending conditions because for the individual it is always more profitable to try to get back the total amount invested, even if that is realised at the costs of other depositors.²⁶ This is called the “collective action problem”²⁷.

Assuming that a bank is optimally financed by deposits and assuming a banker who tries to generate some extra profits by considering selling the business to a less skilled agent would lead to the following scenario: the depositors would have to give some of their gains to the banker, additionally, they would assume their investment is no longer

²⁴ Diamond and Rajan (2000) p.2431-2432

²⁵ Diamond and Rajan (2000) p.2432

²⁶ Diamond and Rajan (2000) p.2432

²⁷ Diamond and Rajan (2000) p.2432

safe and therefore, start a run at the bank. In order to prevent this from happening and to keep the depositors as clients the banker acts just as intermediate agent who will make sure to receive the money from the business agent back and repay depositors. In order to prevent a bank run, any additional gains will go to the depositors. It can be seen that under certainty a bank is optimally financed by deposits.²⁸

However, in an environment with uncertainty a solely deposit financed bank is suboptimal because the bank is exposed to risk such as fluctuations in the value of the assets. A sudden drop in value would lead to a bank run without previous changes in the banker's behaviour.²⁹ In order to prevent such a scenario from happening, a banker is well advised to raise equity which can not participate in a bank run. Equity, as a residual claimant, offers security to a bank. However, it comes at a cost namely, that bankers can generate extra profits since the equity holders lack the bank run as bargaining instrument. Therefore, in a one period model, the bank is best financed by deposits and equity. The amount of equity depends on the before mentioned trade off.³⁰

In a model with several periods, the banker gains the opportunity to renegotiate with the business agent as far as, for example, maturity is concerned. In the end, a higher amount of capital has a positive effect for the banker's gains, provides the bank with stability against bank runs and enables to gain a better bargaining position towards the business agent.³¹

2.2.2.1 Single Period Model

Diamond and Rajan (2000) introduce a model with the following characteristics and relationships. First, it is assumed that the model has two periods. Furthermore, the relationships explained above can be applied. Therefore, a business is financed by a lender who has an information advantage over outside loaners. The business agent creates additional value by conducting the business with his special skills. At the end of the second period the business agent will try to receive better conditions compared to those which have been established in form of a contract at time 0. He can do so by making the use of his skills in the future depended on the negotiation result in time 2.

²⁸ Diamond and Rajan (2000) p.2432-2433

²⁹ Diamond and Rajan (2000) p.2433

³⁰ Diamond and Rajan (2000) p.2433

³¹ Diamond and Rajan (2000) p.2433

The business agent will make a new offer to the lender which leads to the following reactions.³²

1. Turn down the new suggested payment and sell the underlying assets.³³
2. Acceptance of the proposal.³⁴
3. Turn down the offer and take the business away to the next best skilled business agent.³⁵

The first answer results in a lower collection sum for the lender since the liquidation price is lower than the borrower's original promised repayment. The second one, obviously results in a lower price. For the business agent it makes only sense to pay less to the investor than what was written in the first contract. The last option decreases the repayment too, since employing the personal skills of the original business agent generates the highest profits. It can be seen that the business agent has an advantage in the negotiation. In the end the business agent will offer the liquidation value since this is the maximum price the lender can get without the special skills of the business agent.³⁶

The lender can act as intermediary and finance his outstanding loan with outside investors. First, it is assumed that they can invest in form of equity. His information advantage makes it possible to collect a higher amount than the outside investors would be able to get. Therefore, the lender (=bank) has a bargaining advantage over the outside investors at maturity ($t=2$). In the event of renegotiations the bank will always enter into that process with the business agent first. This is intuitive since the advantage over the outside investors is the collection power which will be used in the negotiation. If the negotiation with the business agent has already happened than this advantage is worthless. The negotiation process between bank and outside investors is similar to the above mentioned:³⁷

1. Cut the intermediary out and negotiate with the business agent (loss of value due to lack of information).³⁸
2. Except the offer from the bank.³⁹
3. Negotiate who will get into the negotiation process with the business agent.⁴⁰

³² Diamond and Rajan (2000) p.2434-2436

³³ Diamond and Rajan (2000) p.2434-2436

³⁴ Diamond and Rajan (2000) p.2434-2436

³⁵ Diamond and Rajan (2000) p.2434-2436

³⁶ Diamond and Rajan (2000) p.2436-2437

³⁷ Diamond and Rajan (2000) p.2437-2438

³⁸ Diamond and Rajan (2000) p.2437-2438

³⁹ Diamond and Rajan (2000) p.2437-2438

Both profit from a 50:50 distribution of any additional gains due to the information advantage.⁴¹

As mentioned above if the refinancing is done via deposits than a renegotiation is not possible without triggering a bank run. The alternatives a depositor has got are the following.⁴²

1. Except the new offer.⁴³
2. Trying to collect the full amount of his deposit = inducing a bank run, entering into a negotiation process and trying to avoid a bank run.⁴⁴

The second scenario can result in a squeeze out of the bank, which directly engages the business agent and the depositor in a dialogue.⁴⁵

Since any attempt of the bank to change the original commitments to depositors will lead to a bank run and therefore, will reduce a bank's profit to zero, renegotiation is not an option for the respective bank. The bank will forgo gains and only depositors profit from any additional surplus.⁴⁶

Therefore, a banker who seeks for outside investors in $t=1$ will promise those depositors a full repayment to avoid a bank run. Moreover, in order to avoid disintermediation which would result in outside investors' and business agents' direct negotiations, bankers do not extract rents from depositors. In fact they just act as transit station where all gains are distributed to the depositors. Their role in the economy is still valid. They are able to collect a higher amount of money from the business agent for the outside investors. This ability is important because it creates liquidity since the information advantage makes it possible to lend and collect a higher loan.⁴⁷

From the above outlined characteristics of investors it can be seen that the optimal bank capital structure consists of deposits and equity. In this new game a banker who is withholding his skill at $t=2$ has a good bargaining position but only against the equity holders. From the descriptions above the possible outcomes of the game can be easily derived. There can be only two states: either the amount of deposits outstanding is higher or lower than the agreed repayment or banker's collection value. As already mentioned the depositors who feel threatened that their money is in danger will trigger a

⁴⁰ Diamond and Rajan (2000) p.2437-2438

⁴¹ Diamond and Rajan (2000) p.2437-2438

⁴² Diamond and Rajan (2000) p.2439

⁴³ Diamond and Rajan (2000) p.2439

⁴⁴ Diamond and Rajan (2000) p.2439

⁴⁵ Diamond and Rajan (2000) p.2439

⁴⁶ Diamond and Rajan (2000) p.2439

⁴⁷ Diamond and Rajan (2000) p.2441

bank run which is the case when the available amount does not cover the outstanding deposits. Is the agreed repayment or banker's collection value met then there is no bank run. The gains of equity holders and the banker do depend on the amount of repayment, the banker's collection value and the sum that the equity holders can collect without the banker's help. Given that the depositors get paid first, the money left over can be distributed among the other players of this game. In the case of a smaller repayment than the amount equity holders would be able to collect, the banker's help is not needed and therefore, he is disintermediated. In the event of the banker's collection being higher than the repayment and the repayment is bigger than the amount collectable by the equity holders the gains after satisfying the depositors is distributed the following way: the equity holders get the amount that they would have been able to collect themselves plus half of the gains made due to the skills of the banker and the banker gets half of these additional gains too. The gains derive from the difference between repayment and the collectable amount of equity holders. The last possibility is the repayment being bigger than the amount collectable by the skilled banker. In this case, that after the distribution to the depositors the equity holders get the amount they would have been able to collect themselves and half of the gains. The banker gets half of the gains too and the gains are derived from the banker's skilled loan collection minus the amount the equity holders would have gotten without the banker's engagement.⁴⁸

It can be seen from the above statements that the gains of the banker does depend on the amount of deposits chosen at $t=1$. The higher the amount of deposits issued the less rent is possible for the banker, in the worst case the gains might even be zero if a bank run has been triggered. Therefore, the banker has a fierce interest to keep the deposits low in order to realise the maximum gains possible for him. The optimal capital structure is found after trading off the costs of a bank run in a bust with the rent to bankers in a boom. Therefore, the optimal capital structure is characterised by relatively more deposits when a boom is expected since then depositors do feel safer and relatively less deposits when a bust is feared. Additionally, the liquidity of assets does influence the capital structure. It is argued that higher illiquidity calls for a more robust capital structure which can be achieved by issuing equity. Last, the collateral of the loan has an impact on the capital structure too since its risk and the risk of the loan is correlated. It can be compared to the observed risk shifting problem in firms.⁴⁹

⁴⁸ Diamond and Rajan (2000) p.2442

⁴⁹ Diamond and Rajan (2000) p.2443-2444

2.2.2.2 Multiple Period Lending Model

In this case, there are projects involved that last throughout two periods meaning that they do not mature before $t=2$. In general, it seems to be quite intuitive that a banker has to pay his depositors in $t=1$ in order to avoid a bank run. The amount that needs to be paid is the amount of deposits outstanding. Furthermore, the money he can distribute depends on the amount that the business agent will pay him in $t=1$ and how much he can borrow from outside investors in exchange for future promises in $t=2$.⁵⁰

In time $t=1$ the possible solutions of the game are the following:

1. If deposits are higher than the liquidation value and the business agent refuses to pay then there is a bank run. Depositors will directly seize the money, which will be less than the banker could have collected. Bankers and equity holders will get nothing.⁵¹
2. It is assumed that deposits are not higher than risky or safe deposits or the liquidation value. Furthermore, in this scenario the value of safe and risky deposits is higher than the liquidation value. This leads to a loss of the banker's bargaining power. If the risky deposits are higher than the safe deposits then at a certain point the ability of the banker to collect the liquidation value will fall to the value of risky deposits in $t=2$. However, if the risky deposits are smaller than the deposits of $t=1$ do not influence future payoffs.⁵²
3. Again, it is assumed that deposits are not higher than risky or safe deposits or the liquidation value. In this scenario risky deposits are smaller than safe deposits and they are smaller than the liquidation value. Now, the banker can use his liquidation threat. If the amount of deposits held in $t=1$ exceeds the optimal amount of deposits then liquidation in $t=1$ is a possibility, especially if the business agent pays less than what can be received via liquidation.⁵³ In the event that the liquidation value in $t=1$ is higher than the expected returns from the project in $t=2$ then the banker is able to make higher gains than the actual liquidation value of $t=1$. Additionally, the actual deposits are higher than the optimal amount. The business agent will be forced to pay more. This can increase up to the

⁵⁰ Diamond and Rajan (2000) p.2446

⁵¹ Diamond and Rajan (2000) p.2451

⁵² Diamond and Rajan (2000) p.2451

⁵³ Diamond and Rajan (2000) p.2451

optimal amount that he needs to pay in order to avoid liquidation. At that point the additional benefits for the banker decline.⁵⁴

Is the situation vice versa (the liquidation value today is less than the future promises in $t=2$) than it is similar if the actual deposits exceed the optimal amount of deposits. However, if the amount paid by the business agent is bigger than the promised one than it can be possible that the banker only realises the liquidation value of $t=1$.⁵⁵

4. If the safe deposits are smaller than the risky deposits and they are smaller than the liquidation value in $t=1$, independence between bank rents and capital structure is created. This is only true under the assumption that the expected liquidation value of $t=2$ (depending on $t=1$) is smaller than the liquidation value of $t=1$. In the case that, this equation is the other way round, then the banker can gain less than the expected liquidation value.⁵⁶

In $t=0$ the banker tries to maximise his profits over the following two periods. Under competition and under the assumption that a banker does not have any own funds, the following can be derived. If risky deposits are higher than the amount that is needed to be financed and this amount is higher than safe deposits than the banker can be cut out. There is no need for a banker since the project can be financed without a costly intermediary. However, if the situation is different meaning that safe deposit exceed the financing amount and risky deposits are smaller than the financing amount than a banker is valuable. He will use deposits and equity to finance the project and for his service he will get some remuneration. Nevertheless, if he has money of his own than the amount of deposits in $t=1$ depends on how much the business agent will pay and the probability of a bank run, which becomes a higher threat, the higher the amount of deposits. This indicates that a bank with a higher amount of deposits might be better off lending to an entrepreneur, who is not going to produce high rents in $t=1$. However, an entrepreneur how knows that he will receive a high cash inflow in $t=1$ will prefer a well capitalised bank. Why? Because he does not want to take the risk to be liquidated in $t=1$ which can be the case if the bank is highly levered and can not wait for the money to be returned in $t=2$. This indicates that every bank has its own clientele.⁵⁷

⁵⁴ Diamond and Rajan (2000) p.2451

⁵⁵ Diamond and Rajan (2000) p.2451

⁵⁶ Diamond and Rajan (2000) p.2451

⁵⁷ Diamond and Rajan (2000) p.2452-2453

Diamond and Rajan (2000) also explain the case in which a bank has lent money to various borrowers. It is assumed that the borrowers are small and their liquidation values are the same. However, the respective rents do differ among them. It seems to be intuitive that all business agents will make an offer to the banker just high enough to avoid liquidation. If the sum of these offers is sufficient to cover the deposits that need to be paid back in $t=1$ than there is no overpayment. Nevertheless, if that is not the case than business agents have to raise their offer or some might even get liquidated so that the banker is able to pay his obligations. Again, the banker is the one who can accept an offer or liquidate the project. However, liquidation is not free and the costs are the forgone future rents in $t=2$, net of the amount the banker receives in the event of selling the project. On the other hand, the benefits of liquidation are the gain in $t=1$ minus the sum that the banker is able to pledge at this moment. The cost and benefits expressed in a ratio indicate that the banker, who is forced to sell some projects, has an incentive to sell off borrowers whose ratio is the lowest. The business agents are aware of that behaviour and they try to provide the banker with as much as possible in $t=1$ that can be used to attract outside financing. This increases their denominator of the ratio. It can be seen that more cash rich business agents have to offer less money in relation to agents who are short of liquidity. Furthermore, bankers do not explicitly ask for more money from the agents, but agents are aware of the problem and offer more in the first place.⁵⁸

2.3 The optimal Capital Structure under Market Conditions Competition)

2.3.1 The Theory

Allen, Carletti and Marquez (2006) have come up with the following theory, in order to explain why legal requirements do not define capital ratios. In a situation where the good projects are scarce banks need to compete for the few profitable projects available. Monitoring is an important asset for firms when there is a significant information asymmetry. In the case described, banks have two monitoring incentives: first, the fact that they are required to hold equity and second, their interest in the loan being repaid at maturity, which goes along with a higher interest rate since monitoring is costly. Higher capital is preferred by borrowers but implies higher costs for banks which,

⁵⁸ Diamond and Rajan (2000) p.2453-2454

therefore, have higher interest rates as monitoring incentive. So in a competitive state banks need to have at least some amount of capital in order to attract borrowers with profitable projects. The exact number depends on the return of the project and the cost of capital. For example, in a situation where returns are low and capital is relatively cheap, a bank would raise the maximum amount of capital but would not monitor at its maximal capacity. Another surprising finding has been that borrowers are willing to shift some of their profits to the banks in form of higher loan rates in order to give them an incentive to increase the monitoring. In a competitive environment the interest rate is set by the market forces, the regulation body would want to set a minimum capital requirement in order to assure that banks comply with their monitoring duties. This compulsory amount of equity would be higher than the one in the scenario with an oversupply of profitable projects. This is due to the fact that when the amount of profitable projects is low than the market determines a lower loan rate. Therefore, in order to make sure that banks do have a monitoring incentive the level of required capital must be elevated.⁵⁹

Socially optimal and therefore, required by the regulators is bank finance by deposits when the costs of equity are high. In the case of costs of deposits and equity being similar it is preferred to use equity finance since not all costs are included in the costs of deposits. If the cost difference is very high it is better to finance by deposits. The market might lead to other financing proposals. In the case of an oversupply of bank funds, it is suggested to hold more capital than required by law. There might be even more capital accumulated than socially beneficial. This is done, as above mentioned, to attract profitable projects. It can be seen that the effect of regulation on the capital ratio does depend on the market situation. In case of an excessive supply of projects, banks would prefer to hold no capital so regulation does increase the level of capital held. In the situation where banks have to compete for borrowers the amount of capital might be higher than required and even at a socially non beneficial level. Regulatory could improve this situation by introducing a cap on capital held.⁶⁰

2.3.2 The Empirical Evidence

Schaeck and Cihák (2010) take the theory of Allen et al. to a test. They want to analyse if competition, as explained above, does have an influence on the bank capital

⁵⁹ Allen, Carletti and Marquez (2006) p.13-17

⁶⁰ Allen, Carletti and Marquez (2006) p.17-18

ratio. Their sample consists of European commercial, cooperative and savings banks over the period of 1999-2005. 2,600 banks situated in 10 different countries are explored.⁶¹ At the beginning they only analyse commercial banks. This is done because profit is taken as variable to capture success and commercial banks are the only kinds that operate under the profit making condition. However, this has major drawbacks: first, losing a high percentage of the sample under scrutiny, second, being able to apply the outcome to the major European banks and third, not following the way literature has taken so far. The outcome shows that commercial banks do indeed hold a higher amount of capital in a competitive environment.⁶² Conducting the same analyses with all three kinds of banks together (commercial, savings, cooperative) does not change the qualitative results as discovered before. The positive relationship between capital buffer and competition gets even more significant.⁶³

Meh and Moran (2009) test their findings of an increased capital- asset ratio during an event of shock with actual data from the U.S. banking system. It turns out that the model is in accordance with the data which can lead to the conclusion that the factor market is important when it comes to defining the amount of capital held by banks.⁶⁴

2.4 The optimal Capital Structure and deposit insurance

Gangopadhyay and Singh (2000) argue that equity is necessary in order to prevent banks from runs. They point out that on the contrary to common believe deposit insurance by the government is not needed when the amount of equity held by banks is high enough. When the bank capital held is not sufficient than no run must be triggered, it can just mean that the deposits are no longer fully insured.⁶⁵

The basic paper on bank runs is written by Diamond and Dybvig (1983). They create a two period model in which the interest rate is lower in case depositors want their money back after the first period. Since leaving the money for two periods guarantees a higher interest rate, this setup acts as insurance. Furthermore, in cases without government insurance banks can face a bank run. This means that lots of depositors want to

⁶¹ Schaeck and Cihák (2010) p.1,3

⁶² Schaeck and Cihák (2010) p.10-13

⁶³ Schaeck and Cihák (2010) p.16

⁶⁴ Meh and Moran (2009) p.570-572

⁶⁵ Gangopadhyay and Singh (2000) p.626

withdraw their money after one period. The worst case scenario can be prevented by government insurance, which could lead to actions of the government in an event of a bank run. Such a measure could be, for example, tax all the withdrawing depositors. This gives an incentive to leave the money with the bank for a longer period of time and therefore, prevents the economy from losses.⁶⁶

Gangopadhyay and Singh (2000) assume that in their model all participants must invest their money within the bank. Furthermore, they say that the attitude towards the kind of investment (equity or deposits) depends on the risk aversion. Deposits are suited for risk averse people, whereas an investment in equity reflects a risk neutral behaviour. Additionally, the authors assume that any contract is legally binding and can be enforced if necessary.⁶⁷

The model consists of three events along a timeline and two kinds of investors, the risk neutral and the risk averse ones. The information about the investment horizon (one or two periods) is private. The interest rate for the shorter period is lower compared to the longer period. The investors could prefer investing the money for the full time period but then they face the problem that they are unsure if they will get their money back in the second period since there is no insurance.⁶⁸

The bank can finance itself either through deposits or through shares. Shares are residual claim products and can not be sold at $t=1$, they must be kept until the end of the whole model. However, dividends for shareholders are possible in any period. The authors decide to conduct their analyses in a competitive environment which results in non-profit making banks. In order to avoid a bank run investors do need an advantage to let their money in the bank over two periods. Therefore, they must be sure that they will get the money back in the later period and the interest rate must be higher for the long term investment. The bank's investment will only be paid out in period 2. In period 1 the bank must be able to give the deposits back that were only invested for one year and to pay the promised dividends on the equity.⁶⁹ Now, the authors assume that there will be no bank run since the two period investors believe that they will get their money back by the end of period 2. In period 1 short term investors will withdraw their money. They will be left with cash and assets with returns in period 2. Since they are not interested in any long term holdings they will put those assets on the market for long

⁶⁶ Diamond and Dybvig (1983) in Gangopadhyay and Singh (2000) p.627

⁶⁷ Gangopadhyay and Singh (2000) p.629

⁶⁸ Gangopadhyay and Singh (2000) p.629-631

⁶⁹ Gangopadhyay and Singh (2000) p.631-632

term investors. Under the above stated assumption, that shares can not be traded in period 1, it turns out that deposit insurance without government is possible. Therefore, the bank's liability must be unconstrained. This is the case when there is enough risk neutral capital – this is equity. The amount of risk neutral capital is driven by the relationship of investors with different risk attitude and by the availability of deposits and equity per investor.⁷⁰ Last, Gangopadhyay and Singh (2000) look at what will happen when the amount of risk neutral capital is not enough. They add a new assumption. In period 1 it is possible to “allow the banks to suspend convertibility (of deposits) if they want to”⁷¹. The authors find that insufficient capital must not necessarily lead to a bank run. In their paper they proof that it might just mean that deposits are not longer totally, but still partially, insured.⁷²

Gangopadhyay and Singh (2000) suggest that according to their model government insurance is not necessary since there is enough capital to guarantee depositors insurance. The only condition that needs to be met is that banks do operate in a competitive environment.⁷³

Allen, Carletti and Marquez (2006) find similar results in their model of credit market competition. In the absence of insurance, depositors demand a higher return, if they face higher risks. In other words, the return should reflect the risk.⁷⁴ Analysing the banks' behaviour under the assumption that there is no deposit insurance and a higher supply of funds than profitable projects leads to similar results. Banks would have higher capital ratios than required due to the market competition. However, there is a difference when it comes to holding capital in case of excessive funds. Now, banks might have an interest in holding at least some capital for signalling purposes. This means that banks want to attract depositors with a higher capital ratio and showing that they will be monitoring. Again, this could lead depositors to decrease the costs on the deposits and therefore, cut their overall finance costs. This is most effective when the costs of deposits do reflect the risks associated with it. In the case where there is a shortage of funds and a risk-shifting problem, which means that banks are willing to take on

⁷⁰ Gangopadhyay and Singh (2000) p.635-636

⁷¹ Gangopadhyay and Singh (2000) p.637

⁷² Gangopadhyay and Singh (2000) p.638-640

⁷³ Gangopadhyay and Singh (2000) p.641

⁷⁴ Allen, Carletti and Marquez (2006) p.19

projects with higher risk and higher return on the expense of creditors, the results are the same.⁷⁵

2.5 The optimal Capital Structure and Liquidity

Another extension of Diamond and Dybvig (1983) is the introduction of checking accounts and debit cards. However, in these analyses deposit insurance is included in the model. It points out that value is created when a client can pay by check or debit card. Nevertheless, this only happens when the check can be cashed, meaning that the bank has sufficient cash funds to do so. The authors apply their model to two different kinds of banks: unified systems and separated systems. The first is less vulnerable to bank runs triggered by panicking investors but shocks still affect it. Additionally, unified system banks can either choose to hold a lot of cash or invest the money in funds that yield higher rents. The later, however, are subject to bank runs and therefore, need to hold a lot of cash in order to be able to serve withdrawing investors. It is intuitive that this can lead to an overinvestment in cash or cash equivalent assets.⁷⁶

The authors find that unified banks do create more value with hindsight. However, it turns out, that the separate banks provide more stability in the event of a panic that causes a bank run. Yet, the above assumption about overinvestment into liquidity turns out to be correct. This is the way how the separate bank or restricted bank protects itself against impatient clients (clients who will not let their money with the bank for two periods but will demand the deposit back after only one). This finding makes the restricted not look good since the unified bank is able to avoid bank runs without large buffers of liquid assets. Furthermore, large quantities of liquidity are not beneficial because they create bank runs caused by different shocks. This can be so called shocks from the outside environment.⁷⁷

⁷⁵ Allen, Carletti and Marquez (2006) p.19-23

⁷⁶ Peck and Shell (2010) p.420-421

⁷⁷ Peck and Shell (2010) p.420-421, 426

2.6 The Determinants of Capital Structure – Empirical Evidence

2.6.1 Data

Flannery and Rangan (2008) conduct regression analyses with the 100 largest US bank holding companies in order to find out effects on the capital ratio called “MKTRAT”⁷⁸ which is common equity to total assets calculated in market values.⁷⁹ Furthermore, the authors adjust their model for effects on the capital ratio that can appear due to changes in a company’s share price.⁸⁰ Stock price effects are not actively neutralised, but gone after one year. Testing the regression by adding a constraint that does not allow “MKTRAT”⁸¹ to be influenced by changes in the stock prices leads to similar results. Adjusting the original regression in a way that only allows having the optimal capital ratio leads to the same findings. It still can be seen that the capital ratio increases in the later years.⁸²

Kleff and Weber (2008) analyse the determinants of bank capital on German banks. When talking about banks they differ between savings banks, cooperative banks and all other banks. According to them, this is important because these banks have different possibilities or constraints due to their ownerships or the environments they are operating in. Therefore, their banks’ capital might not be influenced by the same determinates or at least not in the same direction. Savings banks for example are owned by the state and their access to the capital market is constrained. Therefore, they highly depend on profits in order to build up equity. Cooperative banks are less restricted since they are owned by cooperative members. However, they only operate in a regional environment. All other banks are characterised by better access to the capital markets and a more diversified portfolio, since they can operate worldwide.⁸³ They use unconsolidated balance sheets and profit and loss statements of German banks that have been collected by the Deutsche Bundesbank. The sample period is from 1992 to 2001.⁸⁴ Bank capital is measures in two ways: one “as equity capital from the balance sheet

⁷⁸ Flannery and Rangan (2008) p.405

⁷⁹ Flannery and Rangan (2008) p.405

⁸⁰ Flannery and Rangan (2008) p.406, 408

⁸¹ Flannery and Rangan (2008) p.405

⁸² Flannery and Rangan (2008) p.416-417

⁸³ Kleff and Weber (2008) p.354-356

⁸⁴ Kleff and Weber (2008) p.358-359

over total assets (*CAP1*)”⁸⁵ and the other as “total regulatory capital (Tier 1 + Tier 2)”⁸⁶, called “(*CAP2*)”^{87, 88}.

Cebenoyan and Strahan (2004) test how risk management influences the capital structure of banks. Therefore, they look at the loan buying and selling behaviour of a bank. Furthermore, they also check if that behaviour has any influence on the lending of the respective bank.⁸⁹ The sample consists of US commercial banks and their loan selling and buying behaviour over the period of June 1987 to 1993 (end). The data has been available on a quarterly basis.⁹⁰ The authors define their capital variable as “Capital/Risky assets = Book value of equity/(Total assets – Cash – Fed funds sold – Securities)”⁹¹. Right from the beginning it can be seen, only by looking at the characteristics of different subsamples that, banks that seem to actively manage their risks are better off. It means that banks that are selling and buying loans do have lower capital buffers and simultaneously their liquidity ratios are lower. However, it looks as if they are also engaged in most of the high risk loan activities. Furthermore, it is discovered that these banks have a higher chance of using interest-derivates.⁹²

Brewer III, Kaufmann and Wall (2008) try to find out why the capital ratios across countries differ, even though, the capital requirements are the same.⁹³ The sample is derived from bankscope and includes data from 1992 to 2005. They take the 150 biggest banks as they have been ranked in The Banker for the respective years under scrutiny. The banks have their head office in 12 different countries. Furthermore, the banks are commercial or bank holding companies. The sample does not contain cooperative banks or banks in which the government holds a significant stake in. In the end, they operate with a group that consists of 78 banks every one has been at least included in one of the years under observation.⁹⁴ The capital ratio is measured in two different ways. First, it is derived by the “ratio of a banking organization’s book value equity to the banking

⁸⁵ Kleff and Weber (2008) p.359

⁸⁶ Kleff and Weber (2008) p.359

⁸⁷ Kleff and Weber (2008) p.359

⁸⁸ Kleff and Weber (2008) p.358-359

⁸⁹ Cebenoyan and Strahan (2004) p.19, 23

⁹⁰ Cebenoyan and Strahan (2004) p.26-27

⁹¹ Cebenoyan and Strahan (2004) p.24

⁹² Cebenoyan and Strahan (2004) p.26-27

⁹³ Brewer III, Kaufman and Wall (2008) p.1-3

⁹⁴ Brewer III, Kaufman and Wall (2008) p.12-13

organization's book value total on-balance sheet assets"⁹⁵. Second, it is calculated as "the ratio of a banking organization's book value Tier 1 capital to the banking organization's book value Basel I risk-weighted on and selected off-balance sheet assets"^{96, 97}. All in all, the authors find that the bank's characteristics taken all together are significantly responsible for the capital ratios.⁹⁸ The enhanced basic model (allowing for country fixed effects) shows that these country effects, taken all together, help to clarify the differences in the capital ratios. The fact that 6 of the 10 tested country factors do have a positive relationship with the Tier I capital ratios seems to prove the argument above.⁹⁹ Moreover, both models test macroeconomic factors, which are not significant. This can indicate that these are not the only country effects that influence the capital ratios. Furthermore, it can be said that international active banks are also subject to the macroeconomic variables of their host countries. These receiving countries have also an influence on the capital ratios.¹⁰⁰

2.6.2 Risk

The relationship of risk and bank capital can be threefold. For banks that have high bank capital ratios it is expected to be positive. The more risk they have the more capital is taken on. Banks with a low ratio experience a negative relationship. The less capital they have the more risky is the bank and the more capital they need in order to make up for the risk. Therefore, these banks can try to meet the minimum capital structure by reducing their risk. However, banks that have significantly high capital ratios should not be affected at all. In this case the capital buffer theory is expected to be inapplicable.¹⁰¹

In order to better identify the influence of risk on the capital ratio, Flannery and Rangan (2008) split the period under observation into four blocks. These periods are chosen due to regulation changes within these years. The research period is divided into the following blocks: 1986-1989, 1990-1993, 1994-1997 and 1998-2001.¹⁰² Risk is measured as asset volatility, which is calculated as suggest by Ronn and Verma (1986).

⁹⁵ Brewer III, Kaufman and Wall (2008) p.13

⁹⁶ Brewer III, Kaufman and Wall (2008) p.13

⁹⁷ Brewer III, Kaufman and Wall (2008) p.18

⁹⁸ Brewer III, Kaufman and Wall (2008) p.20

⁹⁹ Brewer III, Kaufman and Wall (2008) p.21

¹⁰⁰ Brewer III, Kaufman and Wall (2008) p.21

¹⁰¹ Kleff and Weber (2008) p.357

¹⁰² Flannery and Rangan (2008) p.406, 408

The findings of risk's influence on the capital ratio are twofold significant. From 1986-1993 risk is negatively correlated (at a 5% level of significance), which is not intuitive, since a higher capital ratio should actually compensate for higher risk. On the contrary, in the other two periods risk has a positive and significant (1% level) relationship with capital.¹⁰³ Introducing a constraint that does not allow "MKTRAT"¹⁰⁴ to be influenced by stock price changes leads to the following results. Risk is still negatively correlated in the first two time blocks (earlier period at a 1% significance level and later period at 5%) followed by a positive correlation in the other periods (both results are significant at 1%). However, the effect can no longer be described as monotonically rising. Adjusting the regression one last time in a way that the wanted market equity ratio is always met does not change the outcome.¹⁰⁵

Kleff and Weber (2008) define bank risk as "risk-weighted on-balance-sheet assets over total assets"¹⁰⁶. The authors find a significantly positive relationship only for savings banks, using "CAP1"¹⁰⁷ as dependent variable. Furthermore, their results confirm the theory mentioned above because the relationship is insignificant for cooperative and all other banks. However, when looking at banks that have a high but not significantly high capital ratio the relationship becomes significantly positive. Combining regulatory pressure and risk leads to negative correlations but the results are insignificant. Generally spoken it would mean that under regulatory pressure and holding less capital the impact on bank capital is negative. This is true for both forms of dependent variables.¹⁰⁸

Cebenoyan and Strahan (2004) call their measurement risk management. They find out that banks that actually manage their assets by buying and selling loans have smaller "capital-to-risky assets"¹⁰⁹ ratios. Moreover, the results are significant. The authors take it even one step further by declaring that banks that participate in selling and buying have lower ratios compared to banks that adjust their assets only by selling loans. The findings are again significant.¹¹⁰ Another finding is that the more risk managing is

¹⁰³ Flannery and Rangan (2008) p.413-414

¹⁰⁴ Flannery and Rangan (2008) p.405

¹⁰⁵ Flannery and Rangan (2008) p.416-417

¹⁰⁶ Kleff and Weber (2008) p.359

¹⁰⁷ Kleff and Weber (2008) p.359

¹⁰⁸ Kleff and Weber (2008) p.368

¹⁰⁹ Cebenoyan and Strahan (2004) p.27

¹¹⁰ Cebenoyan and Strahan (2004) p.27-28

involved the higher is the investment in loans that are qualified as high risk loans.¹¹¹ The results show that these selling and buying loan banks have more commercial and industry loans on their books. Again, the ratio is not so high for banks that only engage in selling loans. Only one year in the sample lacks of statistic significance. The same qualitative findings are reported for commercial real estate lending behaviour.¹¹² Cebenoyan and Strahan (2004) also assume that the closer a bank watches and manages its assets and therefore, its credit risk, the less capital needs to be held. This assumption is proven to be valid. The managing activity is 8% of total loans on average and inflows and outflows seem to be cancelling each other out.¹¹³

In order to rule out reverse causality the authors conduct some more test. They find that competition in the loan selling and buying business depresses the capital-risky asset ratio. Furthermore, in an environment where the competition is not simultaneously engaged in both risk management activities, leads banks to hold more liquid assets similar qualitative effects turn out to be also true for lending. Furthermore, in the case where competition is engaged in the risk managing market banks have more loans on their books. This is true for commercial and industry as well as for real estate loans. The results have the same quality for both “multi-bank and multi-state BHCs”¹¹⁴. The only difference lays in the coefficients which turn out to be higher in the multi-state BHCs.¹¹⁵

Brewer III, Kaufman and Wall (2008) do not talk about asset risk but bank risk. This variable is defined as “dividing a banking organization’s Basel I risk-weighted assets (RWA) by its total on-balance sheet assets”¹¹⁶. In their analyses the result is also twofold. On the one hand, the relationship is positive with the leverage ratio and on the other it is negative with the Tier I capital ratio. Moreover, both results are significant.¹¹⁷ The quality of the above results does not change even when extending the basic model with country fixed variables.¹¹⁸ The qualitative relationship of both capital ratios is still valid in the model including regulatory factors. Both correlations are significant.¹¹⁹

¹¹¹ Cebenoyan and Strahan (2004) p.28-29

¹¹² Cebenoyan and Strahan (2004) p.31-32

¹¹³ Cebenoyan and Strahan (2004) p.32-33

¹¹⁴ Cebenoyan and Strahan (2004) p.28

¹¹⁵ Cebenoyan and Strahan (2004) p.34-35

¹¹⁶ Brewer III, Kaufman and Wall (2008) p.14

¹¹⁷ Brewer III, Kaufman and Wall (2008) p.19

¹¹⁸ Brewer III, Kaufman and Wall (2008) p.20

¹¹⁹ Brewer III, Kaufman and Wall (2008) p.22

Table 1: The influence of risk on the equity ratio

	Relationship	Significance
Flannery and Rangan (2008)	– / +	yes, at 5% - 10% / 1%
Kleff and Weber (2008)	+	yes, at 1%
Cebenoyan and Strahan (2004)	–	yes, at 5%
Brewer III, Kaufman and Wall (2008)	+ / –	yes, at 1% - 5% / 1%, 10%

Adapted from: Flannery and Rangan (2008) p.416-417; Kleff and Weber (2008) p.368; Cebenoyan and Strahan (2004) p.32-35; Brewer III, Kaufman and Wall (2008) p.19-22

2.6.3 Charter Value

In theory, the charter value is highly important to banks. Therefore, banks are willing to take on less risk or debt on their balance sheets.¹²⁰

Flannery and Rangan (2008) do indeed reveal that the charter value and the bank capital ratio are positively related. These findings are significant. Moreover, this is true for all three regressions (basic, no stock price effects, obtained equity ratio over time).¹²¹

Table 2: The influence of the charter value on the equity ratio

	Relationship	Significance
Flannery and Rangan (2008)	+	yes, at 1%

Adapted from: Flannery and Rangan (2008) p.416

2.6.4 Profitability

Profitability indicates the ability of a bank to build up equity through internal reserves. Therefore, profitability and bank capital are expected to be positively related. This behaviour actually is predicted by the Pecking Order Theory.¹²²

Flannery and Rangan (2008) measure profitability as “Ratio of net operating income to book value of total assets”¹²³. They find a positive and highly significant relationship between that variable and bank capital.¹²⁴

¹²⁰ Flannery and Rangan (2008) p.406

¹²¹ Flannery and Rangan (2008) p.416

¹²² Myers and Majluf (1984) in Kleff and Weber (2008) p.357

Furthermore, Kleff and Weber (2008) expect profitability to be highly valued by savings banks since it is their first resource of generating equity.¹²⁵ As measure for profitability they use ROA, which is calculated the following way: “annual net profit, net of provisions and after taxes divided by total assets.”¹²⁶ As predicted the profitability and bank capital is positively and significantly related for savings and cooperative banks. However, it is not significant for other banks. This is true for both capital ratios.¹²⁷

Brewer III, Kaufman and Wall (2008) conduct their analyses with the variable called profitability. They find a positive correlation with both capital ratios. However, there is a difference as far as the significance is concerned: the “Tier 1 capital ratio”¹²⁸ turns out to be significant at 5%, whereas the result for the leverage ratio only shows significance at 10%.¹²⁹ Introducing country fixed effects into the basic model does not change the direction of the relationships between capital and profits. However, the results lose their significance.¹³⁰ Including regulatory variables in the regression does not change the quality of the findings above.¹³¹

Table 3: The influence of profitability on the equity ratio

	Relationship	Significance
Flannery and Rangan (2008)	+	yes, at 1%
Kleff and Weber (2008)	+	yes, at 1%
Brewer III, Kaufman and Wall (2008)	+	yes, at 5% - 10%

Adapted from: Flannery and Rangan (2008) p.416; Kleff and Weber (2008) p.366-367, 369; Brewer III, Kaufman and Wall (2008) p.21-22

¹²³ Flannery and Rangan (2008) p.413

¹²⁴ Flannery and Rangan (2008) p.416

¹²⁵ Kleff and Weber (2008) p.358

¹²⁶ Kleff and Weber (2008) p.361

¹²⁷ Kleff and Weber (2008) p.366-367, 369

¹²⁸ Brewer III, Kaufman and Wall (2008) p.20

¹²⁹ Brewer III, Kaufman and Wall (2008) p.20

¹³⁰ Brewer III, Kaufman and Wall (2008) p.21

¹³¹ Brewer III, Kaufman and Wall (2008) p.22

2.6.5 Size

Larger banks are assumed to have lower capital ratios because they have easier access to the various methods of funding.¹³² Furthermore, larger banks have the advantage of holding a more diversified portfolio which can decrease the bank capital even further. Moreover, fixed direct bankruptcy costs weigh less heavily on larger banks.¹³³

Flannery and Rangan (2008) define size as “natural logarithm of total assets”¹³⁴. The relationship is significantly negative, which means the bigger a company the lower is the capital ratio. This is true for the basic regression.¹³⁵

Kleff and Weber (2008) find different results depending on which kind of bank the attention is drawn to. Size is calculated the following way: “natural log of total assets”¹³⁶. Savings banks do experience a significant and positive relationship. On the contrary, other banks show a significantly negative relationship. This is true for both dependent equity ratio variables.¹³⁷

Cebenoyan and Strahan (2004) discover in their analyses that larger banks hold indeed less capital. They use the better access to capital markets as the main argument to explain that phenomenon.¹³⁸

Brewer III, Kaufman and Wall (2008) find in their analyses similar results. The relationship between size and capital ratio is negative. This is valid, independent of how the authors define the capital ratio. However, the “Tier 1 capital ratio”¹³⁹ does not show a significant relationship.¹⁴⁰ Adding country fixed effects to the basic model does not change the effect that size has on the capital ratios. Moreover, the relationship between “Tier 1 capital”¹⁴¹ and size has become significant in those analyses.¹⁴² In their model

¹³² Flannery and Rangan (2008) p.407

¹³³ Kleff and Weber (2008) p.358

¹³⁴ Flannery and Rangan (2008) p.407

¹³⁵ Flannery and Rangan (2008) p.416

¹³⁶ Kleff and Weber (2008) p.362

¹³⁷ Kleff and Weber (2008) p.369

¹³⁸ Cebenoyan and Strahan (2004) p.27

¹³⁹ Brewer III, Kaufman and Wall (2008) p.19

¹⁴⁰ Brewer III, Kaufman and Wall (2008) p.19

¹⁴¹ Brewer III, Kaufman and Wall (2008) p.20

¹⁴² Brewer III, Kaufman and Wall (2008) p.20

which also includes regulatory factors the qualitative findings do not change and are still significant.¹⁴³

Table 4: The influence of size on the equity ratio

	Relationship	Significance
Flannery and Rangan (2008)	–	yes, at 1%
Kleff and Weber (2008)	+ / –	yes, at 1% / 1%
Cebenoyan and Strahan (2004)	–	yes, at 5% but the absolute amount decreases with size
Brewer III, Kaufman and Wall (2008)	–	yes, at 1% - 5%

Adapted from: Flannery and Rangan (2008) p.416; Kleff and Weber (2008) p.369; Cebenoyan and Strahan (2004) p.27; Brewer III, Kaufman and Wall (2008) p.20-22

2.6.6 Regulatory Pressure

This variable is assumed to show a positive relationship with the bank capital ratio. The higher the pressure the higher should be the ratio.¹⁴⁴ Moreover, not being able to meet the minimum bank capital comes at a cost which banks try to avoid.¹⁴⁵

Therefore, Flannery and Rangan (2008) define a dummy variable. The variable is one when the “BHC’s book equity capital lies within 1.5% of mandated minimum value, and zero otherwise.”¹⁴⁶ However, the results indicate that regulation does not have an influence on bank capital.¹⁴⁷

Additionally, Kleff and Weber (2008) also define a dummy variable. It is “based on lagged capital and equals unity if the ratio of capital over risk-weighted assets is within one standard deviation of a certain threshold and zero otherwise.”¹⁴⁸ The threshold is defined as 25 percentile of the least capitalised bank in Germany.¹⁴⁹ For savings and cooperative banks the findings are not significant if the dependent variable is defined as

¹⁴³ Brewer III, Kaufman and Wall (2008) p.22

¹⁴⁴ Flannery and Rangan (2008) p.413

¹⁴⁵ Kleff and Weber (2008) p.361

¹⁴⁶ Flannery and Rangan (2008) p.413

¹⁴⁷ Flannery and Rangan (2008) p.416

¹⁴⁸ Kleff and Weber (2008) p.362

¹⁴⁹ Kleff and Weber (2008) p.362

“CAP1”¹⁵⁰. However, taking “CAP2”¹⁵¹ as dependent variable reveals significantly positive results.¹⁵²

Table 5: The influence of regulatory pressure on the equity ratio

	Relationship	Significance
Flannery and Rangan (2008)	–	No
Kleff and Weber (2008)	+	yes, at 1% - 5%

Adapted from: Flannery and Rangan (2008) p.416; Kleff and Weber (2008) p.368

2.6.7 Deposits from non-bank customers

This can be a variable to measure competition. Non-bank deposits are longed for by banks because on these deposits the interest rate is relatively low. For other deposits or bank deposits, banks have to pay a larger interest rate. Theory suggests that the higher the bank deposit ratio “(BDR)”¹⁵³ the higher the bank capital. This is due to the fact that if a bank already has lots of different depositors they can even find more new depositors.¹⁵⁴

Kleff and Weber (2008) calculate the variable as follows “ratio of all liabilities to non-bank customers¹⁵⁰ divided by total assets”¹⁵⁵. They find that all other banks’ bank capital ratios are highly negatively correlated. Heterogeneity can cause this result because banks, which serve only small markets, tend to have less customer deposits which they try to compensate with higher bank capital ratios. Therefore, when adjusted for high capital ratios the relationship becomes less strong. Additionally, Kleff and Weber (2008) find that bank capital of cooperative banks is significantly positive related. This seems intuitive since the variable deposits from non-banks is one of their main sources of financing. The highly significant results come from the “CAP1”¹⁵⁶ regression.¹⁵⁷

¹⁵⁰ Kleff and Weber (2008) p.359

¹⁵¹ Kleff and Weber (2008) p.359

¹⁵² Kleff and Weber (2008) p.368

¹⁵³ Kleff and Weber (2008) p.361

¹⁵⁴ Kleff and Weber (2008) p.361

¹⁵⁵ Kleff and Weber (2008) p.361

¹⁵⁶ Kleff and Weber (2008) p.359

¹⁵⁷ Kleff and Weber (2008) p.369

Table 6: The influence of deposits from non-bank customers on the equity ratio

	Relationship	Significance
Kleff and Weber (2008)	– / +	yes, at 1% - 5% / 1% - 10%

Adapted from: Kleff and Weber (2008) p.369

2.6.8 Loan Loss Provisions

Provisions can be considered as an indicator for portfolio risk. Moreover, they show in what shape a bank is. Therefore, a negative correlation with bank capital can mean that an already troubled bank does experience greater difficulties raising new equity. On the other hand, a positive correlation can indicate that troubled banks want to compensate their misery with higher capital ratios.¹⁵⁸

Kleff and Weber (2008) define “new loan loss provisions over total assets (*PROV*)”¹⁵⁹ to represent the variable loan loss provisions.¹⁶⁰ They find a significant and positive relationship in all three bank categories and both capital ratios. However, the impact is especially severe for savings and cooperative banks. They seem to build a higher capital buffer, which means that they are taking on additional capital in excess to what is required by law.¹⁶¹

Table 7: The influence of loan loss provisions on the equity ratio

	Relationship	Significance
Kleff and Weber (2008)	+	yes, at 1% - 10%

Adapted from: Kleff and Weber (2008) p.369;

2.6.9 Mergers

In Germany, mergers have been quite common for banks. Since mergers can obviously change the bank capital ratio, mergers need to be considered.¹⁶²

¹⁵⁸ Kleff and Weber (2008) p.361

¹⁵⁹ Kleff and Weber (2008) p.361

¹⁶⁰ Kleff and Weber (2008) p.361

¹⁶¹ Kleff and Weber (2008) p.369

¹⁶² Kleff and Weber (2008) p.362

Kleff and Weber (2008) define a dummy variable in order to capture the effects of mergers. The variable is one when the bank has been involved in a merger, more specific, if the bank has been the acquirer.¹⁶³ The results are weak. Savings and other banks seem to experience a significant positive relationship for both capital ratios. However, there can not be drawn any conclusion of how mergers exactly do influence the bank capital ratio.¹⁶⁴

Table 8: The influence of mergers on the equity ratio

	Relationship	Significance
Kleff and Weber (2008)	+	yes, at 1% - 10%

Adapted from: Kleff and Weber (2008) p.370

2.6.10 Ownership

Cebenoyan and Strahan (2004) test if the amount of capital held does depend on the ownership, more precisely they want to find out if “BHC affiliation”¹⁶⁵ influences the capital. The authors find that the relationship is negative and significant. However, in cases where the bank is related to bank holding companies in different states the correlation is positive and also highly significant. They explain this by the fact that the more states are involved the more regulations are applied to the bank and therefore, it might have to hold a higher amount of capital.¹⁶⁶

Furthermore, the influence of ownership is discussed in this paper, whenever the results are split up according to the different types of banks (savings, cooperative, etc).

Table 9: The influence of ownership on the equity ratio

	Relationship	Significance
Cebenoyan and Strahan (2004)	- / +	yes, at 5% for both

Adapted: Cebenoyan and Strahan (2004) p.27

¹⁶³ Kleff and Weber (2008) p.362

¹⁶⁴ Kleff and Weber (2008) p.370

¹⁶⁵ Cebenoyan and Strahan (2004) p.27

¹⁶⁶ Cebenoyan and Strahan (2004) p.27

2.6.11 Economic cycle

Brewer III, Kaufman and Wall (2008) test in their model the relationship between capital ratios and different GDP variables. They do discover a positive correlation between real change in GDP and capital ratios. However, the results do not show any significance.¹⁶⁷

Table 10: The influence of the economic cycle on the equity ratio

	Relationship	Significance
Brewer III, Kaufman and Wall (2008)	+	No

Adapted from: Brewer III, Kaufman and Wall (2008) p.21

2.6.12 Importance of Banks for the Environment

A less friendly environment for possible bailouts, accompanied by less “federal safety”¹⁶⁸ (deposit insurance) could motivate banks to take on more equity.¹⁶⁹

Brewer III, Kaufman and Wall (2008) define a variable as “The extent to which a country’s financial system is bank-based (*BANK*) is estimated by taking the total assets of the banking system divided by the country’s gross domestic product”¹⁷⁰. The relationship with capital ratios is negative and significant.¹⁷¹ Adding regulatory factors into the regression does not change that direction. However, this time the significance is only given for the leverage ratio.¹⁷² The model with regulatory variables only reveals insignificant results.¹⁷³

Table 11: The influence of importance of banks for the environment on the equity ratio

	Relationship	Significance
Brewer III, Kaufman and Wall (2008)	–	yes, at 10%

Adapted from: Brewer III, Kaufman and Wall (2008) p.22

¹⁶⁷ Brewer III, Kaufman and Wall (2008) p.21

¹⁶⁸ Flannery and Rangan (2008) p.393

¹⁶⁹ Flannery and Rangan (2008) p.403-404

¹⁷⁰ Brewer III, Kaufman and Wall (2008) p.14

¹⁷¹ Brewer III, Kaufman and Wall (2008) p.21

¹⁷² Brewer III, Kaufman and Wall (2008) p.22

¹⁷³ Brewer III, Kaufman and Wall (2008) p.22

2.7 The Determinants of Liabilities – Empirical Evidence

2.7.1 Data

All the analyses of Gropp and Heider (2010) are based on a sample consisting of “the 200 largest publicly traded banks in the United States and 15 EU countries from 1991 to 2004”¹⁷⁴. They perform regressions with different dependent variables for leverage: one variable is defined as “one minus the ratio of equity over assets in market values”¹⁷⁵ and another is derived the same way but in book values.¹⁷⁶ The authors run the regressions in which the dependent variable (the leverage) is split up in deposits and non-deposits, because they want to know which factors influence the amount of deposits held. This is done by calculating both market and book values.¹⁷⁷ The book value of deposits is defined as “total deposits/book value of assets”¹⁷⁸ and the market value as “total deposits/market value of assets”¹⁷⁹.¹⁸⁰

2.7.2 Risk

Gropp and Heider (2010) find in their regressions for both market and book value leverage a negative relationship. This result is statistically significant at the 1% level.¹⁸¹ Controlling for banks’ fixed effects does not change the strong and negative correlation. Furthermore, when looking at the decomposed leverage regressions it can be seen that risk and non-deposit liabilities and deposits are negatively related for both market and book values. However, none of these findings are significant.¹⁸²

Table 12: The influence of risk on leverage

	Relationship	Significance
Gropp and Heider (2010)	–	yes, at 1%

Adapted from: Gropp and Heider (2010) p.605-606

¹⁷⁴ Gropp and Heider (2010) p.588

¹⁷⁵ Gropp and Heider (2010) p.596

¹⁷⁶ Gropp and Heider (2010) p.596-598

¹⁷⁷ Gropp and Heider (2010) p.602-605

¹⁷⁸ Gropp and Heider (2010) p.618

¹⁷⁹ Gropp and Heider (2010) p.618

¹⁸⁰ Gropp and Heider (2010) p.603-604

¹⁸¹ Gropp and Heider (2010) p.601-602

¹⁸² Gropp and Heider (2010) p.605-606

2.7.3 Profitability

Gropp and Heider (2010) reveal a negative and highly significant relationship between profits and leverage (measured in book values as well as in market values).¹⁸³ The results are consistent with the regression that includes banks' fixed effects.¹⁸⁴ Looking at the influence of profits on non-deposit liabilities shows a highly positive correlation for both market and book values. These results are significant at the 1% level. The relationship is exactly the other way for deposits.¹⁸⁵

Table 13: The influence of profitability on leverage

	Relationship	Significance
Gropp and Heider (2010)	- / +	yes, at 1% / 1%

Adapted from: Gropp and Heider (2010) p.605-606

2.7.4 Size

The regressions for both market and book values of leverage show a positive relationship. Moreover, the significance is 1%.¹⁸⁶ Taking banks' fixed effects into account reduces the significance for the market leverage to only 5% and for the book leverage all the significance is gone.¹⁸⁷ Furthermore, using deposits as dependent variable reveals a highly significantly negative relationship. Again, the results are vice versa for the non-deposit liabilities. This means that larger banks are less financed with deposits.¹⁸⁸

Table 14: The influence of size on leverage

	Relationship	Significance
Gropp and Heider (2010)	+ / -	yes, at 1% - 5% / 1% - 5%

Adapted from: Gropp and Heider (2010) p.597-599, 605-607

¹⁸³ Gropp and Heider (2010) p.597-599

¹⁸⁴ Gropp and Heider (2010) p.606-607

¹⁸⁵ Gropp and Heider (2010) p.605-606

¹⁸⁶ Gropp and Heider (2010) p.597-599

¹⁸⁷ Gropp and Heider (2010) p.606-607

¹⁸⁸ Gropp and Heider (2010) p.605

2.7.5 Collateral

The advantage of banks is the fact that they enlarge the amount of collateral available. The outside investors are only able to collect parts of the loan which again can be used as collateral. The ability of the banker to increase that value enables to raise a higher amount of loan that serves as collateral.¹⁸⁹

The studies of Gropp and Heider (2010) indicate a positive relation between liabilities and collateral. The significance is with 5% higher for the market leverage and lower for the book leverage (10%).¹⁹⁰ The addition of banks' fixed effects into the regressions results in a total loss of significance for both measures of leverage.¹⁹¹ Furthermore, the deposits are negatively related with the leverage. This is true for market and book values but only the market leverage shows a low significance at the 10% level. The non-deposit liabilities are again equipped with the opposite sign and significant at the 10% level in both cases. Therefore, it can be assumed that banks with more collateral are more likely to be financed with deposits.¹⁹²

Table 15: The influence of collateral on leverage

	Relationship	Significance
Gropp and Heider (2010)	+ / -	yes, at 5% -10% / 10%

Adapted from: Gropp and Heider (2010) p.605

2.7.6 Dividends

The variable dividends is negatively related with book and market leverage. The findings in the study of Gropp and Heider (2010) are significant at a 1% level.¹⁹³ The banks' fixed effects regression leads to insignificant results.¹⁹⁴ Furthermore, deposits and non-deposit liabilities experience a negative relationship. However, the results are insignificant.¹⁹⁵

¹⁸⁹ Diamond and Rajan (2000) p.2445

¹⁹⁰ Gropp and Heider (2010) p.597-599

¹⁹¹ Gropp and Heider (2010) p.607

¹⁹² Gropp and Heider (2010) p.605

¹⁹³ Gropp and Heider (2010) p.597-599

¹⁹⁴ Gropp and Heider (2010) p.607

¹⁹⁵ Gropp and Heider (2010) p.605

Table 16: The influence of dividends on leverage

	Relationship	Significance
Gropp and Heider (2010)	–	yes, at 1%

Adapted from: Gropp and Heider (2010) p.605, 607

2.7.7 Market-to-Book-ratio

Gropp and Heider (2010) find a highly significant and negative relationship for that variable leverage in book and as well as in market values.¹⁹⁶ However, when adding bank fixed effects the results are still highly significant but only negative for the market leverage.¹⁹⁷ Moreover, in market values the variable is highly significant and negatively related with deposits and non-deposit liabilities. The relationship for book values is still negative but insignificant for both dependent variables.¹⁹⁸

Table 17: The influence of Market-to-Book-ratio on leverage

	Relationship	Significance
Gropp and Heider (2010)	–	yes, at 1% / 1% - 5%

Adapted from: Gropp and Heider (2010) p.605, 607

2.7.8 Deposit Insurance

Gropp and Heider (2010) want to find out what influence deposit insurance has on leverage. Deposit insurance is defined in two ways: first, “by per capital deposit insurance divided by per capita GDP”¹⁹⁹ and second by per capital deposit insurance “divided by average deposits per depositor”^{200, 201}. The results reveal a positive and significant relationship with the market leverage. The significance for the first variable is at 5% and even higher for the second one (1%). However, the book leverage does not experience any significance for the first variable and only a small significance (10% level) for the other variable. Furthermore, when including bank characteristics than

¹⁹⁶ Gropp and Heider (2010) p.597-599

¹⁹⁷ Gropp and Heider (2010) p.607

¹⁹⁸ Gropp and Heider (2010) p.605

¹⁹⁹ Gropp and Heider (2010) p.610

²⁰⁰ Gropp and Heider (2010) p.610

²⁰¹ Gropp and Heider (2010) p.609-610

there is no more significance of any kind. Therefore, the authors conclude that deposit insurance does not influence the liabilities of a bank.²⁰²

Table 18: The influence of deposit insurance on leverage

	Relationship	Significance
Gropp and Heider (2010)	+	yes, at 1% -10%

Adapted from: Gropp and Heider (2010) p.610-611

3 Bank Capital and Regulation

It is assumed that regulators are driven by the following two reasons: first, it is desired to create a stable environment, which means preventing banks from failing and the costs that are associated with it and second, regulators try to keep the output balanced since lending is crucial in a working economy.²⁰³ Furthermore, a minimum required standard of capital is assumed to mitigate principal agent problems. The most important one is called moral hazard. This event occurs when deposits are insured and therefore, a bank is willing to take on excessive risk since it knows that in a bust the depositors are protected. These costs of protection are not included in the bank's calculations.²⁰⁴

3.1 Bank regulation in theory

Diamond and Rajan (2000) describe the consequences of minimum capital requirements in their model as follows. They are talking about "a minimum capital-to-asset ratio".²⁰⁵ It is said that more capital is assumed to make a bank more secure in respect to bank runs. On the other hand, more capital offers the banker to make higher gains since the equity holders can not threaten to start a bank run. The introduction of regulations such as prohibition of any new deposits creates the following scenarios. The maximum pay out at $t=2$ is the loan on the banker's book. However, the new demanding rules for capital do not change the banker's bargaining power which is his ability to sell

²⁰² Gropp and Heider (2010) p.610-611

²⁰³ Estrella (2004) p.1476-1477

²⁰⁴ Van den Heuvel (2008) p.298

²⁰⁵ Diamond and Rajan (2000) p.2454

the borrower's assets. Therefore, the capital regulations constrict a banker's actions but not his bargaining power.²⁰⁶ Two different outcomes can be observed by "shortening of the banker's horizons"²⁰⁷. Borrowers who do not have much liquidity will be shut down by the banker, medium liquid funds are forced to higher payments and clients with substantial liquidity face lower payments. In the worst case scenario this can lead to a situation in which borrowers, who are low on liquidity and would need cash can not get access to funding. The burden is borne by the weaker. Therefore, higher capital requirements seem to benefit the substantially liquid borrowers. This is an effect that is not intended by the regulator. If the adjustment to higher capital is not made in a decent way it can even lead to bank run itself because the depositors that are left over might fear that their money is at risk.²⁰⁸

Capital regulation is important in order to insure that banks hold the optimal amount of capital. In a situation where the supply of credit is smaller than the potential investment project available banks would prefer not to hold any capital. Only deposits are on the liability side of a bank's balance sheet. Furthermore, the interest rate would be as high as possible in order to maximize a bank's profit. A higher interest payment motivates a bank to invest relatively more in monitoring. Under the assumption that deposit insurance is free its real costs are underestimated. Therefore, regulation would increase social welfare by taking into account the external deposit insurance costs by forcing banks to hold at least some capital which increases a bank's interests in monitoring. The amount held introduces costs which should not outweigh the positive effects such as monitoring and social welfare. So in a situation with a great supply of valuable projects regulation's required amount of equity is higher than the amount that would be held in the market equilibrium.²⁰⁹

Dietrich and James (1983) mention another argument why regulation should have an influence on capital structure. They talk about a dilemma between shareholders and the deposit insurer. In a world with 100 percent deposit insurance, additional capital only benefits the insurer since his exposure is better protected. Shareholders, however, would prefer to hold less capital in this situation. This could be even less capital than optimal.

²⁰⁶ Diamond and Rajan (2000) p.2454-2455

²⁰⁷ Diamond and Rajan (2000) p.2455

²⁰⁸ Diamond and Rajan (2000) p.2455

²⁰⁹ Allen, Carletti and Marquez (2006) p.10-13

Therefore, a regulator should exist.²¹⁰ In an environment without full deposit insurance the shareholders' desire for capital depends on various factors: "the extent of deposit insurance coverage, the degree of monopoly power in the bank's loan market, and the effectiveness of deposit rate ceilings on partially insured deposits"²¹¹.

3.2 Cyclical behaviour of bank capital and regulation

Estrella (2004) introduces a dynamic model which indicates that the optimal capital does not only vary over time but shows a cyclical pattern. The correlated variables are value at risk, external capital flows, net capital changes and the optimal capital.²¹²

In the model banks try to minimize the following three types of costs: holding, bankruptcy and adjustment costs.²¹³ Bank lending and the probability of bank failure do have a positive relationship. Furthermore, regulation can have an impact on bank lending as well as the overall economic output. In cases in which the regulator defines the maximum amount of probability of failure allowed, the following can happen. Banks cut their lending activities in order to avoid costs associated with taking on fresh capital. Additionally, output might decrease too since it has a positive relationship with lending which is again positively correlated with the probability of failure. Regulators only tend to influence the output when the associated failing costs get too high. Otherwise, no interference would be made. However, there can be situations in which regulator's measures are beneficial. When there is a mispriced situation that would motivate banks to increase lending while - at the same time - the disproportionally goes up, regulators can again help to establish a social equilibrium. The measures taken by regulators can be twofold: either via a maximum amount of allowed probability of failure or via defined initial capital and value at risk or via the accounting based rule of loan loss concept.²¹⁴

The findings of the study are the following: the optimal capital and the value at risk concept do have some contradictions. In economic booms the optimal capital can be higher than the amount required by the value at risk method. This can lead banks to

²¹⁰ Dietrich and James (1983) p.1651-1652

²¹¹ Taggart and Greenbaum (1978) in Dietrich and James (1983) p.1652

²¹² Estrella (2004) p.1469

²¹³ Estrella (2004) p.1472

²¹⁴ Estrella (2004) p.1477-1478

drop their capital rate or they might use this high rate in order to take on less valuable loans.²¹⁵

However, in the turndown cycle banks might not meet the minimum required standards by value at risk. In order to strengthen their ratios banks can either cut lending and, or adjust their liability side. Banks would not opt to get their ratios up by taking on new capital since this is too expensive in this model.²¹⁶

Estrella (2004) brings the model to a test. Therefore, annual data from US commercial banks is used. The sample period lasts from 1984 until 2001. The adjustment costs in the model are related to changes in external capital. That leads to the assumption that the net external capital does not differ from zero, if than not by much. This is proven valid. Moreover, high income can imitate a swap from more costly external to internal capital, this effect is also found in the study. However, high losses make it necessary to raise additional capital in order to sustain the ratios required. Furthermore, a negative relationship between fresh capital issued and net income is assumed. However, net income and net change in capital are supposed to reveal a positive correlation. Those assumptions turn out to be valid too.²¹⁷

All in all, it can be said that in situations where adjustment costs are excluded, optimal capital and minimum value at risk requirements paths are similar. Furthermore, value at risk can only be used to measure differences in the initial capital and the capital of a later period. Including adjustment costs does create the problem of incompatibility between value at risk and optimal capital. The change in the optimal capital and the value at risk do experience a negative relationship. However, the value at risk and the best net fresh non- internally issued capital move in the same direction. Therefore, a procyclical relationship is assumed when analysing value at risk and the amount of capital.²¹⁸

This correlation can be mitigated by introducing various measures. The negative impact of value at risk and optimal capital on a bad economy has to be avoided. Moreover, regulations need to be set in place when the optimal capital and the value at risk path do differ too much in a flourishing economy. Last, maybe the implemented measures should follow an anti-cyclical direction in order to be most effective.²¹⁹

²¹⁵ Estrella (2004) p.1488

²¹⁶ Estrella (2004) p.1488

²¹⁷ Estrella (2004) p.1489

²¹⁸ Estrella (2004) p.1493

²¹⁹ Estrella (2004) p.1493

Khorana and Perlman (2010) look at the 150 largest banks of the US and do find a procyclical relationship. However, it turns out that this behaviour is actually very dangerous and might decrease the value of a bank in the future. This becomes obvious when looking at the time before, during and after the financial crisis. In their sample they show that in the period of January 2003 and December 2007 banks pursued a procyclical strategy. This means that in a time of prosper banks reduced their equity by buying back shares and distributed dividends in the amount of \$330 billion. However, during the financial crisis they have been forced to increase their capital. Additional \$180 billions have been issued. Unfortunately, the issue prices have been lower than the previous share repurchase prices. It can be seen that existing shareholders have lost in comparison to the selling shareholders.²²⁰

3.3 Capital Regulation over time

The optimal capital structure of banks is defined in two ways: first, by the market constraints and second, by the regulatory constraints. This leads to a problem since the market values everything in market prices, whereas the regulatory constraints come in book values. Significant differences do evolve in accounting rules such as the US GAAP. Applying specific rules can lead to changes in book values (lease-back plan, loss and gain realisation).²²¹

3.3.1 The development up to now

Capital minimum requirement standards are applied in order to protect the public from being forced to bear severe costs. Having too much risk on the balance sheet can make a bank vulnerable to shocks. Furthermore, in such an event a bank might need to use its deposit insurance or in the worst case scenario needs to be bailed out by the state. These two cases come at costs for the public and therefore, need to be successfully circumvented. The capital serves as additional buffer that is used before public funds need to be tapped.²²²

However, regulations protect the above mentioned interests but are only in place since 1981 in the United States. The introduction of regulations is formally established in the

²²⁰ Khorana and Perlman (2010) p.94

²²¹ Flannery and Rangan (2008) p.395

²²² Ennis and Price (2011) p.2

International Lending Supervision Act. Nevertheless, these rules have been far from being perfect and critics have pointed out that the equal treatment of assets with different risks stimulates a wrong behaviour of banks. Meaning, that if the same capital requirement is applicable for different risks, than banks are better off to invest in high risk assets that at the same time promise higher returns.²²³

Before Basel I has been set into place the US regulation of banks was defined the following:

- “primary” capital²²⁴ >5,5% which included equity and loan loss reserves²²⁵
- “secondary” capital²²⁶ >6% which mostly consisted of subordinated debentures²²⁷

In order to level the playing field in the banking sector and to avoid regulatory arbitrage the Group of Ten committed to the Basel I regulations.²²⁸

Basel I has tried to find a way to better reflect risk related to the required equity. Therefore, two forms of capital were defined:

- Tier 1 capital: “includes common equity, noncumulative preferred stock, and minority interests in consolidated subsidiaries.”²²⁹
- Tier 2 capital: “includes the loan loss allowance (up to a maximum of 1.25% of RWA), cumulative and limited-life preferred stock, subordinated debentures and certain hybrid securities (such as mandatory convertible debt).”²³⁰

The RWA are divided into four different categories and should make up for the weakness of the first regulations in the U.S. However, it has been criticised that, even though, there is now a distinction between assets risks, that there is still missing a mechanism to account for risk that is not defined as credit risk. Basel II has been created in 2004 to adjust for these weaknesses. The rating for credits can either be done by rating agencies or by the individual internal rating system of banks.²³¹

Basel I (and so does Basel II) requires banks to hold a certain amount of Tier 1 capital, which is 4% of RWA. Furthermore, Tier 1 and Tier 2 capital together have to be over

²²³ Ennis and Price (2011) p.2

²²⁴ Flannery and Rangan (2008) p.397

²²⁵ Flannery and Rangan (2008) p.397

²²⁶ Flannery and Rangan (2008) p.397

²²⁷ Flannery and Rangan (2008) p.397

²²⁸ Ennis and Price (2011) p.2

²²⁹ Flannery and Rangan (2008) p.397

²³⁰ Flannery and Rangan (2008) p.397

²³¹ Ennis and Price (2011) p.2-3; Monroe (2010) p.33-34

8% of RWA.²³² This is necessary to lessen the principal –agent problem that arises between depositors and banks.²³³ The FDICIA has tightened the constraints even more by requiring Tier 1 and Tier 2 capital of 5% and 10%, respectively.²³⁴

3.3.2 The future outlook

The financial crisis brought to attention that the composition of capital is crucial. Therefore, it matters of which components and of what quantity the Tier 1 capital is formed. Consequently, common capital has become popular, since it seems to be of high quality and for this reason Tier 1 capital should hold large quantities of that capital.²³⁵ The change of capital ratios is currently discussed and might be considered in the new Basel III regulations.²³⁶ The overall intention of the new regulation is to make it applicable to all banks, not just the biggest ones.²³⁷

In an environment in which the asset quality of many assets deteriorates, the composition of capital is vital. In this case losses can no longer be balanced out by hybrid and common equity.²³⁸ This change in capital valuation shifts value from "total Tier 1 to an emphasis on the distinction between loss absorbing or going concern capital"²³⁹ versus non-loss absorbing or "gone concern" capital"²⁴⁰. This distinction should make sure that in the first case, which is expressed as Tier 1 capital, a bank is able to operate although it experiences some losses along the way. The second kind of capital, defined as Tier 2 capital, is supposed to ensure that in the event of bankruptcy the stakeholders (depositors and senior creditors) can be paid.²⁴¹

Additionally, regulation might intend to give an incentive for anticyclical behaviour because the procyclical management has turned out to hurt banks in the long run.²⁴²

It has been discussed to also introduce a liquidity ratio but this idea has been put aside due to extensive criticism. Nevertheless, it is still on the mind of the committee and it is

²³² Flannery and Rangan (2008) p.397

²³³ Gropp and Heider (2010) p.594

²³⁴ Flannery and Rangan (2008) p.397

²³⁵ Khorana and Perlman (2010) p.94

²³⁶ Khorana and Perlman (2010) p.95

²³⁷ Ennis and Price (2011) p.3

²³⁸ Khorana and Perlman (2010) p.96-97

²³⁹ Khorana and Perlman (2010) p.98

²⁴⁰ Khorana and Perlman (2010) p.98

²⁴¹ Khorana and Perlman (2010) p.105

²⁴² Khorana and Perlman (2010) p.100

just postponed. Furthermore, in these times liquidity is important and monitored even though it is not part of the actual Basel Accord.²⁴³

In the end, the influence of higher capital ratios on the economy can only be estimates because there is no prior experience.²⁴⁴

3.4 The Cost of Regulation

Regulation is supposed to create benefits. However, Van den Heuvel (2008) argues that regulation comes at a cost. This negative impact is caused by the fact that a bank is hindered to create the maximum amount of liquidity. The best way to produce liquidity is through deposits. If the amount of deposits is limited or a certain amount of equity is required, than the possible liquidity that banks could offer differs from the optimal liquidity. The costs are related to how good a bank is when it comes to liquidity creation.²⁴⁵ Furthermore, if regulators would be able to perfectly supervise and detect excessive risk taking of each individual bank, than regulation could be applied to the respective bank's capital adequacy ratios. Since this is not possible an overall regulation is imposed and that leads to these welfare costs.²⁴⁶

The author manages to set up a model and more importantly an equation that can actually measure these costs. The formula looks the following way:

$$v = \frac{d}{c} (R^E - R^D - g_D(d, L))(1 - \gamma)^{-1} \quad 247$$

This is valid under the assumption that

$$\sigma \leq \gamma R^E \quad 248$$

v = welfare loss

d = deposits

c = consumption

R^E = return on equity

R^D = return on debt

g_D = resource cost of intermediation

L = loans

γ = fraction

σ = riskiness

²⁴³ Monroe (2010) p.35

²⁴⁴ Ennis and Price (2011) p.4

²⁴⁵ Van den Heuvel (2008) p.299

²⁴⁶ Van den Heuvel (2008) p.304

²⁴⁷ Van den Heuvel (2008) p.308

²⁴⁸ Van den Heuvel (2008) p.308

This expression takes into account the importance of liquidity to households and the returns on the different investments. It needs to be pointed out that the difference of the return on equity and deposits indicates how much liquidity is worth to households. They invest in deposits to create liquidity even though, the return on the respective investment is lower. The last term with the fraction variable represents the adjustment of the amount of deposits held in the event of an altering capital adequacy ratio under the condition that everything else stays the same. The economy is assumed to be in a steady state at the beginning. However, different first steady state economies with different capital structures can not just be compared.²⁴⁹ It has to be known that the following applies: “a manifestation of the envelope theorem: these quantities are constrained optimal in the sense of social planner’s problem, so their response to a change in γ has only a second-order effect on welfare”²⁵⁰.

Additionally, the author provides a formula for the optimal capital adequacy. The following assumption needs to be valid. The social welfare can be increased by bank supervision but the supervision is not perfect. Therefore, capital needs to be employed. Furthermore, supervision and the amount of capital are positively correlated.²⁵¹

$$\max_{T, \gamma} V_0(\theta) \gamma^{252}$$

$$\gamma \beta^{-1} \geq S(T)^{253}$$

$$cv = -(dT / d\gamma) \Big|_{S(T)=\gamma \beta^{-1}} = -1 / (\beta S^d(T))^{254}$$

$T = \text{costs of supervision}$

$S = \text{supervision technology}$

It can be seen that there is always a trade off between costs and benefits (less supervision needed) of capital requirement.²⁵⁵

Van den Heuvel (2008) puts his theory to a test, when he examines the data of US commercial banks between 1993 and 2004. In the event of the capital requirement being 10% he calculates welfare costs of 0.22%. This means that at a level of 10% the loss in

²⁴⁹ Van den Heuvel (2008) p.308

²⁵⁰ Van den Heuvel (2008) p.308

²⁵¹ Van den Heuvel (2008) p.309

²⁵² Van den Heuvel (2008) p.309

²⁵³ Van den Heuvel (2008) p.309

²⁵⁴ Van den Heuvel (2008) p.309

²⁵⁵ Van den Heuvel (2008) p.309

consumption is 0.22%. Furthermore, lowering the level of capital requirement – under the assumption that everything else stays the same – creates yearly 1.bn\$. Therefore, if supervision costs are the same or even lower than the lower capital requirement can create value. Furthermore, under the assumption that deposits are not free and everything else equal the social welfare costs are 0.10% of consumption.²⁵⁶

Additionally, with the data available the author checks if the capital requirements in place are efficient. It is found that the “marginal effectiveness of supervision spending, α_s ,”²⁵⁷ is smaller than “1.6 (per billion \$)”²⁵⁸. This is calculated for a capital requirement of $\gamma=0.1$. The result is a “marginal welfare benefit of 6.2bn \$ per year”²⁵⁹. However, this is only valid if the bank supervision costs are plain spending costs. In the event where these costs take also compliance costs into account the number changes. Under the assumption that bank supervision costs consist of one third of plain spending costs and two thirds of compliance costs, α_s becomes lower than 0.53 and the benefit simultaneously increases to 18.7 bn \$. This is not the end of the story because in order to get the net gain, the welfare benefits and costs need to be analysed. Comparing the benefits to the lowest costs that can be calculated reveals that the deployed capital requirements are not efficient since the costs are higher than the benefits. Therefore, lowering the capital requirements can create value.²⁶⁰

3.5 Does Regulation define the Capital Structure?

In this part the question is, if capital regulation is indeed a binding factor or significantly influences the capital structure.

For a long time Basel I seemed to be the most important constraint when setting the amount and structure of bank capital. Gropp and Heider (2010) argue that this might not always be true. Publicly traded banks can act as firms, which means that the Pecking Order Theory can be applied and Basel I must not be a first order constraint.²⁶¹

²⁵⁶ Van den Heuvel (2008) p.309-312

²⁵⁷ Van den Heuvel (2008) p.315

²⁵⁸ Van den Heuvel (2008) p.315

²⁵⁹ Van den Heuvel (2008) p.315

²⁶⁰ Van den Heuvel (2008) p.315-316

²⁶¹ Gropp and Heider (2010) p.594

Koziol and Lawrenz (2009) introduce a model that determines a bank's optimal capital structure under the assumption that default is costly. In order to evaluate a bank's default risk, factors that influence this risk needs to be identified. In the model regulation is active and the capital ratio is adjusted via deposit changes.²⁶² Two other rather new aspects are: the introduction of a dynamic model which allows for continuous adjustment of deposits by banks and the introduction of a so-called "jump-diffusion process"²⁶³.²⁶⁴

The following trade-off has to be considered when making financing decisions: the more assets held, the higher is the return but at the same time the regulation constraint is binding at an earlier stage of time. Furthermore, it is assumed that all deposits are insured and the moral hazard problem is not an issue, which means that the regulatory constraint is always fulfilled. Additionally, a change in bank financing (increasing the amount of deposits) is costly (advertising, marketing costs). These costs are borne by equity injections. Restructuring of a bank's liabilities is necessary after a shock that has changed the value of the assets on the book. Moreover, the deposit adjustments do positively depend on the development of the value of the assets. In case of value accumulating in assets the deposits go up too and vice versa. Furthermore, the optimal capital depends also on the initial capital and restructuring barrier. If, the value of the assets drops below this barrier the bank defaults, because the value of the assets is insufficient to cover all the deposits this area is named "default region"²⁶⁵ by the authors.²⁶⁶ A bank's deposit finance decision is negatively influenced the higher the volatility, the impact of change in asset value and the relative restructuring barrier. Furthermore, costs involved in the restructuring process and regulation are also negatively correlated with the amount of deposits held. It is intuitive that less favourable assets do increase the possibility of default. On the other hand, less valuable assets induce the bank to hold fewer deposits at an earlier point of time and so reduce the risk of default. Moreover, in this case banks tend to opt to change their deposits later in time. This behaviour is only shown in the dynamic model. Therefore, the effect of assets is twofold and can not be exactly determined without further investigation.²⁶⁷

²⁶² Koziol and Lawrenz (2009) p.861-862

²⁶³ Koziol and Lawrenz (2009) p.862

²⁶⁴ Koziol and Lawrenz (2009) p.862

²⁶⁵ Koziol and Lawrenz (2009) p.865

²⁶⁶ Koziol and Lawrenz (2009) p.861-865

²⁶⁷ Koziol and Lawrenz (2009) p.867-868

The empirical outcome of Koziol and Lawrenz (2009) indicates the following. The most important risk for a bank's default is the "jump risk"²⁶⁸. They further indicate that an effective regulation needs to be based on that kind of risk.²⁶⁹

Volatility and drift do not have as substantial influence on default risk as primarily assumed. Moreover, in the dynamic model the cost of default turns out to be smaller at $t=0$. This is true under the following conditions, the drift is low and volatility is high, which leads to lower deposits in the first place. Furthermore, it can be observed that banks will restructure earlier.²⁷⁰

These observations reveal a "self-regulation mechanism"²⁷¹. Banks that are aware of the factors that influence the default risk will take countermeasures themselves, when they are confronted with weak investment alternatives. This means they do adjust their capital structure according to the risks involved even without regulatory pressure.²⁷²

Last, restructuring costs have a significant influence on the risk of default which is again measure by today's costs of default. Since these costs are not the same for all banks, it is difficult for the regulator to take account for them in the regulatory requirements.²⁷³

Dietrich and James (1983) use in their study a peer group of over 10 000 commercial banks. The banks' field of operations is limited to the US and the period is from 1971-1975.²⁷⁴ They define "ABC"²⁷⁵ as factor which should capture changes of the capital due to regulatory rules or set ups. They "test the joint hypothesis that regulation is effective and that uninsured depositors do not influence capital structure"²⁷⁶. Out of the five sample years, only two are significant. There is no significant negative relationship between the variable "ABC"²⁷⁷ and bank capital in the sample period. Therefore, the hypothesis can be rejected. There is no empirical evidence that regulation has an impact of capital structure.²⁷⁸

²⁶⁸ Koziol and Lawrenz (2009) p.862

²⁶⁹ Koziol and Lawrenz (2009) p.862

²⁷⁰ Koziol and Lawrenz (2009) p.868-870

²⁷¹ Koziol and Lawrenz (2009) p.870

²⁷² Koziol and Lawrenz (2009) p.870-871

²⁷³ Koziol and Lawrenz (2009) p.870

²⁷⁴ Dietrich and James (1983) p.1655

²⁷⁵ Dietrich and James (1983) p.1653

²⁷⁶ Dietrich and James (1983) p.1655

²⁷⁷ Dietrich and James (1983) p.1653

²⁷⁸ Dietrich and James (1983) p.1654-1655

Gropp and Heider (2010) do compare their outcome with a study about firms' capital structure determinants. It is found that banks' asset volatility and profitability is lower than the firms', whereas a higher number of banks pay dividends. Furthermore, it is noticed that the banks' leverage is much higher. The authors have found variables that do have an influence on the leverage.²⁷⁹

For example higher profits do imply less leverage but higher asset risk and collateral.

Gropp and Heider (2010) do another analysis by running a regression with the following form:²⁸⁰

$$L_{ict} = \beta_0 + \beta_1 MTB_{ict-1} + \beta_2 Prof_{ict-1} + \beta_3 Ln(Size_{ict-1}) + \beta_4 Coll_{ict-1} + \beta_5 Div_{ict} \quad 281$$

$$+ c_c + c_t + u_{ict}$$

This regression says "The dependent variable is one minus the ratio of equity over assets in market values"²⁸² and the independent variables are market-to-book ratio, profitability, size, dividend paying and special country effects. The authors discover a positive relationship between leverage, size and collateral and a negative relationship between leverage market-to-book ratio, profits and dividends. All findings are statistically significant. Therefore, regulation does not seem to be the only factor influencing bank capital.²⁸³

Furthermore, adjusting the above regression in a way to measure the dependence on the book leverage provides the same correlations. There should be some differences to the market leverage since regulation is always measured in book values. When factoring risk into the equation it shows a negative relationship with the market and book leverage. This does not support the argument that regulation has an influence on bank capital. Moreover, the result has the highest R2 in the book leverage analysis and is only outweighed by the market-to-book ratio in the market leverage analysis. On the other hand, taking risk out of the equation does not lead to the expected change in the significance of all other factors.²⁸⁴

Additionally, taking into account banks' specific fixed effects shows that they have an impact on banks' capital. They explain 76% of the leverage in market values and even more (92%) of the leverage in book values. This is another indicator that regulation is

²⁷⁹ Gropp and Heider (2010) p.593

²⁸⁰ Gropp and Heider (2010) p.596

²⁸¹ Gropp and Heider (2010) p.596

²⁸² Gropp and Heider (2010) p.596

²⁸³ Gropp and Heider (2010) p.596-598

²⁸⁴ Gropp and Heider (2010) p.596-603

not defining bank capital.²⁸⁵ Furthermore, it shows that regulation is not so much responsible for bank capital since banks to not only hold the minimum bank capital in the end.²⁸⁶

Flannery and Rangan (2008) find in their sample of the 100 largest US bank holding companies from 1896 until 2001 that banks significantly hold more bank capital than required. The mean Tier 1 capital was 7.26% in 1994 and peaked at 11.1% in 1994. Furthermore, Tier 1 and 2 capital was 9.44% in 1986 and at a high of 13.8% in 1994. This is another indicator that regulation does not ultimately define capital or constrains banks. Moreover, the authors show that the number of constrained banks has declined over the sample period. Such a bank is defined by a book capital ratio that is not higher than the regulatory demand plus 1.5%. Since the year 1992 the percentage of constrained banks is rather negligible.²⁸⁷ Flannery and Rangan (2008) also want to know if the capital ratio is higher due to regulations. They test the influence of portfolio risk on the capital ratio. This ratio is expressed in book values. The relationship is negative in three periods, which is one period longer than when conducted with “MKTRAT”²⁸⁸. However, the results show that regulation fails to provide an explanation for the development of the market equity ratio.²⁸⁹

Jokipii and Milne (2011) have observed different correlations for risk and capital buffers over time. Especially, after Basel I has been put into place, they find that banks have been interested in accumulating additional capital. This has been done to avoid any negative consequences (costs) in case of falling below the minimum capital required. Interestingly, in this period of time (the 1990ies) banks adjusted their ratios in both ways: increasing the capital buffer and, or reducing risk.²⁹⁰

²⁸⁵ Gropp and Heider (2010) p.604-608

²⁸⁶ Gropp and Heider (2010) p.608

²⁸⁷ Flannery and Rangan (2008) p.397-399

²⁸⁸ Flannery and Rangan (2008) p. 405

²⁸⁹ Flannery and Rangan (2008) p.420-421

²⁹⁰ Jokipii and Milne (2011) p.177

4 Bank Capital in Practise

4.1 The Development of Bank Capital Ratios over time

Jokipii and Milne (2008) analyse the cyclical behaviour of capital buffers of European banks. Their work has been conducted under Basel 1988 and the related capital requirements.²⁹¹ Jokipii and Milne (2008) find out that the capital buffers of European banks are significantly higher than required by the regulators. The amount of excess capital held differs from country to country. The buffers of smaller EU countries seem to be larger compared to the bigger countries. It is interesting that the buffers of the “EU15”²⁹² are smaller than the ones held by “RAM10”²⁹³ at 5.14%.²⁹⁴ “RAM10”²⁹⁵ is defined as “10 countries that joined the EU in May 2000”²⁹⁶. The sample consists of 468 banks of the “EU25”²⁹⁷ in the period of 1997 until 2004. Furthermore, the authors have divided the peer group into three subgroups: commercial, savings and co-operative banks. Additionally, banks are categorised by size into large and small banks, where a large bank is considered to have a median of at least €37 billion of balance sheet sum in 2004. Furthermore, the sample is divided into “RAM10”²⁹⁸ and “EU15”²⁹⁹. The “EU15”³⁰⁰ is again divided into the Euro area and the non-Euro area, consisting of Denmark, Sweden and UK.³⁰¹

Flannery and Rangan (2008) look at “common equity’s market value to the market value of total assets (defined as the sum of equity’s market value plus liabilities’ book value)”³⁰². Starting in 1990 the ratio has begun to rise and has hit its highest value in 1998 at 20.1%. Furthermore, the authors discovered that the asset volatility has dramatically risen to 6.09% between 1998 and 2001, compared to 1.76% in the period of 1986-1999. This higher risk could be due to the Asia crisis in 1997 and some deregulations in the banking sector. The findings indicate that banks have taken on

²⁹¹ Jokipii and Milne (2008) p.1441

²⁹² Jokipii and Milne (2008) p.1442

²⁹³ Jokipii and Milne (2008) p.1441

²⁹⁴ Jokipii and Milne (2008) p.1441

²⁹⁵ Jokipii and Milne (2008) p.1441

²⁹⁶ Jokipii and Milne (2008) p.1441

²⁹⁷ Jokipii and Milne (2008) p.1442

²⁹⁸ Jokipii and Milne (2008) p.1441

²⁹⁹ Jokipii and Milne (2008) p.1442

³⁰⁰ Jokipii and Milne (2008) p.1442

³⁰¹ Jokipii and Milne (2008) p.1441

³⁰² Flannery and Rangan (2008) p.399

larger amounts of capital since their assets have become more risky. It is not clear why they did so. Flannery and Rangan (2008) suggest that it might be because of outside pressure. Furthermore, it could also be an artefact in the sample. This means dividends do not increase as quickly and proportional as earnings, while earnings are high, the amount of dividends stays almost the same and the rest is kept in the banks as retained earnings, which automatically leads to higher equity. Moreover, a higher, maybe overvalued share price could have given incentives to the managers to even issue additional shares. Therefore, the capital would have risen without managers actively trying to build up capital to insure against default and riskier assets. On the other side, after the peak of equity capital in 1997 management seems to have taken measures to, again, increase the leverage. This was done by cutting down equity and issuing debentures.³⁰³

The increase of capital is explained by market and by passive phenomena. Flannery and Rangan (2008) precisely define five effects: shareholder demanding higher capital for riskier assets, changes in the riskiness of the underlying assets, the combination of the effects already mentioned, passive effects such as stock price changes and last other technical effects. The difference in the capital ratio between 1986-1989 and 1998-2001 is with 42% explained by the market power (shareholders' demands). However, the riskier portfolio has a negative influence (67%). The sum of these two effects and the single effects explain 87.9% of the difference. In contrast, the passive effects contribute only 3% and the technical component are responsible for 13%.³⁰⁴

Chen (2010) takes up the concept of market-values as suggested in the paper of Flannery and Rangan (2008). He analyses, how stock returns and profits influence the capital ratios of Japanese's banks over time. The sample consists of listed commercial banks from 1977 to 2009. The data is based on yearly and market value data.³⁰⁵ First value-weighted capital ratios are calculated. They are derived as the banks' individual total market capitalisation and weighted. It can be seen that also in Japan the value has been around 4.34 from 1977-1983. After that period an increase has been noticeable with the highest level of 17.9 in 1987. The following years have been characterised by a decline to 3.59 which marks the Japanese banking crisis in 2003. A recovery has been dampened by the crisis in 2007 and 3.62 marks the end of the sample period. In order to

³⁰³ Flannery and Rangan (2008) p.400-403

³⁰⁴ Flannery and Rangan (2008) p.416-420

³⁰⁵ Chen (2010) p.744-745

better analyse the variation of capital ratios, the influence of profits and changes in the stock values are separated. The author finds that the difference in capital ratios over time is caused by the expected stock return. On the contrary, the cross-sectional analysis seems to be the result of a mixture of expected profitability and stock returns.³⁰⁶

4.2 The Capital Buffer Theory

The theory of capital buffers has developed from the charter value theory. That theory takes into account that distressed banks do have much more to lose than just deposits and equity; they will also lose future profits. This motivates them to hold on to more capital than required by the regulation authorities.³⁰⁷ However, holding excess capital does come at costs, so there is a trade-off between holding additional capital and the costs of falling below the required amount. Last, the capital buffer theory should not be applicable to banks that have huge capital buffers, because their chances of falling below the minimum requirement and therefore, experiencing costs due to regulation are very low.³⁰⁸

Generally speaking, the bank capital buffer depends on the variables presented below.

4.2.1 Data

In order to better understand the influence of the different variables on the capital buffer the samples are described in this section. Several authors have conducted different analyses across different countries and time periods.

Flannery and Rangan (2008) have created a sample which has already been presented in the previous section.³⁰⁹

Fonseca and González (2010) take their data from the Databank Bankscope. They work with consolidated numbers. The sample period is from 1995-2002. After some adjustments the authors end up analysing banks from 70 different countries. A generalized method of moments estimator is used, and panel data to take account for

³⁰⁶ Chen (2010) p.751-753

³⁰⁷ Jokipii and Milne (2011) p.165-166

³⁰⁸ Kleff and Weber (2008) p.357

³⁰⁹ Flannery and Rangan (2008) p.400-402

endogeneity. The dependent variable capital buffer is given in relative values. Results do not change when using absolute values.³¹⁰

Jokipii and Milne (2011) conduct their analysis based on US commercial banks and bank holding companies. The sample period is from 1986 to 2008. The information used can be found in the Consolidated Report of Condition and Income.³¹¹

The sample of Jokipii and Milne (2008) has already been described in the section above.³¹²

Lindquist (2004) is analysing the influence of certain factors on the capital buffer of Norwegian savings and commercial banks. The period under observation is from 1995-2001 and quarterly data is used for the analyses. The author finds out that savings and commercial banks' capital buffer do indeed react differently to some of the tested variables.³¹³

Stolz and Wedow (2011) analyse the effects of the business cycle on banks' capital buffer, which is composed the following way: "banks' capital buffers (*BUF*) as the Basel capital to risk-weighted assets ratio minus 8 percent regulatory minimum"³¹⁴ ³¹⁵. As dataset 492 West German corporative and savings banks are used, only banks with positive capital buffers are taken into account. The observed period is from 1993-2001.³¹⁶

The sample and the methods of Schaeck and Cihák (2010) are already explained earlier in the thesis.

³¹⁰ Fonseca and González (2010) p.895

³¹¹ Jokipii and Milne (2011) p.167

³¹² Jokipii and Milne (2008) p.1441

³¹³ Lindquist (2004) p.499

³¹⁴ Stolz and Wedow (2011) p.100

³¹⁵ Stolz and Wedow (2011) p.98-99

³¹⁶ Stolz and Wedow (2011) p 102

4.2.2 Costs

4.2.2.1 Funding Costs

Funding costs do influence the amount of buffer that a bank holds. In general, shareholders do require a higher return on their capital since the risk involved is higher too. In case of deposit insurance lending to banks is riskless for depositors. Therefore, the interest rate asked is the risk free rate. In this event banks will not hold a capital buffer. Deposits are the cheapest way of financing because risk and capital are not related. On the other hand, when there is no or only partly deposit insurance than the rate demanded by depositors depends on the risk involved. Furthermore, an increased leverage drives up the equity interest rates too.³¹⁷ In the end, the augmented costs of deposit financing have a positive and highly significant impact on the capital buffer.³¹⁸

Table 19: The influence of funding costs on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+	yes, at 1%

Adapted from: Fonseca and González (2010) p.899

4.2.2.2 Financial Distress Costs

Financial distress costs have an impact on the buffer capital. These costs comprise legal, bankruptcy and distress costs, additionally, to the loss of the charter value. This value is even higher when the bank possesses some kind of market power.³¹⁹

Fonseca and González (2010) use the LERNER index to account for market power.³²⁰ They find that capital buffer and the LERNER are positively and significantly related; however, when using the LERNERQ the relationship changes to a negative one. They interpret the results the following: banks that have higher market power do not rely that much on capital buffers, they have other means to compensate losses.³²¹

³¹⁷ Fonseca and González (2010) p.893

³¹⁸ Fonseca and González (2010) p.899

³¹⁹ Fonseca and González (2010) p.894

³²⁰ Fonseca and González (2010) p.897

³²¹ Fonseca and González (2010) p.899

Jokipii and Milne (2011) do support the argument that banks with higher charter values have more to lose and therefore, accumulate a higher buffer. Significance is found in six out of seven models. The findings are the same if testing the risk adjusting equation. The later equation is highly significantly related in all cases.³²² Furthermore, the simultaneous equation shows a positive and significant correlation in all three specifications in the capital regression. Nevertheless, the risk equation changes to a significant negative relationship for in all cases.³²³

Table 20: The influence of financial distress costs on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+ than –	yes, at 1% both times
Jokipii and Milne (2011)	+ / –	yes, at 1%, 10% / 1%

Adapted from: Fonseca and González (2010) p.899; Jokipii and Milne (2011) p.171-174

4.2.2.3 Adjustment Costs

Adjustment costs need be considered when talking about capital buffers too.³²⁴ Banks might tend to hold more capital than required, in order to avoid costs that would occur, if elevating the level of capital on short notice.³²⁵ Furthermore, banks might want to avoid falling below the required standard, because that can result in fines. This is often true for profitable banks that pay dividends.³²⁶ It can signal the wrong information about banks when shocks are only equalled out through equity. Additionally, adjusting the capital ratio through asset adjustments takes away the possibility to stay liquid in case of upcoming profitable project.³²⁷

Fonseca and González (2010) prove that adjustment costs and capital buffers are positively related at a highly significant level. Furthermore, they confirm that adjustment costs hinder banks to achieve a total adjustment to the desired capital ratio.³²⁸

³²² Jokipii and Milne (2011) p.171-172

³²³ Jokipii and Milne (2011) p.173-174

³²⁴ Fonseca and González (2010) p.893

³²⁵ Gropp and Heider (2010) p.595

³²⁶ Gropp and Heider (2010) p.595

³²⁷ Fonseca and González (2010) p.894

³²⁸ Fonseca and González (2010) p.898-899

Jokipii and Milne (2008) find in their country group sample a positive and highly significant relationship between adjustment costs and capital buffers. However, not every group tested shows significant results. Furthermore, the non-Euro country group experiences a negative and highly significant correlation.³²⁹ Conducting analyses within the “EU15”³³⁰ group reveals that adjustment costs play the most significant role for commercial banks. For savings banks these costs are significant too, whereas co-operative banks do not seem to depend on them due to the insignificance.³³¹ There is no difference between the small and large banks when testing for the correlation with adjustment costs. The relationship is positive and significant. It can be said that these costs might be of higher importance for larger banks due to the higher significance.³³²

In Lindquist (2004) the effect of the costs of additional capital is twofold. Savings banks seem to be negatively correlated, which supports the argument that this buffer is used as insurance payment, whereas commercial banks are positively correlated.³³³

Table 21: The influence of adjustment costs on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+	Yes, at 1%
Jokipii and Milne (2008)	+ than –	yes, at 1% for both
Lindquist (2004)	– / +	yes, at 1% / 5%

Adapted from: Fonseca and González (2010) p.898-899; Jokipii and Milne (2008) p.1447-1449; Lindquist (2004) p.505-509

4.2.3 Retained Earnings

Retained earnings can have a positive effect, if they are used to build up capital. On the contrary, if big banks are motivated to hold less capital buffers due to their high earnings, than earnings do have a negative impact.³³⁴

Jokipii and Milne (2008) find in their country group analyses of European banks on a country level that the impact of return on equity on the capital buffer is significantly

³²⁹ Jokipii and Milne (2008) p.1447-1448

³³⁰ Jokipii and Milne (2008) p.1441

³³¹ Jokipii and Milne (2008) p.1449

³³² Jokipii and Milne (2008) p.1449

³³³ Lindquist (2004) p.505-509

³³⁴ Stolz and Wedow (2011) p.101; Milne (2004) in Jokipii and Milne (2008) p.1445

negative, even though, the effect does not seem to be quite large.³³⁵ Testing the influence of ROE on buffers of different kinds of banks shows similar results. In the “EU15”³³⁶ sample the coefficient of savings bank is more significant than ones of the other banks.³³⁷

Table 22: The influence of retained earnings on the capital buffer

	Relationship	Significance
Jokipii and Milne (2008)	–	yes, at 1% - 10%

Adapted from: Jokipii and Milne (2008) p.1447-1449

4.2.4 Size

The effect of a bank’s size on the amount of capital buffer is less clear. Larger banks might either have easier access to cheaper capital because the market has better information about them or it might be more difficult for them due to their high complexity and their incentive to exploit asymmetric information.³³⁸ In order to reduce the asymmetric information a bank can either engage in monitoring or hold a significant amount of capital. In case of any economies of scale in the monitoring area, a larger bank should do more monitoring and a smaller bank should take on more capital instead of engaging a lot in monitoring. Furthermore, larger banks might have a diversification advantage. Therefore, they might be less vulnerable to exogenous shocks, which could have a negative impact on the amount of extra capital held. In addition, banks do profit from the too-big-to-fail argument which also has a negative influence on the buffer.³³⁹

Jokipii and Milne (2011) identify that size and capital are negatively related in the single capital buffer equation. However, the result does not show significance in all models (five out of seven are insignificant). In the simultaneous equations the capital equation and size are positively and significantly related. Nevertheless, the risk equation shows a positive relationship, but all these results lack significance.³⁴⁰

³³⁵ Jokipii and Milne (2008) p.1447

³³⁶ Jokipii and Milne (2008) p.1441

³³⁷ Jokipii and Milne (2008) p.1449

³³⁸ Gropp and Heider (2010) p.595

³³⁹ Stolz and Wedow (2011) p.101

³⁴⁰ Jokipii and Milne (2011) p.173-174

Jokipii and Milne (2008) use dummy variables to measure the effect of size. They introduce two variables “BIG”³⁴¹ and “SMALL”³⁴². The first is one if the bank is in the highest decile of asset size and zero in any other case. The second variable is one if the bank is in the lowest 30 percentile again measured by the size of assets, in any other event it is zero.³⁴³ The “BIG”³⁴⁴ variable reveals a negative relationship but is insignificant in the following subsamples: “EU15”³⁴⁵, non-EU countries and “RAM”³⁴⁶. This is consistent with the theory that the smaller the bank, the larger the buffer and the larger the bank the smaller the buffer. The “SMALL”³⁴⁷ variable is tested positively. This result is only slightly significant in “EU15”³⁴⁸, “EA”³⁴⁹ (=Euro area) and the “RAM”³⁵⁰ sample.³⁵¹ Testing the impact of the “EU15”³⁵² different kinds of banks does not change the quality of the result. However the only significant result is shown when analysing small savings banks.³⁵³

Lindquist (2004) finds that the buffer of commercial and savings banks do react negatively with the size variables. However, size is less significant for commercial banks.³⁵⁴

The negative relationship is further supported by Fonseca and González (2010)³⁵⁵, Stolz and Wedow (2011)³⁵⁶ as well as Schaeck and Cihák (2010) in their sample of testing just commercial banks.³⁵⁷ The authors of the last study however, test if this size effect is related to the above mentioned diversification advantage. It turns out that in their analyses diversification has no influence on the negative relationship of size and capital buffer. Furthermore, the too-big-to-fail argument is put to test. The authors adjust the sizes necessary to be too-big-to-fail in the respective country. Medium and

³⁴¹ Jokipii and Milne (2008) p.1445
³⁴² Jokipii and Milne (2008) p.1445
³⁴³ Jokipii and Milne (2008) p.1445
³⁴⁴ Jokipii and Milne (2008) p.1445
³⁴⁵ Jokipii and Milne (2008) p.1442
³⁴⁶ Jokipii and Milne (2008) p.1443
³⁴⁷ Jokipii and Milne (2008) p.1445
³⁴⁸ Jokipii and Milne (2008) p.1442
³⁴⁹ Jokipii and Milne (2008) p.1443
³⁵⁰ Jokipii and Milne (2008) p.1443
³⁵¹ Jokipii and Milne (2008) p.1446-1447
³⁵² Jokipii and Milne (2008) p.1442
³⁵³ Jokipii and Milne (2008) p.1449
³⁵⁴ Lindquist (2004) p.505-509
³⁵⁵ Fonseca and González (2010) p.899
³⁵⁶ Stolz and Wedow (2011) p.103
³⁵⁷ Schaeck and Cihák (2010) p.13

large size banks show a negative and significant relationship with capital in their regressions. Apart from the too-big-to-fail argument the authors conclude that smaller banks might be required to hold larger capital since their resources of managing risk are much less advanced. There is no empirical prove for this conclusion.³⁵⁸ Testing with all three kinds of banks also shows that smaller banks seem to be better capitalised, which they again explain with the monitoring argument.³⁵⁹

Table 23: The influence of size on the capital buffer

	Relationship	Significance
Jokipii and Milne (2011)	–	yes, at 10%
Jokipii and Milne (2008)	– / +	yes, at 5% - 10% for both
Lindquist (2004)	–	yes, at 1% / 5%
Fonseca and González (2010)	–	yes, at 1%
Stolz and Wedow (2011)	–	yes, at 1%
Schaeck and Cihák (2010)	–	yes, at 1%

Adapted from: Jokipii and Milne (2011) p.173-174; Jokipii and Milne (2008) p.1449; Lindquist (2004) p.505-509; Fonseca and González (2010) p.899; Stolz and Wedow (2011) p.103; Schaeck and Cihák (2010) p.13-16

4.2.5 Loan Loss

Jokipii and Milne (2011) discover that, this variable is positively correlated with the amount of additional capital held. These findings are also valid when measuring the change in risk. Therefore, banks that have more loans at possible default on their book are also considered riskier. The results of the single capital equation are significant in five models and insignificant in two models. The significance ranges from 1%, 5% to the 10% level. Moreover, the risk equation shows the same relationship with significant results in three out of four models.³⁶⁰ When running the simultaneous equation the relationship turns significant in all three models in the capital equation. Nevertheless, the risk equation only shows significance in two models.³⁶¹

³⁵⁸ Schaeck and Cihák (2010) p.13-15

³⁵⁹ Schaeck and Cihák (2010) p.16

³⁶⁰ Jokipii and Milne (2011) p.171-172

³⁶¹ Jokipii and Milne (2011) p.173-174

Fonseca and González (2010) have empirically discovered that riskier banks do not hold higher capital buffers. The relationship is significantly negative. Nevertheless, that outcome might not be that clear since there is an indication of “correlation between the instruments and the error term”^{362, 363}.

In Lindquist (2004) savings banks’ buffers are not significantly related with loan losses. However, commercial banks reveal are negatively and significantly correlated.³⁶⁴

Table 24: The influence of loan loss on the capital buffer

	Relationship	Significance
Jokipii and Milne (2011)	+	yes, at 1% - 10%
Fonseca and González (2010)	–	yes, at 1%
Lindquist (2004)	–	yes, at 1%

Adapted from: Jokipii and Milne (2011) p.171-174; Fonseca and González (2010) p.899Lindquist (2004) p.503-507

4.2.6 Liquidity

Liquid assets do also influence the capital buffer. Since banks with more liquid assets have better opportunities to adjust their capital ratios, the influence is negative in theory. Furthermore, these assets are almost classified as risk free so their impact is quite obvious when it comes to calculating the amount of capital that needs to be set aside due to the risk weighted asset regulations.³⁶⁵

Jokipii and Milne (2011) find that the higher the liquidity the less capital buffer is held by banks in the single capital equation. However, the results are not significant in every model. Only two reveal significance whereas five models do not. The risk equation even shows a positive relationship. Nevertheless, the results are only significant in 50% of the cases.³⁶⁶ Furthermore, the simultaneous equation does still show the negative relation with the capital equation but loses all the significance. The risk equation does

³⁶² Fonseca and González (2010) p.899

³⁶³ Fonseca and González (2010) p.899

³⁶⁴ Lindquist (2004) p.503-507

³⁶⁵ Stolz and Wedow (2011) p.101

³⁶⁶ Jokipii and Milne (2011) p.171-172

not change the direction of the relationship either, but is only significant in one out of three specifications.³⁶⁷

However, Stolz and Wedow (2011) reveal a significantly positive relationship.³⁶⁸

Studies have shown that increased liquidity can act as a substitute for excessive capital. Interestingly Wagner (2007) has conducted analyses indicating that increased liquidity is actually harmful to the economy.³⁶⁹ The author finds out that growing liquidity gives banks the option to sell off their risky assets in the secondary market. While this has a positive impact on the banking stability it soon turns into a negative relationship. Wagner (2007) explains this with the following argument: banks profit from increased liquidity because it has the advantage that the value of banks goes up, whereas the costs of liquidation decrease. Banks being aware of that fact take on more risk on their balance sheet. This reaches a point where the positive effect of increased asset liquidity is not only set off but outweighed.³⁷⁰ Wagner (2007) finds out that capital regulation is a way of tackling this problem; however, it becomes less effective the more liquid the assets are. Therefore, he suggests penalties as a way of mitigating the problem. Such a penalty could be, for example, to make bank failures more costly for their owners.³⁷¹

Table 25: The influence of liquidity on the capital buffer

	Relationship	Significance
Jokipii and Milne (2011)	–	No
Stolz and Wedow (2011)	+	yes, at 1%

Adapted from: Jokipii and Milne (2011) p.171-174; Stolz and Wedow (2011) p.103;

4.2.7 Asset Risk

Asset risk can have a twofold influence on the amount of capital that is held. A positive one is found if banks outweigh their riskier assets with higher profits and

³⁶⁷ Jokipii and Milne (2011) p.173-174

³⁶⁸ Stolz and Wedow (2011) p.103

³⁶⁹ Wagner (2007) p.121

³⁷⁰ Wagner (2007) p.130-131

³⁷¹ Wagner (2007) p.132-136

therefore, holding more capital than required by Basel I and II. On the other hand, the impact is negative, if banks have to cut down the amount of risky asset held.³⁷²

Jokipii and Milne (2008) define risk in their country group study as “non-performing loans over total lending”³⁷³. The findings are twofold significant: the relationship is positive for the major samples, only the non-Euro group experiences a negative impact of risk on the capital buffer.³⁷⁴ In the “EU15”³⁷⁵ and subgroups the relationship is again twofold. The commercial and cooperative banks’ buffers are still moving in the same direction with risk, whereas savings banks reveal a negative relationship.³⁷⁶ When testing for differences due to the size of banks, large and small banks are positively correlated. The relationship is significant.³⁷⁷

Lindquist (2004) finds that capital buffers of savings and commercial banks are negatively correlated with risk, which means that banks do not adjust their capital in case of higher risks. Nevertheless, the author argues that this outcome must not be a sign for insufficient capital buffers. It can just mean that in reality banks with a lower credit risk are overcapitalised.³⁷⁸

As it can be seen the influence of risk on the amount of capital buffer is rather controversial. Jokipii and Milne (2011) are the first who break the influence of risk up into long and short term effects. They expect the relationship of banks capital buffers and portfolio risk to be negative. This is based on the assumption that risk loving banks will have a lower capital buffer.³⁷⁹ However, according to the capital buffer theory they expect a “positive time series correlation between adjustments in capital and risk”³⁸⁰. They find that in the years before 1993, risk and buffer had a negative relationship which changes afterwards. They perform their tests in three ways: analysing the changes of capital buffers, then observing the changes in risk and finally, testing the two equations simultaneously. Testing the relationship of capital buffer and risk with single

³⁷² Stolz and Wedow (2011) p.101

³⁷³ Jokipii and Milne (2008) p.1447

³⁷⁴ Jokipii and Milne (2008) p.1447

³⁷⁵ Jokipii and Milne (2008) p.1442

³⁷⁶ Jokipii and Milne (2008) p.1449

³⁷⁷ Jokipii and Milne (2008) p.1449

³⁷⁸ Lindquist (2004) p.499, 505-509

³⁷⁹ Jokipii and Milne (2011) p. 167

³⁸⁰ Jokipii and Milne (2011) p.171

equations leads to the following results: capital and risk are positively related. This is in line with the assumption that higher risk makes banks take on higher amounts of capital.³⁸¹ This previously found relationship is also valid, when tested simultaneously. The findings can be used to argue that managers try to hold an amount of buffer so that they will not fall below the minimum capital requirements in order to avoid the related costs. Furthermore, these two variables are instruments to regulate the “probability of default”³⁸². Another argument that might explain the findings is the manager’s aversion towards risk. In cases if, he is compensated with risk and bank related remuneration he has personal value at stake and therefore, he will be interested in decreasing the risk sometimes even to a lower level than required by the stockholders. However, Jokipii and Milne (2011) find a negative relationship between the amount of capital held and the adjustment of short-term risk and capital buffer. This indicates that less capitalised banks cut their risk when simultaneously building up capital. On the other hand, this could be seen the following way: banks seek risk in the attempt to regain strong capital buffers in the event of being close to reaching the minimum of regulatory required capital. The actions of well capitalised banks are vice versa, meaning that they seek risk when capital declines. They regulate their capital ratio via positive adjustments, such as taking on risk in situations when the capital has gone up.³⁸³

Table 26: The influence of asset risk on the capital buffer

	Relationship	Significance
Jokipii and Milne (2008)	+ (for major sample)	yes, at 1%
Lindquist (2004)	–	yes, only at 50% / 1%, 50%
Jokipii and Milne (2011)	+	yes, at 10%

Adapted from: Jokipii and Milne (2008) p.1449; Lindquist (2004) p.499, 505-509; Jokipii and Milne (2011) p.171-174

³⁸¹ Jokipii and Milne (2011) p.167, 171-172

³⁸² Jokipii and Milne (2011) p.173

³⁸³ Jokipii and Milne (2011) p.173-174

4.2.8 Mergers

Mergers do play a role in the event of building capital buffers. Generally, it can be said that banks that are well capitalised do get acquired, but after a merger the capital ratio is far lower. Therefore, the impact is expected to be negative.³⁸⁴

However, Stolz and Wedow (2011) reveal a positive and significant relationship. They explain that phenomenon the following way: mergers often happen with a larger bank and large size banks tend to be less capitalised. This could lead to a positive sign. Furthermore, distressed banks that are merged have better capital ratios after the event.³⁸⁵

Table 27: The influence of mergers on the capital buffer

	Relationship	Significance
Stolz and Wedow (2011)	+	yes, at 1%

Adapted from: Stolz and Wedow (2011) p.103

4.2.9 Quality of Accounting Information

In order for the market to create an environment in which the investors demand banks to be supervised, the information provided must be valid and relevant. Fonseca and González (2010) expect a positive relationship between accounting information and capital buffers. Better information is expected to literally drive down the costs of bankruptcy but also the related losses of the charter values.³⁸⁶ This assumption is proven valid. Better information does empower the market and therefore, banks tend to hold capital higher than the required minimum. This result is further supported by the LERNER index which shows a negative relationship in countries with insignificant accounting rules.³⁸⁷

³⁸⁴ Stolz and Wedow (2011) p.101

³⁸⁵ Stolz and Wedow (2011) p.103

³⁸⁶ Fonseca and González (2010) p.894

³⁸⁷ Fonseca and González (2010) p.899

Table 28: The influence of quality of accounting information on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+	yes, at 1%

Adapted from: Fonseca and González (2010) p.899

4.2.10 The Extent of Deposit Insurance

Deposit insurance exists in two forms: first, deposits that are actively insured and second, indirectly all deposits are insured on some level since banks are too big and too important for the economy to be let down.³⁸⁸

As already mentioned above deposit insurance is valid if it comes to defining the amount of capital buffer, which indicates a negative relationship.³⁸⁹ On the contrary, there is research that reveals that charter value and deposit insurance do have a positive correlation. This indicates that banks would very well take on additional capital in order to preserve their higher initial value.³⁹⁰

Fonseca and González (2010) find that deposit insurance and capital buffer are indeed negatively correlated.³⁹¹

Schaeck and Cihák (2010) test the effect of deposit insurance on the amount of capital buffers held by commercial banks, but their results are not significant.³⁹² However, including savings and cooperative banks into the sample reveals a significant positive relationship between capital and deposit insurance.³⁹³

Table 29: The influence of the extent of deposit insurance on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	–	yes, at 1%
Schaeck and Cihák (2010)	+	yes, at 1%

Adapted from: Fonseca and González (2010) p.899; Schaeck and Cihák (2010) p.15-16

³⁸⁸ Diamond and Rajan (2000) p.2455

³⁸⁹ Fonseca and González (2010) p.894

³⁹⁰ González (2005) in Fonseca and González (2010) p.894

³⁹¹ Fonseca and González (2010) p.899

³⁹² Schaeck and Cihák (2010) p.15

³⁹³ Schaeck and Cihák (2010) p.16

4.2.11 Regulation of Banks' Businesses

The more additional business a bank is allowed to perform along with the lending transactions, the more supervision is needed. Therefore, banks that are forced to stick to their core activities do not require further monitoring by the market, which would lead to smaller capital buffers.³⁹⁴

The analyses of Fonseca and González (2010) with this variable reveal results that are twofold. There is a negative and a positive relationship between capital and activity restriction. The first argues that in a restricted environment capital buffers become less important. On the other hand, the later indicates that market power gains strengths and therefore, demands higher capital. After accumulating these two opposite effects, the positive effect outweighs the negative.³⁹⁵

Table 30: The influence of the extent of regulation of banks' businesses on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+	not given

Adapted from: Fonseca and González (2010) p.901

4.2.12 Official Supervision

The variable can help if banks are potentially facing bankruptcy, or if a manager needs to be substituted, who fails to perform. In those cases it can lead to an overall risk reduction. Therefore, official supervision is positively correlated with capital buffers. On the other side, in cases if official supervision substitutes market supervision the relationship is negative. Furthermore, the charter value can increase due to the fact that investors do not have to fear any type of rent extraction. On the contrary, the charter value might go down since the allocation of investment and risk is not the same as it would be under deposit insurance. All in all, the effects of supervision are not quite clear.³⁹⁶

³⁹⁴ Fonseca and González (2010) p.894-895

³⁹⁵ Fonseca and González (2010) p.901

³⁹⁶ Fonseca and González (2010) p.895

The analysis of Fonseca and González (2010) shows a negative effect, however, the Lerner index reveals a positive relationship. Summing up these two effects, the result is positive.³⁹⁷

Lindquist (2004) calls the variable “supervisory scrutiny and is measured by the number of on-site inspections by the supervisory authority in Norway”³⁹⁸. The result shows that regulation does not have an impact at all, only commercial banks seem to positively react to that variable.³⁹⁹

Table 31: The influence of official supervision on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+	not given
Lindquist (2004)	+	yes, at 1%, 50% / 1%-5%

Adapted from: Fonseca and González (2010) p.901; Lindquist (2004) p.505-509

4.2.13 Institutions

Legal enforcement is the key term in this field. The market (formed by investors) is only willing to carry out monitoring tasks, if contracts and laws can be enforced. On the other hand, a higher number of competitors decreases all the positive effects that come with acting like a monopoly, therefore, banks can benefit from holding a higher amount of capital buffer.⁴⁰⁰

The empirical results show a negative relationship, as assumed above. However, a positive effect even though of none significance can be observed too.⁴⁰¹

Schaeck and Cihák (2010) conduct analyses on the effect of shareholder rights on the capital buffer of commercial banks. Their results show a positive relationship, which means that in countries where shareholder rights are valued banks do hold higher

³⁹⁷ Fonseca and González (2010) p.901

³⁹⁸ Lindquist (2004) p.497

³⁹⁹ Lindquist (2004) p.505-509

⁴⁰⁰ Fonseca and González (2010) p.894

⁴⁰¹ Fonseca and González (2010) p.901

amounts of capital.⁴⁰² The outcome is the same if enlarging the sample group by cooperative and savings banks.⁴⁰³

Table 32: The influence of institutions on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	–	yes, at 1%
Schaeck and Cihák (2010)	+	yes, at 1%

Adapted from: Fonseca and González (2010) p.901; Schaeck and Cihák (2010) p.19

4.2.14 Economic Cycle

Banks tend to build up their loan portfolio in times the economy is performing well. It is than extremely important that banks do adjust their capital ratios in order to be prepared for less prospective times.

Stolz and Wedow (2011) find that banks raise their capital buffers during a weak economy but the business cycle has no influence in good times. However, it is discovered that low capitalised banks show a different behaviour. Surprisingly, they seem to cut their capital buffers at anytime, meaning they have smaller buffers in good and bad times. Moreover, there is a slight difference between savings and corporate banks. It is shown that in good times savings banks with high capital buffers do significantly increase their cushions, whereas, cooperative banks that are already low capitalised decline the buffers even more during bad times.⁴⁰⁴

The effects of the economic cycle on the amount of capital buffers held depend on the individual country. The relationship turns out to be negative in the following countries: Chile, Denmark, France, Indonesia, the Philippines, the UK and the US. However, Brazil, Hong Kong, India, Italy and Romania are positively correlated. The effects of all the other tested countries are missing statistic significance.⁴⁰⁵

⁴⁰² Schaeck and Cihák (2010) p.16

⁴⁰³ Schaeck and Cihák (2010) p.19

⁴⁰⁴ Stolz and Wedow (2011) p. 102-103

⁴⁰⁵ Fonseca and González (2010) p.901

Schaeck and Cihák (2010) find that “GDP growth, inflation, and real interest rates, show some negative association with capital ratios”⁴⁰⁶. The results are significant in the H-statistics.⁴⁰⁷

Lindquist (2004) discovers that the buffer is moving anti-cyclical with the economy, which is interpreted as banks stocking up to be able to invest in good projects at any time.⁴⁰⁸

In Jokipii and Milne (2008) the following samples are significantly negatively correlated with the domestic GDP growth (used as cycle variable): the “EU25”⁴⁰⁹, the “EU15”⁴¹⁰ and the Euro and non-Euro group. The non-Euro group has experienced the highest negative influence on the capital buffer. However, the “RAM10”⁴¹¹ group points in the other direction. This means that its correlation with the domestic GDP growth is positive. Employing “EU15”⁴¹² or “EU25”⁴¹³ GDP growth as a measure for the cycle does not change the quality of the results.⁴¹⁴ Testing the influence on capital buffers in relation to different kinds of banks has only been done with the “EU15”⁴¹⁵ sample. The correlation of capital buffers of commercial and savings banks and economic cycle is still negative. However, co-operative banks show a behaviour that points in the other direction, namely a positive correlation. The significance is larger for commercial banks which can lead to the conclusion that in the country group results above commercial banks are mainly responsible for the negative impact.⁴¹⁶ Comparing large banks to small banks does lead to twofold results. On the one hand, economic indicators do have a positive as well as a significant correlation with excess capital of small banks. However, the direction is vice versa for large banks.⁴¹⁷

⁴⁰⁶ Schaeck and Cihák (2010) p.16

⁴⁰⁷ Schaeck and Cihák (2010) p.16

⁴⁰⁸ Lindquist (2004) p.505-509

⁴⁰⁹ Jokipii and Milne (2008) p.1442

⁴¹⁰ Jokipii and Milne (2008) p.1442

⁴¹¹ Jokipii and Milne (2008) p.1443

⁴¹² Jokipii and Milne (2008) p.1442

⁴¹³ Jokipii and Milne (2008) p.1442

⁴¹⁴ Jokipii and Milne (2008) p.1446-1447

⁴¹⁵ Jokipii and Milne (2008) p.1442

⁴¹⁶ Jokipii and Milne (2008) p.1448-1449

⁴¹⁷ Jokipii and Milne (2008) p.1449

Table 33: The influence of the economic cycle on the capital buffer

	Relationship	Significance
Stolz and Wedow (2011)	– / +	No
Fonseca and González (2010)	– / +	yes, 1% - 5%
Schaeck and Cihák (2010)	–	yes, at 1%
Lindquist (2004)	–	yes, at 5% - 10% / 5% - 10%
Jokipii and Milne (2008)	–	yes, at 1% - 5%

Adapted from: Stolz and Wedow (2011) p. 102-105; Fonseca and González (2010) p.901; Schaeck and Cihák (2010) p.16; Lindquist (2004) p.505-509; Jokipii and Milne (2008) p.1446-1449;

4.2.15 Competition

Fonseca and González (2010) use LERNER in order to define market power, but they take it up to explain financial distress costs as explained above.⁴¹⁸ I think that the argument about market power would as well fit in here since market power and competition are related.

Lindquist (2004) reveals that competition initiates banks to hold more capital. In this case the market does seem to have a positive influence on capital buffers at least this seems to be true for savings banks.⁴¹⁹

Table 34: The influence of competition on the capital buffer

	Relationship	Significance
Fonseca and González (2010)	+ than –	yes, at 1% both times
Lindquist (2004)	+	yes, at 1%

Adapted from: Fonseca and González (2010) p.897; Lindquist (2004) p.505-509

4.3 The Adjustment of Capital Ratios

Mommel and Raupach (2010) introduce a new model in order to find out how banks do adjust their capital ratios. They do this by analysing each bank separately and using monthly data of “regulatory capital and risk-weighted assets”⁴²⁰ of German banks.⁴²¹ In the end it leaves them with 81 banks to be analysed with a minimum of 50 observations

⁴¹⁸ Fonseca and González (2010) p.897

⁴¹⁹ Lindquist (2004) p.505-509

⁴²⁰ Mommel and Raupach (2010) p.517

⁴²¹ Mommel and Raupach (2010) p.517

per bank. These banks can be further split up into 25 private commercial banks, 32 savings banks, 15 banks of a cooperative division and nine with no matching relation.⁴²²

A Collin-Dufresne and Goldstein model is used. The only modification made, is the introduction of an adjustment possibility of the debt ratio via increasing the amount of risky assets, which is additionally offered to the traditional method of changes in the capital.⁴²³

Memmel and Raupach (2010) test three different variables in order to derive their results. Tier 1 ratio is defined as in the Basel Accord, the total capital ratio is “total capital over RWA of the banking book”⁴²⁴ and the own-fund variable is total capital plus “subordinated debt with a relatively short residual term and unrealized profits in the trading book”⁴²⁵ over RWA.⁴²⁶

In general, it can be said that the alternative hypothesis can be assumed, which means that banks do adjust their capital ratios. More precisely, in the previous sample testing for the Tier 1 ratio 17 out of 81 banks could assume the alternative hypothesis, testing for the total capital ratio 27 out of 81 banks rejected the null hypothesis and 28 out of 81 when tested for the own capital ratio.⁴²⁷

The paper by Memmel and Raupach (2010) is based on three additional hypotheses:

“Hypothesis 1. The more a bank is engaged in proprietary trading (in particular, the larger the contribution of the trading book to total-bank risk-weighted assets), the more likely the bank adjusts its capital ratio.”⁴²⁸

“Hypothesis 2. Private commercial banks are more likely to adjust their capital ratio than public sector banks.”⁴²⁹

“Hypothesis 3. There are compensatory effects between the three strategic parameters: the bank’s target capital ratio, its adjustment speed and its asset volatility. The “probability or insufficient regulatory capital (PIRC)”⁴³⁰ is the key to the banks’ choice of these parameters.”⁴³¹

⁴²² Memmel and Raupach (2010) p.510-512, 517-518

⁴²³ Memmel and Raupach (2010) p.510-512

⁴²⁴ Memmel and Raupach (2010) p.518

⁴²⁵ Memmel and Raupach (2010) p.518

⁴²⁶ Memmel and Raupach (2010) p.518

⁴²⁷ Memmel and Raupach (2010) p.519-520

⁴²⁸ Memmel and Raupach (2010) p.515

⁴²⁹ Memmel and Raupach (2010) p.515

⁴³⁰ Memmel and Raupach (2010) p.517

⁴³¹ Memmel and Raupach (2010) p.515-517

The first hypothesis turns out to hold. Proprietary trading is represented by market which is derived the following way: “RWA of the trading book, divided by total-bank RWA”⁴³². This can be due to the facts that these banks have a better control over their assets, maybe they hold more liquid assets and they can more easily take on measures to manage the risk of the assets that they are holding.⁴³³

The second hypothesis is valid too. The results are derived from the own funds ratio. The sample is split into different types of banks. Afterwards, it is analysed whether and how many banks are significantly (10% level) adjusting their capital ratios. Again, the overall number is 28 banks for the own funds ratio. After the division in different types of banks, it can be seen that the private ones have indeed the highest adjustment rate.⁴³⁴

The third hypothesis is more complex. Falling below the imposed regularly threshold is driven by three ways: the amount of capital held (target debt ratio), the volatility of the assets on the book and the speed of adjusting the capital ratio.⁴³⁵ The analyses are again conducted with all three variables and within those variables with the number of banks that adjust their ratios at the 10% level of significance. This means that the Tier 1 sample contains 17 banks, the total capital sample has 26 banks (one had to be eliminated) and the own funds sample consists of 27 banks (again one needed to be dropped). The outcome for compensatory effects is less clear. While the own funds ratio seems to be experiencing the predicted relationships, the other capital variables do not show the same behaviour. The own funds variable is significantly positively related with the adjustment rate (the higher the target debt ratio, the higher the adjustment rate).⁴³⁶ Therefore, “the negative log debt ratio (own funds)”⁴³⁷ is interpreted as follows: a high target debt ratio represents low capital. Furthermore, the asset volatility and the own funds ratio are significantly negatively related. However, the Tier 1 ratio and total capital ratio reveal a negative relationship with the adjustment rate. The first correlation is significant the second is insignificant but both are different than predicted. Both, Tier 1 ratio and total capital ratio, are significantly negatively related with asset volatility. The authors argue that hypothesis 3 still fits because the amount of actual Tier

⁴³² Memmel and Raupach (2010) p.521

⁴³³ Memmel and Raupach (2010) p.515

⁴³⁴ Memmel and Raupach (2010) p.521-522

⁴³⁵ Memmel and Raupach (2010) p.518

⁴³⁶ Memmel and Raupach (2010) p.522-523

⁴³⁷ Memmel and Raupach (2010) p.519

1 capital way outperforms the required amount. Therefore, this regulatory requirement constrains a bank less.⁴³⁸

In a last step Memmel and Raupach (2010) try to find out if just one “*PIRC*”⁴³⁹ “can explain the compensatory effects in the strategic variables”⁴⁴⁰, by using the own funds ratio. The first non-linear regression tests for the required regulation being 8% of the own funds and is based on least squared errors. The findings are that banks do fall below the regulatory minimum in 0.71% cases. The second non-linear regression is based on a best fit model. That means that the lowest possible squared errors are found by adjusting the minimum requirements and the “*PIRC*”⁴⁴¹. The results indicate that in that case the optimal requirement of own funds is above 8% and the “*PIRC*”⁴⁴² rises to 1.78%. In both models the R^2 is over 70% which means that the “model explains two-thirds of the cross-sectional variation in the panel of log debt ratios”⁴⁴³. This means that the “*PIRC*”⁴⁴⁴ can be a reason for different levels of leverage of banks.⁴⁴⁵

4.3.1 The Adjustment Speed

Mommel and Raupach (2010) find that banks adjust their capital ratios; however, the speed of adjustment is not the same within the three different capital variables. Testing the speed of adjustment for all the banks that have proven to adjust their capital ratios at the 10% percent significance level leads to the following results. Tier 1 has a median adjustment rate of 19.48% per months, total capital has a median rate of 24.30% per month and own funds adjusts with a median rate of 18.23% per month. This means, for example, for the last result that the difference between target capital ratio and the actual ratio is reduced by 18% each month.⁴⁴⁶

On the contrary Gropp and Heider (2010) have found adjustment ratios much lower than the above discovered ones. All their analyses are conducted with book values since regulatory constraints and implications are measured this way. The speed of adjustment is measured with OLS analysis and is 9% per period which is similar to the adjustment

⁴³⁸ Memmel and Raupach (2010) p.522-523

⁴³⁹ Memmel and Raupach (2010) p.515

⁴⁴⁰ Memmel and Raupach (2010) p.523

⁴⁴¹ Memmel and Raupach (2010) p.515

⁴⁴² Memmel and Raupach (2010) p.515

⁴⁴³ Memmel and Raupach (2010) p.523

⁴⁴⁴ Memmel and Raupach (2010) p.515

⁴⁴⁵ Memmel and Raupach (2010) p.523

⁴⁴⁶ Memmel and Raupach (2010) p.520

speed of companies. If the calculations take specific bank fixed effects into account than the speed dramatically rises to 45%. This indicates that the bank specific effects do play an important role when it comes to setting bank capital and adjustments.⁴⁴⁷

Flannery and Rangan (2008) analyse the adjustment rate to the optimal capital structure. Since adjustment is not always costless it can be beneficial to only partly converge to the optimal ratio. The underlying model allows for this partly change. They find that the adjustment speed is not the same within the four time blocks (mentioned earlier in the paper) it varies from 29% to 74% per year. Calculating the average leads to 49% per year. This means that banks do converge to their target capital ratios quicker than non-financial companies. Constraining the regression by not allowing the share price change effect lowers the adjustment speed to 30% per year with greater differences within the observed periods.⁴⁴⁸

The outcome from above is similar to what Jokipii and Milne (2011) have discovered. The adjustment is tested in three ways: first by adjusting the capital, second by adjusting the risk and last by running an equation that allows capital and risk to adjust simultaneously. The single capital equation experiences significant adjustment rates from 4% to 9% per quarter, depending on what variables have been used for risk in the different models. The adjustment speed is the highest (9% per quarter) when risk is measured as “index based measure”⁴⁴⁹ in the capital equation. These 9% are equivalent to an adjustment speed of 35% per year. This corresponds to the result from above.⁴⁵⁰

The risk equation reveals adjustment speeds that are much smaller (between 1% and 3% per quarter). The 3% are experienced in Model I and correlate to an adjustment of 12% per year.⁴⁵¹

The simultaneous equation shows the following results: in the first specification the speed of adjustment is again positive and significant. Additionally, the capital equation reveals a higher speed than the risk equation. The second specification gives more insights on how the speed of adjustment is related to the size of a bank’s capital buffer. In the capital equation it is discovered that banks with lower capital buffers (<2%) show

⁴⁴⁷ Gropp and Heider (2010) p.608

⁴⁴⁸ Flannery and Rangan (2008) p.407-408 and p.416-417

⁴⁴⁹ Jokipii and Milne (2011) p.169

⁴⁵⁰ Jokipii and Milne (2011) p.172

⁴⁵¹ Jokipii and Milne (2011) p.172

a higher adjustment speed. However, the same behaviour can not be found in the risk equation.⁴⁵²

Brewer III, Kaufman and Wall (2008) find that the adjustment rate of capital ratios is different for the different measures of capital. The speed of the leverage ratio is only 12%, whereas the adjustment rate for Tier I is 21% per year.⁴⁵³ Extending the basic regression model by regulatory policy factors leads to a small increase in the adjustment speed, 18% and 26% per year for leverage ratio and Tier I capital, respectively.⁴⁵⁴

4.3.2 Means of Adjustment

Higher capital requirements leave the manager with four possibilities in order to meet the required ratio: he can leave the industry, finance the gap with his own private capital, increase the capital or adjust the asset side via loan cuts. Hyun and Rhee (2011) only discuss the last two solutions. A bank values the two possibilities equally if it does not take into account any past records. This means that only in the case if creditworthiness of its customers or previous behaviour does not affect the decision than both options have the same value. This does not seem to be applicable to the real world since banks do care about the characteristics of their customers and the relationships. Losses are experienced anyway either through dilution or less dividends due to lower profits caused by fewer loans on the book. Furthermore, dividends do decrease in either scenario for existing shareholders.⁴⁵⁵

4.3.2.1 Adjusting the Asset Side

Mommel and Raupach (2010) investigate further how the adjustments of capital ratios are done. The analysis is done with the variable “own funds”⁴⁵⁶. From the previous findings it can be recalled that 28 banks adjusted their capital ratio at the 10% significance level. This sample is further divided into banks that have a positive adjustment speed, which gives us 20 banks. Out of these 20 banks nine prove to have a positive and also significant relationship. Both subsamples show that the adjustment

⁴⁵² Jokipii and Milne (2011) p.173-174

⁴⁵³ Brewer III, Kaufman and Wall (2008) p.20

⁴⁵⁴ Brewer III, Kaufman and Wall (2008) p.22

⁴⁵⁵ Hyun and Rhee (2011) p.326-327

⁴⁵⁶ Mommel and Raupach (2010) p.516

rate of the asset side is higher than the one of the liability side. For the 20 banks the value is 2.46 times more elevated and for the nine banks it is 4.57 times. This means that in a situation of capital adjustment, banks are faster in adjusting the asset side (loans, risks, etc.).⁴⁵⁷

Hyun and Rhee (2011) try to find explanations to understand why loan cutting and collection are banks' first measures when restructuring their balance sheets in order to meet the capital requirements. They pick up the argument by Onado (2008) which says that additional equity is not considered along the way due to dilution. It means that no additional capital is issued because this action would have an impact on shareholders' voting rights and can potentially change them.⁴⁵⁸ Hyun and Rhee (2011) explore in their study if dilution can explain banks' behaviour. It seems intuitive that the existing shareholders will not vote for anything that might decrease their power which could make asset side adjustments the only way to meet the target capital ratios. In order for this statement to be valid managers have to act in line with shareholders' preferences and the potential benefit of new shareholders is not allowed to affect the financing decision. The agency problem between managers and shareholders in banks has been discussed in the literature. It is supposed to be as valid for banks as it is for non-financial institutions. Monitoring can be an incentive for the manager to behave in favour of the shareholders; increased monitoring can be put in place through boards, ownership structure and other measures. Since there seem to be possibilities to increase the compliance of managers the model of Hyun and Rhee (2011) considers managers to decide in the interest of shareholders. Furthermore, the model only takes the wealth of existing shareholders into account and states that managers act along this assumption. This means that new shareholders decrease value for the old shareholders, whereas loan cutting and collection does not trigger the same amount of loss, especially, if riskier loans are eliminated. High risk weighted-assets seem to be the first, which have to go during a restructuring process. Hyun and Rhee (2011) assume that issuing new equity is free.⁴⁵⁹

A cut on the asset side leads to reduced dividend payments, but as already mentioned above the relative losses might be less in the loan cutting scenario. Additionally, taking off risk weighted-assets from the balance sheet is beneficial. Therefore, the projects

⁴⁵⁷ Memmel and Raupach (2010) p.521

⁴⁵⁸ Onado (2010) in Hyun and Rhee (2011) p.323

⁴⁵⁹ Hyun and Rhee (2011) p.323-324

with the least net asset value will be cut. Since firms are cut that are rated with the highest probability of default, gains are relatively less reduced. This is especially, true in a state in which the economy is bad. In this case, the bank is able to prevent itself from defaulting loans through cutting them in the first place.⁴⁶⁰ After the crisis of 2007 banks have needed to adjust their capital ratios, since they have suffered from enormous capital losses. The adaption of the ratios has been done by restructuring the asset side. Therefore, fewer loans have been issued and the outstanding ones have become due.⁴⁶¹ The literature explains it the following way: banks are mostly constraint in a bad economy. In those times taking on fresh equity is very costly. These costs are driven by time and the fact that the market is tight.⁴⁶² The costs occur due to asymmetric information, signalling effects and so on. According to the Pecking Order Theory equity even is the last resort to be used in financing.⁴⁶³

4.3.2.2 Adjusting the Liability Side

Memmel and Raupach (2010) reveal in their subsample (as described above) the following results: the nine banks show that the liability side is responsible for 64.6% of the adjustment speed of the variable own funds. However, the liability side's speed of adjustment is lower. These findings appoint more efficiency to the liability adjustments.⁴⁶⁴

Hyun and Rhee (2011) suggest in their model that if banks are forced to stop long term lending the effects might be quite different. Giving up these loans simultaneously means forgoing future profits in the form of interest payments. The negative impact on the gains is defined by the number of cut loans and their amounts. Especially, when banks do not have bad loans on their balance sheet than the cutting of loans is not beneficial for them, because they do not profit from clearing their asset side from bad loans. Additionally, an increased interest rate has a negative relationship with the advantages of asset adjustments since it causes the bank to forgo future gains due to the fact that it has stopped lending. However, in cases in which the changes of the capital ratio are not big, the adjustment will be done by restructuring the asset side. Even in the

⁴⁶⁰ Hyun and Rhee (2011) p.326-327

⁴⁶¹ Hyun and Rhee (2011) p.323

⁴⁶² Hyun and Rhee (2011) p.323

⁴⁶³ Myers and Majluf (1984) in Hyun and Rhee (2011) p.323

⁴⁶⁴ Memmel and Raupach (2010) p.521

event of equity being free of charge banks might not take on the deal because new equity always is costly in some ways to them, unless a bank has only long term loans on its book. In that case, the adjustment of capital ratios will be done through equity.⁴⁶⁵

5 Empirical Evidence of European Banks

5.1 Introduction

First, I want to look at the capital structure and what factors do have an influence on it. This is done by analysing the equity ratios. Furthermore, the equity ratio is calculated in two ways: book and market values.

Second, the Basel ratio is used in order to see which variables do influence it.

Third, capital buffers are taken as dependent variables. I want to know if banks do hold more than the amount that is required by law. Moreover, in the next step the regression tests which factors do influence the additional amount of capital that is held.

Last, I want to find out if the structure of bank financing has changed and which factors do have an impact on that structure. Therefore, I use the deposit ratio and within the analyses, again, book and market values.

5.2 Dataset

All the data used in this empirical part is extracted from the SNL database.⁴⁶⁶

In the search mask I have checked the box to only look for listed European banks and for data that has been originally reported and actual. The sample period is from 2005 until 2010. That search leads to a dataset of 225 banks. Not for all banks the information which I need for my regressions is available. After dropping all the banks without information on market capitalisation the sample includes 152 banks. Additionally, banks that do not report Tier 1 capital are eliminated, which reduces the sample to 112 banks. Furthermore, banks that miss actual numbers on Tier 2 capital are taken out of the sample, which leaves 105 banks. Last, banks that do not have any information on

⁴⁶⁵ Hyun and Rhee (2011) p.326-327

⁴⁶⁶ www.snl.com

RWA (= risk weighted assets) are dropped, so that the final sample consists of 104 banks.

5.3 Variables

5.3.1 Dependent variables

One dependent variable is the equity ratio. First, it is calculated as book value of the equity over the book value of the total assets. The ratio is called “equity_ratio1”. The components needed are given as “total equity”⁴⁶⁷ and “total assets”⁴⁶⁸ in the database. Moreover, the same variable is calculated in market values. It is named “equity_ratio2”. Therefore, it is assumed that the book value of debt is equal to the market value of debt. This is a rather big assumption but there was no information about the market value of debt in the database. As market value of equity “market capitalisation”⁴⁶⁹ is used, which is given in SNL.

The next variables are calculated according to the Basel agreement. These variables are given in the SNL database. The first dependent variable is “Basel_1”, which is Tier 1 capital over total risk weighted assets (RWA). The second dependent variable in this category is “Basel_2” which is derived by taking (Tier 1 + Tier 2 capital) / RWA.⁴⁷⁰

In order to generate the ratios, which show how much additional capital is held, I look again at Tier 1 and Tier 2 capital and RWA. First, I take Tier 1 capital over RWA minus 4%. The four percent represent the amount required by the Basel 2 agreement. The variable is called “capital_buffer1”. The second variable is called “capital_buffer2”. I calculate ((Tier 1 capital + Tier 2 capital) / RWA) – 8%. Again, the minimum requirement is deducted in order to get the access capital held by banks.⁴⁷¹

Last, I want to see how banks finance themselves. This is done by looking at the deposit ratios over total assets. The variable is measured in book values and is called “deposit_ratio_BV”. As measure for deposits I have used “total deposits of customers”⁴⁷² and for the denominator I take “total assets”⁴⁷³ both variables are given in SNL. To calculate the variable “deposit_ratio_MV” (in market values) I use total

⁴⁶⁷ www.snl.com

⁴⁶⁸ www.snl.com

⁴⁶⁹ www.snl.com

⁴⁷⁰ www.snl.com

⁴⁷¹ Flannery and Rangan (2008) p.397

⁴⁷² www.snl.com

⁴⁷³ www.snl.com

deposits of customers / (market capitalisation + book value of total debts). In order to find out the amount of other non-deposit financing, I just use 1 minus the deposit ratio, again for both book and market values the variables are called “non-deposit_ratio_BV” and “non-deposit_ratio_MV”, respectively.⁴⁷⁴

5.3.2 Independent variables

As independent variable I used size. Size is defined as the natural logarithm of the book value of total assets.⁴⁷⁵

Profitability is another variable that is supposed to have an influence on bank capital. It is measured as (pre-tax profit + interest expense) / book value of total assets.⁴⁷⁶

Collateral is used to explain the dependent variables. To define collateral the following components are used (total securities + cash and equivalents + fixed assets) / book value of total assets. The variable is chosen this way, because this is the data available in SNL.⁴⁷⁷

Liquidity is another variable and it is defined in two ways. Liquidity is calculated as (cash and equivalents + loans maturity < 3 months + loans maturity 3-12 months + net loans to banks) / book value of total assets. Many banks do not provide the information necessary in SNL. Therefore, another approach is used to define liquidity1 as (cash and equivalents + net loans to banks) / book value of total assets. This variable is easier to calculate, because the information needed is available.⁴⁷⁸

The costs of funding are measured as return on equity (ROE). ROE is calculated as net profits over book value of total equity.⁴⁷⁹

The riskiness of a bank and its assets also play an important role. Risk is defined as net loans to customers over book value of total assets.⁴⁸⁰

Furthermore, the market value to book value (MVBV) is included. A higher ratio can mean easier access to the capital market, which can be translated in a lower cost of

⁴⁷⁴ Gropp and Heider (2010) p.604-605

⁴⁷⁵ Flannery and Rangan (2008) p.407; Gropp and Heider (2010) p.596; Stolz and Wedow (2011) p.104; www.snl.com

⁴⁷⁶ Gropp and Heider (2010) p.617; www.snl.com

⁴⁷⁷ Gropp and Heider (2010) p.618; www.snl.com

⁴⁷⁸ Stolz and Wedow (2011) p.101; Jokipii and Milne (2011) p.170; www.snl.com

⁴⁷⁹ Jokipii and Milne (2008) p.1445; Fonseca and González (2010) p.897; www.snl.com

⁴⁸⁰ Fonseca and González (2010) p.897; Jokipii and Milne (2011) p.169; www.snl.com

raising equity. The variable is defined as MVBV calculated by taking $(\text{market_capitalisation} + \text{total_debt}) / (\text{total_equity} + \text{total_debt})$.⁴⁸¹

Last, dummy variables for each year are defined.

5.4 Descriptive Statistics

Table 35: Country distribution

Country	Frequence	Percent	Number of banks
Austria	24	3.85	4
Belgium	6	0.96	1
Czech Republic	6	0.96	1
Denmark	102	16.35	17
Finland	12	1.92	2
France	18	2.88	3
Germany	24	3.85	4
Greece	18	2.88	3
Greenland	6	0.96	1
Hungary	12	1.92	2
Ireland	12	1.92	2
Italy	102	16.35	17
Liechtenstein	6	0.96	1
Netherlands	6	0.96	1
Norway	84	13.46	14
Poland	12	1.92	2
Portugal	18	2.88	3
Spain	42	6.73	7
Sweden	24	3.85	4
Switzerland	24	3.85	4
Turkey	30	4.81	5
United Kingdom	36	5.77	6

Based on data from SNL

⁴⁸¹ Gropp and Heider (2010) p.595, 617; www.snl.com

Table 36: Summary Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
deposit_ratio_MV	620	2.0235	1.6352	0	20.2688
non_deposit_ratio_MV	620	-1.0235	1.6352	-19.2688	1
deposit_ratio_BV	621	.4977	.16248	0	.8905
non_deposit_ratio_BV	621	.5023	.16248	.1095	1
Basel_1	624	.1089	.04603	.0093	.5486
Basel_2	624	.1373	.04248	.0133	.5740
equity_ratio1	624	.0777	.04444	.0145	.4727
equity_ratio2	623	.3433	.28434	.0063	1
capital_buffer1	624	.0689	.04603	-.0307	.5086
capital_buffer2	624	.0573	.04248	-.0667	.4940
Size	624	16.9344	2.5199	11.1728	21.6421
Profit	624	.0356	.02066	-.0641	.2251
Collateral	616	.2499	.1468	.0144	.8197
Liquidity	507	.2912	.1203	.0350	1.0374
liquidity1	622	.1048	.0782	.0037	.6242
ROE	624	.0082	.0111	-.0700	.1812
Risk	624	.6270	.1712	.1134	.9442
MVBV	623	1.1345	.4135	.5088	4.9862

Based on data from SNL

The correlations are derived in Stata with the command `pwcorr` which means that the table reports partial correlations. Furthermore, the star (*) indicates that the value is significant at the 5% level. It can already be seen that size is significantly related with every variable. Additionally, ROE is also significantly related but the relationship seems to be less clear.

Furthermore, the table reveals that liquidity and liquidity1 are highly correlated. Due to this correlation two different regressions are derived, each using one of the measures for liquidity. One regression accounts for liquidity and the other one for liquidity1, while all other variables are unchanged. The regressions that are performed with the liquidity1 variable are marked with a (2) in the name of the table.

Table 37: Correlations

	equity_ ratio1	equity_ ratio2	Basel_1	Basel_2	capital_ buffer1	capital_ buffer2	deposit_ MV	non- deposit_ MV	deposit_ BV	non- deposit_ BV	size	profit	collateral	liquidity	liquidity1	ROE	risk	MVBV
equity_ratio1	1.000																	
equity_ratio2	0.6452* 0.0000	1.0000																
Basel_1	0.7388* 0.0000	0.3834* 0.0000	1.0000															
Basel_2	0.6394* 0.0000	0.2926* 0.0000	0.9237* 0.0000	1.0000														
capital_buffer1	0.7388* 0.0000	0.3834* 0.0000	1.0000* 0.0000	0.9237* 0.0000	1.0000													
capital_buffer2	0.6394* 0.0000	0.2926* 0.0000	0.9237* 0.0000	1.0000* 0.0000	0.9237* 0.0000	1.0000												
deposit_MV	0.1555* 0.0001	0.4569* 0.0000	0.0387 0.3356	-0.0334 0.4066	0.0387 0.3356	-0.0334 0.4066	1.0000											
non-deposit_MV	-0.1555* 0.0001	-0.4569* 0.0000	-0.0387 0.3356	0.0334 0.4066	-0.0387 0.3356	0.0334 0.4066	-1.0000* 0.0000	1.0000										
deposit_BV	0.4057* 0.0000	0.6223* 0.0000	0.1616* 0.0001	0.0609 0.1292	0.1616* 0.0001	0.0609 0.1292	0.6186* 0.0000	-0.6186* 0.0000	1.0000									
non-deposit_BV	-0.4057* 0.0000	-0.6223* 0.0000	-0.1616* 0.0001	-0.0609 0.1292	-0.1616* 0.0001	-0.0609 0.1292	-0.6186* 0.0000	0.6186* 0.0000	-1.0000* 0.0000	1.0000								
size	-0.5734* 0.0000	-0.4575* 0.0000	-0.3697* 0.0000	-0.2420* 0.0000	-0.3697* 0.0000	-0.2420* 0.0000	-0.3520* 0.0000	0.3520* 0.0000	-0.5640* 0.0000	0.5640* 0.0000	1.0000							
profit	0.3067* 0.0000	0.1706* 0.0000	0.2768* 0.0000	0.2360* 0.0000	0.2768* 0.0000	0.2360* 0.0000	-0.1859* 0.0000	0.1859* 0.0000	0.0107 0.7896	-0.0107 0.7896	-0.1480* 0.0002	1.0000						
collateral	-0.1343* 0.0008	-0.0298 0.4600	0.1190* 0.0031	0.2316* 0.0000	0.1190* 0.0031	0.2316* 0.0000	-0.0852* 0.0350	0.0852* 0.0350	-0.2869* 0.0000	0.2869* 0.0000	0.4767* 0.0000	-0.0075 0.8533	1.0000					
liquidity	0.1235* 0.0054	0.3381* 0.0000	0.1212* 0.0063	0.1019* 0.0217	0.1212* 0.0063	0.1019* 0.0217	0.0957* 0.0314	-0.0957* 0.0314	0.0984* 0.0269	-0.0984* 0.0269	-0.0740 0.0959	0.2418* 0.0000	-0.0838 0.0609	1.0000				
liquidity1	0.1291* 0.0013	0.2760* 0.0000	0.1674* 0.0000	0.1394* 0.0005	0.1674* 0.0000	0.1394* 0.0005	0.0383 0.3415	-0.0383 0.3415	-0.0273 0.4984	0.0273 0.4984	-0.0526 0.1905	0.2030* 0.0000	-0.0639 0.1139	0.6178* 0.0000	1.0000			
ROE	0.4972* 0.0000	0.4019* 0.0000	0.3687* 0.0000	0.3145* 0.0000	0.3687* 0.0000	0.3145* 0.0000	-0.1212* 0.0025	0.1212* 0.0025	0.1531* 0.0001	-0.1531* 0.0001	-0.1944* 0.0000	0.7157* 0.0000	-0.0232 0.5657	0.1541* 0.0005	0.1158* 0.0038	1.0000		
risk	0.0783 0.0506	-0.0334 0.4050	-0.1729* 0.0000	-0.2786* 0.0000	-0.1729* 0.0000	-0.2786* 0.0000	0.1344* 0.0008	-0.1344* 0.0008	0.3954* 0.0000	-0.3954* 0.0000	-0.4989* 0.0000	-0.0334 0.4050	-0.8503* 0.0000	-0.2042* 0.0000	-0.3785* 0.0000	-0.0108 0.7878	1.0000	
MVBV	0.2588* 0.0000	0.6383* 0.0000	0.1749* 0.0000	0.1331* 0.0009	0.1749* 0.0000	0.1331* 0.0009	-0.0572 0.1550	0.0572 0.1550	0.2974* 0.0000	-0.2974* 0.0000	-0.0927* 0.0206	0.2169* 0.0000	0.0272 0.5009	0.2540* 0.0000	0.2547* 0.0000	0.3856* 0.0000	-0.1155* 0.0039	1.0000

Based on data from SNL

5.5 Results

All the regressions are done in the Stata program. At the end of each regression there is written an “r” this is done to make the results robust against heteroscedasticity. The t-statistics are given in parentheses, the stars represent the significance and are defined the following way: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.5.1 OLS regressions

5.5.1.1 Equity ratio

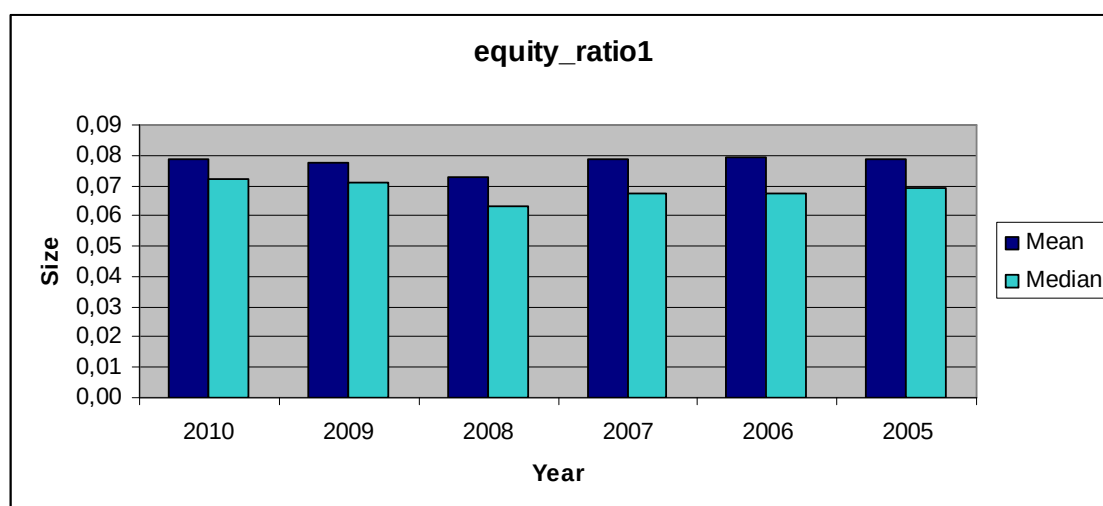


Figure 1: Development of the equity_ratio1

Based on data from SNL

It can be seen that the equity ratio has been rather constant over time. However, there is a drop of approximately 2 percent in 2008. This could be explained by the financial crisis. Nevertheless, it appears as if by 2010 the banks have managed to compensate their losses with fresh capital.

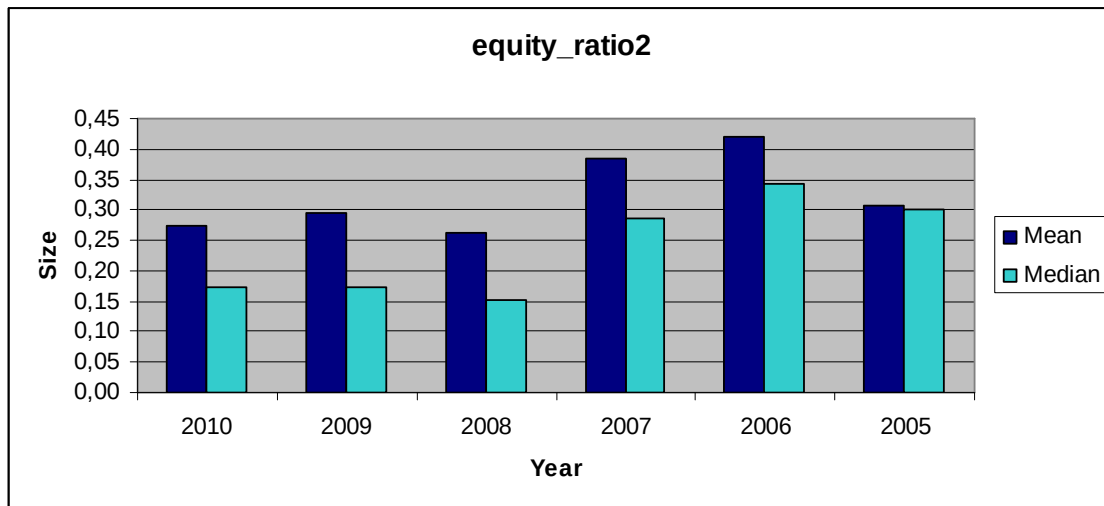


Figure 2: Development of equity_ratio2

Based on data from SNL

Looking at the equity ratio2, which is the ratio in market values, paints a different picture. The ratio peaked in 2006 then has started dropping in 2007 and has reached a low in 2008. However, the ratio has not recovered yet. On the contrary, it seems to be weaker in 2010 than it was in 2009 and it is far away from the all-time high in 2006. These observations are true for the mean and the median.

Table 38: Equity ratio OLS regressions

	(1) equity_ratio1	(2) equity_ratio2
size	-0.0117*** (-7.70)	-0.0604*** (-13.81)
profit	-0.227* (-1.76)	-4.053*** (-6.02)
collateral	-0.0282 (-0.69)	0.421*** (3.40)
liquidity	-0.00956 (-0.54)	0.507*** (6.26)
ROE	1.810*** (3.47)	7.884*** (4.14)
risk	-0.0923* (-1.81)	-0.104 (-0.86)
MVBV	0.00699 (1.55)	0.316*** (6.63)
_cons	0.340*** (4.93)	0.890*** (5.18)
<i>N</i>	501	501
<i>R</i> ²	0.556	0.670

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 39: Equity ratio (2) OLS regressions

	(1) equity_ratio1	(2) equity_ratio2
size	-0.0115*** (-8.09)	-0.0533*** (-11.73)
profit	-0.177 (-1.61)	-4.091*** (-6.07)
collateral	-0.136*** (-2.75)	0.494*** (2.66)
liquidity1	-0.138*** (-3.00)	0.688*** (3.34)
ROE	1.812*** (3.70)	8.348*** (4.14)
risk	-0.186*** (-3.21)	0.103 (0.53)
MVBV	0.0113** (2.56)	0.345*** (7.35)
_cons	0.407*** (5.48)	0.655*** (2.76)
<i>N</i>	613	613
<i>R</i> ²	0.569	0.647

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Attention should be drawn to the variable size. It is negative and significant in both regressions. These findings are in line with the findings by other authors mentioned earlier in the paper.⁴⁸² It means that larger banks tend to hold less capital.

Profit is negatively related, which contradicts the findings of Kleff and Weber (2008)⁴⁸³, Brewer III, Kaufman and Wall (2008)⁴⁸⁴ and the work of Flannery and Rangan (2008)⁴⁸⁵. The findings are significant for the equity_ratio1 and highly significant (at the 1% level) for the equity_ratio2.

The variable collateral reveals contradicting findings. However, only the positive relationship in the equity_ratio2 is significant.

⁴⁸² Flannery and Rangan (2008) p.407, Kleff and Weber (2008) p.369; Cebenoyan and Strahan (2004) p.27

⁴⁸³ Kleff and Weber (2008) p.366-367, 369

⁴⁸⁴ Brewer III, Kaufman and Wall (2008) p.22

⁴⁸⁵ Flannery and Rangan (2008) p.416

The liquidity variable experiences a negative and a positive relationship, but is only significant in the equity_ratio2 regression. In that regression the significance is very high and the relationship is positive.

ROE, however, is significantly positively related. This can be explained by theory, which indicates that the more expensive capital is the more banks will hold in order to be prepared for bad times.

Risk is negatively correlated with the equity ratios. This seems to be similar to the findings of Kleff and Weber (2008)⁴⁸⁶. However, the variable risk is only significant for the book value regression.

Last, MVBV is positively related with the equity ratios. Nevertheless, the market value regression is the only one of significance, but it is significant at a high level (1%).

Running the regressions with the liquidity1 variable leads to the following results:

Size has not changed.

Profit is no longer significant in the equity_ratio1 regression, but still negative and significant for the equity_ratio2.

Collateral is again twofold significant, however, this time the high significance is related to the positive and the negative sign. Therefore, the variable does not seem to be robust.

Measuring liquidity1 reveals highly significant relationships. It is negative for the equity_ratio1 and positive for the equity_ratio2. Again, the variable misses robustness.

ROE has not changed.

Risk is now negatively and positively related. However, the result is only significant for the negative relationship with the equity_ratio1.

Now, MVBV is also significant in the equity_ratio1 regression but only at a 5% level.

⁴⁸⁶ Kleff and Weber (2008) p.368

5.5.1.2 Basel ratio

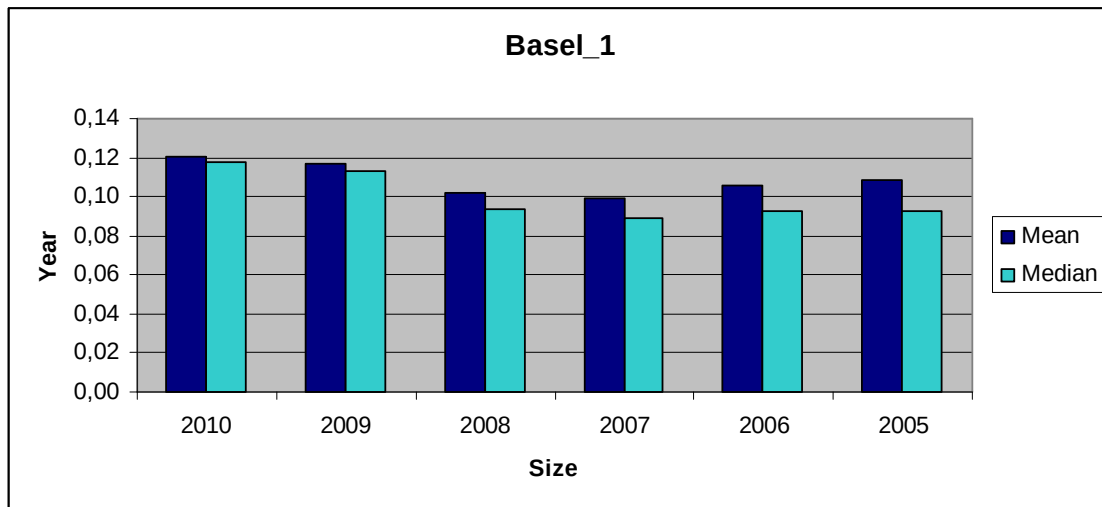


Figure 3: Development of Basel_1 ratio

Based on data from SNL

The ratio has always been not even close to the minimum threshold of 4%. This fact will become even more obvious if looking at the capital buffer graphs. Furthermore, it can be seen that the Basel ratio has experienced a decline in the years 2007 and 2008. However, in 2010 it is stronger than ever before and peaks at almost 12%.



Figure 4: Development of Basel_2 ratio

Based on data from SNL

The Basel_2 graph shows a quite similar behaviour. There is a decline in the ratio in 2007 and 2008. However, the decline is not as sharp as it is in the Basel_1 graph. Moreover, this ratio has never been close to the minimum threshold of 8%.

Additionally, it is highest in 2010, which has been observed with the Basel_1 variable too.

Table 40: Basel ratio OLS regressions

	(1) Basel_1	(2) Basel_2
size	-0.0103*** (-7.17)	-0.00795*** (-5.89)
profit	0.285** (2.28)	0.162 (1.37)
collateral	-0.00332 (-0.09)	0.0253 (0.67)
liquidity	-0.00952 (-0.39)	-0.00738 (-0.29)
ROE	0.781** (1.99)	0.680* (1.85)
risk	-0.111** (-2.22)	-0.104** (-2.15)
MVBV	0.00447 (0.80)	-0.000504 (-0.09)
_cons	0.355*** (5.47)	0.336*** (5.37)
N	501	501
R²	0.460	0.385

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 41: Basel ratio (2) OLS regressions

	(1) Basel_1	(2) Basel_2
size	-0.0104*** (-6.37)	-0.00840*** (-5.28)
profit	0.322** (2.33)	0.273** (2.06)
collateral	-0.0924 (-1.03)	-0.0853 (-0.95)
liquidity1	-0.125 (-1.35)	-0.145 (-1.54)
ROE	0.886** (2.31)	0.705** (2.05)
risk	-0.208** (-2.09)	-0.216** (-2.16)
MVBV	0.00836 (1.28)	0.00308 (0.47)
_cons	0.413*** (3.70)	0.427*** (3.84)
N	613	613
R²	0.452	0.380

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

The conducted regressions with the variable liquidity show the following results.

Size is negatively related and significant for both regressions. This means that the bigger the banks the lower are the respective Basel ratios.

Profit is significantly positively related. However, the relationship with the Basel_2 ratio is not significant. This outcome is contradicting the theory because a more profitable bank would be expected to have lower capital ratios.

The relationship of collateral is twofold but insignificant in both cases.

The results of liquidity are negative, but insignificant.

ROE is positively related with Basel_1 and Basel_2. The results are only significant at the 5% level for the Basel_1 regression and at 10% for the Basel_2 regression.

The variable risk is negatively related, which means the less risk the higher the Basel ratios. This is not predicted by theory. However, the results are significant at the 5% level for both regressions.

MVBV is twofold related but insignificant in both regressions.

Replacing liquidity with the liquidity1 ratio leads to the following findings.

Size is unchanged.

Now, profit is also significant at the 10% level and positive related with the Basel_2 regression.

Collateral is no longer twofold but only negatively related in both equations. However, these findings are insignificant.

Liquidity1 is negatively related but lacks significance.

ROE is almost unchanged with the exception that the Basel_2 regression shows a higher significance (5%) in this regression.

The direction and significance of risk is unchanged.

In this regression MVBV is positively related but insignificant.

5.5.1.3 Capital buffer ratio

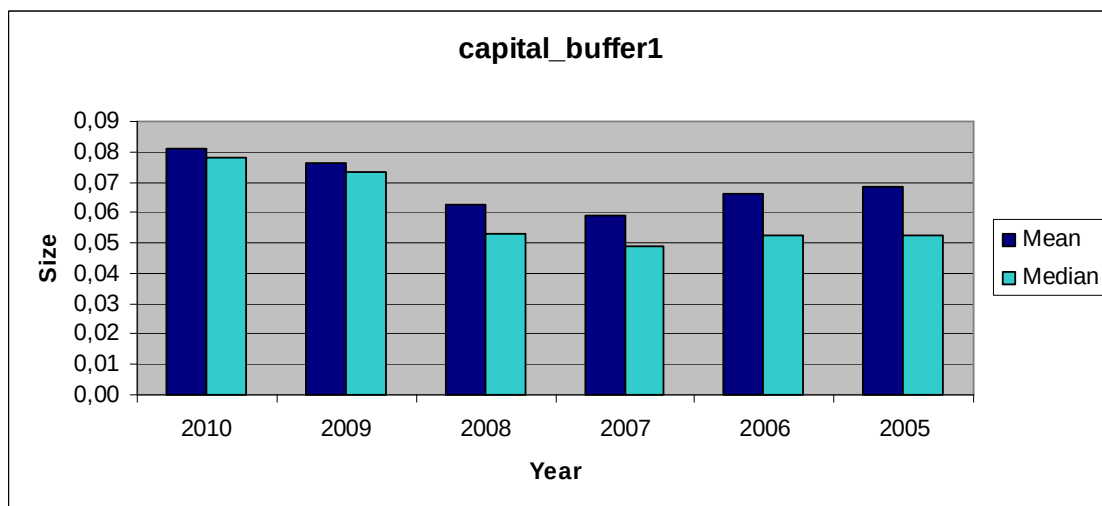


Figure 5: Development of capital buffer1

Based on data from SNL

As in the previous graphs of the equity ratio the capital_buffer1 shows a decline in the amount of capital held as buffer against bad times in 2007 and 2008. However, in this graph it becomes even more obvious how much additional capital has been taken on in

the years of 2009 and 2010. The buffer peaks at 8% in 2010, which is twice as much as required by the original Basel regulation.

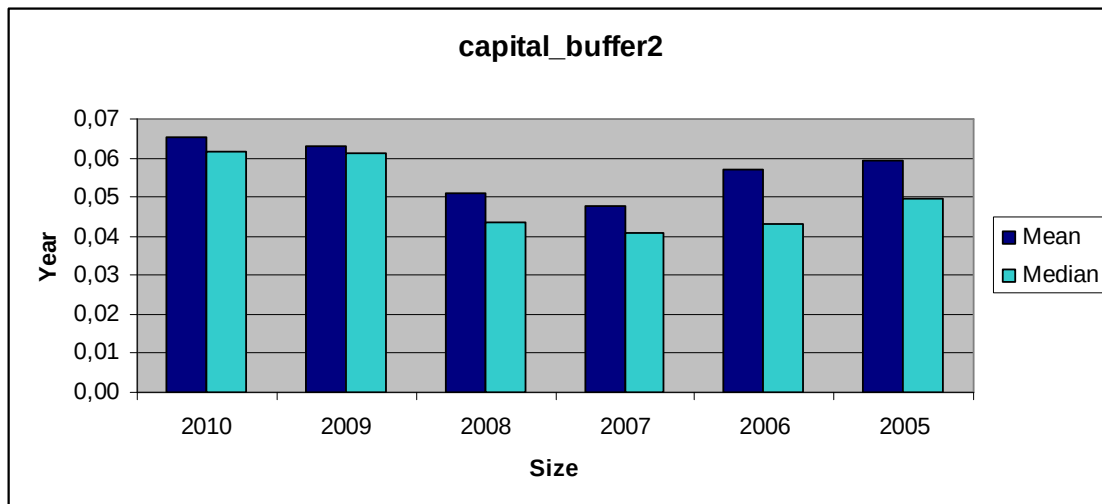


Figure 6: Development of capital_buffer2

Based on data from SNL

The capital_buffer2 ratio just reveals again what has already been previously mentioned: first, the decline in 2007 and 2008 and second, the significant stock of capital that has been taken on in the years of 2009 and 2010. These numbers also strongly point out that there has always been more capital than required by the regulators.

Table 42: Capital buffer ratio OLS regressions

	(1) capital_buffer1	(2) capital_buffer2
size	-0.0103*** (-7.17)	-0.00795*** (-5.89)
profit	0.285** (2.28)	0.162 (1.37)
collateral	-0.00332 (-0.09)	0.0253 (0.67)
liquidity	-0.00952 (-0.39)	-0.00738 (-0.29)
ROE	0.781** (1.99)	0.680* (1.85)
risk	-0.111** (-2.22)	-0.104** (-2.15)
MVBV	0.00447 (0.80)	-0.000504 (-0.09)
_cons	0.315*** (4.85)	0.256*** (4.09)
<i>N</i>	501	501
<i>R</i> ²	0.460	0.385

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 43: Capital buffer ratio (2) OLS regressions

	(1) capital_buffer1	(2) capital_buffer2
size	-0.0104*** (-6.37)	-0.00840*** (-5.28)
profit	0.322** (2.33)	0.273** (2.06)
collateral	-0.0924 (-1.03)	-0.0853 (-0.95)
liquidity1	-0.125 (-1.35)	-0.145 (-1.54)
ROE	0.886** (2.31)	0.705** (2.05)
risk	-0.208** (-2.09)	-0.216** (-2.16)
MVBV	0.00836 (1.28)	0.00308 (0.47)
_cons	0.373*** (3.34)	0.347*** (3.12)
<i>N</i>	613	613
<i>R</i> ²	0.452	0.380

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Size is negatively related and significant for both regressions that include liquidity. These findings are in line with Fonseca and González (2010)⁴⁸⁷, Schaeck and Cihák (2010)⁴⁸⁸ and others⁴⁸⁹ who have already been mentioned before. This means that the bigger the banks are the less buffer capital is held. Therefore, size acts as a substitute for capital buffer.

The variable profit reveals a positive relationship. It is only significant in the capital_buffer1 regression. This result contradicts the findings of Jokipii and Milne (2008).⁴⁹⁰

⁴⁸⁷ Fonseca and González (2010) p.899

⁴⁸⁸ Schaeck and Cihák (2010) p.13

⁴⁸⁹ Lindquist (2004) p.505-509; Jokipii and Milne (2011) p.173-174; Brewer III, Kaufman and Wall (2008) p.19; Stolz and Wedow (2011) p.103

⁴⁹⁰ Jokipii and Milne (2008) p.1447

Collateral shows a twofold relationship. Nevertheless, none of these findings are significant.

The findings of liquidity are negative but insignificant.

ROE has a positive relationship with both dependent variables but the significance is not very high (5% for the capital_buffer1 variable and 10% for the capital_buffer2 variable). This is in line with the findings of Fonseca and González (2010)⁴⁹¹.

The variable risk is negative in both regressions and significant at 5%.

MVBV is twofold related but lacks of significance in both regressions.

In the regressions with the liquidity1 variable the following changes occur.

Size is unchanged.

However, profit is significant at 5% in both regressions and still positively related.

Nevertheless, collateral does no longer experience a twofold relationship. Now, it is only negatively, but insignificantly related.

The results of ROE do not change much, only the significance in the capital_buffer2 relation has increased to 5%.

Risk has remained unchanged.

MVBV has lost the twofold relationship and is only positively related, but still insignificant in both regressions.

⁴⁹¹ Fonseca and González (2010) p.893

5.5.1.4 Deposit ratio

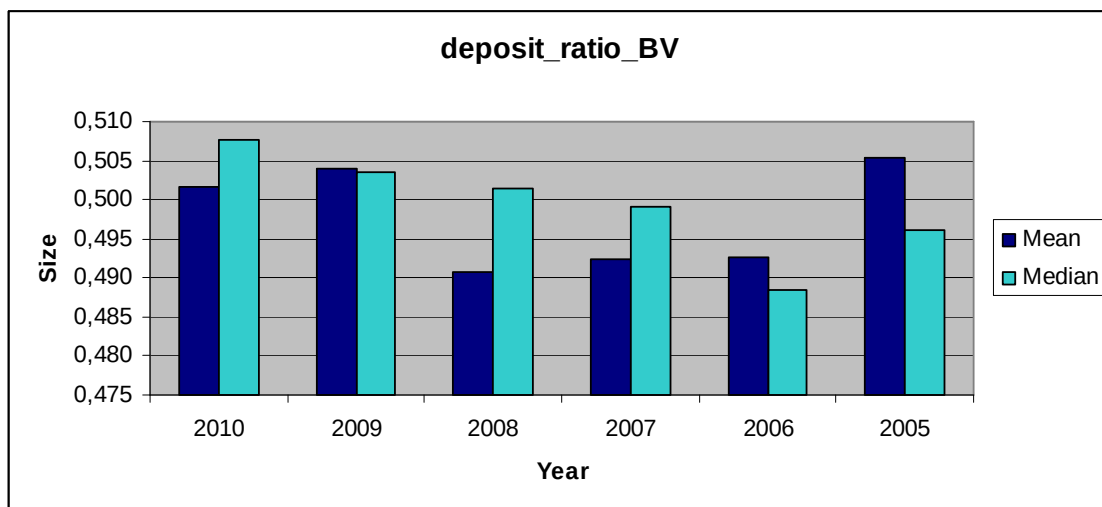


Figure 7: Development of deposit_ratio_BV

Based on data from SNL

At first this graph seems to indicate a high drop in relative deposits in the years 2006, 2007 and 2008. However, looking at the percentages the decline is less severe. The mean difference in relative deposits between 2005 and 2008 is only 1.5%. Additionally, the median deposit ratio has even increased from 2006 to 2010. These results indicate that the source of financing has not substantially changed over the years.

It is difficult to interpret these results. It can mean that due to deposit insurance depositors are willing to leave their money within banks even in the case of a crisis. On the other hand, it can indicate that deposits have decreased but so has the equity, therefore, the relative ratio is still constant. However, that graph does not tell the reasons why the relative deposit ratio is rather stable.

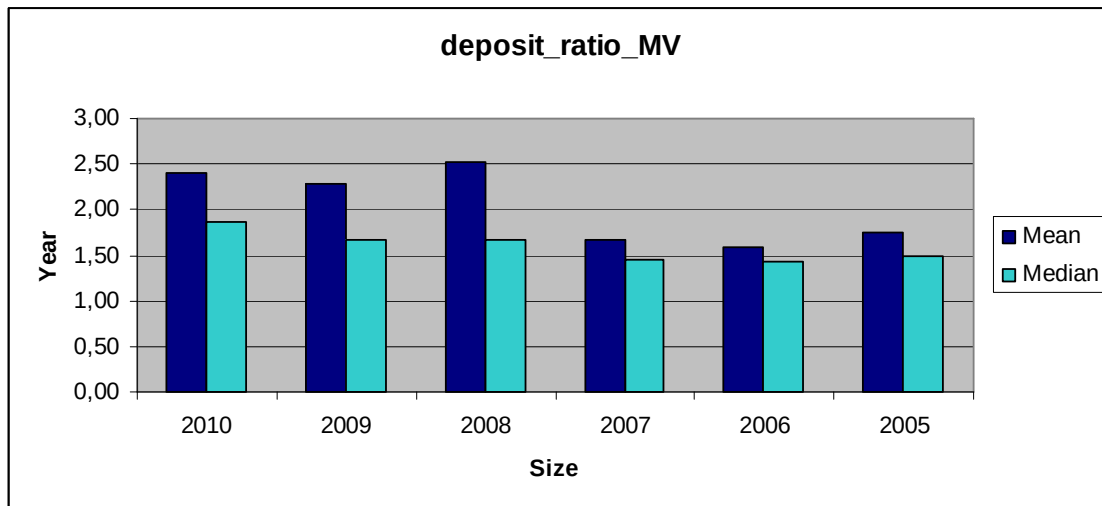


Figure 8: Development of deposit_ratio_MV

Based on data from SNL

What can be seen is that the values are over one, which means that they are over 100%. This indicates that the numerator is higher than the denominator, which explicitly says that the value of deposits is higher than the market value of the bank. This variable has to be interpreted with caution. Equity is the only component that is measured in actual market values in this ratio; deposits are still measured in book values due to a lack of data.

However, it can be seen that until 2008 the deposits have been rather stable and have augmented starting in 2008. The incline is higher in the mean than the median variable. The increase could be a result of a drop in equity (measured in market values). Additionally, a higher number of deposits could be responsible for this result or a decrease in debt. In this case, the reason can not be exactly identified from the graph.

Table 44: Deposit ratio OLS regressions

	(1) deposit_ratio_MV	(2) deposit_ratio_BV
size	-0.286*** (-9.44)	-0.0300*** (-13.76)
profit	-28.98*** (-6.89)	-1.613*** (-2.68)
collateral	3.753*** (4.69)	0.525*** (4.54)
liquidity	2.943*** (4.57)	0.247*** (4.09)
ROE	20.16*** (2.60)	1.902** (2.05)
risk	1.797** (2.33)	0.585*** (5.69)
MVBV	-0.163 (-0.98)	0.124*** (6.63)
_cons	4.590*** (4.24)	0.316*** (2.63)
N	500	500
R²	0.338	0.496

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 45: Deposit ratio (2) OLS regressions

	(1) deposit_ratio_MV	(2) deposit_ratio_BV
size	-0.250*** (-8.27)	-0.0257*** (-11.54)
profit	-31.41*** (-7.44)	-2.064*** (-3.55)
collateral	6.274*** (5.04)	0.836*** (6.44)
liquidity1	7.118*** (5.05)	0.712*** (4.24)
ROE	20.69** (2.04)	2.644*** (2.80)
risk	5.053*** (4.09)	0.948*** (7.43)
MVBV	-0.0663 (-0.46)	0.123*** (6.96)
_cons	1.329 (0.89)	-0.0601 (-0.42)
N	610	610
R²	0.277	0.503

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Four regressions have been set up with four dependent variables. Only the deposit ratios are reported, once in book values and once in market values. It seems quite intuitive that, since the non_deposit ratio is 1 minus the deposit ratio, the influence of the independent variables is the same with just the sign changed.

Size does have a negative and significant impact on both deposit ratios. This indicates that larger banks are less deposit financed. These findings contradict Gropp and Heider (2010)⁴⁹². Therefore, the role of size does not seem to be so clear.

However, the negative and significant relationship between profits and deposits supports the work done by Gropp and Heider (2010)⁴⁹³.

⁴⁹² Gropp and Heider (2010) p.597-599

⁴⁹³ Gropp and Heider (2010) p.597-599

The variable collateral is positively and highly significantly related with deposits. This is in line with Gropp and Heider (2010)⁴⁹⁴.

The outcome for liquidity is a significantly (at 1%) positive relationship in both regressions. The higher the liquidity the higher the deposit ratio, this is in line with the theory of Diamond and Rajan (2000) who predict more equity for more illiquidity.⁴⁹⁵

ROE is positively and significantly related with both deposit_ratios but only highly statistically significant for the deposit_ratio_MV. This result seems intuitive. The more costly it gets to take on additional equity, the more banks are financed via deposits.

Moreover, risk has also a highly significant and positive impact on deposits. This means that the riskier a bank the more deposit financing it is experiencing. These results are contradicting the findings of Gropp and Heider (2010)⁴⁹⁶.

The variable MVBV is twofold related: negatively with the deposit_ratio_MV and positively with the deposit_ratio_BV. However, only in the second case statistic significance is given. These results are not in line with Gropp and Heider (2010), who report negative relations and significance in the case of deposit_ratio_MV.⁴⁹⁷

Using liquidity1 instead of liquidity leads to the following results.

Size and profit are unchanged and therefore, still highly negatively related with the deposit ratios.

The positive relationships of collateral and liquidity1 at a 1% significance level are unchanged.

ROE continues to be positively related with the dependent variables. Nevertheless, the significance does differ a little bit. In these regressions the deposit_ratio_BV is highly significant (1%), whereas the deposit_ratio_MV shows only a 5% significance level.

Risk is positively related and in comparison to before, this time it is significant at 1% for both ratios.

Last, MVBV shows the same twofold results. Again, only the positive relationship in the deposit_ratio_BV regression is significant (1%),

5.5.2 Panel regressions

Panel regressions can be used to account for unobserved heterogeneity.

⁴⁹⁴ Gropp and Heider (2010) p.597-599

⁴⁹⁵ Diamond and Rajan (2000) p.2444

⁴⁹⁶ Gropp and Heider (2010) p.601-602

⁴⁹⁷ Gropp and Heider (2010) p.597-599

First, the differences between the two panel regressions with liquidity and liquidity1 are discussed. Second, the analyses focus on the results that differ from the OLS regressions. Therefore, the OLS regression and the panel regression are compared.

5.5.2.1 Equity ratio

Table 46: Equity ratio panel regressions

	(1) equity_ratio1	(2) equity_ratio2
size	-0.0157*** (-3.17)	-0.0977** (-2.50)
profit	-0.125 (-1.43)	-1.449** (-2.10)
collateral	-0.0181 (-0.88)	0.0734 (0.45)
liquidity	-0.000925 (-0.12)	0.177*** (2.85)
ROE	0.753*** (6.86)	2.737*** (3.16)
risk	0.00502 (0.27)	0.354** (2.37)
MVBV	0.00276 (1.23)	0.173*** (9.76)
_cons	0.335*** (4.01)	1.555** (2.35)
N	501	501
R²	0.351	0.577

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 47: Equity ratio (2) panel regressions

	(1) Equity_ratio1	(2) equity_ratio2
size	-0.0198*** (-4.77)	-0.0949*** (-3.20)
profit	-0.178** (-2.31)	-0.907* (-1.65)
collateral	0.0108 (0.51)	0.293* (1.93)
liquidity1	0.00735 (0.36)	0.561*** (3.81)
ROE	0.820*** (8.13)	2.394*** (3.32)
risk	0.0370* (1.73)	0.610*** (4.00)
MVBV	-0.00166 (-0.82)	0.144*** (9.86)
_cons	0.393*** (5.22)	1.259** (2.34)
N	613	613
R²	0.310	0.565

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

The regression that uses liquidity reveals the following results.

Size is significantly and negatively related with both equity ratios. However, the significance is not the same (1% for the equity_ratio1 and 5% for the equity_ratio2).

Profit experiences a negative relationship, but is only significant for the equity_ratio2 (5%).

Collateral is twofold related but insignificant in both cases.

Liquidity shows a negative and a positive relationship but is only significant (at 1%) for the equity_ratio2, that is positively related.

ROE has a highly (1%) significant and positive correlation with both equity ratios.

Risk has a positive relationship with both ratios, but is only significant for the equity_ratio2 (5%).

MVBV shows a positive relationship, however, just the equity_ratio2 experiences significance (1%).

Using liquidity1 instead of liquidity reveals the following results.

Size is again negatively related. However, this time the relationship is significant at 1% for both ratios.

Profit is again negatively connected with both ratios. Nevertheless, the significance has changed. The equity_ratio1 is significant (at 5%) now, whereas the significance of the equity_ratio2 has dropped to 10%

Collateral is no longer twofold related. However, only the positive relationship with the equity_ratio2 is significant (at 10%).

Liquidity1 is not twofold related. It has a positive relationship, that is only significant for the equity_ratio2 at 1%.

The relationship and the significance of ROE have not changed.

Risk is still positively related but has increased in significance to 10% for the equity_ratio1 and to 1% for the equity_ratio2.

Now, MVBV experiences a positive and a negative relationship. Again, only the positive relationship with the equity_ratio2 is highly significant (1%).

Differences between the OLS and the panel regressions

The direction of size does not change and it is significant at a 1% level for the equity_ratio1 but no longer for the equity_ratio2 (only 5%).

Compared to the normal OLS regression the panel shows a lower significance for profit. The negative relationship is no longer significant for the equity_ratio1 and only significant at 5% in the equity_ratio2 regression.

Furthermore, collateral has lost all its significance. Therefore, its twofold relationship is not a problem.

Liquidity is unchanged.

ROE is still the same (positive and significant at the 1% level).

Risk is in the panel regression positively related. However, only the result of the equity_ratio1 is significant (5%).

MVBV has the same direction and significance (for the equity2 ratio) as in the OLS regression.

Analysing the regressions with the variable liquidity1 presents the following outcome.

Size has the same significance and direction as in the regression that uses liquidity.

Profit is still negatively related with both equity ratios. Nevertheless, it loses significance (10%) for the equity_ratio2. However, it gains significance for the equity_ratio1 (5%).

Collateral no longer reveals a twofold relationship now, but only the positive relationship with the equity_ratio2 is significant at 10%. Compared to the OLS regression this correlation is less significant.

Liquidity1 is positively related with both dependent variables but only significant for the equity_ratio2 (at 1%).

ROE has the same direction and significance as in the graph before.

Risk is no longer twofold related. Now it is only positively related and it reveals significance (equity_ratio1 at 10% and equity_ratio2 at 1%).

MVBV shows a twofold relationship, but the result is again only significant for the positive relationship with the equity_ratio2 (1%).

5.5.2.2 Basel ratio

Table 48: Basel ratio panel regressions

	(1) Basel_1	(2) Basel_2
size	-0.0400*** (-4.50)	-0.0351*** (-3.47)
profit	0.0864 (0.55)	0.00295 (0.02)
collateral	0.0549 (1.48)	0.0783* (1.86)
liquidity	-0.0146 (-1.03)	-0.00872 (-0.54)
ROE	0.181 (0.92)	0.139 (0.62)
risk	-0.0871** (-2.56)	-0.0648* (-1.68)
MVBV	0.00602 (1.49)	0.00553 (1.21)
_cons	0.800*** (5.31)	0.732*** (4.27)
<i>N</i>	501	501
<i>R</i> ²	0.280	0.178

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 49: Basel ratio (2) panel regressions

	(1) Basel_1	(2) Basel_2
size	-0.0336*** (-4.24)	-0.0291*** (-3.23)
profit	0.158 (1.08)	0.206 (1.24)
collateral	-0.0986** (-2.43)	-0.136*** (-2.94)
liquidity1	-0.110*** (-2.80)	-0.184*** (-4.12)
ROE	0.237 (1.23)	0.0594 (0.27)
risk	-0.237*** (-5.81)	-0.289*** (-6.23)
MVBV	0.00772** (1.98)	0.00560 (1.27)
_cons	0.869*** (6.04)	0.868*** (5.31)
<i>N</i>	613	613
<i>R</i> ²	0.275	0.202

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Size is significantly (1%) and negatively related.

Profit shows a positive, but insignificant relationship.

Collateral is positively related but only significant (at 10%) for the Basel_2 ratio.

Liquidity has a negative, but insignificant relationship.

ROE is positively correlated, however, it lacks of significance.

Risk shows a negative relationship. Nevertheless, the significance is 5% for the Basel_1 ratio and 10% for the Basel_2 ratio.

The variable MVBV is positive, but insignificant.

The analyses of the regressions with liquidity1 lead to the following outcome.

Again, size is highly significantly and negatively related.

Profit has not changed.

Now, collateral experiences a negative relationship. Moreover, the results are significant at 5% for the Basel_1 ratio and at 1% for the Basel_2 ratio. That outcome could indicate that the variable is not robust.

Liquidity1 is negatively related too. The significance is 1% for both ratios.

ROE is unchanged.

Risk has again a negative relationship; however, the significance has increased to 1% for both Basel ratios.

The direction (positive) of MVBV has not changes. Nevertheless, the relationship is significant at 5% for the Basel_1 ratio now.

Differences between the OLS and the panel regressions

Size is unchanged.

Profit is no longer significant.

Collateral shows only a positive relationship, which contradicts the theory, but this outcome is just significant for the Basel_2 ratio (10%).

The variable liquidity has still a negative sign, but is insignificant.

ROE is no longer significant in both regressions.

In the panel regressions risk loses significance in the Basel_2 regression and is significant at the 10% level now.

MVBV is no longer twofold related but still insignificant in both regressions.

Using liquidity1 instead of liquidity does not change the sign and significance of the variable size.

Profit loses all significance.

However, collateral is again negatively related, but the findings are significant (5% for the Basel_1 ratio and 1% for the Basel_2 ratio) now.

Liquidity1 is negatively related and in those two cases highly significant (1%).

The positive relationship of the variable ROE is unchanged, but has lost all significance.

Risk is still negatively related, but has increased to 1% significance.

MVBV does not change direction in the panel regressions, but gains significance (5%) in the Basel_1 regression.

5.5.2.3 Capital buffer ratio

Table 50: Capital buffer ratio panel regressions

	(1) capital_buffer1	(2) capital_buffer2
size	-0.0400*** (-4.50)	-0.0351*** (-3.47)
profit	0.0864 (0.55)	0.00295 (0.02)
collateral	0.0549 (1.48)	0.0783* (1.86)
liquidity	-0.0146 (-1.03)	-0.00872 (-0.54)
ROE	0.181 (0.92)	0.139 (0.62)
risk	-0.0871** (-2.56)	-0.0648* (-1.68)
MVBV	0.00602 (1.49)	0.00553 (1.21)
_cons	0.760*** (5.05)	0.652*** (3.81)
N	501	501

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Table 51: Capital buffer ratio (2) panel regressions

	(1) capital_buffer1	(2) capital_buffer2
size	-0.0336*** (-4.24)	-0.0291*** (-3.23)
profit	0.158 (1.08)	0.206 (1.24)
collateral	-0.0986** (-2.43)	-0.136*** (-2.94)
liquidity1	-0.110*** (-2.80)	-0.184*** (-4.12)
ROE	0.237 (1.23)	0.0594 (0.27)
risk	-0.237*** (-5.81)	-0.289*** (-6.23)
MVBV	0.00772** (1.98)	0.00560 (1.27)
_cons	0.829*** (5.76)	0.788*** (4.82)
N	613	613

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Size is negatively and significantly (1%) related.

Profit has a positive, but insignificant relationship.

Collateral is positively correlated. Nevertheless, only the capital_buffer2 ratio is significant (at 10%).

Liquidity has a negative and insignificant relationship with both ratios.

ROE is positively related. However, the results are not significant.

Risk has a negative relationship, but differs in significance. The capital_buffer1 ratio is significant at 5%, the significance of the capital_buffer2 ratio drops to 10%.

MVBV is positively correlated, but the results lack significance.

The regressions with the variable liquidity1 show the following results.

Size and profit have not changed.

Now, collateral is negatively related. The significance is 5% for the capital_buffer1 ratio and even higher (1%) for the capital_buffer2 ratio. This could indicate that the variable is not very robust.

Liquidity1 also has a negative relationship. Moreover, both regressions are significant at 1%.

ROE has not changed.

Risk is negatively related, but has increased in significance to 1% for both regressions.

MVBV experiences a positive relationship. However, only the capital_buffer1 ratio is significant (5%).

Differences between the OLS and the panel regressions

In the panel regressions size is again negative and highly significant.

Profit is no longer significant in both regressions.

The variable collateral is now positively related with the capital buffer ratios but only significant (at 10%) for the capital_buffer2 ratio.

Now, liquidity is negatively related too, but still insignificant.

Furthermore, ROE loses the significance in both regressions.

Risk becomes less significant in the regression capital_buffer2 (10%), but is still negatively related.

MVBV does not longer experience a twofold relationship, but the positive relationship with both dependent variables is still insignificant.

Using liquidity1 in the regressions leads to the following results.

Size is still highly negatively related (1% significance).

Profit does not change direction, but is insignificant now.

The variable collateral still experiences a negative relationship. Furthermore, the results become significant (5% for the capital_buffer1 ratio and 1% for the capital_buffer2 ratio).

Moreover, liquidity1 has gained high significance (1%), but is still negatively related.

ROE remains unchanged as far as the relationship is concerned (positive), but loses all significance.

The variable risk is still negatively related. However, the significance has increased to 1% for both regressions.

Now, MVBV is significantly positively related with the capital_buffer1 ratio at a 5%.

5.5.2.4 Deposit ratio

Table 53: Table 52: Deposit ratio (2) panel regressions

Table 52: Deposit ratio panel regressions

	(1) deposit_ratio_MV	(2) deposit_ratio_BV		(1) deposit_ratio_MV	(2) deposit_ratio_BV
size	-0.569* (-1.77)	-0.0863*** (-4.50)	size	-0.647** (-2.05)	-0.0838*** (-5.57)
profit	-11.55** (-2.00)	0.232 (0.67)	profit	-5.041 (-0.86)	0.158 (0.56)
collateral	0.296 (0.22)	-0.0854 (-1.07)	collateral	0.267 (0.16)	0.0156 (0.20)
liquidity	0.774 (1.51)	-0.00132 (-0.04)	liquidity1	2.364 (1.51)	0.0828 (1.11)
ROE	11.34 (1.57)	-0.313 (-0.73)	ROE	1.883 (0.25)	-0.255 (-0.70)
risk	0.552 (0.45)	0.0674 (0.92)	risk	0.314 (0.19)	0.193** (2.48)
MVBV	-2.093*** (-14.18)	0.0212** (2.42)	MVBV	-1.935*** (-12.47)	0.0232*** (3.13)
_cons	13.61** (2.43)	1.925*** (5.77)	_cons	14.98*** (2.61)	1.779*** (6.50)
N	500	500	N	610	610
R²	0.507	0.117	R²	0.386	0.149

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

t statistics in parentheses

The years are controlled for in the regressions.

Based on data from SNL

Size is negatively related. The significance is lower (10%) for the deposit_ratio_MV compared to 1% for the deposit_ratio_BV.

Profit has a twofold relationship, but only the negative one with the deposit_ratio_MV is significant (at 5%).

Collateral is also twofold related but insignificant in both regressions. The same is true for liquidity and ROE.

Risk has a positive relationship with both ratios. Nevertheless, the results are insignificant.

MVBV is twofold related and experiences significance. The deposit_ratio_MV has a negative relationship and the significance is 1%. However, the deposit_ratio_BV is positive, but only significant at 5%.

The use of liquidity1 instead of liquidity reveals the following outcome.

Size is still negatively related and has gained significance (5%) in the deposit_ratio_MV regression.

The direction of profit has not changed, but experiences a lack of significance both times.

Collateral is no longer twofold related, but still insignificant..

Liquidity1 is only positively related, but insignificant.

ROE is unchanged.

Risk has still a positive relationship, but is now at least significant at 5% for the deposit_ratio_BV regression.

The twofold correlation is still valid for MVBV, but significant at 1% both times.

Differences between the OLS and the panel regressions

Size is no longer highly significant (at the 1% level) for all regressions. For the deposit_ratio_MV the significance has dropped to 10%. However, the deposit_ratio_BV is still significant at the 1% level.

Furthermore, in the panel regressions profit is twofold related. However, the deposit_ratio_MV is the only variable that is significantly related (5% level). The relationship is negative.

Additionally, collateral is twofold related and no longer significant in any regression. The same happens to the liquidity ratio and to ROE.

In the panel regressions risk is still positively related, but loses all significance.

Last, MVBV still experiences a twofold relationship. However, this time both relations are significant.

Running the regressions again, but using another variable to represent liquidity leads to the following results.

Size is a little bit less significant (5%) for the deposit_ratio_MV and unchanged for the deposit_ratio_BV.

Profit is twofold related, but no longer significant in any case.

Collateral has a positive relationship, but the results are insignificant.

Liquidity1 is positively related but insignificant.

ROE experiences a twofold relationship now. However, the results are insignificant.

Risk is still positively related, but has lost significance. The deposit_ratio_MV is insignificant and the deposit_ratio_BV has declined to a 5% level.

MVBV is still twofold and now significantly related with both ratios.

5.6 Summary

It can be seen that not all results can be explained by theory. Moreover, the findings are not necessarily the same in the OLS regression and in the panel regression. The only variable that seems to be independent of the regressions used is size. This variable already reveals a clear and significant correlation in the correlation table. Furthermore, profit seems to be a variable which is rather robust.

However, the empirical research reveals that regulation does not seem to be the only variable that influences the equity ratio, the capital buffer, basel ratio and the deposit ratio. Bank specific factors such as, for example, size do play a role in the capital buffer decision making process.

6 Conclusion

Bank financing is a complex topic. Different theories have been discussed in the literature. All of them have interesting aspects and none can be just rejected. They differ from firm financing theories, because banks have the possibility to finance them with deposits. These deposits have special because they seem to be insured through different ways. Furthermore, banks have to be cautious because they are subject to potential bank runs. Therefore, financing is complicated.

Regulation (Basel I, II, III) might not be the absolute binding condition for bank capital, because banks seem to hold significantly more capital than required.

The empirical literature has presented results that support the argument that there are other variables than regulation that influence the amount of capital held. Bank specific factors and environmental variables seem to have an impact on bank capital too.

In the study that has been conducted with European banks from 2005 until 2101, the results show that there are factors, apart from regulation that influence the amount of capital held. The regressions are conducted with market and book values whenever possible. Furthermore, the OLS and panel regression tools are applied to the data. The dependent variables are again the equity ratio, the Basel ratios, the capital buffer and the deposit ratio. The independent variables are size, profit, collateral, two different types of liquidity, ROE, risk and market value to book value. The results confirm, what authors before have already proven, that regulation is not the only factor that influences the amount of capital held. However, the influence of the respective variable can vary across the regressions. Furthermore, the OLS and panel regressions reveal different outcomes. Additionally, not all the results are in line with what theory is predicting.

In the end, it can be said that using regulation as the only variable that defines the capital ratio of banks, does not reflect the reality. Therefore, this approach alone can not explain banks' behaviour of today.

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Appendix

I. Abstract - English

The optimal capital structure of banks is hard to determine. Several theories in the literature try to explain what motivates banks to take on equity. The approaches consider asymmetric information, competition, deposit insurance and liquidity. Additionally, the financing of banks is special due to deposits. These deposits have the capacity to trigger a bank run.

In order to protect claimants regulatory measures are introduced. Therefore, the capital structure is influenced by regulations. However, regulation does not seem to be the ultimate constraint for the amount of equity held by banks. In the empirical analyses over the past years the equity ratio has grown independently of regulatory demands. It can be seen that there are factors, other than regulation, that drive the amount of capital held by banks.

In the empirical part these methods of analysis are applied to a dataset of European banks from 2005 to 2010. The regressions are conducted with market and book values, and split up into OLS regressions and panel regressions. The dependent variables are the equity ratio, the Basel ratios, the capital buffer and the deposit ratio. The independent variables are size, profit, collateral, two different types of liquidity, ROE, risk and market value to book value. The results confirm that regulation is not the only factor that influences the amount of capital held.

Summing up, it can be said that regulation is not the final constraint in bank capital decisions. Therefore, this approach alone can not explain banks' behaviour of today.

II. Abstract – German

Die optimale Kapitalstruktur für Banken ist schwer zu definieren. In der Literatur versuchen einige Theorie zu erklären, was Banken motiviert Eigenkapital zu halten. Die Ansätze nützen asymmetrische Information, Konkurrenz, Bankeinlagenversicherung und Liquidität als Erklärungsmöglichkeiten. Weiters, kennzeichnen sich die Selbstfinanzierungsmöglichkeiten von Banken durch die Existenz von Bankeinlagen aus. Diese haben die Möglichkeit einen „Bankensturm“ hervorzurufen.

Um für die Sicherheit von Einlagen zu sorgen, wurden Regulationsmaßnahmen eingeführt. Trotz der genauen Regulierung zeigt sich, dass die Eigenkapitalquoten der Banken von den Vorgaben abweichen. Daher kann angenommen werden, dass Regulation nicht alleine zur Bestimmung dieser Quote beiträgt. In empirischen Analysen über die letzten Jahre hinweg ist die Eigenkapitalquote gestiegen.

Aufgrund von diesen Beobachtungen wurden Faktoren analysiert, die auch im Zusammenhang mit der Kapitalstruktur von Banken stehen könnten. Das Ergebnis zeigt, dass nicht nur Regulation die Höhe verschiedener Kapitalquoten beeinflusst.

Der empirische Teil der Arbeit analysiert einen Datensatz von Europäischen Banken von 2005 bis 2010 an. Die Regressionen werden mit Markt- und Buchwerten durchgeführt, und OLS und Panel Regressionen benutzt. Die abhängigen Variablen sind die Eigenkapitalquote, die Baselquote, der Eigenkapitalbuffer und die Bankeinlagenquote. Die unabhängigen Variablen werden definiert als Größe, Profit, Kreditbesicherung, zwei verschiedener Arten von Liquidität, ROE, Risiko und Markt- zu Buchwert.

Die Ergebnisse bestätigen, dass Regulation nicht der einzige Faktor ist, der die Kapitalstruktur von Banken beeinflusst.

Zum Schluss sei gesagt, dass die Annahme, dass Regulation alleine die Kapitalstruktur bestimmt nicht die Realität widerspiegelt. Daher kann dieser Ansatz für sich alleine genommen nicht das Verhalten heutiger Banken erklären.

III. Lebenslauf

Persönliche Daten:

Eva Maria Brunhuber

Ausbildung

10/ 2010 -	Universität Wien Master: Internationale Betriebswirtschaft Kernfachkombination: Corporate Finance
02/ 2012- 06/ 2012	Università degli Studi di Firenze Auslandssemester
10/ 2006 – 04/ 2010	Wirtschaftsuniversität Wien BSc Wirtschafts- und Sozialwissenschaften: in BWL und IBW Schwerpunkte: Finanzierung, BWL des Außenhandels
08/ 2009 – 12/ 2009	George Washington University Auslandssemester
08/ 2005 – 09/ 2007	Medizinische Universität Wien Humanmedizin 1. Studienabschnitt
09/ 1997 – 06/ 2005	Bundesgymnasium Werndlpark Steyr Matura mit Auszeichnung

IV. Resume

Eva Maria Brunhuber

Education

10/ 2010 – present	UNIVERSITÄT WIEN <i>Master of Business Administration Candidate</i> Major: Corporate Finance	Vienna, Austria
02/2012 – 06/ 2012	UNIVERSITÀ DEGLI STUDI DI FIRENZE <i>Master Program – Erasmus Exchange Semester</i>	Florence, Italy
10/ 2006 – 04/ 2010	WIRTSCHAFTSUNIVERSITÄT WIEN <i>BSc in Business, Economics and Social Science</i> Majors: Business Administration International Business Administration Minors: Finance, Tax Law and Foreign Trade	Vienna, Austria
08/ 2009 – 12/ 2009	GEORGE WASHINGTON UNIVERSITY <i>Joint Study Program – Exchange Semester</i>	Washington,D.C.
08/ 2005 – 09/ 2007	MEDIZINISCHE UNIVERSITÄT WIEN <i>First Section of Human Medicine</i>	Vienna, Austria
09/ 1997 – 06/ 2005	BUNDESGYMNASIUM WERNDLPARK <i>High school Graduate 2005 with distinction</i>	Steyr, Austria