



Turun yliopisto
University of Turku

THE COSTS OF RAISING EQUITY RATIO FOR BANKS

Evidence from publicly listed banks operating in Finland

Master's Thesis
in Economics
Kauppatieteet, kansantaloustieteen pro
gradu -tutkielma

Author /Laatija:
Kirsi Haimi

Supervisor/Ohjaaja:
PhD Kaisa Kotakorpi

6.5.2016
Turku



Turun kauppakorkeakoulu • Turku School of Economics

The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

TABLE OF CONTENTS

LIST OF FIGURES	5
LIST OF TABLES	6
1 INTRODUCTION	7
2 THE COST OF HOLDING EQUITY	11
2.1 From where do the capital requirements for banks arise?.....	12
2.2 Modigliani and Miller theory	14
2.3 Over-leverage and underinvestment.....	18
2.4 Tax deductibility	19
2.5 Capital Crunch is caused by the lack of bank equity	21
2.6 Credit contagion	23
3 BASEL AND ACCOUNTING STANDARDS	26
3.1 Bank for International Settlements Accord.....	27
3.2 Basel II	28
3.3 Basel 2.5 and Basel III	30
3.3.1 Capital definition and requirements.....	31
3.3.2 Capital conservation buffer.....	32
3.3.3 Countercyclical buffer	33
3.3.4 Leverage ratio	33
3.4 The effects of the minimum equity ratio on the business cycle.....	34
4 THE COSTS AND BENEFITS OF MORE HIGHLY CAPITALIZED BANKS	37
4.1 Do Danske Bank and Nordea Meet the Requirements?.....	38
4.2 Capital Asset Pricing Model and the size of the equity beta.....	39
4.3 The benefits of lower leverage	41
4.4 Results of debt guarantee	42
5 THE ESTIMATES OF A RISE IN FUNDING COSTS FOR BANKS IN FINLAND.....	45
5.1 A naïve example without equity premium effect	47
5.2 Estimates including equity premium effect.....	48
5.2.1 Analyzing the changes in funding costs for Danske Bank Group ...	50
5.2.2 Analyzing the changes in funding costs for Nordea Group.....	52
5.3 Evaluation of the used methods	53

6	CONCLUSIONS	56
7	APPENDIX	60
	REFERENCES.....	63

LIST OF FIGURES

Figure 1	Balance sheet liabilities (Finanssivalvonta)	13
Figure 2	Capital to assets ratios of OECD countries (Financial Soundness Indicators, IMF).....	14
Figure 3	The effect of increased equity on ROE (Admati, DeMarzo, Hellwig & Pfleiderer 2010, 11)	17
Figure 4	A graph presenting a European interbank network (Toivanen 2015, 5)	24
Figure 5	The loss probability density function and the capital required by a financial institution	29
Figure 6	The comparison of different ways to measure equity ratios.....	34

LIST OF TABLES

Table 1	An example on how to calculate risk weights	28
Table 2	Standardized capital charge for correlation-dependent instruments ..	31
Table 3	Required amount of CET1, T1 and T2 capital over risk-weighted-assets in comparison to the amounts that Nordea and Danske Bank hold	38
Table 4	Equity and Gearing ratios 2013.....	49
Table 5	Costs of doubling equity over assets -ratio for Danske Bank	50
Table 6	Costs of doubling equity over risk-weighted-assets -ratio for Danske Bank	51
Table 7	Costs of doubling equity over assets -ratio for Nordea.....	52
Table 8	Costs of doubling equity over risk-weighted-assets -ratio for Nordea	53

1 INTRODUCTION

Banks are heavily leveraged. In Finland the overall bank capital to assets ratio has declined from 10.3 % (2003) to 4.4% (2012) in just under ten years (World Bank data). Equity worked as it is supposed to; as a safety cushion to absorb the losses incurred from the financial crisis of 2007. As the European economy is finally ascending up from the deep decline the crisis caused, the banks should now raise their equity ratios once again to be prepared for forthcoming crisis. In Finland the commercial banking industry is highly interconnected and consolidated on a few large banks, Nordea Suomi Oyj, Osuuspankki, Danske Bank Oyj and S-Pankki Oy. Concentration is characteristic to Scandinavian banking culture. However, it brings along risks that arise from the interconnectedness of the banks. If one of these few banks went under, it would cause the remaining banks huge losses, as they would now lose their investments and loans to the failing bank. This is one of the reasons why the capital structure of these banks should be under closer investigation. If these banks were highly leveraged and would face a negative shock and go under, the whole banking system in Finland would be endangered.

Bankers have argued that as the equity ratio, that is the ratio between a bank's equity and total assets, of a bank increases so will the bank's funding costs and that the higher funding costs will therefore be shifted to the public by tightening lending operations. For example Josef Ackermann, the CEO of Deutsche Bank has said that "More equity might increase the stability of banks. At the same time however, it would restrict their ability to provide loans to the rest of the economy. This reduces growth and has negative effects for all."¹ (November 20, 2009, interview.) They base their argument simply on the fact that equity holders require a higher return than debt holders and therefore equity is more expensive. However, as will be shown in section two, Modigliani & Miller -theorem proves that this is not the case in corporate finance. The Modigliani and Miller theorem states that the funding construction of a corporate is irrelevant to their funding costs since more equity decreases the premium that the investors require for their money.

Based on Modigliani and Miller theory, Miles, Yang and Marcheggiano (2012) estimate how the doubling of banks' equity ratio impacts the total funding costs for banks operating in Great Britain. They find that the funding costs will not increase linearly when raising the equity ratio. This study will lean on their findings and show how raising the equity ratio affects Finnish banks' funding costs. In Finland this issue has not yet been

¹ The argument is quoted to reflect the general view of many on the debate of capital regulations and may not reflect the current opinion of the cited.

studied. Therefore it is interesting and relevant to apply the Modigliani and Miller theorem and recent studies to the situation in Finland. The extra relevance comes from the calculations in chapter 5 where the costs of doubling two of Finnish commercial banks' equity ratios is computed. However, the primary emphasis in this study is to concentrate on the previous literature and research on the subject of the cost of equity. The alleged high cost of equity is the main reason why bank leverage is at a high level. These kind of assumptions expose the whole banking system to financial crisis and can be the cause of an economic downturn.

It also matters whether the costs of equity and debt financing are borne by banks or the public. For instance, even if high bank leverage ratios may seem to lower banks' private costs, the growing risk of bank failure is borne by the public and therefore increases the social cost of bank funding. Admati, DeMarzo, Hellwig and Pfleiderer (2010) have shown that the social *benefits* that arise from significantly higher equity requirements are large, while the social costs are almost non-existent.

Overall this thesis concentrates on the previous literature and articles of defining whether the benefits of raising equity ratios overcomes the increase in funding costs and whether the actual rise in funding costs even exists. However it is interesting to see that if Finnish banks doubled their equity ratios, their funding costs would not rise in the same pace. Actually the rise in funding costs is somewhat small compared to the benefits that arise from stable banks. These results are similar to the studies conducted in the UK and Norway. Therefore it can be concluded that if Basel III² would require for instance an equity ratio of 20 percent or capital ratio of 30 percent³, it would not affect the Finnish economy tremendously by tighter loan supply of banks or as much higher service charges for the banks' customers. In this study the results actually show that if Finnish banks were to double their equity ratios, their funding costs would only increase by 23—163 basis points. When interpreting these figures, it must be kept in mind, that Nordea and Danske Bank already have an equity – and capital ratios of 14% to 20%.

The purpose of this study is to examine whether a rise in the equity ratio causes higher funding costs for banks and is the relationship between these two linear as has been the common belief. Does the doubling of Finnish banks' equity ratios also increase their funding costs in the same pace? This study also examines the modern day banking regulations and their complexity. It is controversial whether the raising of the equity ratio to

² Basel requirements are the frames that control banks' financial structure and risk measuring.

³ The difference between equity and capital ratio in this context is thought as that equity ratio is equity over all assets as capital ratio is equity over risk-weighted-assets.

some predefined percentage would solve some of the stability problems that are now controlled by heavy regulation. The heavy regulation has also triggered the banks to create their own ways of measuring risk and this leads to a situation where risk-weighting can be biased. In a situation like this, the accurate financial structure of a bank is not easy to estimate. This study discusses about the issue of risk-weighting and its reliability. This study examines the reasons behind the heavy Basel regulation. One research goal is to analyze whether Danske Bank and Nordea meet the given requirements. As the banking system is now moving towards the Basel III requirement, all the new regulation requires monitoring and that of course incurs costs. Basel requirements are the frames that control banks' financial structure and risk measuring. The European Central Bank has estimated that in 2015 their expenditure for banking supervision is going to be around 260 million euros per year (European Central Bank, press release 2014). This can be seen a great cost just to monitor that everyone follows the rules and the complex system that Basel agreements have created. To calculate the accurate costs of regulation is rather challenging. However, there has been some estimations on the matter and this thesis assesses them more closely in chapter 3. However there are reasons behind the regulation of bank equity. Banks, on their own initiative, do not hold enough equity to avoid insolvency. The governments grant banks deposit insurance which reflects on the banks' interest of deposits by lowering them under their accurate market rate. This happens because the deposit insurance decreases the risk of scarce capital stock to the banks' shareholders. Nevertheless, banking crisis induce costs to the economy and in long term to avoid the crisis banks need to hold more equity than they would do under the deposit insurance subsidy. Despite of all the negative externalities such as credit contagion⁴, banks do not have enough incentives to guard themselves against bankruptcy.

This thesis is structured as follows; at first, this study will explain why and how capital requirements are controlled. Section 2 will provide the reader with an understanding of the costs of holding different types of capital. The most important theory to comprehend financing costs is Modigliani & Miller -theory, which will be introduced in section 2. It will also go over some of the problems over-leverage inflicts and show the reader how the governments in many countries subsidize bank indebtedness by granting debt tax deductions. Section 3 is a close examination of the capital adequacy rules described in the accord of Basel. It is essential to understand how the banking field is regulated to evaluate whether these requirements are enough. At the end of section 3 we will examine the criticism of minimum equity requirements on the cyclical changes point of view. Section 4

⁴ Credit contagion is a situation when the money market freezes because banks stop interbank lending because they cannot know whether the borrower is close to insolvency.

indicates how well the above mentioned requirements are followed in Finland and do the requirements accrue extra costs to Finnish banks. The section follows closely Miles, Yang and Marcheggiano's article *Optimal bank capital* (2012). Miles et al. examined how the doubling of a bank's equity ratio affects their capital costs. They noticed that the costs do not increase linearly with the raised equity ratio and concluded that even the private costs of raising equity levels are almost non-existent for banks. Furthermore the social costs to the public decreased as the equity levels were raised. To study the same question with Finnish banks, I have chosen to examine Nordea Group and Danske Bank Group. This stems from the fact that they were the only Finnish commercial banks that are publicly listed and to closely follow Miles et al., the acquired data needs to include stock prices. However, the Finnish subsidiaries of Nordea Group and Danske Bank Group are not listed in the stock market as a regular share. Danske Bank Oyj is fully owned by Danske Bank Group and therefore its shares are not a unit of trading. Nordea Pankki Suomi Oyj has only its depositary receipts exchanged in the NASDAQ OMX Helsinki. For these reasons the figures used in this study are those of Nordea Group and Danske Bank Group, using data on stock returns in 2000—2013 from Thompson Reuters Datastream. These Nordea and Danske Bank specific findings will be discussed in section 5. Section 6 concludes the study and presents the key findings.

2 THE COST OF HOLDING EQUITY

The equity premium is believed to be more expensive than the interest rate of a loan. As the borrower can also deduct the interest payments from one's taxes, with tax concessions like this the mainstream belief does not seem to be far-fetched. However, the aim in this chapter is to show that the capital structure of a bank is insignificant when one compares the capital costs altogether.

First, this chapter explains why banks need equity capital and how it is connected to the bank's balance sheet. Next it focuses on the theory of investment introduced by Franco Modigliani and Merton H. Miller in 1958. Their two key findings state that the capital structure of a firm is irrelevant when calculating the average cost of capital. However, the question is whether this conclusion only stands for regular companies. The field of banking is skewed because of the government grant subsidies. This may in fact affect the Modigliani and Miller theory. On the other hand, the results calculated in chapter 5 using the figures of two different banks, show similar outcomes as the Modigliani and Miller theory.

Second, this chapter discusses some of the main problems that originate from excessive leverage. Myers (1977) shows a connection between over leveraged companies and underinvestment. Myers illustrates that when over leveraged, a company is willing to pass profitable investment opportunities. In the present state of the economy in Europe, this point may partly explain why it has been so difficult to get back on the economic growth trend after the financial crisis.

Section 2.4 concentrates on the tax deductibility of loan interest. This chapter will end with the analysis of credit crunch which can be thought as a cost of holding too little equity. Credit crunch is a situation when the loan supply of banks falls due to a negative economic shock and their lack of holding enough equity. This subject will be extended to credit contagion. The section will end to the analysis of Mervi Toivanen (2015) who has calculated how the concentration of the Finnish banking system reacts to a situation where a Finnish or a foreign bank goes bankrupt.

Debt guarantee⁵ creates a safety net for banks that affects the price of deposits. When a company has irregular income and has only a little equity, the company's loans are thought as risky. It is the same thing with banks, except the company loan is now thought as a deposit. Without the debt guarantee this risk would affect the interest of deposits. For example; bank A has an equity rate of 30% and bank B has an equity rate of 3%. If there

⁵ In Finland the government grants a guarantee to the depositors of banks. If the bank would become insolvent, the government would secure the customer's deposits until 100 000euros.

is no debt guarantee, the depositors would not be eager to loan bank B in the same rate as to bank A. They would demand a risk premium from bank B. This is consistent with the Modigliani and Miller theorem. However, when the deposits are guaranteed by the government, both of the banks will get deposits with the same interest, no matter how their capital structure looks like. This leads to a situation where the banks' finance as much as they can by deposits and their equity rate stays low. But this does not mean that an assumption should be made that this is the best way to finance for the society. The deposits are cheap because of the actions of the government. Nevertheless, for the society it is not wise to support the risky finance structure when there is always insolvent banks going belly up and the society needs to repair the damage to the depositors by compensating the guaranteed deposits. This study will return to the matter of debt guarantee in section 4.4.

The other issue concerning the banks' government safety net is that it tempts the banks to take on more risky investments. Because of the deposit guarantee, the depositors are willing to keep their deposits in the bank regardless of where the banks' reinvest their capital. If the risk-taking succeeds, the bank will gain big profits. If the gamble fails, the bank goes belly up and the government will compensate the deposits. To prevent the negative incentive, the society has to regulate the solidity of the banks.

2.1 From where do the capital requirements for banks arise?

Commercial banks accept deposits, provide loans for individuals and businesses and offer basic investment products for their customers. In Finland a commercial bank is defined as a joint-stock deposit bank (The law of commercial banks, Finlex). The deposit bank - category also includes savings banks and cooperative banks. In Finland all deposit banks are part of the deposit insurance fund. This entitles the deposited funds of an individual or a corporation to be insured until 100 000 euros (Deposit Insurance, Finanssivalvonta).

Equity provides protection against disadvantageous situations. Regulators try to ensure that a bank has enough capital to cover risks. Equity is categorized as Tier1 capital. (Hull 2012, 26) Equity acts as a protective layer of capital that is easily converted into needed funds and therefore it is categorized as Tier 1 capital. Central bank regulators require banks to hold capital for the risks they are bearing. In 1988, international standards were developed for the determination of this capital, as the Basel I was created. Capital is now required for each of three types of risk: credit risk, market risk, and operational risk. Credit risk arises from the risk that loans and derivatives might default. A bank could lose a lot of money when a corporate it has lent to defaults. This has traditionally been the greatest risk facing a bank and is usually the one for which the most regulatory capital is

required. Market risk is formed when a bank's assets decrease in value. Operational risk is the risk that the bank cannot manage its operations as usual. That is to say internal or external systems fail to work normally and this will generate losses to the bank. (Hull 2012, 37).

During the last 15 years Finnish commercial banks' balance sheets have grown remarkably. As a result the amount of liabilities of banks has also risen. Below, Figure 1 illustrates the ballooning of banks' liabilities during the last 15 years.

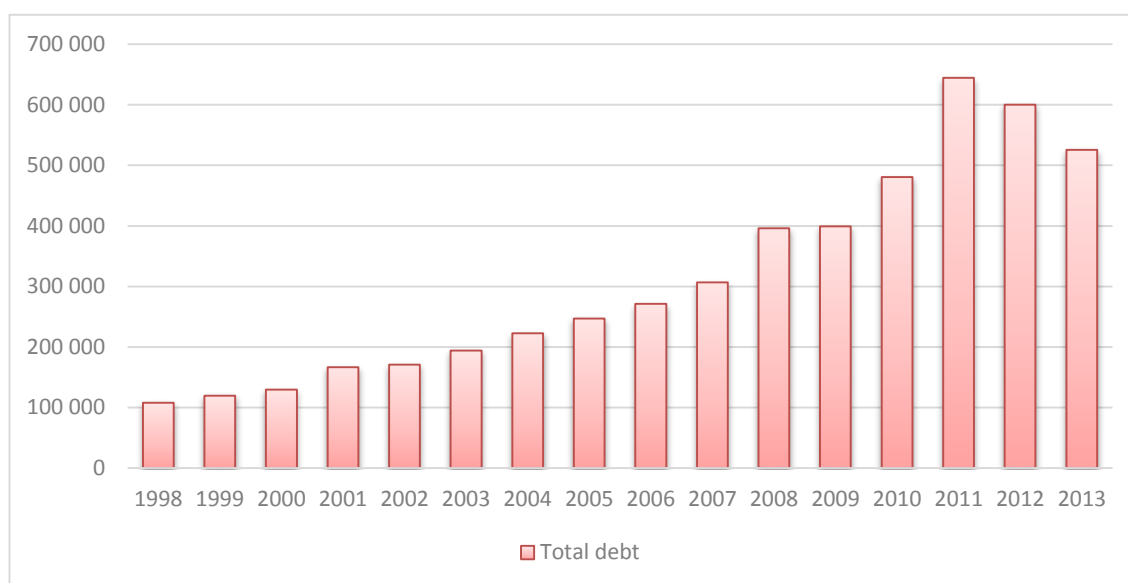


Figure 1 Finland's financial institutions' balance sheet liabilities (Finanssivalvonta)

As the size of the balance sheet has grown, the wide range of financial instruments it withholds has also diversified. This leads to a problem of measuring the risk of the liabilities. When a negative shock hits the economy, bank's accounts receivable is usually the first instalment to be affected. Since the economy is in down turn, banks' borrowers might run into financial difficulties that may prevent them from paying back their loans. This causes credit losses. To absorb these losses the bank has to use its equity.

The difference between the whole value of a bank's balance sheet and the value of its risk weighted assets can be remarkable. Even though Finnish banks' total regulatory capital to risk weighted assets ratio has been around 15-16% during 2012 and 2013 (Financial Soundness Indicators Finland, IMF), Finnish banks' capital to assets ratio, 4,9% in 2012–2013, has been one of the lowest in comparison with other OECD countries. Figure 2 below shows the difference between the countries.

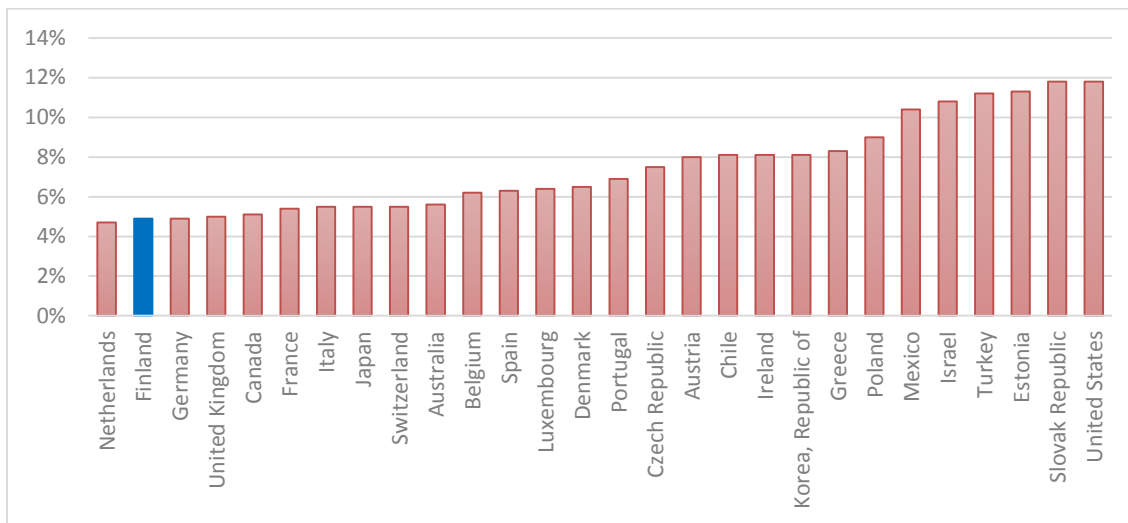


Figure 2 Capital to assets ratios of OECD countries 2012-2013 (Financial Soundness Indicators, IMF)

It seems justified to regulate the minimum amount of capital according to how risky its claims are. However, it is difficult to interpret correctly all the risks a modern bank's balance sheet holds. To tie bank's capital to its risk weighted assets seems reasonable but it withholds risks since the risk weighting of assets can overlook global risks and is vulnerable to the banks' own risk measuring. All this uncertainty in the banking field urges banks to prepare themselves against losses with accumulating equity, which is to pay for the potential losses. However, the consensus in the field seems to be that when taking the equity premium into account, the costs of holding equity overshadows the benefits of being able to cover potential losses.

2.2 Modigliani and Miller theory

When examining how the capital structure of a bank affects its cost of capital, the Modigliani and Miller theory of investment (1958) must be considered. Modigliani and Miller theory studies whether there is an optimal financial structure for a firm. Financial structure is simplified as being the relation between equity and debt. Modigliani and Miller distinguish the difference between the special cases of certainty and uncertainty. In case of certainty, profit maximization and market value maximization seem to have equivalent implications. But as uncertainty was taken into consideration this equivalence vanished. The profit outcome, in the case of uncertainty, can be seen as a random variable. This means that the use of debt financing rather than equity to finance a project may increase the expected return to the owners but at the same time it increases the dispersion of the

outcomes. Under uncertainty each decision of a firm is not going to be a unique profit outcome but a wide variety of mutually exclusive outcomes. The profit outcome can now be thought as a random variable. Modigliani and Miller raise one important question: “Will the project, as financed, raise the market value of the firm’s shares?” (Modigliani & Miller 1958, 263—264.)

Before stating their primary conclusions it is important to acknowledge the assumptions behind their findings. Modigliani and Miller theory assumes that (Modigliani & Miller 1958, 264—266)

- The mean value of the profit stream over time is finite and represents a random variable dependent on a probability distribution.
- Firms can be divided into homogenous groups by categorizing their equivalent returns into the same class. This assumption is relaxed when debt financing is considered.
- Firms and investors operate in the same competitive markets and they both are price takers.
- Prices are equal to the firms and investors.
- There is perfect information.

With these assumptions, Modigliani and Miller discover that there must be an equality between the market value of the firm and the market values of the firm’s common shares and debt. The market value of a firm, denoted with V_j , is equal to the market value of the firm’s common shares, S_j , and the market value of the debt of the firm, D_j . \bar{X}_j denotes the expected return on the assets owned by the firm and ρ_k is a constant that can be given many economic interpretations. ρ_k is the expected rate of return of any share in class k . It can also be regarded as market rate of capitalization for the expected value of the uncertain streams of the kind generated by the k th class of firms. Modigliani and Miller *proposition I* states that

$$V_j = S_j + D_j = \bar{X}_j / \rho_k \quad \text{for any firm } j \text{ in class } k. \quad (1)$$

Equations (1) shows that *the firm’s market value is independent of its capital structure*. It also shows that the firm’s market value is given by capitalizing the expected rate of return at the rate of ρ_k which is particular to the firm’s class. To alter this proposition into a form addressing capital costs, it can be stated that *the average cost of capital, \bar{X}_j / V_j ⁶, to any firm is independent of its capital structure* and is equal to the capitalization rate of a pure equity stream of its class. In the form of an equation, it can be stated that

⁶ \bar{X}_j / V_j is the ratio of the firm’s expected return to the market value of all its securities.

$$\frac{\bar{x}_j}{(S_j+D_j)} \equiv \frac{\bar{x}_j}{V_j} = \rho_k \quad \text{for any firm } j \text{ in class } k. \quad (2)$$

If these equalities do not hold for any given pair of firms in a class, arbitrage⁷ will take place until the equalities are restored. If proposition 1 does not hold, an investor could buy and sell shares and bonds in a way where he would just exchange one income stream to another. The income streams would be identical in all relevant aspects but the investor would sell in a lower price. When investors would exploit these arbitrage opportunities, the price of an overpriced share would fall and the price of an underpriced share would rise. This eliminates the difference between the firms' market values. (Modigliani & Miller 1958, 266—269.) From proposition I Modigliani and Miller derive their *proposition II*. For companies whose capital structure includes some debt, the expected rate of return, i^8 , is a linear function of the leverage as follows:

$$i_j = \rho_k + (\rho_k - r)D_j/S_j \quad (3)$$

In other words, the expected rate of return of a share of stock is equal to the appropriate capitalization rate for a pure equity stream in the class, plus a premium related to financial risk equal to the leverage ratio⁹ times the spread between the capitalization rate and debt's interest rate, r . From this it can be seen that as the leverage of a company rises, so does the cost of holding equity. Figure 3 illustrates how the increase of leverage affects a firm's expected return on equity. The return on equity¹⁰, ROE, rises linearly as the leverage ratio rises. This is due to the rising risk level which follows from the growing amount of debt. Naturally the owners of the firm want to be compensated for tolerating more risk.

⁷ In an arbitrage situation one can make profit without a risk.

⁸ On the stock of any company j belonging to the k th class.

⁹ Leverage meaning the debt-to-equity ratio

¹⁰ Shareholders of a company's stock require a compensation of their investment in the company. This is called return on equity, which is abbreviated ROE.

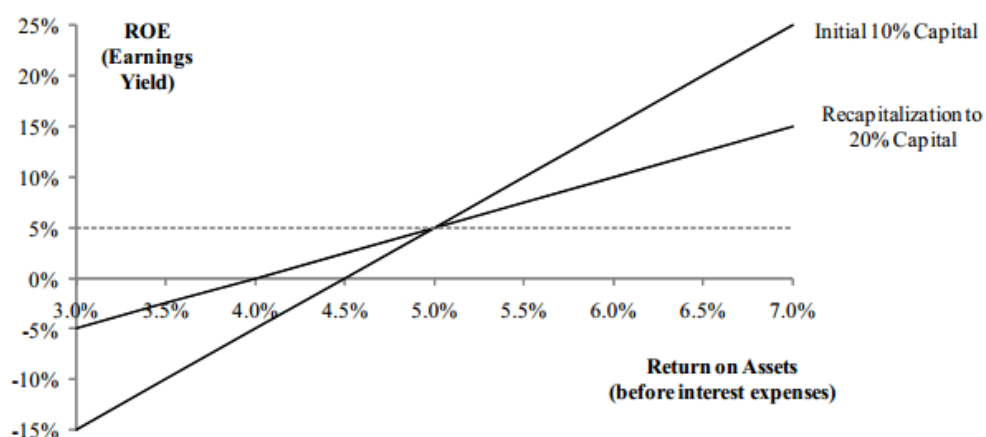


Figure 3 The effect of increased equity on ROE (Admati, DeMarzo, Hellwig & Pfleiderer 2010, 11)

The Modigliani and Miller theory concludes that the change towards a higher equity ratio is a way to reallocate the risks between creditors and shareholders and therefore the capital costs altogether do not change. As the firm's risks decrease due to the raised equity ratio so falls the required return on equity. (Admati et al. 2011, 13.) Simply the Modigliani and Miller theory is about dividing a cake; how the profits, costs and risks are divided between the firm's owners and creditors. Return on equity may not be the best way to measure the profitability of equity. As figure 3 shows, a smaller equity ratio steepens the slope of the line which can be seen in two ways. For a given capital structure ROE does really reflect the realized profitability of the bank's assets. However, to compare the underlying profitability of two banks, ROE cannot be used when the two banks that have a different capital structure. Secondly, higher capital requirements will tend to lower the bank's ROE only in times when ROE is high. They will raise the ROE in bad times when ROE is low. This can be seen from *ex-ante* perspective that the high ROE in good times that is induced by high leverage comes at the cost of having a really low ROE in bad times. (Admati et al. 2011, 11.)

Modigliani and Miller summarize that a firm cannot reduce their cost of capital by selling bonds even though debt financing seems to be cheaper. They give an example by comparing the division of whole milk into butter fat and skimmed milk. Their proposition I simply says, that under perfect markets, the dairy farmer cannot earn more by skimming the whole milk and selling the butter fat with a higher price even though the price of butter fat is higher than the price of the whole milk. The gain that originates from selling higher-priced butter fat would be lost in the sale of the low-priced residue of thinned milk. Also proposition II is compared to the skimming of the milk. Modigliani and Miller say that as

the price per dollar of levered stream falls as debt-to-equity ratio increases, it can be compared to the fact that the price per gallon of thinned milk falls continuously as more butter fat is skimmed off. (Modigliani & Miller 1958, 279—280.) This linearity, on the other hand, can be controversial when the different aspects of banks are taken into consideration. Theorem II states that the cost of equity increases linearly as the leverage of the company rises. The more debt a company holds in comparison to equity, the higher is the required return on equity since investors will require a higher yield for their now riskier investment. However, the deposit guarantee and governments' willingness to save banks that are *too-big-to-fail* have an effect to the linearity between equity costs and leverage. Section 4.4 will return to explain the problem of whether *Modigliani and Miller theory works for banks*.¹¹

2.3 Over-leverage and underinvestment

Steward Myers (1977) contemplates why firms with the advantage of tax-deductibility are not financing all their operations with debt. Myers suggests that highly leveraged firms will, in some states of nature, dismiss valuable investment opportunities that would increase the firm's market value if executed. (Myers 1977, 148-149).

The main problem with over-leverage is that it can cause underinvestment. Investing would be optimal for the society as to when the net present value of the investment is greater than zero. However, the owners of the company could still dismiss the investment opportunity if the future profits of the investment would be shifted to the creditors instead of themselves.

This is a common problem in banking crisis. As banks hold a lot of debt, financing a new investment whose net present value is greater than zero, can be unprofitable to the bank's owners and therefore they will discard the new investment. If the bank held less debt, the owners would benefit more from the new investment and it would be realized. This was the case in the financial crisis in Greece. The Greek banks had enormous amount of hidden bad debt in their balance sheet that their true solidity was actually negative.

¹¹ Modigliani and Miller theory establish that with prevailing conditions, such as perfect information, the capital structure of a firm is irrelevant. Later studies such as Myers 1977, Jensen & Meckling 1976, Townsend 1979, Myers & Majluf 1984, have shown that with asymmetric information, the capital structure is relevant. Some of these theories favor equity but most of them support debt financing.

This means over-leverage. During the crisis, Greek banks could have admitted new profitable loans, however, their shareholders were reluctant to invest new capital. That was because their newly invested capital would have capitalized the banks to be solvent again and therefore most of the new equity would have been used to pay off older debt. (Admati et al. 2014, The leveraged ratchet effect, 2).

Another important concern about over-leverage and underinvestment, raised by Myerson (2014), relates to Basel III and risk weighting. Basel III favors certain marketable securities over loans to individuals and small businesses (Myerson 2014, 207). If the marketable traded security is well-rated, it will have lower risk weights than individual loans, which are not as liquid as securities traded in financial markets. In other words, Basel III's way of using risk weights, creates an incentive for the banks to shift away from lending to individuals and small businesses during financial difficulties when their equity buffers become scarce, and this leads to an increase in unemployment thereafter. To move these loan assets into a lower risk category might have been the motivation for the markets to bundle and repackage small loans into marketable securities (Myerson 2014, 207). The securitization of small loans into bundles and selling them to investors who were not able to understand the whole risk of these securities was one of the main reasons that started the financial crisis in US.

As banks are big agents in the borrowing and lending field and in that way they create dependency to each other, it is necessary that they are able to trust in each other's capital adequacy. Non-transparency was one of the issues in the 21st century's credit crunch. Later on, in section 3.4, the term credit crunch is explained and discussed in detail.

2.4 Tax deductibility

Tax deductibility distorts bank's incentives to finance their operations with equity. In Finland, as in many other countries, public policy has created an incentive for corporates to use debt financing rather than equity because the corporates can deduct their interest payments from their taxes. Most arguments against equity financing base their idea on the subsidized debt financing. As Admati et al. (2010) prove, this argument does not take into consideration the social costs that the debt subsidy incurs on the public. Yes, tax deductibility penalizes equity financing but the costs of equity financing in this case are only focused on the private costs to the banks and do not take into account the social costs borne by the public if high leverage causes a bank to go under.

The type of the financing is insignificant to the overall financial costs when taxes are not taken into consideration. When liabilities' interest payments are allowed to be deducted from the company's taxes, equity financing, on the other hand, is treated differently. The company is not allowed to deduct the costs of equity from taxes. These costs are for instance the dividends the company distribute to the shareholders and capital gains to the company. In Finland there has been an ongoing debate on the double taxation of the public company dividends.

Tax deductibility creates an illusion of lowering capital costs when actually it is only the case of distribution of public money. When banks choose to finance their operations by debt because they are allowed to deduct the debt's interest payments from their taxes, they are also therefore reducing the tax revenue to the government. This can lead to reductions in spending on public goods or to raise taxes somewhere else (Admati et al. 2011, 20). This means just shifting financing costs from banks to the general public.

It is contradictory to encourage banks to finance their business with debt by granting them tax deductions and at the same time use enormous amount of regulations to attract them to use equity financing instead. Panier, Pérez-González, and Villanueva (2012) have researched what happens if a government drastically changes when corporations are allowed to deduct interest payments from taxes. The notional interest deduction was introduced in Belgium in 2006. In the research they find that if the tax policy encourages firms to use more equity this will evidently lead to more capitalized firms. In Belgium, the implementation of notional interest deduction has *allowed firms to deduct from their taxable income a notional charge equal to the product of the book value of equity times a benchmark interest rate based on historical long-term government bonds* (Panier et al. 2012, 1)

This means that the firms are granted a significant tax deduction despite of their source of financing. In the study Panier et al. find a considerable increase in the equity ratios of the exanimated companies within only two years' time horizon. The study also points out that similar experiments have been established in Australia, Italy and Brazil for instance, but they were only for a short period of time and the results are mixed. The other experiments also had stricter conditions and did not cover all firms operating in the represented country. (Panier et al. 2012, 8.) Their results show that large Belgian firms raised their equity ratios relative to comparison neighboring countries after the implementation of notional interest deduction in 2006. Equity ratios increased by 1. 8 to 3. 5 percentage points (Panier et al. 2012, 21).

The findings of Panier et al. (2012, 3) are significant since they also studied the subsidiaries of multinational firms and found that it does not affect the results. They also discover that the field of business is insignificant. Their data also comprehended a sample

of 1 988 723 firm-year observations from 314 228 unique firms (Panier et al. 2012, 15). As the field of study in banking taxation is narrow especially with extensive data, the results cannot be generalized into Finnish banking field. However, the results are suggestive of what might happen if the tax deductibility of debt is changed to cover equity financing in Finland. Nevertheless, more studies and research on this area of taxing and banking must take place before extrapolating it to Finland.

It is important to note that the most tax deductible way to finance a company is not always the best or even the cheapest way to finance a company when looking at the big picture. In Finland the principle of neutrality is taking a bigger role in tax legislation. In Finland the aim in taxation is that the tax payers' behavior should not be distorted in any direction by the tax laws. (Tikka 1995, 3). What should also be taken into consideration is that, as the distribution of dividends is decided on the company level, whereas the liabilities and their interest payments should be paid as the scheme of payment agreement beholds. That is why it is rather unnerving to be directed into using debt financing as it is inflexible to the economic environment.

2.5 Capital Crunch is caused by the lack of bank equity

The study of credit and capital crunches was trendy in the 1990's. That is when the world was just recovering from the 1990 recession. Now again, when the world is still living in the aftermaths of the financial crisis of 2010, capital and credit crunches are yet again a popular topic. Richard F. Syron (1991) was one of the first to make a distinction between a *credit crunch* and a *capital crunch*. A credit crunch follows the business cycles and it can be solved by lowering the interest rates, whereas a capital crunch cannot be as easily solved because it originates from a different background. As credit crunch is mainly caused by the lack of bank deposits, a capital crunch results from the lack of bank capital (Syron 1991, 4). They both cause a serious drop in lending and can freeze the whole financial markets. In the recent financial crisis the capital crunch froze the whole interbank lending markets. Banks lend to each other in short-term maturity bases. As the banks did not know whether the borrowing bank was solvent enough to pay back the loan, it was more secure not to lend any capital. This caused a snowball effect when the short-term maturity lent loans fell due and banks were reluctant to continue lending to each other. Even the banks that were solvent to begin with could no longer borrow from the interbank markets and were therefore unable to meet their expiring liabilities. This problem originated from the lack of bank equity. In a state of economy where bank equity measures are higher and

equity to all capital levels are throughout the bank markets permanently at higher level, it could be tested whether this kind of stagnation in the interbank markets would exist. However, this is more likely in a world where the banks keep equity levels high in all world states, that is also during recession. If capital requirements are held back and loosened during economic down turns, the stagnated situation could still occur and escalate quickly.

Peek and Rosengren (1995) studied the capital crunch of New England in the early 1990's. They found that a negative shock on capital is a necessary but not a sufficient condition to cause a capital crunch. They noticed that regulations and regulators have a deep impact on how large the effect of the negative shock is on banks. If the amount of capital stays well above the minimum required or if the regulators do not enforce the capital requirements, the banks will shrink by less. (Peek & Rosengren 1995, 630)

During the reference period of 1990-1991 large commercial bank equity fell by \$33 million and at the same time the assets dropped by \$4.5 billion¹² (Peek and Rosengren 1995, 631). They assess that the large drop in assets was due to the low capital ratios that reacted to the collapse of real estate prices. 62 percent of the commercial banks in New England that were included in their study contracted during 1990-1991. Peek and Rosengren (1995, 632—633) create the capital crunch hypothesis that predicts that a negative capital shock will cause a shrinkage of liabilities and assets to be greater, the lower the capital per assets –ratio of the bank is. They find that the deposit growth rates are positively related to capital per assets –ratios. This would not be the case if the shrinkage would only be caused by the reduction in loan demand.

The difficulty in defining the actual size of the capital crunch is in separating the decrease in loan demand that usually occurs during recessions from the reduced supply of loans. Peek and Rosengren (1995, 633—634) avoid this problem by focusing on the liability side of the banks' balance sheets in their calculations. They studied New England's banks' behavior during the 1990's recession by comparing the well-capitalized banks to the ones that did not have additional capital and going over their balance sheets during the recession. Their model implies that poorly capitalized banks that have a negative shock to their capital will shrink their liabilities more than better-capitalized banks that are experiencing the same shock. The capital crunch hypothesis finds support in their findings. They find that the coefficient on the change in capital is a negative function of the capital to assets –ratio. Consequently the coefficient on the change in capital is *smaller* for well-capitalized banks than for poorly-capitalized banks. In the end of their study they

¹² In the region of New England, which was the subject of Peek and Rosengren study.

emphasize the adverse effects that regulation can have on the economy. (Peek & Rosengren 1995, 635—638)

Ben Bernanke and Cara Lown (1991, 206) also find that the recession of the early 1990's was steepened by the lack of bank equity. However they prefer a more skeptical view on the power that the lack of bank equity had on the recession. They find that it was the falling credit *demand* that had the major role in the lending slowdown. Bernanke and Lown do not find any evidence that overzealous regulation has reduced lending (1991, 221). They note that reduced bank lending arising from the lack of bank equity could suppress economic activity and this would affect both aggregate demand and aggregate supply. This would lead to the reduction of output in short and long run (229).

To reach a conclusion; it can be seen that there is a connection between the lack of bank equity and the origin of a recession. Furthermore, the lack of bank equity effects the ability to ascend from the recession. Poorly capitalized banks are hit hard by the drop in deposits and at the same time they face strict regulation. Banks that are well-capitalized find it easier to adjust on the regime of bank regulation.

2.6 Credit contagion

The linkages that banks have on each other was touched upon in the section 2.5. Now this section focuses on the core of the credit contagion problem. During the financial crisis of 2008, the governments and central banks were called to rescue falling banks. The crisis showed the importance of links and relationships between banks. The falling bank could have repercussions for the other banks even though the banks would not be directly in touch. This can be seen from the figure 4. The interbank network is highly concentrated on a few large banks that can be seen as the big white dots in the center of the figure. In the figure, each node represents a bank in the sample and its size is scaled in the proportion to the sum of interbank exposures of the given bank. Also the darkness of the line reflects the proportional value of a bilateral exposure. The figure 4 is a realization of the Barabasi-Albert (1999) model for the European interbank network.

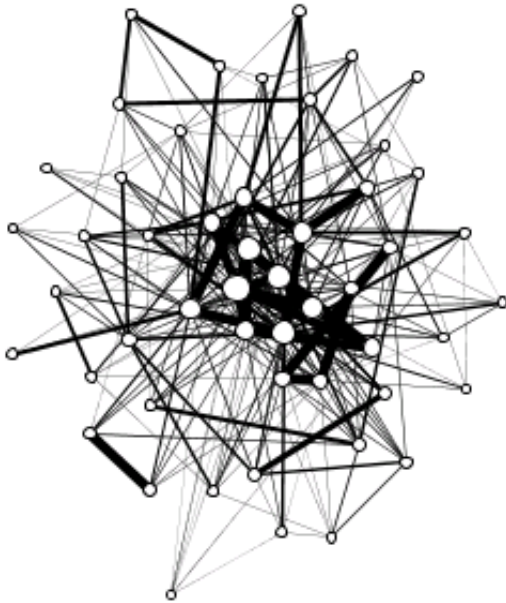


Figure 4 A graph presenting a European interbank network (Toivanen 2015, 5)

Contagion describes the negative spillover that can spread in an economy or financial markets. Therefore it is a crisis that expands from another bank to another. (Toivanen Mervi 2015, 1—5).

Toivanen (2015, 25) finds evidence that the more concentrated the banking system is, the more vulnerable it is to contagion. She compares the Finnish crisis of the early 1990s and the also the crisis of 2005—2011. In Finland during the 1990's crisis three banks out of ten would have caused a contagion. The contagion would have affected over half of the banking system. Without the intervention of authorities, the consequences to the society would have been enormous.

In the crisis of 2005—2011 five big and middle-sized banks were the source of contagion. The contagion of a Finnish bank would have had an effect on 66 percentages of Finnish banks' assets. However, the bankruptcy of a foreign bank would have affected 77 percentages of Finnish banks assets. (Toivanen 2015, 25). As noted before, the concentration of Finnish banking system is alarming. Even more so when one can see the sensitivity of Finnish banking system to the foreign banks' bankruptcy. Toivanen also remarks that most remarkable sources of contagion are English, French, German and Spanish banks. Contagion risk is bigger when the bank has a central position on financial markets

and is large on size. On the other hand, banks in Greece, Ireland and Portugal have only limited negative effects on the European interbank banking system. (Toivanen 2015, 27).

Same kind of results is noticed in the research of Paulo Mistrulli (2011), who studied the Italian interbank banking system. Mistrulli finds that interconnectedness conduces to financial contagion. However, he sees that the severity of the systematic risk of falling banks is overestimated in other literature (2011,1125). Mistrulli's simulation also shows that if conglomerates are allowed to recapitalize their affiliated companies, the resilience to financial contagion tends to improve.

Nevertheless, there are important questions that would still need to be answered. Which banks in the global markets are the ones that have the biggest risk of infecting other banks in the case of insolvency? If these banks can be identified and are then demanded to hold more equity, the stability of the whole banking system would improve.

3 BASEL AND ACCOUNTING STANDARDS

The purpose of bank regulation is to ensure that banks hold enough capital to cover their risks. In Finland the government insures individuals and corporates by providing them deposit insurance. Since a bank is now faced with a moral hazard problem¹³, by taking more risk as the government will cover their losses, it is natural that the government agrees to bear the risk only if bank actions are controlled by regulation.

The fear of systemic risk actuates governments to impose regulations for banks. Systemic risk realizes when a bankruptcy of one large bank causes other banks to fail and can paralyze the whole financial system. In situations where a large bank seeks a rescue from the government the public authority has to assess whether to bail out the struggling bank, and by doing so to signal the market their willingness to be the lender of last resort, or to risk the whole financial system by letting the large bank to fail. (Hull 2012, 257-258)

To truly understand the cost of the current solvency requirements, it is important to understand what these requirements are. The current requirements are based on the assumption that equity is expensive. Therefore higher equity ratio is required only when the bank's lending operations contain risks. If the bank lends to a safe business, required equity is low. This principle works as an incentive and protects the banks that need the equity buffer the most. In this chapter the research reviews the important factors in Basel agreements. To deeply understand where the requirements arise, this chapter begins with the older forms of Basel; that is Bank for International Settlements Accord, which is also referred as Basel I. The chapter then reviews Basel II and Basel 2.5. The main focus, however, remains in Basel III, whose implementation takes place at the moment. This chapter also shows how to calculate risk weights on assets. Risk-weighting is a controversial way of measuring assets. It is important to understand how risk-weighting works and the complexity of measuring risk. This is one of the key issues in this study. At the end of this chapter the study concentrates on the effects that regulation generates over economic business cycles. Banking industry is a complex system. To control the industry, heavy regulation has been established. However, the heavy regulation creates complexity to the banking field that has an impact to the whole economy.

¹³ The moral hazard problem occurs in situations when a party increases its risk-taking knowing that part of the consequence of the risk is borne by others.

3.1 Bank for International Settlements Accord

As banks started operating internationally and began to trade more and more complicated instruments, in 1974 Basel Committee was formed to harmonize the rules and requirements of the banking industry. The committee's first agreement was named The 1988 Bank for International Settlements Accord and it has recently be known as Basel I. Basel I defined two requirements bank capital had to satisfy. The first was that the ratio of the bank's assets to its capital had to be less than 20. (Hull 2012, 259) The second demand concerned the key regulatory requirement of Cooke ratio. With Cooke ratio the bank's total risk-weighted assets are calculated by observing both the on-balance-sheet and off-balance-sheet items. Each on-balance-sheet item is assigned a risk weight to reflect its credit risk. The off-balance-sheet items are indicated as credit equivalent amount. The credit equivalent amount is considered to be a loan capital and to hold the same risk as loan capital. The Accord required banks to keep capital equal to at least 8 % of their risk weighted assets. The capital was divided into two categories, Tier 1 Capital and Tier 2 Capital. (Hull 2012, 259-262) The division still holds this day even though the Basel committee has updated the content of Tier 1 Capital in Basel III. Tier 1 equity capital includes share capital and retained earnings. But it does not include deferred tax assets or goodwill. Tier 2 Capital is considered as additional capital and it includes instruments such as cumulative perpetual preferred stock, certain types of 99-year debenture issues, and subordinated debt with an original life of more than five years (Hull 2012, 262).

The 1996 Amendment supplemented Basel I withholding capital to cover market risks caused by trading activities. This new way of calculating capital requirements included the use of VaR, that is to say *Value at Risk* –method. VaR takes into account the risk that arise from market volatility and it supports diversification of the asset portfolio. The VaR-measure is calculated with a 10-day time horizon and a 99% confidence level. It is the loss that has a 1% chance of being exceeded over a 10-day period. The capital requirement is

$$\max(VaR_{t-1}, m_c \times VaR_{avg}) + SRC \quad (1)$$

where VaR_{avg} is the average value-at-risk over the last 60 days, VaR_{t-1} is the previous day's value-at-risk. SRC is a specific risk charge and m_c is a multiplicative factor. The minimum value for m_c is three. VaR indicates movements in several market valuables, for instance interest rates, exchange rates, commodity prices and stock indices. (Hull 2012, 266)

3.2 Basel II

Basel II was published in 2004 and its implementation started in 2007. It must be noted that the implementation of Basel II begun at the same time as the financial crisis. That is to say that the panacea for the troubles was to fix something that was already broken. It is hard to say whether if the Basel II requirements would have been in place years earlier, has the financial crises taken place or had it been so severe. However, Basel II is still the base for the todays' Basel III and its understanding is essential. Basel II is based on three pillars;

1. Minimum Capital Requirements
2. Supervisory Review
3. Market Discipline (Hull 2012, 268)

This study concentrates only on Pillar 1 – Minimum Capital Requirements. As a reform, Basel II took into account the credit ratings of the borrowing corporates. It states that

$$Total\ Capital = 0.08 \times (credit\ risk\ RWA + market\ risk\ RWA + operational\ risk\ RWA) \quad (2)$$

where RWA is the amount of *risk weighted assets*. The capital requirement of 8 % of risk weighted assets remained the same as in Basel I but now operational risk was also included. (Hull 2012, 268)

Credit risk capital is calculated in a new manner where it reflects the credit rating of obligors or the bank's own calculations of the default probabilities. There is three different approaches to compute the amount of credit risk capital needed. The first is *The Standardized Approach* which is used by banks that are not advanced enough to use the internal ratings approach. It is similar to Basel I apart from the calculation of risk weights. Table 1 summarizes some of the new rules and is presented as in Hull 2012, 270.

Table 1 An example on how to calculate risk weights

	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to BB-	B+ to B-	Below B-	Unrated
Country *	0	20	50	100	100	150	100
Banks **	20	50	50	100	100	150	50
Corporations	20	50	100	100	150	150	100

The second way to calculate the needed credit risk capital is *The Foundation Internal Ratings Based (IRB) Approach*. Regulators base the amount of capital to VaR^{14} and the capital now equals to $VaR - \text{expected losses}$. On the next page the figure 4 shows the model underlying the IRB approach as it is drawn in Hull 2012, 272.



Figure 5 The loss probability density function and the capital required by a financial institution

Under the Foundation IRB, banks supply the probability that the counterparty will default within one year (PD) while the loss given default (LGD), the exposure at default EAD and the maturity of the exposure (M) are supervisory values set by the Basel committee. The third remedy to compute credit risk capital is *The Advanced IRB Approach*. It diverges from the Foundation IRB by estimating its own values to LGD, EAD and M for corporate, sovereign and bank exposures. (Hull 2012, 274-275)

Basel II also introduces *operational risk* to the minimum capital requirements. Operational risk originates from a situation where a bank cannot function as it is supposed to. The risk threatens a bank's daily operations. The assessed capital to cover operational risk is calculated by using one of the three different approaches:

1. The Basic Indicator Approach
2. The Standardized Approach
3. The Advanced Measurement Approach

The sophistication of the bank determines which of these approaches is used. The first, *the basic indicator approach*, rules that

¹⁴ Calculated by using one-year time horizon and a 99.9% confidence level.

$$\text{Operational risk capital} = 0.15 \times \text{Annual Gross Income}^{15} \quad (3)$$

The second one, *the standardized approach*, applies different factors to gross incomes from different business lines. Otherwise it is closed to the basic indicator approach. The third one, *the advanced measurement approach*, allows a bank to use its own internal models to calculate an operational risk loss that is 99.9% sure will not be exceeded within one year. (Hull 2012, 277-278)

3.3 Basel 2.5 and Basel III

As Basel II was implemented so close to the beginning of the financial crisis, in 2007, it needed some modifications to meet the needs of the unstable financial world. Basel 2.5 was implemented in 2011 and it brought about three important adjustments to raise more market risk capital compared to Basel II.

1. The calculation of a stressed VaR
2. A new incremental risk charge
3. A comprehensive risk measure for instruments dependent on credit correlation

Compared to the VaR measure calculated by using a one to four year VaR, *stressed VaR* is measured by using 250-days period of stressed market conditions. To formulate the total capital charge banks must calculate the regular VaR and the stressed VaR.

$$\max(\text{VaR}_{t-1}, m_c \times \text{VaR}_{avg}) + \max(\text{sVaR}_{t-1}, m_s \times \text{sVar}_{avg}) \quad (4)$$

Where VaR_{t-1} and sVaR_{t-1} are VaR and stressed VaR computed on the previous day, with a 10-day time horizon and a 99% confidence level. VaR_{avg} and sVaR_{avg} are the averages of VaR and stressed VaR over the previous 60 days, with a 10-day time horizon and a 99% confidence level. m_c and m_s are multiplicative factors determined by banks, although they must be at least equal to three.

Incremental risk charge (IRC) brought into line bank's trading book and their banking book. IRC ruled out banks gimmicking habits to securitize their loans in their banking book to lower its regulatory capital. The IRC requires banks to calculate a one-year 99.9% VaR for losses from credit sensitive products in the trading book. *The Comprehensive*

¹⁵ Average over the last three years. Gross income is defined as net interest income plus non-interest income

Risk Measure (CRM) perceives the risk of instruments that are vulnerable to the correlations between the default risks of different assets. These instruments are such as asset-backed securities (ABSs) and collateralized debt obligations (CDOs). These instruments were especially fragile in the financial crisis. To calculate CRM capital charge the bank uses percentages of the securitizations as shown in the 2 table below. (Hull 2012, 288)

Table 2 Standardized capital charge for correlation-dependent instruments

External Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to BB-	Below BB- or Unrated
Securitizations	1.6%	4%	8%	28%	Deduction
Resecuritizations	3.2%	8%	18%	52%	Deduction

For unrated companies banks are allowed to apply their own internal models to calculate the CRM. This again, leaves room for maneuver and error for the banks own risk assessments. However, this study will return on this matter later on.

Although, Basel 2.5 made major improvements considering market risk, Basel III still needed to better perceive credit and liquidity risk and also tighten the definition of capital. There are six different parts to the Basel III regulations which are observed more closely below:

1. Capital Definition and Requirements
2. Capital Conservation Buffer
3. Countercyclical Buffer
4. Leverage Ratio
5. Liquidity Risk
6. Counterparty credit risk

The implementation of these regulations begun in 2013 and will continue gradually until 2019. (Hull 2012, 286–289)

3.3.1 *Capital definition and requirements*

Basel III defines total capital into three categories:

1. Tier 1 equity capital also known as core Tier 1 capital
2. Additional Tier 1 capital
3. Tier 2 capital

Tier 1 capital includes share capital and retained earnings but it does not contain goodwill or deferred tax assets. Common equity, or Tier 1 equity, is referred as going concern capital and it means that it is able to absorb losses. Tier 2 capital is known as gone-concern capital and when the bank is insolvent, all the losses are absorbed by Tier 2 capital. As long as Tier 2 capital is positive, all the lenders to the bank should be paid fully back. Tier 1 equity capital is adjusted to be at least 4.5% of risk weighted assets at all times. Tier 1 equity capital and additional Tier 1 capital needs to be at least 6% of risk weighted assets at all time. The whole total capital, that is to say Tier 1 and Tier 2 capital is required to be at least 8% of risk weighted assets at all time. (Hull 2012, 289-290)

As these percentages are only considered to be a portion of the *risk weighted assets*, one cannot but to ponder what inaccuracies the risk weighting holds inside. By using risk-weights, banks are relying on the market monitors' capability of rating companies correctly. In addition, for smaller companies which have no rating, they are allowed to rate themselves. Also securitizing financial instruments makes it hard to rate them and establish their risks accurately. If capital and reserves are compared to the whole balance sheet of a Finnish bank, for instance in 2012 the percentage reduces from 15.8% (Finanssivalvonta, tilinpäätösten avainluvut) to only 4% (Statistical Data Warehouse, European Central Bank). The use of risk weights means that decreasing amount of capital is supposed to bear even a bigger balance sheet.

3.3.2 *Capital conservation buffer*

Capital conservation buffer's aim is to ensure that banks have enough capital to bear losses during financial crisis. It requires banks to collect more Tier 1 equity capital during normal financial circumstances to ensure their solidity during economic down turns. During normal times a bank's capital conservation buffer, that is core Tier 1 equity, must be at least 2.5% more than usual of risk weighted assets. This means that the Tier 1 capital is required to be at least 7% of risk weighted assets during normal times. Furthermore, if the capital conservation buffer has been partially used up, banks are forbidden to share dividends until the buffer has been restored. (Hull 2012, 290–291)

The definition of *normal times* is yet to be seen. Since the highest regulatory organ to superintend the regulation is the European Central Bank's observers, the fickle phrase of normal times may cause problems and divide consistent line of uniform regulation. For instance in the European Union, there is many structurally different member countries which may interpret the normal times differently. Although, Europe as a whole may seem blooming, one member country can struggle to find economic growth. Then the struggling

country may find it hard to expand their conservation buffer. As this leads to the prohibition of dividend sharing, bank investors may transfer their money to other countries' banks and therefore even worsen the situation for the already struggling banks.

3.3.3 *Countercyclical buffer*

Bank earning depends on business cycles. To protect a bank from the cyclicity Basel III regulates a countercyclical buffer, which can set to between 0–2.5 percent of risk weighted assets. The extension of its implementation is determined by the authority of the country at issue. (Hull 2012, 292) The counter cyclicity will be discussed more closely in section 3.4.

3.3.4 *Leverage ratio*

Basel III defines a minimum leverage ratio which is 3%. This ratio considers the risk of risk weighting, since it is measured by capital to total exposure (Hull 2012, 292). The adding of 3% leverage ratio to Basel III is a step towards right direction as the total exposure includes all items on the balance sheet without any risk-weights and also some off-balance sheet items like loan commitments. Leverage ratio however is expected to be introduced as late as 2018. The difference between risk weighted assets and the total assets is that the risk weighted assets rely on a correct rating of a credit agency, such as Moody's or S&P's. In the 2007 financial crash, many banks lost a lot of capital because they had invested in ABS CDOs¹⁶ that had been rated as AAA. Merrill Lynch, for example, lost a lot of money from investing in ABS CDOs (Hull 2012, 128–129). The problem then relies on the reliability of the ratings. Although, during normal financial times the AAA-rating would be correct, during financial turmoil the risk weights are not accurate and up-to-date. Some of the ratings can decrease steeply as financial difficulties hit the rated companies.

¹⁶ Asset backed securities that were collateralized debt obligations

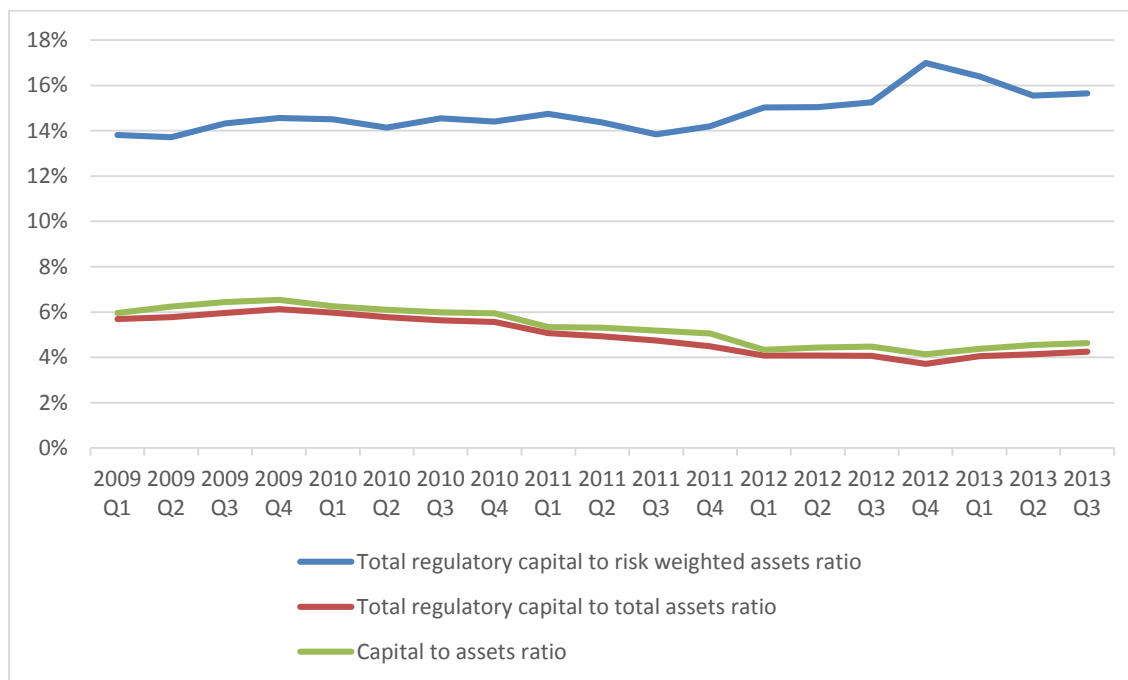


Figure 6 The comparison of different ways to measure equity ratios

3.4 The effects of the minimum equity ratio on the business cycle

This section examines whether the Basel requirements amplify the procyclicality of the real economy. There have been fears that in an economic down turn, the Basel requirements may deepen the coming recession since banks are required to hold on to more equity that would be natural during economic slumps. The idea behind this is that since banks need to raise more equity this comes off from the funds that would otherwise be lent to the public. Therefore the lending market becomes thinner and the banks' client firms are not able to invest. The effect of the minimum equity ratio on the business cycle is examined here because the critique against regulation often argue that regulation magnify the business cycle. Of course, there are many other effects that arise from the minimum equity requirements, however, the effect on the business cycle gives this study a broader macro economical overview and therefore it is being brought to closer examination in this study.

Basel II, which was implemented in 2007, has caused concern whether the regulations amplify business cycles¹⁷. In Basel III the regulators have tried to mitigate the *pro-cyclical behavior*¹⁸ by implementing the *countercyclical buffer*. Previously used Basel II linked capital requirements with risks. These risks are connected to business cycles since the measurement of risk, loan grading, follows economical fluctuations. During economic down-turns the grading of loans and companies are in general decreasing in value. This creates pressure for banks to bring up their equity assets. For this reason Basel III introduced the countercyclical buffer implementation.

After the Modigliani and Miller theory (1958) argued that the financial structure of a firm is irrelevant, the forthcoming *real business cycle models* left the finance aspect without attention (Freixas & Rochet 2008, 195). However, Bernanke (1983) established a new theory to explain the severity of the Great Depression in the 1930's USA where he took the banking view into consideration. He established a *lending view approach* where simple causal effect was considered; banks with liquidity shortages lend less (Freixas & Rochet 2008, 198). This argument is against the view of high equity requirements causing banks restrict their lending and actually points towards the opposite. In addition Minamihashi (2011, 135) finds that bank failures amplify recession due to falling investments. He estimates that the failing banks' client firms reduce their investments by nearly 30 % because they stagnate their activities under the credit crunch¹⁹. As Minamihashi (2011, 137—138) acknowledges, the literacy of bank failures effecting the real economy faces two main problems; banks' secret client lists and shock identification. Since banks are obligated to secrecy about their clients, there is no data to identify which client belongs to which bank. Therefore there is no way to link the failed banks to their failed customers. However, Minamihashi finds that Japanese banks are required to identify their lenders and as a result uses the data of failed Japanese banks and their customers to research the effect of a bank failure to the real economy. He finds that bank failures decrease the investments made by their client firms by approximately 30 %. He comes to a conclusion

¹⁷ Business cycles are periodical fluctuations in economic activity. They are usually measured in the changes in GDP.

¹⁸ In this thesis, the term pro-cyclicality refers to the phenomenon when banks increase their capital reserves during economical down-turn and decrease them during business booms.

¹⁹ Credit crunch describes the situation when the lending activity is diminished because of the uncertain world states. Banks stop lending money to each other and clients because they cannot be certain whether the receiving bank (or a firm) is solvent. This leads to a situation when the whole lending market is frozen.

that bank failures can trigger and deepen recessions because they impose severe credit crunches on their clients (Minamihashi 2011, 153).

Repullo and Suarez (2012) discuss what the effect of Basel II really was to the business cycles. They define that Basel II was in the middle between the arguments whether the procyclicality of bank regulation is a necessary evil or something that should be explicitly corrected (452—453). As Basel III was implemented recently Repullo and Suarez only cautiously take a stand that the reforms introduced in the Basel III is a move to the right direction. However, they conclude that that with the interaction of relationship lending and friction in banks' access to equity markets has the potential to cause *significant* cyclical swings in the credit supply. Repullo and Suarez (2012, 483) stress that their findings show that the swings are highlighted under the risk-based requirements of Basel II compared to the flat requirements of Basel I. The main critique from Repullo and Saurina (2012) is directed to the use of *credit-to-GDP* gap to signal the increase and decrease of the countercyclical buffer of Basel III. They find that the correlation between GDP growth and the credit-to-GDP gap is negative and so it is also between the GDP growth and the countercyclical capital buffer. They conclude that the Basel committee's decision to choose credit-to-GDP gap as the common reference point to take buffer decisions increase the procyclicality of the Basel III. They specify that its negative correlation with the GDP growth means that the credit-to-GDP gap tends to signal to reduce capital requirements when GDP growth is high and to increase the requirements when GDP growth is low. This increases the business cycles. (Repullo & Saurina 2012, 8—13) This stands against the mandate of building buffers in good times and releasing them during economic downturns. As an alternative Repullo and Saurina (2012, 16—18) suggest to use *credit growth* as the reference point instead of credit-to-GDP gap.

Alternatively, Jokivuolle, Pesola and Viren (2015, 117—118) argue that the credit-to-GDP is a good measure for setting countercyclical capital buffers. With the data of nine European countries, they examine the effect of private indebtedness to the bank losses when there is a drop in output. As an example they mention Finland, where the severe drop in output in 2009 did not cause a serious amount of losses in bank loans. This, they say, was accounted for the low private indebtedness. Their conclusion is that banking crisis depend on three macro-economic factors: output growth shock, real interest rate and excessive indebtedness of the private sector. To measure the excessiveness of the indebtedness of the private sector is simply to use the trend deviation of the debt-to-GDP ratio. As economy cannot control output changes directly, and interest rates' policy instruments are affected by several other goals, Jokivuolle et al. suggest that Basel III's idea to base countercyclical buffers on the trend deviation of the credit-to-GDP ratio is in the right tracks (2015, 125).

4 THE COSTS AND BENEFITS OF MORE HIGHLY CAPITALIZED BANKS

This chapter evaluates the costs and benefits of more highly capitalized banks. As argued before there are many different views on whether more equity induces costs or benefits to the banks and the public. An argument towards that more equity denotes higher capital costs argues that more equity leads to greater payments to shareholders since the required return on equity is higher than the required return on debt. Controversially these costs will be shifted to the bank's customers through increasing bank costs for example issuing higher loan margins. If continued on this argument it is shown that this kind of stricter loan granting will lead to decreasing investments and therefore it will unfavorably affect the whole economy.

On the other hand, highly leveraged banks are more vulnerable to economic crisis. If assumed that higher equity requirements will not raise the average cost of capital, there is no valid reason to argue against higher capital requirements. Alternatively if the assumption is relaxed, it is still evident that the higher capital costs to the bank will be balanced out by the more reliable banking industry to the public. As there is now only a little chance for a higher equity bank to be declared bankrupt, the public's chance to bail the banks out will also decrease. This leads to a more trustful community and an economy that is not as vulnerable to crisis as before.

Although it is quite easy to measure the costs of capital, it is not, however, as easy to measure the *benefits* of capital. There might be arguments that it is incompetent to even compare the costs that will generally be borne by banks and the benefits yielded to the general public. Nevertheless, as said before the banks are likely to shift the costs of more equity to the public, and therefore the comparison becomes significant.

This chapter will at first discuss whether Danske Bank Group and Nordea Group fulfill the requirements of Basel III. As it was established in chapter 2, the capital structure of a bank affects its required ROE. This study then moves to examine the validity of this statement in the banking industry. This chapter looks into the issue to what extent the MM-theory holds for banks. The chapter follows closely Miles, Yang and Marcheggiano's article *Optimal bank capital* (2012), which studied the same question by examining data from banks in Great Britain. After measuring the cost-validity of higher equity requirements this chapter turns to measure the benefits of higher equity ratios. Of course this necessitates the quantification and specific definition of the benefits which the chapter also covers.

As said before, many have argued that as banks are important institutions, they are usually considered too-big-to-fail, and, in case of insolvency, national governments will

bail them out. This would mean that the MM-theory does not hold for banks since they are in no risk of bankruptcy. In Finland the government has established a *deposit guarantee fund* which covers all private persons, companies, foundations, municipalities and parishes and it secures the deposits to the maximum of 100 000 euros per bank. The deposit guarantee is bank-specific and both Nordea Bank Finland Oyj and Danske Bank Oyj deposits are guaranteed (The deposit guarantee fund). With attributes like mentioned above, it seems unlikely that the Modigliani and Miller theory is adequate for banks.

4.1 Do Danske Bank and Nordea Meet the Requirements?

In this section Danske Bank Group and Nordea Group's financial statements' key figures are compared to those of required by Basel III. In this section we face the problem of risk-weighting yet again. As can be expected, both Nordea and Danske Bank manage their required capital ratios well.

Table 3 Required amount of CET1, T1 and T2²⁰ capital over risk-weighted-assets in comparison to the amounts that Nordea and Danske Bank hold²¹

	NORDEA GROUP	NORDEA SUOMI	DANSKE BANK GROUP	DANSKE BANK OYJ	
CET1CAPITAL/RWA	15,7	14,2	15,1	13,9	>7%
(T1+T2)/RWA	20,1	15,2	14,5	19,3	>8%

Danske Bank and Nordea both have almost double the required amount of both CET1 Capital and Tier1 and Tier 2 capital. If equity capital is perceived expensive then how come these two banks hold almost double the amount required? Easy conclusion would be that the banks do not think equity capital that expensive after all. However, as has been seen before, risk-weighting is not an easy task for banks. Therefore it also could be that having an extra amount of equity capital is preparation for the problem that risk-weighting

²⁰ As defined in section 3.3.1; Tier 1 capital includes share capital and retained earnings but it does not contain goodwill or deferred tax assets. Common equity, or Tier 1 equity, is referred as going concern capital and it means that it is able to absorb losses. Tier 2 capital is known as gone-concern capital and when the bank is insolvent, all the losses are absorbed by Tier 2 capital.

²¹ In this table, the figures from Nordea and Danske Bank are from the year 2013 (Danske Bank and Nordea's annual reports).

is not accurate. If a bank inspector was to point out that the risk assessment is not strict enough, then the banks would already have the extra amount of equity capital required. On the other hand, it may seem irrelevant to calculate the cost of doubling equity ratios when the current level of equity is already notably higher than the required level to begin with. However, in this study the calculations are meant to test whether the higher equity requirements would rise the funding costs of banking substantially. It will be seen in Section 5 that costs are not as high as feared. Also it is worth speculating whether an increase of the required equity over risk-weighted assets for instance to 20 percent would save the industry a whole lot of monitoring costs. One important area of study would be to measure how much the new regulatory regime costs for banks as monitoring costs.

Although Danske Bank and Nordea hold more equity than required by Basel agreement, they probably do so to prepare themselves for rising loan demand. Banks' loan demand can rise suddenly. If the equity rate is already at the minimum level, the bank cannot grant these new loans. However, if the bank has enough leeway between their actual equity rate and the required one, they will be able to grant the new loans without breaking the requirements. On the contrary, a bank that only just meets the requirements may suffer from bad debt that consumes the bank's equity even more. To be able to meet the required equity rate, the bank may have to give up some of its good and healthy loans to balance out the consumed equity. This cause and effect cannot be beneficial to the bank or to the public. Yet, if the bank had additional equity to begin with, it would still meet the requirements after the bad debt and would not have to cut off its loan supply. Additional equity therefore creates elasticity. When interpreting the Danske Bank and Nordea's figures of 2013, is it easy to see why they have willingly doubled their equity ratios compared to the required ones. Still, this does not mean that the banks' equity requirements could be doubled without any consequences. If the requirements were to be doubled, the banks would probably react to the new requirements by yet again with even more additional equity to serve the possibility of adapting to the moves in loan demand. Nevertheless, the depositors might not trust the solvency of a bank, even though it met the capital requirements. To get the depositors to trust in a bank's safety, it might have to operate on a higher equity level than required.

4.2 Capital Asset Pricing Model and the size of the equity beta

The Capital Asset Pricing Model is used to calculate the expected return of an asset, for instance, a stock. Capital Asset Pricing Model perceives the capital risk of a firm in its beta (β_{asset}). It denotes that the risk of bank's assets can be broken in to two parts; risks

borne by equity holders (β_{equity}) and by debt holders (β_{debt}). As this study is interested in the required return on equity and the cost of equity it is important to look how the risks of different capital instruments, now equity and debt, are calculated. β_{equity} depends upon the correlation between the rate of return of a firm's share and that of the market as a whole, so the Capital Asset Pricing Model is

$$\beta_{asset} = \beta_{equity} \frac{E}{D+E} + \beta_{debt} \frac{D}{D+E}, \quad (5)$$

where E is the equity and D is the debt of a bank. If we assume the debt holder's risk to be zero ($\beta_{debt}=0$)²² equation (1) will become:

$$\beta_{equity} = \frac{D+E}{E} \beta_{asset} \quad , \quad (6)$$

where $\frac{D+E}{E}$ is the leverage. From the equation (5) one can see the link between the MM-theory and Capital Asset Pricing Model. If β_{debt} is zero the risk premium on equity declines linearly with leverage. For example if a bank halves its leverage, each unit of equity should now bear only half of the risk as before, otherwise the β_{equity} should fall by half. The Capital Asset Pricing Model would then imply that the risk premium on that equity should also fall by one half. (Miles et al. 2012) In chapter 5 this study tests how this works for banks operating in Finland.

Capital Asset Pricing Model illustrates the relationship between the *expected* returns and risks. The return to the shareholders always contains risk and this risk is rewarded with risk premium, a premium paid for the shareholders to compensate the risk. The Capital Asset Pricing Model suggests that the expected returns of the risky investment must be higher than risk-free investment's since risk averse shareholders require compensation to invest in risky shares.

Miles et al. (2012) find that the equity premium is the key in assessing the bank's cost of capital because it is the only difference between the cost of debt and the rate of return of equity that matters. They find that the impact of leverage on beta is highly significant and that the Capital Asset Pricing Model and Modigliani and Miller theory –joint hypothesis conditions do not hold. They confirm this by using their estimates to assess how the

²² This is based on the assumption that the fluctuations in the value of the debt are not correlated with the general market movements. The debt grantors and holders are eager to avoid risk that would arise from binding the debt value to the general market fluctuations. Hence, debt's compensation is generally tied to interest rates which are not as volatile as shares for instance.

change in leverage affects the average cost of bank funds. They estimate that with an approximately 15% required return on equity the cost of capital, at a 30%-leverage and a 5% risk-free interest rate, is 5.33%. When they halve the leverage to 15% the cost of capital rises to 12.6%. (Miles et al. 2012, 11—13). If Modigliani and Miller theory held for banks the change in leverage would not have affected the original cost of capital, 5.33%. Nonetheless, if the Modigliani and Miller theory had not hold for banks at all, the change in leverage would not have had any impact on the required return on equity. It is concluded that the Modigliani and Miller theory holds for bank to some extent.

The extent to which the Modigliani and Miller theory holds, is important to acknowledge since it is the main theory where this study bases its assumptions about the controversy between leverage and the cost of capital. If the Modigliani and Miller theory holds for banks to *some extent*, how considerable should this connection be to be relevant? Miles et al. (2012, 14) find that compared to a situation where Modigliani and Miller theory holds exactly, so when doubling the leverage doubles the risk, the actual rise in risk is about 70% of what it would be if the Modigliani and Miller theory held exactly. To be noted is that these estimates are not even taking into consideration what will happen to the required rate of return on debt as the leverage changes. Of course conclusion is that as leverage doubles, also the creditors want more compensation to their now riskier loan. However, this assumption is conservative and potentially understates the Modigliani and Miller effects. Miles et al. (2012, 15) find when using regression analyst that the Modigliani and Miller theorem effect is between 45%—90% as large as it would be if the theory held exactly. Yet in their findings they ignore tax effect. However, the loss that incurs to the banks as extra tax payments when the leverage ratio decreases, is offset by the revenue the government gains in taxes.

4.3 The benefits of lower leverage

To say that highly leveraged banks can cause damage because they are connected with credit crunches²³ is true but not an accurate statement. Although this study has concentrated on the costs of equity financing, the benefits of secured banks must also be studied thoroughly. Only after this study has computed the value of the benefits, can the true costs of low equity financing be calculated. In the *Optimal bank capital* paper (2012, 18) Miles et al. quantify the benefit by defining the benefit to be the more robust banking

²³ Credit crunch is a situation when all credit activity in the financial sector is frozen because the counterparties cannot verify whether the other one is a financially stable company.

sector and the lower frequency of banking crisis. They conclude that the benefits of a higher equity ratio can be measured as the *expected cost* of a financial crisis that has been avoided. That means that the *marginal benefit equals the reduction in the probability of banking crisis times the expected cost of a banking crisis*.

There is one key assumption that needs to be taken into account. It is assumed that the decrease in the value of banks' assets is caused by changes in the levels of incomes in the economy. To be more precise, if income levels fall then losses will arise to the banks. After modelling the process which determines the income level the asset value's probability distribution can be calculated. This leads to find the probabilities when the *value of assets declines more than the value of how much equity there is*. This is the probability of a banking crisis. From there it is easily seen that when equity levels rise how the probability of insolvency changes. (Miles et al. 2012, 19.)

Miles et al. suggest evidence that during recessions that are associated with banking crisis the fall in GDP can be proportionally equal to the fall in bank assets. However Miles et al. assume that the fall in bank assets for a given fall in incomes is only about a half as large as that (19). However, the more international are banks the less tight will be the link between movements in domestic incomes and the value of bank assets. Miles et al. (2011, 20) calculate an example that if GDP falls by 10 % in a year when using the average risk weight of 0.45, the fall in assets would be 4.5 %. Now the assets would be worth 95.5 % of their start of the year value. A bank with leverage less than 22.2 ($1/0.045$) would have enough capital to absorb this loss.

4.4 Results of debt guarantee

Bank's debt has implicit and explicit guarantee. In Finland the bailer or guarantor is the government. This means that a lender does not perceive its loan to a bank as a risky business. The government granted safety net skews banks' loan markets. This leads to a situation where a bank gets loans under the accurate market price. Alternatively, the guarantee of the government entails that bank owners, also known as equity holders, do not need to compensate creditors fully for the risk of the debt. As the government guarantee is considered to exist for the safety of depositors, and banks do not pay any premium for it, it can be examined as subsidy to the bank owners. (Vale 2011, 4)

Inevitably, such a benefit will have an effect on the validity of the MM-theorem. To see the effect it is necessary to draw a distinction between social and private funding costs. The social funding costs consists of three elements: the required return on equity, the required return to the debt holders, and the cost to the guarantor of being paid less

than the actual security premium for the debt guarantee²⁴. The total social funding costs, SFC, can be written as

$$SFC = R_E(\underline{e})e + R_{Dg}(\underline{e})[1 - e] + P(\underline{e})[1 - e] \quad (7)$$

and when SFC is differentiated w.r.t. e , the dSFC will then be

$$dSFC = [R_E - R_{Dg} - P]de + \frac{\partial R_E}{\partial e}e \times de + \frac{\partial R_{Dg}}{\partial e}[1 - e]de + \frac{\partial P}{\partial e}[1 - e]de = 0 \quad (8)$$

where R_{Dg} is the required return on debt in presence of a debt guarantee, and P is the cost of the guarantee to the guarantor, that is the cost of being paid less than the actuarially fair premium for the debt guarantee. It must be noted that P is negative in e i.e., a higher equity implies lower cost of the debt guarantee. The second equation (8) states that when taking into account all the social funding costs that is to include all the costs borne by all parties, the MM-theory still holds. An increase in the equity ratio will not affect the total social funding costs. However, the distribution of the costs will change between the three parties. Now a higher equity ratio implies a lower cost for the guarantor, hence the term $\frac{\partial P}{\partial e}[1 - e]de$ is negative. The guarantor will now get all the benefits from the raising of equity ratio. For creditors there will be some benefit or none since the term $\frac{\partial R_{Dg}}{\partial e}[1 - e]de$ is negative or equal to zero depending on whether the guarantee is partial or full. The term $\frac{\partial R_E}{\partial e}e$ is negative and a higher equity ratio implies a less volatile value of the bank's equity for a given volatility of the bank's assets. The first term $[R_E - R_{Dg} - P]de$ is positive since the required ROE is always larger than the required return on debt plus the cost of the debt guarantee. (Vale 2011, 4—5)

The total private funding costs PFC are the total social funding costs minus the guarantor's cost of the debt guarantee.

$$PFC = R_E(\underline{e})e + R_{Dg}(\underline{e})[1 - e] \quad (9)$$

Now it is essential to see how these private funding costs are affected by an increase in the equity ratio. As a higher equity ratio reduces the cost to the guarantor, we will see that $\frac{\partial P}{\partial e}[1 - e]de < 0$. Noticing this we will get

²⁴ $R_E(\underline{e})e$ means the required return on equity, $R_{Dg}(\underline{e})[1 - e]$ indicates the required return to the debt holders and $P(\underline{e})[1 - e]$ is the security premium of the debt guarantee.

$$dPFC = [R_E - R_{Dg}]de + \frac{\partial R_E}{\partial e} e \times de + \frac{\partial R_{Dg}}{\partial e} [1 - e]de > 0 \quad (10)$$

From here it can be seen that the bank cannot fully enjoy all of the benefits of lower cost of debt from raising its equity ratio. Some of the benefits are shifted to the guarantor. It can also be thought as the subsidy that the bank gets is now smaller. Therefore the higher equity ratio will reduce the value of the subsidy inherent in the debt guarantee. (Vale 2011, 5—6)

In Vale's study (2011, 6—9) he finds that the increase in DnB NOR Bank's equity ratio from 5,51 per cent to 11,02 percent inflicts a growth in private funding costs of 57 basis points in the naïve example. Nevertheless, when he calculates that the change in private funding costs when he uses the estimates of Miles et al. and includes the equity premium effect, is in the range of 11 to 41 basis points.

5 THE ESTIMATES OF A RISE IN FUNDING COSTS FOR BANKS IN FINLAND

This section will follow the example of Bent Vale (2011) and Miles et al. (2012) and look into a case where the equity ratios of Finland's two largest banks, Nordea and Danske Bank²⁵, doubles. Why calculate the *doubling* of the equity ratio and not for example an increase of ten percent? The biggest reason is to be able to compare this study to the similar ones made by Vale and Miles et al. In addition, the purpose of this study is to show that the increase of equity ratio does not increase the funding costs of a bank in the same phase. Also to correct the critique of highly capitalized banks having high funding costs, it is necessary to show the exaggerated representation of banks having to double their equity ratios to start a conversation to recommend highly capitalized banks. Section five analyzes the effects of the doubling to the funding costs. As Nordea and Danske Bank are both global banks operating in Nordic countries, it is hard to come by accurate stock market data and annual reports concentrating only on the subsidiaries operating in Finland. For instance Danske Bank Oyj is a subsidiary of Danske Bank Group and the whole capital stock of the Finnish subsidiary is owned by the Danish parent company (Danske Bank Financial Statement Handout 2013). This leads to a situation where the annual reports of Danske Bank Oyj can be researched *but* there is no stock market data to be found and used in the calculations later on. It is important for the sake of accurate results that this thesis does not mix subsidiary and controlling company data. This is the reason why *only* controlling company data is used.

In this thesis the data is gathered from Datastream of Thompson Reuters. Thomson Reuters datastream is a global financial and macro economical database that covers key economic indicators for 175 countries and 60 markets. By using the database this study has been able to calculate the averages of Nordea and Danske Bank Groups' annual stock returns through 2000—2013. Datastream is also used to calculate the annual average of three months Euribor, which is used as a proxy for short term money market debt²⁶.

By the end of 2013 Nordea Group had a *total capital ratio* of 18,1% and Danske Bank Group had an equity ratio of 21,4% (Annual Reports of Nordea Group and Danske Bank

²⁵ Nordea Suomi Oyj and Danske Bank Oyj are the two largest public limited companies in Finland. Osuuspankki is the second largest banking group in Finland but its company form is cooperative bank and therefore it cannot be used in this research.

²⁶ Three month euribor is a money market rate that is usually slightly lower than the interest cost of a bond debt.

Group). Although the equity numbers from the balance sheet seem stable, a common concern is directed towards the ways of measuring and calculating risk. Instead of using the ratios which are compared to *risk-weighted-assets* it is more accurate to compare equity to *all* assets measured in the balance sheet of the banks. This is done because the banks' own calculations of measuring the risks of their assets can be biased. The calculations with ratios to all assets changes the numbers enormously. For example as the year 2013 figures are compared Danske Bank's and Nordea's equity ratio declines from 21.4% to 5.6% and from 18.1% to 4.5% respectively²⁷. Basel regulates the Core Tier 1 Capital ratio to be at least over 4.5% and the official numbers of Danske Bank (14.7%) and Nordea (14.9%) seem to fulfill this requirement easily. Again these figures are compared to the risk-weighted-assets. Once they are divided by all assets the figures fall to 3.9% and 3.7% respectively. (Annual Reports of Danske Bank Group and Nordea Group.) To follow the example of Miles et al. (2012) and Vale (2011), this study will test the effects of increasing the equity ratios, or doubling them, to 9% for Nordea Group and to 11,2% for Danske Bank Group.

To test how the funding costs react to different equity levels, this thesis uses equity measures that are in comparison with all the assets of the representative banks' balance sheets. This way the thesis eliminates uncertainty that originates from the inaccuracies in risk weighting. However, to avoid the inaccuracies in risk weighting, this research also tests the change in funding costs with equity ratios that are per risk-weighted-assets. When testing this, it is good to examine the results skeptically. To perform the test of doubling the banks' equity ratios, assumptions need to be established. First, the assumption of full debt guarantee holds²⁸. Second assumption is that there is no equity premium effect. This is a naïve assumption and it can be relaxed later on. As a result of such a small sample of banks in Finland, this study uses the estimates of equity- β s based on Miles, Yang and Marcheggiano (2012). After calculating the effects of doubling the equity ratio for Danske Bank Group and Nordea Group, this chapter finishes with the evaluation of the used methods.

²⁷ Total capital ratio comparison is calculated at first by dividing Capital base by risk-weighted assets and then by all assets.

²⁸ I.e. there is no debt premium effect from higher equity ratio. Even though it may seem a little bit pessimistic, for the sake of the results, it is better to estimate the effects of funding costs a little too high than too low.

5.1 A naïve example without equity premium effect

At first the naïve case with no equity premium effect from higher equity ratio is considered. Then only the first term in equation (10) comes into consideration, that is, we only have $dPFC = [R_E - R_{Dg}]de$. In the cases of Nordea Group and Danske Bank Group, de is 0,045 and 0,056 respectively. As an estimate for the *required* return on equity, R_E , we use the average annual return on Nordea Group and Danske Bank Group stocks. Danske Bank Group stock's average annual return for the years 2000 through to 2013 was 15,61% and Nordea Bank's was 13,886%. (Datastream).

To estimate the required return on bank debt, R_{Dg} , it is assumed that when replacing the debt with equity, the most expensive parts of debt is firstly replaced. In addition banks prefer to hold onto stable bonds and therefore we will assume that banks will reduce their short term money market debt. As a proxy of the cost of this debt we use the annual average of the three months EURIBOR. Over the years of 2000–2013 the average three-month EURIBOR was 2,456%.

Now we can calculate the naïve estimate of the increase in the banks' funding costs from raising their equity ratios from 0,056 (Danske Bank) and 0,045 (Nordea) to 0,112 and 0,09 respectively.

$$dFC_{NAIVE,Nordea} = [13,886 - (2,456)] \times 0,045 = 0,51435 \text{ or } 51 \text{ bps}$$

$$dFC_{NAIVE,Danske\ Bank} = [15,61 - (2,456)] \times 0,056 = 0,736624 \text{ or } 74 \text{ bps}$$

With these figures it is easy to see that the growth in financial costs is not tremendous. Actually, if these banks *double* their amounts of equity, their financial costs will grow only by 0,51 (Nordea) and 0,74 (Danske Bank) percentages. These results are in line with Vale (2011) and Miles et al. (2012), although, they are higher than the previous results. This can be explained by Nordea and Danske Bank's bigger share of equity in the first place. The results are compared to the previous studies more thoroughly later on in the section 5.2.

To see the range of variation of the calculations more thoroughly it is intriguing to check results arising from the equity ratios which are compared to the banks' own risk-weighted-assets. In the case of Nordea Group the rise in the funding costs is

$$(13,886 - 2,456) \times 0,181 = 2,06883 \text{ or } 207 \text{ bps.}$$

In the case of Danske Bank Group the funding costs rise

$$(15,61 - 2,456) \times 0,214 = 2,814956 \text{ or } 281 \text{ bps.}$$

These figures mean that if Nordea Group doubles its equity ratio, their funding costs will grow by 2,07 percentages. For Danske Bank group it means a rise of 2,81 percentages in funding costs. It is important to yet acknowledge that these last figures can be biased by the banks' own risk-weighting evaluation.

5.2 Estimates including equity premium effect

As shown in section 4.2 Miles et al. (2012) estimate the funding costs with different equity ratios by using the Capital Asset Pricing Model. Equation (5) in section 4.1 stated that the risk of assets is equal to the relative amount of equity multiplied by equity's risk plus the relative amount of debt times the risk of debt. As this section researches the outcomes when there is no equity premium effect it must be that there is a full debt guarantee. This assumption creates the equation (6) which is

$$\beta_{equity} = \frac{D+E}{E} \beta_{asset} \quad (6)$$

From this equation it is easy to see that if leverage, $\frac{D+E}{E}$, is doubled so should the risk of equity be doubling.

Miles et al (2012) had 38 observations of β_{equity} when they researched six UK banks. They used Ordinary Least Squares method and Fixed Effect to regress these β_{equity} -figures and then used the Capital Asset Pricing Model to measure how the return on bank equity depends on bank leverage. They assumed a risk-free interest rate of 5% in other words that means a required return on bank debt of 5%. They find that under reasonable assumptions even the doubling of the bank capital has modest impact on the average cost of bank funds. The rise in costs range between under 10 bps to under 40 bps. (Miles et al. 2012, 8—18.)

To create the same test for banks operating in Finland, the test encounters problems. Altogether there is only a few different banks operating in Finland. And only two of the few is publicly listed commercial bank. This creates a problem of lacking data when regressing the β_{equity} -figures for Finnish banks. In this paper the problem is solved by using the same method as Vale (2011) and partially relying on the parameter estimates from Miles, Yang and Marcheggiano (2012)²⁹.

Vale (2011, 8) starts the test by calculating the equity risk premium for the whole market, R_p . To find R_p , it is important to examine the β_{Equity} regression from Miles et al.

²⁹ Vale used the parameter estimates as they were in Miles et al. in their 2011 paper *Optimal Bank Capital*. In this research the 2012 version of the same paper is used. There is only a few differences between the papers and none of them concerns the parameter estimates.

$$\beta_{it} = \mathbf{X}'_{it}\mathbf{b} + \varepsilon_{it}, \quad (11)$$

where for every bank i at time t , β_{it} is the estimated semi-annual equity beta. \mathbf{X}'_{it} is a vector of regressors which include leverage and year dummies. \mathbf{b} is a vector of parameters. (Miles et al. 2012, 9.) These predicted equity betas are embedded into the Capital Asset Pricing Model to get an estimate on how the return on bank equity depends on leverage. Here R_{Equity} stands for the required return on equity, R_f is the risk-free interest rate, \hat{a} is a constant, \hat{b} is the coefficient on leverage from the beta regressions and R_p stands for equity risk premium (Miles et al. 2012, 12).

$$R_{Equity} = R_f + (\hat{a} + \hat{b} \times \frac{D+E}{E})R_p \quad (12)$$

Now it is assumed that equation 12, as estimated by Miles et al., holds also for Danske Bank Group and Nordea Group³⁰. Furthermore R_{Equity} is the average annual return on the Danske Bank Group and Nordea Group shares. The time line goes from the year 2000 to 2013 $R_{Equity, Danske Bank}$ during these years was 15,61 per cent and $R_{Equity, Nordea}$ is similarly 13,89 per cent. For the same period of time the European Central Bank's average key policy rate was 2,21 per cent and it is used as a dummy for the riskless rate. Again this research focuses on two cases; equity ratio measured over *risk-weighted-assets* and also over *all assets*. Table 3 below shows the figures that are used next in a more concise form.

Table 4 **Equity and Gearing ratios 2013**

	Danske Bank Group	Nordea Group
Equity/RWA	21,4	18,1
Equity/Assets	5,6	4,5
Gearing Ratio _{RWA}	4,673 %	5,525 %
Gearing Ratio _{ASSETS}	17,857 %	22,222 %

The inverse of both banks' equity ratio is gearing ratio and in these cases for Danske Bank it is 4,673 (over risk-weighted-assets) and 17,857 (over all assets) per cent. For Nordea the gearing ratios are 5,525 (over risk-weighted-assets) and 22,222 (over all assets) per cent.

³⁰ Of course using parameters from multiple UK banks to two specific Finnish banks includes inaccuracies. Nevertheless, the purpose of this paper is generally evaluate the costs of a higher equity ratio to Finnish banks and therefore, these inaccuracies borne are not in the center of this study.

Now to calculate market equity premium, R_p , the initial required return on equity (ROE), risk-free return R_f , gearing ratio and coefficients for \hat{a} and \hat{b} as found in Miles et al. (2012, 10—14) are entered to the equation 12. After finding the R_p it is easy to calculate the new required return on equity (ROE) with the halved leverage. After this, the *private funding costs* (PFC) can be calculated after halving the leverage by using equation 9. This new private funding cost is then compared to the initial private funding cost to the bank. Below in tables 4, 5, 6 and 7 the results of these calculations are shown and compressed into tables for each bank.

5.2.1 Analyzing the changes in funding costs for Danske Bank Group

For Danske Bank, the doubling of their equity ratio, when measured by equity over all assets, increases their funding costs in the range of 16 to 54 bps. This result takes into consideration that as equity ratio rises, the required return on equity decreases. It is a clear assumption because riskiness of the bank falls as their equity ratio increases. This result is smaller than in the naïve example previously, 74 bps. These results illustrate that the naïve manner of calculation may overestimate the results. Miles et al. (2012) and Vale (2011) both calculated similar results. Table 4 next page, shows the increase in private funding costs (PFC) using both linear and log-linear specification. It also shows the results of two different estimation methods, Ordinary least squares (OLS) and Fixed Effects (FE), and it can be seen from the results that they do not differ outstandingly. Table 4 also demonstrates how the Return on equity falls after the leverage of Danske Bank is cut in half. This is explained by the fact that as the risks of debt are now fallen as well, the bank's investors are now requiring less profit for their investment.

Table 5 Costs of doubling equity over assets -ratio for Danske Bank

DANSKE BANK (EQUITY/ASSETS)				
B-LEVERAGE EQUATION	Linear	specification	Log-linear	specification
ESTIMATION METHOD	OLS	FE	OLS	FE
INITIAL ROE	15,61	15,61	15,61	15,61
INIINTIAL PRIVATE FUNDING COSTS (PFC)	3,19	3,19	3,19	3,19
MARKET EQUITY PREMIUM RP	7,96	8,24	9,63	9,91
ROE AFTER HALVED LEVERAGE	13,83	13,33	11,04	10,50
PFC AFTER HALVED LEVERAGE	3,73	3,67	3,42	3,36
INCREASE IN PFC	0,54	0,48	0,22	0,16
INCREASE IN PFC, NAIVE METHOD	0,74	0,74	0,74	0,74

For thorough examination, also the risk-weighting of assets must be taken into consideration. On next page table 5 illustrates the changes in funding costs after doubling the equity over *risk-weighted-assets* -ratio. It is shown that the table 5 estimates a greater increase in Danske Bank's funding costs. However, the raise in costs is nowhere near the doubling of the costs. This was also the case in the figures of table 4. It is therefore shown that the costs do not grow linearly with the raising of equity ratio. As can be seen from the table 5, in the log-linear specification the rise in private funding costs is between 63 and 86 bps. However, the market equity premium is significantly higher in the log-linear specification.

Table 6 Costs of doubling equity over risk-weighted-assets -ratio for Danske Bank

DANSKE BANK (EQUITY/RWA)				
B-LEVERAGE EQUATION	Linear	specification	Log-linear	specification
ESTIMATION METHOD	OLS	FE	OLS	FE
INITIAL ROE	15,61	15,61	15,61	15,61
INITIAL PRIVATE FUNDING COSTS (PFC)	5,27	5,27	5,27	5,27
MARKET EQUITY PREMIUM RP	9,89	11,01	21,59	25,06
ROE AFTER HALVED LEVERAGE	15,03	14,81	11,04	10,50
PFC AFTER HALVED LEVERAGE	7,84	7,74	6,13	5,90
INCREASE IN PFC	2,57	2,47	0,86	0,63
INCREASE IN PFC, NAIVE METHOD	0,74	0,74	0,74	0,74

However, in the case where the degree of self-sufficiency is measured as equity over risk-weighted assets, the increase in private funding costs is outstanding. It ranges from 63 to 257 bps. When comparing this result to the one obtained from the equity over assets –calculations, the great difference cannot be overlooked. The high value of the difference arises question of which manner of calculation is more accurate and reliable.

As pointed out before, one of the key questions is *who* bears the costs. Previously the public was to collect the risks of overleveraged banks. If the banks move the costs directly to the bank lenders, otherwise the public, how will this affect the overall economy? Miles et al. (2012, 16) assume that the banks pass on the increasing funding cost to the lending rates one-for-one. This means that the cost of lending to the public would increase by 0,63% to 2,57% . The study will briefly return on this matter in the chapter 6.

5.2.2 Analyzing the changes in funding costs for Nordea Group

Mimicking the custom of research from the previous section, this subdivision shows the same calculations when using the data of Nordea Group. In table 6 the calculations are based on the percentages of equity over assets -ratio whereas the figures of table 7 are measured on equity over risk-weighted assets basis.

Table 7 Costs of doubling equity over assets -ratio for Nordea

NORDEA (EQUITY/ASSETS)				
B-LEVERAGE EQUATION	Linear specification		Log-linear specification	
ESTIMATION METHOD	OLS	FE	OLS	FE
INITIAL ROE	13,89	13,89	13,89	13,89
INITIAL PRIVATE FUNDING COSTS (PFC)	2,97	2,97	2,97	2,97
MARKET EQUITY PREMIUM RP	6,51	6,63	7,36	7,43
ROE AFTER HALVED LEVERAGE	12,08	11,61	9,91	9,44
PFC AFTER HALVED LEVERAGE	3,32	3,28	3,13	3,08
INCREASE IN PFC	0,35	0,31	0,16	0,11
INCREASE IN PFC, NAIVE METHOD	0,51	0,51	0,51	0,51

Table 6 shows an increase of 11 to 31 bps. The raise in costs is therefore smaller than when it was calculated by using the naïve method. Again, the calculations illustrate that the raise in costs is not linear with the raise in equity ratio. Nevertheless, a slight increase in the private funding costs can be founded.

The table 7 next page shows the figures when they are calculated by using equity over risk-weighted-assets -ratio. Like in the case of Danske Bank group, the increase in private funding costs is greater when measured by using equity over risk-weighted-assets -ratio.

Table 8 Costs of doubling equity over risk-weighted-assets -ratio for Nordea

NORDEA (EQUITY/RWA)				
B-LEVERAGE EQUATION	Linear specification		Log-linear specification	
ESTIMATION METHOD	OLS	FE	OLS	FE
INITIAL ROE	13,89	13,89	13,89	13,89
INITIAL PRIVATE FUNDING COSTS (PFC)	4,53	4,53	4,53	4,53
MARKET EQUITY PREMIUM RP	8,49	9,39	17,01	19,45
ROE AFTER HALVED LEVERAGE	13,30	13,09	9,91	9,44
PFC AFTER HALVED LEVERAGE	6,38	6,30	5,15	4,98
INCREASE IN PFC	1,86	1,78	0,63	0,46
INCREASE IN PFC, NAIVE METHOD	0,51	0,51	0,51	0,51

Also, the increase is greater than it was in the naïve method. The growth in private funding costs varies from 46 to 186 bps. The 5.3 section will concentrate more on the matter of differences between the two ways of measuring equity ratios.

5.3 Evaluation of the used methods

This section concentrates on the evaluation of computational methods used above. First it will look into the used data and its source. Second it focuses on the estimates that originate from Miles et al. research and their suitability for this study. Third this section concentrates on the inaccuracies that arise from the two different ways of measuring equity ratios.

The data used is retrieved from Thomson Reuters Datastream. Datastream is a global financial database operated by Thomson Reuters Corporations. It is one of the largest databases worldwide. This research has retrieved all the annual returns used in section 5 from Datastream. The used required return on equity figures are averages of annual returns of 2000-2013. Hence the time period covers the economic boom of the early 21st century and the recession period that started in 2007 and is yet to be solved. The figures used to calculate equity and capital ratios are retrieved from Danske Bank Group's and

Nordea Group's annual reports of 2013. However as there is only a sample of two companies, the results must be interpreted directionally and cannot be generalized. On the other hand, this study is the first study to examine Danske Bank Group and Nordea Group precisely and therefore the results are suggestive. The reason behind the decision to use only two banks as research subjects originates from the small amount of publicly listed commercial banks in Finland. However, it must be perceived that due to lacking data from the Finnish subsidiaries, this study uses the group level data. On group level both Nordea Group and Danske Bank group operate also in other Nordic countries besides Finland.

To estimate the equity beta for Finnish banks the study again collides with the problem of a small sampling frame. To create a plausible and accurate beta regression, the sample of two banks in Finland is not sufficiently enough. For this reason, the study copies the beta coefficients from the research of Miles et al. (2012). In their examination they used six different banks from the UK to create the beta regression. They estimate equity betas by using publically traded stock returns together with the FTSE 100 index returns. The UK banks in their research are Lloyds TSB, RBS, Barclays, HSBC, Bank of Scotland and Halifax that were turned into HBOS later. Because of mergers of Bank of Scotland and Halifax to create HBOS, the merged bank HBOS is treated as a continuation of Halifax. This leads to the problem of Bank of Scotland not existing after the merger. However, the unbalanced panel does not affect the panel estimation in this case. (Miles et al. 2012, 8-9.) How does this all affect the results in this study? The estimated equity betas are from the UK banks. There are differences between the Finnish and the UK banking fields. Yet, the beta describes the riskiness of the returns and as the whole banking industry is regulated by Basel III, and the deposit insurance is regulated by the EU directives, the riskiness of the returns can be thought as similar. For this reason, even though the use of the UK beta estimations causes inaccuracies to the cost of equity calculations, it is the closest estimation the study can find. Also for the sake of the results which are with a view to observe the size of the impact of the raising equity ratios to the bank equity owners, the inaccuracies are not disruptive.

In this chapter it has been evaluated how much costs a rise in equity ratio would generate. One of the key issues here is whether the change in financial costs is measured by using equity over assets ratio or equity over risk-weighted-assets ratio. The importance of the measuring manner stems from the inequality of the two terms. The difference between the measures when using equity over risk-weighted-assets and equity over assets - ratios originates from the aberration between the two ratios. It is easy to see that these two figures are not equal. Nevertheless, it is disturbing to see how greatly the two differ from each other. It again questions the way banks measure and estimate the riskiness of their assets. The main difference in the tables 4 and 5 and also 6 and 7 originates from the

way of measuring equity ratio. The size of the balance sheet affects the two measures. It is important for a bank to have a solid financial standing. However, the internal risk assessment gives banks latitude to whitewash their assets and eventually look more solid than they actually are. This is also the difference between equity over assets and equity over risk-weighted-assets -ratios.

Criticism can also be concentrated on the use of Return on Equity to measure the cost of equity. As noted earlier in section 2.2, return on equity may not be the best way to measure the profitability of equity. The more a bank is leveraged the bigger is the required return on the risky owner's equity. The Modigliani and Miller theory covered in section 2.2 suggests that the costs of a higher equity level are close to zero. However, in the government subsidized banking industry, the Modigliani and Miller effect cannot be thought as holding true purely. Nonetheless, as required return on equity is the controversial manner to measure the costs of equity, it cannot be left untouched. The mean of this research is to study whether the costs for stock owners rise with the rise in equity capital and therefore the use of return on equity as a cost measurement is necessary.

6 CONCLUSIONS

The aim of this research was to evaluate whether there is relative evidence and precious research to prove that higher capital ratios for banks do not lead to greatly higher funding costs. To study the assertion above, this study has focused on the previous literature, theories, articles and researches and absorbed in two studies of Miles et al. and Vale who have already calculated the rise in funding costs that were the result of raising capital ratios. At first this study concentrated on different views to equity holding. For instance Modigliani and Miller theorem shows that the financial structure of a firm is irrelevant to the funding costs. Then the thesis focused on the down-side of over-leverage and tax deductibility and the causes of the lack of equity that can be seen in the situations of capital crunches and credit contagion. Chapter 3 was engrossed in Basel requirements that control the financial standings of banks. Since Basel requirements is the main reasons that directs the banks funding behavior, the whole chapter is devoted to explain the regulations. Section 4 is absorbed in the studies of Vale and Miles et al. It will also explain the Capital Asset Pricing Model which is essential to understand when reproducing the results of Vale and Miles et al. with the data of the two selected Finnish banks of Nordea and Danske Bank in chapter 5. The results in section 5 are similar to those of Miles et al. and Vale, however the financial standing of Nordea and Danske Bank were somewhat different to those banks studied in the previous researches.

In this research the main focus was on the alleged high price of equity. The chapters of this study observe the key findings of Modigliani and Miller (1958), Miles et al. (2012) and Vale (2011) about their discoveries on how financial costs behave when equity ratio rises. After that it was important to see whether their findings would hold in Finland. Modigliani and Miller state that the financial structure of a company is irrelevant to the financial costs. Miles et al. gather data from the UK banks and come to conclusion that the doubling of the banks' equity ratios does not double their financial costs at the same time. Actually, the doubling of their equity ratio only increases their average financial costs somewhere between 10 to 40 basis points. Vale's findings (2011) support Miles. et al. (2012). Vale researched the effects of doubling equity ratio on Norway's largest bank DnB NOR. He finds similar results as Miles et al. When the equity ratio of DnB NOR rises from 5.5 to 11 per cent its total funding costs would increase only in the range of 11 to 41 basis points. Miles et al. (2011) find that the total funding cost for UK banks will increase in the range of 8 to 33 basis points. Kashyap, Stein and Hanson (2010) do a similar research with US banks and they find that an increase of 10 percentage points in their equity ratios would raise the total funding costs in the range of 24 to 45 basis points.

One important research question was to calculate how much Nordea and Danske Bank's funding costs would grow if their equity or capital ratios were doubled. The research found clear answers to the question. Yes, the funding cost of Nordea and Danske Bank grow when their leverage is halved. The results however vary tremendously depending on whether the calculations are done with the relationship of equity over all assets or equity over risk-weighted assets. For Nordea, the results vary from 11 to 186 basis points. For Danske Bank, the results vary between 16 and 257 basis points. The deviation of the results cannot be overlooked. It seems to compromise the results. However, the results were similar to those of Miles et al. and Vale when the equity ratios were measured over all assets. Also by doing this, the study approaches the equity ratio levels of a typical European bank. All the raises in funding costs that were above 54 basis points were calculated on the term of risk-weighted assets. It is clear to see that doubling of an equity ratio of 4,5 percent to 9 percent keeps the change in more relevant area than doubling it from 18,1 percent to 36,2 percent. These were the numbers of Nordea's equity and capital ratios respectively. This thesis clashes again with the fact that both of Nordea's and Danske Bank's capital ratios were on a high level to begin with.

The aim of this research has been to solve whether the equity ratios of Finnish banks ought to rise to secure banking system during financial difficulties and whether the rise generates costs to banks that will undo the positive effects to the economy. At first when compared to other OECD countries, it turned out that Finland had one of the lowest capital to assets ratio on the banking sector. However, the capital to assets ratio is not an unambiguous indicator of the stability of a banking sector. To evaluate whether the banking sector can bear risk, it is important to assess the riskiness of the banks' assets. To do so Basel III agreements measures equity over risk-weighted-assets. When bank stability is measured by equity over risk-weighted-assets, the banks' solidities grow sharply in Finland. However, the system relies on the banks' own risk-weighting methods. Nevertheless, all things considered, bank assets or equity operates as a safety buffer against financial losses.

The findings concerning Finnish banks, Nordea and Danske Bank, also show that the doubling of the equity ratio will not increase total funding costs one to one. However, the rise in funding costs for Finnish banks is higher than the findings in the UK and Norway. There are many reasons for that. One of the main reasons is nevertheless the fact that Finnish banks have higher equity ratios to begin with. The doubling of it therefore lifts it a lot higher than in the examples of Miles et al. and Vale. Therefore in this study there has also been used the equity over all assets ratio in comparison to the equity over risk-weighted-assets. The results of equity over all assets are more similar to the other researches discussed in this study. And when considering the risks of risk-weighting assets,

the calculations covering capital over all assets can be seen as a more risk-free way of studying the results. When doubling Nordea's equity over risk-weighted-assets ratio the private funding costs rise approximately 118 basis points. However, if the rise in funding costs is measured by using the ratio of equity over all assets, the rise is only approximately 23 basis points. This latter figure agrees with Miles et al. and Vale's results, which land between 8 to 41 basis points. For the Nordea and case it can be said that even though the bank's equity levels are high compared to other banking field, even the doubling of their equity ratio would not induce remarkably higher funding costs. This result comes in line also with Admati et al. (2010). However, in the case of Danske Bank the rise in funding costs is slightly steeper. Over risk-weighted assets it is approximately 163 basis points and over all assets the increase in the funding costs is approximately 35 basis points.

As this research has argued, bank equity is not expensive and therefore it should be used as a tool to heal the financial system from risky leverage levels. This should be done by simplifying the monitoring process by giving banks a clear higher level of equity ratio that should be in place all the time. Of course, during recessions and financial crisis there could be some room to relax the instructions. As pointed out before, European Central Bank has estimated that in 2015 their expenditure for banking supervision is going to be around 260 million euros per year (European Central Bank, press release 2014). And when adding the costs of consultants for the banks to help them pass the stress tests, the overall costs of highly and complexly regulated banking field rise considerably. Can significant savings be gained if bank regulation is simplified to cover a certain amount of relation between equity and assets? Further investigation on this matter could entail the comparison of banks own monitoring costs to the increase in funding costs as equity levels are raised up. The new field of study should also take into consideration the costs that central banks and other supervisory bodies gain from all the monitoring. This might occur some challenges.

Further research could also study how to increase the amount of equity with minimum possible costs for banks and the public? The decision to do so should be instantaneous and come as a surprise to the market. To start, a temporary restriction of dividend payments would raise the equity to assets ratio immediately with no costs if implemented to the whole banking field at the same time. It would be worth examined what other ways of raising the equity ratios are sensible.

Third field of supplementary study would be to investigate whether the increase in private funding costs are passed on to the public by one-for-one. Miles et al. (2012, 16) assume that the banks pass on the increasing funding cost to the lending rates one-for-one. Nevertheless, there is more room for researches in this area of study. One way of investigating the matter could be to compare the service charges and loan margins of

banks before and after the implementation of new Basel rules. Challenges may occur on timely basis since the banks might not increase the charges immediately after new regulation. This study might be topical a few years after the final implementation of Basel III in 2018.

Nevertheless, banks are in a special position in the corporate world and in the society. Banks create a great part of the money floating through the economy by lending to the public. Yet, the global world is going through a digital change and this will affect the banking industry when more and more of their customers are changing their way of using bank services. This of course creates new companies in the banking industry that will not have the conventional brick and mortar offices because all the operations are taken online. It could even be compared to the liberalization of banking industry all over again and therefore the change should be embraced but also at the same time the banks need to get ready for the upcoming convulsion. As before, the liberalization can at first boost the banking industry, but within a while, it can cause new problems that the industry has not seen before.³¹To prepare itself for future, the banks should rise their equity levels to assure their operations even in economic distress.

³¹ A good read about this subject is C. Reinhart and K. Rogoff's book *This time is different* (2009).

7 APPENDIX

The calculations used in the section 5 are presented here in the appendix.

Miles et al. <i>Optimal Bank Capital</i> (2012, 10-14)					
Linear:			Log-linear		
OLS	\hat{a}	1,238	OLS	\hat{a}	-1,405
	\hat{b}	0,025		\hat{b}	0,602
FE	\hat{a}	1,072	FE	\hat{a}	-1,693
	\hat{b}	0,031		\hat{b}	0,692
Danske Bank					
			Log-modification	OLS	FE
Re1	15,61		Equity per ASSETS	$\ln(\beta) = -1,405 + 0,602 * \ln(17,8571486)$	$\ln(\beta) = -1,693 + 0,692 * \ln(17,8571486)$
EKP	2,21			$\beta = 1,391256$	$\beta = 1,352052$
leverage_assets	17,85714				
leverage_RWA	4,672897		New	$\ln(\beta) = -1,405 + 0,602 * \ln(8,9285)$	$\ln(\beta) = -1,693 + 0,692 * \ln(8,9285)$
Rp			New	$\beta = 0,916611$	$\beta = 0,836909$
E-ratio_Assets	0,056				
E-ratio_RWA	0,214		Equity per RWA	$\ln(\beta) = -1,405 + 0,602 * \ln(4,672897)$	$\ln(\beta) = -1,693 + 0,692 * \ln(4,672897)$
Euribor	2,456			$\beta = 0,620736$	$\beta = 0,534679$
			New	$\ln(\beta) = -1,405 + 0,602 * \ln(2,3364485)$	$\ln(\beta) = -1,693 + 0,692 * \ln(2,3364485)$
			New	$\beta = 0,408966$	$\beta = 0,330964$
Miles et al. <i>Optimal Bank Capital</i> (2012, 10-14)					
Linear:			Log-linear		
OLS	\hat{a}	1,238	OLS	\hat{a}	-1,405
	\hat{b}	0,025		\hat{b}	0,602
FE	\hat{a}	1,072	FE	\hat{a}	-1,693
	\hat{b}	0,031		\hat{b}	0,692
Nordea					
			Log-modification	OLS	FE
Re1	13,89		Equity per ASSETS	$\ln(\beta) = -1,405 + 0,602 * \ln(22,22222)$	$\ln(\beta) = -1,693 + 0,692 * \ln(22,22222)$
EKP	2,21			$\beta = 1,58702$	$\beta = 1,572955$
leverage_assets	22,22222				
leverage_RWA	5,524862		New	$\ln(\beta) = -1,405 + 0,602 * \ln(11,11111)$	$\ln(\beta) = -1,693 + 0,692 * \ln(11,11111)$
Rp			New	$\beta = 1,045592$	$\beta = 0,973652$
E-ratio_Assets	0,045				
E-ratio_RWA	0,181		Equity per RWA	$\ln(\beta) = -1,405 + 0,602 * \ln(5,524862)$	$\ln(\beta) = -1,693 + 0,692 * \ln(5,524862)$
Euribor	2,456			$\beta = 0,686584$	$\beta = 0,60038$
			New	$\ln(\beta) = -1,405 + 0,602 * \ln(2,762431)$	$\ln(\beta) = -1,693 + 0,692 * \ln(2,762431)$
			New	$\beta = 0,452349$	$\beta = 0,371632$

For example to calculate the market equity premium for Danske Bank equity over assets with Log-modification and using OLS-specification:

$$R_E = R + 1,391256033 \times R_p$$

$$R_p = 9,63$$

Now we can calculate the new R_E with the halved leverage 8,9285. After finding the new $R_E = 11,03841316$, we use it in the PFC-equation

$$PFC = R_E(\underline{e})e + R_{Dg}(\underline{e})[1 - e].$$

$$PFC = 11,03841316 \times 0,112 + 2,456 \times (1 - 0,112)$$

$$PFC = 3,42$$

In the next page, the figures from these calculations are presented in one table.

Danske Bank (Equity/Assets)				
β -leverage equation	Linear	specification	Log-linear	specification
Estimation method	OLS	FE	OLS	FE
Initial ROE	15,61	15,61	15,61	15,61
Initial private funding costs (P	3,19	3,19	3,19	3,19
Market equity premium Rp	7,96	8,24	9,63	9,91
ROE after halved leverage	13,83	13,33	11,04	10,50
PFC after halved leverage	3,73	3,67	3,42	3,36
Increase in PFC	0,54	0,48	0,22	0,16
Increase in PFC, naive method	0,74	0,74	0,74	0,74
Danske Bank (Equity/RWA)				
β -leverage equation	Linear	specification	Log-linear	specification
Estimation method	OLS	FE	OLS	FE
Initial ROE	15,61	15,61	15,61	15,61
Initial private funding costs (P	5,27	5,27	5,27	5,27
Market equity premium Rp	9,89	11,01	21,59	25,06
ROE after halved leverage	15,03	14,81	11,04	10,50
PFC after halved leverage	7,84	7,74	6,13	5,90
Increase in PFC	2,57	2,47	0,86	0,63
Increase in PFC, naive method	0,74	0,74	0,74	0,74
Nordea (Equity/Assets)				
β -leverage equation	Linear	specification	Log-linear	specification
Estimation method	OLS	FE	OLS	FE
Initial ROE	13,89	13,89	13,89	13,89
Initial private funding costs (P	2,97	2,97	2,97	2,97
Market equity premium Rp	6,51	6,63	7,36	7,43
ROE after halved leverage	12,08	11,61	9,91	9,44
PFC after halved leverage	3,32	3,28	3,13	3,08
Increase in PFC	0,35	0,31	0,16	0,11
Increase in PFC, naive method	0,51	0,51	0,51	0,51
Nordea (Equity/RWA)				
β -leverage equation	Linear	specification	Log-linear	specification
Estimation method	OLS	FE	OLS	FE
Initial ROE	13,89	13,89	13,89	13,89
Initial private funding costs (P	4,53	4,53	4,53	4,53
Market equity premium Rp	8,49	9,39	17,01	19,45
ROE after halved leverage	13,30	13,09	9,91	9,44
PFC after halved leverage	6,38	6,30	5,15	4,98
Increase in PFC	1,86	1,78	0,63	0,46
Increase in PFC, naive method	0,51	0,51	0,51	0,51

REFERENCES

- Admati, Anat, Peter DeMarzo, Martin Hellwig & Paul Pfleiderer (2010) Fallacies, irrelevant facts, and myths in the discussion of capital regulation: why bank equity is not expensive. *The Rock Center for Corporate Governance at Stanford University Working Paper Series No. 86*. Stanford GSB research paper no. 2063.
- Admati, Anat, Peter DeMarzo, Martin Hellwig & Paul Pfleiderer (2015) *The Leverage Ratchet Effect* (December 31, 2015). Working paper No. 146, Stanford University
- Bernanke, Ben (1983) Non-monetary effects of the financial crisis in propagation of the Great Depression. *American Economic Review* 73 (3): 257 – 276.
- Bernanke, Ben, Lown, Cara & Friedman, Benjamin (1991) The credit crunch. *Brookings Papers on Economic Activity*, Vol. 1991, No. 2, 205-247.
- Danske Bank Group Annual Report 2013, <<http://www.danskebank.com/en-uk/ir/Documents/2013/Q4/Annualreport-2013-parent-company.pdf>>, retrieved 23.10.2014.
- Danske Bank Financial Statement Handout 2013, <http://www.danskebank.fi/fi-fi/tietoa-danske-bankista/media/Julkaisut/Documents/Danske%20Bank%20Oyj%20-%20Tilinp%C3%A4%C3%A4t%C3%B6kset%20ja%20tulokset/Tilinp%C3%A4%C3%A4t%C3%B6stiedote2013_Danske%20Bank%20Oyj.pdf>, retrieved 23.10.2014.
- The deposit guarantee fund, <http://talletussuoja.fi/en/information_to_depositor/Pages/default.aspx>, retrieved 16.6.2014.
- Deposit Insurance, Finanssivalvonta, <http://www.finanssivalvonta.fi/fi/finanssiasiakas/asiakkaansuoja/korvausrakorvau/Talletussuojara_hasto/Pages/Default.aspx#.UwiqbIWFVws>, retrieved 22.2.2014.
- European Central Bank, press release 2014, <<http://www.ecb.europa.eu/press/pr/date/2014/html/pr140527.en.html>>, retrieved 22.9.2014.
- Fama, Eugene & French, Kenneth (2002) The equity premium. *The Journal of Finance*, Vol. 57 (2), 637-659.
- Financial Soundness Indicators, IMF, <<http://elibrary-data.imf.org/Report.aspx?Report=4160271>>, retrieved 22.4.2014.
- Financial Soundness Indicators Finland, IMF, <<http://elibrary-data.imf.org/Report.aspx?Report=4160276&Country=172>>, retrieved

5.5.2014.

- Freixas, Xavier & Rochet, Jean-Charles (2008) *Microeconomics of banking*. 2nd ed. The MIT press, Cambridge, Massachusetts.
- Hull, John (2012) *Risk management and financial institutions*. John Wiley & Sons, Inc., Hoboken, New Jersey.
- Jensen, Michael & William Meckling (1976) Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics*, Vol 3 (4), 305 – 360
- Jokivuolle, Esa, Pesola, Jarmo & Viren, Matti (2015) Why is credit-to-GDP a good measure for setting countercyclical capital buffers? *Journal of Financial Stability*, Vol. 18 (June), 117-126.
- Kashyap, Anil, Stein, Jeremy and Hanson, Samuel (2010) *An analysis of the impact “substantially heightened” capital requirements on large financial institution*. University of Chicago and Harvard working paper.
- Miles, David, Jing Yang & Gilberto Marcheggiano (2012) Optimal Bank Capital. *The Economic Journal*, Vol. 123 (March), 1-37.
- Minamihashi, Naoaki (2011) Credit Crunch Caused by Bank Failures and Self-Selections Behavior in Lending Markets. *Journal of Money, Credit and Banking*, Vol. 43, No. 1 (February 2011), 133 – 161.
- Mistrulli, Paolo (2011) Assessing financial contagion in the interbank market: Maximum entropy versus observed interbank lending patterns. *Journal of Banking and Finance*, Vol. 35 (5), 1114-1127.
- Modigliani, Franco & Miller, Merton H. (1958) The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, Vol. 48 (3), 261 – 297.
- Myers, Steward (1977) Determinants of corporate borrowing. *Journal of Financial Economics*, Vol. 5, 147-175.
- Myers, Steward & Nicholas Majluf (1984) Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, Vol 13 (2), 187 – 221
- Myerson, Roger (2014) Rethinking the principles of bank regulation: a review of Admati and Hellwig’s The bankers’ new clothes. *Journal of Economic Literature*, Vol. 52 (1), 197-210.
- Nordea Group Annual Report 2013, <http://www.nordea.com/sitemod/upload/root/www.nordea.com%20-%20uk/Investorrelations/reports/ar/Nordea_Annual_Report_2013.pdf>, retrieved 23.10.2014.
- Panier, Frédéric, Francisco Pérez-González & Pablo Villanueva (2012) Capital

- Structure and Taxes: What Happens When You (Also) Subsidize Equity? Working Paper, Stanford University, Stanford, CA.
- Peek, Joe & Rosengren, Eric (1995) The Capital Crunch: Neither a Borrower nor a Lender Be. *Journal of Money, Credit and Banking*, Vol. 27, No. 3 (August 1995), 625 – 638.
- Repullo, Rafael & Saurina Jesús (2012) The countercyclical capital buffer of Basel III: a critical assessment. In M. Dewatripont and X. Frexas (eds.) *The crisis aftermath: New regulatory paradigms*. London:CEPR.
- Repullo, Rafael & Suarez, Javier (2012) The Procyclical Effects of Bank Capital Regulation. *The Review of Financial Studies*, Vol. 26 (2), 452 – 490.
- Statistical data warehouse, European Central Bank, <<http://sdw.ecb.europa.eu/browse.do?node=2018811>>, retrieved 24.2.2014.
- Syron, Richard (1991) Are we experiencing a credit crunch? *New England Economic Review*, July/August 1991.
- Tikka, Kari (1995) *Yritysverotuksen perusteet*. Lakimiesliiton kustannus, Helsinki.
- Tilinpäättöksen avainluvut, Finanssivalvonta, <<http://www.finanssivalvonta.fi/fi/Tilastot/Tilinpaatokset/Pages/tilinpaatostilinpaatoste.aspx>>, retrieved 24.2.2014. <<http://www.finanssivalvonta.fi/FI/Tilastot/Tilinpaatokset/Pages/Tilinpaatos.aspx>>, retrieved 24.3.2014.
- Toivanen Mervi (2015) *Essays on Credit Contagion and Shocks in Banking*. Doctoral dissertation. University of Vaasa, Acta Wasaensia, 332, Vaasa.
- Townsend, Robert (1979) Optimal contracts and competitive markets with costly state verification. *Journal of Economic Theory*, Vol. 21, 265 – 293.
- Vale, Bent (2011) Effects of higher equity ratio on a bank's total funding costs and lending. *Staff Memo of Norges Bank*, Vol. 10.