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Master Thesis

Systematic risk and liquidity:

An empirical study comparing Norwegian equity certificates before and after the regulation in 2009

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Summary

In 2009, the Norwegian savings banks industry was subject to a regulation change, which resulted in a modification of the instrument issued by these banks. Thus, in this empirical study we compare the systematic risk and liquidity of equity certificates issued by Norwegian savings banks before and after the regulation change. We go about estimating systematic risk and liquidity using regression analysis. In order to estimate systematic risk we use the empirical model of the CAPM often referred to as the "Single index model". We apply the liquidity cost measure developed by Pástor and Stambaugh (2003) to evaluate whether liquidity cost (which is a proxy for liquidity) has changed between the two sample periods. Our findings suggest that the systematic risk of equity certificates has increased, however we are unable to pinpoint whether the source for change is the regulation in 2009 or changed market dynamics due to the largest financial turmoil in modern time. Concerning liquidity, we are unable to draw any definite conclusions related to change. This is due to the weak robustness of our tests, which will make any conclusion drawn unreliable. We are however able to state that primary capital certificates seemed to be characterized by continuations in excess return related to order flow. On the contrary, this does not seem to be the case for the modified instrument.

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1.0 Norwegian Savings Banks

Norway's first savings bank, Christiania Sparebank, was established in 1822. It had the objective of working against poverty by letting people from the local community both make deposits and borrow money if needed (The Norwegian Savings Banks Association 2009f). Traditionally, savings banks in Norway have been organized as ownerless firms, where the equity essentially has been consisting of ownerless capital which has been built up through retained profits (The Norwegian Savings Banks Association 2009a). This structure implies that investors have no claims to earnings, which again means that savings banks have been able to give back to their local communities through CSR activities. Over the years, Norwegian savings banks have had a very strong market position. This also applies today, as savings banks (including DNB) holds more than 70% of the Norwegian deposit market, summing up to 2,517 billion NOK as of 2009 (The Norwegian Savings Banks Association 2009e). Due to their complex nature, we will describe the most important features related to Norwegian savings banks.

1.0.1 Development in Number of Savings Banks

The number of savings banks has changed rapidly over the past century. In the 1920's there were more than 600 savings banks in Norway. In the decades following the Second World War the industry experienced a sharp decline in number of banks as the customers became gradually wealthier, and the need for expertise increased (*Exhibit 1*). The decline was mainly due to mergers between banks in order to meet the increased demand for expertise and larger borrowing amounts (The Norwegian Savings Banks Association 2009g). As of November 2012 there were 110 savings banks remaining (The Norwegian Savings Banks Association 2013).

1.0.2 Savings Bank Structures

Today, Norwegian savings banks are split into three different categories regarding structure (Ministry of Finance 2009c):

- Traditional savings bank (Ownerless firm)
- Savings banks with equity certificates (Partially ownerless, partially investors)
- Savings banks with issued stocks/limited companies (Requirement of minimum 10% ownerless capital)

New laws concerning Norwegian savings banks have emerged over the years, and consequently new structures have appeared. However, the main purpose of the Norwegian Ministry of Finance has always been to maintain the characteristics and uniqueness of savings banks. One of the intentions behind the regulations has been to make it easier for banks to raise capital without having to change company form to limited company. An additional measure was the minimum requirement of 10% ownerless capital in order to be considered a savings bank (The Norwegian Savings Banks Association 2009a). This will apply if the bank chooses to issue stocks. If they do not satisfy this requirement, they are not eligible to be called a savings bank and would thus be characterized as a commercial bank. The reasons why banks would like to be characterized as savings banks are related to, among other things, local affiliation, and ownership and voting structure.

1.0.3 CSR Activities

An important trait of Norwegian savings banks through the years has been the gifts they give to the local communities. Such CSR activities can typically be donations to sports teams, cultural activities, young entrepreneurs or educational purposes. The total CSR spending in 2009 amounted to 460 million NOK. This was a significant reduction from the previous year's 680 million, due in particular to the financial crisis (The Norwegian Savings Banks Association 2009c).

1.1 Primary Capital Certificates

Savings banks were until 1988 organized as ownerless firms, and as such had no owners who could provide additional funding. The Ministry of Finance introduced in 1987 a new law that would take effect in June 1988 considering banks capital requirement. The new law required a Core Tier 1 capital of minimum 8% for both commercial and savings banks (Law December 18th 2009 nr. 1603 §2-9b about financing activities). The new law was based on the "Capital Accord" of 1988 created by the Basel Committee at the Bank of International Settlements (The Norwegian Savings Banks Association 2001). The purpose of "Capital Accord" was to establish a standard for large international banks in order to:

- Strengthen the solvency and stability of the international banking sector
- Reduce differences in competitiveness due to different capital requirements

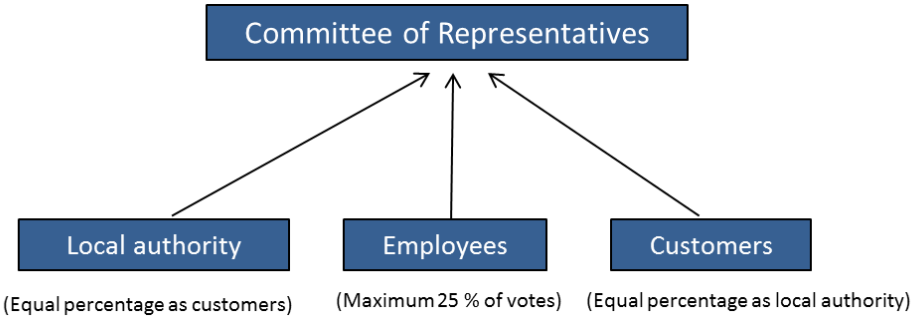
For traditional (ownerless) savings banks, retained earnings would not be sufficient to meet the new requirements, given that their Core Tier 1 capital base was significantly lower than 8%. Many of the savings banks do not have high enough market capitalization today to meet the NOK 300 million requirement to perform an IPO to raise capital (*Exhibit 2*), and thus only a few banks would be able to issue stocks on Oslo Stock Exchange (AF Kommunepartner 2012). This was also the case in 1987. Consequently, the new regulation introduced in 1987 gave savings banks the opportunity to issue "primary capital certificates". This was because the Ministry of Finance did not want to introduce a capital requirement law that would benefit commercial banks from a competitive perspective, or motivate savings banks to change company form. As a result, they made it possible for savings banks to raise capital through a new security called primary capital certificate. This enabled the savings banks to raise additional funds to meet the new capital requirement. The capital raised through primary capital certificates would count as Core Tier 1 capital under the provisions governing capital adequacy (The Norwegian Savings Banks Association 2009a).

The new security gave the holder only limited ownership to the company's capital. As follows, investors did not have ownership to all of the company's assets, profits or capital. They were only entitled to the portion of primary capital to total capital. For instance, if the primary capital certificates holders owned 25% of the total capital, they were entitled to 25% of the profits.

1.1.1 The Committee of Representatives

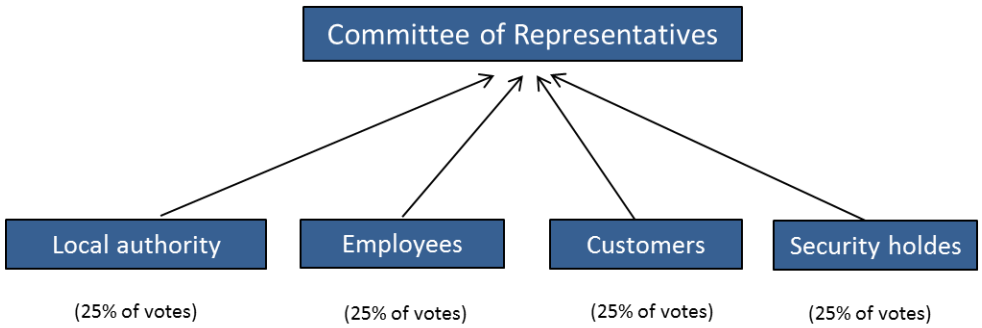
In contrast to limited companies where the general assembly elects the board of directors, whom work as decision makers, savings banks and have a different structure. Their equivalent to the board of directors is the "committee of representatives", who are elected in accordance with the law, and specified in the savings banks statute. According to the law about savings banks, there are certain constraints regarding the composition of the committee of representatives. In traditional savings banks the control of the company is split between three parties; employees, local authority and customers. The law states that the two latter should represent a minimum of ¾.

Figure 1: Composition of Committee of Representatives in Traditional Savings Banks



For savings banks with primary capital certificates the arrangement was slightly different as a new party, the security holders, were introduced. The law of primary capital certificates stated that the local authorities and the customers should have an equal number of representatives, and that the primary capital certificate holders and employees should have ¼ of the representatives each (Halvorsen 2006). This meant that all of the four parties should represent ¼ of the committee of representatives, which implied that the owners would never have the majority of votes.

Figure 2: Composition of Committee of Representatives in Primary Capital Certificate Banks



The capital structure also changed when converting to primary capital certificate bank as the ownerless firm went from having no capital claimants to having liabilities to security holders. In the new model (*Exhibit 3*), profits were split between two parties according to their share of the bank's capital; the primary capital certificate holders, who owns 5% – 90% of the bank's capital, and the ownerless capital (The Norwegian Savings Banks Association 2009b). The security holder's share of the profits was most often distributed as dividends, while the ownerless capital was restrained by law to distribute a maximum of 25% of their share of the profits (The Norwegian Savings Banks Association 2009d). The security holder's profits which were not distributed in a given year was added to an equalization fund, which had the intention of smoothing

out dividends when savings banks had low or negative profits. The banks were allowed to have different dividend policies subject to what the committee of representatives approved, but the general consensus was that there should be a relatively high and constant dividend flow (The Norwegian Savings Banks Association 2009a).

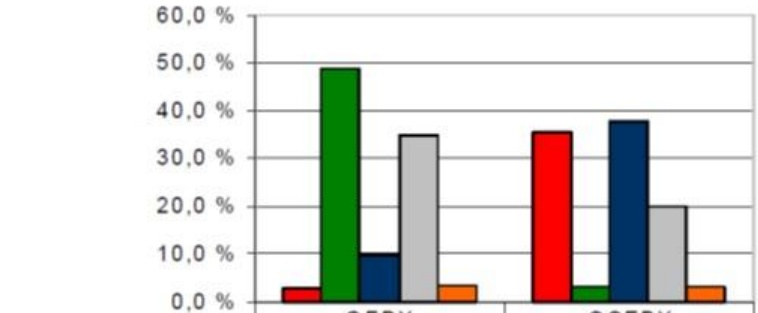
The primary capital certificate holders would, as described above, have a maximum of 25% of the votes, unconditional on their ownership share of the total capital. They would consequently be unable to overrule how the profits should be distributed or if mergers and acquisitions could take place.

1.1.2 Dilution Effect

Since savings banks are linked to the region which they are located in, both through the committee of representatives and their customers, distributions from the ownerless capital are given to the local community through CSR activities. Keeping in mind that the ownerless part of the firm was, as described above, restrained to distribute maximum 25% of the profits as gifts. The proceeds that were not distributed resulted in an increase in ownerless capital. Consequently, this led to an increased ownership share for the ownerless part of the firm, while the ownership share of the primary capital certificates remained constant. This meant that the primary capital certificate holder's share of the total capital was diluted from one year to the next. This dilution effect was continuous as long as the banks had positive earnings (Pedersen 2003). If the banks were to run a deficit on the other hand, the primary certificate capital was given seniority over the additional portions of the equity, after the equalization fund was depleted (*Exhibit 4*). In other words, this implied that deficits would in fact result in an increased ownership share for primary capital certificate holders since the ownerless capital would be depreciated before the primary certificate capital. In short, the key intuition was that the distribution of earnings (*Exhibit 3*) was not proportional to the ownership ratios, and for that reason it would result in a dilution of ownership for investors. To counteract this dilution effect, secondary equity offerings and public divestiture were quite common from time to time.

The dilution effect experienced by investors would, in years with positive earnings, be seen as a negative aspect of primary capital certificates both for foreign and institutional investors. A report from ABG Securities (2000) on behalf of Sparebankforeningen gave an assessment of primary capital certificates and its attractiveness to investors. They observed decreasing interest from foreign and institutional investors, and consequently the turnover had dropped from 1996-2000 (*Exhibit 5*), which again contributed to reduced attractiveness of the instrument (ABG Securities 2000). This was also observable in the composition of investors of primary capital certificates compared to the Oslo Stock Exchange Benchmark Index from 2006.

Figure 3: Ownership Ratios of GFBX and OSEBX in 2006



	GFBX	OSEBX
State and county	2,8 %	35,7 %
Private investors	48,8 %	3,3 %
Foreign investors	10,0 %	37,8 %
Private owned companies	35,0 %	20,0 %
Other	3,4 %	3,2 %

Source: Rammevilkårutvalgets innstilling (2006)

1.2 Equity Certificates

In 2009, the Norwegian Ministry of Finance received an assessment from the banking regulatory commission (sub division of the Ministry of Finance) who wanted to modernize the regulations of primary capital certificates. Their aspiration was to make the primary capital certificates more attractive to investors and more similar to regular stocks. Moreover, they wanted to maintain the characteristics of savings banks and enable easier accessibility to capital without having to change company form to limited company (Ministry of Finance 2009d). In the press release of April 2009 the Ministry of Finance accepted the proposed regulation changes to the law of 1988 (Ministry of Finance 2009b).

The Ministry of Finance was according to Tore Øystein Gløersen (bank analyst at Terra Markets) initially against the regulation changes, but due to the broad consensus within the industry, an agreement was made to change the regulations to counteract changes in the banks characteristics and role in the Norwegian market (Gløersen 2012). The new law was introduced by the Ministry of Finance June 29th the same year (Ministry of Finance 2009a). The new regulation brought about the transition from primary capital certificates to equity certificates.

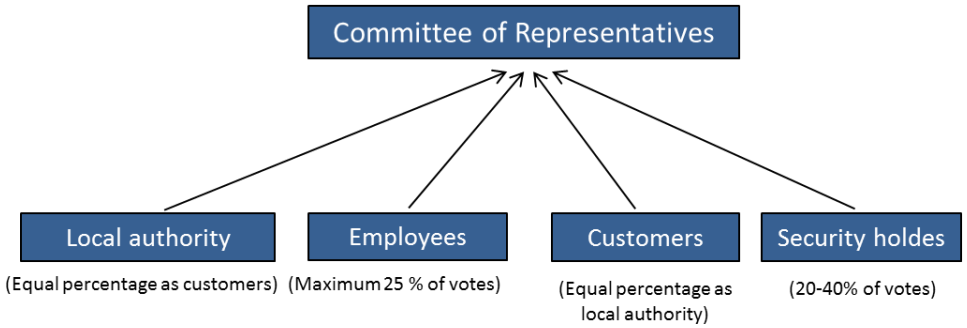
1.2.1 The 30/60 Rule

The new instrument gave savings banks the opportunity to raise equity like before; however the security now had closer resemblance to common stocks rather than a dividend paying fixed income instrument. This was due to, among other things, the new 30/60-rule, and the opportunity of having a new composition within the committee of representatives. The 30/60 rule meant that if savings banks wanted to give out more than 30% of their profits as dividends or gifts, they would have to report to the Financial Supervisory Authority of Norway. If they were to exceed 60%, they would have to ask for approval. The intention was that payouts now would be proportional to the ownership ratios (Ministry of Finance 2009c). By introducing this law, the Ministry of Finance wanted to eliminate the dilution effect which had characterized the primary capital certificates. This law thus opened for higher CSR spending, but limited the dividend payout of equity certificates compared to primary capital certificates. The priority list (*Exhibit 4*) would still be intact after 2009 such that the equity certificate capital was "protected". The ownerless capital would accordingly work as a cushion for investors in the case of deficits. Consequently, deficits would result in an increased ownership share for equity certificate holders as it had been with the previous security. This is also why a Norwegian equity research analyst Jon Gunnar Pedersen in 2009 characterized the equity certificates as a super stock protected by the equity (Becker 2009). The twofold structure, consisting of both the ownerless capital and the equity share capital would accordingly be beneficial to equity certificate holders compared stock holders.

1.2.2 Composition of the Committee of Representatives

The new structure of equity certificates had more or less the same characteristics as primary capital certificates, but as mentioned, some changes were made (*Exhibit 6*). The 30/60 rule set restrictions on payouts to prevent dilution of ownership. The possible composition of the committee of representatives also changed, and it opened for other allocations than the previous 25% from each of the four parties. The new law gave room for increased influence for equity certificate holders, as they could have 20-40% of the representatives (Law December 10th 2004 nr. 81 §8 about savings banks).

Figure 4: Composition of Committee of Representatives in Equity Certificate Banks



In the previous arrangement, the security holder would never be able to vote against mergers and acquisitions as they had less than 1/3 of the votes. The new regulation therefore made the security more equal to common stocks also from an influential point of view, as security holders would have the opportunity to vote against such significant changes.

1.2.3 Structural Changes after 2009

After the new law was introduced in 2009 the banks got new opportunities to choose different ways of organizing transformation, mergers and capital structure. This made savings banks able to choose different structural- and alliance models in the following years. Moreover, in many banks, the ownerless capital has been separated from the operations to be part of a "foundation", while the banking operations continue in a "new" savings bank or as a limited company. According to the law, the foundation is required to be a long term steady investor that should maintain the traditional CSR activities of savings banks (Sparebankstiftelsen DNB 2012). In 2002 the banks got the opportunity to convert to limited companies, but as mentioned above, they needed

at least 10% ownerless capital. Thus, in 2002 DNB (former DNB-NOR) changed company form to limited company and established a foundation named "Sparebankstiftelsen DNB" (Sparebankstiftelsen DNB 2002). After the regulation change in 2009, an increasing number of banks also changed to a similar structure where a foundation takes over the ownerless capital in the bank. The result was; two new foundations established in 2009, seven in 2010, five in 2011 and five in 2012 (*Exhibit 7*).

2.0 Research Question

Based on the transition from primary capital certificates to equity certificates, we want to assess the characteristics of the two securities.

The objectives of this empirical study are to:

- Measure and compare systematic risk of the security issued by savings banks before and after the regulation in 2009.
- Measure and compare the impact of volume traded on expected security excess returns before and after the regulation in order to assess change in liquidity.

We expect to find that that the systematic risk of the instrument of savings banks has increased after 2009. This is because the regulators set restrictions on dividend payouts to counteract the dilution effect, which again would reduce the resemblance to steady dividend paying fixed income instrument. Thus, we would expect the correlation to market movements to increase. Furthermore, we expect that the cost of liquidity, according to the liquidity proxy developed by Pástor and Stambaugh (2003), decreases. This is because literature by Banerjee, Gatchev, and Spindt (2007) suggest that dividend and liquidity act as substitutes to investors. As the new regulations restricted dividend payouts, we expect the liquidity to have increased. Additionally, the reduced dilution effect and the opportunity of increased influence could have resulted in increased attractiveness of equity certificates. As a result, this might have contributed to increased liquidity. If the results are in line with our expectations, it may be supporting evidence that the regulation has brought about the desired effects.

We want to test two hypotheses:

1) H_0: There is no change in the systematic risk of equity certificates in Norway before and after 2009
2) H_0: There is no change in the cost of liquidity of equity certificates in Norway before and after 2009

3.0 Literature Review

By introducing primary capital certificates in 1988, the government, as mentioned, intended to ease the accessibility of funding for savings banks as the new capital requirements were announced. This meant that the savings banks got access to capital without fulfilling all requirements met by companies with issued stocks.

Historically, savings banks have been attractive investments because of their high exposure to the most profitable segments in banking; the private segment and small-to-medium sized corporations. Furthermore, their large portion of private to corporate loans has led to a generally low risk exposure of savings banks (ABG Securities 2000). The ABG report also states that the primary capital certificates were still attractive to investors in 2000, but the institutional and foreign investors kept their distance, as shown in *Figure 3*. The result was accordingly that investors required a higher cost of equity compared to investments in banks with issued stocks.

One of the main challenges revealed in ABGs assessment, on the expected future of primary capital certificates, was related to the low and decreasing attractiveness of primary capital certificates towards institutional and foreign investors. Regardless of their attractive pricing, low risk and high dividend yield, the primary capital certificates had become increasingly unattractive due to decreasing liquidity, small banks size and dilution of ownership (ABG Securities 2000).

3.1 Systematic Risk

Since its introduction, the Capital Asset Pricing Model (CAPM) (Lintner 1965; Mossin 1966; Sharpe 1964) has been widely used and acknowledged by financial academics and professionals when assessing the risk and expected return relationship of risky securities. CAPM was developed as a simplification of Markowitz (1952)

and is based on his views on diversification and mean-variance efficient portfolios. Consequently, one of the core assumptions underlying CAPM is that the market portfolio is mean variance efficient. The simplification of this model relates to the reduced number of covariance terms, which again results in easier calculations. The CAPM can be written as:

$$E(r_i) = r_f + \beta_i(E(r_M) - r_f)$$

CAPM tries to predict ex-ante or expected returns of securities. It has the benefit of being "simple" in its structure, since it is a single index one period model, which only assumes two types of risk; systematic and unsystematic. More specifically, the systematic risk is a non-diversifiable macroeconomic risk which the security is exposed to. How sensitive the security is to macroeconomic changes can be explained by the slope coefficient β. Unsystematic/idiosyncratic risk on the other hand is firm-specific and diversifiable when combined with multiple securities in a portfolio. The simple structure of CAPM is also one of the main reasons for its broad practice in the financial industry.

3.1.1 Empirical Model

The empirical model of the CAPM is often referred to as the "Single index model". In this model, the assumptions underlying CAPM are removed and the model is rewritten to ex-post returns. This is a common model to apply when estimating systematic risk on individual assets. The reason why is because β of the single index model turns out to be the same as the CAPM β, except that the theoretical market portfolio of CAPM is replaced by an observable market index proxy (Bodie, Kane, and Marcus 2011).

3.1.2 Assumptions and Implications Underlying CAPM

As Bodie, Kane and Marcus (2011, 308) states, "The capital asset pricing model is a set of predictions concerning equilibrium expected returns on risky assets". Thus, to make the CAPM testable, a set of assumptions must be applied. These assumptions are;

1) There are many investors with low wealth compared to the total market wealth. Investors are price takers, where prices are unaffected by individual trades.
2) One identical holding period for all investors.
3) Investments are limited to a universe of publically traded financial assets and borrowing and lending is risk free.
4) No taxes or transaction costs
5) Investors are rational mean-variance optimizers, which mean that the Markowitz portfolio selection model is used.
6) There are homogeneous expectations among investors.

Furthermore, these assumptions lead to a set of implications:

1) All investors will hold the market portfolio
2) All investors will choose a combination of the tangency portfolio and the risk-free asset, to achieve optimal capital allocation (CAL). The market portfolio will be the tangency portfolio, which combined with the risk-free asset results in the capital market line (CML).
3) The risk premium of the market portfolio is:

$$E(r_M) - r_f = \bar{A}\sigma_M^2,$$

Where:

$\bar{A}$	Average degree of risk aversion across investors
σ_M^2	Variance of the market portfolio

4) The risk premium of individual assets is:

$$\beta_i = \frac{Cov(r_i, r_M)}{\sigma_M^2}$$

The risk premium of an individual security is:

$$E(r_i) - r_f = \frac{Cov(r_i, r_M)}{\sigma_M^2}\left[E(r_M) - r_f\right] = \beta_i[E(r_M) - r_f]$$

3.1.3 Empirical Tests

Since CAPM was introduced in the 1960's, it has been empirically tested by multiple researchers. Among the most recognized are Black, Jensen, and Scholes (1972); Fama and French (1992); Fama and Macbeth (1973). Black, Jensen, and Scholes

(1972), cited in (Elton et al. 2009, 340) find that low beta stocks seem to perform better than what CAPM predicts, while the opposite applies for high beta stocks. They therefore grouped stocks on the basis of beta size and found that a straight line describes asset returns well, as suggested by theory. Fama and Macbeth (1973) find that the relationship between expected return and beta is positive and linear and that unsystematic risk does not explain average returns. Both their slope and intercept estimates are different than what CAPM predicts, but the difference is not significant and thus they do not reject CAPM. Fama and French (1992), find that when the tests allow for variation in β unrelated to size, the relation between β and average return is weak or nonexistent. Hence, they conclude that CAPM does not describe average stock returns.

3.1.4 Limitations of CAPM

CAPM has been questioned by several academics for its limitations. Among them, (Acharya and Pedersen 2005; Amihud and Mendelson 1986; Fama and French 1992; Merton 1987; Roll 1977)). The critique mainly concerns the testability of CAPM and the failure of the strong assumptions, but also the return variability not explained by the single factor. Roll (1977) pointed out that the CAPM is not independently testable as the market portfolio is unobservable.

3.1.5 Time Varying Beta

Researchers have found that CAPM does not manage to capture time varying changes in market risk premium and beta properly over time. Ferson (1989); Ferson and Harvey (1991, 1993); Ferson and Korajczyk (1995); Jagannathan and Wang (1996) cited in Akdeniz, Altay-Salih, and Caner (2003, 4) argue that time variation in beta and market risk premium should be incorporated in the static CAPM. When looking at two separate periods as chosen in this thesis, our calculations will not be able to capture the full picture regarding systematic risk. On the contrary, researchers do not have a clear view on how to capture this time variation. Many researchers model variations in beta by using continuous approximation with the theoretical framework of the conditional CAPM (Akdeniz, Altay-Salih, and Caner 2003). Ghysels (1998) find that despite efforts to model time variation in β risk, the constant β models in many cases yield on average better predictions. He claims that betas change through

time very slowly and thus the conditional CAPM may have the tendency of overstating the time variation and produce too volatile β estimates, which leads to large pricing errors. Ghysels (1998) therefore concludes that it is better to use the static CAPM as the search for a satisfactory specification is still far from accomplished.

3.1.6 Changing Correlations

When elaborating about what may implicate our results, it is also important to recognize that researchers have shown that correlations between asset classes change during market downturns. Silvapulle and Granger (2001) find that the average conditional correlation within a sample of 30 Dow Jones Industrial stocks is much higher when the market movements are negative then when the movements are "normal". This phenomenon is likely to impact our β estimates as our sample includes the largest financial turmoil in modern time. The financial crisis will thus have the likely effect of increasing the β estimates since correlations are likely to increase between savings banks and the OSEAX during this period.

Despite its limitations and incompleteness, CAPM is widely acknowledged within financial literature to be a good measure of systematic risk. As academics and professionals cannot agree on a better model that can replace CAPM, we choose to apply the single index model to assess the banks systematic risk.

3.2 Liquidity

3.2.1 Liquidity in Primary Capital Certificates

The consensus among Norwegian professionals was that the liquidity, measured by turnover, of primary capital certificates was low and decreasing, as stated in a report by ABG Securities (2000). The table in *Exhibit 5* shows the turnover of primary capital certificates, and clearly illustrates a decreasing trend in the years 1996-2000. According to ABG Securities (2000), low liquidity has also been one of the main drivers for low attractiveness among institutional and foreign investors. As a result of the regulations of 2009 it was expected to see improved liquidity as the security would have broader similarities to common stocks, due to increased influence and

lower/no dilution of ownership share. Furthermore, as mentioned, it was expected to see a decrease in dividend payouts (Becker 2009).

Findings by Banerjee, Gatchev, and Spindt (2007) suggests that there is a link between dividend policy and liquidity. Their results imply that dividend and liquidity act as substitutes to investors. Therefore, as there were imposed restrictions on dividend payouts for Norwegian savings banks in 2009, their theory suggests that liquidity should have improved. As we know, this was also one of the effects the industry hoped to see.

3.2.2 Liquidity in Asset Pricing

Research suggests that one of the limitations of the standard CAPM model is the expected impact of liquidity on return (Amihud and Mendelson 1986). Since Amihud and Mendelson (1986) released their paper, multiple researchers have looked at the effect of liquidity on asset pricing. Findings by Amihud and Mendelson (1986) suggest that expected asset returns are increasing with (relative) bid-ask spreads. Although several studies discuss the impact and relevance of liquidity in asset pricing, researchers do not agree on a common measure for liquidity risk (Acharya and Pedersen 2005; Amihud 2002; Pástor and Stambaugh 2003).

Many researchers agree that liquidity/illiquidity is an important factor within asset pricing. However, as liquidity is not directly measurable, different proxies for liquidity has been developed to capture the causalities that might exist. Amihud (2002, 32) states that: "It proposes that over time, the ex-ante stock excess return is increasing in the expected illiquidity of the stock market". Amihud (2002) implemented new tests to cover additional effects such as the effect that realized illiquidity has on expected illiquidity. Acharya and Pedersen (2005) applied Amihud's (2002) measure in empirical tests. Their findings suggest that L-CAPM has greater explanatory power than CAPM.

Pástor and Stambaugh (2003), present a different model that tries to capture the impact of traded volume on expected stock excess returns. They find that a stocks order flow induce larger return reversals when liquidity is low. Consequently, they suggest that increased liquidity should be associated with smaller price impact on

expected excess return. Their liquidity measure γ works as a proxy for liquidity cost, and we have decided to implement their model to assess the liquidity of Norwegian equity certificates.

3.2.3 Time Varying Liquidity Risk

A study by Watanabe and Watanabe (2008) find evidence that liquidity betas vary across two distinct states, one with high liquidity betas and one with low betas. In addition, they find that the liquidity betas change over time. In our study this may mean that any change in liquidity may be due to market-wide factors and not solely due to the regulation change in 2009. Thus, our results may be affected by changed market wide conditions for all securities after the financial crisis.

4.0 Data

4.1 Research Period

The research period range from 27.12.2001 to 27.12.2012 using weekly returns and volume. We use the whole period 27.12.2001 – 26.12.2012 (574 observations), the first period 27.12.2001 – 02.07.2009 (392 observations) and the last period 03.07.2009 – 26.12.2012 (182 observations). The motive for dividing our data into these periods is to look at the transition from primary capital certificates to equity certificates on July 1st 2009. We split the periods on the Wednesday closest to the transition from primary capital certificate to equity certificate (02.07.2009). These two periods enables us to test if the systematic risk and the cost of liquidity have changed from the first to the second period. The reason why we also have the whole period is to compute the rolling window β.

4.2 Banks Sample

The equity certificate index includes 20 savings banks per 26.12.2012 (*Exhibit 8*). We have selected a set of criteria to choose which banks to include in our analysis. The selection criteria are comparable to Pástor and Stambaugh (2003), but used on weekly data rather than daily:

- The equity certificate have been traded on Oslo Stock Exchange during the whole research period

- The equity certificate has been traded at least 75% of the weeks in each sub-period

From the first criteria, we can exclude KLEG, NTSG, SOAG as they were all listed on Oslo Stock Exchange later than 2002. ROGG changed company form to limited company in 2012 and converted consequently its equity certificates to stocks. ROGG is therefore excluded from our sample. The last criterion is equal to what Pástor and Stambaugh (2003) use in their article. They choose to exclude stocks that were traded less than 15 days (out of 20 trading days) in any given month. We apply the same trading percentage (75%) on weekly data. Based on these two criteria, we end up with ten savings banks; HELG, MING, MORG, NONG, PLUG, SADG, SBVG, SPOG, SVEG and TOTG (*Exhibit 9*).

4.3 Data Needed to Measure Changes in Systematic Risk

We use weekly returns of the securities and the equity certificate index (OSEEX/GFBX) as well as the OSEAX. These are collected from OBI-data, which are calculated from Wednesday to Wednesday. If an equity certificate is not traded on a Wednesday, the closest trading day prior to that Wednesday is used. The returns are adjusted for dividends, stock splits and other corporate events. The 3-month NOK T-bill rate is de-compounded to weekly rates and averaged over the week to serve as a proxy for the risk free rate.

4.4 Data Needed to Measure Changes in Liquidity

To assess the liquidity according to the model of Pástor and Stambaugh (2003) we use weekly traded volumes and returns of the equity certificates/primary capital certificates. We calculate the daily traded volume based on the closing prices each day multiplied by the number of traded stocks that day. This is because VWAP prices are not available. The weekly traded volume is then calculated as the sum of traded volumes from Wednesday to Wednesday. The weekly return on OSEAX is used as the market index to compute the excess return of the equity certificates relative to the market. Finally, we create a sign-variable based on the excess return of the equity certificates relative to the market.

4.5 Adjustments

The volume data includes both seasoned equity offerings and public divestiture. These extreme values are adjusted for by using Winsorizing (Hasings et al. 1947). The reason for applying Winsorizing rather than trimming is because we do not want to exclude abnormally large trading volumes which have an impact on return. As such, we are trying to reduce the large trading volumes which do not have an impact on returns. The Winsorizing method reduces the extreme values to the highest value of a given percentile. More specifically, we compute the average weekly volume for each bank in the research period and the respective standard deviation. By adding three times the standard deviation to the mean we obtain a value corresponding to the 99.7th percentile of the normal distribution. All values above this "cut-off" value will be reduced to this value (*Exhibit 10*).

5.0 Methodology

5.1 Systematic Risk

To assess whether there are significant changes in banks systematic risk, we apply the single index model (Bodie, Kane, and Marcus 2011, 277). This is a statistical model of returns which point to two sources of uncertainty for a security; the systematic macroeconomic factor and the unsystematic microeconomic factor, which is assumed to be random. The assumptions underlying this model indicate that assets tend to move together and are determined by the same market forces. The model assumes a linear relationship between the excess return on a stock with the excess return of the market to describe the sensitivity of a stock to market movements. The sensitivity factor (β) can be described as;

$$\beta_i = \frac{Cov(r_i, r_m)}{\sigma_m^2}$$

Where, the covariance between the asset and the marked is divided by the market variance. The single index model thus assumes that the structure of correlation depends on one single factor. This common macroeconomic factor in our model is the Oslo all share index while the Norwegian three-month T-bill is used as the risk free rate. By examining the β of each equity certificate as well as the β of the equity certificate index (OSEEX) in both periods, we can statistically test whether the

systematic risk of the instrument has changed after the regulation was introduced. We may thus infer if the instrument has become more contingent on market movements than before. The regression equation we want to implement is:

$$r_i - r_f = \alpha_i + \beta_i(r_m - r_f) + \varepsilon_i$$

(*Eq.1*)
$$R_i = \alpha_i + \beta_i(R_M) + \varepsilon_i$$

Where:

R_i	Excess return on stock i
R_M	Excess return on the market
r_f	Risk free interest rate
α_i	Securities expected excess return when $R_M = 0$
β_i	Sensitivity to market movements (systematic risk)
ε_i	Unexpected firm-specific (microeconomic) zero mean component of the return

From ABG Securities' (2000) assessment of savings we know that professionals characterized the risk of primary capital certificates as low. This is also what Strøm, Hole, and Lie (1995) find in their thesis when they in essence look for differences in systematic risk between savings banks with primary capital certificates and commercial banks. Consequently, we expect to find that the average beta of savings banks to be lower than the market risk.

Finally, in order to compare the systematic risk estimates in period one and two, we implement the Wald test. With this test we can test the hypothesis that the β's are equal in the both periods. The Wald test equation can be written as:

$$W = \frac{\hat{\theta}_n - \theta_0}{SE}$$

$$W = \frac{\hat{\beta}_2 - \beta_1}{SE}$$

Where:

$$H_0: \hat{\beta}_2 = \beta_1$$

$$H_A: \hat{\beta}_2 \neq \beta_1$$

By subtracting the first period estimates from the second period, and divide by the standard error, we are able to say whether the differences in β values are statistically significant.

As β change slowly through time (Ghysels 1998), we compute the 78 week rolling window of β's in effort to give further insights to the development in systematic risk.

5.2 Liquidity

The impact of liquidity on return is a highly discussed topic within asset pricing theory. As mentioned, several researchers have proposed different models on how liquidity may impact returns. Our goal is to measure if the cost of liquidity for equity certificates has declined, as this will reflect increased liquidity according to Pástor and Stambaugh (2003). This is interesting to investigate since increased trading activity was one of the results the industry hoped for. Given that theory by Banerjee, Gatchev, and Spindt (2007) also suggest that dividend and liquidity work as substitutes to investors, we expect to see lower liquidity cost associated with order flow after 2009. Thus, we are not trying to identify whether liquidity has an effect on the pricing of equity certificates, as we assume it does impact return. We therefore choose to apply Pástor and Stambaugh's (2003) liquidity cost measure with some modifications. The method results in a coefficient estimate which represents the cost of liquidity (Pástor and Stambaugh 2003). High liquidity should be related to a small price impact and a small γ, while low liquidity will have the opposite effect.

Our analysis will differ slightly from Pástor and Stambaugh (2003) in terms of what we want to achieve. Additionally, they use different selection criteria and data frequency. As the whole population of savings banks with equity certificates consists of only 20 instruments (per 26.12.2012), we have a much smaller sample than Pástor and Stambaugh (2003). We will not implement the liquidity cost factor into an asset pricing model. We rather want to find the cost of liquidity associated with order flow

and compare across the two sub periods. Thus, as mentioned we do not want to assess whether liquidity is priced in the assets returns.

We choose to implement a criterion which is close to what Pástor and Stambaugh (2003) use when choosing stocks. They look for stocks that have been traded 15 or more days during a month with 20 trading days. As such, we have excluded the equity certificates that have not been traded more than 75% of total trading weeks in our sample period. Weekly data is used due to the fact that these returns are the only ones available which are corrected for the frequent secondary equity offerings within this industry. This is in contrast to the monthly average of daily volumes which Pástor and Stambaugh (2003) use. As a result of our selection criteria, we have to exclude 10 banks (*Exhibit 9*), which means that we have only 10 banks left in our sample.

The regression function of Pástor and Stambaugh (2003) is:

(*Eq.2*) $$r^{e}_{i,w+1,t} = \theta_{i,t} + \phi_{i,t} r_{i,w,t} + \gamma_{i,t}\left(sign\left(r^{e}_{i,w,t}\right) * v_{i,w,t}\right) + \varepsilon_{i,w+1,t}$$

$$w = 1, \dots\dots, W$$

Where:

$r^{e}_{i,w+1,t}$	Is the excess return of stock i on week w+1 in period t relative to the value weighted market index
$sign(r^{e}_{i,t})$	Is the sign of the excess returns of stock i on week w in period t relative to the value weighted market index
$r_{i,w,t}$	Is the return of stock i on week w, in time t
$v_{i,w,t}$	Is the NOK trading volume of stock i on week w, in time t
$\gamma_{i,t}$	Is the coefficient that measures the expected return reversal for a given level of trading volume.

In their article, γ is compared to another liquidity measure which they simulate over 50,000 daily values. Their result gives a R^2 of 0.98; therefore Pástor and Stambaugh (2003) have confidence in that γ is a good proxy for liquidity cost.

Pástor and Stambaugh (2003) state that the OLS estimated slope coefficient $\hat{\gamma}_{i,t}$ is an imprecise measure for single stocks. Thus, they average the stocks γ values each month according to the following formula:

(*Eq.3*)

$$\hat{\gamma}_t = \frac{1}{N}\sum_{i=1}^{N}\hat{\gamma}_{i,t}$$

As the disturbances in γ estimates are less than perfectly correlated across stocks, the $\hat{\gamma}_t$ above will give a more precise estimate of the average liquidity cost. The average liquidity cost of the sample is thus equally weighted. As Pástor and Stambaugh (2003) measure the liquidity for the whole market, they have N= 951 → 2,188. We use the same approach, but we only have 10 securities to average, and we will therefore only be able to eliminate some of the disturbances in γ compared to a larger sample size. As we use weekly data instead of daily data, some of the noise will be reduced as a result of data selection. Finally, Pástor and Stambaugh (2003) scale $\hat{\gamma}_t$ since a trade of $1 is different in the start of the period compared to the end.

$$"Scaled\ \hat{\gamma}" = \hat{\gamma}_t \times \frac{m_t}{m_1}$$

Where:

m_t	Total market value of the stocks in the portfolio at time t
m_1	Market value at the beginning of the period

We choose to calculate the γ-values of each equity certificate according to a 26 week rolling window as this is the lowest number of weeks we believe is justifiable to get reasonable results from the OLS estimation. The rolling window estimation is in contrast to Pástor and Stambaugh's monthly estimations. The justification for using a rolling window is because it will give us more estimates compared to estimating every 26 month period separately. It will also make it easier to see developments in γ. Furthermore, this means that our liquidity estimates include weekly values for half a year, while Pástor and Stambaugh (2003) use daily values within a month. After calculating all the γ-values, we average every 26 week rolling window according to *Eq.3*, and multiply the average with the scaling factor to differentiate between NOK

value traded in 2002 and 2012. We exclude the estimates that include data from both periods. Consequently, we do not have γ-values until 26 weeks into each period.

We choose to scale up the values of γ like Pástor and Stambaugh (2003), such that they are more "readable". We therefore multiply the γ-values with 100 million.

According to Pástor and Stambaugh (2003), γ is expected to have a negative sign, because trading volume is inversely related to stock returns. However, the opposite may be the case in certain situations. Llorente et al. (2002) cited in Pástor and Stambaugh (2003, 647-648) state that asymmetric information can weaken the reversal effect and even cause volume-related continuation in returns for stocks where information motivated trading is important. Additionally, Lee and Swaminathan (2000) cited in Pástor and Stambaugh (2003, 648) state that momentum effects in monthly returns are stronger for stocks with high recent volume. Thus, research supports that positive γ can stem from multiple sources, among them information based trading and momentum effects.

Finally, in order to test whether γ has changed from period one to period two, which is something Pástor and Stambaugh (2003) do not assess, we have chosen to apply an ANOVA test to compare means between the periods. The test will give us the opportunity to evaluate whether the mean γ-value are significantly different in the two periods based on the two periods variance.

6.0 Analysis

6.1 Systematic Risk

One of the assumptions underlying the OLS method is that the error terms are assumed to have constant variance. If that is not the case, it will not bias the $\hat{\beta}$, but a violation means that the estimates do not have the minimum variance property. The result of not correcting for this is that the standard errors are affected, and it may lead to wrongful conclusions. As we detect heteroscedasticity in both periods using Whites test, we correct for this using Whites "heteroscedasticity consistent coefficient covariance" available in EViews. Another assumption underlying OLS is that the error terms are uncorrelated with one another. If this is not the case, they are autocorrelated. The Durbin Watson test only detects autocorrelation of first order, but

we want to check if there are any autocorrelation of higher order. The Breusch-Godfrey serial correlation test is therefore implemented for this purpose. As a result, we choose to adjust for autocorrelation where it is detected by using the Newey-West technique which produce "heteroscedasticity and autocorrelation consistent" standard errors. We choose to fix the number of lags equal to the highest number of lags where we detect autocorrelation in each regression, given an upper limit of 5 lags.

The reason why we choose to correct for heteroscedasticity and autocorrelation, even though they do not affect the β estimates, is because both of them affect the standard errors. As we use the standard errors in the Wald test, they may affect the results and conclusions drawn from this test. These measures are only taken for the static CAPM model, not the 78 week rolling window β estimates.

Additionally, we test for non-normality in the error terms. Looking at the Jarque Bera values in both periods, we observe that we have a non-normal distribution in the error terms in both periods. According to Brooks (2008) the non-normality is less problematic when we have many observations. Violation of this assumption will bias the coefficient estimates, but it will be more severe with a low number of observations. Small sample sizes may affect the coefficient estimates such that our inferences may be wrong, but the impact on the coefficient estimates will be less biased when the number of observations increases, appealing to a central limit theorem. We do observe non-normality in the data, but as we have many observations (392 and 182), according to Brooks (2008, 163) we do not make an effort of constructing a dummy variable to try to correct for it. We keep in mind that we may have biases in the coefficient estimates due to non-normality.

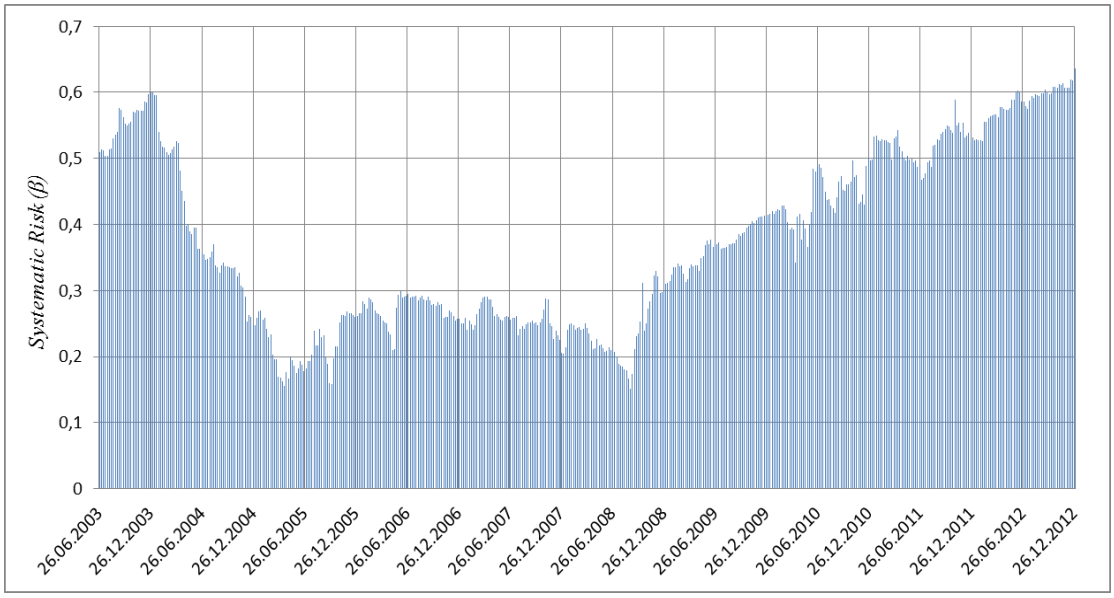
The savings bank index gives β estimates of 0.359 and 0.550 in period one and two respectively, with R^2 values of 0.246 and 0.428 (*Exhibit 11 & 12*). To find whether the second period β differs from the first period β, we proceed to the Wald test. By setting the null hypothesis to $\hat{\beta}_2 = \beta_1$, we find that the difference between the two periods is statistically significant at the 1% level (*Exhibit 13*). This is an indication that the structure of savings banks instruments may have changed after 2009. However, it is difficult to isolate the effects of the financial crisis, thus these results may be a result of changed market dynamics after the financial turmoil in 2008.

When looking at the individual banks, only three of the ten savings banks in our sample have β's in period two that are significantly different from the β in period 1 (MING, SADG and SVEG) (*Exhibit 13*). What we do notice is that the level of noise related to individual banks is very high, making it hard to draw any definitive conclusions, as one would anticipate. Thus, it is better to only assess the index as it is characterized by less noise.

An interesting observation however is that 8 out of 10 banks, in addition to the OSEEX, have higher R^2 values in period two than they had in period one. This indicates that the market movements now explain more of the variation in returns than they did before 2009. This may again be in line with the intentions of having an instrument that more closely resembles common stocks. On the contrary, this might also be a result of increased correlation between assets during the financial crisis (Silvapulle and Granger 2001). In such a case, we would expect both the R^2 and systematic risk to increase in correspondence to what this market phenomenon suggests.

As stated above, our study is based on the static CAPM model, but in effort to give further insights to the development in systematic risk during our sample period, we calculate the rolling β-values with a 78 week rolling window. We acknowledge that Ghysels (1998) conclude that these estimates are too volatile. Consequently, we have chosen to have rather many observations in the rolling window to reduce some of the noise and volatility associated with small sample sizes. We calculate these β's to see if there are any patterns that may strengthen our findings suggesting increased systematic risk in the OSEEX/GFBX index.

Figure 5: 78-Week Rolling Window β-estimates of GFBX/OSEEX



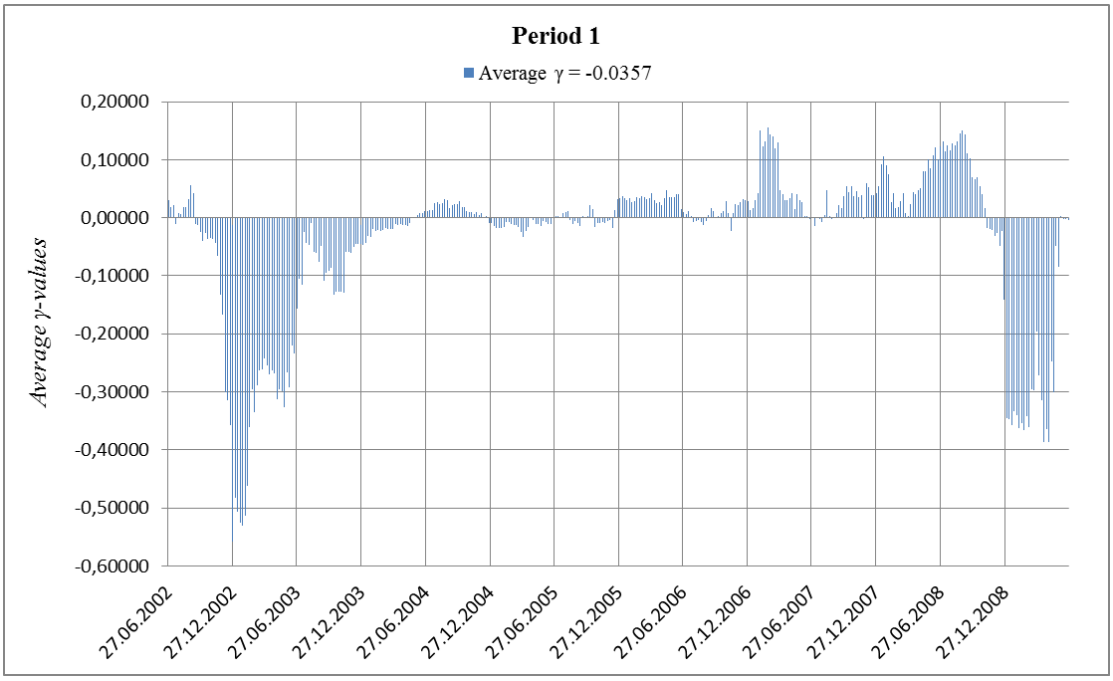
By computing a 78-week rolling window of β's over the entire period, it is not apparent that we have a defined shift in the β estimates at the end of June 2009, or related to news releases of the new instrument. Nonetheless, it may seem like there is a positive trend in β estimates in the second period. We observe that there are also clearly higher β estimates in the beginning of the period. This may be explained by the fact that in 2002 the Norwegian banking sector had the highest number of deficits since the banking crisis in Norway (1987-1991) (*Exhibit 14*). The unemployment rate was increasing and the growth in the Norwegian economy had decreased (The Norwegian Savings Banks Association 2006). As previously stated, correlation between assets has been found to increase during market downturns, thus affecting β estimates. We observe that the instruments sensitivity to market movements coincide well with investor uncertainty. Thus, whether the increase in systematic risk is due to changes in instrument characteristics or market dynamics is hard to isolate from one another. Accordingly, we may state that it seems like the instrument has an increased exposure to market risk, but we are unable to comment upon why that is.

6.2 Liquidity

The estimates of the γ-values from the 26 week rolling windows of the first period give an average value of -0.0357. We observe that throughout the estimation period there are two large liquidity drops. The first period clearly appears to have a connection to the economic situation in 2002, as mentioned above (*Exhibit 14*). The

second liquidity drop is during the financial crisis. Both drops correspond well with the assumed impact of market turmoil experienced by Pástor and Stambaugh (2003).

Figure 6: 26 Week Rolling Window γ-values (Equally Weighted and Scaled for Time Value)

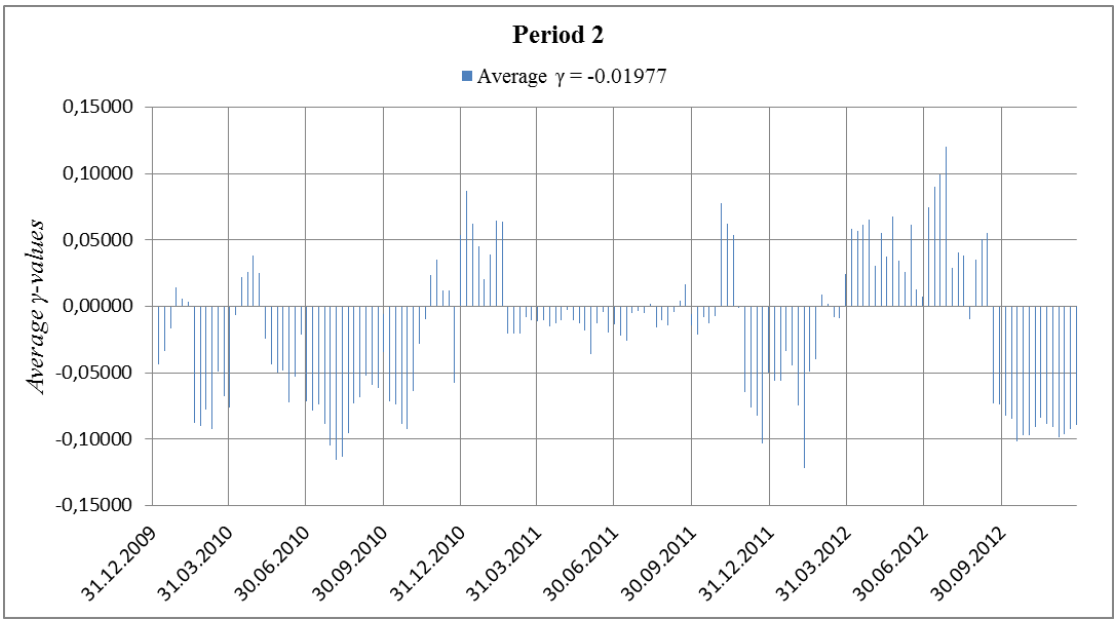


We observe that the γ-values of the primary capital certificates are positive for longer periods of time. This is in contrast to what Pástor and Stambaugh (2003) find. They find that the values occasionally are above zero, but the majority of time it is below. By choosing a period between the two liquidity drops (averaging the values from 01.01.2004 – 31.12.2008) we find that the γ's are on average positive. As mentioned, this is in contrast to the expectations of Pástor and Stambaugh (2003). The positive values therefore indicate that there were continuations in excess returns related to order flow of primary capital certificates. These continuations, as mentioned, could be related to momentum effects and/or information based trading.

As stated in Pástor and Stambaugh (2003), increased liquidity should be associated with a lower γ-value in absolute terms. This is because increased liquidity should result in lower price impact as a result of order flow. The average γ-value of the 26 week rolling windows from period 2 is -0.01977, which is lower than what we get from period one. We observe that there are no extreme liquidity drops like the two we

had in the first period. We detect some positive values in period two, but they seem to be less frequent than what we identified in the first period.

Figure 7: 26 Week Rolling Window γ-values (Equally Weighted and Scaled for Time Value)



Looking at the summary statistics of the average γ-values from the two periods, we observe that the variance in period two is much lower than period one. Most of this variance seems to stem from the large liquidity drops in both 2003 and 2008. The ANOVA test shows that average γ in period two is lower in absolute terms than in period one, but the difference is not statistically significant. Thus, we may not reject the hypothesis of unchanged liquidity. This is in contrast to our expectations. However, the means are very sensitive to sample period. If we for instance had excluded the first two years of the first period, which means that we would have excluded the first large liquidity drop, the difference between the two periods would be statistically significant (*Exhibit 15*). Looking at the turnover from 2002 – 2012, we observe that, if anything, it seems like the traded volume has gone down during our sample period (*Exhibit 16*). As mentioned, parts of the first and second period are influenced by the financial crisis, and thus it is problematic to isolate the change in liquidity as a result of the regulation in 2009.

Table 1: ANOVA Test for Difference in Liquidity Cost

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*	*Std. Dev*
26.06.2002 - 24.06.2009	366	-13,0668	-0,0357	0,01738	0,131832
30.12.2009- 26.12.2012	157	-3,10353	-0,01977	0,00286	0,053481

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0,027895	1	0,027895	2,140487	0,144059	3,859369
Within Groups	6,789776	521	0,013032			
Total	6,817671	522				

7.0 Conclusion

7.1 Systematic risk

The empirical results suggest that the systematic risk of equity certificates has changed after the regulation in 2009. Although the results are in line with our initial expectations, the results are unreliable due to several factors. The results of the fiscal year 2002 were characterized by a large number of deficits among Norwegian savings banks (*Exhibit 14*). As a result we see higher β values from the rolling window estimations in the beginning of the first period compared to the following years. It is also observable that the β's increase following the financial crisis. Whether this is a consequence of the new instrument introduced July 1st 2009 or merely an effect of changed market dynamics after the financial turmoil in 2008 is hard to assess. Thus, we are unable to pinpoint the reason for the change, but from the static CAPM model we are able to infer that the OSEEX/GFBX has statistically significant higher β in the second period. When assessing the individual savings banks, it is harder to get a clear picture as the data are characterized by a lot of noise, and accordingly this is reflected in low R^2 values. We observe that the R^2 values has increased in 8/10 banks, and for the OSEEX/GFBX. This may indicate that the excess return of equity certificates is better explained after 2009. Whether this is due to the new instrument, which was supposed to have broader similarities to stocks rather than a fixed income security, is uncertain. It may also stem from increased correlations between equity certificates and other securities, due to changed market dynamics after the financial crisis. Therefore, we are able to state that the β is significantly higher in period two, but unable to draw any definite conclusions related to what causes this change.

7.2 Liquidity

The empirical results of the liquidity cost are not able to reject the hypothesis of unchanged liquidity as a consequence of the regulation in 2009. Thus, we cannot state that the liquidity has improved for equity certificates. The results found by Banerjee, Gatchev, and Spindt (2007) suggests a link between dividend policy and liquidity, and that they act as substitutes to investors. Despite the fact that dividend payouts now should be lower, and their results imply that liquidity should hence improve, their results do not hold in our empirical study.

The high number of banks with negative results in 2002 clearly shows a sharp liquidity drop. This drop coincides well with investors uncertainty related to the banks future earnings. The same applies for the liquidity drop observed during the financial crisis. Both drops correspond well with the assumed impact of market downturns suggested by Pástor and Stambaugh (2003).

An interesting feature of our results is that we obtain some puzzling observations from period one related to γ-values. We observe that for longer periods of time they are positive. Looking at the in sample period from 2004 to end of 2008, we observe that the majority of γ-values are positive. This is in contrast to the reversal effect suggested by theory, and thus implies that our portfolio of 10 savings banks seemed to have continuations in excess return related to order flow before the regulation. Theory by Llorente et al. (2001) and Lee and Swaminathan (2000) cited in Pástor and Stambaugh (2003, 647-648) suggests that this can stem from momentum effects or information based trading. It therefore seems reasonable to believe that the positive values may be a result of one of these factors. The positive values are a lot less frequent in period two, and we observe that the majority of γ-values are negative. Consequently, period two seems to be more in accordance with theory.

Despite the differences in the two periods related to the sign of γ-values, we are not able to reject the hypothesis of unchanged cost of liquidity with the ANOVA test. Taking a look at the turnover of equity certificates from 2002 – 2012 it may in fact seem like the traded volume to market capitalization has decreased (*Exhibit 16*). If liquidity had improved, we would also expect the turnover to have increased. Consequently, this may be in accordance with the perception of unchanged liquidity.

We observe that the mean values are very sensitive to sample period as the two liquidity drops heavily bias our means. Consequently, selection of sample period will impact the conclusions drawn. By excluding the first liquidity drop to validate the robustness of our result, we find that the p-value of the ANOVA test decreases below the 5% level, thus inferring that the liquidity has changed (*Exhibit 15*). As a result, the weak robustness of this empirical study makes us unable to draw any definitive conclusions regarding change in liquidity.

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Appendix

Exhibit 1: Number of Norwegian Savings Banks 1922 – 2012

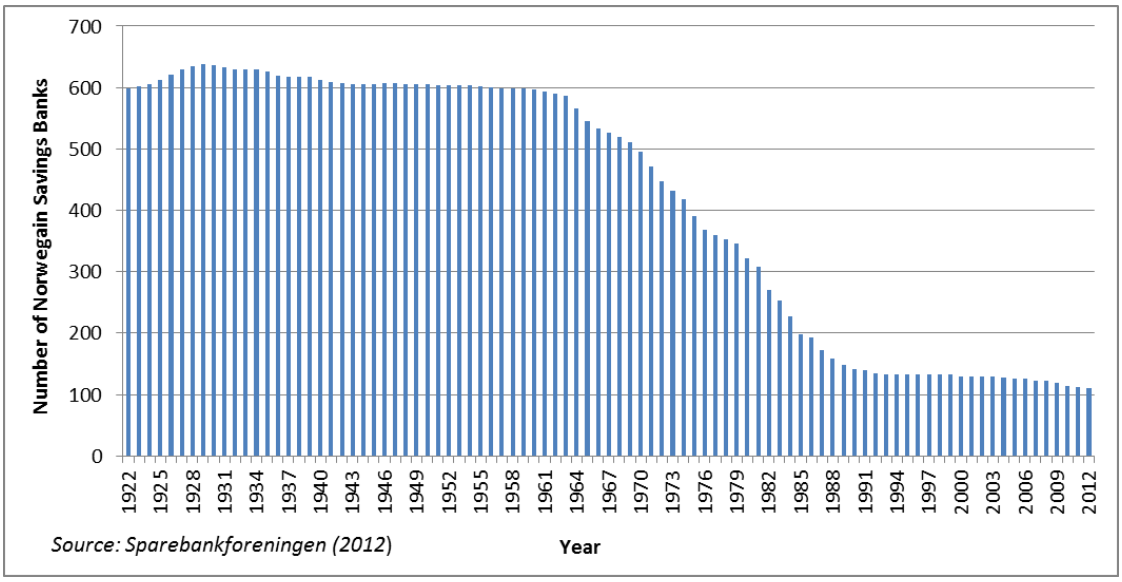


Exhibit 2: Market Capitalization of Norwegian Savings Banks – June 2013

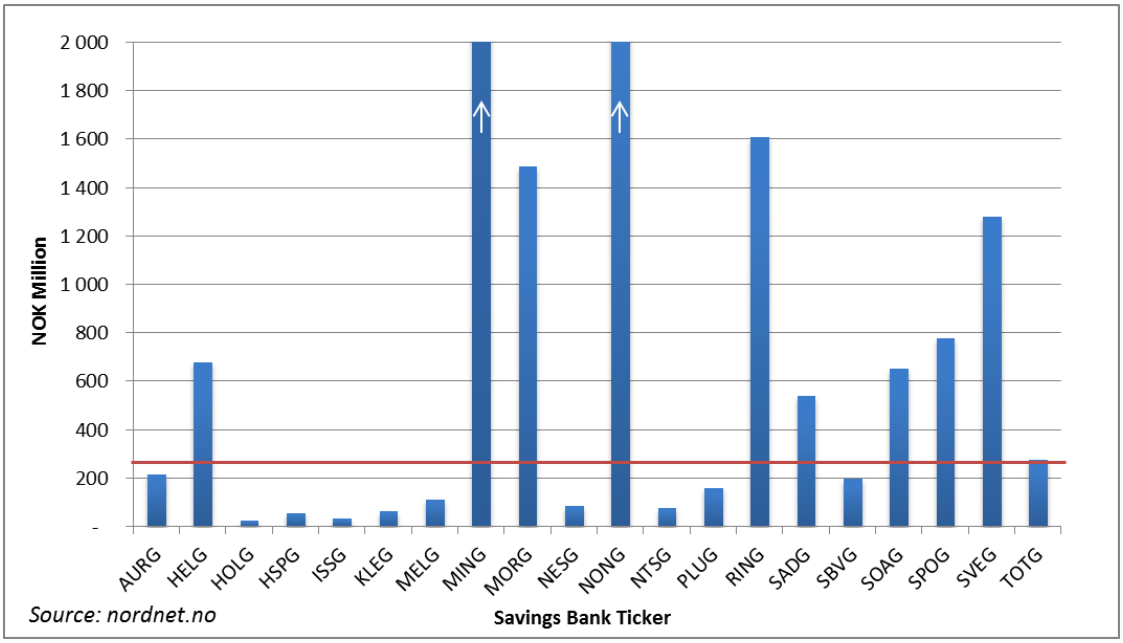


Exhibit 3: Primary Capital Certificate Bank Structure

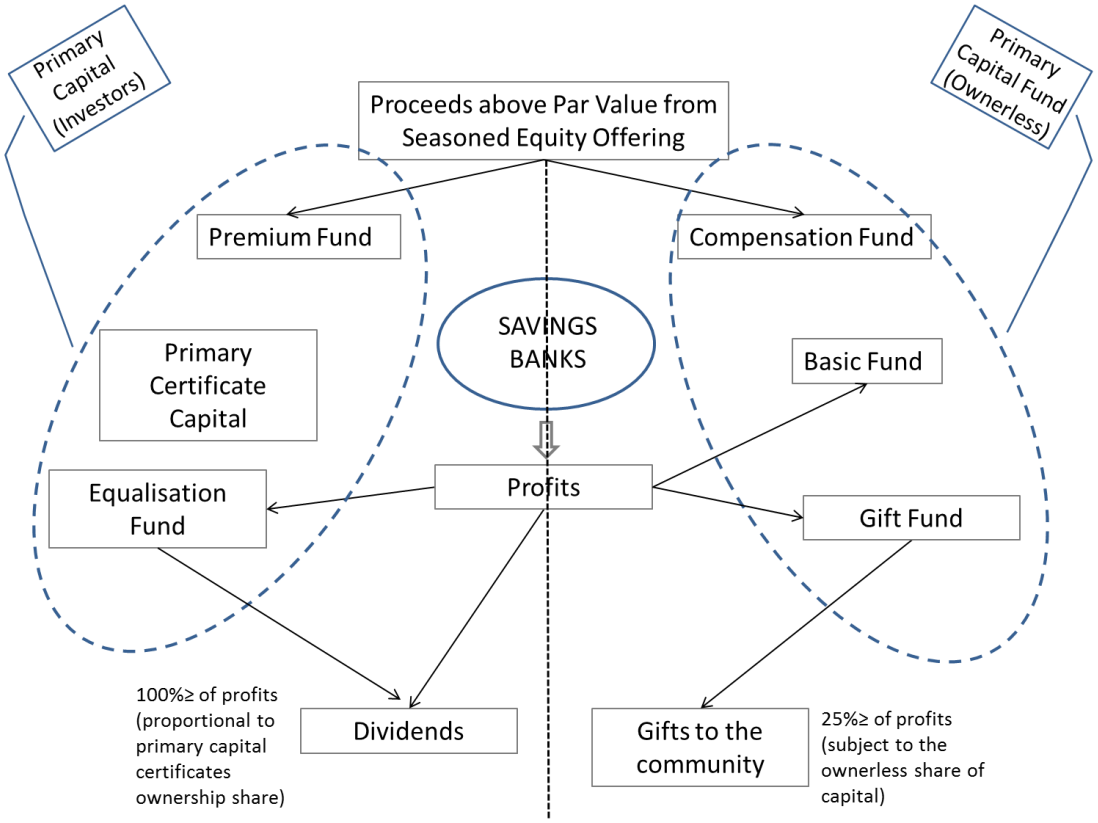
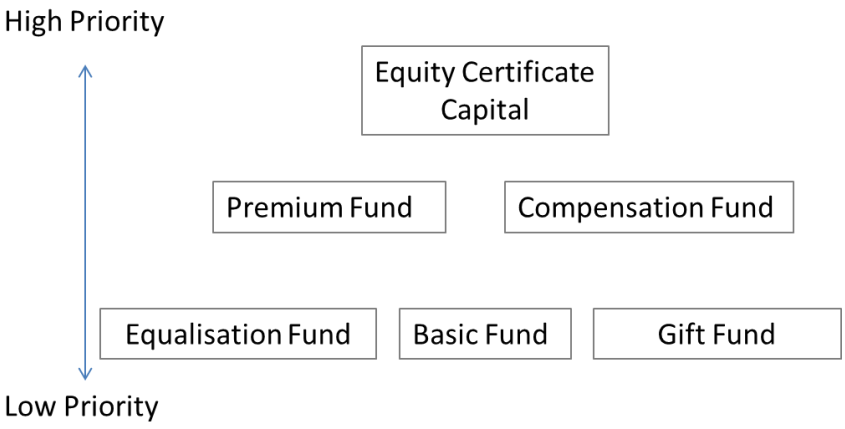
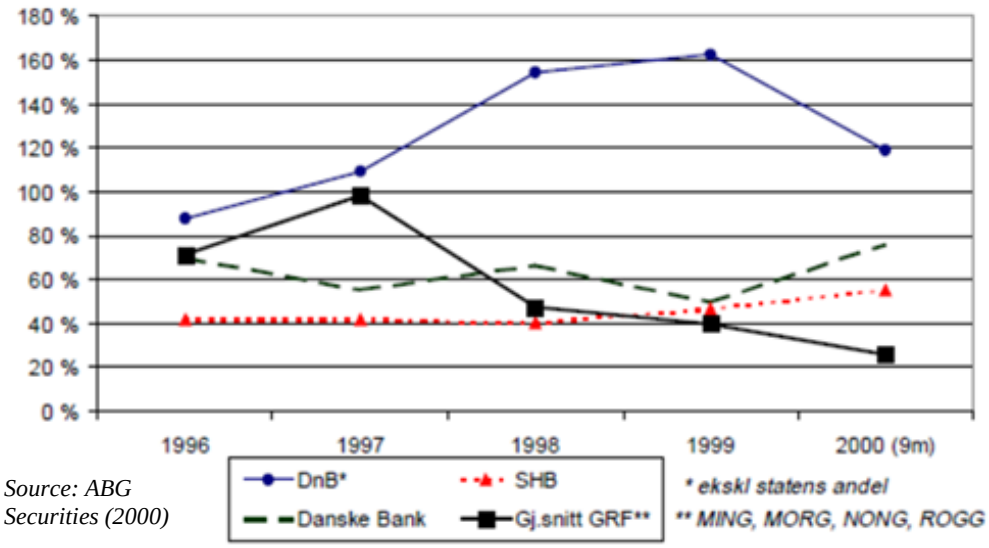


Exhibit 4: Capital Priority List



Source: Sparebankforeningen (2012)

Exhibit 5: Turnover of Primary Capital Certificates and Stocks Issued by Banks



Source: ABG Securities (2000)

Exhibit 6: Equity Certificates Bank Structure

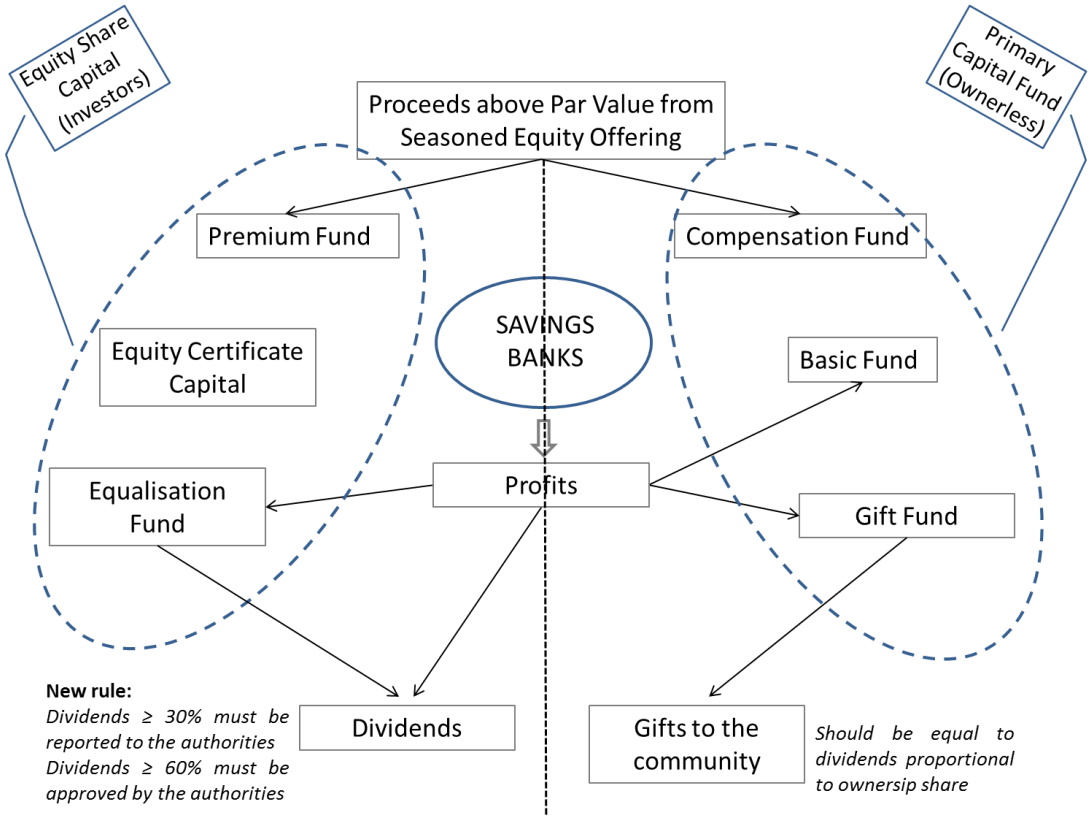


Exhibit 7: Established Foundations Since 2002

ESTABLISHED SAVINGS BANK FOUNDATIONS	ESTABLISHED	CAPITAL (MILLION)
Sparebankstiftelsen DNB	2002	NOK 7.900
Stiftelsen Sparebanken Bien	2007	NOK 100
Sparebankstiftelsen Sauda	2009	NOK 160
Sparebankstiftelsen Tingvoll	2009	NOK 140
Sparebankstiftelsen Gran	2010	NOK 500
Sparebankstiftelsen Jevnaker Lunner Nittedal	2010	NOK 460
Sparebankstiftelsen Ringerike	2010	NOK 800
Sparebankstiftinga Fjaler	2010	NOK 130
Sparebankstiftinga Sogn og Fjordane	2010	NOK 1.800
SpareBank 1 - stiftinga Kvinnherad	2010	NOK 370
Sparebankstiftelsen Helgeland	2010	NOK 690
Sparebankstiftelsen SpareBank 1 Nord-Norge	2011	NOK 150
Sparebankstiftelsen SMN	2011	NOK 100
Sparebankstiftelsen Hardanger	2011	NOK 530
Sparebankstiftelsen Halden	2011	NOK 340
Sparebankstiftelsen Østfold Akershus	2011	NOK 510
Sparebankstiftelsen SR-bank	2012	NOK 2.900
Sparebankstiftelsen Telemark - Holla og Lunde.	2012	NOK 325
Sparebanken Telemark - Grenland	2012	NOK 325
Sparebankstiftelsen Hallingdal	2012	NOK 850
Sparebankstiftelsen Øystre Slidre	2012	NOK 105
SAVINGS BANKS FOUNDATIONS BEING ESTABLISHED		
Sparebankstiftelsen Lillestrøm	-	NOK 300
Sparebankstiftelsen Sparebanken Sør	-	NOK 600
Sparebankstiftelsen Bø. Kapital	-	NOK 180
Sparebankstiftelsen Seljord	-	NOK 130

Source: Sparebankstiftelsen DNB (2012)

Exhibit 8: Listed Savings Banks on the Oslo Stock Exchange with Ticker Name

SAVINGS BANK	TICKER
Aurskog Sparebank	AURG
Helgeland Sparebank	HELG
Hol Sparebank	HOLG
Høland og Setskog Sparebank	HSPG
Indre Sogn Sparebank	ISSG
Klepp Sparebank	KLEG
Melhus Sparebank	MELG
SpareBank 1 SMN	MING
Sparebanken Møre	MORG
Nes Prestegjelds Sparebank	NESG
SpareBank 1 Nord-Norge	NONG
SpareBank 1 Nøtterøy – Tønsberg	NTSG
Sparebanken Pluss	PLUG
SpareBank 1 Ringerike Hadeland	RING
Sandnes Sparebank	SADG
SpareBank 1 Buskerud-Vestfold	SBVG
SpareBank 1 Østfold Akershus	SOAG
Sparebanken Øst	SPOG
Sparebanken Vest	SVEG
Totens Sparebank	TOTG
SpareBank 1 SR-Bank	ROGG

Source: Oslo Børs (2012)

Exhibit 9: Selection Criteria for Savings Banks by Traded Weeks

Period 1 - 27.12.2001 to 01.07.2009	AURG	HELG	HOLG	HSPG	ISSG	KLEG	MELG	MING	MORG	NESG	NONG
Traded weeks	206	342	247	179	253	65	288	392	392	291	392
Non traded weeks	186	50	145	213	139	327	104	0	0	101	0
% non traded weeks	47 %	13 %	37 %	54 %	35 %	83 %	27 %	0 %	0 %	26 %	0 %
Average weekly volume	136 459	1 865 811	105 341	81 657	156 202	162 127	366 952	18 928 081	6 401 094	388 716	10 515 159
Period 2 - 02.07.2009 to 26.12.2012											
Traded weeks	156	180	60	66	144	149	138	182	182	169	182
Non traded weeks	26	2	122	116	38	33	44	0	0	13	0
% non traded weeks	14 %	1 %	67 %	64 %	21 %	18 %	24 %	0 %	0 %	7 %	0 %
Average weekly volume	172 718	1 533 405	22 239	29 739	94 114	88 004	160 150	21 811 406	3 143 495	239 670	6 925 999
Exclude/Include	Exclude	**Include**	Exclude	Exclude	Exclude	Exclude	Exclude	**Include**	**Include**	Exclude	**Include**

Period 1 - 27.12.2001 to 01.07.2009	NTSG	PLUG	RING	SADG	SBVG	SOAG	SPOG	SVEG	TOTG	ROGG
Traded weeks	78	356	230	390	321	163	389	384	383	391
Non traded weeks	314	36	162	2	71	229	3	8	9	1
% non traded weeks	80 %	9 %	41 %	1 %	18 %	58 %	1 %	2 %	2 %	0 %
Average weekly volume	150 652	806 178	127 721	2 550 809	348 969	757 046	2 563 798	1 757 948	1 140 809	10 686 362
Period 2 - 02.07.2009 to 26.12.2012										
Traded weeks	148	163	130	182	169	161	182	180	182	130
Non traded weeks	34	19	52	0	13	21	0	2	0	52
% non traded weeks	19 %	10 %	29 %	0 %	7 %	12 %	0 %	1 %	0 %	29 %
Average weekly volume	204 916	228 224	3 633 994	1 993 788	469 899	412 593	3 849 276	2 193 073	847 735	9 769 155
Exclude/Include	Exclude	**Include**	Exclude	**Include**	**Include**	Exclude	**Include**	**Include**	**Include**	Exclude

Exhibit 10: The Winsorizing Method - Reducing Extreme Values (Three Std. Dev.)

	HELG	MING	MORG	NONG	PLUG	SADG	SBVG	SPOG	SVEG	TOTG
Std.Dev	5 274 915	19 334 274	9 001 020	19 817 229	1 465 717	4 270 110	930 433	4 207 852	3 564 363	1 297 890
Average	1 504 267	17 734 794	4 972 562	8 765 791	670 175	2 136 464	359 022	2 674 949	1 948 215	925 173
Average + 3 Std.Devs	**17 329 012**	**75 737 617**	**31 975 621**	**68 217 477**	**5 067 325**	**14 946 793**	**3 150 320**	**15 298 504**	**12 641 303**	**4 818 843**
Number of Adjustments	8	7	11	1	17	11	7	10	13	17
Largest Weekly Volumes										
1	**75 282 500**	**330 164 324**	**106 758 070**	**487 443 298**	**17 337 400**	**69 667 885**	**16 518 668**	**67 220 206**	**45 233 563**	**9 710 300**
2	**62 792 969**	**108 256 015**	**102 736 296**	49 945 051	**14 628 495**	**42 576 339**	**9 778 682**	**28 416 041**	**31 542 476**	**9 379 436**
3	**52 026 678**	**104 773 328**	**92 446 825**	47 176 750	**11 212 930**	**25 197 800**	**5 647 380**	**27 403 874**	**25 185 150**	**9 172 400**
4	**45 757 706**	**93 858 100**	**67 569 389**	42 044 153	**8 973 250**	**18 102 779**	**5 258 075**	**25 482 597**	**24 804 091**	**8 318 633**
5	**28 056 893**	**88 843 671**	**55 379 424**	41 605 124	**8 466 985**	**18 000 000**	**5 131 932**	**19 055 580**	**22 330 750**	**7 722 550**
6	**25 805 195**	**81 811 665**	**48 723 111**	40 100 657	**7 972 400**	**16 693 995**	**4 737 050**	**19 028 767**	**18 244 450**	**6 512 300**
7	**22 776 497**	**81 602 030**	**44 855 652**	39 870 349	**7 271 800**	**16 450 811**	**4 040 400**	**17 763 590**	**16 725 400**	**6 474 193**
8	**19 636 592**	69 321 132	**43 431 943**	37 594 173	**6 942 725**	**16 276 822**	3 125 288	**16 830 015**	**15 879 569**	**6 059 785**
9	13 760 303	65 321 155	**40 723 500**	36 251 555	**6 720 225**	**15 592 450**	2 800 000	**15 561 463**	**15 716 348**	**5 704 300**
10	12 511 200	64 789 265	**36 394 534**	34 599 812	**6 662 600**	**15 276 535**	2 608 928	**15 445 657**	**15 693 817**	**5 678 288**
11	11 813 538	61 920 182	**35 338 979**	32 123 142	**6 612 912**	**15 222 051**	2 552 000	14 624 290	**14 527 750**	**5 618 995**
12	11 221 170	61 217 780	29 587 850	31 960 495	**6 339 575**	14 384 525	2 101 000	14 333 847	**14 147 394**	**5 460 900**
13	11 212 415	59 398 719	28 637 036	31 674 952	**6 150 000**	13 871 196	2 069 250	13 992 102	**14 003 531**	**5 384 644**
14	10 863 324	57 108 835	25 935 975	30 295 900	**6 095 350**	13 352 585	1 918 000	13 664 560	12 290 200	**5 266 107**
15	10 537 956	56 669 613	23 900 300	29 829 258	**5 965 279**	13 202 563	1 858 800	13 106 914	11 677 548	**5 161 200**
16	10 051 662	54 760 024	23 774 785	29 756 500	**5 944 195**	12 219 450	1 858 100	12 879 574	11 546 140	**5 127 001**
17	9 862 812	54 599 307	22 245 746	29 553 700	**5 912 192**	11 967 022	1 832 100	12 506 044	10 931 710	**4 925 900**
18	9 848 199	54 100 730	21 528 586	29 294 437	4 971 550	11 905 890	1 799 786	12 355 455	10 918 368	4 686 568
19	9 789 002	53 559 445	21 140 558	27 947 217	4 496 250	11 510 572	1 772 180	12 350 578	10 066 996	4 666 385
20	9 700 809	53 240 149	20 961 575	27 929 858	4 204 030	11 151 985	1 750 625	12 345 117	9 673 158	4 627 500

Exhibit 11: β Estimation of GFBX 02.01.2002 – 01.07.2009

Dependent Variable: R_GFBX-RF				
Method: Least Squares				
Sample: 02.01.2002-01.07.2009				
Included observations: 392				
HAC standard errors & covariance (Prewhitening with lags = 3, Bartlett kernel, Newey-West fixed bandwidth = 6.0000)				
Variable	Coefficier	Std. Error	t-Statistic	Prob.
C	0.000456	0.001290	0.353690	0.7238
R_OSLO_ALL_SHARE-RF	0.359339	0.035362	10.16170	0.0000
R-squared	0.246206	Mean dependent var		0.001060
Adjusted R-squared	0.244273	S.D. dependent var		0.024515
S.E. of regression	0.021311	Akaike info criterion		-4.854071
Sum squared resid	0.177127	Schwarz criterion		-4.833809
Log likelihood	953.3979	Hannan-Quinn criter.		-4.846041
F-statistic	127.3824	Durbin-Watson stat		1.933264
Prob(F-statistic)	0.000000			

Exhibit 12: β Estimation of OSEEX 08.07.2009 – 26.12.2012

Dependent Variable: R_GFBX-RF				
Method: Least Squares				
Sample: 08.07.2009-26.12.2012				
Included observations: 182				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficier	Std. Error	t-Statistic	Prob.
C	-0.000328	0.001260	-0.260367	0.7949
R_OSLO_ALL_SHARE-RF	0.550454	0.060889	9.040334	0.0000
R-squared	0.428323	Mean dependent var		0.000841
Adjusted R-squared	0.425147	S.D. dependent var		0.022310
S.E. of regression	0.016915	Akaike info criterion		-5.310319
Sum squared resid	0.051500	Schwarz criterion		-5.275110
Log likelihood	485.2390	Hannan-Quinn criter.		-5.296046
F-statistic	134.8632	Durbin-Watson stat		1.951318
Prob(F-statistic)	0.000000			

Exhibit 13: β Estimates using OLS and Test for Difference using Wald's test

	HELG	MING	MORG	NONG	PLUG	SADG	SBVG	SPOG	SVEG	TOTG	OSEEX
$\hat{\beta}_1$	**0,152**	**0,485**	**0,304**	**0,465**	**0,105**	**0,435**	**0,096**	**0,338**	**0,283**	**0,195**	**0,359**
Heteroscedasticity	No	Yes	No	No	No	Yes	No	Yes	No	No	Yes
Autocorrelation	(-1) and (-2)	No	No	(-1) and(-4)	(-1),(-2) and (-4)	(-2)	(-1) and(-4)	(-2),(-3) and (-4)	(-1)	No	(-3)
R^2	0,013	0,156	0,139	0,152	0,018	0,142	0,007	0,069	0,092	0,042	0,246
$\hat{\beta}_2$	**0,262**	**0,733**	**0,134**	**0,500**	**0,073**	**0,859**	**0,170**	**0,444**	**0,442**	**0,389**	**0,550**
Heteroscedasticity	No	Yes	No	No	No	No	No	No	No	No	Yes
Autocorrelation	No	(-1) and (-2)	(-1)	(-1)	(-1),(-2) and (-3)	No	(-1) and (-5)	No	No	(-2)	No
R^2	0,061	0,278	0,023	0,156	0,004	0,146	0,010	0,131	0,165	0,076	0,428
Wald p-value	**0.1543**	**0.0363**	**0.0866**	**0.7388**	**0.6730**	**0.0069**	**0.5641**	**0.2167**	**0.0327**	**0.0670**	**0.0020**

Exhibit 14: Savings Banks with Negative Results

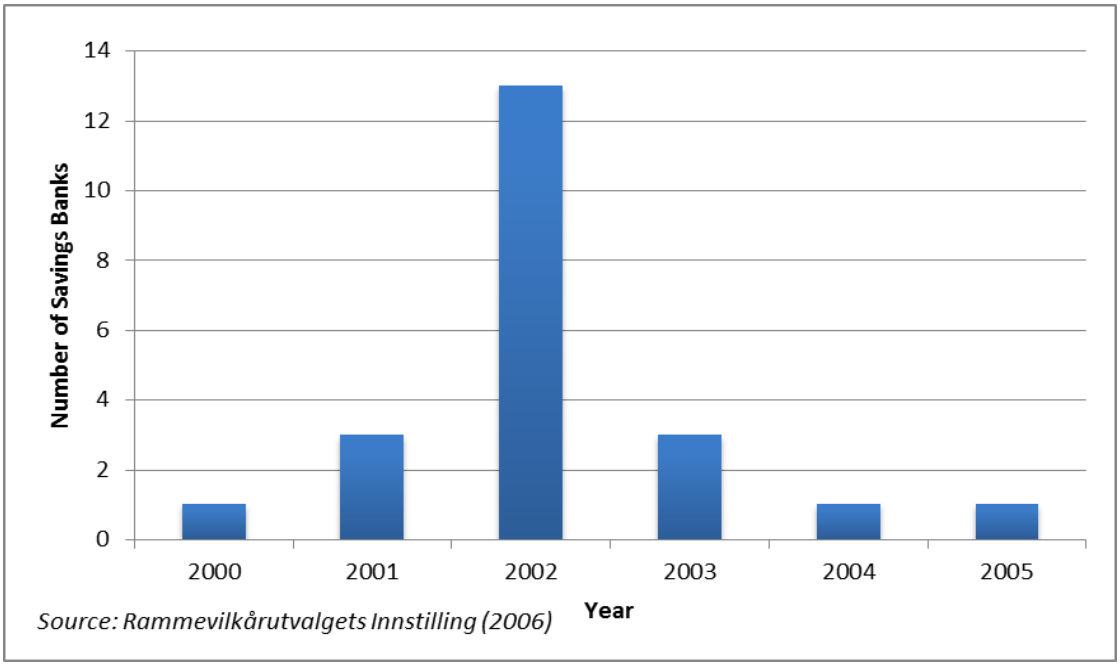


Exhibit 15: ANOVA Test (Excluding the Liquidity Drop in 2002 – 2003)

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*	*Std. Dev*
01.01.2004 - 24.06.2009	287	-0,62787	-0,00219	0,009954	0,09977
30.12.2009- 26.12.2012	157	-3,10353	-0,01977	0,00286	0,053481

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0,031364	1	0,031364	4,2098	0,04078	3,862583
Within Groups	3,293045	442	0,00745			
Total	3,324409	443				

Exhibit 16: Turnover of Primary Capital- and Equity Certificates 2002 – 2012