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The Impact of IAS 19 R on Shareholder Wealth and Firms' Actuarial Choices

Evidence from the Oslo Stock Exchange

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Abstract

The purpose of this study is to examine the effects of the amendments to the IFRS accounting standard, IAS 19 (Employee Benefits), on firms listed on the Oslo Stock Exchange. More specifically, the effect on defined-benefit pension plan sponsors that used the "corridor method" to defer the recognition of actuarial gains and losses prior to the revision. IAS 19 R, which has been in effect since the financial year 2013, requires firms to recognize actuarial gains and losses in other comprehensive income on a continuous basis, and accumulated corridor values had to be recognized during the effective year. This had a negative effect on shareholders' equity for defined-benefit plan sponsors on average, and I investigate both market reactions to the announcements leading up to the revision and the changes in firms' actuarial choices for defined-benefit plans leading up to the effective year. I find that firms that used the corridor method during the issuance of the near-final draft of IAS 19 R experienced lower abnormal returns than other firms on average during this announcement, but that this effect was mostly driven by leverage. The negative impact of leverage on abnormal returns was, however, stronger for firms with negative corridor values during the release of the exposure draft and the near-final draft. I also find that highly leveraged firms used more liberal actuarial assumptions when estimating the pension liability in the years leading up to the revision, but that this effect diminished during the effective year. Lastly, I found that firms that had negative corridors in 2012 changed their actuarial assumptions more aggressively than other defined-benefit sponsors in 2013, thereby reducing the accumulated corridor value that had to be recognized. The effect of leverage on actuarial choices is somewhat consistent with previous research on pensions and earnings management, but the findings in this study present new insights regarding IAS 19 in Norway specifically. Overall, the findings suggest that the IAS 19 revision has improved the quality of pension accounting.

Keywords: IFRS, Pension, Market Efficiency, Earnings Management

Preface

This thesis concludes my Master of Science in Economics and Business Administration at the Norwegian School of Economics. The process of writing this thesis has been challenging, but very interesting and educational. It has also provided me with a deeper understanding of issues related to accounting information and capital markets. I would like to extend my gratitude to Dr. Tzu-Ting Chiu for her guidance and useful insights during the process.

Contents

Frequently Used Abbreviations and Expressions

IFRS	International Financial Reporting Standards
IAS	International Accounting Standards
IASB	International Accounting Standards Board
NASB	The Norwegian Accounting Standards Board
PBO	Projected benefit obligation
ABO	Accumulated benefit obligation
Corridor	Accumulated unrecognized actuarial gains and losses
G	The public pension base amount in Norway
Folketrygden	The national insurance scheme in Norway
CAR	Cumulative abnormal return
IAS 19 (2011)	IAS 19 R (Effective from 2013)
IAS 19 (1998)	The old IAS 19 standard, superseded by IAS 19 R
OCI	Other comprehensive income statement
P&L	Profit and loss statement
DB	Defined-benefit pension plan
DC	Defined-contribution pension plan
OSE	Oslo Stock Exchange

1. Background and Introduction

On June 16th, 2011, the International Accounting Standards Board issued a revised version of the IFRS accounting standard, IAS 19 (Employee Benefits), which included important changes related to pension accounting. IFRS accounting has been mandatory for firms listed on the Oslo Stock Exchange (OSE) since 2005, and the revised version of IAS 19 took effect beginning in the financial year 2013. The most significant component of the revision was the elimination of the "corridor method," which had previously allowed for deferred recognition of actuarial gains and losses related to the pension liability recognized in the balance sheet[1]. The elimination of this accounting method had a significant impact on shareholders' equity for firms with large accumulated corridors, due to the immediate recognition of accumulated corridors in other comprehensive income (OCI) during the effective year. Researchers have argued that there is not enough attention being paid to pension information, particularly the off-balance sheet portion of the pension liability that the corridor represented. Though unrecognized actuarial gains and losses accumulated in corridors only were included in the pension notes in annual reports, they had the same effect on future cash flows as the pension liabilities recognized in balance sheets. The purpose of this study is to investigate if the off-balance sheet values contained in the corridors were already taken into account by market participants prior to IAS 19 (2011) or if announcements leading up to the revision had any effect on stock prices. Although information about unrecognized actuarial gains and losses (corridors) had to be included in the pension notes in annual reports prior to the IAS 19 revision, many argued that this information was too complex for market participants to process properly and that there was a need for simplification of the accounting for defined-benefit (DB) pension plans. The efficient market hypothesis (Fama, 1970 and 1991) suggests that in a market with semi-strong efficiency, prices should reflect all public information, which includes information in annual reports. The reason why the results in this study may be interesting is that they show that change in presentation of accounting information may affect stock prices without having any effect on future cash flows. In addition to the market reaction

[1] Under the corridor method, firms were only required to recognize actuarial gains/losses on pensions if the accumulated actuarial gains or losses exceeded 10 percent of the pension benefit obligation if the plan had a deficit or 10 percent of the plan assets if the plan had a surplus. (The "corridor" was defined as 10 percent of the greater of the two.)

around the announcements, I also investigate how firms adapted in the years leading up to 2013, which was the first effective year of IAS 19 (2011).

Accounting for pensions has long been regarded as overly complex, and several researchers have discussed issues related to the presentation of pension information in financial statements. Gopalakrishnan (1994) suggested that market participants not only interpret pension information disclosed in the footnotes to a limited extent but also that they attach equal importance to information disclosed in the balance sheet and the footnotes. Harper, Mister, & Strawser (1987) also found evidence that pension information disclosed in the footnotes is treated differently by market participants than if it were included in the balance sheet. More recently, Coronado, Mitchell, Sharpe, & Nesbitt (2008) found evidence that investors often misprice defined-benefit (DB) plans when valuing companies, a finding that is consistent with Picconi (2006) who suggested that off-balance sheet pension items are predictive of future returns. Franzoni & Marin (2005) also found that firms with severely underfunded pension plans earn lower stock returns than firms with healthier pension plans for at least five years after the first emergence of the underfunding. If this market anomaly holds, one may expect announcement effects, related to the IAS 19 revision, when investors discovered the effects of moving the off-balance sheet value represented by the corridor from the pension notes to the balance sheet. When Chang (2009) explored similar issues related to the 2006 introduction of SFAS 158 in the US[2], he found market reactions related to the funded status of pension plans, the probability of bankruptcy, capital requirements, and the volatility of pension assets. Chang also suggested that firms with underfunded pension plans reacted by lobbying against SFAS 158 during the rulemaking process, and by increasing discount rates to reduce their pension liabilities. Contrary to Chang (2009), Beaudoin, Chandar, & Werner (2011) suggested that SFAS 158 did not change the way market participants interpret pension information in financial statements.

Researchers have also suggested that DB plans are used as a tool for earnings management and that reporting incentives might affect firms' decisions on actuarial assumptions when estimating the value of pension items. Bergstresser, Desai, & Rauh (2006) suggested that managers make particularly optimistic assumptions about returns on pension assets during

[2] SFAS 158 introduced balance sheet recognition of the funded status of defined-benefit plans for US firms, and had similarities to the 2011 revision of IAS 19.

periods where they are exercising stock options. Sharad (1999) found evidence that when DB plans become overfunded, firms make conservative actuarial assumptions to avoid visibility costs and that when DB plans are underfunded, firms make liberal actuarial assumptions. Sharad also suggested that firms used actuarial assumptions to manage the pension cost and maximize tax benefits. On the other hand, Hann, Lu, & Subramanyam (2007) did not find any evidence that allowing discretion when choosing actuarial assumptions impaired the value relevance of the projected benefit obligation (PBO). More relevant to Norwegian firms, and to this study specifically, Døskeland & Kinserdal (2010) found evidence that most analysts covering firms on the OSE do not incorporate all relevant pension information in their valuations. In addition, Kinserdal (2006) found evidence that highly leveraged firms often used more optimistic actuarial assumptions to reduce their pension benefit obligation (PBO), and that most analysts do not adjust for abnormal actuarial assumptions. However, many of the issues mentioned in this section were addressed when developing IAS 19 (2011), and the impact of these changes presents an interesting topic.

In this study, I examine the security price response and changes in firms' actuarial assumptions related to the elimination of the corridor method. The purpose is to investigate the impact of accumulated corridors on the market and firm reactions, as well as the impact of leverage on market and firm reactions. If the market anomaly and the accounting incentives suggested in previous research hold, one would expect that the IAS 19 revision caused reactions from both market participants and firms. This is because of the immediate OCI recognition of accumulated corridors, which affects shareholders' equity. Since actuarial gains and losses have to be recognized on a continuous basis after the revision, the effectiveness of using actuarial assumptions as a tool for altering a firm's financial position has also been reduced (thereby reducing incentives). The study consists of two general topics; market reactions are explored in section 3, and firms' reactions are explored in section 4. Further, I develop three hypotheses for each of the topics.

Since the IAS 19 amendments was announced two years before its effective year, there is a reason to believe that the market reaction (if any) occurred before accumulated corridors had to be recognized in the 2013 balance sheets. During the data collection, I also noticed that some firms informed about the consequences of the IAS 19 amendments in their 2011 and 2012 annual reports and that its implications received more attention in general during the last years leading up to the effective year. Some firms also adapted to the new standard by fully recognizing the corridor in their OCI statements before the effective year, or by terminating

their DB plans and introducing defined-contribution (DC) plans instead. Since the efficient market hypothesis suggests that new information that affects future cash flows should be incorporated in stock prices (Fama, 1970 and 1991), I focus my analysis on market reactions to those announcements from the International Accounting Standards Board (IASB) which increased the probability of the IAS 19 revision. Although the elimination of the corridor method was only a change in presentation of information, the fair value of the pension liability for firms with accumulated corridors may have been new information for market participants due to the increased transparency after the revision. There is also reason to believe that these announcements, together with announcements from secondary sources such as auditors, media, and annual reports, did shed more light on issues related to pension items in general. The first out of the two topics in this study, regarding the market reactions to the amendments, is divided into the following hypotheses:

H1a: The security price response following the IASB announcements was negative for firms that were using the corridor method, compared to firms that did not.

H1b: Firms' security price responses were positively affected by corridor values following the IASB announcements.

H1c: Firms' security price responses were negatively affected by leverage following the IASB announcements.

H1 is mainly related to the changes in shareholders' equity and debt-to-equity ratios as a result of the immediate recognition of actuarial gains and losses, but H1a is also associated with accounting transparency. Several researchers have found evidence that reporting transparency is associated with lower cost of capital, which is an important component in firm valuations (Barth & Schipper, 2008). Examples of measures of transparency that have been associated with the cost of capital in research are earnings transparency (Barth, Konchitchki, & Landsman, 2013), AIMR corporate disclosure scores (Botosan & Plumlee, 2002, and Botosan, 1997) and accruals quality (Francis, LaFond, Olsson, & Schipper, 2005). Since the corridor method is the least transparent accounting method for actuarial gains and losses, a firm's perceived reporting transparency may be affected by the use of this method, especially when its implications become apparent.

In addition, I investigate how firms with DB plans adapted to these changes, with attention to the choice of actuarial assumptions. PBOs are usually estimated by an external actuary, but

several of the actuarial assumptions used are set by and at the discretion of, firm management. For the sponsoring firm, assumptions about employee wage growth and discount rates for the PBO have a significant impact on the funded status of a DB plan and the balance sheet. Although disclosure of these parameters in the pension notes was a requirement prior to the IAS 19 revision, verifying an actuarial assessment stated in the footnotes can be too complex for many users of financial statements. As mentioned, previous research on Norwegian firms suggested that some firms were using the actuarial assumptions as a tool for earnings management and that analysts rarely detected it. Research on US firms has also suggested that firms with certain characteristics used more liberal actuarial assumptions than others. Since, after the revision of IAS 19, actuarial gains and losses have to be recognized immediately, it is worthwhile to investigate whether accounting incentives have changed as a result of this. Prior to the IAS 19 revision, under-pricing of the PBO did not materialize before the accumulated actuarial gains or losses reached the limit of the corridor, which made it a useful tool for earnings management. The accumulation of unrecognized actuarial gains or losses could, therefore, continue for years by utilizing the corridor method. After the revision, mispricing of a PBO would materialize in the following year if these assumptions deviated from reality or if actuarial assumptions had to be adjusted. This is the basis for the second topic, regarding firms' reaction, which is divided into three hypotheses as well:

H2a: The discount and compensation rates used to compute PBOs during the years prior to the effective year of IAS 19 R were affected by firm leverage.

H2b: The relationship between leverage and discount and compensation rates changed during the effective year of IAS 19 R.

H2c: Firms with negative corridors during the years leading up to IAS 19 R changed their actuarial assumptions more aggressively during the effective year than other firms.

H2a and H2b are based on the assumption that highly leveraged firms had an incentive to use actuarial assumptions to minimize their debt-to-equity ratios prior to the revision, but that this changed when the corridor method was eliminated. There is also reason to believe that firms with negative corridors had, in the effective year of 2013, an incentive to use actuarial assumptions to minimize their PBOs and mitigate the negative effect on shareholders' equity. The focus in this thesis is the assumed discount and compensation rates used by firms when estimating the PBO. The Norwegian Accounting Standards Board (NASB) publishes

guidelines for determining these parameters semi-annually, but many firms' assumptions deviate from these guidelines. I, therefore, investigate whether there has been any difference in deviations from NASB's guidelines a result of IAS 19 (2011). The estimated return on plan assets has also been argued to be an effective tool for altering the pension cost recognized in the profit and loss statement (P&L), but IAS 19 (2011) has eliminated this mechanism by introducing a net interest element that will be explained in section 2. The analysis of actuarial assumptions, however, is limited to the discount and compensation rates that affect PBOs.

In the analyses, I use ordinary least squares (OLS) to investigate the effect of firm characteristics on market reactions and firms' actuarial assumptions. I regress market reaction on IASB announcement dates and firm characteristics in section 3, and firms' actuarial assumptions on financial years and firm characteristics in section 4. The measure for market reaction is cumulative abnormal return (CAR) surrounding the IASB announcements, which is computed using the event study methodology and asset pricing data from the OSE. The measure for actuarial assumptions is the discretionary part of the PBO value, which is a combined factor of discount and compensation rates that have been adjusted for the NASB guidelines in order to observe the deviations for each firm. The explanatory variables of interest in all the regressions are corridors and leverage, but other firm characteristics are included as control variables. I also include interaction terms with the IASB announcement dates when examining market reactions, and with the financial years when examining actuarial assumptions. When testing for statistical significance, I use a 10 percent alpha (α) when making conclusions about the hypotheses. After presenting the results concerning H1 and H2 in section 3 and 4, I provide a discussion of the main findings in section 5. Overall, I find that both corridors and leverage had implications for market reactions and firm reactions and that IAS 19 has improved the quality of pension accounting in general.

2. Theoretical Foundation

2.1 The Norwegian Pension System

The Norwegian pension system consists of three pillars: the public pension (Folketrygden), occupational pensions, and individual pensions. Though this study is limited to DB plans, the other pillars are relevant in several ways since most occupational pension plans are based on the Norwegian pension system. All three pillars are therefore described in this section.

2.1.1 Public Pension

The Norwegian national insurance law states that the public pension benefits are the most important and significant pillar in the Norwegian pension and welfare system. The idea is to ensure a minimum standard of living for the Norwegian population, and most residents have rights to public benefits. The national insurance entity in Norway, called "Folketrygden," was established in 1967 and pension benefits were initially based on a DB structure, with a vesting period of 40 years and a defined benefit paid annually at retirement. The benefit was based on the vested fraction of the 40-year vesting period, and on the 20 years with the highest taxable salary[3]. This structure was effective until the Norwegian pension reform in 2011. After the reform, the vesting of public pension benefits converted to a DC structure, due to the high cost of and vesting inconsistencies related to the old structure[4]. Since the 2011 reform, the vesting of public pension benefits has been based on an annual contribution of 18.1 percent of taxable income, up to 7.1 times the public pension base rate in Norway (G). The benefit is defined at the time of retirement and is based on each individual's pension balance and life expectancy. The annual return on the pension balance is equal to the average growth in wages. While most DB plans are structured after the pre-2011 benefit calculation system, DC plans are based on the vesting structure of the new reform. This will be described further in the next section. The assumed retirement age is 67, which is also common for most occupational and private pension

[3] Pensionable salary was limited to 12 times the public pension base rate (G) and reduced in the interval 6G–12G.

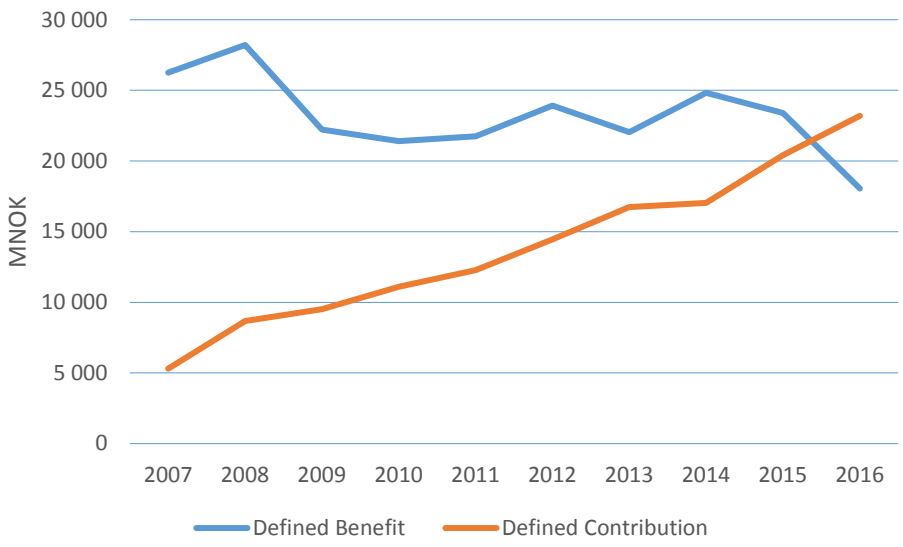
[4] The old vesting structure is still applicable for workers born before 1954 and partially applicable for workers born between 1954 and 1963.

plans in Norway (with exceptions for certain occupations and plans). Early retirement from age 62 is usually possible as well for most pension plans, at a reduced benefit-payment rate.

2.1.2 Occupational Pension

In addition to pension benefits from the national insurance scheme, an occupational pension scheme is mandatory for Norwegian firms that have workers over the age of 20 and whose total work-hours are equal to or greater than 20 percent of a full-time equivalent[5]. Sponsoring occupational pensions for employees has been mandatory in Norway since 2006. Benefits from occupational pension schemes come in addition to the benefits from the national insurance, but benefits and contributions for most occupational pension plans are computed on the basis of estimated pension payments from the national insurance and/or the G amount. Most occupational pension schemes in Norway are DC and DB plans, and in figure 2.1, annual premiums from employers to DB and DC plans are illustrated.

Figure 2.1: Premiums Paid by Defined Benefit Sponsors in the Period 2007–2016



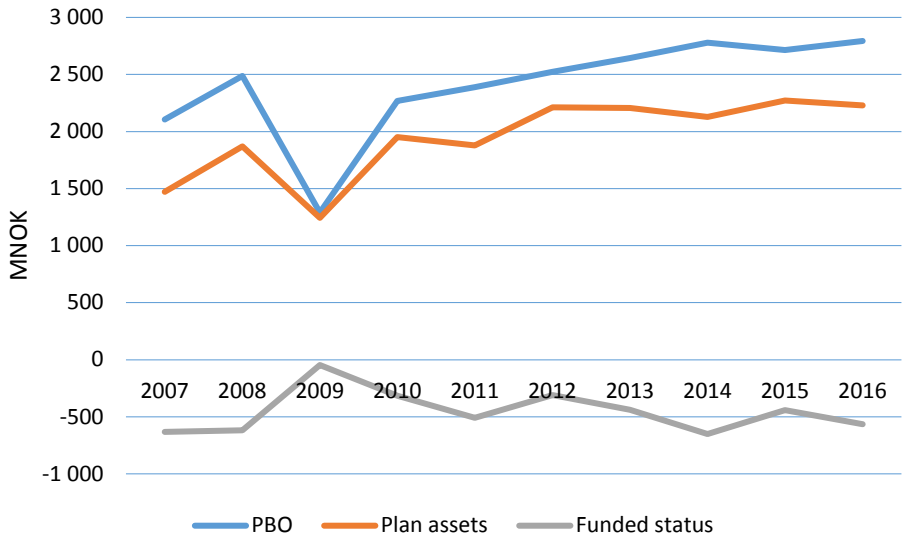
Source: Statistics Norway

Figure 2.1 clearly shows an increase in payments to DC plans and a decrease in payments to DB plans, and there may be several explanations for this shift. The introduction of

[5] Employers are responsible for sponsoring the pension plan for their employees with an exception for firms with a small number of part-time employees only. (Paragraph 2-3 in the *Lov om innskuddspensjon i arbeidsforhold* act.)

mandatory occupational pensions in 2006 was most likely a trigger of the growth in DC plans since every new employee and every member of a terminated DB plan have to be enrolled in a DC plan. A possible reason for the decline in DB plans may have been that the cost of sponsoring a DB plan is significantly higher than for DC plans. (There is an especially large drop following the financial crisis in 2008.) Atanasova & Hrazdil (2010) also found evidence that freezing DB plans have a positive effect on the sponsoring firms' equity returns and credit ratings. Another reason might be the introduction of IFRS in 2005 and the subsequent revision of IAS 19 in 2013 since both events introduced stricter disclosure and recognition requirements related to DB plans, which can be a burden to employers. In addition, Beaudoin, Chandar, & Werner (2010) found evidence of DB plan freezes related to the 2006 introduction of the pension-accounting standard SFAS 158 in the US. Although the number of DB plans seems to be decreasing, the liabilities related to DB plans are still relevant for many firms. Figure 2.2 shows the development of average PBO, value of plan assets, and funded status for a sample of DB plan sponsors listed on the OSE.

Figure 2.2: Average PBO, Plan Assets and Funded Status in the Period 2007–2016



Source: Thomson Reuters (Appendix 6.1)

As figure 2.2 shows, the average pension liability is almost at the same level in 2016 as it was ten years earlier. Though many employers have shifted from DB to DC plans and reduced their liabilities as a result of this, the low-interest-rate environment in recent years has increased PBOs significantly. (Long-term commitments such as pension liabilities are highly sensitive to interest rates.) The fact that, before the IAS 19 amendment, increases in

PBO values as a result of low interest rates could have been kept off-balance sheet under the corridor method is a good example of the importance of transparent pension accounting. The discount rate used to discount PBOs and other factors that affect pensions will be described further in section 2.2.2.

Defined Benefit Plans

The focus in this thesis is liabilities related to DB plans. The main characteristic of a DB plan is that the benefit paid to the employee at retirement is defined, while the annual premium paid by the employer varies and can be affected by several factors during the vesting period. In other words, the risk is held by the employer. Risks associated with DB plans were described by Peasnell & Kiosse (2009) as longevity risk, interest rate risk, inflation risk, and investment return risk. In Norway, benefits from most DB plans are defined as a fraction of the wage at retirement, minus the estimated benefit from Folketrygden. The mentioned inflation risk will, therefore, incorporate both wage increases until retirement for each employee and the growth in the G amount, which is used as a benchmark for benefits from Folketrygden[6]. Most Norwegian firms have DB plans in life insurance companies, but some firms also administer their own pension funds. According to IAS 19, the PBO of a DB plan should be calculated using the *projected unit credit method*[7], which is illustrated in figure 2.3 using the following equations for the accumulated benefit obligation (ABO) and the PBO:

$$ABO = \frac{\left(\frac{t}{T}\right) * Wage * Pension\ rate * P_{r,L} * (1 - y)}{(1 + r)^n}$$

and

$$PBO = \frac{\left(\frac{t}{T}\right) * Wage * Pension\ rate * P_{r,L} * [(1 + s)^n - y(1 + g)^n] * Turnover}{(1 + r)^n}$$

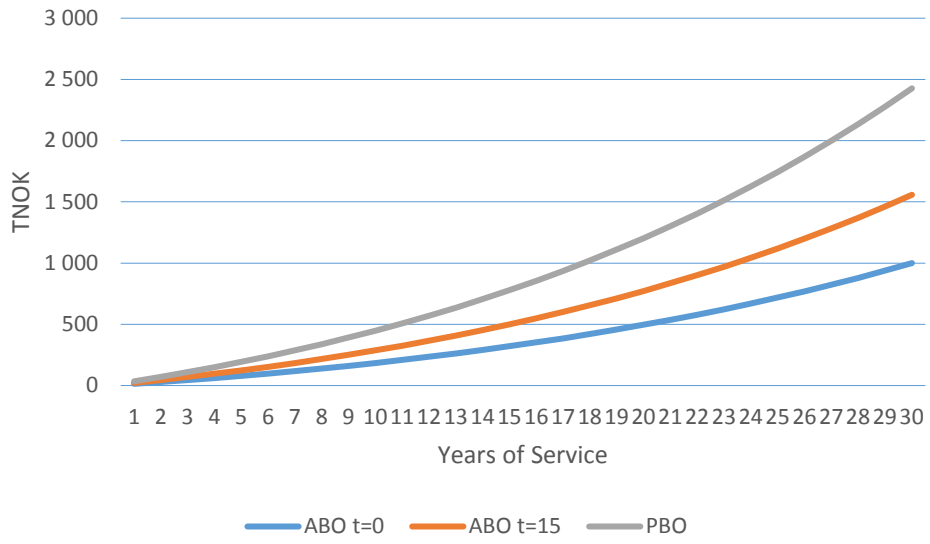
[6] In addition to affecting the estimated benefits from Folketrygden, the G amount determines the pensionable income ceiling for occupational pensions. Pensionable income for both DB and DC plans is limited to 12G, which makes up NOK 1,162,596 as of today. (The G amount is adjusted once a year and was adjusted from NOK 93 634 to NOK 96 883 as of May 1st, 2018.) Additional pension contributions are taxed at the respective employees' income tax rates.

[7] The projected unit credit method sees each period of service as giving rise to an additional unit of benefit entitlement and measures each unit separately to build up the final obligation. (Paragraph 68, IAS 19.)

where *t* is the number of years of service, *T* is the total vesting period required to receive full benefits, *r* is the discount rate, *n* is the number of years to retirement, *P* is the present value factor for an annuity of *L* years using a discount rate of *r*, *y* is the pension adjustment factor used by Folketrygden, *s* is the growth in wage, and *g* is the growth in G. The equation was proposed by Kinserdal (2006) and is representative for DB plans in Norway.

The mechanisms of these equations are illustrated in figure 2.3, using an example with a 37-year-old employee earning NOK 500,000 today and assuming a 3 percent annual wage increase, a 3 percent increase in G, and a 3 percent discount rate. The vesting period is 30 years from today, and the employee will receive a lifelong benefit of 66 percent of salary adjusted for a 75 percent pension base from Folketrygden[8] at age 67. The ABO represents the present value of earned benefits assuming today's salary and G, while the PBO assumes the wage and G at age 67 according to the growth parameters. (The ABO assumes no growth in wage and G, while the PBO includes the assumed growth rates.)

Figure 2.3: Illustration of the Development of an ABO and a PBO over Time



[8] Most defined-benefit plans in Norway assume a pension base rate from the national insurance of around 75% for participants when estimating the benefit. In reality, this depends on the individual's marital status at retirement and salary during the vesting period. According to the National Insurance Act (Lov om folketrygd), both a higher salary and being married at retirement reduces the pension base rate (the fraction of salary) received from Folketrygden. For the *L* parameter, I have used the official K2013 mortality table, which suggests a longevity of 45.29 years for a person that is 37 years old today. For simplicity, and due to lack of information on turnover rates, I have assumed no turnover.

The *ABO* curve in figure 2.3 represents the present value of earned benefits at any point in time, assuming no changes in the wage and G parameters. The increase in the *ABO* curve represents the service cost for the period, which is usually paid annually by the sponsor to a life insurance company. However, if the assumption of 3 percent increases in wage and G turns out to be correct next year, the *ABO* curve will shift towards the *PBO* curve, and an additional cost for past service will occur. (The shift represents the past service cost.) It is worth noticing that the magnitude of this shift increases with years of service, which is denoted on the horizontal axis. Shifts in the *ABO* curve will usually occur continuously until age 67 when the ABO and PBO will be equal. The *ABO t=15* curve illustrates the total shift from the day of employment to 15 years of service, and the distance from the *ABO* curve at *t=15* represents 15 years of past service cost. The *ABO t=15* curve would also be the PBO curve if the employee is assumed to quit or retire after 15 years (if, for example, the employee was 52 years old instead of 37). The total of individual PBOs for all employees in a firm makes up the PBO that IFRS firms have to disclose in their balance sheets under IAS 19.

Defined Contribution Plans

A DC plan is a savings plan where the employer contributes a fixed amount to each employee's pension balance in a life insurance company. In Norway, the contribution is usually defined as a percentage of annual salary, and the annual contributions must be 2–7 percent of salary between 1G and 7.1G. (Contributions of salary between 0G and 1G is optional.) For salary in the range of 7.1G–12G, employers may choose to contribute between 2 and 25.1 percent of the annual salary. The minimum contribution to a DC plan in Norway is 2 percent of salary between 1G and 12G. The concept of this structure, and of the 2011 pension reform, is that workers will receive an annual contribution in the range of 20.1–25.1 percent of salary up to 7.1G (2–25.1 percent of salary between 7.1G and 12G), combined, from their employer and Folketrygden. (This may deviate slightly, depending on if the employer makes contributions on salary between 0G and 1G.)

The plan is held by an insurance company, and employees can usually make individual investment choices among the funds that the pension provider offers. Beginning at retirement, the accumulated balance is paid out monthly, until age 77 at least or for the minimum number of years that the balance is sufficient to pay at least 20 percent of G. In DC plans, the employee bears both the investment return risk and the longevity risk, while the employer's exposure is limited to the annual contributions. The reduced risk for employers, together with the reduced

cost and complexity in accounting and administration, may be contributing factors for the recent shift from DB to DC plans.

Other Plans

Other types of occupational pension plans include AFP and hybrid schemes. AFP is an early retirement scheme and is a collaboration between the national insurance and several workers' and employers' unions. (It is financed both by Folketrygden and by the employer.) Hybrid schemes were introduced in Norway in 2014 and have the characteristics of a DC plan during the vesting period and of a DB plan at retirement (similar to today's pension from the national insurance). As of today, hybrid plans are not common in Norway. In addition, public employees are covered by a public occupational pension ("offentlig tjenestepensjon") that pays a defined benefit.

2.1.3 Individual Pension

Following the 2011 reform, the first pillar of the Norwegian pension system (Folketrygden) has been reduced, and the third pillar, individual pensions, has become more important. To facilitate increased pension savings by individuals, the government has allowed for tax deductions on pension contributions, up to NOK 40,000 annually. In order to get the tax deduction, the amount has to be locked in an "IPS account" until retirement, which is at age 62 at the earliest. The amount is usually invested in one of the funds offered by the pension provider and paid out in a similar manner as DC plans.

2.2 Pension Accounting

Since IFRS became mandatory in 2005, all firms listed on the OSE must comply with the accounting standard IAS 19 when accounting for pensions. In this section, I elaborate upon IAS 19 and other issues related to pension accounting.

2.2.1 Funded Status of Defined-Benefit Plans

The funded status of a DB plan is the value of a firm's pension assets minus the PBO, and must be included in the balance sheet. The PBO is a long-term liability that is recognized when an employee has provided his or her services in exchange for benefits. Plan assets are the total premiums paid to the pension plan by the sponsor in order to meet future pension obligations. Figure 2.2 showed that DB plans for firms listed on the OSE have a deficit on average. The

underfunding of pension plans makes sense, in a way, since the PBO takes economic factors, such as salary increases for the rest of the average vesting period for the employee base, into account. Pension providers usually invoice continuously, so that the ABO is paid in at any point in time. The PBO for the employee in figure 2.3, would, for example, be calculated on the basis of a 30-year vesting period, along with the estimated salary and G amount at age 67, while the ABO would be lower since it uses today's salary and G as a basis. If the employee were to quit today, the value of the ABO is the amount he or she would receive from the plan as a paid-up pension insurance policy[9]. DB plans will therefore usually have a deficit unless further payments are made in addition to the ABO.

There are several factors and events that affect the funded status of a DB plan through time, and firms using IFRS are required to disclose changes in PBOs and plan assets in the footnotes in their annual reports. A simplified example of typical changes in plan assets and obligations as disclosed in the pension notes under IAS 19 is illustrated in table 2.1.

Table 2.1: Changes in Funded Status for a Fictional IFRS Firm

PBO 01.01.201XX	*- 100,000*		
Service and interest cost	*-12,000*		
Actuarial loss	*-8,000*		
PBO 31.12.20XX	*-120,000*		
Pension assets 01.01.20XX	*100,000*		
Return on assets	*+5,000*		
Premiums paid to the plan	*+5,000*		
Pension assets 31.12.20XX	*110,000*		
Funded status 31.12.20XX	***-10,000***	←	Recognized in balance sheet under IAS 19 (2011)
Unrecognized actuarial losses	*+20,000*		
Recognized pension asset	***10,000***	←	Recognized in balance sheet under IAS 19 (1998)

As table 2.1 shows, a net asset is recognized at year-end under IAS 19 (1998), while a net liability is recognized under IAS 19 (2011). This is because, under IAS 19 (1998), the actuarial

[9] A paid-up insurance policy ("Fripolise" in Norwegian) is a DB pension plan held by an individual. These policies are issued to employees that have been terminated from DB plans, and usually have the same characteristics as the original plan.

loss of 8,000 is allocated to the corridor, which already had a balance of -12,000 (not showed in the table). At year-end, the corridor value is -20,000, which is added on to the net pension asset recognized in the balance sheet. The existing corridor indicates that the firm has used too optimistic actuarial assumptions in the past. Since the corridor value of -20,000 has reached 10 percent of the PBO value of -120,000, the exceeding amount of 8,000 has to be amortized in P&L over the average remaining vesting period of the employees. Under IAS 19 (2011), the corridor value of -20,000 has to be fully recognized in OCI the same year. This is an example of how the elimination of the corridor method affected the recognized net pension liability for several firms. If economic assumptions used when calculating the PBO deviated a lot from reality, corridor values could become substantial.

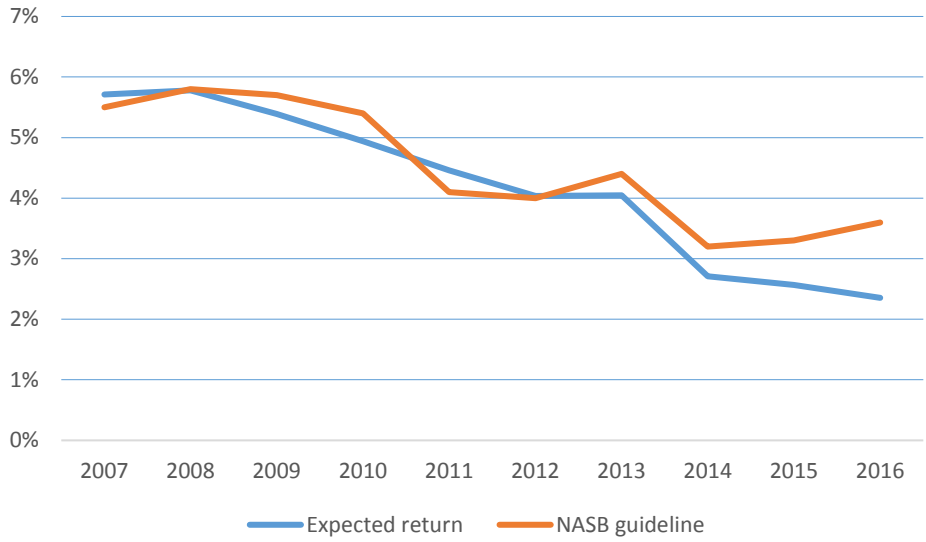
2.2.2 Actuarial Assumptions

As illustrated in figure 2.3, a small wage increase can have a significant impact on the ABO. This is why the PBO net of plan assets gives a better picture of a DB plan's effect on future cash flows, since it includes future "shifts" in the ABO curve. There are several economic factors that will affect a DB plan's funded status through the employee's vesting period, and an estimate of the present value of these changes is usually estimated by an external actuary. However, some of the assumptions used in the calculations are set at the management's discretion. According to both IAS 19 (1998) and IAS 19 (2011), firms are required to disclose assumptions about the discount and compensation rates used when estimating the PBO, in addition to the expected return on plan assets. IAS 19 also states that any other material actuarial assumptions used should be disclosed, and many firms in Norway disclose the assumed growth in G and turnover.

Plan Assets

Plan assets consist of accumulated contributions from the sponsor adjusted for returns and are usually invested in stocks, bonds, and other asset classes. However, firms have to assume a return rate on plan assets when recognizing the interest income from plan assets as part of the net pension cost recognized in P&L. This is because the return is unknown at the time of the preparation of the financial statement. Deviations between expected and actual return on plan assets are classified as actuarial gains or losses and were subject to the corridor under IAS 19 (1998), but under IAS 19 (2011) they must be recognized immediately. The expected return on pension assets and the asset allocation for a sample of DB plan sponsors listed on the OSE are presented in figure 2.4 and 2.5, respectively.

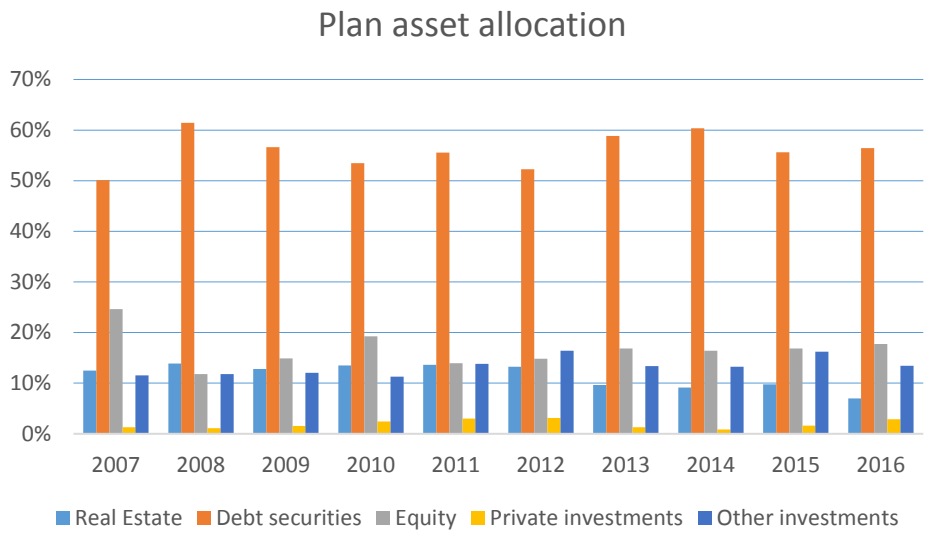
Figure 2.4: Average Expected Return on Plan Assets 2007–2016



Source: Thomson Reuters (Appendix 6.1)

As figure 2.4 shows, firms on the OSE used a similar rate as the NASB guidelines on average until 2013. The deviation in the years after 2013 may be due to the net interest element introduced by IAS 19 (2011), which means that firms have to use the same expected return on plan assets as the discount rate used on the PBO. (This will be explained in section 2.2.3.)

Figure 2.5: Average Asset Allocation 2007–2016



Source: Thomson Reuters (Appendix 6.1)

As figure 2.5 shows, the largest portion of plan assets is invested in debt securities, but the allocation changes slightly over time. The large portion invested in debt securities makes sense since they offer more consistent returns, an important factor when the funds are set aside in order to meet future obligations[10]. Volatile plan assets will also lead to increased balance sheet volatility, which can have implications for firms. The allocation to debt securities also seems to increase during years with economic uncertainty, such as 2008, and to decrease during times with low interest rates, such as the most recent years. This may be due to the pursuit of yield on plan assets in today's low-interest-rate environment.

The Projected Benefit Obligation (PBO)

The PBO is usually a more complicated calculation than the plan assets since the value of this item is determined by several factors. The NASB publishes guidelines for the relevant economic assumptions that may affect DB plans in Norway. The guidelines are generalized for Norwegian firms, but large deviations from the guidelines for individual firms should be justified. NASB also provides a sensitivity test for the PBO and the actuarial assumptions, which is presented in table 2.2.

Table 2.2: NASB's Sensitivity Test as of December 31st, 2017

	PBO		Pension cost	
	1 % increase	1 % decrease	1 % increase	1 % decrease
Discount rate	*-18 %*	*24 %*	*-15 %*	*20 %*
Compensation rate	*11 %*	*-10 %*	*18 %*	*-16 %*
Growth in G	*-3 %*	*2 %*	*-5 %*	*4 %*
Turnover	*-1 %*	*2 %*	*-2 %*	*3 %*

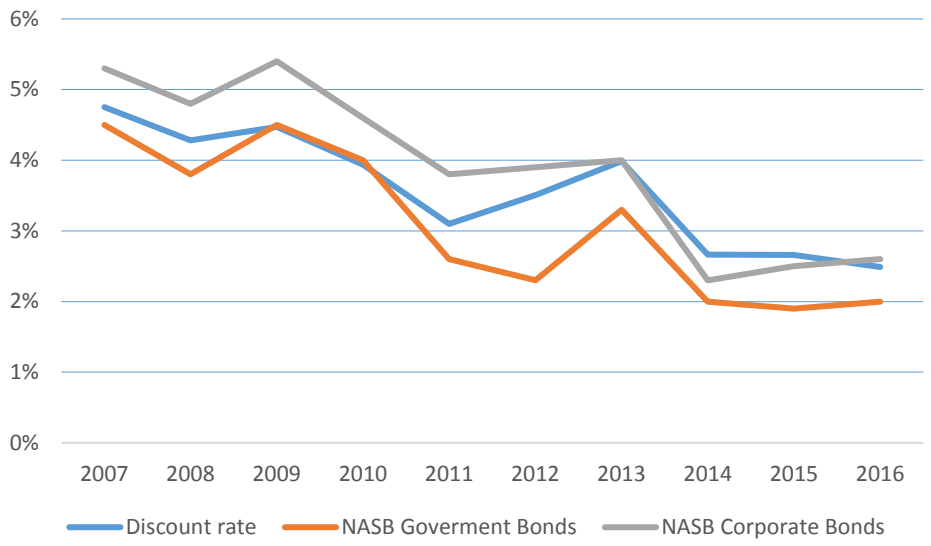
The sensitivity analysis is based on a DB plan with 106 employees and 18 retirees, an average salary of 520 000 and an average age of 47.25. Assumptions as of December 31st, 2017 were 2.4 percent for the discount rate, 2.5 percent for the compensation rate, 2.25 percent for the growth in G, and 2–3 percent for the turnover rate.

In addition to the discount rate and compensation rate specified in IAS 19, the growth in the G amount affects most DB plans in Norway, as previously shown in the ABO and PBO

[10] Plan assets are *liability driven investments*, where the target balance and date are the obligations to each employee at retirement. To reduce volatility and interest-rate risk, debt securities that provide fixed coupon payments are often used. This strategy provides a better return than government bonds, but is less risky than other asset classes.

equations. Turnover will also have an effect since only the individual ABO is paid when a participant is terminated from a DB plan. However, the discount rate and compensation rate are the most significant factors, as table 2.2 clearly shows, and the analysis in section 4 is limited to these two variables. Under IAS 19, the PBO is the sum of individual PBOs estimated using the projected credit unit method, as shown in figure 2.3. Figures 2.7 and 2.8 show the average assumptions about discount and compensation rates used by a sample of DB plan sponsors listed on the OSE.

Figure 2.6: Average Discount Rates 2007–2016



Source: Thomson Reuters (Appendix 6.1).

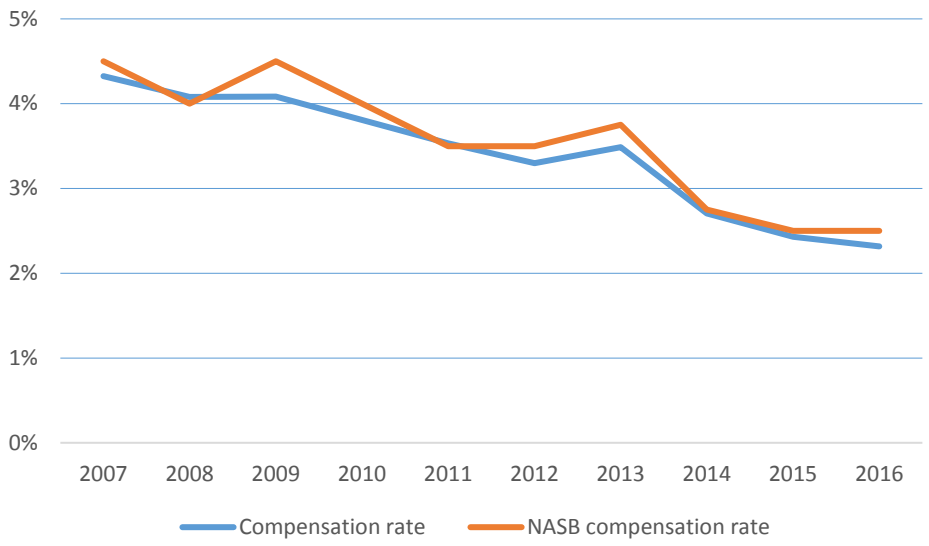
Note that the NASB rates are stated with both government and corporate bonds as a reference. This is because corporate bonds were not commonly used as a reference for PBO discount rates before 2012.

Under IAS 19, the reference for the discount rate should be the yield on "high-quality corporate bonds" traded in the same currency as the PBO. If there is no deep market for such bonds, government bonds should be used. The Norwegian market for covered bonds satisfied this requirement as of 2012 (Gabler Wassum, 2012). Before this, government bonds were to be used as the reference for the discount rate for PBOs denoted in NOK (NASB, 2012).[11] As figure 2.6 shows, there is a shift towards the NASB corporate bond reference rate in 2012 and 2013. Discount rates also vary between individual firms, which I will investigate more

[11] The corporate bond adaption is voluntary, but firms have an incentive to do this since a higher discount rate will reduce the PBO and increase shareholders' equity.

thoroughly in the second analysis. This is also the case with the compensation rate illustrated in figure 2.7.

Figure 2.7: Average Compensation Rates 2007–2016



Source: Thomson Reuters (Appendix 6.1)

For the compensation rate, the average compensation rate in Norway and historical data relevant to the characteristics of the individual firm's employee base should be used according to the guidelines.

2.2.3 IAS 19 – Employee Benefits

IAS 19 was initially issued in 1983 (and was amended in 1998 and 2011), and applies to all employee benefits, though this study is limited to post-employment benefits. More specifically, DB retirement plans. IAS 19 states that a DC plan is defined as a plan where a fixed amount is paid to a separate entity, and the employer has no further obligations. All other post-employment benefits are defined as DB plans. While the accounting for DC plans is limited to recognizing the contribution as an expense as the employees render their services, accounting for DB plans is more complex. The 2011 revision of IAS 19 superseded the 1998 version and went into effect on January 1st, 2013. The changes that will affect sponsors of DB plans the most is the new classification of the cost components related to DB plans. This includes the elimination of the corridor method and the introduction of a net interest element, which is illustrated in table 2.3.

Table 2.3: Components of the DB Pension Cost under IAS 19 (1998) and IAS 19 (2011)

Component	IAS 19 (1998)	IAS 19 (2011)
Service cost	Only current service cost had to be recognized immediately in P&L. Past service costs could be deferred.	Includes current and past service cost and is recognized in P&L.
Net Interest cost	The discount rate was used to compute interest cost, and the estimated return on plan assets was used to compute interest income (often at a different rate). Both components were recognized in P&L.	The net interest is the funded status multiplied by the discount rate and is recognized in P&L. (This may be a net income or a net cost, depending on the funded status of the plan.)
Remeasurements	Included actuarial gains or losses, and could be recognized in P&L, OCI or deferred using the corridor method.	Includes actuarial gains or losses, and must be recognized in OCI as they occur.

In addition, IAS 19 (2011) includes increased disclosure requirements related to the plan's risk and its effect on future cash flows. This includes a sensitivity test similar to NASB's sensitivity test in table 2.2. The most significant change is the elimination of the corridor method, which had previously allowed for deferred recognition of actuarial remeasurements when previous estimations deviated from reality or new actuarial assumptions were made. Under the corridor method, firms were only required to recognize actuarial gains or losses if the accumulated actuarial gains or losses exceeded 10 percent of the PBO if the plan had a deficit, or 10 percent of the plan assets if the plan had a surplus. (The corridor limit was the greater of the two.) The idea was to smooth the effect of changes in actuarial estimates and to reduce balance sheet volatility. If the 10 percent limit was reached, only the amount in excess of the corridor had to be amortized in P&L over the average remaining vesting period of the employees. This way, firms could defer actuarial gains/losses using both the mechanisms from the corridor (the 10 percent buffer) and the amortization. The corridor could, therefore, be larger than the 10 percent limit, because only a portion of the amount exceeding the limit had to be amortized every year, and several firms had large accumulated corridors as a result of this accounting practice. However, IAS (1998) required that the value of the corridor be disclosed in the footnotes. The mandatory balance sheet recognition of this amount under IAS 19 (2011) is the basis for H1.

2.2.4 An Example: SAS

To illustrate the effect of the elimination of the corridor method and the introduction of the net interest element, I use SAS (Scandinavian Airlines), the firm on the OSE that had the largest negative corridor relative to total assets in 2012, as an example. Table 2.7 shows the changes in the PBO and pension assets through 2012, as presented in the 2012 SAS annual report, with the equivalent balance sheet values under IAS 19 (2011) as a reference.

Table 2.4: Changes in PBO and Plan Assets for SAS in 2012 (Amounts in MSEK)

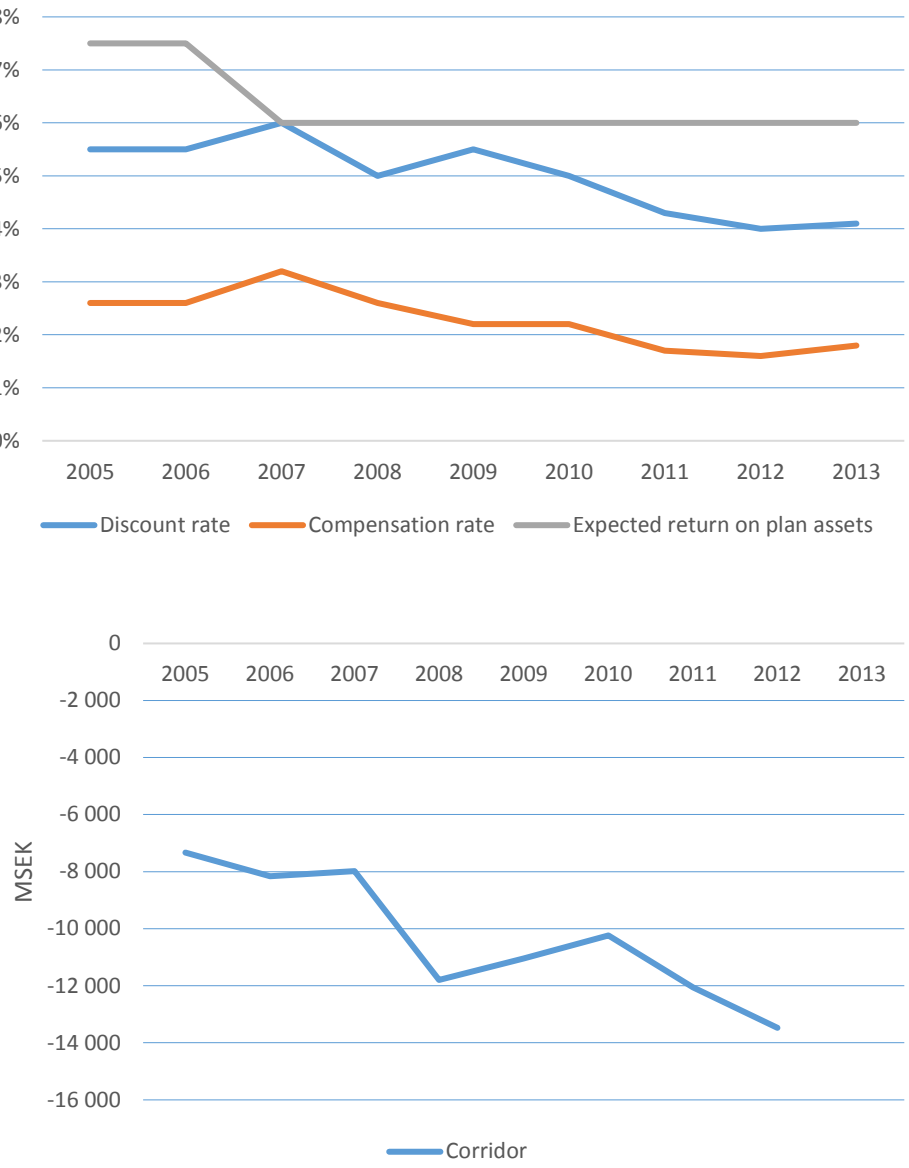
	Annual Report 2012				Under IAS 19 (2011)
	PBO	Plan assets	Corridor	Recognized in Balance Sheet	Recognized in Balance Sheet
Balance 01.01.2012	*-32,786*	*32,089*	*12,052*	*11,355*	*-697*
Service Cost	*-754*				
Interest Cost	*-1,051*				
Expected Return on Assets		*+1,551*			
Pensions paid Out	*+1,478*	*-1,478*			
Actuarial Gains/Losses	*-509*	*-1,360*			
Exchange rate Differences	*+116*	*-79*			
Employer Contributions		*1,541*			
Balance 31.12.2012	***-33,506***	***32,264***	***13,474***	***12,232***	***-1,242***
		Shareholders' equity 31.12.2012:		***11,156***	***-2,318***

Source: SAS 2012 annual report

As table 2.4 shows, implementing IAS 19 (2011) at the end of 2012 would have resulted in negative shareholders' equity for SAS. This was pointed out as a major issue both in SAS's 2012 and 2013 annual reports and in the media (Hegnar, 2012), and the resolution was the termination of DB and early retirement plans under the threat of bankruptcy. Instead, DC plans were introduced, which is supposed to reduce the PBO by 60 percent (19.5 billion SEK) by 2018, according to the plan. It is also worth noticing that, while the financial status of the pension plan was weakened through 2012 (the PBO increased more than plan assets), the recognized amounts in the balance sheet showed the opposite. This is because the total actuarial losses of MSEK 1,869 on the PBO and plan assets were allocated to the corridor. The

development in actuarial assumptions and the corridor for SAS in the years leading up to IAS 19 (2011) is illustrated in figure 2.8.

Figure 2.8: Actuarial Assumptions and Corridor for SAS in the Period 2005–2013



Source: SAS annual reports

As figure 2.8 shows, accumulated actuarial losses grew from MSEK 7,331 at the end of 2005 to MSEK 13,474 at the end of 2012, a result of actuarial assumptions deviating from reality and subsequent remeasurements. Figure 2.8 also shows that the discount rate and the expected return on plan assets were higher than the rates suggested by the NASB and that the compensation rate was lower than suggested by the NASB, which was consistent for the whole period. In 2013, the accumulated corridor was recognized, and an “IAS 19 R impairment” of

MSEK 10,268 was charged to shareholders' equity. In addition to the removal of the corridor method, the introduction of the net interest element affects the DB pension cost. This is illustrated in table 2.5, using numbers from SAS's annual report as an example and the equivalent under IAS 19 (2011) as a reference.

Table 2.5: Interest Cost and Income for SAS in 2012 (Amounts in MSEK)

Amounts in MSEK	Reported 2012	IAS 19 (2011)
Interest cost	*-1,051*	
Expected Return on Assets	*+1,551*	
Interest on net Pension Liability		*-29*
Net Interest Recognized in P&L	***+500***	***-29***
EBIT for SAS in 2012:	***–286***	***-815***

Source: SAS 2012 annual report

As presented in table 2.8, EBIT in 2012 would have been reduced by MSEK 529 in 2012 if IAS 19 (2011) had been applied. This is because a higher rate was used to compute the interest income on plan assets than for the interest cost[12] on the PBO. Under IAS 19 (2011), the interest cost of MSEK 29 is computed on the net pension liability using the funded status of (-) MSEK 697 and the reported discount rate of 4.2 percent[13].

This example illustrates how firms could effectively alter their reported earnings and financial position using discretionary actuarial assumptions and the corridor method. Though using these mechanisms might alter EBIT and the balance sheet at the time, deviations must be recognized at some point, which is reflected in the accumulated corridor. SAS was as mentioned the firm with the largest corridor and is not representative for most firms that used the corridor method, but it demonstrates the financial distress that can occur as a result of DB plans and accounting choices.

[12] The interest cost is the time-value cost of being one year closer to settlement of the PBO.

[13] The weighted discount rate for SAS was 4.2 % in 2012, which is slightly higher than the domestic rate used for Norwegian plans. (SAS sponsors DB plans in several countries and assumes different rates in each country. The interest cost and income are stated as a total amounts for all countries.) For the rest of the example, I have used the domestic rates stated for Norwegian plans for comparability.

2.3 Financial Theory

As shown in the SAS example and the previous section in general, DB plans can have implications for firms, both for internal stakeholders such as employees and management and for external stakeholders such as creditors and shareholders. If market participants are not aware of these mechanisms and their implications, it can lead to misvaluations of firms that sponsor DB plans. Since the entire funded status of a DB plan is included as an asset or a liability in the balance sheet under IAS 19 (2011), changes in the value of this item will affect the financial position of the firm. Immediate recognition of changes in funded status as they occur can lead to balance sheet volatility, which may affect the perceived risk of the firm. Under IAS 19 (1998), firms could, to some extent, avoid this kind of volatility from DB plans by using the corridor method, which had a smoothing effect. Though using the corridor method may have affected earnings if large amounts had had to be amortized in P&L, Glaum & Fasshauer (2012) suggested that pension items affecting the financial position are more value relevant than the pension cost. In other words, the PBO and plan assets have a stronger effect on firm value than the pension cost. Glaum & Fasshauer also found evidence that unrecognized pension amounts were incrementally value relevant.

Regardless of the accounting practice, contributions and thereby cash flows to a DB plan will remain the same. Failure to correctly interpret the cash flow effect of a DB plan can lead to misvaluations of firms when using common valuation methods. The systematic equity risk (beta) used in many valuation models will also be affected by the perceived risk of DB plans (Jin, Merton, & Bodie, 2006). Since risk, cash flows, and leverage are key factors for the fundamental analysis of a firm, failure to correctly interpret relevant information will have implications. If the increased transparency from IAS 19 (2011) altered the perception of these factors, one might expect a market reaction at some point. Some of the mechanisms that drive market reactions and firm incentives related to pensions are described briefly in this section.

2.3.1 Accounting Incentives

Since external stakeholders use financial statements as their main source of information, asymmetric information can create agency problems if the management's and the external stakeholders' incentives are not aligned (Jensen & Meckling, 1976). In the case of DB plans, the management may have an incentive to alter the pension liability or the pension cost by utilizing the effects of actuarial assumptions. An example is performance-based compensation

for management, which can give management the incentive to make accounting choices in order to meet accounting or capital market targets (Bergstresser, Desai, & Rauh, 2006). Debt covenants from creditors may also create the incentive to maintain specified accounting metrics (Sweeney, 1994). Asthana (1999) suggested that the choice of actuarial assumptions can be motivated by a firm's profitability, cash flow from operations, tax liability, and leverage. On the other hand, Barth & Schipper (2008) argued that reporting transparency has an effect on cost of capital. Suspicions of earning management and asymmetric information may, therefore, have a negative impact on firm value.

However, actuarial choices will not affect contributions to a DB plan, unless the plan is terminated or plan amendments are made. Deviations will, therefore, materialize at some point during the vesting period. Setting a high discount rate for the PBO, for example, will reduce the PBO today, but increase the interest cost for the rest of the vesting period. This is because the interest cost related to DB plans is the time-value cost of being one year closer to the settlement of the liability. Another example is assuming a low compensation rate in order to reduce the PBO. If the actual compensation rate is higher than the assumed rate, this has to be adjusted and compensated for, consecutively and with retrospective effect (a past service cost will occur), every year as previously shown, in regard to the ABO-PBO relationship. Contributions and thereby cash flows to the plan will be higher than expected. Prior to IAS 19 (2011), firms could also assume a high return on plan assets, which could be used as a tool to manage the pension cost as showed in the SAS example. Since the corridor method delayed the balance sheet effect of actuarial remeasurements, there is a reason to believe that accounting incentives have fewer implications for pension items after the introduction of the immediate recognition and the net interest element under IAS 19 (2011).

2.3.2 The Efficient Market Hypothesis

Whether complex and possibly altered pension information is an issue depends on the market participants' ability to interpret the information. Transparency and comparability were the main issues discussed when IAS 19 (2011) was developed, and similar issues were investigated in the research mentioned in the literature review. The effect of the IAS 19 amendments on security prices depends on the market efficiency of the OSE, which is defined as the market's ability to price in available information about firms in security prices. Fama (1970 and 1991), who proposed the efficient market hypothesis, suggested that, in an efficient

market, security prices reflect all available information. Fama further proposed three forms of market efficiency that depend on the kind of information that is reflected in security prices:

- Weak form: Reflects historic security prices only.
- Semi-strong form: Reflects historic security prices and public information.
- Strong form: Reflects historic security prices, public and private information.

Historic information refers to information captured by asset-pricing models, such as the CAPM model (Sharpe, 1964), that compare historic stock returns to historic market returns. *Public information* refers to all public information, such as earnings announcements or other news, and under semi-strong form, security prices will instantly be adjusted accordingly when such information becomes public. *Private information* refers to all information, including inside information, and under strong form, there will be no mispriced securities in the market. (Strong form does not apply in reality.) Fama (1991) suggests that semi-strong efficiency is valid in developed security markets, though other researchers have found anomalies that contradict this proposition. If security prices on the OSE reflect all available public information (semi-strong efficiency), the revision of IAS 19 should not have any effect on security prices, since it only introduced a different presentation of the same information[14]. If the assumption about semi-strong efficiency holds, one should not be able to find significant abnormal returns around the IASB announcements leading up to the revision.

2.3.3 Equity Valuation

When valuing a firm, analysts usually want to estimate the present value of future payments to shareholders, which are affected both by external factors (such as the economic environment or the industry situation) and by internal factors (such as financials or other firm characteristics). When evaluating the financials for a firm, the quality of the accounting information available is of high importance, and misinterpreting important information may lead to misvaluations. Parameters in typical valuation models may be affected by pension information, and as discussed by Døskeland & Kinserdal (2010), among others, value-relevant information that is too complex may not always be included in valuations even though the

[14] IAS 19 (2011) did introduce increased disclosure requirements about plan characteristics and sensitivity to change in actuarial assumptions that might have introduced new value relevant information from the effective year (2013) and onwards. However, this is not relevant when testing H1, since it focuses on the announcements leading up to the amendment.

information is available. Typical valuation methods include *balance sheet models*, *discounted cash flow models*, and *relative valuation*, most of which may be affected by pension information. Increased transparency due to the elimination of the corridor method and the introduction of the net interest element under IAS 19 (2011) may, therefore, have affected the fundamental analysis of firms if the user did not interpret the information correctly prior to the revision. In this section, I briefly discuss the implications that altered PBOs and earnings had for the most common valuation models under IAS 19.

Since the PBO affects the book value of equity, keeping a part of it off the balance sheet may alter the intrinsic value of the firm when conducting a fundamental analysis. When using balance sheet models, benchmarks for equity value may be the current book value of equity, the liquidation value of the firm minus its liabilities, or the replacement cost of the firm minus its liabilities. (These are known as the *book value*, *replacement cost*, and *liquidation value* methods.) Omitting unrecognized actuarial gains or losses accumulated in the corridor may, therefore, lead to inaccurate estimates. When using discounted cash flows models, such as *dividend discount* or *discounted free cash flow* models, one wants to discount dividend or free cash flows using the *cost of equity* or the *weighted average cost of capital*, respectively. Looking at the formulas for leveraged equity beta, cost of equity using CAPM, and cost of capital using WACC, we see that the debt-equity ratio (which itself is affected by the amount of the recognized PBO) affects both discount rates:

$$\beta_L = \beta_U * \left[1 + (1 - T) * \frac{Debt}{Equity}\right]$$

$$\downarrow$$

$$r_{CAPM} = r_f + \beta_L * (r_m - r_f)$$

$$\downarrow$$

$$r_{WACC} = r_{CAPM} * \frac{Equity}{Equity + Debt} + r_{Debt} * \frac{Debt}{Equity + Debt} * (1 - T)$$

where $\beta_{L,}$ $\beta_{L,}$ and T represent levered beta, unlevered beta, and corporate tax rate. The r_f and r_m represent the risk free rate and the return of the market index. The leveraged beta formula (Hamada, 1972) shows that the beta increases with the debt-equity ratio. The levered beta is again used to compute the cost of equity, often using the CAPM model (Sharpe, 1964) when

using dividend discount models. The cost of capital is again used for computing WACC when using free cash flow models. In the WACC formula, the r_{CAPM}, $\frac{Equity}{Equity+Debt}$, and $\frac{Debt}{Equity+Debt}$ terms are all affected by leverage. Misinterpreting the true value of book equity will also have implications when using comparative valuation ratios, such as price/book ratios, when using relative valuation techniques.

The introduction of the net interest element under IAS 19 (2011) may also affect valuation parameters if pensions were used to alter earnings. In the classic dividend discount model, dividend and future growth in dividends is a formula of earnings, reinvestment, and dividend payout ratio (Gordon, 1959). Altered earnings may, therefore, affect expected dividend. It will also have implications when using comparative valuation ratios, such as price/earnings ratios when using relative valuation techniques. If pensions were previously used to smooth earnings and the IAS 19 revision increased volatility, prices might have changed if volatility was negatively valued by investors (Michelson, Jordan-Wagner, & Wootton, 2000).

3. Market Reactions to IAS 19 R

To examine the shareholder wealth effect of IAS 19 Revised, I use the event study methodology, as explained in MacKinlay (1997), to measure the cumulative abnormal return (CAR) for each firm during the key announcements leading up to the IAS 19 revision. The firms of interest are the firms that used the corridor method to account for actuarial gains and losses during the announcements, but I also include firms that were not affected by the elimination of the corridor as control firms. The event study methodology is often used in research on wealth effects associated with regulatory change, and Horton & Serafeim (2009), Onalia & Ginesti (2014), and Christensen, Lee, & Walker (2007) also examined issues related to IFRS using the event study methodology. The events are identified in table 3.1, and I expect the strongest effect from the 2010 and 2011 announcements, which included the exposure draft, the near-final draft, and the completion of IAS 19 (2011). This is due to the specifics of the announcements and the significant increase in the probability of the amendments. What this analysis tries to examine is whether the IAS 19 revision presented any new information to the market and whether security prices were adjusted as a result.

Table 3.1: Key Events Associated with the IAS 19 Revision

Event #	Date	Description
1	June 29th, 2006	A revision of IAS 19 was added to the agenda during the IAS Committee Foundation trustees' meeting. It was pointed out that current literature allowed entities to exclude substantial liabilities from the balance sheet.
2	March 27th, 2008	A discussion paper on IAS 19 published by the IASB. The deferral of the recognition of gains and losses is pointed out as a main issue for transparency and comparability.
3	April 29th, 2010	The IASB published an exposure draft of proposed amendments to IAS 19 which included removal of the corridor, change in the pension cost components and increased disclosure.
4	June 6th, 2011	Near Final Draft of the amendments to IAS 19 released by the IASB.
5	June 16th, 2011	Completion of IAS 19 (2011) announced by the IASB.

Source: IAS Plus news archives

3.1 Sample and Data

The initial sample distribution of pension plans and accounting methods for recognition of actuarial gains and losses is presented in table 3.2. Initial sample firms include firms that were listed on the OSE through the respective years. Data on pension plans and accounting practices are stated as of December 31st and has been collected from annual reports.

Table 3.2: Initial Sample Distribution by Pension Plan and Accounting Practice (DB Plans in Shaded)

Year	Positive Corridor	Negative Corridor	OCI Recognition	P&L Recognition	Defined Contribution	No Plan	No Data	Total
2005	12	93	9	6	20	9	71	220
2006	12	83	15	8	29	1	82	230
2007	21	99	18	7	36	2	59	242
2008	12	103	20	5	51	2	32	225
2009	22	81	19	5	49	2	31	209
2010	15	88	20	5	70	0	8	206
2011	13	86	21	5	64	0	9	198
2012	31	56	28	4	69	0	6	194
Total	138	689	150	45	388	16	298	1,724

Due to limited access to annual reports for the first years, there are a lot of missing observations for the first two events[15]. However, the size of the group of firms using the corridor method should be sufficient for testing for significant mean CAR. The distribution in table 3.2 suggests a shift towards immediate OCI recognition of actuarial gains and losses and DC plans through the period. It is worth noticing the change in the distribution in 2012, which was the last year prior to the effective date of IAS 19 R. In 2012, the number of firms with negative corridors decreased by 35 percent (30 firms) while the number of firms using OCI recognition increased by 33 percent (7 firms). It is also worth noticing the 138 percent increase in firms with positive corridors in 2012 (18 firms), seeing that the only way to achieve this would be either a higher return on plan assets than expected or optimistic changes in actuarial assumptions. However, a lot of the 2012 increase in corridor values was due to the introduction of corporate bond rates as a reference for PBO discount rates in Norway. As figure 2.6 showed, the average discount

[15] The "no data" group in in table 3.2 includes firms that do not have annual reports available on newsweb.no or on company websites. According to paragraph 5-5 in the Norwegian Securities Trading Act, it is only mandatory for listed firms to keep annual reports public for five years.

rate used by the firms shifted from NASB's government bonds reference towards NASB's corporate bonds reference in 2012 and 2013. The increase in discount rates leads to reduced PBO values, which results in actuarial gains and increased corridor values for firms that used the corridor method. In the analysis in this section, I only use data from annual reports prior to the events of interest (which are the 2005, 2007, 2009, and 2010 reports, for events 1 through 5). Further, the sample selection procedure is presented in table 3.3.

Table 3.3: Sample Selection Procedure

	Observations
Initial sample for 2005, 2007, 2009 and 2 x 2010* as presented in table 3.2	1,079
Observations with missing annual reports or pension data	- 173
Stocks without sufficient return observations for the Fama-French regressions	- 111
Stocks with less than three return observations between t-1 and t+1	- 188
Final sample for the three day event windows	= 607

**The initial 2010 sample is multiplied by two due to two events in 2011.*
Firms used in the final sample are listed in appendix 6.2.

After filtering the initial sample, I am left with 607 observations consisting of 191 individual firms. The composition of sample firms used also differs for each announcement, due to new listings, de-listings, and changes in pension plans and accounting methods. I, therefore, have an unbalanced panel. A summary for the final sample used in the event study is presented in table 3.4. All variables except the CAR variables are stated as of December 31st the year before each announcement.

Table 3.4: Descriptive Statistics for the Final Sample

Panel A: Variables

stats	Corridor	Size	BM	Earn	ROA	Debt	CAR
N	607	607	607	607	607	607	607
mean	-.0046	8.1650	.7761	.1552	-.0150	.3070	-.0065
sd	.0176	2.0465	.6788	3.4782	.1851	.2082	.0493
25th %	-.0029	6.6432	.3759	-.7999	-.0425	.1222	-.0289
Median	0	8.2939	.6061	-.0381	.0151	.3180	-.0049
75th %	0	9.6098	.9615	.3951	.0731	.4635	.0188

All continuous variables have been winsorized at the 1st and 99th percentiles by replacing observations outside these parameters with the 1st and 99th percentiles in order to limit extreme values. (Winsor, Tukey, Hastings, & Mosteller, 1947)

Variable descriptions are presented in appendix 6.1.

Panel B: Industry Distribution

Two-digit GICS	Industry	N	%
10	Energy	179	29.49 %
15	Materials	24	3.95 %
20	Industrials	122	20.10 %
25	Consumer Discretionary	27	4.45 %
30	Consumer Staples	45	7.41 %
35	Health Care	34	5.60 %
40	Financials	48	7.91 %
45	Information Technology	79	13.01 %
50	Telecom	8	1.32 %
55	Utilities	8	1.32 %
00	Not Classified	33	5.44 %

Industry classification is based on two-digit Global Industry Classification Standard sector codes. Firms not classified by the GICS-system consists of savings banks.

Panel C: Pearson Correlation Matrix for Independent Variables

	Corridor	Size	BM	Earn	ROA	Debt
Corridor	1.0000					
Size	-0.0166	1.0000				
BM	0.0122	0.0501	1.0000			
Earn	-0.0311	0.0510	0.0050	1.0000		
ROA	-0.0459	0.3842	-0.1654	-0.0334	1.0000	
Debt	0.1272	0.3475	0.2335	0.0285	0.0207	1.0000

Panel A in table 3.4 shows that firms had negative corridor values and negative CARs on average during the events. Panel B shows that more than half of the sample firms are classified as energy or industrial firms which is representative of the rest of the firms listed on the OSE (Ødegaard, 2018). The correlation matrix in Panel C shows that the correlations between the independent variables are in the interval [-0.1654, 0.3842] which suggests that multicollinearity should not be an issue in the cross-sectional analysis. Of the final sample, 46 percent of the sample had negative corridors, 9 percent had positive corridors, and 45 percent of the sample did not use the corridor method or did not have DB plans. In the next sub-section, I compute mean CAR for two groups, based on whether or not the firm used the corridor method during the announcements.

3.2 Time Series Analysis

To examine the market reaction for firms affected by the elimination of the corridor method, I compute CAR from the day before to the day after (three trading days) the IASB announcements leading up to the IAS 19 revision. The length of the event windows are consistent with Oler, Harrison, & Allen (2008), who suggested that most short-term event windows in research are five days or less. Normal returns are estimated from 250 days prior to each event to the day before the event window, using the Fama-French three-factor model:

$$r = r_f + \beta_m * (r_m - r_f) + \beta_{SMB} * SMB + \beta_{HML} * HML + \alpha$$

where r_i is the return on security i, r_f is the risk free rate, r_m is the return of the market and *SMB* and *HML* are Fama-French factors that adjust for size and value effects. I run regressions for each stock prior to each event, and the betas (β) represents the estimated coefficients for the respective factors. The abnormal return for each observation is expressed by the error term (α) and is expected to be zero. I use daily NIBOR rates as the risk-free return (r_f), the OBX Total Return Index as the market reference (r_m), and Fama-French size and book-to-market portfolios consisting of stocks from the OSE for the *SMB* and *HML* factors. [16]

[16] NIBOR is the Norwegian Interbank Offered Rate. The OBX Total Return Index consists of the 25 most liquid shares traded on the Oslo Stock Exchange ranked after six month share turnover. The SMB (Small Minus Big) factor accounts for the spread between firms with small and large market capitalization, and the HML (High Minus Low) factor accounts for the spread between firms with high and low book-to-market ratios. The returns on the SMB and HML factors are based on portfolios which have been constructed in accordance with Fama & French (1996).

The three-factor model proposed by Fama & French (1996) is known for its explanatory power since it adjusts for size and market-to-book ratio in addition to exposure to the market. On the other hand, MacKinlay (1997) suggested that the benefits from imposing additional factors to the model may be limited, but the Fama–French three-factor model is frequently used in research. CAR for each stock (*i*) during the event windows is defined as follows:

$$CAR_{i(t_1,t_2)} = \sum_{t=t_1}^{t_2} \alpha_{i,t}$$

where $\alpha_{i,t}$ is the abnormal return for stock i at time t.[17] For the three-day event windows, t_1 and t_2 represent t-1 and t+1 respectively. After computing CARs for each event, I test for significant differences in mean CAR, between the test group consisting of firms with accumulated corridors and the control group consisting of any other types of firms listed in table 3.2, using Welch's t-test (Welch, 1947) for differences in means. CARs three days surrounding the events of interest are presented in table 3.5. Mean CAR during the event windows are expected to be negative for the test group due to the negative effect on shareholders' equity for most of the firms.

Table 3.5: Cumulative Abnormal Returns (CARs) 3 Days Surrounding the IASB Announcements

	N Test	Mean CAR Test	t-stat Test	N Control	Mean CAR Control	t-stat Control	Difference	t-stat Difference
Event 1	62	0.0102	1.8192*	31	0.0072	0.8106	0.0030	0.2810
Event 2	73	-0.0090	-1.5662	40	-0.0029	-0.3353	-0.0061	-0.5802
Event 3	74	-0.0209	-4.0137***	57	-0.0225	-3.6884***	0.0017	0.2089
Event 4	66	-0.0189	-3.4493***	71	-0.0034	-0.6013	-0.0155	-1.9702*
Event 5	59	0.0009	0.1507	74	0.0031	0.4523	-0.0022	-0.2474
Event 2–5	272	-0.0125	-4.4533***	242	-0.0059	-1.7320*	-0.0066	-1.5109
Total	334	-0.0083	-3.2473***	273	-0.0044	-1.3800	-0.0039	-0.9626

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels (two-tailed) for means.*

[17] $\alpha_{i,t}$ is the error term using the coefficients estimated during the 249 day estimation window prior to t-1. ($\alpha_{i,t}$ equals the return of stock *i* at time *t*, minus the normal return predicted by the estimated coefficients and the factors in the Fama-French model.)

As table 3.5 shows, the difference in mean CAR was positive during events 1 and 3, and negative for the rest of the events. The only event with a significant difference in CAR between the test and control group was event 4, with a p-value of 0.0509. The null hypothesis of no negative mean CAR during the other events cannot be rejected. Mean CAR around event 5 - the issuance itself was, however, not significantly different from zero or the control group. This result suggests that only the issuance of the near-final draft (on June 6th, 2011) had a negative effect on shareholder value for firms that used the corridor method compared to other firms during the announcements. During the 2010 announcement, CARs seem to be negative and significant for both the test group and the control group, but the difference between the groups is not significant. The results so far indicate that event 4 is the only event where returns were significantly different between the corridor firms and the rest of the sample.

3.3 Cross-Sectional Analysis

Though the results from table 3.5 suggest that firms with corridors experienced lower abnormal returns around event 4 in general, there is a reason to believe that other firm characteristics affected CARs during the IASB announcements. To investigate this further, I conduct a cross-sectional analysis to test for interference between CARs and the firm-specific variables presented in table 3.4. The variables of interest are corridor values (*Corridor*) and leverage (*Debt*), but I include total assets (*Size*), book-to-market ratio (*BM*), one-year growth in net income (*Earn*), and return on assets (*ROA*) as control variables as well. I also include GICS industry fixed effects, event indicators, and interaction terms with each event, and use ordinary least squares to estimate the coefficients for the following regression models using the whole sample of 607 firm observations:

(1) $$CAR_{i,t} = \beta_0 + \beta_1 * Corridor <> 0_{i.t} + \beta_2 * Size_{i,t} + \beta_3 * BM_{i,t} + \beta_4 * Earn_{i,t} + \beta_5 * ROA_{i,t} + \beta_6 * Debt_{i,t} + \sum Event + \sum Industry + \sum Interactions + \varepsilon_{i,t}$$

(2) $$CAR_{i,t} = \beta_0 + \beta_1 * Corridor < 0_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * BM_{i,t} + \beta_4 * Earn_{i,t} + \beta_5 * ROA_{i,t} + \beta_6 * Debt_{i,t} + \sum Event + \sum Industry + \sum Interactions + \varepsilon_{i,t}$$

(3) $$CAR_{i,t} = \beta_0 + \beta_1 * Corridor > 0_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * BM_{i,t} + \beta_4 * Earn_{i,t} + \beta_5 * ROA_{i,t} + \beta_6 * Debt_{i,t} + \sum Event + \sum Industry + \sum Interactions + \varepsilon_{i,t}$$

where the *Corridor<>0, Corridor<0,* and *Corridor>0* are indicator variables for firms with accumulated corridors, firms with negative corridors and firms with positive corridors, respectively. *Industry* represents GICS industry indicators based on the two-digit sector codes presented in table 3.4, and *Event* represents event indicators for each of the five events presented in table 3.1. The rest of the variables are described in appendix 6.1. Using the indicator variables for the corridors, I can observe the difference in CARs for the group of interest while also controlling for firm characteristics. One would expect that firms with negative corridors experienced lower abnormal returns than the control firms and the opposite for firms with positive corridors, due to the projected effect of the corridor on shareholders' equity. If this is the case, then the expected coefficient for the group of firms with negative corridors will be negative, and the opposite will be true for the group of firms with positive corridors. The results from regression 1–3 are presented in table 3.6. To analyze the effect of the raw corridor value, I remove firms that did not use the corridor method from the sample and run the following regression using 334 firm observations:

$$(4)/(5)\quad CAR_{i,t} = \beta_0 + \beta_1 * Corridor_{i,t} + +\beta_2 * Size_{i,t} + \beta_3 * BM_{i,t} + \beta_4 * Earn_{i,t} + \beta_5 * ROA_{i,t} + \beta_6 * Debt_{i,t} + \sum Event + \sum Industry + \sum Interactions + \varepsilon_{i,t}$$

where the *Corridor* variable represents the raw corridor scaled by total assets. The other variables remain as explained previously. I also run the same regression using firms with negative corridors only (regression 5) to investigate if the interference is different for firms with negative corridors. The results from regression 4 and 5 are presented in table 3.8. The coefficients for the raw corridor are expected to be positive if H1b holds since the hypothesis is that a negative corridor leads to lower abnormal returns.

The coefficients for leverage are expected to be negative for all five regressions, due to the increased risk of bankruptcy, financial distress costs, or breaching possible debt covenants. The rest of the variables are included as control variables. The base case, in relation to the event and industry indicators, is event 1 and a firm that is not classified by the GICS system. The *Event 1* indicators and interaction terms and the *Not Classified* industry indicators are therefore thrown out of the regressions. The t-statistics are computed using robust standard errors corrected for firm-level clustering (191 clusters for the initial sample) in all regressions. The *Corridor* variable in table 3.6 represents *Corridor<>0*, *Corridor<0*, and *Corridor>0* indicators for regression 1, 2, and 3 respectively, and in table 3.8 it represents raw corridor values scaled by total assets for regression 4 and 5.

Table 3.6: Output Regression 1–3

Dependent Variable: 3 Day CAR

	(1)	t-stat	(2)	t-stat	(3)	t-stat
Constant	0.00276	(0.13)	0.00480	(0.22)	0.00236	(0.11)
Event 2	-0.0167	(-0.56)	-0.0178	(-0.60)	-0.0174	(-0.58)
Event 3	-0.0594**	(-2.22)	-0.0609**	(-2.26)	-0.0592**	(-2.22)
Event 4	-0.0265	(-1.05)	-0.0287	(-1.13)	-0.0228	(-0.93)
Event 5	-0.0399	(-1.45)	-0.0393	(-1.44)	-0.0370	(-1.36)
Corridor	-0.00456	(-0.43)	-0.00646	(-0.69)	0.00805	(1.15)
Event 2 x Corridor	0.00136	(0.09)	0.00184	(0.14)	-0.00503	(-0.30)
Event 3 x Corridor	0.00311	(0.21)	0.00668	(0.50)	-0.0115	(-0.71)
Event 4 x Corridor	-0.00892	(-0.71)	-0.00885	(-0.76)	-0.00359	(-0.26)
Event 5 x Corridor	-0.00418	(-0.30)	0.00248	(0.19)	-0.0270**	(-2.31)
Debt	0.0305	(1.27)	0.0295	(1.26)	0.0290	(1.26)
Event 2 x Debt	-0.0604	(-1.62)	-0.0586	(-1.60)	-0.0601	(-1.64)
Event 3 x Debt	-0.0268	(-0.81)	-0.0266	(-0.83)	-0.0257	(-0.81)
Event 4 x Debt	-0.0871***	(-2.67)	-0.0862***	(-2.71)	-0.0920***	(-2.81)
Event 5 x Debt	0.00812	(0.24)	0.00632	(0.19)	0.00707	(0.21)
Size	-0.00178	(-0.95)	-0.00188	(-1.01)	-0.00214	(-1.15)
Event 2 x Size	0.00248	(0.72)	0.00259	(0.76)	0.00267	(0.79)
Event 3 x Size	0.00603**	(2.22)	0.00605**	(2.22)	0.00632**	(2.26)
Event 4 x Size	0.00687**	(2.48)	0.00706**	(2.55)	0.00612**	(2.33)
Event 5 x Size	0.00345	(1.17)	0.00307	(1.06)	0.00314	(1.07)
BM	0.0140	(0.64)	0.0145	(0.67)	0.0126	(0.59)
Event 2 x BM	0.00113	(0.04)	-0.000327	(-0.01)	0.00233	(0.08)
Event 3 x BM	-0.0197	(-0.86)	-0.0202	(-0.88)	-0.0183	(-0.82)
Event 4 x BM	-0.0257	(-1.16)	-0.0264	(-1.19)	-0.0239	(-1.10)
Event 5 x BM	0.00110	(0.05)	0.000922	(0.04)	0.00267	(0.12)
Earn	-0.000692	(-0.16)	-0.000667	(-0.15)	-0.000690	(-0.16)
Event 2 x Earn	0.000673	(0.15)	0.000609	(0.14)	0.000695	(0.15)
Event 3 x Earn	0.000571	(0.13)	0.000526	(0.12)	0.000543	(0.12)
Event 4 x Earn	-0.00126	(-0.27)	-0.00150	(-0.32)	-0.00144	(-0.30)
Event 5 x Earn	0.00136	(0.29)	0.00127	(0.27)	0.00157	(0.33)
ROA	0.133***	(3.43)	0.134***	(3.47)	0.132***	(3.38)
Event 2 x ROA	-0.128***	(-3.06)	-0.130***	(-3.10)	-0.127***	(-3.06)
Event 3 x ROA	-0.136***	(-3.10)	-0.138***	(-3.15)	-0.136***	(-3.09)
Event 4 x ROA	-0.154***	(-2.96)	-0.157***	(-2.99)	-0.153***	(-2.97)
Event 5 x ROA	-0.0996*	(-1.76)	-0.100*	(-1.79)	-0.0973*	(-1.74)
Industry Fixed Effects	Included		Included		Included	
N	607		607		607	
Adjusted R^2	0.0786		0.0788		0.0756	

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels. (two-tailed) for means.*

The results in table 3.6 show a negative and significant CAR during event 3 in general, which is consistent with the results from the previous analysis in table 3.5. However, the coefficients for the corridor indicators and their interaction with the events are not significant, except for the *Event 5 x Corridor* coefficient in regression 3, which is negative. This suggests that firms with positive corridors experienced negative CARs on average, which is somewhat unexpected. Looking into the eight sample firms with positive corridors during event 5, I find that they on average had abnormal returns of -0.0140, 0.0054, and -0.0040 respectively during the three-day event window, which makes up a mean CAR of -0.0126. This suggests that the negative market reaction was before the announcement. Overall, the significance of the corridor indicators is weak, which does not correspond with the results in the univariate analysis in table 3.5. The *Event 4 x Debt* coefficients, however, are negative and significant at the 1 percent level, which indicates that leverage had a negative effect on CARs during event 4. The results from the univariate analysis in table 3.5 and the regression 1-3 in table 3.6 provide the basis for assessing H1a:

H1a: The security price response following the IASB announcements was negative for firms that were using the corridor method, compared to firms that did not.

The results from the univariate analysis of CARs in table 3.5 suggests that firms that used the corridor method during event 4 experienced CARs of -1.89 percent on average, which is 1.55 percent less than for the control firms. The mean CAR for the test group and the difference in means between the groups are significant, at the 1 percent and 10 percent levels respectively. Other than event 4, none of the other events showed significant difference in mean CARs, which suggests that the issuance of the near-final draft was the event with the most importance. However, when controlling for other firm characteristics in the cross-sectional analysis, the significance of the results are different. In regression 1–3, the negative CARs during event 4 seem to be driven more by leverage than by the use of the corridor method or the sign of the corridor value.

I also test the joint significance of all *Event + Event x Corridor* terms to test the effect of the events on CAR, interactive with corridor values or not. When running Wald tests (Judge, Griffiths, Hill, Lütkepohl, & Lee, 1985) on the coefficients, I get high significance levels for *Event 3 + Event 3 x Corridor* terms in all regressions and *Event 5 + Event 5 x Corridor>0* terms in regression 3. The significance of the *Event 3 + Event 3 x Corridor* terms are however mostly due to the significance of *Event 3* terms alone since the whole sample had significant

negative CARs on average during this announcement.[18]. The rest of the F-statistics for joint significance are presented in table 3.7.

Table 3.7: F-Statistics for Event and Corridor Coefficients in Regression 1–3

Coefficients	Regression 1	Regression 2	Regression 3
Event 2 + Event 2 x Corridor	0.16	0.18	0.21
Event 3 + Event 3 x Corridor	2.46*	2.55*	2.56*
Event 4 + Event 4 x Corridor	0.84	0.96	0.47
Event 5 + Event 5 x Corridor	1.19	1.04	4.12**

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels.*

Based on the results from the univariate analysis in table 3.5, I reject the null hypothesis that the group of firms with accumulated corridors did not experience lower CARs than other firms during event 4. This does, however, seem to be driven by leverage rather than by use of the corridor method when controlling for other firm characteristics in the cross-sectional analysis. For the other events, I keep the null hypothesis of no differences in mean CAR for firms using the corridor method. The results from regression 4 and 5, which use raw corridor values instead of corridor group indicators, are presented in table 3.8.

[18] The Wald test examines the null hypothesis that *Event* = *Event x Corridor* = 0. Since the *Event 3* coefficients have a high significance level alone, the probability of *Event 3* being jointly significant with any other variable is high. The Wald test will only tell us if the variables are jointly significant, not which individual variable that is significant.

Table 3.8: Output Regression 4–5

Dependent Variable: 3 Day CAR

	(4)	t-stat	(5)	t-stat
Constant	0.0132	(0.52)	0.0162	(0.55)
Event 2	-0.0888**	(-2.34)	-0.0787*	(-1.92)
Event 3	-0.0847**	(-2.21)	-0.0736*	(-1.79)
Event 4	-0.0559	(-1.63)	-0.0509	(-1.27)
Event 5	-0.0721*	(-1.97)	-0.0617	(-1.62)
Corridor	0.274*	(1.71)	0.237	(1.38)
Event 2 x Corridor	-0.666**	(-2.02)	-0.924**	(-2.27)
Event 3 x Corridor	-0.259	(-1.09)	-0.0940	(-0.37)
Event 4 x Corridor	-0.108	(-0.63)	-0.0351	(-0.18)
Event 5 x Corridor	-0.282	(-1.58)	-0.186	(-0.90)
Debt	0.0525**	(2.17)	0.0571**	(2.15)
Event 2 x Debt	-0.0582	(-1.25)	-0.0579	(-1.05)
Event 3 x Debt	-0.0699	(-1.65)	-0.102*	(-1.97)
Event 4 x Debt	-0.116***	(-2.65)	-0.129**	(-2.53)
Event 5 x Debt	-0.0439	(-1.07)	-0.0402	(-0.83)
Size	-0.00280	(-1.42)	-0.00349	(-1.34)
Event 2 x Size	0.00919**	(2.17)	0.00895*	(1.89)
Event 3 x Size	0.00867**	(2.52)	0.00879*	(1.91)
Event 4 x Size	0.00906**	(2.56)	0.00848*	(1.96)
Event 5 x Size	0.00590	(1.55)	0.00430	(1.03)
BM	0.000125	(0.00)	-0.00207	(-0.07)
Event 2 x BM	0.0112	(0.30)	-0.0129	(-0.24)
Event 3 x BM	0.00136	(0.05)	0.00669	(0.20)
Event 4 x BM	-0.0137	(-0.53)	-0.00399	(-0.12)
Event 5 x BM	0.0274	(0.99)	0.0379	(1.11)
Earn	-0.247*	(-1.81)	-0.254*	(-1.75)
Event 2 x Earn	0.246*	(1.81)	0.252*	(1.73)
Event 3 x Earn	0.247*	(1.81)	0.254*	(1.75)
Event 4 x Earn	0.246*	(1.81)	0.254*	(1.75)
Event 5 x Earn	0.247*	(1.82)	0.253*	(1.74)
ROA	0.120***	(2.79)	0.118**	(2.59)
Event 2 x ROA	-0.0853	(-1.45)	-0.0655	(-1.04)
Event 3 x ROA	-0.132**	(-2.55)	-0.116*	(-1.98)
Event 4 x ROA	-0.108*	(-1.73)	-0.0906	(-1.23)
Event 5 x ROA	-0.108*	(-1.79)	-0.0794	(-1.14)
Industry Fixed Effects	Included		Included	
N	334		279	
Adjusted R^2	0.0987		0.105	

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels (two-tailed) for means.*

The raw corridor variables in regression 4 and 5 have higher t-values and seem to be better predictors for CARs than the corridor indicators. While the focus for H1a is the use of the corridor method, the focus for H1b is the value of the effect of the accumulated corridor:

H1b: Firms' security price responses were positively affected by corridor values following the IASB announcements.

The coefficients for the *Corridor* variable, and the interactions with *Event* in regression 4 suggest that CARs were positively affected by corridor values during events 1, 3, and 4, and negatively affected during events 2 and 5. When reducing the sample to firms with negative corridors only in regression 5, CARs are positively affected during event 5 as well. The *Event 2 x Corridor* interaction, however, is the only corridor coefficient that is significant in both regressions, which is somewhat unexpected given that it is negative. This suggests that firms with negative corridors experienced higher CARs on average during event 2. Another interesting finding, that points in the direction of H1b is that the magnitude of the *Event 4 x Corridor* terms is weaker than for the other events, which suggests that the positive effect on CAR from corridor values was stronger during this event. The F-statistics from Wald tests for joint significance of *Event + Event x Corridor* are presented in table 3.9.

Table 3.9: F-Statistics for Event and Corridor Coefficients in Regression 4–5

Coefficients	Regression 4	Regression 5
Event 2 + Event 2 x Corridor	4.69**	4.33**
Event 3 + Event 3 x Corridor	2.97*	1.76
Event 4 + Event 4 x Corridor	1.55	0.81
Event 5 + Event 5 x Corridor	3.22**	1.81

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels.*

As table 3.9 shows, only *Event 2 + Event 2 x Corridor* is significant in both regressions. Event 3 and 5 also seems to have an impact, but only in regression 4. The *Corridor* coefficient in table 3.8 that represents event 1 also loses its significance in regression 5. The difference in coefficients and significance between the models suggests that the relationship between corridor values and CARs is somehow different for firms with negative corridors than for all corridor firms, but the results are similar. Event 2 is the only event where I can reject a null hypothesis of no effect of corridor values on CARs for both regressions, but the effect on corridor values is negative, which contradicts H1b in that it suggests that a negative corridor value had a positive effect on CARs. I, therefore, keep the null hypothesis for H2b. On the

other hand, the effect of the *Event 4 x Debt* coefficients in regression 4 and 5 seems to correspond with regression 1–3, which gives the basis for assessing H1c:

H1c: Firms' security price responses were negatively affected by leverage following the IASB announcements.

The most interesting findings in regression 1–5 are the coefficients for the *Debt* variable, and its interaction terms, especially during event 4. The *Event 4 x Debt* coefficients are significant at the 1 percent or 5 percent levels for all the regressions, and the negative effect of the coefficients outweighs the main effect of the *Debt* coefficients. This indicates that leverage had a negative effect on CARs during event 4. I also test the joint significance of all *Event + Event x Debt* terms in regression 1–5 and F-statistics are presented in table 3.10.

Table 3.10: F-statistics for Event and Debt Coefficients in Regression 1–5

Coefficients	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
Event 2 + Event 2 x Debt	1.49	1.49	1.59	3.94**	2.51*
Event 3 + Event 3 x Debt	2.64*	2.73*	2.74*	5.11***	3.48**
Event 4 + Event 4 x Debt	3.76**	3.94**	4.16**	4.72**	3.78**
Event 5 + Event 5 x Debt	1.2	1.14	1.01	2.36*	1.48

, ** and * represent significance at 10 percent, 5 percent, and 1 percent levels.*

As expected, the *Event 4 + Event 4 x Debt* terms are significant in all the regressions, but so are the *Event 3 + Event 3 x Debt* terms as well, especially when reducing the sample in regression 4 and 5. As shown in table 3.10, *Event 2 + Event 2 x Debt* and *Event 5 + Event 5 x Debt* also become significant in regression 4 and 5, although the significance level is lower. This is because sample firms with corridors and only firms with negative corridors are included. When running regression 4 and 5 with raw corridor values and all sample firms, only events 3 and 4 are significant, which is consistent with regression 1–3. The significance of *Event 3 x Debt* in regression 1–3 is low, however, and the joint significance of *Event 3 + Event 3 x Debt* is mainly due to the high significance of the *Event 3* term, which was also the case with the *Event 3 + Event 3 x Corridor* variables. When using corridor firms only in regression 4 and 5, the total effect of leverage during event 3 is negative, and the significance levels of both joint and individual coefficients are higher. It is also worth noticing that the *Event 3 x Debt* coefficient changes from -0.0699 in regression 4 to -0.102 in regression 5, while the main effect only increases slightly from 0.0525 to 0.0571. This suggests that the negative effect of leverage was stronger for firms with negative corridors during event 3. The *Event 2 + Event 2*

x Debt terms are also jointly significant at the 5 and 10 percent levels in regression 4 and 5, but mostly due to the *Event 2* coefficients.

The *Debt* variable and its interaction terms with the *Event* indicators suggest that the interference between leverage and CAR differs between corridor and non-corridor firms, but that leverage had a negative effect on CAR in all regressions during event 4. I, therefore, reject the null hypothesis that leverage did not have a negative effect on CARs for all sample firms during event 4. I also reject the same null hypothesis for event 3 for sample firms with negative corridors based on regression 5.

3.4 Extending the Event Window

As a robustness test, I also run the test from section 3.2 and the regressions from section 3.3 using a five-day event window, and the results are presented in table 3.11 and 3.12. If the market reaction persisted for more than one day after the announcement, the results might change when extending the event window. If the market underreacted the first day after the announcements, then the results using a five-day window will become stronger, and if the market overreacted, then the results will be weaker. The results will also become weaker if the significant abnormal return ceased after the three-day window, due to more noise from fluctuations in stock prices that are not related to the announcements. In table 3.11 and 3.12, the dependent CAR variable represents cumulative abnormal returns between t-2 and t+2 (five trading days).

Table 3.11: Cumulative Abnormal Returns (CARs) 5 Days Surrounding the IASB Announcements

	N Test	Mean CAR Test	t-stat Test	N Control	Mean CAR Control	t-stat Control	Difference	t-stat Difference
Event 1	62	0.0070	1.0521	29	-0.0030	-0.2355	0.0100	0.6956
Event 2	69	-0.0023	-0.2531	37	0.0112	0.8148	-0.0135	-0.8184
Event 3	72	-0.0273	-4.5512***	55	-0.0218	-2.3737**	-0.0054	-0.4951
Event 4	64	-0.0251	-3.1919***	73	-0.0036	-0.4298	-0.0215	-1.8726*
Event 5	56	-0.0083	-1.1636	70	0.0034	0.3809	-0.0116	-1.0247
Event 2–5	261	-0.0161	-4.1608***	235	-0.0035	-0.7173	-0.0126	-2.0396**
Total	323	-0.0116	-3.4160***	264	-0.0034	-0.7562	-0.0082	-1.4549

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels (two-tailed) for means.*

As table 3.11 shows, several of the t-values get weaker when using a five-day window, but the negative CARs for the test group is still significant at the 1 percent level during events 3 and 4. The difference in mean CAR is also significant during event 4, which is consistent with the three-day results. The difference in mean CAR during event 4 changes from -0.0155 when using a three-day window to -0.0215 when using a five-day window, which suggests that the market reaction persisted for more than three days for corridor firms during the announcement of the near-final draft. The t-value, however, is slightly lower. The five-day results seem to be consistent with the three-day results during event 3 as well since both groups had significant negative CARs during event 3. The difference in mean CAR for events 2–5 in total becomes significant when using five-day CARs, which is because the t-values for the control group are reduced more than the test group in general. The results from regression 1–5 in section 3.3 using five-day CARs are presented in table 3.12. The *Corridor* variable represents *Corridor<>0*, *Corridor<0*, and *Corridor<0* indicators for regression 1, 2, and 3 respectively, and raw corridor values scaled by total assets for regression 4 and 5.

Table 3.12: Output Regression 1–5 Using 5 Day CARs

Dependent Variable: 5 Day CAR

	(1)	t-stat	(2)	t-stat	(3)	t-stat	(4)	t-stat	(5)	t-stat
Constant	-0.020	(-0.74)	-0.017	(-0.63)	-0.017	(-0.63)	-0.004	(-0.11)	-0.025	(-0.59)
Event 2	0.001	(0.03)	-0.002	(-0.03)	-0.004	(-0.09)	-0.116**	(-2.23)	-0.088	(-1.41)
Event 3	-0.046	(-1.35)	-0.049	(-1.45)	-0.050	(-1.51)	-0.107**	(-2.27)	-0.079	(-1.48)
Event 4	0.005	(0.13)	0.002	(0.06)	0.007	(0.20)	-0.072	(-1.49)	-0.079	(-1.51)
Event 5	-0.034	(-0.99)	-0.034	(-0.97)	-0.030	(-0.91)	-0.080**	(-2.22)	-0.069*	(-1.67)
Corridor	0.006	(0.41)	0.002	(0.12)	0.013	(0.89)	0.183	(0.50)	0.204	(0.53)
Event 2 x Corridor	-0.017	(-0.74)	-0.005	(-0.23)	-0.028	(-1.26)	-0.604	(-1.19)	-0.432	(-0.58)
Event 3 x Corridor	-0.014	(-0.70)	0.004	(0.24)	-0.038*	(-1.85)	-0.206	(-0.41)	-0.060	(-0.12)
Event 4 x Corridor	-0.023	(-1.22)	-0.023	(-1.36)	0.006	(0.27)	-0.363	(-0.93)	-0.397	(-0.97)
Event 5 x Corridor	-0.027	(-1.38)	-0.017	(-0.94)	-0.034	(-1.55)	-0.066	(-0.17)	-0.002	(-0.00)
Debt	-0.015	(-0.39)	-0.014	(-0.37)	-0.014	(-0.38)	0.034	(0.96)	0.025	(0.63)
Event 2 x Debt	-0.030	(-0.54)	-0.034	(-0.62)	-0.038	(-0.70)	-0.047	(-0.74)	-0.059	(-0.74)
Event 3 x Debt	0.019	(0.37)	0.015	(0.30)	0.017	(0.35)	-0.048	(-0.94)	-0.041	(-0.75)
Event 4 x Debt	-0.044	(-0.93)	-0.044	(-0.96)	-0.055	(-1.16)	-0.100*	(-1.87)	-0.095	(-1.62)
Event 5 x Debt	0.044	(0.90)	0.039	(0.80)	0.036	(0.75)	-0.022	(-0.48)	-0.003	(-0.06)
Size	0.001	(0.45)	0.001	(0.47)	0.001	(0.33)	-0.001	(-0.39)	0.000	(-0.02)
Event 2 x Size	0.000	(0.00)	0.000	(-0.08)	0.000	(-0.04)	0.011**	(2.02)	0.009	(1.21)
Event 3 x Size	0.003	(0.82)	0.002	(0.63)	0.003	(0.84)	0.009**	(2.04)	0.007	(1.20)
Event 4 x Size	0.003	(0.64)	0.003	(0.66)	0.001	(0.31)	0.010**	(2.05)	0.011*	(1.89)
Event 5 x Size	0.004	(0.92)	0.003	(0.74)	0.002	(0.53)	0.007*	(1.89)	0.006	(1.21)
BM	0.003	(0.09)	0.004	(0.14)	0.005	(0.15)	-0.008	(-0.21)	0.008	(0.17)
Event 2 x BM	0.047	(1.06)	0.045	(1.01)	0.050	(1.09)	0.047	(0.91)	0.050	(0.58)
Event 3 x BM	-0.001	(-0.03)	-0.002	(-0.08)	-0.003	(-0.09)	0.015	(0.38)	0.001	(0.03)
Event 4 x BM	-0.018	(-0.55)	-0.019	(-0.58)	-0.019	(-0.55)	-0.019	(-0.47)	-0.031	(-0.63)
Event 5 x BM	0.001	(0.04)	0.001	(0.02)	0.000	(0.01)	0.015	(0.39)	0.003	(0.07)
Earn	-0.001	(-0.17)	-0.001	(-0.14)	-0.001	(-0.11)	-0.306	(-1.42)	-0.270	(-1.15)
Event 2 x Earn	-0.001	(-0.09)	-0.001	(-0.11)	-0.001	(-0.12)	0.303	(1.40)	0.267	(1.14)
Event 3 x Earn	0.001	(0.17)	0.001	(0.12)	0.001	(0.08)	0.305	(1.41)	0.269	(1.15)
Event 4 x Earn	-0.002	(-0.20)	-0.002	(-0.27)	-0.003	(-0.31)	0.305	(1.41)	0.272	(1.16)
Event 5 x Earn	0.002	(0.24)	0.001	(0.16)	0.002	(0.19)	0.305	(1.42)	0.269	(1.15)
ROA	0.101*	(1.90)	0.102*	(1.94)	0.103**	(1.99)	0.114**	(2.11)	0.111*	(1.86)
Event 2 x ROA	-0.120	(-1.45)	-0.122	(-1.47)	-0.121	(-1.47)	-0.134*	(-1.77)	-0.135	(-1.50)
Event 3 x ROA	-0.107*	(-1.80)	-0.113*	(-1.88)	-0.114*	(-1.94)	-0.078	(-1.08)	-0.044	(-0.50)
Event 4 x ROA	-0.140*	(-1.87)	-0.143*	(-1.93)	-0.141*	(-1.91)	-0.132	(-1.53)	-0.077	(-0.76)
Event 5 x ROA	-0.126	(-1.49)	-0.126	(-1.48)	-0.125	(-1.48)	-0.020	(-0.27)	0.009	(0.10)
Industry fixed effects	Incl		Incl		Incl		Incl		Incl	
N	587		587		587		323		269	
Adjusted R^2	0.0246		0.0231		0.0231		0.0686		0.0666	

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels (two-tailed) for means.*

Using five-day event windows, the significance of the corridor indicators and interactions in regression 1–3 becomes stronger, and the coefficient values decrease further, which suggests a stronger negative effect. Some of the coefficients also change signs. The t-values, however, are still too low to reject null hypotheses about no CARs for most of the terms. In regression 4 and 5, the coefficients for raw corridor values and their interaction with the events lose their significance when using five-day CARs. The t-values for debt and its interactions with the events also become lower, and the adjusted R-squared is lower for all regressions. It is also worth noticing that event 5 is the only event with significant negative returns in both regression 4 and 5, which indicates a stronger negative effect during the completion of IAS 19 (2011) for corridor firms when using five-day CARs.

Overall, the significance of the debt and raw corridor variables becomes weaker, and the significance of the corridor indicators becomes stronger when using five-day CARs. This is somewhat consistent with the results in the univariate analysis in table 3.11 since the difference in mean CAR between the test and the control groups was stronger in total for all events when using five-day CARs. The significance levels of most of the regression results, however, are too low to reject or confirm previous conclusions.

4. Changes in Actuarial Assumptions

During the data collection, I discovered a substantial increase in the number of firms with positive corridors in 2012 as compared to previous years, which is shown in table 3.2. Most of this increase is due to increased discount rates in general, as a result of the introduction of corporate bonds as a reference rate for PBOs denoted in NOK. Since government bonds (which were previously used as a reference) have a lower rate, the change led to actuarial gains for the firms that adopted the new guideline. However, given that 2012 was the last year before the effective date of IAS 19 (2011), there is also reason to believe that some of the effects were due to managerial discretion and not only a result of the introduction of corporate bonds as a reference. Chang (2009) found evidence that the PBO discount rates used by US firms were affected by the 2006 issuance of the accounting standard SFAS 158, which has similarities to IAS 19. Similar effects may, therefore, be found for Norwegian firms around the effective year of IAS 19 (2011), which was the financial year 2013.

In this analysis, I investigate changes in discount rates and assumed compensation rates between 2010 and 2013 for firms listed on the OSE. The analysis is limited to the discount and compensation rates and does not include other parameters such as the assumed increase in the G amount or turnover. However, the discount and compensation rates are by far the most important parameters when estimating PBOs, as showed in NASB's sensitivity test in table 2.2. The discount and compensation rates are also the only parameters that firms are specifically required to disclose under IAS 19, which provides better data availability. Since the discount and compensation rates affect the PBO in opposite directions, I use a combined factor of the two to observe the effect of both parameters simultaneously. I then conduct a cross-sectional analysis similar to the one conducted in section 3.3. The purpose of the analysis is to disentangle the effect of managerial discretion (in any) from the effect of the corporate bond introduction.

4.1 Methodology

To observe the effect of discount and compensation rates simultaneously, I compute the *discretionary part of the PBO* for each firm, in a similar manner as Hann, Lu, & Subramanyam (2007). The discretionary part of the PBO is computed by first solving the PBO equation proposed by Hann, Lu, & Subramanyam for the annual annuity paid at retirement:

$$PBO = \frac{P_{r,L}*(KW(1+g)^N)}{(1+r)^N} \qquad \rightarrow \qquad \widehat{KW} = \frac{PBO*(1+r)^N}{P_{r,L}*(1+g)^N}$$

where r is the discount rate, g is the compensation rate, P is the annuity present value factor, KW is the annual benefit paid at retirement, L is the life expectancy after retirement, and N is the number of years to settlement. L is assumed to be 16 and N is assumed to be 20 for all firms.[19] The rest of the parameters are firm-specific. After computing KW for each individual firm, I recalculate the PBO, replacing the discount rate and compensation rate used by each individual firm (r and g) with the rates suggested by the NASB at the time (r^* and g^*). This results in the non-discretionary part of the PBO (PBO_X), which is again solved for the discretionary part of the PBO (PBO_D):

$$PBO_X = \frac{P_{r^*,16}*\left(\widehat{KW}(1+g^*)^{20}\right)}{(1+r^*)^{20}} \qquad \rightarrow \qquad PBO_D = PBO - PBO_X$$

Hann, Lu & Subramanyam (2007) computed assumed number of years to settlement for each firm individually based on the relationship between the ABO and PBO, but due to limited data on ABOs for my sample, this is not possible in this study. (Most firms only disclose the PBO.) However, this analysis focuses on the change in the discretionary PBO and big demographic changes in employee bases from one year to another are not likely. Hann, Lu, & Subramanyam (2007) also used industry medians as references for the non-discretionary discount and compensation rates, but this would not be feasible in this case due to few observations in several of the GICS industry groups. Also, the majority of the sample had negative corridors and leverage, so if H2 holds, the use of sample medians as a reference for the non-discretionary PBO will generate biased results. I do, however, include industry fixed effects in the cross-sectional analysis to adjust for differences between industries. After computing the discretionary PBO for each firm, I scale it by the total PBO for comparability between firms. A positive value for the discretionary PBO indicates that a firm used more conservative assumptions than the NASB guidelines, while a negative value indicates that the firm used more liberal assumptions the NASB guidelines. A sensitivity test for the PBO using the formula suggested by Hann, Lu & Subramanyam (2007) is presented in table 4.1.

[19] According to NASB's pension guideline, the average age for participants in defined-benefit plans in Norway was normally 47. According to the official K2013 mortality table, remaining life expectancy for a 47-year-old is 35.7 years. Assuming a retirement age of 67, reasonable estimates of life expectancy after retirement (L) and number of years to settlement (N) are 15.7 and 20, respectively. (For simplicity, I have rounded life expectancy after retirement up to 16 years.)

Table 4.1: PBO Sensitivity Test Using Hann, Lu & Subramanyam's Formula

		Discount Rate				
		-2 %	-1 %	0 %	+1 %	+2 %
Compensation Rate	-2 %	18 %	-11 %	-33 %	-49 %	-61 %
	-1 %	43 %	8 %	-18 %	-37 %	-52 %
	0 %	74 %	32 %	0 %	-24 %	-42 %
	+1 %	112 %	60 %	21 %	-7 %	-29 %
	+2 %	157 %	94 %	47 %	12 %	-14 %

The PBO is computed assuming a 2.4 percent discount rate and a 2.5 percent compensation rate. (NASB's guidelines as of December 31st 2017.)

As table 4.1 shows, PBOs computed using Hann, Lu and Subramanyam's formula are more sensitive to discount and compensation rates than NASB's sensitivity test in table 2.2. This is because NASB's test includes more factors in addition to the discount and compensation rate such as retirees, growth in G and turnover.

4.2 Descriptive Statistics and Analysis

To analyze the choice of actuarial assumptions, I use the same initial sample as previously presented in table 3.2. Further sample selection procedure is presented in table 4.2. In this analysis, I only include firms with DB plans. (Other retirement benefits do not require actuarial estimations.)

Table 4.2: Sample Selection Procedure

	Observations
Initial sample for 2009, 2010, 2011 and 2012 as presented in table 3.2	807
Observations with missing pension data or annual reports	- 58
Firms without defined benefit plans	- 254
Delistings, termination of defined benefit plans and series stocks*	- 42
Final sample	= 453

**For firms with two series of stock, I only include one observation for the firm as a whole. (The initial sample consists of all listed stocks retrieved from Børsprosjektet's database.)*
Firms used in the final sample are listed in appendix 6.2.

I use the 2009-2012 sample firms from the initial sample in table 3.2 because I lag the corridor variable by one year in the regression. This is to reduce possible endogeneity issues from simultaneity or reverse causality.[20] Firms listed in 2013 that were not listed in 2012 are therefore excluded, but out of the eight new listings in 2013, only two firms had information about DB plans in their annual reports.[21] These firms, however, were not useful for this analysis, due to lack of pension information and significance of the plans. Descriptive statistics for the final sample, which consists of 136 individual firms, are presented in table 4.3. All variables except the corridor variable are stated as of December 31st at time t. (The corridor variable is stated as of December 31st at time t-1.)

Table 4.3: Descriptive Statistics for the Final Sample

Panel A: Variables

stats	Corridor	Size	BM	Earn	ROA	Debt	PBO_D
N	453	453	453	453	453	453	453
mean	-.0063	8.7638	1.1480	.2957	.0023	.3298	.0838
sd	.0213	1.7358	.9131	6.8912	.1038	.1960	.1765
25th %	-.0045	7.5856	.5988	-.8103	-.0101	.1898	.0000
Median	-.0004	8.6713	1.0204	-.1514	.0068	.3204	.0919
75th %	0	9.8249	1.4286	.3810	.0478	.4615	.2333

All continuous variables have been winsorized at the 1st and 99th percentiles by replacing observations outside these parameters with the 1st and 99th percentiles in order to limit extreme values. (Winsor, Tukey, Hastings, & Mosteller, 1947)

Variable descriptions are presented in appendix 6.1.

[20] Using the corridor at time t as the corridor variable could have led to reverse causality issues, since changes in discount and compensation rates directly affect the PBO. This may again cause actuarial gains or losses, which in turn may affect the corridor. The corridor at time t-1, however, will not be affected by discount and compensation rates set at time t. (These parameters can only affect corridors at time t or in future periods.)

[21] New listings in 2013 include the tickers ATLA, NAPA, BWLPG, RECSOL, WBULK, ODL, OCY and ASETEK. (Only ODL and OCY provided information about defined-benefit plans.)

Panel B: Industry Distribution

Two-digit GICS	Industry	N	%
10	Energy	112	24.72 %
15	Materials	23	5.08 %
20	Industrials	99	21.85 %
25	Consumer Discretionary	28	6.18 %
30	Consumer Staples	24	5.30 %
35	Health Care	8	1.77 %
40	Financials	32	7.06 %
45	Information Technology	33	7.28 %
50	Telecom	4	0.88 %
55	Utilities	8	1.77 %
00	Not Classified	82	18.10 %

Industry classification is based on two-digit Global Industry Classification Standard sector codes. Firms not classified consists of savings banks.

Panel C: Pearson Correlation Matrix for Independent Variables

	Corridor	Size	BM	Earn	ROA	Debt
Corridor	1.0000					
Size	0.0474	1.0000				
BM	-0.0585	0.0819	1.0000			
Earn	0.0341	0.0706	-0.0253	1.0000		
ROA	-0.0848	0.2451	-0.1323	0.1203	1.0000	
Debt	0.1264	0.1015	0.1172	0.0276	-0.1830	1.0000

Out of the final sample, 62.91 percent had negative corridors, 16.56 percent had positive corridors, and 20.53 percent did not use the corridor method. Panel A shows that the sample firms had positive *PBO_D* values on average, but this is partly because firms had to use government bonds as a reference in 2010 and 2011. In this analysis, I use NASB's corporate bond reference for the whole period for consistency, which leads to high *PBO_D* values in 2010 and 2011.[22] The corridors, however, are still negative on average for the final sample. The industry distribution is also similar to the one in table 3.4, in which energy and industrials dominate. The correlation between the independent variables is in the interval [-0.1830,

[22] Since firms with PBOs in NOK had to use government bonds as a reference for the discount rate in 2010 and 2011, most firms used a lower discount rate than the corporate bond rate suggested by NASB at the time. After firms were permitted to use corporate bond rates in 2012, discount rates increased significantly. Since firms seem to have adapted gradually in 2012 and 2013, I use NASB's corporate bond reference to compute non-discretionary PBOs for the whole period for consistency.

0.2451], which should not be problematic in relation to multicollinearity. The rates suggested by the NASB between 2007 and 2016 are presented in table 4.4.

Table 4.4: Discount and Compensation Rates Suggested by the NASB as of December 31st

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Gov Bonds	*4.50 %*	*3.80 %*	*4.50 %*	*4.00 %*	*2.60 %*	*2.30 %*	*3.30 %*	*2.00 %*	*1.90 %*	*2.00 %*
Corp Bonds	*5.30 %*	*4.80 %*	*5.40 %*	*4.60 %*	*3.80 %*	*3.90 %*	*4.00 %*	*2.30 %*	*2.50 %*	*2.60 %*
Comp Rate	*4.50 %*	*4.00 %*	*4.50 %*	*4.00 %*	*3.50 %*	*3.50 %*	*3.75 %*	*2.75 %*	*2.50 %*	*2.50 %*

Source: Historic NASB pension guidelines.

As table 4.4 shows, discount rates decrease through the period, having a positive effect on PBO values, while the compensation rate decreases, which has a negative effect on PBO values. The effect of discount rates, however, is stronger, as shown in the sensitivity tests in table 2.2 and 4.1. The decrease in government bond rates from 4 percent in 2010 to 3.3 percent in 2013 should initially have increased PBO values in general, but the shift to government bonds offsets this effect, as the corporate bond rate was 4 percent in 2013. (The suggested discount rate was effectively the same in 2010 as in 2013.) The compensation rate, on the other hand, decreases from 4 percent to 3.75 percent, having a negative effect on PBO values. Overall, PBO values should decrease according to NASB guidelines as a result of lower compensation rates. Many individual firms, however, did deviate from these rates. In figures 4.1-4.3, the development of mean discretionary PBO, corridor value, discount rate, and compensation rate for the final sample through the period are presented.

Figure 4.1: Mean Discretionary PBO for Sample Firms 2010–2013

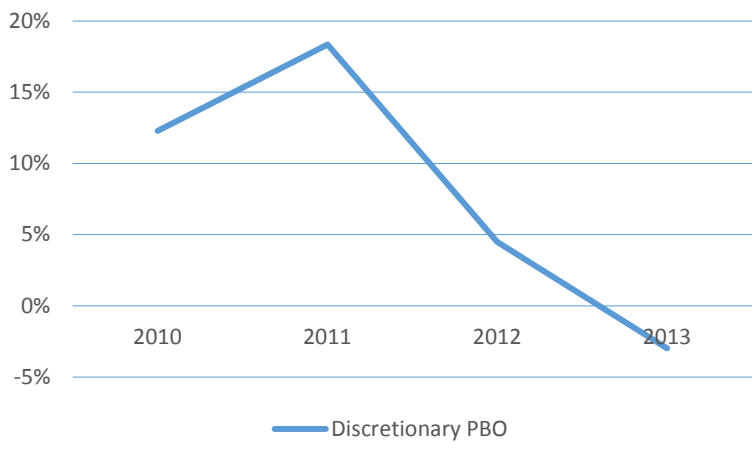
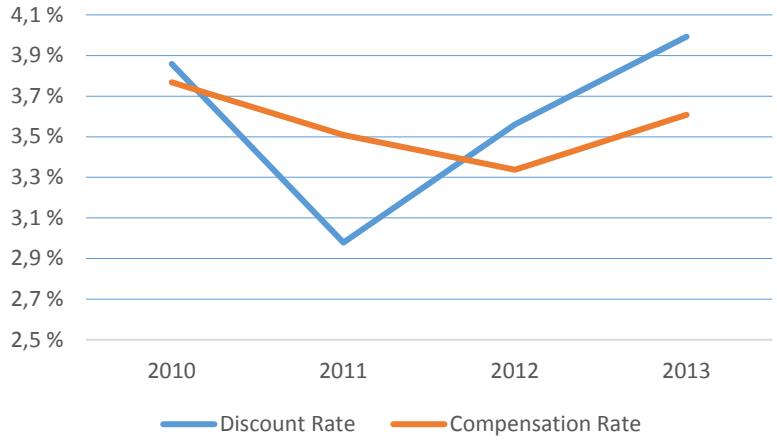


Figure 4.2: Mean Corridor for Sample Firms 2009–2013

Figure 4.3: Mean Discount and Compensation Rates for Sample Firms 2010–2013



As figure 4.1 shows, discretionary PBOs increased in 2011 but decreased on average for the rest of the period. The decrease for the rest of the period is somewhat expected, since the suggested discount rate by the NASB changed from a 2.6 percent government bond rate in 2011 to a 3.9 percent corporate bond rate in 2012, and I use the government bond reference to compute *PBO_D* for the whole period. The 2011 increase in *PBO_D* may be due to the increase in the risk premium on NASB's corporate bond rate from 0.6 percent in 2010 to 1.2 percent in 2011. The decrease in *PBO_D* continued in 2013 as well, and in 2013, the mean discretionary PBO was negative, which indicates that firms valued their PBOs lower than the NASB on average. As a result, corridor values increased in 2012, and in 2013 all corridor values were eliminated due to the mandatory OCI recognition under IAS 19 (2011) as shown in figure 4.2. The changes in corridor values are expected, due to PBOs' sensitivity to the discount rate. Using the NASB sensitivity test as an example, an increase in the discount rate

from 2.6 percent in 2011 to 3.9 percent in 2012 should reduce PBO values by more than 20 percent. Corridor values, however, were still negative on average in 2012.

4.3 Cross-Sectional Analysis

To examine if changes in discount and compensation rates around the effective year of IAS 19 (2011) were affected by firm characteristics, I run the following regression:

$$PBO\_D_{i,t} = \beta_0 + \beta_1 * Corridor_{i,t} + \beta_2 * Size_{i,t} + \beta_3 * BM_{i,t} + \beta_4 * ROA_{i,t} + \beta_5 * Debt_{i,t} + \beta_6 * Earn_{i,t} + \sum Year + \sum Industry + \sum Interactions + \varepsilon_{i,t}$$

where the *Corridor* variable is the raw corridor value scaled by total assets. The other terms are as explained in section 3.3 and appendix 6.1. Since a negative *PDO_D* indicates an under-priced PBO, the expected signs of the corridor and leverage coefficients are similar as for the analysis in section 3. I expect the corridor coefficient to be positive since firms with negative corridors had an incentive to mitigate the negative OCI effect in 2013 by under-pricing the PBO. The leverage coefficient is expected to be negative, since highly leveraged firms may have had incentives to maintain a certain equity ratio by minimizing the PBO. The results from the regression are presented in table 4.5. The base case, in relation to the year and industry indicators, is the financial year 2010 and firms that are not classified by the GICS system. For the t-statistics, I use robust standard errors clustered by firm (136 clusters).

Table 4.5: Regression Output

Dependent variable:	PBO_D	t-stat
Constant	0.324***	(3.01)
2011	0.0402	(0.56)
2012	-0.0388	(-0.43)
2013	-0.190**	(-2.47)
Corridor	1.981**	(2.44)
Corridor x 2011	-0.891*	(-1.94)
Corridor x 2012	-0.780	(-1.47)
Corridor x 2013	0.705	(1.42)
Debt	-0.205**	(-2.47)
Debt x 2011	0.0768	(1.09)
Debt x 2012	0.168	(1.61)
Debt x 2013	0.208**	(2.23)
Size	-0.00783	(-0.81)
Size x 2011	-0.000244	(-0.03)
Size x 2012	-0.0154	(-1.56)
Size x 2013	-0.00762	(-0.82)
BM	-0.0385	(-1.11)
BM x 2011	0.00563	(0.23)
BM x 2012	0.0389	(1.21)
BM x 2013	0.0380	(1.15)
ROA	0.0177	(0.16)
ROA x 2011	0.123	(0.91)
ROA x 2012	-0.0217	(-0.09)
ROA x 2013	0.0993	(0.72)
Earn	0.00162	(1.29)
Earn x 2011	-0.0103**	(-2.46)
Earn x 2012	-0.00587	(-1.57)
Earn x 2013	-0.00208	(-1.59)
Industry Fixed Effects	Included	Included
N	453	
Adjusted R^2	0.308	

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels (two-tailed) for means.*

The results in table 4.5 suggest that the discretionary PBO decreases towards 2013 in general since the *2013* indicator has the lowest coefficient of the year indicators. The *2013* indicator is also the only significant year indicator. The *Corridor* and *Corridor x 2011* coefficients are also significant at the 5 percent and 10 percent levels respectively, but an interesting finding is that the *Corridor x 2013* term changes sign from the 2011 and 2012 corridor interaction

terms. The change in the coefficient of the corridor interaction term from -0.780 in 2012 to 0.705 in 2013 indicates that the corridors' effect on *PBO_D* was stronger in 2013. However, the corridor–year interaction terms are not significant for 2012 and 2013, although they have p-values of 0.145 and 0.157, respectively. Leverage had a negative effect on *PBO_D* from the main effect of the *Debt* coefficient, but the effect seems to diminish every year, and in 2013, the *Debt x 2013* term seems to cancel out the negative main effect of *Debt*. Some of the coefficients for the control variables have high t-values in some cases as well but are not related to the hypotheses. The F-statistics for joint significance of the *Year + Year x Corridor* and *Year + Year x Debt* coefficients are presented in table 4.6.

Table 4.6: F-Statistics for Event, Corridor, and Debt Coefficients

Coefficients	F-stat
2011 + 2011 x Corridor	2.55*
2012 + 2012 x Corridor	1.13
2013 + 2013 x Corridor	3.66**
2011 + 2011 x Debt	0.97
2012 + 2012 x Debt	1.30
2013 + 2013 x Debt	5.47***

, ** and * represent significance at the 10 percent, 5 percent, and 1 percent levels.*

As expected, the *2011 x Corridor* and *2013 x Debt* coefficients are jointly significant with their respective year indicators, as well as individually. Overall, the results in table 4.6 suggests that 2011 and 2013 had an impact on *PBO_D*, in general, through corridor value, or through leverage. However, 2013 clearly had the biggest impact. In the following, results that support or contradict H2a, H2b and H2c are presented for each of the hypotheses separately.

H2a: The discount and compensation rates used to compute PBOs during the years prior to the effective year of IAS 19 R were affected by firm leverage.

As the *Debt* coefficient in table 4.5 shows, the main effect was negative and significant at the 5 percent level. This suggests that leverage had a negative effect on the discretionary PBO in 2010. The interaction terms for year and leverage are positive, which indicates that the negative effect of leverage is weaker than in 2010. The only significant interaction term, however, is *Debt x 2013*, which is significant at the 5 percent level. Since the main effect of leverage is significant, and the magnitude of the coefficients for the 2011 and 2012 interaction terms are lower than the main effect, I reject the null hypothesis that leverage did not have a

negative effect on discretionary PBO during 2010, 2011, and 2012. In 2013, the interaction term outweighed the main effect, which is the basis for H2b:

H2b: The relationship between leverage and discount and compensation rates changed during the effective year of IAS 19 R.

Looking at the leverage interaction terms, the magnitude of the coefficient values becomes higher every year leading up to 2013. Since the main effect is negative and the interaction terms become higher, it suggests that the negative effect of leverage on discretionary PBOs diminished between 2010 and 2013. In 2013, the interaction term outweighed the main effect 0.208 to 0.205, indicating that the total effect of leverage was canceled out in 2013.[23] I, therefore, conclude that leverage had a negative effect on discretionary PBOs until 2013. The question of how much of this change occurred in 2011 and 2012 is difficult to answer since the interaction terms are not statistically significant. The positive coefficients suggest that some of the effects occurred during 2011 and 2012, but the t-values are too low to reject the null hypothesis for these years.

H2c: Firms with negative corridors during the years leading up to IAS 19 R changed their actuarial assumptions more aggressively during the effective year than other firms.

Observing the coefficients for the corridor variable and the interactions with year, the main effect is positive and significant at the 5 percent level. This means that a negative corridor value in 2009 had a negative effect on *PBO_D* in 2010. This effect seems to persist to some degree through all the years, based on the negative 2011 and 2012 interaction terms, which are weaker in magnitude than the main effect. The effect of the corridor value, therefore, seems to be weaker in 2011 and 2012 than in 2010, and stronger in 2013 since the *Corridor x 2013* interaction term becomes positive this year. The total effect, however, is positive during all the years. Comparing the 2011 and 2013 interaction with corridor value as an example, the total effect of the corridor main effect and the interaction with year changed from 1.090 in 2011 to 2.686 in 2013.[24] The result is similar when comparing 2012 and 2013 as well, but the

[23] The positive effect of leverage in 2013 is 0.208 – 0.205 = 0.003, which means that the average level of debt in 2013 resulted in a less than 0.1% increase in the discretionary PBO. In comparison, the same level of leverage would have reduced discretionary PBO by 6.6% in 2010.

[24] The estimation of the total effect is 1.981 – 0.891 = 1.090 for 2011 and 1.981 + 0.705 = 2.686 for 2013.

2012 interaction term is not significant. The 2013 interaction term with corridor value is not significant either, but it is positive, which suggests that the 2013 effect of the corridor value is either similar to or stronger than the 2010 main effect. In both cases, the 2013 effect is significantly stronger than in 2011 and 2012. In addition, the *2013 + 2013 x Corridor* terms are jointly significant at the 5 percent level. Based on these findings, I reject the null hypothesis for H2c.

5. Conclusion

The results from the analyses in sections 3 and 4 correspond with a lot of previous research but also present new insights into IAS 19 in Norway. Since the pension liability is highly sensitive to the discount rate, low interest rates have had a significant impact on PBOs in the recent years, and preserving the corridor method in today's low-interest environment could possibly have resulted in substantial corridor values for many firms. On the other hand, the introduction of corporate bond rates as a reference rate has relieved firms of some of the effect of low interest rates, but NASB's corporate bond reference rate as of December 31st, 2017 is lower than the government bond reference rate was before the IAS 19 revision. One might, therefore, argue that the increased transparency from the revision was necessary since the complexity of pension information seems to have implications for various stakeholders in firms. Findings in this study that relate to corridors and leverage are discussed further in the following sub-sections.

5.1 Unrecognized Actuarial Gains and Losses (Corridors)

Overall, the results from the cross-sectional analysis in section 3 suggest that other firms' characteristics may have outweighed the projected OCI effect the corridor represented when it comes to market reactions around the IASB announcements. Although the univariate analysis indicates that sample firms that used the corridor method experienced negative market reaction during event 4, most of the corridor-related coefficients in the cross-sectional analysis showed low significance levels. This suggests that accumulated corridors alone had little predictive power on abnormal returns during the announcements. However, it is interesting to find that, when reducing the sample to firms with negative corridors, the interaction terms for leverage become lower for events 3 and 4 (especially during event 3). This suggests that the negative effect of leverage was stronger for firms with negative corridors during the release of the exposure draft and the near-final draft, which makes sense given that debt-equity ratios will increase further when a negative corridor value has to be recognized in OCI. The announcements leading up to the IAS 19 revision, therefore, seem to have shed light on the importance of pension information to some degree.

An unexpected result from the cross-sectional analysis in section 3 is that corridor values had a negative effect on abnormal returns during event 2, which suggests that firms with negative

corridors had higher abnormal returns around the release of the discussion paper on IAS 19. Though I find no apparent explanation for this result, the 2008 financial crisis may have affected the results, since the discussion paper was issued during a time of financial turmoil (Oslo Børs, 2008). Another aspect that may have obscured the results during event 2 is that many firms had yet to release their 2007 annual reports at the time. Looking into the sample firms for event 2, I find that 13 out of the 113 firms did either change the sign of their corridor value or terminate their DB plan during 2007. If the 2007 reports were the first time updated pension information for 2007 became public, market participants might have lacked relevant information on certain firms during this announcement.

Accumulated corridor values did, however, seem to have a more significant impact on firms' actuarial choices during the years leading up to the effective year of IAS 19 (2011). This is somewhat expected and indicates that firms that had used too optimistic assumptions in the past which had resulted in actuarial losses, had a tendency to do this. The most interesting finding with relation to corridor values, however, is that the effect of accumulated corridors on actuarial assumptions was considerably stronger in 2013. This indicates that many firms used discount and compensation rates that reduced the negative OCI effect of accumulated corridors during the effective year of IAS 19 (2011).

5.2 Leverage

The most significant findings in this study are related to the effect of leverage, both on market reactions and on firms' reactions to the IAS 19 revision. In regression 1–5 in section 3, the results indicate that leverage had a negative effect on cumulative abnormal returns during event 4, which was the release of the near-final draft of IAS 19 (2011). For the sub-sample of firms with negative corridor values in regression 5, leverage also had a negative effect during event 3, which was the release of the exposure draft of IAS 19 (2011). The negative effect of leverage on firms with negative corridors is somewhat expected due to the increased risk of bankruptcy, financial distress costs, and the breach of debt covenants. All of the above may also increase the cost of corporate debt (Merton, 1973).

The market reactions around the release of the exposure draft and the near-final draft, in particular, may be due to the attention the revision received during this period. The exposure draft for IAS 19 (2011) received more than 220 comment letters from interested parties. In addition, most of the "Big Four" auditing firms (Deloitte, KPMG, PwC, and EY) issued

publications addressing issues related to the proposed amendments following the 2010 exposure draft.[25] The "Big Four" also acted as auditors for about 90 percent of the publicly listed firms in Norway at the start of the IAS 19 project[26], which may also explain the early adaption of OCI recognition of actuarial gains and losses and the introduction of DC plans for several firms. Negative abnormal returns during event 3 (April 29th, 2010) may also be related to expectations of changes in the Norwegian Key Policy Rate[27], which increased from 1.75 percent to 2.00 percent on May 5th, 2010 (Norges Bank, 2010).

In addition, the results in section 4 suggest that firms' actuarial assumptions were affected by leverage as well under IAS 19 (1998), but that this effect was canceled out in 2013. This result suggests that accounting incentives for pensions changed after the introduction of IAS 19 (2011) in 2013. Since the revision removed the option of deferring the recognition of actuarial gains and losses under the corridor method, actuarial assumptions are now a less effective tool for earnings management. One can, therefore, argue that the IAS 19 revision has helped to reduce asymmetric information and to align managers' incentives with those of the shareholders and creditors.

5.3 Limitations

Though IAS 19 (2011) applies to employee benefits in general, this study is limited to DB plans. The main focus in the analyses is the elimination of the corridor method, although the introduction of the net interest element is discussed briefly. This thesis is also limited to firms on the OSE and might not be representative for firms traded on other exchanges. Another limitation may be confounding events that have affected the results of the analyses. For the analysis on market reactions, this could be the effect of contemporaneous news. For the analysis on actuarial assumptions, the introduction of corporate bonds the year before the effective date of IAS 19 (2011) may have created noise for the analysis. The results, however,

[25] The publications "A study of the IASB's proposal" (PwC, 2010), "IAS Plus Update – Closing the Corridor" (Deloitte, 2010), and "New on the Horizon: Defined benefit plans" (KPMG, 2010) were all published shortly after the exposure draft in April 2010.

[26] Stated in the 4/2006 issue of "Revisjon og Regnskap" (The Norwegian Institute of Public Accountants, 2006).

[27] The Norwegian Key Policy Rate is the interest rate on bank reserves in the Norwegian Central Bank (Norges Bank).

are strong in several cases. The analyses are also limited to market and firm reactions and do not try to analyze the materialization of the corridors in 2013 itself.

The analyses in this thesis are also subject to limitations related to data availability. For the analysis on market reactions, missing annual reports for the first two events reduced the sample significantly, and a larger sample might have increased the power of the statistical tests. There are also variables that were not included and that perhaps could have improved the results of both analyses, but data on these parameters is difficult to obtain. For the analysis on market reactions, it would have been interesting to observe the effect of probability of bankruptcy or institutional ownership. Boehmer & Kelley (2009) found evidence that institutional ownership had a positive effect on the informational efficiency of prices for US firms, which is a relevant factor for the analysis on market reactions to the IAS 19 revision. For the analysis on actuarial assumptions, the inclusion of assumed turnover and the public pension base rate (G) could have led to more precise results. However, hand-collecting data on these variables would have been too time-consuming and would not have brought much value to the analysis, since the impact of these parameters on PBO values is small. Kinserdal (2006) included growth in G in his analysis on actuarial assumptions for Norwegian firms and found a strong correlation between salary and growth in G, which is consistent with the guidelines from NASB. Assuming that this holds, omitting growth in G should still allow for comparability between firms. Overall, the study may also be subject to sample errors in databases or the hand-collected data.

5.4 Suggestions for Further Research

The results from the analyses in this thesis, together with previous research, suggest that complex accounting information such as pension items are not always incorporated in stock prices. If market participants seem to omit value-relevant information, it might create incentives for earnings management, and it could be interesting to investigate market efficiency related to other accounting items or standards. However, I still believe that there are unexplored issues related to the revision of IAS 19 that could be interesting to investigate. The elimination of the corridor method may have resulted in increased volatility, both in earnings and in shareholders' equity for the firms affected. In this case, it would be interesting to investigate whether there has been any change in risk premiums as a result of this. It would

also be interesting to explore implications related to debt covenants. Analysing these issues might be challenging, but if feasible, it represents an interesting research topic.

Another interesting topic related to pensions is how life insurance companies manage in today's low-interest environment, given that pension liabilities are highly sensitive to interest rates and that the risk is often transferred to the insurer when premiums are paid by the sponsor. The case with the Norwegian pension provider Silver, which was placed under public administration last year and was later taken over by Storebrand, is an example of the financial distress pension liabilities can cause for pension providers when interest rates are low (The Ministry of Finance, 2017). An analysis could also include obligations related to other insurance products that are affected by low interest rates. The recent shift from DB to DC plans also presents an interesting research topic. Though the termination of DB plans relieves employers of risk and often of costs, some argue that a shift to DC plans has negative economic consequences for employees (Orskaug, 2016). It would, therefore, be interesting to examine the redistribution of wealth as a result of shifts from DB to DC plans.

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6. Appendix

6.1 Data Sources and Definitions

Due to the long time span of the study and limited data availability of pension data in databases, data is collected from several sources. The data sources are listed in table 6.1.

Table 6.1: Data Sources

Data	Source
Corridor values (accumulated actuarial gains or losses)	Hand collected from annual reports.
Financial data	Thomson Reuters (Datastream and Eikon)
Daily stock prices	Børsprosjektet's database at NHH. (Amadeus)
Fama-French asset pricing data on Oslo Stock Exchange	Professor Bernt Arne Ødegaard's website (UiS)

Missing data in databases have been supplemented with data hand collected from annual reports. For the illustrations in section 2, I have used the Thomson Reuters Eikon data items presented in table 6.2.

Table 6.2: Thomson Reuters Eikon Data Items

Data Item	Thomson Reuters Eikon Code	Figure
PBO	TR.PensionObligationDomestic	2.2
Plan Assets	TR.PlanAssetsDomestic	2.2
Funded Status	TR.FundedStatusDomestic	2.2
Expected Return on Plan Assets	TR.ExpectedRateofReturnDomesticBSStmt	2.4
Real Estate	TR.RealEstatePctDomestic	2.5
Debt Securities	TR.DebtSecuritiesPctDomestic	2.5
Equity	TR.EquityPctDomestic	2.5
Private Investments	TR.PrivateInvestmentsPctDomestic	2.5
Other Investments	TR.OtherInvestmentsPctDomestic	2.5
Discount rate	TR.DiscountRateDomesticBSStmt	2.6
Compensation rate	TR.CompensationRateDomesticBSStmt	2.7

The sample used for the figures in section 2 consists of all firms on the OSE with available data in the Eikon database for the respective years, which makes up 40 – 80 firms each of the years, depending on the year. Descriptions of the variables used for the regressions in section 3 and 4 are presented in table 6.3 with Thomson Reuters Datastream codes in parenthesis where applicable.

Table 6.3: Variable Descriptions

Dependent variables	Description
CAR t + 1	Three day cumulative abnormal return using the Fama-French 3-factor model.
CAR t + 2	Five day cumulative abnormal return using the Fama-French 3-factor model.
Discretionary PBO	Discretionary PBO as suggested by Hann, Lu, & Subramanyam (2007) scaled by total PBO.
Independent variables	**Description**
Corridor	Accumulated actuarial gains and losses scaled by total assets (WC02999).
Size	The natural logarithm of total assets in MNOK (WC02999).
B/M	Common equity / Market Capitalization (WC09704)
Earn	One year change in net income (WC01751) in %.
ROA	Net income (WC01751) / Average of total assets current and last year (WC02999)
Debt	Total debt (WC03255) scaled by total assets (WC02999).
Indicator variables	**Description**
Event indicators	One indicator variable for each of the IASB announcement dates described in table 3.1 (5 in total).
Year indicators	Indicators for the years 2010, 2011, 2012 and 2013.

Corridor indicators	Sample firms are divided into two groups depending on if they use the corridor method. Two subgroups are also created within the corridor group to separate between firms with positive corridors and negative corridors. There are four groups in total, and the sign of the corridor is denoted by <>0, >0, <0 and =0.
Industry indicators	Industry indicators based on two-digit Global Industry Classification Standard (GISC) industry classification codes.

6.2 Lists of Firms Used in the Analyses

Due to different time scopes and purposes for the analyses in section 3 and 4, I use different sample firms for each analysis. Firms included in the final samples are listed in table 6.4 and 6.5 with their respective tickers on the Oslo Stock Exchange.

Table 6.4: Sample Firms Used for the Analysis of Market Reactions in Section 3

June 29th, 2006		March 27th, 2008		April 29th, 2010		June 6th, 2011		June 16th, 2011	
Test	Control	Test	Control	Test	Control	Test	Control	Test	Control
AIK	ACTIVE	AGR	APP	AKER	AMSC	AFG	ALGETA	AFG	AKVA
AKA	AKD	AIK	BIOTEC	AKERBP	APP	AKA	APP	AKA	ALGETA
AKER	AMSC	AKER	COMROD	AKFP	ASD	AKER	ARCHER	AKER	APP
ASC	APP	ASC	COP	AUSS	AXA	AKERBP	AVM	AKERBP	ARCHER
ATEA	BIOTEC	ATEA	DAT	BON	BERGEN	ASC	AXA	ASC	ASD
AWO	CONSA	AUSS	DNO	CEQ	BIOTEC	ATEA	BAKKA	ATEA	AVM
BEL	DEEP	AWO	EKO	DNB	BWG	AUSS	BIOTEC	AUSS	AXA
BON	DNO	BEL	ELT	DOCK	COD	BON	BWG	BWO	BAKKA
BOR	EDRILL	DESSC	FAKTOR	DOF	COP	BWO	COD	CEQ	BIOTEC
CEQ	ELT	DNB	FUNCOM	EIOF	DNO	CEQ	COP	DESSC	BWG
DOF	FUNCOM	DOCK	GOL	EMS	DOLP	DESSC	DNO	DNB	COD
EKO	HEX	DOF	HIDDN	FAR	EKO	DNB	DOCK	DOF	COP
EMS	HIDDN	ECHEM	JIN	FOE	ELT	DOF	DOLP	ECHEM	DNO
EVRY	IMAREX	EMGS	KOG	FOP	FAIR	ECHEM	DOM	EMS	DOCK
FAR	KOG	EMS	MAFA	GOGL	FAKTOR	EMS	EKO	FOE	DOLP
GAS	MHG	EVRY	MHG	GRO	FUNCOM	FOE	ELT	GRO	DOM
GGG	NEC	GAS	NAVA	GSF	GOD	HAVI	FAIR	HNB	EKO
GOL	NEL	GSF	NEC	HAVI	GOL	HELG	FAKTOR	INC	ELT
HAVI	OPERA	HAVI	NPRO	HNA	HEX	HNB	FRO	IOX	FAIR
HNA	PAR	HNA	OLT	HNB	HIDDN	INC	FUNCOM	KIT	FAKTOR
HNB	PRS	HNB	OPERA	INC	HRG	INFRA	GJF	KOA	FRO
KIT	RCL	IGNIS	PDR	INFRA	IGNIS	IOX	GOD	KVE	FUNCOM
LSG	ROGG	IMSK	PHO	IOX	ITE	JSHIP	GOGL	MING	GJF
MEDI	SDRL	INC	PRS	KIT	JIN	KIT	GOL	MORG	GOD
MORG	SINO	INM	QEC	KOA	MHG	KOA	GSF	NAS	GOGL
NAS	STB	IOX	RCL	KOG	NEC	KVE	HEX	NEL	GOL
NHY	SUB	JSHIP	REC	KVE	NGT	MING	HIDDN	NOCC	GSF
NOD	TAA	KOA	REPANT	MING	NORD	MORG	HRG	NOD	HEX
NONG	TCO	LSG	ROGG	MORG	NPRO	NAS	IGNIS	NONG	HIDDN
NRC	TGS	MING	SBX	NAS	OLT	NEL	INM	NOR	HRG
OCR	YAR	NAS	SNI	NEL	OPERA	NOCC	ITE	NRC	IGNIS
ODF		NEL	SOLON	NOCC	OTS	NOD	JIN	NSG	INM
ODIM		NONG	STB	NOD	PAR	NONG	KOG	ORK	ITE
ORK		NOR	STL	NONG	PHO	NOR	MHG	PGS	JIN
OTR		NRC	STRONG	NOR	PROD	NRC	MORPOL	QFR	KOG
QFR		OCR	SUBC	NRC	PRS	NSG	NAUR	REACH	MAMUT
REACH		ODFB	TAA	NSG	QEC	ODF	NAVA	SALM	MHG
SAS		ORK	TGS	ODF	RCL	ORK	NEC	SAS NOK	MORPOL

NOK	PAR	WRL	ORK	REC	PGS	NGT	SEVAN	NAUR
SCHA	QFR	YAR	PGS	REPANT	QFR	NOF	SIOFF	NAVA
SEVAN	SADG		PROTCT	RIE	REACH	NORD	SOFF	NEC
SFM	SALM		QFR	ROGG	SADG	NPRO	SONG	NGT
SIT	SAS NOK		REACH	RXT	SALM	OLT	SPOG	NOF
SNI	SIMTRO		SALM	SADG	SAS NOK	OPERA	SVEG	NORD
SOFF	SIOFF		SAS NOK	SBX	SEVAN	OTS	TEL	NPRO
STL	SIT		SEVAN	SDRL	SIOFF	PDR	TOM	OLT
STXEUR	SOFF		SIOFF	SNI	SONG	PEN	TTS	OPERA
SUBC	SOI		SKUE	SOLON	SPOG	PHO	VEI	OTS
SUO	SONG		SOFF	STB	TEL	PRS	WWI	PDR
TAD	SPOG		SONG	STL	TIDE	QEC	WWIB	PEN
TAT	STXEUR		SPOG	STRONG	TOM	RCL	WWL	PHO
TECH	SUB		SUB	SUBC	TOTG	REC	**AIK**	PRS
TOM	TEL		TOM	TECO	TTS	REPANT	**EMGS**	QEC
UNISON	TIDE		TTS	TGS	VEI	RGT	**EVRY**	RCL
VEI	TOM		VEI	WEIFA	WWI	ROGG	**FBU**	REC
WWI	TTS		WWI	WRL	WWIB	RXT	**LSG**	REPANT
DNB	VEI		**AGR**	YAR	WWL	SBX	**NHY**	RGT
FOE	WNOR		**AIK**		**AIK**	SDRL	**PRON**	ROGG
INC	WWI		**ASC**		**EMGS**	SFR	**SCHA**	RXT
MING	WWIB		**BEL**		**EVRY**	SINO		SBX
PGS	**BON**		**BWO**		**FBU**	SNI		SDRL
SIOFF	**BWO**		**DAT**		**LSG**	SOLON		SFR
TEL	**CEQ**		**ECHEM**		**NHY**	STB		SINO
	DETNOR		**EMGS**		**NTS**	STL		SNI
	OLD		**EVRY**		**PRON**	STRONG		SOLON
	FOE		**FBU**		**SCHA**	SUBC		STB
	IMAREX		**JSHIP**			TECH		STL
	KVE		**LSG**			TGS		STRONG
	NHY		**NHY**			WEIFA		SUBC
	NSG		**PDR**			WRL		TECH
	PGS		**SCHA**			YAR		TGS
	SCHA		**TECH**					WEIFA
	SFM		**TEL**					WRL
	TECH		**TOTG**					YAR

The test firms consist of firms using the corridor method during the IASB announcements and tickers in bold letters represents firms with positive corridors. The control firms (underlined) consists of firms that recognized actuarial gains and losses immediately in OCI or P&L or did not have defined benefit plans during the announcements.

Table 6.5: Sample Firms Used for the Analysis of Actuarial Assumptions in Section 4

2010		2011		2012		2013	
AFG	SBVG	AFG	SADG	AFG	SBVG	AFG	**EMGS**
AFK	SEVAN	AFK	SALM	AFK	SCHA	AFK	**EMS**
AKER	SIOFF	AKA	SAS NOK	AGR	SEVAN	AKER	**EVRY**
AKERBP	SKUE	AKER	SBVG	AKA	SIOFF	AKERBP	**HELG**
AKFP	SOAG	AKERBP	SEVAN	AKER	SOAG	ATEA	**HSPG**
AURG	SOFF	ASC	SIOFF	AKERBP	SOLV	AURG	**JAEREN**
AUSS	SONG	ATEA	SKUE	ASC	SONG	AUSS	**MING**
BMA	SPOG	AURG	SOAG	ATEA	SPOG	BMA	**NEL**
BON	SUB	AUSS	SOFF	AURG	SVEG	BON	**NHY**
BOR	SVEG	BEL	SOLV	AUSS	TEL	BOR	**NONG**
CEQ	TIDE	BMA	SONG	BMA	TOM	BRG	**PROTCT**
DNB	TOM	BON	SPOG	BON	TOTG	CEQ	**RING**
DOCK	TTS	BOUVET	SVEG	BOR	TTS	DNB	**SADG**
DOF	VEI	BWO	TEL	BWO	VEI	DOF	**SCHA**
EIOF	WILS	CEQ	TIDE	DESSC	WILS	EIOF	**SOAG**
EMS	WWI	DESSC	TOM	DNB	WWI	ELE	**SOLV**
FAR	**AGR**	DNB	TOTG	DOF	WWL	FAR	**SPOG**
FOE	**AIK**	DOF	TTS	ECHEM	**BEL**	FOE	**SSI**
FOP	**ASC**	ECHEM	VEI	EIOF	**CEQ**	GRO	**TEL**
GGG	**BEL**	EIOF	WILS	EVRY	**DAT**	HAVI	**TOM**
GRO	**BWO**	EMS	WWI	FAR	**ELE**	HFISK	**WILS**
GSF	**DAT**	FAR	WWL	FOE	**EMGS**	HNA	AKA
GYL	**ECHEM**	FOE	**AGR**	FOP	**EMS**	IMSK	ARCHER
HAVI	**EMGS**	FOP	**AIK**	GRO	**HOLG**	INC	BWG

HELG	**EVRY**	GRO	**BOR**	HAVI	**JSHIP**	IOX	COMROD
HNA	**FBU**	GYL	**DAT**	HELG	**LSG**	KIT	EKO
HOLG	**JAEREN**	HAVI	**EMGS**	HFISK	**SSI**	KOA	ELT
HSPG	**JSHIP**	HELG	**EVRY**	HLNG	ARCHER	KVAER	GJF
IMAREX	**LSG**	HNA	**HOLG**	HNA	BWG	LSG	GOD
IMSK	**NHY**	HSPG	**LSG**	HSPG	COMROD	MELG	GYL
INC	**NTS**	IMAREX	**NHY**	IMSK	EKO	NAS	HEX
INFRA	**SCHA**	IMSK	**NTS**	INC	ELT	NOCC	HRG
IOX	**SSI**	INC	**PRON**	IOX	GJF	NOD	ISSG
ISSG	**TECH**	INFRA	**RING**	JAEREN	GOD	NRC	KOG
KIT	**TEL**	IOX	**SCHA**	KIT	GOL	NRS	MORG
KOA	**TOTG**	ISSG	**SSI**	KOA	HEX	NSG	NTS
KVE	ASD	JAEREN	ARCHER	KVAER	HRG	NTSG	QFR
MEDI	BWG	JSHIP	BWG	MELG	INFRA	ODF	RISH
MELG	COMROD	KIT	COMROD	MING	ISSG	ORK	SKUE
MING	EKO	KOA	EKO	MORG	KOG	PGS	SOR
MORG	ELT	MEDI	ELT	NEL	MORPOL	POL	SRBANK
NAS	GOD	MELG	GJF	NHY	REC	SAS NOK	STB
NEL	GOL	MING	GOD	NOCC	RIE	SBVG	STL
NOCC	HEX	MORG	GOL	NOD	RISH	SEVAN	SUBC
NOD	HRG	NAS	HEX	NONG	ROGG	SIOFF	VVL
NONG	REC	NEL	HRG	NOR	SKUE	SONG	YAR
NOR	RIE	NOCC	KOG	NRC	SOR	SVEG	
NRC	RISH	NOD	MORPOL	NRS	STB	TIDE	
NSG	ROGG	NONG	REC	NSG	STL	TOTG	
NTSG	SDRL	NOR	RIE	NTS	SUBC	TTS	
ODF	SOR	NRC	RISH	NTSG	VVL	VEI	
ORK	STB	NSG	ROGG	ODF	YAR	WWI	
PGS	STL	NTSG	SFR	ORK		WWL	
POL	SUBC	ODF	SOR	PGS		**AGR**	
PROTCT	VVL	ORK	STB	POL		**ASC**	
QFR	YAR	PGS	STL	PROTCT		**BEL**	
REACH		POL	SUBC	QFR		**BWO**	
RING		PROTCT	VVL	RING		**DAT**	
SALM		QFR	YAR	SADG		**DESSC**	
SAS NOK		REACH		SAS NOK		**ECHEM**	

The sample consists of firms with defined benefit plans only. Tickers in bold represent firms with positive corridors, underlined tickers represents firms not using the corridor method, and the rest of the tickers represent firms with negative corridors.