Essays on Pension Accounting

by

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Contents

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1 Introduction

1.1 Purpose

Corporate pensions can be considered deferred compensation, i.e., a form of debt owed by a company to its employees, with a recognized liability once employees provide services in exchange for benefits. Defined benefit plans (hereinafter, "DB plans") guarantee certain pension benefit payments to employees—often lifelong payments based on final salary; hence, a company takes on the obligation to provide such benefits as well as any associated risks. Such plans are usually funded with a pool of plan assets (usually a multi-asset portfolio) that has been set aside to match benefit payment timing and amounts. Since the total value of such benefit payments depends on many factors (e.g., salary growth, mortality rates, etc.), assessing the total amount required to fund DB plans, often decades in advance, is a complex task. Kiosse and Peasnell (2009) describes risks associated with DB plans as longevity risk, interest rate risk, inflation risk, and investment return risk. Moreover, a lot of important information about DB plans, i.e., information that determines pension liabilities, is only disclosed in the footnotes to the financial statements. Yet, liabilities related to DB plans can greatly impact financial statements, underscoring their importance.[1] In contrast, the accounting and assessment involved in defined contribution plans (hereinafter, DC plans) are relatively straightforward given that firms are only responsible for making guaranteed contributions to their employees in the current period. In the case of DC plans, benefit payments depend on investment returns, with risk taken on by employees when benefits are earned. While there there seems to be a globally trending shift from DB plans to DC plans (PwC 2014a), obligations related to DB plans are still substantial (Milliman 2024). For example, as illustrated in Figure 1, Norwegian DB plan liabilities are still greater than DC plan liabilities (i.e., pension balances) and have been growing in the last two decades, despite the steady decline in newly vested benefits for DB plans. Consequently, how (1) DB plans are accounted for and (2) related information is presented remains of significance for preparers and users of financial statements.

This thesis uses the setting of pension accounting under International Financial Reporting Standards (IFRS) to examine the effects of accounting standards on firm and investor behaviors. IFRS standards are intended to improve transparency, strengthen accountability, and contribute to economic efficiency (IFRS Foundation 2024), but whether or not IFRS standards achieve their intended effects is not always clear in retrospect. Because conflicting views across different stakeholders complicate the standard-setting process, it is critical to understand the channels in which various stakeholders respond to regulations. Specifically, I examine if firms strategically utilize flexibility offered by accounting standards and how such discretion

[1]A number of major companies have experienced financial distress due to their pension liabilities. Examples include SAS (Financial Times 2012), General Electric (CNN 2018), GM Motors (CBS News 2009).

impacts equity and debt market outcomes. I leverage recent regulatory changes in pension accounting standards and practices that generally reduced discretion and improved transparency to investigate several economic questions.

Under IFRS, accounting for DB plans is governed by International Accounting Standard (IAS) 19 *Employee Benefits*—the keystone regulation examined in this dissertation. While I discuss various IAS 19 amendments, both proposed and finalized, this thesis mostly focuses on changes introduced by the 2011 revision to IAS 19 (hereinafter, "IAS 19R").[2] IAS 19R introduced major changes with powerful implications for financial statements, representing a good setting to study discretionary accounting choices and market efficiency. The objective of IAS 19R was to improve financial statement transparency, comparability, and understandability by improving disclosures and limiting options relating to recognition and presentation (IFRS Foundation 2011b). However, there is limited research to-date on the effects of these changes specifically. This dissertation poses the following research question:

> **RQ:** Do discretionary accounting choices affect how market participants process complex accounting information, and is discretion used strategically by firms?

With pension accounting as the foundational setting, this dissertation consists of three empirical studies that examine regulatory changes with significant impacts on financial statements. The first study examines stock market reactions to IAS 19R elimination of the "corridor method", which previously allowed firms to smooth out actuarial gains and losses (hereinafter, "AGLs") on pensions by keeping substantial accumulated AGLs off the balance sheet.[3] The second study examines two opposing effects of IAS 19R on discount rates, namely financial statement users' increased ability and motivation to scrutinize discount rates due to amended disclosure requirements and increased importance of the discount rate assumption versus stronger earnings management incentives driven by earnings decreases. The third paper examines if changes in prescribed discount rates affect borrowing costs.

1.2 Background and key concepts

Several key concepts of this thesis include: (1) the projected benefit obligation (PBO) component of the pension liability recognized in the balance sheet, which is the present value of future benefits paid from

[2]In the first and second papers, I examine various effects of the finalized version of IAS 19R. In the second and third papers, however, I consider potential effects related to proposed changes to IAS 19 disclosures (IFRS Foundation 2021) and discount rates (IASB 2009), respectively.

[3]Actuarial gains and losses are defined as changes in the net pension liability due to revision of actuarial assumptions for current or future periods, and are recorded in other comprehensive income (OCI) under IAS 19R. The corridor method was intended to smooth out temporary changes in funded status driven by short-term fluctuations in actuarial assumptions or plan asset returns, with the assumption that accumulated AGLs would eventually even out over time. However, in practice, many firms that used the corridor method accumulated substantial actuarial losses (due to consistently using optimistic actuarial assumptions) that were kept off the balance sheet.

the plan; (2) actuarial assumptions made by firms when reporting pension liabilities and pension expense and subsequent approach to AGL recognition. When forecasting benefit payments, actuaries have to make assumptions about the future regarding factors like salary growth or mortality rates. Furthermore, actuaries must determine the appropriate discount rate to discount benefit payments to their present value. The long-term nature of DB plans makes actuarial assumption determination difficult—not to mention that the PBO is sensitive to changes in actuarial assumptions, particularly to changes in the discount rate. Given the potential impact that actuarial choices have on financial statements, as well as the degree of discretion involved, pension accounting can effectively serve as a tool for firms to alter the appearance of their financial positions. Aspirations to meet earnings targets, reduce volatility, or maintain certain accounting ratios (for example, due to debt covenants), to name a few, may incentivize firms to choose actuarial assumptions strategically. Generally, actuarial assumptions must be revised between reporting periods, and AGLs occur whenever (1) the PBO has to be remeasured using updated assumptions and (2) actual returns on plan assets deviate from expected returns.

This thesis focuses on two regulatory events related to actuarial assumptions: IAS 19R and the introduction of a higher reference rate for discount rates in Norway. IAS 19R introduced three major changes to pension accounting. First, IAS 19R mandated that firms record AGLs in OCI in the period they occur. Prior to IAS 19R, firms also had the option to include AGLs in the pension expense in the income statement or defer AGL recognition using the corridor method. The first paper of this dissertation examines stock market reactions to the elimination of this option to defer AGLs known as the corridor method; although the underlying economics of the plan did not change, the increased transparency and potential pension-induced balance sheet volatility may have presented new information for investors to react to.

Second, IAS 19R eliminated the expected rate of return (ERR) on plan assets when calculating the interest income component of the pension expense in the income statement. Before IAS 19R, interest income on pension plan assets was calculated using an ERR based on plan asset composition, similar to current SFAS 158 under U.S. Generally Accepted Accounting Principles (GAAP). IAS 19R replaces the ERR with the same discount rate used to estimate PBO and interest cost, which usually reduces net interest income on pensions (thereby, net income) since discount rates are generally lower than ERRs. Third, IAS 19R introduced new disclosure requirements regarding PBO duration, an important input to discount rate determination. The second paper of this dissertation examines the impact of the ERR elimination and new disclosure requirements under IAS 19R on firms' discount rate choices.

Under both the original and revised IAS 19, discount rates should be determined in reference to market yields on high-quality corporate bonds with the same currency and maturity as the PBO. However, if there is no deep market for such corporate bonds, market yields on government bonds should be used instead.

Consequently, otherwise similar PBOs from different jurisdictions may report significantly different PBO values (and thereby deficits), simply driven by varying development of local bond markets. The third paper of this dissertation examines whether the type of reference rate used to determine PBOs (market yields on corporate bonds versus market yields on government bonds) affects cost of debt.

For my empirical tests, I use single-country settings leveraging country-specific institutional features within Norway and the U.K., which both provide sufficient DB plan prevalence and data availability (e.g., access to old annual reports, language familiarity, etc.) to answer my research questions. Specifically for the first paper where I examine stock market reactions to the elimination of the corridor method, I use a Norwegian sample because (1) the majority of Norwegian firms used the corridor method prior to IAS 19R, and (2) risk-taking in plan asset allocation, thereby ERRs was generally low among Norwegian firms, mitigating the confounding effect of the ERR elimination. In the second paper, since almost no U.K. firms used the corridor method, I use a sample of publicly listed firms in the U.K. mainly to remove the confounding effect of IAS 19R elimination of the corridor method. In the third paper, I use a sample of Norwegian firms, because the change in prescribed discount rate reference being investigated is specific to Norway, and such events do not happen frequently. Of note, a single country setting limits the generalizability of my findings because the effects that have been identified in my dissertation rely on the country-specific context and characteristics of my Norwegian and U.K. samples, making international samples unfeasible in most cases.

1.3 Summary of my research

The first paper in this thesis is co-authored with Tzu-Ting Chiu and is presented in Section 2. The paper is published in the Journal of International Accounting Research and provides some of the first empirical evidence of the capital market effects of IAS 19R elimination of the corridor method. We perform an event study and measure cumulative abnormal returns surrounding the timing of relevant International Accounting Standards Board (IASB) announcements leading up to IAS 19R. Market reactions indicate whether the changes conveyed relevant information to investors (MacKinlay 1997). Ultimately, we find that corridor method elimination (i.e., immediate recognition of accumulated and future AGLs) was value-neutral to investors, in that market reactions were not different between affected and unaffected firms. This result supports the efficient market hypothesis (Fama 1991), given that IAS 19R changed the presentation, but not the underlying economics, of DB plans. However, we do find stronger negative stock market reactions to IAS 19R for DB sponsors with higher bankruptcy risk, more optimistic (i.e., PBO-reducing) actuarial assumptions, and higher funding levels. In general, substantial off-balance sheet AGLs accumulated via the corridor method seem to already be reflected in stock prices prior to IAS 19R, contradicting some of the

IASB's concerns about the transparency of the corridor method. Yet, our results indicate that investors do care about the balance sheet effects of eliminating the corridor method when firms are vulnerable to debt covenant violations (i.e., high bankruptcy risk) and when actuarial losses are more likely (i.e., optimistic actuarial assumptions).

In the second paper, presented in Section 3, I examine U.K. firms' discount rate choices following the two other major changes under IAS 19R (i.e., not relating to the corridor method), namely elimination of the ERR component of the pension expense calculation and amended disclosure requirements. On the one hand, firms could be pressured to increase discount rates to mitigate the increase in pension expense resulting from replacement of the ERR with the discount rate. On the other hand, discount rates could receive greater scrutiny because of newly required disclosure of PBO duration (a discount rate determinant) and heightened discount rate importance to earnings via replacement of the ERR. Ultimately, financial statement users' increased ability and motivation to monitor discount rates following IAS 19R could reduce discount rates, especially for firms that used abnormally high discount rates prior to IAS 19R. I find that U.K. firms used lower discount rates following IAS 19R, despite higher interest rates post-IAS 19R. However, the reduction is smaller for firms with better-funded plans and riskier asset allocation, i.e., stronger incentives to maintain higher discount rates. Furthermore, I find that some of the reduction in discount rate discretion is substituted with an increase in inflation rate discretion. Overall, my results demonstrate how firms use discretion offered by accounting standards and how they respond to scrutiny of specific discretionary choices (in this case, the discount rate).

In theory, it may not be an issue that firms make discretionary actuarial assumptions, assuming that financial statement users are able to process disclosed pension information and adjust for abnormal actuarial assumptions. The third paper presented in Section 4 aims to shed more light on this assumption, and whether changes in prescribed discount rates affect cost of debt for Norwegian firms. In 2012, the Norwegian Accounting Standards Board (NASB) shifted from mandating market yields on government bonds as the reference for discount rates to permitting the use of market yields on covered bonds issued by specialized credit institutions, which are higher—thereby reducing Norwegian PBO values and making them more comparable to PBOs in most developed markets. I find weak evidence that borrowing costs were reduced for firms with larger PBOs following this regulatory change and that the reduction was greater for firms with higher bankruptcy risk. Additionally, I find positive stock market reactions to the NASB's announcement about the change, specifically for firms with DB plans and especially when they have high bankruptcy risk—suggesting that stock market participants had predicted positive effects of the change before they materialized.

1.4 Conclusion

Findings from this dissertation contribute to our understanding of accounting standards by disentangling the effects of some of the most significant features of IAS 19 and studying them separately. Knowing how users and preparers of financial statements respond to changes in recognition, presentation, and disclosure of complex accounting items such as pensions can give regulators a better basis for future standard-setting. During the standard-setting process of various IAS 19 projects, several concerns are usually brought up by stakeholders. Documenting the benefits of the changes is therefore important in order to justify any drawbacks. Specifically, contrary to the main arguments for removing the corridor method under IAS 19R, my findings suggest that markets were efficient regarding previously off-balance sheet AGLs. However, stock market participants reacted negatively to the removal of the smoothing mechanism offered by the corridor method only when pension-induced balance sheet volatility was more likely and potential consequences were more severe. My finding that IAS 19R curbed opportunistic discount rates should be of particular interest in light of U.S. GAAP, which still applies ERRs and does not require PBO duration disclosure. Lastly, the finding that PBOs are valued differently by investors in IFRS jurisdictions that use discount rates based on market yields on government bonds substantiates the IASB's concerns that drove the (later abandoned) IAS 19 2009 discount rate project. Overall, this thesis addresses several concerns that have come up during the standard-setting process leading to the current IAS 19. The findings may also be relevant for other jurisdictions, given that the overarching, long-term goal is improvement and convergence of major global accounting standards.

Although there is extensive literature on pensions to-date that examine questions related to how market participants process and interpret pension accounting information (e.g., Hann, Lu, and Subramanayam 2007; Anantharaman and Henderson 2021; Campbell, Dhaliwal, and Schwartz 2012; Yu 2013) and how actuarial choices are influenced by factors unrelated to the economics of the pension plan, such as monitoring (e.g., Naughton 2019; Chuk 2013) or managerial incentives (e.g., Anantharaman 2017; Asthana 1999; Comprix and Muller 2011; Bergstresser, Desai, and Rauh 2006), most studies are conducted within a U.S. GAAP setting or under the previous IAS 19. Furthermore, few studies explore the relationship between specific institutional features and accounting standard outcomes. The studies in this dissertation aim to fill this gap by examining unanswered empirical questions leveraging specific institutional features that may help predict the impact of accounting standards in other settings.

Overall, the empirical analyses of this thesis aim to examine the state of pension accounting under IFRS as of today and to what extent there is still information friction between firms and investors. Identifying differences across local rules and practices, and the implications of accounting standards across

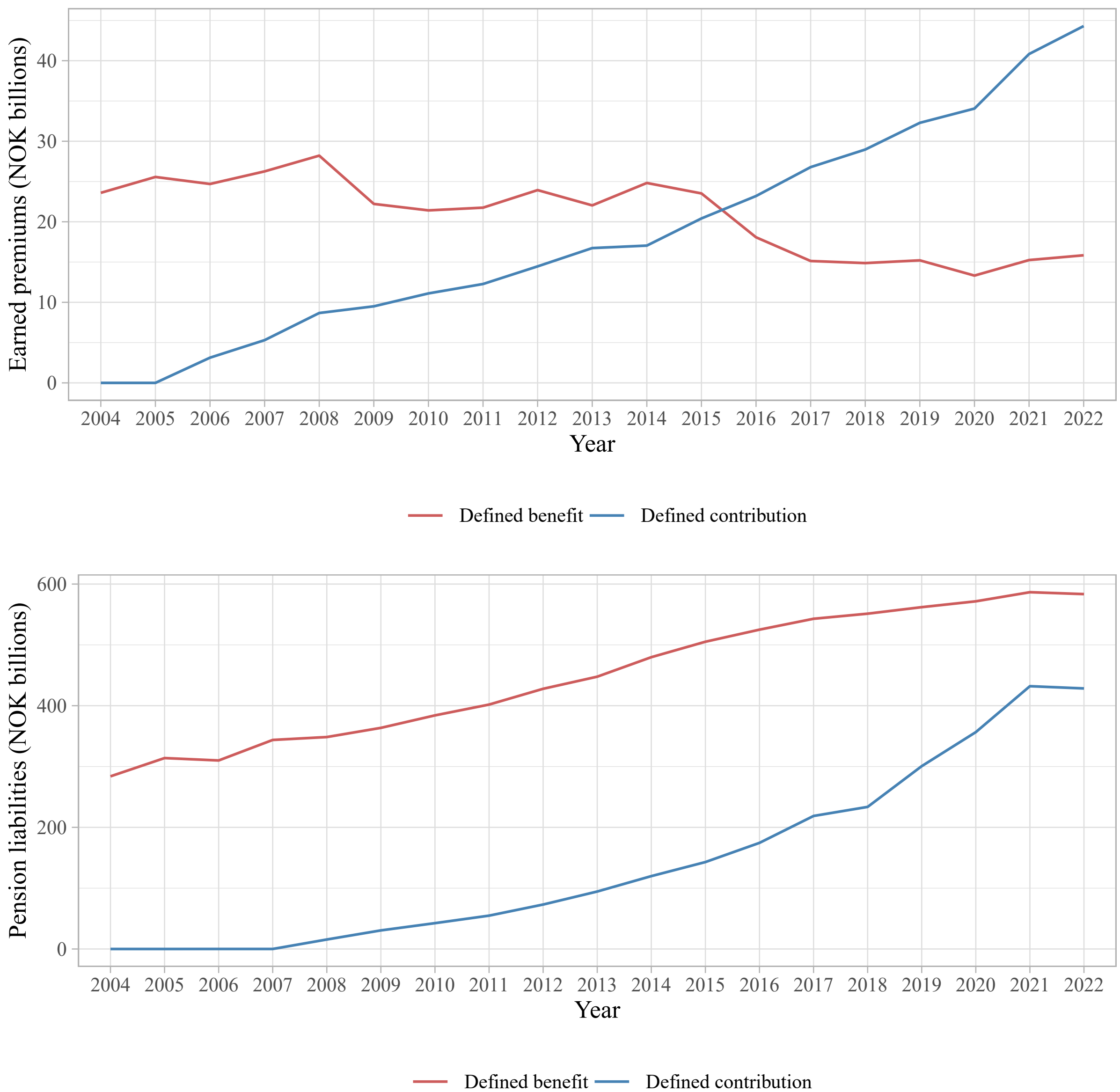
IFRS jurisdictions, underscores the need for studies that explore different institutional settings, which can better inform evidence-based policymaking (Cascino 2019). In this thesis, I touch upon how a few stakeholders—namely firms, stock market participants, and debtholders—react to regulatory events related to pension accounting. To gain a more complete understanding of the effects of regulatory changes, future studies may examine how other stakeholders respond. Future studies may also use different settings to focus on the roles of institutional features, as their importance is highlighted by both this thesis and recent papers (e.g., Barthelme, Kiosse, and Sellhorn 2019; Anantharaman and Chuk 2018; Chircop and Kiosse 2024).[4] Ultimately, pension accounting is still an avenue of research worth exploring, even as the current (slow) shift from DB plans to DC plans may eventually make DB plans less relevant. It is also worth noting that funding levels of DB plans are higher than in over a decade due to the recent interest rate increases (Milliman 2024), currently lessening the financial burden of DB plans. An interesting example is IBM's legacy DB plan that they froze in 2008 where overfunding recently got to the point that they reopened the DB plan to make use of the surplus and stopped making contributions to employee DC accounts (Forbes 2024). Nevertheless, insights from pension accounting studies may also be generalized to motivate studies on other accounting standards with similar characteristics and implications.

The dissertation is organized into a first, second and third paper with appendices and tables in Section 2, Section 3, and Section 4, respectively, and a combined reference list for the thesis at the end.

[4]Specifically, Anantharaman and Chuk (2018), Barthelme et al. (2019), and Chircop and Kiosse (2024) examine whether risk-taking in pension investments changed following IAS 19R, using sample firms from Canada, Germany, and the U.K., respectively. While all three studies find that firms reduced their allocation of pension plan assets to equity securities, they each explore different drivers and aspects distinct to their respective institutional settings. Rather than being generalizable across all IFRS regimes, their findings complement each other. These studies are discussed in more detail later in this thesis and by Cascino (2019).

1.5 Figures

Figure 1: Defined benefit and defined contribution plans in Norway



Source: Statistics Norway

2 The Impact of Changes in Pension Accounting under IAS 19R on Shareholder Wealth[5]

Abstract

This study examines stock price reactions to International Accounting Standards Board announcements associated with International Accounting Standard (IAS) 19R during the standard-setting process. IAS 19R removes the corridor approach in accounting for actuarial gains and losses on defined benefit plans. This rule change likely weakens the financial position of most firms that previously used the corridor approach upon adoption and subsequently increases balance sheet volatility. Using a sample of listed firms in Norway, we find that the market generally reacts negatively to IAS 19R events, but stock price responses are insignificantly different for affected and unaffected firms, suggesting that shareholders view the standard as value neutral. However, market reactions are more negative for firms with higher bankruptcy risk. Additional analyses indicate that market reactions vary with discretion in actuarial assumptions and funded status. Overall, our results document how investors respond to the amendments to pension accounting rules under IAS 19R.

2.1 Introduction

This study examines the effects of International Accounting Standard (IAS) 19 *Employee Benefits* (amended 2011) (hereafter, "IAS 19R") on shareholder wealth. A major change under IAS 19R is the removal of the corridor approach, which allowed firms to defer the recognition of actuarial gains and losses (AGLs) on defined benefit pension plans.[6] Upon adoption of IAS 19R, firms must adjust both the net pension asset or liability and accumulated other comprehensive income (OCI) by the amount of the previously unrecorded accumulated AGLs. Subsequently, firms must recognize AGLs in OCI as they occur.

Due to the immediate recognition of previously unrecorded accumulated AGLs, this rule change is likely to have a negative effect on the balance sheet for firms that applied the corridor approach under the previous IAS 19 (hereafter, "corridor firms") and had unrecorded actuarial losses. For example, Scandinavian Airlines (known as SAS) almost went bankrupt because this requirement would have wiped out its shareholders' equity if it had not managed to shift the majority of its employees from defined benefit plans to defined contribution plans (Financial Times 2012). This anecdotal evidence suggests that the IAS 19R rule change had an economically significant impact on the financial position of some firms. In addition, the requirement

[5]This section is based on Chiu and Ogudugu (2023) with minor differences in structure, formatting, reference list, and numbering of sections and footnotes.

[6]AGLs arise from either the projected benefit obligation or plan assets when firms experience adjustments to actuarial assumptions or change those assumptions for future periods. See Appendix A for more details on how AGLs occur in defined benefit pension plans.

to recognize AGLs in OCI as they occur is expected to increase balance sheet volatility in future periods, which could affect investor perceptions of the firm's default risk (Ernst & Young 2011).[7]

The previous IAS 19 (hereafter, "IAS 19 Unrevised") was widely criticized for permitting deferred recognition of AGLs under the corridor approach, thereby impairing financial reporting transparency (Deloitte 2010). To address this issue, the International Accounting Standards Board (IASB) issued IAS 19R, which removed the corridor approach, in June 2011 (effective for fiscal periods beginning on or after January 1, 2013).[8] As a result, firms can no longer defer a portion of AGLs within a threshold or "corridor" (equal to 10 percent of the greater of the projected benefit obligation (PBO) or the fair value of plan assets). Under IAS 19R, all AGLs are recognized in OCI as they occur. Due to this rule change, the net pension asset or liability recorded on the balance sheet becomes fully reflective of the pension plan's actual funded status (i.e., the difference between PBO and plan assets), thereby improving the transparency of a firm's pension position.

Prior to IAS 19R, accumulated AGLs were partially kept off-balance sheet. This pension-related information was therefore less salient and might not have been fully reflected in stock prices. Footnote disclosure is widely seen as an inadequate substitute for financial statement recognition. Prior research shows that financial statement users do not value the pension information in footnotes in the same way as they value balance sheet liabilities (Harper, Mister, and Strawser 1987; Landsman and Ohlson 1990; Picconi 2006). This suggests that investors may not fully incorporate the pension information provided in footnotes into their investment or stock valuation decisions. Therefore, the IAS 19R rule change is intended to improve the transparency of pension accounting information by moving previously off-balance sheet AGLs from the footnotes onto the financial statements. Given enhanced transparency, capital market participants would be better able to assess the implications of pension information (Cheng and Swenson 2018).

Two major effects of IAS 19R on the financial statements are (1) the inclusion of previously unrecorded pension liabilities (or assets) on the balance sheet and (2) the expected increase in volatility due to future changes in AGLs.[9] As demonstrated in the previous SAS example, first-time adoption of IAS 19R would have an immediate and possibly large impact on the net pension asset/liability and the accumulated OCI

[7] Ernst & Young (2011) states that: "These changes will result in increased balance sheet volatility for those entities currently applying the corridor approach. Entities should carefully consider how these changes will impact their key balance sheet metrics or debt covenants on a continuing basis."

[8] AGLs are handled differently under U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). Under U.S. GAAP, SFAS 158 requires firms to recognize AGLs as OCI, which is subsequently amortized into pension expense in net income using the corridor approach. Under the previous IAS 19, AGLs were not recognized as OCI. Instead, they were amortized into pension expense in net income using the corridor approach. Under IAS 19R, AGLs are recognized as OCI, but AGLs are no longer amortized into pension expense over time. The recognized OCI does not affect net income, but it does affect the amount of net pension liability that firms must report.

[9] We conjecture that the effect of the unrecorded pension liability (or asset) might elicit a greater investor response than the effect of the expected increase in volatility because of the immediate and significant change in the firm's financial position. We discuss IAS 19R's effects on the balance sheet and the income statement in more detail in Section 2.2.1.

for corridor firms that had unrecorded actuarial losses. Thus, these firms are more likely to violate debt covenants and other contractual agreements, which could lead to negative market reactions to the rulemaking events associated with IAS 19R. Furthermore, the expected increased volatility of OCI, equity, and net pension asset/liability arising from the IAS 19R rule change could negatively affect investor perceptions of the firm's default risk (Bao, Billett, Smith, and Unlu 2020). High equity volatility might also negatively affect shareholders' expectations about dividend distributions, especially if the firm faces dividend constraints linked to the balance sheet (i.e., retained earnings). Therefore, the market is likely to react negatively to the IAS 19R events if investors anticipate a significant increase in future balance sheet volatility.

Nonetheless, if investors have efficiently and unbiasedly processed all available pension information, they might not react to the amendments to pension accounting rules (Jin, Merton, and Bodie 2006). Alternatively, if investors simply do not understand the implications of the pension accounting changes until the effects are reflected in the financial statements, they might not react to the IAS 19R events. Furthermore, if investors perceive IAS 19R as neither value increasing nor value decreasing, any stock price around the IASB announcements associated with IAS 19R might not be significantly different between affected and unaffected firms (Khan, Li, Rajgopal, and Venkatachalam 2018).

In this study, we use a sample of firms listed on the Oslo Stock Exchange in Norway for two main reasons. First, unlike some IFRS jurisdictions, in which defined benefit pension plans are rare (e.g., Italy and Spain), the prevalence of defined benefit pension plans in Norway offers a sufficient sample size to examine the impact of IAS 19R. These sample firms also provide adequate variation in terms of their pension plan features, actuarial assumptions, and other firm characteristics, which allows us to explore the cross-sectional effects of IAS 19R. Second, our empirical analyses require pension data from the annual reports of firms with defined benefit plans and the reference rates in order to measure the discretion in firms' pension assumptions. Therefore, data availability and a manageable sample size are important considerations. Norway is one of the few IFRS jurisdictions that provides reference rates for pension assumptions. Pension guidelines issued by the Norwegian Accounting Standards Board (NASB) allow us to more accurately measure the size of discretionary pension assumptions.

Using a sample of firms with and without defined benefit pension plans ("DB' and "non-DB firms," respectively), we find that the market reacts negatively to both DB and non-DB firms and that the market reactions around the rulemaking events of IAS 19R are not significantly different between these firms. Similarly, we find no significant difference in market reactions to the IAS 19R events between corridor and noncorridor firms, or between firms with and without unrecorded actuarial losses. These findings are consistent with findings in Khan et al. (2018), which reveal no significant difference in stock price responses to the Statement of Financial Accounting Standards (SFAS) 158-related events between affected and unaffected firms.[10] However, we document that firms with higher bankruptcy risk experience significantly more negative abnormal returns around the rulemaking events of IAS 19R than firms with lower bankruptcy risk. This suggests that investors are concerned about a potential increase in the likelihood of debt covenant violations resulting from the rule change for firms that are closer to default.

In additional analyses, we show that market reactions to the IAS 19R events vary with the size of the discretionary actuarial assumptions and pension plan funding levels. Moreover, we examine how the market responds to earnings before and after the IAS 19R rule change and find no significant change in the earnings response coefficient (ERC) around the implementation of IAS 19R. Lastly, we analyze changes in financial statement volatility from the pre-IAS 19R period to the post-IAS 19R period. In contrast to expectations, we do not observe a significant change in the volatility of total liabilities, shareholders' equity, or return on assets (ROA) between DB and non-DB firms, or between corridor and noncorridor firms. This lower-than-expected change in financial statement volatility could partly explain why we do not find a significant difference in stock price responses to the IAS 19R events for affected and unaffected firms.

Our paper makes the following contributions. First, it responds to calls in Barthelme et al. (2019) and Cascino (2019) for further research that explores different settings to gauge the effects of pension accounting rules. We provide evidence from a Norwegian setting on how the IAS 19R rule change affects shareholder wealth. Anantharaman and Chuk (2018) and Barthelme et al. (2019) highlight the importance of comparing findings from a "mosaic of studies" (Glaeser and Guay 2017).[11] These comparisons enable us to better understand whether and to what extent the effects of rule changes depend on institutional features, which is important for evidence-based policymaking (Cascino 2019).

Second, our study adds to the literature on recognition versus disclosure, which is the topic of a long-standing debate in accounting and finance research. Our findings have implications for managers, regulators, and researchers, because we document how IAS 19R, which brings information on unrecorded accumulated AGLs from the footnotes onto the financial statements, is perceived by investors. Our findings imply that shareholders view the rule change as value neutral in general. However, investor responses to the IAS 19R events vary with certain firm characteristics, namely, the level of bankruptcy risk, the size of discretionary pension assumptions, and the pension plan's funding level.

Third, our study complements prior studies that examine how changes in pension accounting rules affect

[10] SFAS 158, which was issued in 2006, requires firms to recognize the full funded status of defined benefit plans on the balance sheet. SFAS 158 is similar to IAS 19R in that both standards require the recognition of pension assets or liabilities that were previously kept off-balance sheet.

[11] Anantharaman and Chuk (2018) and Barthelme et al. (2019) examine the impact of IAS 19R on pension asset allocations and find that firms shift their pension assets from equities to bonds following the adoption of IAS 19R. However, the former (latter) uses a Canadian (German) sample and attributes the findings mainly to the elimination of the expected rate of return (ERR) (the removal of the corridor approach). This difference in the channel behind the documented shift in pension asset allocations between these two studies is mostly due to the differences in institutional features between the Canadian and German settings.

firms' pension asset allocations. We provide empirical evidence that, following the adoption of IAS 19R, balance sheet volatility did not increase significantly, partly due to the measures that firms took to mitigate the expected increase in pension-induced volatility, such as altering pension asset allocations.

Our study is subject to some caveats. First, like any event study, our inferences rely on the proper identification of events that are closely related to the passage of IAS 19R. Although we have carefully selected these events based on milestones in the standard-setting process, there could still be some error in our event identification. Second, it is possible that any results are driven by confounding events or factors. Although we cannot completely rule out this possibility, we attempt to mitigate these concerns by performing a number of cross-sectional analyses to determine whether the results are stronger in situations where we have reasons to expect them to be. Third, our findings may not be generalizable to other settings. As Glaum (2009) points out, country-specific institutional differences in pension regulations, taxation, and funding requirements could affect firms' production of pension accounting information and information processing by market participants. The advantage of using a single-country setting is that it allows us to draw clearer inferences than cross-country settings, but the disadvantage is that it limits the generalizability of our findings.

The paper proceeds as follows. Section 2.2 explains the background for the pension accounting regime under IAS 19R, reviews the relevant literature, and develops the hypotheses. Section 2.3 describes the research design. Section 2.4 presents the empirical analyses and discusses the results. Section 2.5 concludes.

2.2 Background, literature, and hypotheses development

2.2.1 Pension accounting under IAS 19R

In June 2011, the IASB issued IAS 19R, which became effective for fiscal periods beginning on or after January 1, 2013, with retrospective application, meaning that the comparative figures presented in the 2013 financial statements should be based on IAS 19R. Two major changes introduced by IAS 19R are: (1) the removal of the corridor approach (and the mark-to-market (MTM) approach, which is uncommon in practice) in accounting for AGLs; and (2) the elimination of the use of the ERR (which was replaced with the discount rate) in determining the return on the plan assets component of pension expense.

We focus on the impact of IAS 19R's removal of the corridor approach on shareholder wealth for several reasons.[12] First, as the IASB pointed out, the deferral of the recognition of AGLs under IAS 19 Unrevised creates substantial off-balance sheet liabilities, which impairs the transparency of financial statements.

[12] For a detailed discussion of the effect of eliminating the use of the ERR in determining the return on the plan assets component of pension expense, see Anantharaman and Chuk (2018). The authors find that eliminating and replacing the ERR with the discount rate in the pension expense calculation reduces firms' risk-taking in pension investments, as reflected in their pension asset allocation.

Therefore, a major issue to be addressed in the amendments to IAS 19 is to eliminate off-balance sheet liabilities created by the deferred recognition of AGLs, which results in the removal of the corridor approach.

Second, the immediate recognition of current-year AGLs in OCI required by IAS 19R is likely to increase pension-induced balance sheet volatility, especially for firms that relied on the corridor approach before adopting IAS 19R (Ernst & Young 2011). The increase in the volatility of the OCI amount, equity book value, and net pension liability (and, hence, the leverage ratio) resulting from the adoption of IAS 19R could negatively affect investor perceptions of the firm's default risk (Bao et al. 2020).

Third, among the changes made by IAS 19R, practitioners consider the removal of the corridor approach to have the most significant impact in practice (Deloitte 2010). Consistent with this, anecdotal evidence suggests that this rule change may result in a significant negative effect on shareholders' equity for firms that used the corridor approach and had unrecorded actuarial losses from prior periods (see, e.g., the SAS anecdote in Appendix C).

In our sample, more than 80 percent of firm-year observations applied the corridor approach before the adoption of IAS 19R. Of these, 66 percent had a negative value for accumulated unrecorded AGLs, which accounted for about 5 percent of the book value of equity, on average. Therefore, we posit that if IAS 19R has any effect on shareholder wealth for our sample firms, the removal of the corridor approach is likely to be the main cause.[13]

IAS 19 Unrevised offers three options for accounting for AGLs. Option 1 is to immediately recognize AGLs in OCI (i.e., the OCI method). Option 2 is to recognize the portion of accumulated AGLs that exceeded the "corridor" (equal to 10 percent of the greater of the PBO or the fair value of plan assets), amortized over the remaining service years of employees, in net income (i.e., the corridor method), and the rest of the accumulated AGLs are kept off-balance sheet. Option 3 is to recognize AGLs immediately in net income (i.e., the MTM method). To improve the comparability and transparency of financial reporting, IAS 19R removes the corridor and MTM methods, leaving firms with the OCI method for accounting for AGLs. Due to the elimination of the corridor method, AGLs can no longer be kept off-balance sheet and deferred for recognition. Given the immediate recognition requirement, the recognized pension asset and liability on the balance sheet always reflect the actual funded status of pension plans.

In addition to the balance sheet effect of the removal of the corridor approach, IAS 19R can affect the income statement in two ways. First, after switching to the OCI method, firms that previously used the corridor approach can no longer recognize the amortized portion of accumulated AGLs that exceeds

[13]Our Norwegian sample shares some similarities in terms of pension plan features with the German sample used in Barthelme et al. (2019). The authors find that the documented shift from equities to bonds in pension asset allocation is mainly caused by the removal of the corridor approach, rather than the elimination of ERR under IAS 19R (which is in contrast to findings in Anantharaman and Chuk (2018) due to different settings). Therefore, considering the sample characteristics, we posit that our findings are most likely driven by the removal of the corridor approach under IAS 19R.

10 percent of the greater of the PBO or the fair value of plan assets in net income. Depending on the sign and size of the AGLs, this change could potentially improve earnings going forward. Alternatively, the replacement of the ERR with the discount rate in calculating the return on plan assets component of pension expense under IAS 19R likely has a negative effect on earnings because the discount rate tends to be lower than the ERR.[14] Therefore, the effect of the IAS 19R rule change on earnings (i.e., the income statement effect) is unclear.

In Appendix A, we discuss in more detail: (1) pension accounting under IAS 19 Unrevised, IAS 19R, and SFAS 158, as well as their effects on the balance sheet and the income statement; and (2) the calculation of pension expense under IAS 19 Unrevised versus IAS 19R. In Appendix B, we use numbers from SAS's 2013 annual report to illustrate the corridor method under IAS 19 Unrevised and the balance sheet effect of switching from the corridor method to the OCI method, as required by IAS 19R.

2.2.2 Relevant literature

Pension accounting rules are often considered complex. Pension assets, liabilities, and expenses were relatively opaque prior to IAS 19R because of pension assets and liabilities that were kept off-balance sheet. Important pension information was disclosed in footnotes, instead of being recognized in financial statements, which may have made this information less salient and more likely to be overlooked. As standard setters acknowledge, footnote disclosure is not an adequate substitute for financial statement recognition, especially for unsophisticated financial statement users. Consistent with this concern, several studies document that financial statement users fail to process pension information disclosed in footnotes, especially information related to off-balance sheet liabilities (Harper et al. 1987; Landsman and Ohlson 1990; Picconi 2006).

Among others, Picconi (2006) finds that, due to the complexity of pension accounting, investors and analysts do not fully process and incorporate the pension information available in firms' annual reports, especially information in pension footnotes, into their valuations and forecasts. Specifically, the off-balance sheet portion of the pension plan's funded status and the PBO are predictive of future stock returns, suggesting that investors fail to accurately assess these off-balance sheet items' impact on future earnings and cash flows. Other studies show that firms with defined benefit pension plans are misvalued by market participants (Franzoni and Marín 2006; Coronado, Mitchell, Sharpe, and Nesbitt 2008). These findings also suggest that investors do not fully understand the cash flow and earnings implications of pension liabilities until their effects materialize. In contrast to evidence suggesting that the market is informationally inefficient

[14]The discount rate follows the yield on high-quality corporate bonds that are traded in the same currency as the PBO and matched to the duration of the PBO. If there is not a deep market for these bonds, the discount rate should follow the yields on government bonds. Firms with plan assets allocated to riskier securities usually have a higher ERR than the discount rate. Consequently, replacing the ERR with the discount rate in the calculation could reduce the interest income on pension assets, thereby negatively impacting earnings.

with respect to processing pension accounting information, Jin et al. (2006) find that the market appears to process all available pension information in an unbiased way.

In general, by moving off-balance sheet AGLs from the footnotes to the financial statements, the adoption of IAS 19R is expected to improve the transparency of pension accounting information and make this information more salient. Given this enhanced transparency, capital market participants should be better able to accurately assess the implications of firms' pension positions. Consistent with this reasoning, Cheng and Swenson (2018) find that more transparent reporting (i.e., full recognition of net pension assets/liabilities) and improved pension disclosure enable financial statement users to better understand the funded status of defined benefit plans and their implications. However, improved transparency can have negative economic consequences for some firms. Kalogirou, Kiosse, and Pope (2021) document a higher cost of debt for financially risky firms that report unexpectedly high pension deficits after adopting IAS 19 Unrevised. As the increased transparency resulting from IAS 19 adoption reveals higher than expected pension deficits for financial risky firms, it leads to an increase in their cost of debt.

Overall, improved transparency from changes in pension accounting rules may be beneficial for investors by enabling them to better assess the implications of pension information. However, it may not be universally beneficial for all firms because if it reveals some negative information, firms' cost of capital could increase.

2.2.3 Hypotheses development

Upon adoption of IAS 19R, firms must adjust both the net pension asset or liability and accumulated OCI by the amount of the previously unrecorded accumulated AGLs. For firms with substantial accumulated actuarial losses that were not recorded under the corridor method, this change may have a significant negative impact on shareholders' equity and, thereby, put the financial position of these firms in jeopardy. In addition, under IAS 19R, firms are required to report subsequent AGLs in OCI as they occur. This immediate recognition of AGLs increases the expected volatility of OCI, equity book value, and net pension liability. Because certain debt covenants are based on accounting ratios (e.g., the debt-to-equity ratio), high equity volatility would increase the likelihood of violating accounting-based debt covenants and, hence, may negatively affect investor perceptions of the firm's default risk (Bao et al. 2020). High equity volatility might also negatively affect shareholders' expectations about dividend distributions, especially if the firm faces dividend constraints linked to the balance sheet.

Prior research documents that firms are concerned about pension-induced equity volatility and, thus, are likely to take actions (e.g., alter pension asset allocations or terminate/freeze defined benefit pension plans[15])

[15] In addition to the SAS example mentioned earlier, Norwegian Air Shuttle ASA terminated defined benefit plans in December 2012, which could, in part, be related to the adoption of IAS 19R, although the firm did not explicitly state its reason.

to mitigate this undesirable volatility (Amir, Guan, and Oswald 2010; Barthelme et al. 2019).[16] For example, in a comment letter on the exposure draft of IAS 19R submitted to the IASB in 2010, Deutsche Post AG stated that: "From a conceptual viewpoint, we are not convinced that highlighting short-term volatility provides any additional relevant information to the reader of financial statements and may, in addition, lead to inefficient investment decisions by entities (in order to avoid such volatility)" (Deutsche Post AG 2010). This suggests that firms view the expected increase in volatility arising from the rule change in IAS 19R as negative and that they may take suboptimal actions (e.g., make inefficient pension investment decisions) to avoid this volatility. These actions, in turn, can negatively affect shareholder wealth.

Most of our sample firms have underfunded pension plans and unrecorded accumulated actuarial losses. For these firms, the adoption of IAS 19R likely results in a weakened balance sheet and a decrease (increase) in shareholders' equity (liabilities). This increases their probability of violating debt covenants, which could lead to negative market reactions to the rulemaking events associated with IAS 19R. However, if investors already fully understand pension accounting rules and process all available pension information in an unbiased manner, they would not react to the amendments to the pension accounting rules introduced by IAS 19R. In other words, if investors perceive the IAS 19R rule change as value neutral, stock price reactions to the rulemaking events should not be significantly different for firms that are affected and those that are not affected by this rule change (Khan et al. 2018). Because we do not expect investors to be this sophisticated, our hypothesis, stated in the alternative, is as follows:

H1: Firms affected by IAS 19R experience negative abnormal returns around significant IAS 19R rulemaking events.

Furthermore, we expect changes in the stock price response to differ with firms' probability of bankruptcy. Chang (2009) documents that stock market participants react more negatively to the events related to SFAS 158 for firms with underfunded pension plans that have a higher probability of bankruptcy. The author argues that firms with defined benefit pension plans may suffer a negative market reaction around the rulemaking events of SFAS 158 if they have a higher likelihood of violating debt covenants or other contractual arrangements due to their underfunded status after SFAS 158. The negative market reaction is expected to be stronger for firms that are more likely to violate debt covenants or contractual arrangements, such as those with higher bankruptcy risk. Relatedly, Rauh (2009) provides evidence on the effect of financial distress (or bankruptcy risk) on firms' pension investment strategies by showing that more financially distressed firms allocate less pension assets to equities because their risk-management incentives lead them to limit costly

[16] The interview evidence in Barthelme et al. (2019) indicates that firms are concerned about equity volatility resulting from the elimination of the corridor method under IAS 19R and that these concerns are distinct from their concerns about earnings volatility.

financial distress. If these pension investment decisions are inefficient or suboptimal, they can negatively affect shareholder wealth.

As discussed above, IAS 19R is expected to increase the volatility of OCI, equity, and net pension liability. Investor perceptions of the firm's default risk might increase when balance sheet volatility rises as a result of the rule change. Because certain accounting-based debt covenants are tied to financial statement metrics that involve the book value of equity and liability (e.g., the debt-to-equity ratio), pension-induced volatility is likely to increase the likelihood of debt covenant violations. Thus, we expect stronger market reactions to the rulemaking events of IAS 19R for firms with higher bankruptcy risk because they are closer to debt-covenant violations. This leads to the following hypothesis, stated in the alternative:

H2: Negative abnormal returns around significant IAS 19R rulemaking events are more pronounced for firms that are affected by IAS 19R and have higher bankruptcy risk.

2.3 Research design

2.3.1 Measuring cumulative abnormal returns

To examine how the IAS 19R rule change affects shareholder wealth, we perform an event study that measures cumulative abnormal returns (CARs) for each firm around IASB announcements that increased the probability of the passage of IAS 19R. Following the IASB's due process for standard setting, we identify five rulemaking events associated with IAS 19R, which are described in Table 1, Panel A.[17] Consistent with Khan et al. (2018), the event dates included in our analyses are important announcements made directly by the IASB that are likely to influence investor expectations about the passage of IAS 19R. These announcements include placing the item on the IASB's agenda, releasing the exposure draft, and issuing the final standard. Details on the potential amendments to pension accounting rules are revealed in conjunction with each event, and the certainty about the implementation of IAS 19R also increases after each event. Hence, investors' ability to assess the potential impact of the IAS 19R rule change should improve as the standard-setting process proceeds.

We calculate CAR from the day before to the day after the IASB announcement (i.e., over the three-day window $[-1, +1]$). To control for potential confounding effects of firm size, growth opportunities, and market-wide factors, we calculate abnormal returns using the Fama-French three-factor model. Abnormal

[17]In Appendix D, we provide a list of 19 events broadly pertaining to IAS 19R. We conduct a univariate analysis comparing the stock price reactions for DB and non-DB firms around the event dates (the results are qualitatively similar when comparing firms that used the corridor method to firms that did not use the corridor method within the sample of DB firms). Although these events are related to IAS 19R, many of them are not directly from the IASB or are internal IASB events that the public may not be aware of. Therefore, we focus on the five events that are the key milestones in the IASB standard-setting process. We thank the discussant for the suggested list of events.

returns are the residuals from Equation (1). The coefficients are estimated using returns from 250 trading days ending two days before the announcement:

$$r_i = r_f + \beta_m(r_m - r_f) + \beta_{SMB}SMB + \beta_{HML}HML + \varepsilon \tag{1}$$

where r_i is the return on the security i, r_f is the risk-free rate, r_m is the market return, and SMB and HML are FamaFrench factors that adjust for the size and value effects. We use daily Norwegian interbank offered rates (NIBOR) as the risk-free rate, the OBX Total Return Index as the market return, and Fama-French size and book-to-market portfolios consisting of stocks from the Oslo Stock Exchange for the SMB (Small Minus Big) and HML (High Minus Low) factors.[18]

2.3.2 Main regression model

To investigate stock price reactions to the IASB announcements associated with IAS 19R and assess the effect of the IAS 19R rule change on shareholder wealth, we estimate the following ordinary least squares (OLS) regression model:

$$\begin{aligned} CAR = {} & \beta_0 + \beta_1 EVENT2 + \beta_2 EVENT3 + \beta_3 EVENT4 + \beta_4 EVENT5 + \beta_5 SIZE + \beta_6 BM \\ & + \beta_7 ROA + \beta_8 LEV + IndustryFixedEffects + \varepsilon \end{aligned} \tag{2}$$

CAR is the three-day CAR estimated using the Fama-French three-factor model, as described above. $EVENTX$ is an indicator variable for each of the IAS 19R rulemaking events. To control for other factors that may affect stock prices, we incorporate firm size ($SIZE$), book-to-market ratio (BM), ROA (ROA), and leverage (LEV) into the model. We also include industry fixed effects to control for cross-industry variation, where the industry classification is based on two-digit Global Industry Classification Standard (GICS) codes. We provide detailed variable definitions in Appendix E.

2.4 Empirical results

2.4.1 Sample, data, and descriptive statistics

Table 1, Panel B summarizes the sample-selection procedure. We obtain the accounting and stock return data from Compustat Global and collect pension-related data, including actuarial assumptions, from firms' annual reports. Our initial sample consists of 1,194 firm-year observations for firms listed on the Oslo Stock

[18] The OBX Total Return Index consists of the 25 most liquid shares traded on the Oslo Stock Exchange. The SMB factor accounts for the spread between firms with small and large market capitalization, and the HML 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 constructed following Fama and French (1996).

Exchange with data available in Compustat Global at the end of the year prior to each event. We drop 147 observations with annual reports that are unavailable to hand collect the required pension data. We also drop 137 observations with missing returns during the event window or an insufficient number of returns to calculate CAR, 1 duplicate observation due to a fiscal-year change, and 206 observations with missing values for the main regression variables. This leaves a sample of 703 firm-year observations, 403 of which have defined benefit pension plans. Of the 403 observations with defined benefit plans, 340 used the corridor method and 63 used the OCI method or the MTM method before adopting IAS 19R.

Table 2 presents the sample distribution across industries, descriptive statistics, and correlations among variables for the sample of firms with defined benefit plans. The industry distribution in Panel A indicates that the majority of our sample firms are in the industrials and energy sectors. The descriptive statistics in Panel B show that the average CARs are negative around the IASB announcements associated with IAS 19R. More than 80 percent of the sample firms used the corridor approach before the adoption of IAS 19R, and 66 percent of these had negative unrecorded accumulated AGLs. The average of the unrecorded accumulated AGLs is negative and accounts for 0.8 percent of total assets. Our sample firms, on average, have underfunded pension plans (i.e., they have larger pension liabilities than pension assets). The average discretionary discount rate and compensation rate are positive, indicating that firms' pension assumptions for the discount and compensation rates tend to be more liberal than the rates suggested by the NASB guidelines. However, the average discretionary ERR is negative, indicating that our sample firms are more conservative in their ERR assumption or pension asset allocation. In Panel C, the correlation coefficients indicate that CARs are significantly and positively correlated with the size of discretion in the compensation rate. We also observe a positive correlation between firms that used the corridor method and had unrecorded actuarial losses and the probability of bankruptcy.

2.4.2 Regression results

Main analyses

First, we examine stock price reactions around the IASB announcements that increase the likelihood of the passage of IAS 19R and report the results in Table 3. We estimate the main regression model in Equation (2) using a sample of DB firms in column (1) and a sample of non-DB firms in column (2). The IAS 19R rule change affects DB firms, but not non-DB firms, so non-DB firms serve as a control sample in this analysis. We find significant and negative coefficients for *EVENT2*, *EVENT3*, *EVENT4*, and *EVENT5* in both columns (1) and (2), indicating negative stock price reactions when the IASB published a discussion paper, an exposure draft, a near-final draft, and a final standard of IAS 19R, respectively, for both DB and non-DB firms. Column (3) shows no significant difference in the coefficients between DB firms in column (1) and non-DB firms in column (2). This suggests that shareholders view the IAS 19R rule change as value neutral. One possible reason for this finding could be that pension information was already included in the notes to the financial statements and, hence, might have already been understood by investors. Alternatively, investors might be unaware of future changes in firm-specific liability or OCI volatility on the various rulemaking event dates.

Next, we investigate whether stock price reactions depend on the extent to which the rule change affects firms' financial statements. Among DB firms, firms that used the corridor method to account for AGLs before IAS 19R (i.e., $CORRIDOR\_USE = 1$) and firms that had a negative value for the unrecorded amount of accumulated AGLs (i.e., $UA\_AGL\_NEG = 1$) are likely to be more affected by the adoption of IAS 19R due to the recognition requirement. The results of this subsample analysis are presented in Table 4. Panel A, column (3), which compares stock price reactions for firms with $CORRIDOR\_USE = 1$ and firms with $CORRIDOR\_USE = 0$, shows no significant difference in market reactions around the IAS 19R events for corridor and noncorridor firms. Panel B compares stock price reactions for firms with $UA\_AGL\_NEG = 1$ and firms with $UA\_AGL\_NEG = 0$.[19] Similar to the results in column (3) of Panel A, we find that market reactions around the IAS 19R events are not significantly different between firms with a negative value for unrecorded accumulated AGLs and firms with a positive value for unrecorded accumulated AGLs.

Overall, we find partial evidence supporting H1, which suggests that stock market participants react negatively to IASB announcements related to IAS 19R for affected firms. However, we do not find a significant difference in stock price reactions for affected and unaffected firms. This finding is consistent with finding in Khan et al. (2018), which documents an insignificant difference in market reactions to events related to SFAS 158 for affected and unaffected firms.

To test whether stock price reactions to the rulemaking events of IAS 19R are stronger for firms with higher bankruptcy risk (H2), we partition the sample of firms that used the corridor method into two subsamples based on the sample median of the probability of bankruptcy measure. We follow Zmijewski (1984) to measure the probability of bankruptcy (PB).[20] We estimate Equation (2) for the subsamples separately and present the results in columns (1)–(3) of Table 5. Furthermore, to examine whether stock price reactions to the IAS 19R events for firms with a negative value for unrecorded accumulated AGLs vary with the level of bankruptcy risk, we include an indicator variable, UA_AGL_NEG, and its interaction with the event variables in columns (4)–(6) of Table 5.

We find a negative and significant coefficient on $EVENT4$ in columns (3) and (6), indicating that when the

[19]We also partition the sample into two subsamples based on the terciles of the unrecognized AGL amounts scaled by total assets (i.e., UA_AGL)—one subsample contains observations with the largest negative AGLs, and the other contains all other observations in the middle and top terciles. The results are similar to those reported in Table 4, Panel B.

[20]In an untabulated analysis, we use Ohlson (1980) O-score and Altman (1968) Z-score as alternative proxies for bankruptcy risk and obtain similar inferences.

IASB released the near-final draft of IAS 19R, firms with higher bankruptcy risk experienced more negative abnormal returns than firms with lower bankruptcy risk. However, the coefficients on all interactions between UA_AGL_NEG and the event variables are not significantly different for firms with higher bankruptcy risk and firms with lower bankruptcy risk. This suggests that whether firms had unrecorded actuarial losses did not affect market reactions to the IAS 19R events, regardless of their level of bankruptcy risk. Overall, the findings in Table 5 support our H2—that the market reacts to the rulemaking events surrounding IAS 19R more negatively for firms that have higher bankruptcy risk.

Additional analyses

To complement our main findings, we investigate whether market reactions around the IASB announcements associated with IAS 19R vary with the size of the discretionary actuarial assumptions and pension plan funding levels. A firm's pension position is highly sensitive to the pension plan's actuarial assumptions.[21] The way in which firms exercise their discretion in actuarial assumptions is influenced by their earnings management and contracting incentives (Bergstresser et al. 2006; Jones 2013). All else equal, firms that use more liberal actuarial assumptions are presumably more likely to have actuarial losses in the future than firms that use less liberal actuarial assumptions. These former firms could thereby be affected more negatively by the removal of the corridor method under IAS 19R. We therefore expect market reactions around the rulemaking events of IAS 19R to be stronger for firms that use more liberal pension assumptions.

In our analyses related to the size of discretionary pension assumptions, we focus on three important pension assumptions: the ERR, the discount rate, and the compensation rate (i.e., the wage growth rate). These assumptions have a significant impact on the pension position relative to other pension assumptions (Naughton 2019). To capture the size of discretion in actuarial assumptions, we use the reference rates provided in the NASB's pension guidelines as a benchmark. We measure the size of discretion in the ERR (ERR_D) and the discount rate ($DISC\_D$) as the actual ERR and discount rate used by firms minus the ERR and discount rate suggested by the NASB. To make the interpretation of the discretionary compensation rate ($COMP\_D$) consistent with ERR_D and $DISC\_D$, we measure the size of discretion in the compensation rate as the compensation rate suggested by the NASB minus the actual compensation rate used by firms. Positive values for ERR_D, $DISC\_D$, and $COMP\_D$ indicate that the firm uses more liberal actuarial assumptions, yielding a lower pension liability/cost.[22]

[21]For example, in the notes to the 2013 financial statements, SAS estimated that a 1 percent reduction in the discount rate would have increased its total pension obligations by 11.91 percent, or Swedish kronor (SEK) 3,400 million.

[22]Using a higher discount rate and a lower compensation rate will reduce the amount of the PBO, and using a higher ERR will reduce the pension cost. Thus, if a firm uses a higher ERR and discount rate and a lower compensation rate relative to the reference rates suggested by the NASB, it means that its actuarial assumptions are more liberal.

We perform this test by estimating in Equation (2) using two subsamples partitioned based on the median of the size of the discretionary actuarial assumption for the ERR, the discount rate, and the compensation rate. Similar to columns (4)–(6) in Table 5, we also include UA_AGL_NEG and its interaction with the event variables to examine the joint effect of discretionary actuarial assumptions and unrecorded actuarial losses on market reactions to IAS 19R events. The results for ERR_D, $DISC\_D$, and $COMP\_D$ are reported in Table 6, Panels A, B, and C, respectively.[23] We find that the market reacts more negatively to the IAS 19R rulemaking events for firms with more liberal actuarial assumptions than for firms with more conservative actuarial assumptions, as indicated by the negative and significant coefficients for some of the event variables in column (3). As shown in column (6), the coefficients on the interactions between UA_AGL_NEG and the event variables are mostly insignificantly different for firms that use more liberal actuarial assumptions and firms that use more conservative actuarial assumptions. Together, these results indicate that stock price reactions to IAS 19R events vary with the size of discretionary actuarial assumptions, but the reactions are not affected by whether firms had unrecorded actuarial losses.

Next, we examine the effect of the pension plan's funding level on stock price reactions to the IAS 19R events. Chang (2009) documents that stock price responses to announcements related to SFAS 158 vary with firms' funded status and their proximity to debt covenant violation. The author argues that, upon adoption, the SFAS 158 rule change would lead to a decline in shareholders' equity for firms with underfunded pension plans, which might reduce some firms' ability to pay dividends or increase the probability of debt covenant violation. Therefore, firms with underfunded pension plans are more likely to experience negative stock returns around the rulemaking events of SFAS 158.

We perform our analysis by augmenting Equation (2) with interactions between UA_AGL_NEG and the event variables using subsamples partitioned based on the median pension plan funding level. We measure the funding level (FL) as the difference between pension assets and pension liabilities deflated by total assets. The results in Table 7 indicate that stock price reactions are more negative for firms with a higher funding level than for firms with a lower funding level, which seems counterintuitive and inconsistent with Chang (2009). One possible explanation could relate to pension asset allocations that these firms use to mitigate pension-induced volatility. Barthelme et al. (2019) finds that firms affected by IAS 19R significantly shift their pension assets from equities into bonds in order to reduce pension-induced volatility and that this shift is less pronounced for firms with larger and better-funded pension plans. If firms with larger and better-funded pension plans fail to sufficiently mitigate pension-induced volatility, investors might react

[23] In columns (4)–(6) of Panel C, $EVENT5 \times UA\_AGL\_NEG$ is automatically dropped in the regression estimation due to the singularity resulting from the sample partition. Because 152 of the 340 observations in this sample have a value of 0 for $COMP\_D$, partitioning the sample based on the median of $COMP\_D$ leads to an uneven distribution of observations across the events, which creates estimation problems.

negatively. Another possible explanation could relate to firms' actuarial assumptions for their pension plans. A pension plan's funding level looks better if the firm uses more liberal pension assumptions. Consequently, the results in Table 7 may be confounded by the effects of pension assumptions.[24] Similar to the results in columns (4)–(6) of Tables 5 and 6, we do not find that the market reactions conditional on the funding level vary with the existence of unrecorded actuarial losses.

Other analyses and robustness checks

Next, we perform an ERC test to provide evidence on how the market responds to earnings that are affected by changes in pension accounting under IAS 19R.[25] As explained above, earnings are affected by both the removal of the corridor method and the replacement of the ERR with the discount rate under IAS 19R. However, the net effect of IAS 19R on earnings informativeness is unclear. On the one hand, the replacement of the ERR with the discount rate could make earnings less informative because the interest income on plan assets (i.e., a component of net interest) no longer reflects the expected return on plan asset investments. On the other hand, the removal of the corridor method could make earnings more informative because earnings are no longer affected by the amortization of amount that exceeds 10 percent of the greater of the PBO or the fair value of plan assets. Following Lundholm and Myers (2002), we regress the annual return (R) on the prior year's earnings (X_LAG) and the current year's earnings (X), and we include an indicator variable ($POST$) for the post-IAS 19R period, as well as its interactions with X and X_LAG. Table 8 reports the results, controlling for different fixed effects in different columns. The results indicate no significant change in the ERC from the pre-IAS 19R period to the post-IAS 19R period.[26]

In addition to the ERC test, we perform a value-relevance test to examine whether investors price accounting numbers differently before and after the IAS 19R rule change. In this untabulated analysis, we find that the value relevance of earnings and shareholders' equity do not change after the adoption of IAS 19R. This finding is consistent with our finding for the ERC in Table 8.

As discussed earlier, companies (e.g., Deutsche Post AG) and practitioners (e.g., Ernst & Young) expect the requirement to recognize AGLs in OCI introduced by IAS 19R to increase balance sheet volatility. To test whether this is the case, we examine changes in firms' financial statement volatility around the implementation of IAS 19R.[27] As shown in Table 9, coefficients on the difference-in-differences estimators

[24] The negative market reactions for firms that use more liberal actuarial assumptions (as shown in Table 6) and for firms with seemingly healthier pension plans (as shown in Table 7) suggest that there is some overlap between these two groups of firms and that the financial health of pension plans is partly due to the use of liberal actuarial assumptions.

[25] Note that the sample in this test is different from the sample in our main analyses. The ERC sample contains DB firms that have nonmissing values for earnings and stock returns for fiscal years from 2011 through 2014 (i.e., two years before and after IAS 19R became effective).

[26] Our ERC results could be affected by other concurrent events around the implementation of IAS 19R. Therefore, we caution readers against drawing a causal inference regarding the impact of the rule change on earnings informativeness from these results.

[27] As in the ERC and value-relevance tests, the sample period for this analysis is from 2011 through 2014.

$DB \times POST$ in Panel A and $CORRIDOR\_USE \times POST$ in Panel B are positive, but insignificant, for the volatility of total liabilities, shareholders' equity, and ROA. These results suggest that the changes in financial statement volatility around IAS 19R are not significantly different between affected and unaffected firms, which does not support managers' and accountants' beliefs that the rule change would increase balance sheet volatility. One explanation could be that managers took actions to mitigate the expected increase in balance sheet volatility resulting from the adoption of IAS 19R. Alternatively, changes in year-to-year AGLs might not be large enough to cause significant volatility in financial statements in general.

In robustness checks, we also control for the pension size, the funding level, and the amount of unrecorded accumulated AGLs. The results are similar. We also use a five-day CAR and obtain qualitatively similar results, suggesting that our inferences are not sensitive to the choice of event window.

2.5 Conclusion

This paper examines the effect of changes in pension accounting under IAS 19R on shareholder wealth. Using a sample of publicly traded firms in Norway, we find negative stock price reactions around the rulemaking events of IAS 19R for firms both with and without defined benefit pension plans. Consistent with Khan et al. (2018), we do not find a significant difference in the stock price responses between affected and unaffected firms, suggesting that the IAS 19R rule change is value neutral to shareholders. However, we document that stock price reactions are more negative for firms with higher bankruptcy risk. This suggests that investors might be concerned that the IAS 19R rule change could increase the likelihood of debt covenant violations for these firms. We also document that the market reacts more negatively to IAS 19R events for firms with more liberal actuarial assumptions and firms with better-funded pension plans. However, we find no significant change in the ERC and value relevance of earnings and shareholders' equity around the implementation of IAS 19R. Overall, our results provide evidence on how investors respond to the amendment of the pension accounting rules under IAS 19R.

Although improved transparency of pension accounting information may help investors better understand and assess the implications of pensions, transparency might not be universally beneficial for all firms, especially when it reveals new information that is viewed negatively by investors (Cheng and Swenson 2018; Kalogirou et al. 2021). To gain a better understanding of whether and when improved pension accounting transparency is and is not beneficial, future research can investigate other economic consequences that are likely caused by changes in pension accounting rules. For example, researchers could examine whether the implementation of IAS 19R affects analyst forecasts and stock price synchronicity to determine whether IAS 19R helps improve the usefulness of pension accounting information, as reflected in analyst forecast properties and stock price synchronicity.

2.6 Tables

Table 1: Description of selected IAS 19R rulemaking events and sample selection

Panel A: Selected rulemaking events associated with IAS 19R

Event	Date	Description
1	June 29, 2006	A revision of IAS 19 was added to the agenda during the IAS Committee Foundation trustees' meeting, pointing out that pension accounting under IAS 19 allows entities to exclude substantial liabilities from the balance sheet.
2	March 27, 2008	The IASB published a discussion paper on IAS 19. The deferral of the recognition of actuarial gains and losses is characterized as impairing financial statement transparency and comparability.
3	April 29, 2010	The IASB published an exposure draft of proposed amendments to IAS 19, including the removal of the corridor method, changes in pension cost components, and increased disclosure.
4	June 6, 2011	The IASB released a near-final draft of the amendments to IAS 19 (i.e., IAS 19R).
5	June 16, 2011	The IASB issued IAS 19R, which is effective for fiscal periods beginning on or after January 1, 2013.

Panel B: Sample selection

	Firm-years
Firms listed on the Oslo Stock Exchange with data available in Compustat Global at the end of the year prior to each event	1,194
Less:	
Firms with defined benefit pension plans whose annual reports are unavailable for hand collection of the pension data	−147
Firms with missing returns during the event window or an insufficient number of returns for estimating the Fama-French three-factor model	−137
Duplicate observation due to the fiscal year change	−1
Firms with missing values for main regression variables	206
Final sample	703
Among which:	
Firms without defined benefit pension plans (i.e., non-DB firms)	300
Firms with defined benefit pension plans (i.e., DB firms)	403
Among which:	
DB firms that used the corridor method before IAS 19R	340
DB firms that used the OCI method or the MTM method before IAS 19R	63

Table 2: Sample distribution, descriptive statistics, and correlations

Panel A: Industry distribution

Industry (GICS codes)	Frequency	Percent
Energy (10)	109	27.05
Materials (15)	24	5.96
Industrials (20)	139	34.49
Consumer discretionary (25)	28	6.95
Consumer staples (30)	33	8.19
Health care (35)	12	2.98
Financials (40)	4	0.99
Information technology (45)	38	9.43
Telecom (50)	13	3.23
Utilities (55)	3	0.74
Total	403	100.00

Panel B: Descriptive statistics

	N	Mean	Median	S.D.	Q1	Q3
CAR	403	−0.001	0.001	0.045	−0.023	0.021
CORRIDOR_USE	403	0.844	1.000	0.364	1.000	1.000
UA_AGL_NEG	403	0.663	1.000	0.473	0.000	1.000
UA_AGL	403	−0.008	−0.001	0.027	−0.006	0.000
PB	403	−1.149	−1.006	1.368	−1.949	−0.372
ERR_D	403	−0.001	0.000	0.008	−0.002	0.003
DISC_D	403	0.001	0.000	0.004	−0.001	0.002
COMP_D	403	0.003	0.000	0.005	0.000	0.005
FL	403	−0.020	−0.009	0.026	−0.025	−0.002
SIZE	403	8.263	8.287	1.622	7.205	9.370
BM	403	0.753	0.605	0.529	0.375	0.999
ROA	403	0.026	0.031	0.119	−0.011	0.079
LEV	403	0.322	0.325	0.208	0.154	0.476

Panel C: Correlations

	N	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) *CAR*	403		−0.043	−0.034	−0.008	−0.058	**0.085**	−0.006	**0.207**
(2) *CORRIDOR_USE*	403	−0.017		**0.603**	**−0.134**	**0.135**	**0.106**	**−0.136**	−0.065
(3) *UA_AGL_NEG*	403	−0.009	**0.603**		**−0.295**	**0.148**	0.042	−0.069	−0.016
(4) *UA_AGL*	403	−0.011	**−0.360**	**−0.821**		−0.020	−0.046	**−0.101**	**−0.188**
(5) *PB*	403	−0.040	**0.147**	**0.203**	**−0.118**		**0.102**	**0.086**	**−0.114**
(6) *ERR_D*	403	0.020	0.003	−0.051	0.070	0.072		**0.153**	**0.232**
(7) *DISC_D*	403	−0.014	**−0.140**	**−0.107**	**0.102**	0.017	**0.581**		**0.152**
(8) *COMP_D*	403	**0.177**	−0.060	0.009	**−0.095**	**−0.098**	**0.105**	**0.104**	
(9) *FL*	403	−0.024	0.047	0.022	**0.266**	**0.102**	−0.018	−0.022	**−0.112**
(10) *SIZE*	403	−0.049	0.049	**0.097**	0.028	**0.148**	**0.124**	0.005	**0.085**
(11) *BM*	403	**−0.085**	**0.114**	**0.091**	−0.056	0.079	−0.066	−0.076	**−0.087**
(12) *ROA*	403	−0.001	**−0.121**	**−0.128**	**0.085**	**−0.646**	0.037	−0.006	**0.163**
(13) *LEV*	403	−0.033	**0.140**	**0.149**	0.063	**0.647**	0.012	−0.055	**−0.189**

	N	(9)	(10)	(11)	(12)	(13)
(1) *CAR*	403	−0.015	−0.044	−0.032	0.034	−0.057
(2) *CORRIDOR_USE*	403	−0.047	0.010	**0.111**	**−0.099**	**0.137**
(3) *UA_AGL_NEG*	403	−0.044	0.062	0.054	**−0.100**	**0.151**

(4) *UA_AGL*	403	**0.358**	0.000	−0.062	0.016	**0.167**
(5) *PB*	403	0.064	**0.097**	0.032	**−0.691**	**0.638**
(6) *ERR_D*	403	−0.046	**0.166**	−0.006	0.027	**0.132**
(7) *DISC_D*	403	0.035	**0.084**	−0.020	−0.016	0.016
(8) *COMP_D*	403	−0.057	**0.096**	−0.066	**0.128**	**−0.180**
(9) *FL*	403		**0.143**	**0.184**	−0.056	**0.337**
(10) *SIZE*	403	**0.127**		**0.140**	**0.149**	**0.241**
(11) *BM*	403	**0.173**	**0.223**		**−0.103**	**0.251**
(12) *ROA*	403	**−0.110**	0.029	**−0.310**		**−0.303**
(13) *LEV*	403	**0.355**	**0.282**	**0.323**	**−0.430**	

All continuous variables are winsorized at the 1st and 99th percentiles.
The sample consists of firms with defined benefit plans.
Pearson (Spearman) correlations are reported above (below) the diagonal. Values in bold are significant at the 0.10 level or better.
Variables are as defined in Appendix E.

Table 3: Stock price reactions to rulemaking events associated with IAS 19R

Dependent variable = *CAR*	(1) DB firms	(2) Non-DB firms	(3) Difference (1) − (2)
Intercept	−0.007	−0.022	0.015
	(−0.571)	(−1.172)	(0.685)
EVENT2	−0.020***	−0.024***	0.005
	(−2.913)	(−2.801)	(0.430)
EVENT3	−0.020***	−0.028**	0.008
	(−2.856)	(−2.531)	(0.627)
EVENT4	−0.025***	−0.023**	−0.003
	(−3.356)	(−2.316)	(−0.230)
EVENT5	−0.013*	−0.019*	0.005
	(−1.802)	(−1.735)	(0.412)
SIZE	0.001	0.005**	−0.004
	(1.015)	(2.125)	(−1.448)
BM	0.002	−0.002	0.004
	(0.458)	(−0.505)	(0.682)
ROA	0.005	−0.016	0.021
	(0.411)	(−0.864)	(0.949)
LEV	0.005	0.003	0.003
	(0.437)	(0.195)	(0.154)
Industry fixed effects	Included	Included	
R^2	0.056	0.069	
N	403	300	

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 4: Stock price reactions conditional on the use of the corridor method and the sign of the unrecognized accumulated actuarial gains and losses

Panel A: Use of the corridor method (*CORRIDOR_USE*)

Dependent variable = *CAR*	(1) *CORRIDOR_USE* = 1	(2) *CORRIDOR_USE* = 0	(3) Difference (1) − (2)
Intercept	−0.016	0.028	−0.044
	(−1.372)	(0.597)	(−0.924)
EVENT2	−0.016**	−0.023	0.007
	(−2.307)	(−1.119)	(0.336)
EVENT3	−0.016**	−0.033*	0.017
	(−2.080)	(−1.791)	(0.850)
EVENT4	−0.023***	−0.026	0.003
	(−2.840)	(−1.440)	(0.139)
EVENT5	−0.010	−0.022	0.011
	(−1.311)	(−1.040)	(0.525)
SIZE	0.002*	0.002	0.001
	(1.720)	(0.392)	(0.131)
BM	0.002	−0.028*	0.030**
	(0.481)	(−1.999)	(2.058)
ROA	0.002	−0.291**	0.293**
	(0.135)	(−2.190)	(2.228)
LEV	0.005	−0.018	0.023
	(0.385)	(−0.486)	(0.589)
Industry fixed effects	Included	Included	
R-squared	0.055	0.273	
N	340	63	

Panel B: Sign of the unrecognized accumulated actuarial gains and losses (*UA_AGL_NEG*)

Dependent variable = *CAR*	(1) *UA_AGL_NEG* = 1	(2) *UA_AGL_NEG* = 0	(3) Difference (1) − (2)
Intercept	−0.013	−0.038*	0.025
	(−0.851)	(−1.809)	(1.019)
EVENT2	−0.016**	−0.017	0.000
	(−2.054)	(−1.606)	(0.019)
EVENT3	−0.012	−0.026**	0.014
	(−1.410)	(−2.123)	(0.950)
EVENT4	−0.021**	−0.027**	0.006
	(−2.194)	(−2.064)	(0.367)
EVENT5	−0.010	−0.002	−0.008
	(−1.273)	(−0.147)	(−0.498)
SIZE	0.001	0.007***	−0.006**
	(0.665)	(2.890)	(−2.090)
BM	0.001	0.000	0.001
	(0.116)	(0.033)	(0.050)
ROA	0.005	−0.005	0.010
	(0.249)	(−0.172)	(0.282)
LEV	0.015	−0.027	0.041
	(1.084)	(−0.915)	(1.324)
Industry fixed effects	Included	Included	
R^2	0.064	0.204	
N	267	73	

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 5: Stock price reactions conditional on the probability of bankruptcy and the existence of unrecognized accumulated actuarial losses

Dependent variable = *CAR*	(1) High *PB*	(2) Low *PB*	(3) Difference (1) − (2)	(4) High *PB*	(5) Low *PB*	(6) Difference (4) − (5)
Intercept	−0.025	−0.013	−0.013	−0.033	−0.003	−0.030
	(−0.794)	(−0.876)	(−0.370)	(−0.980)	(−0.201)	(−0.814)
EVENT2	−0.028*	−0.010	−0.018	−0.020	−0.022	0.001
	(−1.976)	(−1.199)	(−1.113)	(−1.614)	(−1.189)	(0.063)
EVENT3	−0.029*	−0.009	−0.019	−0.049**	−0.017	−0.031
	(−1.815)	(−1.086)	(−1.097)	(−2.351)	(−1.118)	(−1.234)
EVENT4	−0.045***	−0.008	−0.037**	−0.074***	−0.014	−0.059**
	(−2.924)	(−1.120)	(−2.232)	(−3.125)	(−1.243)	(−2.297)
EVENT5	−0.023	−0.005	−0.018	0.002	−0.010	0.012
	(−1.480)	(−0.811)	(−1.035)	(0.034)	(−0.801)	(0.241)
SIZE	0.002	0.003**	−0.000	0.003	0.003**	−0.000
	(0.708)	(2.282)	(−0.104)	(0.910)	(2.210)	(−0.046)
BM	0.005	−0.004	0.008	0.003	−0.005	0.008
	(0.680)	(−0.523)	(0.857)	(0.350)	(−0.740)	(0.777)
ROA	0.021	−0.031	0.052	0.012	−0.035	0.048
	(0.785)	(−1.540)	(1.567)	(0.446)	(−1.629)	(1.334)
LEV	0.036*	−0.021	0.057**	0.040*	−0.022	0.062**
	(1.910)	(−1.386)	(2.400)	(1.976)	(−1.479)	(2.485)
UA_AGL_NEG				0.001	−0.014	0.015
				(0.089)	(−1.399)	(0.811)
EVENT2 × *UA_AGL_NEG*				−0.011	0.014	−0.025
				(−0.547)	(0.752)	(−0.919)
EVENT3 × *UA_AGL_NEG*				0.026	0.010	0.016
				(0.998)	(0.554)	(0.514)
EVENT4 × *UA_AGL_NEG*				0.032	0.006	0.026
				(1.185)	(0.453)	(0.834)
EVENT5 × *UA_AGL_NEG*				−0.028	0.004	−0.032
				(−0.571)	(0.287)	(−0.636)
Industry fixed effects	Included	Included		Included	Included	
R^2	0.089	0.105		0.110	0.114	
N	170	170		170	170	

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.

All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 6: Stock price reactions conditional on the size of discretionary actuarial assumptions

Panel A: Discretionary expected rate of return (*ERR_D*)

Dependent variable = *CAR*	(1) High *ERR_D*	(2) Low *ERR_D*	(3) Difference (1) − (2)	(4) High *ERR_D*	(5) Low *ERR_D*	(6) Difference (4) − (5)
Intercept	−0.023	−0.024	0.001	−0.012	−0.008	−0.005
	(−1.245)	(−1.323)	(0.033)	(−0.616)	(−0.419)	(−0.172)
EVENT2	−0.018**	−0.016	−0.001	−0.017	−0.035**	0.018
	(−2.064)	(−1.449)	(−0.110)	(−1.230)	(−2.193)	(0.833)
EVENT3	−0.037***	−0.011	−0.026	−0.034**	−0.038**	0.004
	(−2.806)	(−1.127)	(−1.583)	(−2.413)	(−2.612)	(0.196)
EVENT4	−0.019	−0.023**	0.005	−0.020	−0.042***	0.022
	(−1.049)	(−2.286)	(0.230)	(−1.579)	(−3.092)	(1.150)
EVENT5	−0.040**	−0.002	−0.038**	−0.026	−0.009	−0.016
	(−2.532)	(−0.237)	(−2.106)	(−1.570)	(−0.480)	(−0.626)
SIZE	0.002	0.004*	−0.002	0.001	0.004*	−0.002
	(0.846)	(1.984)	(−0.560)	(0.698)	(1.818)	(−0.728)
BM	0.003	0.002	0.001	0.003	0.002	0.000
	(0.226)	(0.400)	(0.078)	(0.193)	(0.474)	(0.026)
ROA	−0.016	−0.002	−0.014	−0.022	−0.006	−0.016
	(−0.272)	(−0.105)	(−0.229)	(−0.381)	(−0.387)	(−0.260)
LEV	0.049**	−0.018	0.067***	0.048**	−0.021	0.069***
	(2.290)	(−1.362)	(2.816)	(2.185)	(−1.525)	(2.867)
UA_AGL_NEG				−0.006	−0.018	0.012
				(−0.471)	(−1.474)	(0.712)
EVENT2 × *UA_AGL_NEG*				−0.002	0.022	−0.023
				(−0.092)	(1.034)	(−0.863)
EVENT3 × *UA_AGL_NEG*				−0.004	0.033*	−0.037
				(−0.236)	(1.855)	(−1.610)
EVENT4 × *UA_AGL_NEG*				0.002	0.022	−0.019
				(0.089)	(1.251)	(−0.659)
EVENT5 × *UA_AGL_NEG*				−0.019	0.007	−0.027
				(−0.860)	(0.343)	(−0.846)
Industry fixed effects	Included	Included		Included	Included	
R^2	0.112	0.093		0.121	0.102	
N	130	210		130	210	

Panel B: Discretionary discount rate (*DISC_D*)

Dependent variable = *CAR*	(1) High *DISC_D*	(2) Low *DISC_D*	(3) Difference (1) − (2)	(4) High *DISC_D*	(5) Low *DISC_D*	(6) Difference (4) − (5)
Intercept	−0.054***	−0.012	−0.042	−0.050**	0.002	−0.053*
	(−3.080)	(−0.698)	(−1.644)	(−2.208)	(0.140)	(−1.769)
EVENT2	−0.025***	−0.007	−0.017	−0.028*	−0.004	−0.024
	(−2.922)	(−0.578)	(−1.214)	(−1.822)	(−0.336)	(−1.196)
EVENT3	−0.045***	−0.002	−0.043**	−0.042**	−0.027**	−0.016
	(−3.268)	(−0.255)	(−2.575)	(−2.614)	(−2.153)	(−0.805)
EVENT4	−0.013	−0.018**	0.005	−0.020	−0.032***	0.012
	(−0.756)	(−2.013)	(0.236)	(−1.189)	(−2.661)	(0.574)
EVENT5	−0.050***	0.008	−0.059***	−0.022	−0.000	−0.022
	(−2.994)	(0.877)	(−3.013)	(−1.216)	(−0.010)	(−0.802)
SIZE	0.006**	0.001	0.005	0.006**	0.001	0.006*
	(2.504)	(0.498)	(1.529)	(2.478)	(0.285)	(1.664)
BM	0.003	0.001	0.001	0.001	0.001	0.000
	(0.219)	(0.222)	(0.099)	(0.116)	(0.253)	(0.004)
ROA	−0.004	0.006	−0.010	−0.009	0.000	−0.009
	(−0.105)	(0.358)	(−0.228)	(−0.239)	(0.001)	(−0.212)
LEV	0.059***	−0.012	0.071***	0.057***	−0.012	0.069***
	(2.853)	(−0.854)	(2.914)	(2.768)	(−0.826)	(2.873)
UA_AGL_NEG				−0.004	−0.013	0.009
				(−0.315)	(−1.420)	(0.520)
EVENT2 × *UA_AGL_NEG*				0.004	−0.006	0.011
				(0.237)	(−0.326)	(0.381)
EVENT3 × *UA_AGL_NEG*				−0.004	0.030*	−0.034
				(−0.220)	(1.953)	(−1.493)
EVENT4 × *UA_AGL_NEG*				0.010	0.017	−0.007
				(0.423)	(1.095)	(−0.237)
EVENT5 × *UA_AGL_NEG*				−0.035	0.009	−0.044
				(−1.613)	(0.418)	(−1.431)
Industry fixed effects	Included	Included		Included	Included	
R^2	0.188	0.099		0.203	0.110	
N	130	210		130	210	

Panel C: Discretionary compensation rate (*COMP_D*)						
Dependent variable = *CAR*	(1) High *COMP_D*	(2) Low *COMP_D*	(3) Difference (1) – (2)	(4) High *COMP_D*	(5) Low *COMP_D*	(6) Difference (4) – (5)
Intercept	0.011	−0.061**	0.072**	0.018	−0.039	0.057*
	(0.658)	(−2.628)	(2.445)	(1.062)	(−1.487)	(1.793)
EVENT2	−0.003	0.005	−0.009	−0.027**	0.014	−0.040
	(−0.371)	(0.690)	(−0.720)	(−2.021)	(0.612)	(−1.614)
EVENT3	−0.013	−0.008	−0.005	−0.025	−0.018	−0.007
	(−1.637)	(−0.704)	(−0.342)	(−1.467)	(−0.714)	(−0.222)
EVENT4	−0.019	0.007	−0.026*	0.002	−0.013	0.015
	(−1.644)	(0.846)	(−1.892)	(0.159)	(−0.530)	(0.555)
EVENT5	−0.012	0.022**	−0.034**	−0.012	0.019**	−0.031**
	(−1.057)	(2.270)	(−2.265)	(−1.048)	(2.125)	(−2.172)
SIZE	−0.002	0.005**	−0.007**	−0.002	0.005*	−0.007**
	(−0.964)	(2.032)	(−2.106)	(−1.289)	(1.985)	(−2.300)
BM	0.005	−0.001	0.006	0.005	−0.003	0.008
	(0.804)	(−0.091)	(0.579)	(0.769)	(−0.556)	(0.872)
ROA	−0.037	0.022	−0.059	−0.041	0.023	−0.064*
	(−1.125)	(1.325)	(−1.545)	(−1.299)	(1.370)	(−1.767)
LEV	0.030**	−0.015	0.045*	0.028**	−0.013	0.040
	(2.384)	(−0.691)	(1.777)	(2.173)	(−0.608)	(1.610)
UA_AGL_NEG				−0.003	−0.019	0.017
				(−0.301)	(−1.122)	(0.852)
EVENT2 × *UA_AGL_NEG*				0.037**	−0.013	0.050*
				(2.396)	(−0.549)	(1.800)
EVENT3 × *UA_AGL_NEG*				0.014	0.003	0.011
				(0.759)	(0.122)	(0.324)
EVENT4 × *UA_AGL_NEG*				−0.024	0.023	−0.046
				(−1.242)	(0.801)	(−1.363)
Industry fixed effects	Included	Included		Included	Included	
R^2	0.105	0.098		0.136	0.123	
N	166	174		166	174	

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 7: Stock price reactions conditional on the pension plan's funding level

Dependent variable = CAR	(1) High FL	(2) Low FL	(3) Difference (1) − (2)	(4) High FL	(5) Low FL	(6) Difference (4) − (5)
Intercept	−0.015	−0.027	0.012	−0.016	−0.009	−0.007
	(−0.653)	(−1.593)	(0.446)	(−0.643)	(−0.433)	(−0.219)
$EVENT2$	−0.028***	−0.006	−0.021	−0.017	−0.026	0.008
	(−3.176)	(−0.575)	(−1.541)	(−1.362)	(−1.425)	(0.364)
$EVENT3$	−0.031***	−0.004	−0.027*	−0.029*	−0.036**	0.007
	(−3.286)	(−0.330)	(−1.797)	(−1.823)	(−2.304)	(0.329)
$EVENT4$	−0.044***	−0.004	−0.040***	−0.053**	−0.026	−0.027
	(−4.037)	(−0.342)	(−2.618)	(−2.269)	(−1.553)	(−0.932)
$EVENT5$	−0.020	0.000	−0.020	0.012	−0.023	0.035
	(−1.523)	(0.001)	(−1.200)	(0.300)	(−1.562)	(0.816)
$SIZE$	0.003	0.001	0.001	0.003	0.001	0.001
	(0.964)	(0.889)	(0.426)	(0.980)	(0.896)	(0.363)
BM	0.009	−0.005	0.014	0.009	−0.004	0.013
	(1.059)	(−1.038)	(1.455)	(1.038)	(−0.938)	(1.373)
ROA	0.003	0.001	0.002	−0.002	−0.001	−0.001
	(0.075)	(0.089)	(0.039)	(−0.047)	(−0.077)	(−0.016)
LEV	0.010	0.003	0.007	0.010	0.001	0.009
	(0.486)	(0.231)	(0.275)	(0.488)	(0.068)	(0.373)
UA_AGL_NEG				0.004	−0.025	0.029
				(0.362)	(−1.437)	(1.371)
$EVENT2 \times UA\_AGL\_NEG$				−0.013	0.024	−0.037
				(−0.788)	(1.099)	(−1.312)
$EVENT3 \times UA\_AGL\_NEG$				−0.002	0.040**	−0.041
				(−0.080)	(2.039)	(−1.619)
$EVENT4 \times UA\_AGL\_NEG$				0.010	0.027	−0.017
				(0.387)	(1.306)	(−0.504)
$EVENT5 \times UA\_AGL\_NEG$				−0.038	0.029	−0.067
				(−0.907)	(1.483)	(−1.445)
Industry fixed effects	Included	Included		Included	Included	
R^2	0.094	0.055		0.109	0.068	
N	170	170		170	170	

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.

t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 8: Market responses to earnings before versus after IAS 19R

Dependent variable = R	(1)	(2)	(3)
Intercept	-0.059^{**}	-0.267^{***}	-0.036
	(-2.186)	(-5.899)	(-0.182)
X_LAG	-0.098	-0.151^{*}	-0.246^{***}
	(-1.217)	(-1.894)	(-2.630)
X	0.403^{***}	0.402^{***}	0.203^{*}
	(5.349)	(5.471)	(1.817)
$POST$	0.181^{***}	0.183^{***}	0.176^{***}
	(4.680)	(4.896)	(4.670)
$X\_LAG \times POST$	-0.044	0.023	-0.035
	(-0.401)	(0.220)	(-0.276)
$X \times POST$	-0.012	-0.077	0.045
	(-0.109)	(-0.731)	(0.342)
Industry fixed effects	Excluded	Included	Excluded
Firm fixed effects	Excluded	Excluded	Included
R^2	0.169	0.246	0.421
N	452	452	452

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All variables are as defined in Appendix E.

Table 9: Change in financial statement volatility around the implementation of IAS 19R

Panel A: Use of defined benefit pension plans (DB)			
	(1)	(2)	(3)
Dependent variable =	$\sigma Liabilities$	$\sigma Equity$	σROA
Intercept	0.024***	0.028***	0.040***
	(8.163)	(9.509)	(17.119)
$DB \times POST$	0.005	0.007	0.008
	(0.536)	(0.694)	(0.778)
Firm fixed effects	Included	Included	Included
Year fixed effects	Included	Included	Included
R^2	0.872	0.871	0.861
N	600	600	600

Panel B: Use of the corridor method ($CORRIDOR\_USE$)			
	(1)	(2)	(3)
Dependent variable =	$\sigma Liabilities$	$\sigma Equity$	σROA
Intercept	0.023***	0.028***	0.041***
	(7.686)	(9.070)	(16.838)
$CORRIDOR\_USE \times POST$	0.007	0.007	0.001
	(0.910)	(0.892)	(0.071)
Firm fixed effects	Included	Included	Included
Year fixed effects	Included	Included	Included
R^2	0.872	0.871	0.861
N	600	600	600

*, **, *** Represent significance levels of 0.10, 0.05, and 0.01, respectively, in a two-tailed test.
All continuous variables are winsorized at the 1st and 99th percentiles.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
$\sigma Liabilities$, $\sigma Equity$, and σROA are calculated as the standard deviation of total liabilities, shareholders' equity, and return on assets from year $t-3$ to t, respectively, where total liabilities and shareholders' equity are deflated by total assets.
All variables are as defined in Appendix E.

2.7 Appendix A: Summary of pension accounting under different regimes and the effect on financial statements

In the following, we first explain pension accounting under IAS 19 Unrevised, IAS 19R, and SFAS 158 and the effect on financial statements. We then describe how to calculate pension expense under IAS 19 Unrevised versus IAS 19R.

Pension accounting under IAS 19 Unrevised, IAS 19R, and SFAS 158

AGLs arise from either the PBO or plan assets when firms experience adjustments to actuarial assumptions or change these assumptions for future periods. AGLs on the PBO occur when prior actuarial assumptions (discount rate, wage growth rate, mortality rate, etc.) deviate from the actual rates, or when firms make changes to their current actuarial assumptions (which affect the current value of the PBO). AGLs on plan assets occur when the actual return on plan assets deviates from the expected return (when the expected rate of return has not been replaced by the discount rate under IAS 19 Unrevised). In other words, under IAS 19 Unrevised, AGLs consist of two components: (1) differences between actual and expected returns on plan assets (i.e., AGLs on plan assets), and (2) other AGLs arising from differences between actual and estimated discount rates, salary growth rates, etc. (i.e., AGLs on the PBO). The table below describes the accounting for AGLs under IAS 19 Unrevised, IAS 19R, and SFAS 158 and the effect on the balance sheet and the income statement.[28] Under IAS 19R, firms are only permitted to use the OCI method in accounting for AGLs, and the expected rate of return on plan assets is eliminated and replaced by the discount rate.

IAS 19 Unrevised				
Option 1: OCI method	**Option 2: Corridor method**	**Option 3: MTM method**	**IAS 19R**	**SFAS 158 under U.S. GAAP**
Accounting treatment:				
Recognize all AGLs in OCI as occurred.	Recognize AGLs in net income only when accumulated AGLs exceed 10 percent of the greater of PBO and fair value of plan assets (i.e., the “corridor”). The excess over the corridor is amortized over the average remaining service period of employees and recognized in net income.	Recognize all AGLs in net income as occurred.	Recognize all AGLs in OCI as occurred.	Recognize all AGLs in OCI as occurred. When accumulated AGLs recognized through OCI exceed 10 percent of the greater of PBO and fair value of plan assets, recognize in (or “recycle” to) net income by amortizing the excess over the average remaining service period of employees.
Effect on the balance sheet:				
The balance sheet fully reflects the funded status of the plan.	The balance sheet does not reflect the actual funded status of the plan because the unrecognized amount of accumulated AGLs is off-balance sheet.	The balance sheet fully reflects the funded status of the plan.	The balance sheet fully reflects the funded status of the plan.	The balance sheet fully reflects the funded status of the plan.
Effect on the income statement:				

[28]The tables in this appendix are adapted from Appendices A and B in Anantharaman and Chuk (2018).

Pension expense is reduced by the expected return on plan assets.	Pension expense is reduced by the expected return on plan assets.	Pension expense is reduced by the actual return on plan assets because of the immediate recognition of AGLs on plan assets in net income.	Pension expense is reduced by the discount rate on plan assets because the expected rate of return is replaced by the discount rate.	Pension expense is reduced by the expected return on plan assets.

Calculation of pension expense under IAS Unrevised versus IAS 19R

In addition to the removal of the corridor method for (re)measurement, IAS 19R also changes the way to determine pension expense. The table below compares the components of pension expense between IAS 19 Unrevised and IAS 19R.

	IAS 19 Unrevised			
	Option 1: OCI method	**Option 2: Corridor method**	**Option 3: MTM method**	**IAS 19R**
Basic components of pension expense recognized in net income	+ Service cost + Interest cost (= Discount rate × PBO) – Expected return on plan assets	+ Service cost + Interest cost (= Discount rate × PBO) – Expected return on plan assets	+ Service cost + Interest cost (= Discount rate × PBO) – Expected return on plan assets – (Actual return – expected return on plan assets)	+ Service cost +/– Net interest expense/income (= Discount rate × (PBO – Plan assets))
AGLs recognized in net income	None	+/– Amortization of accumulated AGLs in excess of 10 percent of the greater of PBO and fair value of plan assets	+/– AGLs on PBO (AGLs on plan assets are already included in the basic components of pension expense)	None
AGLs recognized in OCI	+/– All AGLs in the current period	None	None	+/– All AGLs in the current period
Other components of pension expense recognized in net income	+/– Vested prior service costs +/– Amortization of unvested prior service costs	+/– Vested prior service costs +/– Amortization of unvested prior service costs	+/– Vested prior service costs +/– Amortization of unvested prior service costs	+/– Vested prior service costs +/– Unvested prior service costs

2.8 Appendix B: Illustration of the corridor method under IAS 19 Unrevised and the balance sheet effect of switching to the OCI method under IAS 19R

The corridor method under IAS 19 Unrevised

The following example illustrates the corridor method of recognizing AGLs under IAS 19 Unrevised using actual numbers from the SAS annual report for the 2013 fiscal year.[29] All numbers are in Swedish kronor (SEK) millions (MSEK).

Assumptions		Recognition	
Plan assets (PA)	30,775	Actuarial gains (losses):	
Projected benefit obligation (PBO)	28,536	Current year	1,504
Remaining service years of employees	15	Previous years (accumulated corridor)	(13,474)
		Sale of Widerøe Airlines (including pension commitments)	1,113
Actuarial gains (losses):		Corridor (10% of max[PA , PBO])	3,077.5
Current year on PBO	1,598		
Current year on PA	(94)	Excess over corridor	(7,779.5)
Accumulated from previous years	(13,474)	Minimum amount to be amortized	(518.63)
		Amortized into SAS's 2013 net income	(589)

In 2013, SAS amortized MSEK 589 in net income, fulfilling the minimum recognition requirement of MSEK 518.63 (excess over the corridor amortized over employees' remaining service years, i.e., MSEK 7,779.5 divided by 15 years). Using the corridor method, SAS was only required to recognize the portion of accumulated AGLs that exceeds 10 percent of the plan assets since the plan had a positive funded status. Therefore, the remaining accumulated actuarial losses of MSEK 10,268 were kept off-balance sheet.

Under IAS 19R, accumulated unrecognized AGLs would be recorded in the net pension asset/liability and in OCI, both on the balance sheet. Current year AGLs have to be recognized immediately in OCI during the current period. Thus, in this example, SAS would have had to recognize actuarial gains of MSEK 1,504 in 2013. As a result of immediate recognition under the OCI method in IAS 19R, the recognized pension asset and liability on the balance sheet always reflect the plan's actual funded status, which corresponds to the difference between PBO and plan assets. In contrast, under the corridor method in IAS 19 Unrevised, the recognized pension asset and liability fail to reflect the actual funded status due to the unrecognized amount of accumulated AGLs (in this example, it would be the accumulated actuarial losses of MSEK 10,268 (13,474 – 1,504 – 1,113 – 589) that were unrecorded).

The effect of switching from the corridor method to the OCI method

Due to the removal of the corridor method, firms that previously used the corridor method had to switch to the OCI method as required by IAS 19R, resulting in a significant one-time effect on the financial statements. The following example illustrates the effect of the adoption of IAS 19R using actual numbers (in MSEK) from the SAS 2013 annual report. For simplicity, we assume the increase in deferred tax assets from recording the accumulated AGLs that were unrecognized previously to be about MSEK 1,500, as inferred from SAS 2013 and 2014 annual reports.[30]

[29] Note that IAS 19R was not applied by SAS before its 2014 fiscal year (starting on November 1, 2013).

[30] SAS's total assets for the 2013 fiscal year were later restated from MSEK 35,628 to MSEK 26,813 after the implementation of IAS 19R, which corresponds to an increase of approximately MSEK 1,500 in deferred tax assets (i.e., 26,813 – (35,628 – 10,268)).

Reconciliation of pension liabilities under the corridor method in IAS 19 Unrevised

Funded status of the pension plan		**Net pension asset recorded on the balance sheet**	
Projected benefit obligation	(28,536)	Funded status	2,239
Plan assets	30,775	Unrecognized actuarial losses	(10,268)
Funded status	2,239	Recognized net pension assets	12,507

Balance sheet under the corridor method in IAS 19 Unrevised

Assets		**Liabilities and equity**	
Other assets	23,121	Equity	11,103
Net pension assets	12,507	Other liabilities	24,525
Total assets	35,628	Total liabilities and equity	35,628

Balance sheet under the OCI method in IAS 19R

Assets		**Liabilities and equity**	
Other assets	23,121	Equity $(11,103-10,268+1,500)$	2,335
Deferred tax assets (increase)	1,500	Other liabilities	24,525
Net pension assets $(12,507-10,268)$	2,239		
Total assets	26,860	Total liabilities and equity	26,860

In this example, switching from the corridor method under IAS 19 Unrevised to the OCI method under IAS 19R decreases net pension assets by MSEK 10,268, as firms are required to record unrecognized accumulated AGLs from prior periods immediately under IAS 19R. Meanwhile, equity decreases by MSEK 8,768, being the amount of previously unrecognized actuarial losses (MSEK 10,268) net of a corresponding increase in deferred tax assets (MSEK 1,500).[31] This illustration shows that net pension assets or liabilities recognized using the corridor method do not truly reflect a firm's actual pension assets and liabilities due to the unrecognized AGLs hidden in the corridor and kept off-balance sheet, thereby distorting a firm's actual financial position and impairing financial reporting transparency.

[31] In fact, shareholders' equity as of the 2013 fiscal year-end was only adjusted down to MSEK 3,226 due to several measures taken by SAS, according to its 2014 annual report.

2.9 Appendix C: Anecdotal evidence on the impact of IAS 19R from Scandinavian Airlines (SAS) annual reports

This appendix provides anecdotal evidence on the impact of IAS 19R from the discussions pertinent to the adoption of IAS 19R in SAS annual reports for fiscal years 2011–2014 (emphasis added in italics).

SAS 2011 annual report

Page 36: "In June 2011, the IASB (International Accounting Standards Board) published amendments to IAS 19 Employee Benefits. The amendments to IAS 19 have not yet been adopted by the EU, but a decision is expected in 2012. The amendments related to the recognition of defined-benefit pension plans shall be applied from 1 January 2013. Among other features, the revised IAS 19 no longer permits the deferral of the recognition of certain actuarial gains and losses (the "corridor approach" has been removed). Instead, all actuarial gains and losses are to be recognized immediately in other comprehensive income. *As a result of the amendments, the accumulative unrecognized actuarial gains and losses (unrecognized actuarial gains and losses and plan changes) will be recognized in shareholders' equity, which will have a significant negative effect on the Group's shareholders' equity.* The parent company SAS AB's recognized shareholders' equity will not be affected by this amendment. Due to a weak stock exchange trend and lowered discount rates in Sweden and Norway, actuarial gains and losses increased by approximately SEK 1.8 billion compared with the preceding year."

Page 108: "The Board proposes that §8 of the articles of association be amended so that the Company's financial year shall comprise the period 1 November – 31 October, instead of the calendar year, and that the current financial year be shortened and thus will comprise the period 1 January 2012 – 31 October 2012. The purpose of the change is for the financial year to follow the traffic program, in order to improve external reporting and to decrease internal administration. The resolution is contingent upon a permit from the Swedish Tax Agency. *As a consequence of this change, SAS will apply the anticipated revised reporting rules regarding pensions (IAS19) for the financial year commencing 1 November 2013.*"

Remark: At the end of the 2011 fiscal year, SAS accumulated unrecognized actuarial losses were 12,052 MSEK. This amount represented 96.94 percent of its shareholders' equity (MSEK 12,433) and 30.76 percent of total assets (MSEK 39,185) at the time.

SAS 2012 annual report

Page 1: "*In addition, it became apparent that the new accounting rules for pensions, which will be applied from November 1, 2013 will have a substantial negative impact on the SAS Group's equity.*"

Page 7: "In June 2011, the IASB (International Accounting Standards Board) published amendments to IAS 19 Employee Benefits. The amendments to IAS 19 have now been adopted by the EU. The revised IAS 19 no longer permits the application of the "corridor approach." Instead, all actuarial gains and losses are to be recognized immediately in other comprehensive income. *As a result of the amendments, the accumulative unrecognized deviations (unrecognized actuarial gains and losses and plan amendments) will be recognized in full in shareholders' equity, which will have a significantly negative effect on the SAS Group's shareholders' equity.* The Parent Company SAS AB's recognized shareholders' equity will not be affected by this amendment. The amended IAS 19 will be applied from fiscal years beginning on or after January 1, 2013. *Due to the change of fiscal year for the Group, SAS intends to apply the amended standard for the fiscal year starting on November 1, 2013.*"

Page 7: "In November 2012, new collective agreements were signed with flight crews in Scandinavia, which entailed major changes in pension terms. The majority of existing defined-benefit pension plans will be replaced by defined-contribution pension plans. The previous right to early retirement has also been eliminated. These changes were not included in the present value calculation of pension commitments as of October 31, 2012. *The agreed changes in pension terms will reduce actuarial gains or losses and the negative effect on shareholders' equity by about SEK 3.4 billion and pension commitments are estimated to decrease from SEK 33.5 billion to about SEK 14 billion, which is a reduction of almost 60%.*"

Page 7: "*4XNG enables a transition from defined-benefit to defined-contribution pension terms. These changes will reduce the negative effect on shareholders' equity by an estimated SEK 3.4 billion, reduce the defined-benefit pension commitment by SEK 19.5 billion (almost 60%) and reduce earnings volatility arising from changes in pension commitments.*"

Page 38: "*In the period January–October 2012, SAS AB's market capitalization declined 19.4%, due to a weak yield trend and uncertainty concerning the future recognition of pensions under IAS 19. Following the signing of the new collective agreements on November 19, 2012, the share price rose significantly.*"

Remark: At the end of the 2012 fiscal year, SAS accumulated unrecognized actuarial losses were MSEK 13,474. This amount represented 120.78 percent of its shareholders' equity (MSEK 11,156) and 36.66 percent of total assets (MSEK 36,754) at the time.

SAS 2013 annual report

Second cover page: "*The new agreements facilitated the provision of a credit facility of SEK 3.5 billion at the Group's disposal until March 2015.*"

Page 2: "*The new agreements reduced the need for impairment of shareholders' equity from SEK 13.5 billion to SEK 7 billion in parallel with a reduction in the Group's pension commitments of about SEK 19 billion or 60%.* Even with the reduction in impairment of shareholders' equity, the balance sheet, as of November 1, 2013, shows clearly the necessity of continuing to strengthen the Group's financial position. Therefore, the Board has proposed that the AGM resolve in favor of the issue of preference shares and convertibles to address the need for investment and credit facilities falling due."

Page 8: "The changed accounting policies for pension commitments, IAS19, mean that accumulated actuarial gains and losses must be recognized directly in shareholders' equity. *For SAS, allowing the situation to continue would have resulted in negative shareholders' equity.*"

Page 8: "The agreement regarding new pension terms in November 2012 entails new defined-contribution pension solutions for most employees. *The new pension terms reduce the negative impact on shareholders' equity arising on November 1, 2013 for accounting purposes by approximately SEK 3.4 billion. The sale of Widerøe further reduce this effect by about SEK 1 billion. This means that the negative effect on shareholders' equity is estimated at about SEK 7 billion. The defined-benefit pension commitments will be reduced by about 60% over time, which corresponds to about SEK 19 billion and, thereby, reduces earnings volatility.*"

Page 30: "*Annual cost savings generated by the new pension terms are expected to amount to about MSEK 500 and reach their full effect from the 2013/2014 fiscal year.*"

Page 30: "In addition to the transition to defined-contribution pension plans, other measures included the removal of early retirement and part-time pensions, the lowering of pensionable income and raising the retirement age for cabin crew under the Alecta plan from 60 to 65. *These changes have brought about an improvement in earnings of MSEK 450 in 2012/2013 and reduced pension commitments and actuarial gains and losses by about SEK 1.7 billion. In addition, the sale of 80% of Widerøe in September 2013 further reduced pension commitments by about SEK 2.8 billion and actuarial gains and losses by about SEK 1.1 billion.*"

Page 39: "At October 31, 2012, pension commitments totaled SEK 33.5 billion. *In the 2012/2013 fiscal year, pension commitments were reduced by about SEK 5 billion and following recognition of the transition to defined-contribution pension plans, the total reduction will be about SEK 18 billion. Since some employees already have early retirement and part-time pensions in place, this commitment will decrease over the next five years and, at the end of the 2017/2018 fiscal year, pension commitments are therefore expected to amount to approximately SEK 14 billion, which means a reduction of about SEK 19.5 billion, or about 60% of the original pension commitments. Taken together, the above means that shareholders' equity was impaired by about SEK 7 billion on the introduction of the revised IAS 19 on November 1, 2013.*"

Page 64: "Sensitivity to changes in individual parameters can be estimated as follows: A 1 percentage-point change in the discount rate has an impact of approximately SEK 3.4 billion on the commitment, a 1 percentage-point change in the inflation assumption has an impact of approximately SEK 1.4 billion on the commitment and a 1 percentage-point change in the parameter for payroll adjustment has an impact of approximately SEK 1.2 billion on the commitment. A 1 percentage-point change in the expected long-term return on plan assets has an impact of approximately SEK 0.2 billion on the fair value of plan assets."

Remark: At the end of the 2013 fiscal year, SAS accumulated unrecognized actuarial losses were MSEK 10,268. This amount represented 92.4 percent of its shareholders' equity (MSEK 11,103) and 28.82 percent of total assets (MSEK 35,628) at the time.

SAS 2014 annual report (its first year of adopting IAS 19R)

Page 1: "*SAS reported an equity/assets ratio of 17%, up five percentage points year-on-year after adjustment for the amended accounting rules for pensions. A preference share issue was carried out during the year, which raised the equity/assets ratio by eight percentage points, thereby, partly offsetting the effect of the amended accounting rules for pensions.*"

Page 32: "*Taken together, the above means that the total negative effect on the Group's shareholders' equity from the implementation of the amended IAS 19 was about SEK 7.8 billion.*"

Page 78: "SAS took important steps in 2013/2014 to strengthen its long-term financial position. *Preference shares were issued and extensive measures implemented to lower costs, thereby countering the impact of applying new accounting rules for pensions. SAS also introduced new pension terms, which reduced the negative effect from the amended procedure for reporting shareholders' equity. Moody's raised its credit rating for SAS during the fiscal year.*"

2.10 Appendix D: All events related to IAS 19R

			DB firms			Non-DB firms			Difference	
Event	**Date**	**Description**	**N**	**CAR**	**t-stat.**	**N**	**CAR**	**t-stat.**	**CAR**	**t-stat.**
A1	June 15, 2005	The SEC issued a report calling for changes in pension reporting.	93	0.178	0.391	49	0.445	0.548	−0.267	−0.287
A2	November 10, 2005	The FASB initiated an investigation of pension accounting.	99	0.048	0.112	53	0.565	0.735	−0.518	−0.590
A3	December 14, 2005	The FASB confirmed the scope, objectives, and timeline of the project.	102	0.715	1.602	59	1.130	1.426	−0.415	−0.456
A4	June 29, 2006	IAS 19R was added to the IASB's agenda.	95	1.331	3.019	56	1.560	2.200	−0.229	−0.275
A5	July 26, 2006	The house passed the Pension Protection Act.	89	−0.681	−1.525	55	0.076	0.104	−0.757	−0.884
A6	September 29, 2006	The FASB issued SFAS 158.	101	0.513	1.397	57	0.063	0.084	0.450	0.536
A7	December 14, 2007	The IASB discussed revisions to IAS 19. The internal discussion document was not publicly available.	111	0.190	0.424	71	0.125	0.175	0.065	0.078
A8	March 27, 2008	The IAS 19R discussion paper was published.	124	−0.398	−0.986	70	−0.405	−0.556	0.008	0.009
A9	February 17, 2009	Staff presented the proposed IAS 19R timetable to the Board.	104	−0.946	−1.722	61	1.530	1.372	−2.476	−1.992
A10	April 29, 2010	The IASB released the IAS 19R exposure draft.	124	−0.175	−0.490	64	−1.041	−1.500	0.866	1.110
A11	August 11, 2010	A review of comment letters on IAS 19R was scheduled for September 27, 2010.	122	−1.001	−2.452	67	−0.341	−0.509	−0.660	−0.842
A12	September 5, 2010	Deloitte publicly opposed IAS 19R in its comment letter.	122	0.314	1.107	66	0.922	1.365	−0.608	−0.829
A13	September 16, 2010	Staff delivered outreach feedback to the IASB.	122	−0.339	−1.133	66	1.094	1.995	−1.434	−2.294
A14	September 27, 2010	IASB members, staff, and the IAS 19R working group discussed the responses in comment letters.	122	0.503	1.493	66	−0.582	−0.900	1.086	1.488
A15	October 20, 2010	IASB staff summarized outreach feedback and comment letters as supportive of the revision's objective.	121	−0.211	−0.687	66	−0.560	−0.948	0.349	0.524
A16	November 16, 2010	IASB staff created recommendations for specific disclosure, presentation, and classification items to address public concerns.	121	−0.161	−0.501	64	−0.837	−1.412	0.676	1.002
A17	February 2, 2011	Staff provided the IASB with the timetable to the final standard. Only logistical issues (transition, effective date, and carryover issues) were unresolved.	123	−0.572	−1.915	65	−1.218	−2.008	0.646	0.956
A18	June 6, 2011	The IASB released a "near-final" draft of IAS 19R.	122	−0.365	−0.864	66	−0.425	−0.549	0.060	0.068
A19	June 16, 2011	The IASB issued IAS 19R.	122	0.109	0.261	66	0.056	0.075	0.054	0.063

Of the 19 events listed here, we include the events A4, A8, A10, A18, and A19 in the main analyses because they are related to key milestones in the IASB standard-setting process. We describe these five events in more detail in Table 1, Panel A and refer to them as *EVENT1*, *EVENT2*, *EVENT3*, *EVENT4*, and *EVENT5* in the regression model.

2.11 Appendix E: Variable definitions

Variable	Definition
BM	Book-to-market ratio, measured as common equity divided by market capitalization.
CAR	Three-day cumulative abnormal returns (CAR) estimated using the Fama-French three-factor model, measured from the day before to the day after the event (i.e., over the window $[-1\ ,\ +1]$). The coefficients in the Fama-French model are estimated using returns from 250 trading days ending two days before the event. Daily abnormal returns are calculated as the difference between the actual return and the return predicted by the model.
COMP_D	Discretionary compensation rate, measured as the compensation rate suggested by the Norwegian Accounting Standards Board (NASB) at the time minus the compensation rate used by the firm.
CORRIDOR_USE	Indicator variable that equals 1 if the firm used the corridor method under previous IAS 19, and 0 otherwise.
DB	Indicator variable that equals 1 if the firm has a defined benefit pension plan, and 0 otherwise.
DISC_D	Discretionary discount rate, measured as the discount rate used by the firm minus the discount rate suggested by the NASB at the time.
ERR_D	Discretionary expected rate of return, measured as the expected rate of return used by the firm minus the expected rate of return suggested by the NASB at the time.
EVENT1-5	Indicator variable that equals 1 for each of the five rulemaking events of IAS 19R, and 0 otherwise. The five events are described in Table 1, Panel A.
FL	Funding level, measured as the funded status deflated by total assets, where the funded status is calculated by subtracting the PBO from the fair value of plan assets.
LEV	Leverage, measured as total debt divided by total assets.
PB	Zmijewski's (1984) probability of bankruptcy, calculated as –4.336 − 4.513 × (net income/total assets) + 5.679 × (total liabilities/total assets) + 0.004 × (current assets/current liabilities).
POST	Indicator variable that equals 1 for fiscal years starting on or after January 1, 2013 (i.e., the post-IAS19R period), and 0 otherwise.
R	Buy-and-hold return, measured over the 12-month period ending three months after the firm's fiscal year-end.
ROA	Return on assets, measured as net income divided by the average of current and prior year total assets.
SIZE	Firm size, measured as the natural logarithm of total assets (in millions).
UA_AGL	Unrecognized amount of accumulated AGLs deflated by total assets.
UA_AGL_NEG	Indicator variable that equals 1 if the firm had a negative value for the unrecognized amount of accumulated AGLs under previous IAS 19, and 0 otherwise.
X	Earnings in the current year, measured as income before extraordinary items deflated by the market value of equity three months after the prior fiscal year-end.
X_LAG	Earnings in the prior year.

3 Earnings Decreases and Disclosures: The Impact of IAS 19R on Discount Rates

Abstract

This study examines the effects of two changes under International Accounting Standard (IAS) 19R on discount rates. First, the elimination of the expected rate of return (ERR) on plan assets may increase pension expense for most firms, as the discount rate effectively replaces the usually higher ERR when calculating interest income. Consequently, firms may use higher discount rates to mitigate this increase in pension expense. Second, IAS 19R requires that firms disclose projected benefit obligation (PBO) duration, improving financial statement users' ability to scrutinize discount rate choices. Using a sample of firms in the U.K., I find that discount rates are lower following IAS 19R, despite higher interest rates—indicating that firms reduced discount rates in response to increased transparency and importance under IAS 19R. Furthermore, firms seem to mitigate large pension expense increases due to the ERR elimination by maintaining higher discount rates if they are able to do so. Additional analyses indicate that lower inflation rate assumptions are used to counteract the increase in PBO values caused by lower discount rates.

3.1 Introduction

Accounting for defined benefit plans is complex. Despite the shift from defined benefit plans toward defined contribution plans, pension assets and liabilities can have significant impacts on financial statements.[32] Several studies have examined how firms strategically use discretion in actuarial assumptions to manage earnings (Bergstresser et al. 2006) or the balance sheet (e.g., Asthana 1999; Anantharaman 2017; Kisser, Kiff, and Soto 2017), and how they react to changes in recognition and disclosure regulation (Naughton 2019; Li and Klumpes 2013). A major element of pension accounting is the discount rate, as it is used both to discount future benefit payments related to the projected benefit obligation (PBO) in the balance sheet and to calculate the pension expense in the income statement. Since firms use discretion, discount rates may be chosen strategically, depending on incentives. Although the discount rate is the actuarial assumption with the greatest impact on financial statements, measuring managerial discretion is difficult. While discount rates should be based on market yields on high-quality corporate bonds with maturity similar to the PBO, PBO duration is not reported under most accounting regimes.[33] Furthermore,

[32] For example, pension liabilities for FTSE 350 firms amounted to £550 billion in May 2023 (Mercer 2023), which is comparable to the sample period in this study.

[33] The duration of the PBO is the average length of which benefits will be paid from the plan. Under both International Financial Reporting Standards (IFRS) and U.S. Generally Accepted Accounting Principles (GAAP), benefit payments are discounted to present values using rates based on yields on high-quality corporate bonds that matches the maturity of the payments. However, firms are only required to disclose average PBO duration under IAS 19R.

most existing literature that aims to capture discount rate discretion does not take PBO duration into account when measuring the unbiased discount rate or relies on proxies. However, effective January 1, 2013, the 2011 revision of the International Accounting Standard (IAS) 19 *Employee Benefits* (hereinafter "IAS 19R") requires that firms disclose PBO duration, making it possible to disentangle the effect of managerial discretion from the effect of PBO duration on discount rates.

IAS 19R introduced major changes to pension accounting under International Financial Reporting Standards (IFRS). This paper examines the effects of two of those changes on discount rate discretion, namely the elimination of the expected rate of return (ERR) on plan assets and amended pension disclosure requirements. Pre-IAS 19R, the interest income component of the pension expense was calculated by applying the ERR to the fair value of plan assets. With IAS 19R removal of the ERR, the discount rate is applied to the plan funded status (PBO minus plan assets) to calculate net interest, whereas it was previously applied only to the PBO to calculate interest income. Since discount rates are based on high-quality corporate bond yields, they are generally lower than ERRs, which are based on plan asset composition. Because the interest income on plan assets that offsets the interest cost on the PBO is calculated at a lower rate under IAS 19R, total pension expense increases. For example, based on pre-IAS 19R data for my sample, applying the net interest approach increases pension expense by 2.6 percent of shareholder equity on average (median increase is 0.4 percent). However, firms can partially offset this increase by applying higher discount rates. Since the impact of discount rate changes on net interest under the new regime depends on funded status and PBO duration, IAS 19R may create different incentives across firms. Firms with overfunded plans can for example boost net interest income by increasing discount rates, thereby increasing earnings. In addition to eliminating the ERR, IAS 19R amended disclosure requirements, which could improve the ability of financial statement users to detect abnormal pension accounting (Naughton 2019; Chuk 2013). Specifically, PBO duration disclosure allows users to determine how discount rates compare to yields on high-quality corporate bonds with maturity similar to the PBO, possibly placing greater scrutiny on discount rates (Naughton 2019).

Using a sample of firms from the U.K. affected by IAS 19R and a control sample of firms from the U.S., I find that U.K. firms choose lower (i.e., liability-increasing) discount rates following IAS 19R, despite higher yields post-IAS 19R. Furthermore, the association between high-quality corporate bond yields and discount rates is stronger post-IAS 19R, indicating that discount rates are more closely aligned with IAS 19 benchmarks after the revision. When partitioning the sample by pension investment risk-taking and plan funding to explore the effects of the ERR elimination and firms' ability to boost earnings using discount rates, I find that the post-IAS 19R reductions in discount rates are weaker when both risk-taking and plan funding are high (i.e., when earnings decreases are greater). This finding is consistent with the notion that firms may try to contain larger pension expense increases when they are able to, highlighting the incentive firms have to avoid reporting earnings decreases, which is an important earnings threshold (Burgstahler and Dichev 1997). However, when risk-taking is low, higher plan funding is associated with greater post-IAS 19R discount rate reduction, highlighting the importance of the interaction between risk-taking and plan funding. While higher plan funding is generally associated with more conservative actuarial assumptions (Anantharaman 2017; Kisser et al. 2017; Asthana 1999), it is also a determinant for the effect of the ERR elimination on earnings and earnings sensitivity to discount rate changes post-IAS 19R—explaining the opposite effect that funding ratios can have on post-IAS 19R discount rate reductions when both risk-taking and funding ratios are high.

In my additional analysis, I show that the reduction in discount rates is accompanied by a reduction in inflation rate assumptions, mitigating the increase in PBO values caused by reduced discount rates—similar to the substitution effect documented by Naughton (2019).[34] Interestingly, funding levels are slightly higher post-IAS 19R despite lower discount rates, indicating that firms took other measures to improve funded status (e.g., discretion in other actuarial assumptions; contributions; settlements; freezes) as well following IAS 19R. In addition, the number of sample firms that reported a plan surplus increased from 19.5 percent pre-IAS 19R to 25.3 percent post-IAS 19R, possibly reflecting a stronger incentive to overfund pension plans and report a net interest income instead of cost under IAS 19R. Overall, the results suggest that firms are able to fully mitigate the increase in PBOs resulting from lower discount rates on average.

This paper makes several contributions. First, it adds to recent studies (Naughton 2019; Armitage, Gallagher, and Xu 2022) that aim to more precisely capture discount rate discretion by taking PBO duration and yield curves into account.[35] However, this study differs from Naughton (2019) and Armitage et al. (2022) by mainly using reported PBO durations for the treatment sample rather than estimates based on pension plan characteristics. Furthermore, by measuring the unbiased discount rate with higher precision (taking PBO duration and yield curves into account), I examine the impact of IAS 19R, as well as the implications of previously documented earnings management incentives.

Second, this is the first study to examine the effects of ERR elimination on actuarial choices. Specifically, this study finds that while IAS 19R leads to a general reduction in discount rates, firms with well-funded

[34]Naughton (2019) finds that U.S. firms react to regulatory scrutiny by reducing discretion in the targeted actuarial assumption, but increase discretion in other assumptions. In the case of IAS 19R, the discount rate would be the targeted assumption due to amended disclosures and increased importance for the pension expense calculation.

[35]Naughton (2019) does for example highlight that when examining discount rate changes around Statement of Financial Accounting Standards (SFAS) 158 while accounting for PBO duration and yield curves, his results conflict with Jones (2013) who defines the unbiased discount rate as the industry median. While Jones (2013) finds an increase in discount rate discretion following SFAS 158, Naughton (2019) finds a decrease. The conflicting results are due to the yield curve (i.e., the prescribed benchmark for discount rates) shifting during the sample period, which is not taken into account in Jones (2013). However, using industry or sample medians or means is consistent with a number of studies on actuarial assumptions (e.g., Jones 2013; Hann et al. 2007; Billings, O'Brien, Woods, and Vencappa 2017).

plans and incentives to contain pension expense increases choose higher discount rates post-IAS 19R, reducing both the pension expense and PBO. This new role of discount rates in managing earnings under IAS 19R is important, as it currently applies to pension accounting under IFRS. However, most literature on discount rates focuses on managing the funded status under other pension accounting regimes. The ERR has also been subject to debate in the U.S., and general harmonization between U.S. Generally Accepted Accounting Principles (GAAP) and IFRS has been a focus of the International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) (Deloitte 2024). Additionally, due to recent interest rate increases, plan overfunding in the U.K. is at an all-time high as of May 2023 (Mercer 2023), improving firms' abilities to boost earnings using higher discount rates.[36] Recent improvements in plan funding are likely generalizable beyond the U.K. setting since interest rates have increased worldwide.

Third, this study expands what is currently limited literature on pension disclosures by documenting an association between discount rate discretion and compliance with pension disclosure requirements. Beyond Almaghrabi, Opong, and Tsalavoutas (2021), which finds that the degree of compliance with pension disclosures is positively associated with the likeliness of issuing public debt and negatively associated with bond spreads, the implications of pension disclosures receive little attention. Yet, the IASB recently proposed further amendments to IAS 19 disclosures as part of their disclosure initiative (IFRS Foundation 2021), highlighting the relevance to regulators. Although the proposed amendments never realised, they had addressed several concerns about current disclosures, including that they do not meet the needs of the users and that they provide unnecessarily detailed information about items of limited use. Interestingly, sensitivity disclosures received criticism for being of limited use. However, 100 percent of my sample disclose sensitivity tests post-IAS 19R, while only 68.2 percent disclose PBO duration, indicating greater compliance with a less useful disclosure requirement. In addition, sensitivity tests are likely more onerous to prepare, which is another criticism that current IAS 19 disclosures have received. PBO duration, on the other hand, is already a part of actuaries' processes when estimating PBOs, so disclosing average duration should be relatively simple in comparison. Overall, given that PBO duration disclosure is associated with more conservative discount rates in my sample, disclosure choices may be strategic. However, I cannot rule out that firms complying with the new disclosure requirements adjusted their discount rates prior to my sample period (2012–2014) in anticipation of IAS 19R adoption.

Fourth, by providing evidence from a U.K. setting, this study complements existing literature on the effect of changes in pension accounting regulation. In addition to the main findings, I find that firms increase

[36] Since the end of 2020, yields on high-quality corporate bonds have increased by almost 4 percentage points, reducing PBO values relative to plan assets. Consequently, funding levels of FTSE 350 firms have increased as of May 2023 to over 110 percent from less than 90 percent (Mercer 2023)—comparable to my sample—meaning that on average, firms have net interest income that can be boosted significantly by increasing discount rates.

inflation rate discretion to counteract PBO value increases resulting from lower discount rates, suggesting that the substitution effect documented by Naughton (2019) is generalizable to non-U.S. settings.

This study is subject to caveats. First, by using the rather unique U.K. setting where few firms use the corridor method pre-IAS 19R, the overall effect of IAS 19R may not be generalizable, as the elimination of the corridor method is likely to have an effect in other settings. However, my findings likely apply to firms in other settings that do not use the corridor method pre-IAS 19R. Second, the construction of the yield curve used to measure the unbiased discount rate is subject to methodological choices. As discussed by Anantharaman (2017), yield curves may differ considerably, as actuaries may construct issuer-specific curves or reference yield curves from third parties when choosing discount rates.[37] Because there is an acceptable range, retrieving a completely precise measure of the unbiased discount rate is not possible. Therefore, my results may be slightly overstated or understated. I address this issue by using two alternative approaches to measure the unbiased discount rate in my robustness tests. Third, it is possible that my results are driven by confounding factors I have not controlled for in the cross-sectional analysis or robustness tests, particularly related to firms' disclosure levels—especially given that a subset of my sample is characterized by greater compliance with disclosure requirements and more conservative pension accounting and investment.

This paper proceeds as follows. Section 3.2 summarizes relevant literature, background related to IAS 19R, institutional setting, and hypotheses development. Section 3.3 outlines the research design. Section 3.4 presents the empirical results and discussion of the findings. Section 3.5 concludes the paper.

3.2 Background, literature, and hypotheses development

3.2.1 Firm responses to pension accounting regulation

Several studies have found that firms change behavior in response to pension accounting regulation, both when it directly impacts financial statements and reporting incentives, and when changes in disclosures place pension accounting choices under more scrutiny. Specific to the Statement of Financial Accounting Standards (SFAS) 158 requirement that U.S. firms recognize funded status of the pension plan in the balance sheet, previous studies find that firms react by using plan amendments, freezes, and liability-reducing actuarial assumptions to reduce the pension liability and improve funded status (Jones 2013), and by shifting pension asset allocation from equities to bonds to reduce funded status volatility (Amir et al. 2010). A reduced pension liability mitigates the negative balance sheet impact of SFAS 158 in the first year of adoption, while less risky asset allocation reduces pension-induced balance sheet volatility from SFAS 158 in subsequent

[37] Anantharaman (2017) finds that about 20 percent of S&P 500 firms disclose the yield curve used to discount their PBO in 10-K footnotes during its sample period (2000–2008). Yield curves used include issuer-specific curves and third-party curves from Moody's, Citigroup, Bloomberg, Merrill Lynch, S&P, Aon, Hewitt, and Mercer.

years, which may have positive consequences such as lower credit risk (T.-K. Chen, Tseng, and Lin 2022). Reactions to SFAS 158 also varied across firm characteristics, and Jones (2013) finds that the measures taken to reduce pension liabilities are associated with lower market capitalization, lower funded status, and higher leverage, while Amir et al. (2010) finds that the shift in asset allocation can be explained by increases in effective tax rates and leverage.

Specific to SFAS 132, which amended pension disclosures for U.S. firms, Chuk (2013) finds that firms reacted to mandated pension asset composition disclosure by increasing asset allocation to high-risk securities to justify upwards-biased ERRs and/or by reducing their ERRs. Additionally, Naughton (2019) finds that firms reacted to mandated disclosure of expected annual pension benefit payments (i.e., information about the PBO maturity profile) by reducing discretion in discount rates. While changes in disclosures do not alter incentives as directly as changes in recognition do, previous findings related to SFAS 158 and SFAS 132 indicate similar reactions to disclosure amendments resulting in increased transparency. Kisser et al. (2017) also investigates whether firms use regulatory freedom strategically and finds that in a period when U.S. firms simultaneously estimated two pension liabilities: one with mandated discount rates and mortality assumptions and one that allowed for discretion, regulated liabilities exceed unregulated liabilities by 10 percent, and this difference increases for underfunded plans. Ultimately, the effects of pension accounting regulation seem to persist when firms report the same obligation under different regimes simultaneously and not necessarily in reaction to new regulation.

That firms react to pension accounting regulation has been documented in non-U.S. settings as well. Li and Klumpes (2013) finds that U.K. firms with tightening debt covenants choose ERRs and salary growth rates opportunistically and that this effect was stronger during the transitional period of Financial Reporting Standard (FRS) 17. Also regarding FRS 17, Amir et al. (2010) finds that U.K. firms react to both new disclosure requirements and subsequent recognition under FRS 17 by shifting pension assets from equity to debt securities. That similar firm responses can be seen to FRS 17 in the U.K. as to SFAS 158 and SFAS 132 in the U.S. indicates that firms react similarly across institutional settings. However, the generalizability of such findings may rely on certain incentives being in place. For example, Anantharaman and Chuk (2018), Barthelme et al. (2019), and Chircop and Kiosse (2024) all find that firms reduce pension asset allocation to equities (i.e., reduce risk-taking) following adoption of IAS 19R. Interestingly, Anantharaman and Chuk (2018) and Chircop and Kiosse (2024) use Canadian and U.K. samples, respectively, and attribute reduced risk-taking to the elimination of the ERR, while Barthelme et al. (2019) uses a German sample and attributes reduced risk-taking to the removal of the corridor method. This highlights that context can modify the effects of policy changes (Cascino 2019) and that findings may not necessarily be generalized across all IFRS regimes, as institutional features can vary greatly. Overall, the literature suggests that firms respond to pension accounting regulation and that the responses may vary across firm characteristics and institutional settings.

3.2.2 Changes to pension accounting under IAS 19R

IAS 19R was issued by the IASB in June 2011, and effective in fiscal years starting after January 1st, 2013. The revised standard introduced major changes to pension accounting, including elimination of the corridor method, elimination of the ERR, and revised disclosure requirements. The elimination of the corridor method has received the most attention, likely due to changes in recognition that could significantly impact the balance sheet for firms with substantial off-balance sheet liabilities. In most cases, due to its net interest calculation, IAS 19R reduced interest income (thereby, net income) because the discount rate effectively replaced the ERR when calculating interest income on plan assets. This relative reduction in interest income depends on the difference between the ERR and the discount rate. Since most firms' ERRs exceed discount rates, given that the reference for the discount rate is market yields on high-quality corporate bonds (usually considered as bonds rated AA or higher) and that firms allocate plan assets to riskier asset classes, the elimination of the ERR negatively impacted earnings for most firms. Additionally, the revised disclosure requirements addressed concerns about the previous IAS 19 (hereinafter, "IAS 19 Unrevised"), namely that it did not provide sufficient information about the financial effects of liabilities and assets arising from defined benefit plans on the financial statements, and that the volume of disclosures may reduce understandability and usefulness by obscuring important information (IFRS Foundation 2011a). As a result, the IASB amended disclosure requirements in the IAS 19R pertaining to (1) disclosure objectives, (2) defined benefit plan characteristics, (3) future cash flow amount, timing, and uncertainty, and (4) multi-employer defined benefit plans (IFRS Foundation 2011a).

3.2.3 The role of PBO duration

After the exposure draft of IAS 19R was published in 2010, many respondents suggested that the average PBO duration be added to disclosure requirements to provide information about the maturity profile of the PBO. The IASB subsequently added this requirement to the final version of IAS 19R. Of the IAS 19R disclosure requirements, PBO duration is the only disclosure that pertains directly to determinants of discount rates. Because the reference for the discount rate is the yield on high-quality corporate bonds of the same currency and maturity as the PBO, PBO duration disclosure provides relevant information. As a result, financial statement users are better able to assess firms' discount rate choices.[38] The implications of PBO duration are particularly relevant for discount rate choices during periods when the yield curves are steep and the spreads between long and short maturities are large.

The investment horizon for pension plan assets, thereby asset composition, is also informed by PBO duration, as documented by Blankley et al. (2018). From a risk-management perspective, firms are incentivized to invest in debt securities with the same duration as the PBO (i.e., "matching assets"), mitigating funded status volatility, and consequently balance sheet volatility, as interest rate changes have similar effects on the PBO and plan assets. In addition, firms allocate plan assets to "risk-seeking" assets such as equities, hedging against PBO increases that arise from salary increases, as salaries are likely to correlate with the stock market (Rauh 2009). Furthermore, pension plans with shorter maturities (i.e., investment horizons) are more affected by short-term volatility, with less time to make up for shortfalls. Together with other disclosure amendments related to plan assets, disclosing PBO duration could place greater scrutiny on its relationship to pension asset composition as well.

3.2.4 Hypotheses development

Previous research finds that firms use PBO-reducing actuarial assumptions when pension plans are underfunded, suggesting that firms use actuarial assumptions strategically to improve funded status (e.g., Anantharaman 2017; Kisser et al. 2017; Billings et al. 2017; Asthana 1999). Anantharaman (2017) finds that (1) firms with strong incentives to improve funded status (specifically high leverage, poorly funded plans, and upcoming debt issues) use higher discount rates, particularly when the firms are economically important clients of the actuaries involved in estimating the PBO, and that (2) firms initially limited in doing so tend to seek out new actuaries and subsequently increase discount rates. Furthermore, Asthana (1999) finds that (1) firms with lower profitability, cash flow from operations, tax liability, and more debt are more likely to use PBO-reducing actuarial assumptions and that (2) firms with overfunded plans are more likely to use PBO-increasing actuarial assumptions to avoid visibility costs, particularly when firms face higher profitability, cash flow from operations, tax liability, and less debt. PBO-increasing actuarial assumptions are also found when firms want to exaggerate the economic burden of their defined benefit plan before freezes (Comprix and Muller 2011), and boost pension payouts when top executives are eligible to retire with lump-sum benefit distributions (Stefanescu, Wang, Xie, and Yang 2018).

Based on previous studies, I expect variation in discount rates beyond prescribed benchmark rate

[38]The maturity profile of PBOs can also be estimated using SFAS 132 disclosures about future benefit payments (Naughton 2019; Blankley, Hong, and Roland 2018) or IAS 19 disclosures about the PBO's interest rate sensitivity (Armitage et al. 2022). However, these estimates lack accuracy and can be difficult to interpret, making the disclosures less useful for assessing discount rates.

variation, particularly prior to IAS 19R. Subsequently, IAS 19R could either lead to a decrease or an increase in discount rates. First, amended disclosure requirements provide more information about PBO maturity and sensitivity to discount rate changes, making it easier for financial statement users to determine the appropriate discount rate and its implications. Consequently, firms may react to this increased transparency by using lower (i.e., liability-increasing) discount rates (Naughton 2019). Second, since the discount rate effectively replaces the ERR when calculating interest income, firms can reduce (increase) net interest cost (income) by increasing discount rates in most cases, provided that the increase in interest income exceeds the increase in interest cost. However, the increased importance of the discount rate may also lead to greater scrutiny from financial statement users, thereby exhibiting the opposite effect. Consequently, I make the following unsigned hypothesis:

H1: Discount rates change relative to prescribed benchmark rates following the adoption of IAS 19R.

The pension expense increase resulting from the discount rate replacing the ERR under IAS 19R depends on the difference between the discount rate and the ERR, augmenting the increase in pension expense for firms with riskier pension asset composition. Prior studies (Bergstresser et al. 2006; Godwin, Goldberg, and Duchac 1996) find that firms manage actuarial assumptions to avoid earnings decreases, suggesting that firms may try to contain the negative effect of the ERR elimination on earnings. Furthermore, the extent to which a firm can increase net interest under IAS 19R using discount rates depends on plan funding and PBO duration. As discussed by Fried, Davis-Friday, and Davis (2014), the critical point (rate) at which discount rate increases will lower the interest cost on the PBO (under the ERR regime) is determined by the following function: $1/(Duration - 1)$.[39] Conversely, discount rate increases at levels below this critical point will increase the interest cost, which is the case for most of my sample firms, as the average discount rate is 4.4 percent, which requires a 23.7-year PBO duration ($1 + 1/4.4\% = 23.7$) to reach the critical point. However, when the discount rate is applied to the net interest under IAS 19R, plan funding becomes relevant, and the function expands to $(1 - PlanAssets/PBO)/(Duration - 1)$. Consequently, the critical point at which discount rate increases increase net interest is lower than the critical point for the interest cost alone, possibly strengthening incentives to increase discount rates.[40] The difference between the two critical points depends on funded status, and the sensitivity to discount rate changes increases with distance from the

[39] Interest income is the product of PBO and the discount rate. Furthermore, changes in PBO values due to discount rate changes depend on PBO duration, as duration also represents the percentage change in the PBO from a 100 basis point change in the discount rate. For plans with longer duration, the reduction in PBO values due to increased discount rates may be enough to reduce the product of the PBO and the discount rate—which may not be true for lower-duration plans, depending on the interest rate level. A discount rate increase from 4 to 5 percent would, for example, increase the interest cost on a £100 PBO with 15-year duration from £4 ($100 * 4\%$) to £4.25 ($85 * 5\%$), but reduce the interest cost on a £100 PBO with 25-year duration from £4 ($100 * 4\%$) to £3.75 ($75 * 5\%$) due to the discount rate level being below the critical point of the 15-year PBO ($1/(15 - 1) = 7.14\%$), yet above the critical point of the 25-year PBO ($1/(25 - 1) = 4.17\%$).

[40] While only 5.5 percent of my sample have discount rates above the critical point for the interest cost alone, 99.4 percent of the sample have discount rates above the critical point for the net interest.

critical point. Ultimately, the predicted effect of plan funding is unclear, as higher funded status leads to (1) a larger pension expense increase due to the higher value of plan assets relative to the pension plan, and (2) a greater ability to reduce pension expense by increasing discount rates post-IAS 19R due to a lower critical point. Interestingly, most literature (e.g., Anantharaman 2017; Kisser et al. 2017; Asthana 1999) suggests that actuarial assumptions are more conservative among firms with better-funded plans. Given the new role of plan funding under IAS 19R and that risk-taking in pension investments (i.e., the ERR) is a determinant of post-IAS 19R earnings decreases, I make the following hypothesis examining the effect of the ERR elimination:

H2: Discount rate changes following the adoption of IAS 19R depend on plan funding, and are positively associated with risk-taking in pension investments.

Moving on to the amended disclosure requirements, previous research (e.g., Naughton 2019; Chuk 2013) also suggests that incremental pension disclosure may alter firm behavior. In the case of the new IAS 19R disclosures, information about average PBO duration may be particularly useful when assessing the appropriateness of discount rates. Similar to the Naughton (2019) finding that SFAS 132R projected benefit payment disclosures (approximating PBO maturity) lead to less discount rate discretion, I anticipate a similar effect of IAS 19R PBO duration disclosure. For the purpose of matching a firm's discount rate with yields on high-quality corporate bonds of similar maturity, IAS 19R disclosures should be even more useful than SFAS 132R disclosures as they give more precise measures of PBO duration. However, previous studies that examine disclosure compliance with IAS 19 (Cascino and Gassen 2015; Almaghrabi et al. 2021) find variation and significant noncompliance. On the one hand, incremental information from PBO duration disclosure could mitigate opportunistic discount rates, consistent with increased scrutiny (Naughton 2019). On the other hand, firms with higher discount rates relative to prescribed benchmarks are less incentivized to disclose PBO duration, possibly leading to self-selection of firms that disclose. Assuming that the choice to comply with IAS 19R disclosures is random, I make the following hypothesis:

H3: Reductions in discount rates following the adoption of IAS 19R are greater for firms that disclose PBO duration.

3.2.5 The U.K. setting

I use a sample of publicly listed firms in the U.K. mainly because (1) the U.K. has a relatively large number of firms with material defined benefit plans that report under IFRS and (2) most U.K. firms recognize actuarial gains and losses (AGLs) in other comprehensive income (OCI) as they occur under IAS

19 Unrevised, instead of deferring recognition of AGLs using the "corridor method".[41] Since the elimination of the corridor method (i.e., immediate recognition of previously unrecognized and subsequent AGLs) is considered to have the greatest impact due to potential balance sheet implications (Deloitte 2010), prevalent use of the corridor method in other settings makes it difficult to isolate the effects of the ERR elimination and amended disclosures. The U.K. provides a unique setting for examining the effects of ERR elimination and amended disclosures under IAS 19R without the confounding effect of the elimination of the corridor method since most U.K. firms did not use the corridor method prior to IAS 19R (Chircop and Kiosse 2024).[42] In addition, a third of my U.K. sample firms only disclose PBO sensitivity and not duration during the sample period, allowing a single-country difference-in-differences design when examining the implications of PBO duration disclosure—while simultaneously allowing PBO duration to be measured for the whole sample.[43] Lastly, previous studies have documented that the U.K. more strongly enforces accounting standards (Brown, Preiato, and Tarca 2014) and has better pension disclosure compliance (Almaghrabi et al. 2021) compared to other IFRS regimes. Using a U.K. sample should therefore provide high quality data and could make findings related to disclosure-related noncompliance generalizable to other IFRS regimes where noncompliance is more prevalent.

3.3 Research design

3.3.1 Main regression models

To empirically test the general effect of IAS 19R on firms' discount rate choices (H1), I estimate the following regression model using a sample of U.K. treatment firms and U.S. control firms:

$$\begin{aligned} DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \beta_4 AA + \beta_5 PBO + \beta_6 FR + \beta_7 LEV \\ + \beta_8 SIZE + \beta_9 ROA + Industry + \varepsilon \end{aligned} \tag{3}$$

[41]Under IAS 19 Unrevised, firms have the option to (1) immediately recognize AGLs in OCI, (2) amortize the portion of accumulated AGLs that exceeds the "corridor" (10 percent of the greater of the PBO and fair value of plan assets) in net income over the remaining service period of the employees, or (3) immediately recognize AGLs in net income. By using the corridor method, a substantial part of the PBO can be kept off-balance sheet, both due to the 10 percent threshold for recognition and the amortization of the exceeding amount over a relatively long period. For firms that use the corridor method, IAS 19R requires firms to recognize previously unrecorded AGLs in OCI upon adoption and recognize subsequent AGLs as they occur, leading to a change (often a decrease) in shareholders' equity upon adoption and increased balance sheet volatility in subsequent years.

[42]In comparison to other studies examining the effects of IAS 19R, 20 percent of the Canadian sample in Anantharaman and Chuk (2018) and half of the German sample in Barthelme et al. (2019) use the corridor method pre-IAS 19R. Fasshauer, Glaum, and Street (2008) also finds a high prevalence of the OCI option for AGLs when IAS 19 Unrevised was adopted in 2005 for U.K. firms in particular (almost 90 percent of the firms, compared to around 30 percent for other European firms in general), likely because the OCI option is conceptually based on FRS 17 (U.K. GAAP). In my sample selection procedure, I only remove 4 firms that use the corridor method in the last year of IAS 19 Unrevised, which is also consistent with Glaum, Keller, and Street (2018) that shows that the high prevalence of the OCI option among U.K. firms was consistent throughout the IAS 19 Unrevised regime.

[43]Approximate PBO duration can be derived from PBO sensitivity tests, which makes it possible to measure the unbiased discount rate (the yield on high-quality corporate bonds with similar maturity to the PBO) with some precision—even when PBO duration is not disclosed.

$DISC$ is the discount rate chosen by the firm, $TREAT$ is an indicator variable that equals 1 for U.K. firms (i.e., firms affected by IAS 19R) and 0 for U.S. firms, and $POST$ is an indicator variable for fiscal years starting after January 1, 2013 (i.e., when IAS 19R became mandatory). The remaining variables are control variables, and $Industry$ represents industry indicator variables based on two-digit Global Industry Classification Standard (GICS) sector codes. To test H1, I estimate the model for the full sample of U.K. treatment firms and U.S. control firms, and the coefficient of interest is $POST * TREAT$. The results are presented in Table 13 and discussed in Section 3.4.2.

Discount rates should mainly be explained by high-quality corporate bond yields (AA), as the prescribed discount rate under IAS 19 is based on market yields on high-quality corporate bonds with the same currency and maturity as the PBO.[44,45] The other control variables include pension plan and firm and characteristics that may influence discount rate choices. Among plan characteristics, I include PBO materiality (PBO) to control for the impact of the PBO and pension expense on financial statements. I also include funding ratio (FR), given that poorly funded firms may use higher discount rates to improve funded status (Anantharaman 2017; Kisser et al. 2017). Among firm characteristics, I include leverage (LEV) to control for the risk of debt covenant violations, market capitalization ($SIZE$) to control for firm size, and return on assets (ROA) to control for profitability. All variables are defined in Appendix A.

To empirically test the effect of the ERR elimination under IAS 19R on firms' discount rates choices (H2), I estimate Equation (3) while partitioning the sample by (1) risk-taking in pension investments measured as plan assets allocated to equity securities ($\%EQ$), and (2) funding ratio (FR).[46] H2 predicts a higher coefficient on $POST * TREAT$ for firms with higher risk-taking, as these firms have greater increases in pension expense from the ERR elimination that can be mitigated with higher discount rates.[47] The predicted difference in $POST * TREAT$ between high- and low-FR firms is unclear. Furthermore, the impact of plan funding may differ between firms with high and low risk-taking, as plan funding moderates the effect of risk-taking on post-IAS 19R increases in pension expense, while simultaneously being a determinant of the

[44] Since PBO duration is not disclosed under U.S. GAAP, I use the equation proposed by Naughton (2019) to estimate PBO duration for U.S. control firms based on Employee Retirement Income Security Act (ERISA) Form 5500 data. However, since Schedule B filings used by Naughton (2019) was replaced by Schedule SB for single employer plans and the MB for multiemployer plans in 2008, I use Schedule SB filings. While Naughton (2019) uses components of the Retirement Protection Act of 1994 (RPA) current liability, RPA normal cost, and expected disbursements from Schedule B filings as inputs, I use components of the total funding target (i.e., liability), target normal cost from Schedule SB filings and benefits paid from financial statements. The methodology is described in detail under the definition of PBO duration ($DURA$) in Appendix A.

[45] Since the FTSE Pension Discount Curve is constructed for pension liabilities in USD, I follow Armitage et al. (2022) and convert the yield curve to GBP for U.K. firms by inferring the difference between spot and forward foreign exchange rates, based on U.K. and U.S. government bonds. The methodology is described under the definition of AA in Appendix A.

[46] The sample is partitioned into "high" and "low" subsamples based on median $\%EQ$ and FR for U.K. and U.S. firms separately, using pre-IAS 19R data.

[47] The predicted impact of risk-taking on the post-IAS 19R increase in pension expense depends on the difference between ERR and discount rate, as the discount rate effectively replaces the ERR. However, I instead measure risk-taking as plan assets allocated to equities ($\%EQ$), a main determinant of the ERR (Chuk 2013), for two reasons. First, ERR disclosure is less precise in some cases (e.g., firms disclosing intervals) and less prevalent in 2012, possibly due to less relevance of the ERR assumption in the last year of IAS 19R, as it applies to the following period which does not exist due to IAS 19R. Second, the ERR-discount rate difference is inherently influenced by the discount rate.

ability to reduce pension expense using discount rates. To capture this effect, I estimate the following regression model, using the sample partitions based on $\%EQ$ and FR:

$$\begin{aligned} DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \beta_4 TREAT * VAR \\ + \beta_5 POST * VAR + \beta_6 POST * TREAT * VAR + \beta_7 AA + \beta_8 PBO \\ + \beta_9 FR + \beta_{10} LEV + \beta_{11} SIZE + \beta_{12} ROA + Industry + \varepsilon \end{aligned} \tag{4}$$

VAR is a placeholder variable that represents FR when the sample is partitioned by $\%EQ$, and $\%EQ$ when the sample is partitioned by FR. The rest of the variables are as previously defined. I expect the coefficient on $POST * TREAT * VAR$ to be higher for the high-$\%EQ$ and high-FR subsamples. This is because the earnings decrease for U.K. firms due to the ERR elimination—and, consequently, the incentive to mitigate these costs by maintaining a high discount rate—depends on both $\%EQ$ and FR.[48] The results of estimating equations (3) and (4) for the different subsamples are presented in Table 14 and discussed in Section 3.4.2.

Lastly, to examine the implications of amended disclosures on discount rates choices around IAS 19R (H3), I estimate the following regression model, using U.K. firms only:

$$\begin{aligned} DISC = \beta_0 + \beta_1 DISCLOSE + \beta_2 POST + \beta_3 POST * DISCLOSE + \beta_4 AA + \beta_5 DURA + \beta_6 PBO \\ + \beta_7 FR + \beta_8 LEV + \beta_9 SIZE + \beta_{10} ROA + Industry + \varepsilon \end{aligned} \tag{5}$$

$DISCLOSE$ is a placeholder variable that represents (1) first-time disclosure of PBO duration under IAS 19R ($\Delta DDISCL$), or (2) first-time disclosure of both PBO duration and sensitivity under IAS 19R ($\Delta SDDISCL$). The rest of the variables are as previously defined. While the aim is to examine the implication of PBO duration disclosure ($\Delta DDISCL$), I estimate the model using $\Delta SDDISCL$ as well to make sure that I am capturing the effect of PBO duration disclosure and not a general effect of increase in disclosures. If defining $DISCLOSE$ as $\Delta DDISCL$ produces stronger or similar results as $\Delta SDDISCL$, the effect is likely related to disclosure of PBO duration specifically. However, if the results using $\Delta SDDISCL$ are stronger, the effect is most likely due to improved disclosures in general. The results are presented in

[48]Consider two pension plans with PBOs of 100, both having discount rates of 4 percent, but with ERRs of 8 percent ("high-$\%EQ$") and 4 percent ("low-$\%EQ$"), respectively. In the case of the plan with an 8 percent ERR, replacing the ERR with the discount rate results in a greater negative impact on net income when plan funding is higher. Specifically, for a funded status of 100 percent, the impact on net income is $100 * (4\% - 8\%) = -4$, whereas for a funded status of 50 percent, the impact is $50 * (4\% - 8\%) = -2$. This difference indicates that firms with better-funded plans face a stronger incentive to select higher discount rates to offset earnings decreases caused by eliminating the ERR. Furthermore, increasing the discount rate has a greater impact on interest income when the funded status is 100 percent than when it is 50 percent, which further amplifies the incentive for firms with better-funded plans to maintain higher discount rates. In contrast, for the plan with a 4 percent ERR, replacing the ERR with the discount rate does not affect net income regardless of the funded status: $100*(4\%-4\%) = 50*(4\%-4\%) = 0$. This illustrates that plan funding is less relevant to the impact of eliminating the ERR when ERRs are low.

Table 15 and discussed in Section 3.4.2.

3.3.2 Weighting control observations using entropy balancing

To make better inferences about the effect of IAS 19R on discount rates, I use a control sample of U.S. firms that are not affected by IAS 19R. However, there is significant covariate imbalance between U.K. treatment firms and potential U.S. control firms. In addition, the number of eligible U.S. control firms is limited. Consequently, achieving covariate balance using matching procedures (e.g., propensity score matching) is not possible without discarding a significant number of control firms and having one control firm being matched with multiple treatment firms. By weighing each control observation using entropy balancing following Hainmueller (2012), I adjust for inequalities in means between the treatment and control groups and achieve covariate balance.[49] The weight of each U.S. firm is based on pre-IAS 19R values of the control variables in equations (3) and (4), and include PBO, FR, LEV, $SIZE$, and ROA. Using this technique, I am also able to retain all potential control observations rather than discarding unmatched firms.

3.4 Empirical results

3.4.1 Sample, data, and descriptive statistics

Table 10 presents the sample selection procedure for U.K. treatment firms. Accounting and stock market data are obtained from Compustat Global, and pension data is retrieved from Refinitiv Eikon and complemented with hand-collected data from annual reports. I hand-collect PBO duration, sensitivity, and inflation rate assumption data from footnote disclosures because these metrics are not available in databases to my knowledge. In addition, I hand-collect data for firm-year observations that have missing values for any of the pension variables in Refinitiv Eikon to complete the dataset and ensure data quality. Government bond yields and inflation data are also retrieved from Refinitiv Eikon, while the reference yield curve (the FTSE Pension Discount Curve) is retrieved from the Society of Actuaries website.

The initial sample consists of 4,066 firm-year observations of firms headquartered in the U.K., with a sample period from December 31, 2012, to December 30, 2014. Since IAS 19R was mandatory for fiscal years starting after January 1, 2013, this date range keeps one pre-IAS 19R observation and one post-IAS 19R observation for each firm, regardless of fiscal year-end. I remove 3,467 firm-year observations that (1) did not have defined benefit plans or (2) had PBO values of less than 1 percent of total assets. The firm-years removed at this stage are defined as firms that do not have any non-missing PBO observations or PBO observations over 1 percent of total assets in Refinitiv Eikon at any point during the sample period. Also

[49] While the entropy balancing procedure proposed by Hainmueller (2012) is relatively new, the method is now widely used in accounting studies to address covariate imbalance across treatment and control samples (McMullin and Schonberger 2022).

excluded are 134 firm-years with foreign PBOs or plan assets since actuarial assumptions differ between countries, 14 firm-years that do not apply IFRS, 20 firm-years with missing non-pension-related regression variables, and 9 firm-years that only had observations in one of the periods to have a balanced panel.

At this stage, 422 observations remain with data missing only for pension-related variables, which I hand-collect from footnote disclosures for these firms. After consolidating pension data from Refinitiv Eikon and hand-collected pension data, I remove 84 firm-years that do not have available reports nor sufficient pension disclosures. Next, I remove 8 firm-years of firms that used the corridor method to account for AGLs prior to IAS 19R, since elimination of the corridor method is a major change under IAS 19R that could influence results. Since PBO duration or sensitivity is required to determine the unbiased discount rate, I also remove 22 firm-years of firms that do not disclose PBO duration or sensitivity at any point in the sample period.

Lastly, I add a control sample of U.S. firms unaffected by IAS 19R to make more reliable inferences about the effects of the elimination of the ERR and amended disclosure requirements. Accounting, stock market, and most pension data for U.S. firms are retrieved from Compustat North America. Inputs used to estimate PBO duration are retrieved from Employee Retirement Income Security Act (ERISA) Form 5500 Schedule SB filings and merged with Compustat data, primarily based on firms' Employer Identification Number (EIN).[50] Of the 1,168 U.S. firm-years with non-missing Compustat data for the main regression variables pre- and post-IAS 19R, I am able to match 760 firm-years with ERISA data. The final sample consists of 308 U.K. treatment firm-years (154 firms) and 760 U.S. control firm-years (380 firms) weighted using the entropy balancing procedure described in Section 3.3.2.

Table 11 presents descriptive statistics pre- and post-IAS 19R for U.K. treatment firms in Panel A, and U.S. control firms in Panel B.[51] Both panels show that discount rates ($DISC$) and high-quality corporate bond yields (AA) are closely aligned, which is to be expected since the yield on high-quality corporate bonds is the reference rate under IAS 19R. Interestingly, $DISC$ is lower post- than pre-IAS 19R in Panel A, while AA is higher, indicating that discount rates are more conservative among U.K. firms post-IAS 19R. Interestingly, funding ratios (FR) do not change much post-IAS 19R, despite lower discount rates, indicating that firms took measures (e.g., discretion in other actuarial assumptions; contributions; settlements; freezes) to mitigate

[50]EINs in Compustat may be incompatable with ERISA filings in some cases due to entities filing separately from the parent company (i.e., under a different EIN), while remaining consolidated with the parent company for financial reporting purposes. To increase the number of Compustat-ERISA matches, I retrieve subsidiary data from WRDS (primarily based on Exhibit 21 filings with the Securities and Exchange Commission that lists significant subsidiaries) and merge each parent and subsidiary with available ERISA filings. Since the subsidiary dataset does not contain company identification numbers (besides parent company GVKEY), subsidiaries are merged with ERISA data based on company legal name and state. Merging ERISA and Compustat data based on company name is consistent with previous studies using ERISA data (e.g., Chuk 2013; Naughton 2019). If there is more than one ERISA filing linked to a Compustat firm-year, I use the average estimated PBO duration of the ERISA filings, weighted by size of the liability.

[51]Due to the skewness of $SIZE$ and PBO these variables are log-transformed, as described in Appendix A.

reductions in funded status due to lower discount rates. Related to amended disclosures, $SDISCL$ increases from 53.2 percent on average pre-IAS 19R to 100 percent post-IAS 19R, indicating compliance with PBO sensitivity disclosure requirements under IAS 19R. In comparison, $DDISCL$ increases from 7.1 percent pre-IAS 19R to 68.2 percent post-IAS 19R, suggesting weaker compliance with the requirement to disclose PBO duration.

Based on Panel B, U.S. firms and pension plan characteristics differ from U.K. firms in Panel A in a number of ways. Generally, U.S. firms are larger and have higher leverage. Furthermore, U.S. plans are relatively smaller and have shorter PBO duration. Related to the elimination of the ERR, risk-taking in pension investments is significantly higher for U.S. firms based on $\%EQ$, increasing the hypothetical earnings decreases from eliminating the ERR for U.S. firms. On the other hand, U.K. plans are better funded based on FR, exhibiting the opposite effect.

Table 12 presents the Pearson and Spearman correlations for U.K. treatment firms in Panel A, and U.S. control firms in Panel B. As expected, discount rates ($DISC$) correlate strongly with high-quality corporate bond yields (AA) in both panels, but more so for U.S. firms in Panel B, indicating that U.S. firms' discount rates are more aligned with benchmark yields. In the robustness tests where AA is derived from U.K. corporate bonds (Refinitiv's AA Rating GBP Credit Curve) instead of the converted FTSE Pension Discount curve, the correlation between $DISC$ and AA is higher, but still lower than for U.S. firms.

3.4.2 Main results

General discount rate changes following IAS 19R (H1)

The results of estimating Equation (3), which examines general discount rate changes, are presented in column (1) of Table 13. Since the relative importance of the control variables may vary between the pre- and post-IAS 19R periods or across treatment and control firms, I estimate modified versions of the model where I interact all control variables with $POST$ in column (2), $TREAT$ in column (3), and both $POST$ and $TREAT$ in column (4). Consistent with H1, the coefficient on $POST * TREAT$ is negative and significant at the 0.01 level across all columns, indicating that discount rates are more conservative among U.K. firms post-IAS 19R after controlling for known drivers of discount rate choices. As expected, the coefficient on AA is positive and highly significant (p-value = 0.000), as most of the discount rate should be explained by the yield on high-quality corporate bonds.

The role of ERR elimination (H2)

Table 14 examines the implications of the ERR elimination. The results of estimating Equation (3) for subsamples with above- and below median pension investment risk-taking ($\%EQ$) are presented in columns

(1) and (2) in Panel A. The coefficient on $POST * TREAT$ is negative and significant at the 0.01 level for both high and low risk-taking firms, indicating reduced discount rates for both groups, with the effect being stronger for firms less affected by the ERR elimination in column (2). However, the difference in $POST * TREAT$ in column (3) is not statistically significant, and I cannot conclude that post-IAS 19R discount rate changes depend on risk-taking in pension investments alone. The results of estimating Equation (4) for the two subsamples are presented in columns (4) and (5). Interestingly, the coefficient on $POST * TREAT * FR$ is negative and significant at the 0.01 level for firms less affected by the ERR elimination in column (5), while insignificant in column (4), indicating a negative association between plan funding and post-IAS 19R discount rates concentrated among firms less impacted by the ERR elimination. For low-$\%EQ$ firms in column (5), a U.K. firm with a funding ratio (FR) of 90 percent—approximately the average for the U.K. sample—would have a post-IAS 19R discount rate that is 0.819 lower ($0.900 * -0.910 = 0.819$). This suggests that, when the incentive to maintain high discount rates due to the discount rate replacing the ERR is weaker, better plan funding is actually associated with a greater reduction in post-IAS 19R discount rates among U.K. firms. Since firms often use actuarial assumptions to inflate reported funded status when plans are poorly funded (Anantharaman 2017; Kisser et al. 2017), one possible explanation for this finding is that firms with well-funded plans have less incentive to use high discount rates to improve their reported funded status. The difference in $POST * TREAT * FR$ between the two subsamples in column (6) is also significant at the 0.10 level, consistent with H2.

Panel B presents the results of equations (3) and (4), partitioning the sample by above- and below-median funding ratio (FR). The coefficient on $POST * TREAT$ is negative and significant at the 0.01 level for both high and low FR subsamples in columns (1) and (2), but significantly lower for high-FR firms, indicating that firms with better-funded plans reduce discount rates more than firms with lower funded plans, consistent with the results in Panel A. Furthermore, the coefficient on $POST * TREAT * \%EQ$ is significantly higher for high-FR firms in column (4) compared to low-FR firms in column (5), indicating that risk-taking is more positively associated with post-IAS 19R discount rates for firms with better-funded plans. For high-FR firms in column (4), a U.K. firm with equity allocation ($\%EQ$) of 40 percent—approximately the average for the U.K. sample—would have a post-IAS 19R discount rate that is 0.28 higher ($40 * 0.007 = 0.28$). Both $POST * TREAT * \%EQ$ for high-FR firms in column (4) and the difference between the two subsamples in column (6) are significant at the 0.01 level, consistent with H2. This finding indicates that firms tend to maintain higher discount rates post-IAS 19R when significantly impacted by the elimination of the ERR through both the ERR and plan funding mechanisms simultaneously.

Overall, the results indicate that U.K. firms chose lower discount rates following IAS 19R across subsamples, but that the reduction is greater for firms with better plan funding, particularly when the impact of the ERR elimination is lower. Conversely, when the impact of the ERR elimination is high for firms with better plan funding, the reduction in discount rates is weaker, consistent with greater post-IAS 19R earnings decreases and sensitivities to discount rate changes incentivizing higher discount rates.

The role of PBO duration disclosure (H3)

The results of estimating Equation (5), which examines the implications of PBO duration disclosure, are presented in Table 15. In column (1), where $DISCLOSE$ is defined as first-time disclosure of PBO duration ($\Delta DDISCL$), the coefficient on $POST*DISCLOSE$ is positive, indicating that discount rate reductions are weaker for disclosing firms post-IAS 19R than for non-disclosing firms, but the coefficient is not statistically significant (p-value > 0.10). However, the coefficient on $DISCLOSE$ is negative and significant at the 0.01 level, indicating that first-time disclosers of PBO duration had lower discount rates in general. The negative and significant coefficient on $DISCLOSE$ is consistent across all columns. Interestingly, the coefficient on $POST * LEV$ is negative and significant at the 0.01 level in columns (3) and (4), possibly indicating that IAS 19R mitigated some of the positive association between leverage and discount rates documented in previous studies (Anantharaman 2017; Asthana 1999). However, the post-IAS 19R impact of leverage is not significantly different between the treatment and control samples in the previous analyses.[52]

Overall, I do not find evidence that the incremental information in PBO duration disclosures leads to less discretion in post-IAS 19R discount rates (H3). Instead of a sequence where the incremental information from amended disclosures leads to greater scrutiny and thereby lower discount rates, PBO duration is mainly disclosed by firms with already lower discount rates. However, because IAS 19R was published in 2011 and my sample period starts in 2012, a possible explanation is that first-time disclosers of PBO duration reacted to IAS 19R by lowering their discount rates in 2011 and 2012 without early disclosure of PBO duration. In the robustness tests of Section 3.4.4, I discuss factors possibly confounding disclosure, but the conclusion remains that the discount rate is the main determinant of PBO duration disclosure.

3.4.3 Additional tests

Substitution of discount rate discretion

As a final test related to discount rate changes, I examine if post-IAS 19R reductions were accompanied

[52]In an untabulated analysis, I mimic the tests in Table 14 while partitioning the sample based on median LEV instead of $\%EQ$ and FR. Overall, I do not find strong evidence that the leverage effect on post-IAS 19R discount rates is different between U.K. and U.S. firms. However the difference in $POST * TREAT * \%EQ$ in column (6) in Panel B is positive and marginally significant (p-value = 0.094).

by lower inflation rate assumptions when estimating PBOs.[53] While lower discount rates increase PBO values, lower inflation rate assumptions reduce PBO values. Since Naughton (2019) finds that firms react to regulatory scrutiny of one actuarial assumption by reducing discretion in the targeted assumption and increasing discretion in other actuarial assumptions, I predict a similar effect related to IAS 19R. Using a similar research design as Naughton (2019) and all sample firms that reported both Retail Price Index (RPI) and Consumer Price Index (CPI) inflation assumptions, I estimate the following model[54]:

$$RATE\_D = \beta_0 + \beta_1 POST + Firm + \varepsilon \tag{6}$$

The results are presented in Table 16, and $RATE\_D$ is a placeholder variable that is defined as discount rate discretion ($DISC\_D$) in column (1), RPI discretion (RPI_D) in column (2), total discretion ($DISC\_D$+RPI_D) in column (3), CPI discretion (CPI_D) in column (4), and total discretion ($DISC\_D$+CPI_D) in column (5).[55] Discount rate discretion ($DISC\_D$) is defined as the reported discount rate minus the yield on high-quality corporate bonds with maturity equal to PBO duration. RPI discretion (RPI_D) is defined as Bank of England's implied 15-year inflation minus reported RPI assumption, and CPI discretion (CPI_D) is defined as Bank of England's implied 15-year inflation minus 1 percent, minus reported CPI assumption.[56] A higher value for $DISC\_D$, RPI_D, or CPI_D results in a lower PBO value. $Firm$ represents firm fixed effects.

Consistent with previously reported results of this paper, the coefficient on $POST$ is negative and significant at the 0.01 level in column (1), indicating reduced discount rate discretion post-IAS 19R. Furthermore, the positive and significant coefficient on $POST$ in column (2) indicates that inflation rate discretion increased post-IAS 19, consistent with the substitution effect between actuarial assumptions documented by Naughton (2019).[57] However, the coefficient on $POST$ is negative and significant at the 0.01 level in column (3), indicating that total discount and inflation rate discretion was reduced. Together with the relatively unchanged funding ratios, this result indicates that firms took measures beyond the

[53]Previous studies on actuarial assumptions have focused on compensation rates as well. In my sample, many firms do not disclose compensation rates due to freezes, separate compensation rates for specific groups of employees, etc. However, there should be less variation in discount and inflation rate assumptions, which are essentially financial assumptions, while compensation rates are firm-specific and may vary across firm characteristics (e.g., industry)—making it harder to measure discretion.

[54]Benefits from U.K. defined benefit plans are indexed based on RPI inflation. However, from 2030, the indexation will be based on the CPI which is lower than the RPI (Finanial Times 2020). Consequently, U.K. firms disclose both RPI and CPI, which apply to benefits paid before and after 2030, respectively.

[55]Since RPI and CPI represent inflation assumptions that apply during separate periods, total discretion is defined separately using RPI in column (3) and CPI in column (5), rather than the sum of all three rates. Therefore, the interpretation of columns (2) and (3) is similar to that of columns (4) and (5).

[56]While RPI inflation can be implied from market rates, there is no equivalent market for CPI-linked investments. Consequently, I derive the unbiased CPI assumption by making a 1 percent deduction to the RPI assumption, which was common practice among U.K. firms in 2013 (PwC 2014b).

[57]I also re-run the analysis in columns (1)–(3) without requiring non-missing values for CPI_D (to expand the sample), and the results are consistent with the tabulated results.

inflation rate assumption to alleviate the effect of reduced discount rates. As in column (2), the results in column (4) indicate an increase in CPI discretion—but unlike $POST$ in column (3), $POST$ in column (5) does not indicate a significant change in total discretion. However, since the discount rate has a stronger effect on PBO values, the post-IAS 19R increase in inflation rate discretion (RPI_D and CPI_D) is most likely not enough to completely offset the effect of reduced discount rate discretion on PBOs, based on the coefficients on $POST$. Appropriate weighting of the two assumptions when calculating total discretion would most likely lead to a decrease in total discretion in both columns (3) and (5).

3.4.4 Robustness tests

Alternative measurement of unbiased discount rates

Consistent with the yield on high-quality corporate bonds being the reference for discount rates under IAS 19, the results indicate a strong association between AA and $DISC$. However, the yield curve used to measure the unbiased discount rate (the FTSE Pension Discount Curve) is subject to bond selection and index methodology, potentially affecting the results. To test how alternative measures of the unbiased discount rate affect the results, I re-estimate the models using two alternative definitions of AA.

First, I define AA for U.K. firms as the yield on Refinitiv's AA Rating GBP Credit Curve, as it offers the advantage that it is derived directly from bonds denominated in GBP. On the other hand, the converted FTSE Pension Discount Curve offers the advantage that the yield curve is constructed using the same methodology for both U.K. treatment and U.S. control firms, in addition to being constructed for discounting pension benefits (in USD) specifically. On average, AA for U.K. firms is lower when based on Refinitiv's AA Rating GBP Credit Curve (4.134) compared to the FTSE Pension Discount Curve (4.452), and the Pearson (Spearman) correlation with $DISC$ increases to 0.522 (0.513) from 0.434 (0.440). The regression results are generally consistent with the tabulated results, but in Table 15 the positive coefficient on $POST * DISCLOSE$ becomes significant, indicating that the reductions in discount rates are weaker for first-time disclosers of PBO duration.

Second, I define AA as the median discount rate (grouped by $POST$ and $TREAT$). While the results do not change the conclusions related to my hypotheses, there are notable differences. Specifically, the results related to general discount rate reductions (H1) and the effects of funding ratio and risk-taking (H2) are greater in magnitude, indicating a much stronger reaction to IAS 19R for U.K. firms compared to U.S. firms than in the tabulated results. However, while using sample means or medians as measures for the unbiased discount rate is consistent with previous studies aiming to capture discount rate discretion (e.g., Jones 2013; Hann et al. 2007; Billings et al. 2017), it does not account for differences in bond yields of different maturities (i.e., benchmark rates). Consequently, I also estimate the models with PBO duration

($DURA$) as an additional control variable. In this case, the results are more in line with the tabulated results, but still greater in magnitude. Ultimately, these differences in results emphasize that ignoring appropriate corporate bond yields can make for imprecise, unreliable inferences, as discussed in recent studies (Naughton 2019; Armitage et al. 2022).

Standardizing PBO, FR, and ROA

One of the main issues in my discount rate analysis is that the independent variables FR and PBO are partially determined by the dependent variable ($DISC$), as discount rates directly impact PBO values. Similar to previous studies (e.g., Hann et al. 2007; Billings et al. 2017), I adjust FR and PBO to reflect the variables as if the unbiased discount rate (AA) was used to estimate the PBO.[58] In addition, I adjust ROA for the net interest cost and service cost, as ROA is partially influenced by both $DISC$ and $\%EQ$, as they determine these components of the pension expense. Most of the results are consistent with the tabulated results, but the difference in post-IAS 19R discount rates ($POST * TREAT$) between the high- and low-FR subsamples is reduced significantly. As an alternative to standardizing PBO, FR, and ROA to mitigate the effects of discount rates on the PBO and pension expense, I also lag these variables by one year, and the results are consistent with the tabulated results.

Potential confounding factors

There are several reasons for concern about omitted variable bias. Because the subsample of U.K. firms that disclose PBO duration can be characterized as having lower discount rates, I test whether the findings in Table 15 are robust to a number of additional control variables, mostly based on external monitoring of actuarial choices. First, I include institutional ownership (percentage of shares held by institutional investors, retrieved from Refinitiv Eikon), as institutional investors may be better at processing off-balance sheet pension information (Yu 2013). Second, I include analyst following (number of analysts following the firm, retrieved from I/B/E/S) as an alternative control for information environment. Third, I control for bond issues (equals 1 if firms had listed bonds in the sample period) as having public debt may confound pension disclosure choices (Almaghrabi et al. 2021).[59] Fourth, I include an indicator variable that equals 1 if the firm is audited by a Big 4 auditor (EY, Deloitte, KMPG, or PwC, retrieved from Compustat Global). However, the coefficient on $DISCLOSE$ remains significant. Furthermore, most of the coefficients on the additional variables are not statistically significant, with the exception of the interaction between $POST$ and

[58]To standardize FR and PBO, I adjust the PBO by each firms' discount rate deviation from the high-quality corporate bond yields at the reporting date ($DISC\_D$), multiplied by PBO duration ($DURA$) before calculating these variables. This adjustment is based on the concept that PBO duration is a measure of the PBO's sensitivity to interest rate changes. A PBO with a discount rate exceeding the high-quality corporate bond rate by 10 basis points (i.e., $DISC\_D$ of 0.10) and duration of 20 years will, for example, have a standardized PBO value that is 2 percent higher than the reported PBO.

[59]I retrieve data on bonds issued by any of the sample firms before December 31, 2014, and that mature after December 31, 2012 from Refinitiv Eikon.

number of analysts, which is negative and significant at the 0.10 level. Consequently, I cannot rule out that disclosure choices are strategic, as the discount rate is the main determinant of disclosure level. However, it is possible that disclosers responded to the 2011 IAS 19R publication by lowering discount rates in 2011 and 2012 without early disclosure of PBO duration.

Another potential confounding factor is that sample firms have different reporting dates, which could drive the results. Most of the U.K. treatment firms have fiscal years ending December 31 (43.2 percent) or March 31 (26.3 percent). Changes in yield curves over time due to changes in interest rates in general, credit spreads, and term structure may lead to natural differences in discount rate determinants and post-IAS 19R changes. To control for this variation, I re-estimate the models while including fiscal year-end fixed effects (by month), and the results are consistent with the tabulated results.[60] Lastly, I estimate equations (3) and (4) while partitioning the sample by median PBO duration ($DURA$) to ensure that the results are not driven by incorrect measurement of benchmark yields (i.e., assuming an incorrect yield-duration relationship), but the results do not indicate significant differences between high- and low-duration firms for any of the versions of equations (3) or (4).

3.5 Conclusion

This paper examines the effects of the elimination of the ERR and amended pension disclosures under IAS 19R on discount rates. Using a sample of firms headquartered in the U.K. and a control sample of U.S. firms, I find a significant reduction in discount rates relative to benchmark yields in the first year IAS 19R was adopted, consistent with firms reacting to financial statement users' increased ability and motivation to scrutinize discount rate choices. However, the reduction is weaker for firms with higher risk-taking in pension investments, especially when funding ratios are high, indicating that firms that suffered greater earnings decreases due to the ERR elimination maintained higher post-IAS 19R discount rates to mitigate the impact. Furthermore, I find that firms that complied with the new requirement to disclose PBO duration under IAS 19R generally had lower discount rates than non-disclosers, both before and after IAS 19R. While disclosure choices may be strategic, another possibility is that firms that disclose PBO duration reduced discount rates in the years leading up to IAS 19R in anticipation of amended disclosures. Additional analysis also documents that the post-IAS 19R reduction in discount rate discretion is accompanied by an increase in inflation rate discretion, offsetting some of the increase in PBO values caused by reduced discount rates.

Overall, the results suggest that IAS 19R generally curbed the use of opportunistic discount rates to some extent. Perhaps more importantly, this study documents that discount rates are used to mitigate earnings

[60] In addition, I re-estimate the models without industry fixed effects. While industry fixed effects are commonly used in the literature and consistent with the idea that firms use peer data in their pension accounting, discount rates should not depend on industry in theory. That being said, the results are consistent when firm fixed effects are excluded.

decreases, indicating that discount rates play a more important role in managing earnings post-IAS 19R after replacing the ERR in the interest income calculation—similar to the role of the ERR (Bergstresser et al. 2006). Future studies could examine if the association between earnings management incentives and discount rate choices persists throughout the post-IAS 19R period. This study is also one of the first studies to examine the relationship between disclosure level and discretionary actuarial choices. Further research could investigate determinants of pension disclosure compliance, how they relate to earnings management behavior, and how financial statement users respond to differences in compliance with pension disclosure requirements.

3.6 Tables

Table 10: Sample selection

	Observations	Firms
U.K. firm-years ending between December 31, 2012, and December 30, 2014	$4,066$	$2,102$
− Firms with PBOs under 1% of total assets	$-3,467$	$-1,800$
− Firms with foreign PBOs or plan assets	-134	-67
− Non-IFRS firm-years	-14	-8
− Firm-years with missing non-pension related regression variables	-20	-13
− Firms without observations pre- and post-IAS 19R	-9	-9
− Firms without available pension data for hand collection	-84	-42
− Firms that used the corridor method prior to IAS 19R	-8	-4
− Firms that did not disclose PBO duration or sensitivity	-22	-11
= Sample of U.K. firms affected by IAS 19R	308	154
+ U.S. control firms weighted using entropy balancing	760	380
= Final sample	$1,068$	534

Table 11: Descriptive statistics

Panel A: U.K. Sample ($TREAT = 1$)

	Pre-IAS 19R						Post-IAS 19R					
	N	Mean	SD	Q1	Median	Q3	N	Mean	SD	Q1	Median	Q3
DISC	154	4.424	0.186	4.300	4.400	4.600	154	4.362	0.241	4.300	4.400	4.500
AA	154	4.355	0.429	4.010	4.397	4.691	154	4.548	0.300	4.352	4.642	4.765
DURA	154	18.090	2.933	16.000	18.000	20.000	154	17.864	3.077	16.000	18.000	20.000
PBO	154	−0.055	1.474	−0.935	−0.121	0.844	154	−0.032	1.572	−0.960	−0.167	0.838
FR	154	0.892	0.129	0.820	0.904	0.962	154	0.909	0.133	0.841	0.909	1.000
LEV	154	0.587	0.231	0.423	0.581	0.751	154	0.574	0.225	0.429	0.566	0.742
SIZE	154	5.482	2.017	4.025	5.572	7.053	154	5.710	2.023	4.517	5.818	7.243
ROA	154	0.049	0.071	0.021	0.052	0.078	154	0.056	0.058	0.022	0.052	0.088
%EQ	154	41.816	19.348	26.560	43.203	53.930	154	41.462	19.901	26.900	43.834	54.381
DISC_D	154	0.068	0.381	−0.228	0.060	0.310	154	−0.183	0.231	−0.319	−0.220	−0.064
RPI_D	140	−0.042	0.160	−0.164	−0.064	0.036	140	0.040	0.145	−0.047	0.046	0.126
CPI_D	96	−0.180	0.244	−0.318	−0.164	−0.031	96	−0.001	0.186	−0.112	−0.012	0.129
DDISCL	154	0.071	0.258	0.000	0.000	0.000	154	0.682	0.467	0.000	1.000	1.000
SDISCL	154	0.532	0.501	0.000	1.000	1.000	154	1.000	0.000	1.000	1.000	1.000
SDDISCL	154	0.058	0.235	0.000	0.000	0.000	154	0.682	0.467	0.000	1.000	1.000

Panel B: U.S. Sample ($TREAT = 0$)

	Pre-IAS 19R						Post-IAS 19R					
	N	Mean	SD	Q1	Median	Q3	N	Mean	SD	Q1	Median	Q3
DISC	380	4.090	0.412	3.830	4.040	4.250	380	4.697	0.359	4.500	4.750	4.971
AA	380	3.679	0.466	3.463	3.604	3.912	380	4.450	0.392	4.247	4.605	4.733
DURA	380	13.897	2.240	12.000	14.000	15.000	380	13.313	2.269	12.000	13.000	15.000
PBO	380	−1.124	1.312	−1.963	−1.151	−0.344	380	−1.251	1.271	−2.108	−1.227	−0.472
FR	380	0.775	0.157	0.689	0.759	0.847	380	0.899	0.180	0.805	0.883	0.975
LEV	380	0.693	0.196	0.549	0.701	0.874	380	0.681	0.193	0.536	0.686	0.865
SIZE	380	7.540	2.110	6.287	7.652	9.108	380	7.772	2.098	6.647	7.936	9.256
ROA	380	0.045	0.054	0.011	0.039	0.072	380	0.049	0.047	0.012	0.041	0.074
%EQ	380	52.175	16.225	44.000	55.700	63.000	380	51.689	18.232	38.825	55.000	65.000
DISC_D	380	0.409	0.440	0.151	0.422	0.657	380	0.247	0.399	0.017	0.258	0.497

Continuous variables are winsorized at the 1st and 99th percentiles.

All variables are defined in Appendix A.

Table 12: Correlations

Panel A: U.K. Sample ($TREAT = 1$)

	DISC	AA	DURA	PBO	FR	LEV	SIZE	ROA	%EQ	DISC_	RPI_D	CPI_D	DDISC	SDISC	SDDIS
DISC		**0.434**	**0.144**	0.047	0.073	0.090	**0.172**	0.037	**0.155**	**0.132**	−0.046	−0.098	**−0.115**	0.039	**−0.128**
AA	**0.440**		**0.603**	**−0.100**	0.093	0.002	**0.223**	0.004	**0.100**	**−0.831**	0.079	**0.185**	**0.211**	**0.235**	**0.218**
DURA	**0.174**	**0.591**		**−0.188**	0.035	0.042	**0.282**	−0.024	**0.118**	**−0.576**	**−0.211**	**−0.178**	0.075	0.069	0.075
PBO	0.042	**−0.108**	**−0.198**		**−0.112**	**0.624**	**−0.167**	−0.052	**−0.135**	**0.140**	**0.195**	**0.172**	0.070	**0.119**	0.076
FR	0.052	0.079	−0.005	**−0.133**		**−0.096**	**0.177**	0.042	**−0.198**	−0.056	**−0.140**	0.002	0.064	0.025	0.061
LEV	0.080	0.021	0.081	**0.589**	**−0.096**		0.051	**−0.265**	**−0.148**	0.049	0.065	**0.127**	0.020	0.086	0.030
SIZE	**0.157**	**0.223**	**0.291**	**−0.218**	**0.158**	0.041		**0.330**	0.005	**−0.143**	**−0.101**	**−0.207**	**0.183**	**0.153**	**0.180**
ROA	0.021	0.014	0.006	−0.079	0.045	**−0.278**	**0.336**		**0.098**	0.025	**−0.104**	−0.104	0.066	0.010	0.060
%EQ	0.089	0.088	**0.125**	**−0.154**	**−0.212**	**−0.127**	−0.021	0.084		−0.018	−0.087	**−0.121**	−0.089	0.015	−0.088
DISC_D	**0.119**	**−0.798**	**−0.582**	**0.167**	−0.039	0.025	**−0.156**	0.002	−0.025		**−0.116**	**−0.265**	**−0.307**	**−0.236**	**−0.324**
RPI_D	−0.012	0.097	**−0.207**	**0.201**	**−0.155**	0.072	**−0.105**	−0.095	−0.045	**−0.103**		**0.743**	**0.173**	**0.149**	**0.190**
CPI_D	−0.001	**0.187**	**−0.176**	**0.180**	−0.011	**0.123**	**−0.215**	**−0.161**	−0.073	**−0.198**	**0.737**		**0.233**	**0.240**	**0.256**
DDISCL	−0.064	**0.211**	0.062	0.040	0.056	0.024	**0.188**	0.039	−0.072	**−0.303**	**0.172**	**0.212**		**0.398**	**0.986**
SDISCL	0.084	**0.234**	0.052	**0.117**	0.001	0.093	**0.141**	−0.039	−0.001	**−0.228**	**0.142**	**0.201**	**0.398**		**0.423**
SDDISCL	−0.080	**0.221**	0.062	0.043	0.052	0.032	**0.184**	0.037	−0.071	**−0.321**	**0.190**	**0.231**	**0.986**	**0.423**	

Panel B: U.S. Sample ($TREAT = 0$)

	DISC	AA	DURA	PBO	FR	LEV	SIZE	ROA	%EQ	DISC_
DISC		**0.685**	−0.019	**0.086**	**0.335**	0.009	0.037	0.027	**0.073**	**0.218**
AA	**0.709**		**0.426**	**−0.141**	**0.310**	−0.058	**0.072**	**0.077**	**0.084**	**−0.557**
DURA	−0.002	**0.420**		**−0.199**	−0.023	−0.029	0.019	**0.070**	**0.117**	**−0.593**
PBO	**0.086**	**−0.161**	**−0.246**		**−0.102**	**0.125**	**0.100**	**0.156**	**−0.092**	**0.288**
FR	**0.411**	**0.356**	**−0.077**	**−0.075**		0.056	0.045	−0.019	**0.063**	−0.036
LEV	−0.005	−0.046	−0.007	0.043	0.035		**−0.150**	**−0.400**	**0.073**	**0.085**
SIZE	0.044	**0.072**	−0.001	**0.136**	**0.075**	**−0.148**		**0.441**	**−0.112**	−0.048
ROA	0.031	**0.060**	0.007	**0.263**	0.013	**−0.514**	**0.473**		0.011	**−0.071**
%EQ	**0.081**	**0.115**	**0.158**	**−0.158**	0.053	**0.084**	**−0.164**	−0.026		−0.029
DISC_D	**0.139**	**−0.559**	**−0.581**	**0.335**	−0.024	0.029	−0.035	−0.016	**−0.070**	

Pearson (Spearman) correlations are reported above (below) the diagonal.
Column names are truncated to five characters to preserve space for formatting.
Values in bold are significant at the 0.10 level.
Continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 13: General discount rate changes following IAS 19R (H1)

$DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \sum CONTROLS + Industry + \varepsilon$

	(1) $DISC$	(2) $DISC$	(3) $DISC$	(4) $DISC$
Intercept	2.772***	3.126***	2.689***	3.054***
	(9.828)	(10.531)	(7.332)	(8.042)
$TREAT$	−0.028	−0.014	0.485	0.372
	(−0.512)	(−0.237)	(1.175)	(0.968)
$POST$	0.233***	−0.279	0.217***	−0.265
	(3.349)	(−0.732)	(2.878)	(−0.702)
$POST * TREAT$	−0.368***	−0.362***	−0.338***	−0.341***
	(−5.830)	(−5.988)	(−4.332)	(−4.531)
AA	0.366***	0.344***	0.383***	0.358***
	(7.257)	(6.596)	(5.936)	(5.400)
PBO	0.030	0.046**	0.042	0.057**
	(1.569)	(2.167)	(1.628)	(2.128)
FR	0.241	0.069	0.300	0.129
	(1.461)	(0.323)	(1.470)	(0.506)
LEV	0.063	0.020	0.114	0.072
	(0.370)	(0.121)	(0.470)	(0.312)
$SIZE$	−0.015	−0.031**	−0.021	−0.037**
	(−1.395)	(−2.333)	(−1.395)	(−2.160)
ROA	0.213	0.202	0.253	0.235
	(0.457)	(0.395)	(0.332)	(0.299)
$POST * AA$		0.010		0.008
		(0.155)		(0.122)
$POST * PBO$		−0.029		−0.027
		(−1.379)		(−1.286)
$POST * FR$		0.277*		0.270
		(1.707)		(1.630)
$POST * LEV$		0.056		0.045
		(0.360)		(0.294)
$POST * SIZE$		0.033**		0.033**
		(2.568)		(2.581)
$POST * ROA$		−0.083		−0.084
		(−0.145)		(−0.146)
$TREAT * AA$			−0.098	−0.076
			(−1.304)	(−1.041)
$TREAT * PBO$			−0.030	−0.029
			(−1.139)	(−1.145)
$TREAT * FR$			−0.227	−0.196
			(−0.941)	(−0.805)
$TREAT * LEV$			−0.086	−0.077
			(−0.353)	(−0.321)
$TREAT * SIZE$			0.025	0.025
			(1.464)	(1.481)
$TREAT * ROA$			−0.086	−0.060
			(−0.109)	(−0.079)
Industry FE	Yes	Yes	Yes	Yes
Observations	1,068	1,068	1,068	1,068
Adjusted R^2	0.418	0.429	0.421	0.432

Column (1) presents the results of estimating Equation (3) for U.K. and U.S. firms, examining the effect of IAS 19R on discount rates ($DISC$). Columns (2)-(4) present modified versions of the model where the coefficients on the control variables vary across the pre- and post-IAS 19R periods ($POST$), treatment and control firms ($TREAT$), and both ($POST$ and $TREAT$).

U.S. control observations are weighted using the entropy balancing procedure described in Section 3.3.2.

The results are discussed in Section 3.4.2.

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

t-statistics in parentheses are calculated using robust standard errors clustered by firm.

All continuous variables are winsorized at the 1st and 99th percentiles.

All variables are defined in Appendix A.

Table 14: Discount rate changes following IAS 19R conditional on ERR-elimination (H2)

Panel A: Sample split between high and low pension investment risk-taking ($\%EQ$)

$$DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \sum CONTROLS + Industry + \varepsilon$$

$$DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \beta_4 FR + \beta_5 TREAT * FR + \beta_6 POST * FR + \beta_7 POST * TREAT * FR + \sum CONTROLS + Industry + \varepsilon$$

	(1) $DISC$	(2) $DISC$	(3) $DISC$	(4) $DISC$	(5) $DISC$	(6) $DISC$
Intercept	2.450***	2.726***	−0.276	2.514***	2.993***	−0.479
	(6.995)	(6.377)	(−0.499)	(6.831)	(7.115)	(−0.858)
$TREAT$	−0.069	0.022	−0.090	0.020	0.197	−0.177
	(−0.960)	(0.312)	(−0.904)	(0.060)	(0.658)	(−0.393)
$POST$	0.158**	0.279***	−0.122	0.040	−0.291	0.331
	(2.140)	(2.620)	(−0.940)	(0.158)	(−1.077)	(0.895)
$POST * TREAT$	−0.280***	−0.426***	0.146	−0.264	0.348	−0.612
	(−3.927)	(−4.545)	(1.244)	(−0.848)	(1.072)	(−1.362)
$TREAT * FR$				−0.095	−0.137	0.043
				(−0.239)	(−0.375)	(0.079)
$POST * FR$				0.141	0.702**	−0.561
				(0.518)	(2.516)	(−1.440)
$POST * TREAT * FR$				−0.022	−0.910***	0.888*
				(−0.063)	(−2.653)	(1.827)
AA	0.400***	0.340***	0.060	0.398***	0.320***	0.078
	(5.666)	(5.452)	(0.643)	(5.703)	(5.588)	(0.867)
PBO	0.013	0.034	−0.020	0.014	0.038	−0.024
	(0.574)	(1.262)	(−0.573)	(0.613)	(1.529)	(−0.699)
FR	0.262	0.496**	−0.235	0.199	0.220	−0.021
	(1.525)	(2.137)	(−0.814)	(0.689)	(0.700)	(−0.049)
LEV	0.179	−0.100	0.278	0.169	−0.126	0.294
	(0.834)	(−0.449)	(0.903)	(0.782)	(−0.591)	(0.973)
$SIZE$	−0.008	−0.010	0.002	−0.008	−0.009	0.001
	(−0.489)	(−0.867)	(0.103)	(−0.468)	(−0.827)	(0.064)
ROA	−0.111	0.228	−0.340	−0.130	0.216	−0.346
	(−0.160)	(0.412)	(−0.382)	(−0.180)	(0.418)	(−0.391)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	High $\%EQ$	Low $\%EQ$	Col. (1)−(2)	High $\%EQ$	Low $\%EQ$	Col. (4)−(5)
Observations	532	536		532	536	
Adjusted R^2	0.394	0.504		0.392	0.528	

Panel B: Sample split between high and low plan funding (FR)

$$DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \sum CONTROLS + Industry + \varepsilon$$

$$DISC = \beta_0 + \beta_1 TREAT + \beta_2 POST + \beta_3 POST * TREAT + \beta_4 \%EQ + \beta_5 TREAT * \%EQ + \beta_6 POST * \%EQ + \beta_7 POST * TREAT * \%EQ + \sum CONTROLS + Industry + \varepsilon$$

	(1) $DISC$	(2) $DISC$	(3) $DISC$	(4) $DISC$	(5) $DISC$	(6) $DISC$
Intercept	3.206***	2.115***	1.091**	3.059***	2.385***	0.674
	(8.951)	(5.969)	(2.168)	(9.362)	(6.584)	(1.383)
$TREAT$	0.013	−0.076	0.089	0.227	−0.171*	0.398**
	(0.167)	(−1.124)	(0.871)	(1.471)	(−1.727)	(2.173)
$POST$	0.340***	0.102	0.237**	0.563***	−0.099	0.662***
	(4.116)	(1.160)	(1.966)	(3.449)	(−0.708)	(3.085)
$POST * TREAT$	−0.499***	−0.231***	−0.268**	−0.826***	−0.009	−0.817***
	(−6.543)	(−2.865)	(−2.416)	(−5.051)	(−0.057)	(−3.661)
$\%EQ$				0.003	−0.001	0.004
				(1.479)	(−0.551)	(1.520)
$TREAT * \%EQ$				−0.004	0.003	−0.007**
				(−1.623)	(1.225)	(−2.035)
$POST * \%EQ$				−0.004*	0.005*	−0.009**
				(−1.785)	(1.800)	(−2.535)
$POST * TREAT * \%EQ$				0.007***	−0.005*	0.012***
				(2.635)	(−1.705)	(3.036)
AA	0.380***	0.380***	−0.000	0.372***	0.352***	0.020
	(5.941)	(6.878)	(−0.003)	(5.880)	(6.212)	(0.238)
PBO	0.023	0.014	0.009	0.022	0.021	0.000
	(0.840)	(0.640)	(0.249)	(0.799)	(1.062)	(0.010)
FR	−0.288	0.965***	−1.253***	−0.278	0.828***	−1.106***
	(−1.503)	(3.368)	(−3.639)	(−1.492)	(2.985)	(−3.313)
LEV	0.092	0.059	0.033	0.091	0.024	0.066
	(0.420)	(0.373)	(0.123)	(0.397)	(0.164)	(0.245)
$SIZE$	−0.032**	−0.003	−0.029	−0.031**	−0.003	−0.028
	(−2.382)	(−0.257)	(−1.591)	(−2.278)	(−0.279)	(−1.509)
ROA	0.758	−0.648	1.406*	0.765	−0.784*	1.549*
	(1.226)	(−1.310)	(1.777)	(1.180)	(−1.673)	(1.938)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Sample	High FR	Low FR	Col. (1)−(2)	High FR	Low FR	Col. (4)−(5)
Observations	534	534		534	534	
Adjusted R^2	0.449	0.495		0.452	0.506	

This table presents the results of estimating Equation (3) and Equation (4) for U.K. and U.S. firms, partitioning the sample by risk-taking in pension investments ($\%EQ$) in Panel A, and plan funding (FR) in Panel B. Columns (1) and (2) (columns (4) and (5)) present the results for above- and below-median subsamples, and column (3) (column (6)) presents the difference in coefficients between the subsamples.

U.S. control observations are weighted using the entropy balancing procedure described in Section 3.3.2.

The results are discussed in Section 3.4.2.

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

t-statistics in parentheses are calculated using robust standard errors clustered by firm.

All continuous variables are winsorized at the 1st and 99th percentiles.

All variables are defined in Appendix A.

Table 15: Discount rate changes following IAS 19R conditional on disclosure (H3)

$$DISC = \beta_0 + \beta_1 DISCLOSE + \beta_2 POST + \beta_3 POST * DISCLOSE + \sum CONTROLS + Industry + \varepsilon$$

	(1) *DISC*	(2) *DISC*	(3) *DISC*	(4) *DISC*
Intercept	3.112***	3.137***	3.382***	3.424***
	(16.271)	(15.564)	(20.913)	(19.814)
DISCLOSE	−0.093***	−0.087***	−0.093***	−0.095***
	(−3.263)	(−2.976)	(−3.490)	(−3.417)
POST	−0.145***	−0.135***	−1.261***	−1.282***
	(−6.265)	(−7.171)	(−3.563)	(−3.518)
$POST * DISCLOSE$	0.035	0.045	0.022	0.047
	(1.215)	(1.356)	(0.697)	(1.370)
AA	0.284***	0.276***	0.179***	0.170***
	(7.698)	(7.065)	(5.922)	(5.345)
PBO	0.018	0.016	0.005	0.002
	(1.443)	(1.351)	(0.351)	(0.162)
FR	0.076	0.098	0.170	0.194*
	(0.614)	(0.790)	(1.595)	(1.811)
LEV	−0.018	−0.021	0.118	0.112
	(−0.209)	(−0.241)	(1.530)	(1.448)
SIZE	0.012	0.009	0.012	0.009
	(1.551)	(1.249)	(1.543)	(1.098)
ROA	0.109	0.064	0.289	0.240
	(0.462)	(0.267)	(1.372)	(1.146)
$POST * AA$			0.335***	0.337***
			(4.553)	(4.458)
$POST * PBO$			0.026*	0.027*
			(1.800)	(1.934)
$POST * FR$			−0.183	−0.182
			(−1.374)	(−1.377)
$POST * LEV$			−0.279***	−0.273***
			(−3.179)	(−3.083)
$POST * SIZE$			−0.005	−0.004
			(−0.555)	(−0.426)
$POST * ROA$			−0.402	−0.389
			(−1.202)	(−1.161)
Industry FE	Yes	Yes	Yes	Yes
$DISCLOSE =$	$\Delta DDISCL$	$\Delta SDDISCL$	$\Delta DDISCL$	$\Delta SDDISCL$
Observations	308	308	308	308
Adjusted R^2	0.285	0.276	0.352	0.344

This table presents the results of estimating Equation (5) for U.K. firms, examining the effect of IAS 19R on discount rates ($DISC$) conditional on first-time disclosure of PBO duration ($\Delta DDISCL$) in column (1), and first-time disclosure of both PBO sensitivity and duration ($\Delta SDDISCL$) in column (2). Columns (3) and (4) presents modified versions of the model where the coefficients on the control variables vary across the pre- and post-IAS 19R periods.
The results are discussed in Section 3.4.2.
*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 16: Substitution between discretion in discount and inflation rate assumptions around IAS 19R

$RATE\_D = \beta_0 + \beta_1 POST + Firm + \varepsilon$

	(1)	(2)	(3)	(4)	(5)
	$DISC\_D$	RPI_D	$DISC\_D$+RPI_D	CPI_D	$DISC\_D$+CPI_D
Intercept	0.158^{***}	0.089^{***}	0.247^{***}	-0.203^{***}	-0.044^{**}
	(8.084)	(10.922)	(13.506)	(−15.553)	(−2.540)
$POST$	-0.219^{***}	0.086^{***}	-0.133^{***}	0.169^{***}	−0.050
	(−5.593)	(5.253)	(−3.642)	(6.483)	(−1.433)
Firm FE	Yes	Yes	Yes	Yes	Yes
$RATE\_D =$	$DISC\_D$	RPI_D	$DISC\_D$+RPI_D	CPI_D	$DISC\_D$+CPI_D
Observations	174	174	174	174	174
Adjusted R^2	0.313	0.466	0.476	0.388	0.525

This table presents the results of estimating Equation (6) for U.K. firms, examining the discretion in discount rates ($DISC\_D$) and inflation rate assumptions (RPI_D and CPI_D) used to estimate PBOs. The sample includes all U.K. firms with non-missing values for $DISC\_D$, RPI_D, and CPI_D. $RATE\_D$ is defined as discretionary discount rate ($DISC\_D$) in column (1), discretionary RPI assumption (RPI_D) in column (2), total discount rate and RPI discretion in column (3), discretionary CPI assumption (CPI_D) in column (4), and total discount rate and CPI discretion in column (5).

The results are discussed in Section 3.4.3.

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.

t-statistics in parentheses are calculated using robust standard errors clustered by firm.

All continuous variables are winsorized at the 1st and 99th percentiles.

All variables are defined in Appendix A.

3.7 Appendix A: Variable definitions

Variable	Definition
AA	The yield on high-quality corporate bonds, measured as the yield on FTSE Pension Discount Curve (USD) at the reporting date with maturity equal to PBO duration. For U.K. firms, the high-quality corporate bond yield with maturity n is converted from USD to GBP based on zero-coupon yields on U.K. and U.S. government bonds (Gov) with maturity n, using the following equation: $AA_{n,£} = (1+Gov_{n,£})(1+AA_{n,\$})/(1+Gov_{n,\$})$ (source: Society of Actuaries; Refinitiv Eikon).
CPI_D	Discretionary Consumer Price Index (CPI) inflation assumption, measured as the Bank of England implied 15-year inflation, minus reported CPI assumption, minus 1. A higher value reduces the PBO value (source: Refinitiv Eikon; hand-collected).
$DDISCL$	An indicator variable that equals 1 if the firm discloses PBO duration in the current year, and 0 otherwise (source: hand-collected).
$\Delta DDISCL$	An indicator variable that equals 1 if the firm discloses PBO duration for the first time post-IAS 19R, and 0 otherwise (source: hand-collected).
$DISC$	Discount rate, measured as the reported discount rate in percent (source: Refinitiv Eikon; hand-collected; Compustat).
$DISC\_D$	Discretionary discount rate, measured as the reported discount rate, minus the yield on high-quality corporate bonds with maturity equal to PBO duration. A higher value reduces PBO value (source: Refinitiv Eikon; hand-collected; Compustat).
$DISCLOSE$	A placeholder variable that represents first-time disclosure of PBO duration under IAS 19R ($\Delta DDISCL$) or first-time disclosure of both PBO duration and sensitivity under IAS 19R ($\Delta SDDISCL$).
$DURA$	PBO duration, measured for U.K. firms as (1) reported PBO duration if available, (2) post-IAS 19R duration if a firm only discloses PBO duration post-IAS 19R, (3) change in PBO divided by change in discount rate based on PBO sensitivity disclosure if a firm does not disclose PBO duration at any point, or (4) change in PBO divided by change in discount rate based on post-IAS 19R PBO sensitivity disclosure if a firm does not disclose PBO duration at any point and only discloses PBO sensitivity post-IAS 19R. For U.S. firms, duration is estimated using the following equation: $Duration = 16.86 * Act_{Vst} + 20.59 * Act_{Non} + 23.69 * TV + 10.57 * Ret + 26.72 * NC - 50.56 * Dis$ where Act_{Vst}, Act_{Non}, TV, and Ret are the vested active participants, nonvested active participants, terminated vested participants, and retired participants components of the ERISA Form 5500 Schedule SB total funding target, divided by total funding target. NC is the target normal cost divided by total funding target, and Dis is benefits paid divided by PBO (source: hand-collected; ERISA Form 5500 Schedule SB; Compustat).
$\%EQ$	Risk-taking in pension investments, measured as percentage of pension plan assets invested in equity securities (source: Refinitiv Eikon; hand-collected; Compustat).
FR	Funding ratio, measured as the fair value of pension plan assets divided by PBO (source: Refinitiv Eikon; hand-collected; Compustat).
LEV	Leverage, measured as total liabilities divided by total assets (source: Compustat).
PBO	PBO size, measured as the natural logarithm of the ratio of PBO to book value of equity (source: Refinitiv Eikon; hand-collected; Compustat).
$POST$	An indicator variable that equals 1 for fiscal years ending on or after December 31, 2013 (i.e., the post-IAS19R adoption), and 0 otherwise.
$RATE\_D$	A placeholder variable that takes the value of $DISC\_D$, RPI_D, CPI_D, $DISC\_D$+RPI_D, or $DISC\_D$+CPI_D.
ROA	Return on assets, measured as income before extraordinary items, divided by the average of the current and previous year's total assets (source: Compustat).
RPI_D	Discretionary Retail Price Index (RPI) inflation assumption, measured as the Bank of England implied 15-year inflation, minus reported RPI assumption. A higher value reduces the PBO value (source: Refinitiv Eikon; hand-collected).

$SDDISCL$	An indicator variable that equals 1 if the firm discloses both PBO sensitivity and PBO duration in the current year, and 0 otherwise (source: hand-collected).
$\Delta SDDISCL$	An indicator variable that equals 1 if the firm discloses both PBO sensitivity and PBO duration for the first time post-IAS 19R, and 0 otherwise (source: hand-collected).
$SDISCL$	An indicator variable that equals 1 if the firm discloses PBO sensitivity to discount rate changes in the current year, and 0 otherwise (source: hand-collected).
$\Delta SDISCL$	An indicator variable that equals 1 if the firm discloses PBO sensitivity to discount rate changes for the first time post-IAS 19R, and 0 otherwise (source: hand-collected).
$SIZE$	Firm size, measured as the natural logarithm of market capitalization in GBP millions (source: Compustat).
$TREAT$	An indicator variable that equals 1 for U.K. firms, and 0 for U.S. firms.
VAR	A placeholder variable that takes the value of FR or $\%EQ$.

4 Pension Liabilities and Borrowing Costs

Abstract

Within the setting of pension liabilities, I examine an important outcome of applying an accounting standard across distinct local market conditions. When discounting pension liabilities under International Accounting Standard 19 *Employee Benefits*, two different discount rates can be used: market yields on high-quality corporate bonds if the local market is sufficiently deep or market yields on government bonds, which are usually lower. I focus on a regulatory event that eliminated the requirement to use market yields on government bonds when valuing Norwegian pension liabilities. I hypothesize and find some evidence that Norwegian firms with larger pension liabilities incur lower cost of debt following the regulatory change and that the reduction is more pronounced for financially constrained firms. Similarly, I find that stock market participants anticipate these positive effects by reacting positively to the announcement of the regulatory change. Overall, my findings highlight important market outcomes when different approaches are taken to comply with International Financial Reporting Standards.

4.1 Introduction

International Financial Reporting Standards (IFRS) intend to standardize financial reporting practices, thereby improving transparency, facilitating accountability, and contributing to economic efficiency (IFRS Foundation 2024). Whether local reporting practices do in fact converge as a result of IFRS however, is not always clear (Leuz 2010). In 2009, the International Accounting Standards Board (IASB) proposed to amend its guidance on how discount rates are used to estimate projected benefit obligations (PBO) under International Accounting Standard (IAS) 19 *Employee Benefits*—due to concerns about financial statement comparability. The PBO component of the reported net pension liability in the balance sheet requires actuaries to estimate the present value of future pension benefits to be paid by defined benefit pension plans (hereafter, "DB plans"). Several actuarial assumptions (e.g., salary growth, mortality rates, etc.) determine cash flow timing and amounts, which are then discounted at the prescribed discount rate (i.e., as prescribed by the applicable accounting standard). Under IAS 19, the discount rate that estimates the PBO should be based on market yields on high-quality corporate bonds with currencies and maturities consistent with benefit payments (IFRS Foundation 2011a). However, in countries where there is no deep market for high-quality corporate bonds, market yields on government bonds should determine discount rates instead (IFRS Foundation 2011a). Due to the spread between corporate bond and government bond yields, as well as the sensitivity of PBOs to interest rate changes, firms in jurisdictions without a deep market for high-quality corporate bonds may report significantly higher PBOs, that are otherwise equivalent, than firms in jurisdictions with a deep market for such bonds. In 2009, the IASB proposed that firms estimate market yields on high-quality corporate bonds with reference to IAS 39 Financial Instruments *Recognition and Measurement* instead of market yields on government bonds (IASB 2009). Ultimately the IASB rescinded this proposal due to stakeholder concerns, allowing discount rates to instead be determined by local bond market development.[61] At the time of the originally proposed amendments, both interest rates and asset prices had declined following the 2008 financial crisis, which significantly reduced plan funding and thereby gave firms stronger incentives to use actuarial assumptions strategically. Firms that used government bond rates to discount PBOs had particularly strong incentives to do so, because of the large differences between corporate and government bond yields due to high credit spreads during this same period (i.e., from 2008 to 2013).

This paper examines the impact that a deep market for high-quality corporate bonds has on borrowing costs for local firms, in the context of IAS 19. Because of the absence of a deep market for high-quality corporate bonds in Norway, market yields on government bonds have determined the discount rates that estimate PBOs with benefit payments denominated in Norwegian kroner (NOK)—up until 2012. In 2012, however, the Norwegian Accounting Standards Board (NASB) amended its discount rate guidance, permitting use of yields on covered bonds issued by specialized credit institutions ("obligasjoner med fortrinnsrett" in Norwegian—hereinafter, "OMF") to determine discount rates (Norwegian Accounting Standards Board 2012). Because Norwegian government bond rates can be considered risk-free, discount rates determined by OMF rates would be higher than discount rates determined by government bond rates; applying a higher discount rate based on OMF rates instead of government bond rates reduces PBO values, reducing the net pension liability (i.e., plan deficit) in the balance sheet and thereby leverage. Given that DB plans must comply with funding requirements in some jurisdictions (e.g., the U.S., Norway, etc.), plan deficit reductions may reduce the amount of cash needed to fund DB plans in the short term. Campbell et al. (2012) finds that mandatory pension contributions are associated with both higher cost of equity and higher cost of debt, acting as negative shocks to internally generated cash flows. Based on similar arguments, Kalogirou et al. (2021) documents a positive association between borrowing costs and unexpected plan deficits first revealed by IAS 19 disclosures. Figure 2 illustrates the effect of NASB-permitted use of OMF rates (hereinafter, interchangeably referred to as OMF introduction) on discount rates: following the

[61]The 2009 Exposure draft (Discount Rate for Employee Benefits: Proposed amendments to IAS 19) received 100 comment letters from various stakeholders both in agreement of and with objections to the elimination of use of market yields on government bonds. Concerns about eliminating the use of market yields on government bonds were mainly regarding the increased complexity, subjectivity, and costs involved in deriving the appropriate discount rate, specifically in the absence of a deep market for high-quality corporate bonds. Respondents also questioned the appropriateness of high-quality corporate bonds, in substitution of government bonds, when discounting PBOs.

change, discount rates were both lower than prescribed rates and less dispersed. Interestingly, T.-K. Chen et al. (2022) also finds that funded status volatility, partly as a reflection of prior actuarial assumption manipulation (as well as inability to deal with uncertainties), is positively associated with higher credit risk. Ultimately, it seems that the OMF introduction not only directly affects plan funding, but also alleviates earnings management incentives related to actuarial assumptions, thereby improving comparability and reducing the degree of incomplete information. In addition to improving comparability between Norwegian firms, the OMF introduction may improve the comparability of foreign firms to Norwegian firms, which can overall reduce credit risk for Norwegian firms (Kim, Kraft, and Ryan 2013).

For my main analysis, I examine the effect of the OMF introduction on interest expense using a sample of publicly listed Norwegian firms in 2011 and 2012. I find weak evidence that firms with larger PBOs paid lower interest rates on their debt following the OMF introduction, with the effect being more pronounced for firms with higher bankruptcy risk. Consistent with previous literature, it appears that the OMF introduction reduced borrowing costs by (1) improving plan funding, thereby reducing leverage and mandatory pension contributions (Campbell et al. 2012; Kalogirou et al. 2021), and (2) improving comparability of PBO valuations, thereby reducing information risk (T.-K. Chen et al. 2022).

As an additional analysis, I investigate how equity investors responded to the OMF introduction. I find strong positive stock market reactions to the NASB announcement of the OMF introduction on November 30, 2012, for firms with DB plans ("DB firms"), compared to firms without DB plans ("non-DB firms"). In the univariate analysis, the positive stock market reactions are particularly strong for firms with high PBO values. In the cross-sectional analysis, I also find positive stock market reactions for DB firms, and that the stock market reactions are stronger for firms with higher bankruptcy risk, consistent with the main findings as well as the literature (which suggests that financially constrained firms are most affected by changes in plan funding). Lastly, I complement the main analysis conducted at the firm level (using interest paid as reported in income statements) with an analysis at the bond level, using the limited corporate bond universe in Norway. While these results are less robust than those of the main analysis, they indicate lower coupon rates following the OMF introduction for bonds issued by firms with larger PBOs.

This paper makes several contributions. Firstly, the results suggest that PBOs in jurisdictions with no deep market for high-quality corporate bonds are systematically valued differently by investors than otherwise equivalent PBOs in jurisdictions with deep markets for high-quality corporate bonds. Accounting standards that are conditionally based on local features (e.g., corporate bond market development for the purpose of IAS 19 discount rates) may hinder comparability across jurisdictions and points in time. The impact of the OMF introduction on borrowing costs underscores the IASB's concern about financial statement comparability when they initially proposed amendments to the IAS 19 discount rate in 2009. Although outside the scope of this paper, the impact that local bond market development has on borrowing costs manifests in the PBO discount rate and becomes particularly interesting if it leads to systematic differences in investment—as suggested by Campbell et al. (2012) and Rauh (2006). In perhaps an obvious sense, it would be problematic if some Norwegian firms were facing sub-optimal investment simply due to a lack of depth of the Norwegian market for high-quality corporate bonds (i.e., government bond rates applied to discount PBOs instead). Although most developed markets now have a deep market for high-quality corporate bonds or local accounting practices that reflect such (Ernst & Young 2013), regulators may take interest in firm and creditor behaviors during my sample period.

Secondly, this study provides more insight into the mechanisms by which plan funding affects credit risk. Consistent with previous literature (Campbell et al. 2012; Kalogirou et al. 2021), the OMF introduction appears to reduce credit risk, presenting a short-term negative shock to pension contributions, due to the reduction in PBO values brought on by higher discount rates. However, the improvement in plan funding (and reduction in PBOs) following the OMF introduction is generally smaller than what would be predicted by the differences between OMF and government bond rates. Furthermore, as shown in Figure 2, discount rate discretion (i.e., positive deviation from NASB benchmarks) and dispersion were reduced significantly following the OMF introduction, indicating less strategic use of actuarial assumptions. These findings align with the arguments of T.-K. Chen et al. (2022) that a higher degree of actuarial assumption manipulation (measured as funded status volatility in their case) increases credit risk by increasing the degree of incomplete information. Consequently, the effect of DB plans on credit risk, as documented in previous studies (Campbell et al. 2012; Kalogirou et al. 2021), may be accompanied by the effect of incomplete information from actuarial assumption manipulation driven by firms' incentives—which may involve closing large deficits or upcoming debt issues (Anantharaman 2017). In the case of Norwegian firms from my sample period, pressures to manipulate actuarial assumptions likely came from the increase in PBO values brought on by the low interest rates of that time (2011–2013), which was then alleviated by the OMF introduction. Additionally, this study complements existing literature by examining the positive financial statement impacts of a regulatory event, in contrast to previous studies that mostly focus on the negative impacts of regulatory events on DB plans and financial statements (e.g., Campbell et al. 2012; Kalogirou et al. 2021; T.-K. Chen et al. 2022)—providing a better understanding of the mechanisms by which plan funding affects credit risk.

Thirdly, the interpretation of Norwegian covered bonds as "high-quality corporate bonds" for the purpose of IAS 19 discount rates presents an interesting case of how local accounting practices emerge in the presence of vaguely defined accounting standards. Another similar, and perhaps more significant, example of this from the same time period is the adoption of mortgage bonds for the purpose of IAS 19 discount rates in Sweden. While many Norwegian firms used higher discount rates than those prescribed by NASB government bond rates (values somewhere between government and corporate bond rates, but generally closer to government bond rates), Swedish companies gradually started to disclose use of mortgage bond rates to determine discount rates in the years following the financial crisis; in 2012, the surveillance department of Nasdaq Stockholm deemed this practice appropriate (Nasdaq Stockholm 2012) under IAS 19.[62] The general argument is that IAS 19 does not provide a precise definition of high-quality corporate bonds, allowing firms within the same jurisdictions to base their discount rates on different asset classes—thereby challenging direct comparison of reported PBO values. Although local authority monitoring and guidance may ultimately mitigate comparability issues, these concerns in 2012 resonate with the IASB concerns mentioned earlier leading up to the 2009 discount rate project.

This study is subject to some challenges and confounding caveats. Firstly, the OMF introduction in Norway is a rather unusual setting and the findings may not be generalizable to other interest rate changes. While the OMF introduction changes PBO discount rates without affecting plan assets, ordinary interest rate changes usually affect plan assets in the same direction as the PBO, making changes in plan funding less dramatic. Fortunately, my setting helps isolate the impact of PBO changes resulting from discount rate changes specifically. Secondly, adoption of the 2011 revision of IAS 19 (IAS 19R), effective in quarterly reports starting January 1, 2013, presents an important confounding event. Since IAS 19R introduced major changes to pension accounting and was adopted during my sample period, it is likely that my results are affected by IAS 19R to some extent. In addition, the financial supervisory authority announced updated mortality tables for Norwegians (Finanstilsynet 2013) applicable as of 2014, increasing life expectancy and thereby the length of benefit payments (i.e., increased PBO values). However, both IAS 19R and the new mortality tables likely increase credit risk (i.e., oppose the effect of OMF rate adoption)—due to increased longevity and elimination of the corridor method and expected rate of return (ERR) on plan assets.[63] If anything, my results potentially would have been stronger in the absence of IAS 19R and the new mortality tables. Ultimately, this analysis attempts to control for some of the confounding effects of the elimination of the corridor method under IAS 19R.

This paper proceeds as follows. Section 4.2 summarizes relevant literature, background relating to

[62] Most Swedish firms adopted mortgage bond use following guidance from the Nasdaq Stockholm Surveillance Department. In fact, Nasdaq Stockholm took disciplinary action against Telefonaktiebolaget LM Ericsson (Ericsson), a cross-listed company that went back to using government bond rates to determine discount rates (Nasdaq Stockholm 2019). Ultimately there were no penalties, as Ericsson argued that their interpretation of IAS 19 was correct as using mortgage bond rates would potentially create issues with audits and the Securities and Exchange Commission in the U.S. where their securities are also listed. This example of a cross-listed company struggling to comply with IAS 19 interpretations in different markets for the same PBO highlights how accounting standards are applied differently across jurisdictions.

[63] IAS 19R introduced major changes to pension accounting, most of which negatively affected financial statements. Firstly, IAS 19R affected balance sheets by removing the corridor method to account for actuarial gains and losses (AGLs), which prevented firms from deferring AGL-recognition (losses in most cases) on DB plans. Secondly, IAS 19R affected income statements by applying the discount rate to interest income calculations on DB plans instead of the previously used (and higher) ERR on plan assets, overall increasing pension expense.

discount rates, institutional setting, and hypotheses development. Section 4.3 outlines the research design. Section 4.4 presents the empirical results and their discussion. Section 4.5 concludes the paper.

4.2 Background, literature, and hypotheses development

4.2.1 Discounting of pension liabilities

Estimation of the PBO represents an important aspect of pension accounting, embodying the net pension liability that firms must recognize on their balance sheets. Fundamentally, the PBO represents the present value of the plan's expected future benefit payments, reflecting the long-term financial commitment that an organization makes to its employees. Yet, the process of estimating the PBO is complex and subject to several actuarial assumptions (e.g., discount rate, salary growth, mortality, etc.). Actuaries use judgment both when predicting the plan's future cash flows (alongside economic and demographic assumptions) and when determining the applicable discount rate for each cash flow, adding flexibility and complexity.[64] Due to the long maturities of PBOs, their values are highly sensitive to changes in actuarial assumptions—particularly to changes in discount rates.

When estimating PBOs under IAS 19, the present value of expected future benefit payments should be calculated using a discount rate based on market yields on high-quality corporate bonds, which is consistent with the U.S. Generally Accepted Accounting Principles (GAAP) methodology. Generally, corporate bonds rated AA or higher are considered "high-quality" for the purpose of discounting PBOs. Corporate bond maturities and currencies should be consistent with that of the benefit obligations. However, in countries where there is no deep market for high-quality corporate bonds, the discount rate should be based on market yields on government bonds, which are usually lower than market yields on corporate bonds due to the credit risk premium for corporate bonds.[65] Consequently, PBOs in jurisdictions with no deep market for high-quality corporate bonds can be significantly greater in value than otherwise similar PBOs in other jurisdictions, simply due to insufficient depth of the local corporate bond market. Such variability in PBO estimations can compromise comparisons of pension obligations and financial statements across entities.

4.2.2 Institutional background

On November 30, 2012, the NASB amended its discount rate guidance for Norwegian pension plans, stating that it would permit covered bonds as references for discount rates (Norwegian Accounting Standards Board 2012). Prior to this amended guidance, Norwegian DB firms following IFRS referenced

[64] Flexibility relating to discount rate assumptions can be highlighted by the wide range of differing acceptable yield curves that can be used to determine the applicable discount rate.

[65] IAS 19 does not define a deep market, but the term generally refers to markets where large quantities of securities are available for sale or purchase. Local regulators often provide relevant guidance on this issue (Ernst & Young 2013).

NOK government bond rates when discounting PBOs in accordance with IAS 19—in the absence of a deep market for high-quality corporate bonds. Due to the emergence of and growing market for Norwegian OMFs, the NASB deemed it to have sufficient depth according to IAS 19, making it possible for firms to discount PBOs using significantly higher OMF rates instead of government bond rates.[66] Consequently, Norwegian PBO valuations are lower, but more in line with other countries with deep markets for high-quality corporate bonds.

The adoption of OMF rates as benchmarks for Norwegian PBOs provides an interesting setting to examine the impact of discount rate changes for several reasons. While PBOs generally fluctuate in value due to interest rate changes, interest rate changes also tend to similarly affect the fair value of plan assets in parallel, lessening the net impact of the interest rate change on funded status.[67] Furthermore, with few exceptions (e.g., the 2008 financial crisis; post-Covid 19) interest rate changes are generally smaller than the differences between government bonds and OMFs (i.e., the difference in permitted discount rate benchmarks between 2011 and 2012 for Norwegian firms). The wide spread between government and corporate bonds following the 2008 global financial crisis made the switch to OMF rates in 2012 impactful. Furthermore, in contrast to countries where possible yield curves are abundant (e.g., USD curves) or nonexistent, the NASB publishes PBO yield curves for Norwegian companies, making discount rate choices less subject to yield curve selection or construction.[68] Lastly, like some countries (e.g., the U.S.), Norway has funding requirements for DB plans, possibly driving immediate changes in cash contributions to DB plans when PBO values change.[69]

4.2.3 Relevant literature

The effects of DB plans on market outcomes have been studied extensively. Plan funding is a central part of this discussion; an important consideration is that cash needed to fund pension plans may take away from investment and other activities. Rauh (2006) finds that mandatory pension contributions reduce capital expenditures, especially for firms with lower credit ratings. Campbell et al. (2012) argues that the decline in investment documented by Rauh (2006) is due to increased cost of capital driven by mandatory

[66] In 2007, when Norwegian financial institutions started issuing OMFs, the market grew from 51,407 million NOK in 2007 to 779,572 million NOK by 2012 (Finance Norway 2024). Norwegian covered bonds are supervised by the financial supervisory authority of Norway, and the strict requirements (e.g., regarding overcollateralization, limitations on issuing credit institutions, etc.) make OMF credit risk low (mostly rated AA or higher)—consistent with high-quality corporate bonds for the purpose of IAS 19.

[67] DB plans are usually funded with plan assets, which are also sensitive to interest rate changes (e.g., bonds). A fully funded DB plan with plan assets matching the PBO would, for example, experience little change in plan funding from increased interest rates, as both the PBO and the fair value of plan assets would decrease in value. Any increase in funded status from an interest rate increase would be more dramatic for a plan with lower funding because the decrease in plan assets would be smaller than the decrease in PBO in absolute terms. Similarly, the increase in funded status would be greater for plan assets with lower interest rate sensitivity, given the relatively smaller decrease in plan assets.

[68] Twice per year, the NASB publishes detailed actuarial assumption guidelines for Norwegian pension obligation determination, with reference rates specific to the economics of the pension plan.

[69] § 9-1 in the Company Pension Schemes Act (“Foretakspensjonsloven”) states that plan assets should always exceed vested benefits for employees (Ministry of Finance 2023).

contributions and that this increased cost of capital is the intervening variable responsible for the negative association between capital expenditures and pension contributions. Based on similar arguments, both Franzoni (2009) and Campbell, Dhaliwal, and Schwartz (2010) document negative stock market reactions to mandatory pension contributions. Franzoni (2009) finds that a pension-induced drop in cash flows is associated with negative stock returns over the following year, particularly for financially constrained firms. Campbell et al. (2010) uses key announcements leading up to the Pension Protection Act of 2006, which accelerated mandatory pension contributions (i.e., increased short-term cash requirement), to find that firms with DB plans experience negative stock market reactions around the announcements, particularly when firms have greater investment requirements. Based on similar arguments, that pension deficits increase the risk for firms' future operations and financing, Y. Chen (2015) documents an association between deficits and idiosyncratic return volatility. Also related to pension contributions, Armitage and Gallagher (2019) examines if pension contributions by U.K. companies reduce dividend payments, but do not find evidence of this. Instead, they find that firms coordinate the timing of large pension contributions with periods that experience healthy cash flows and stronger profitability.

In addition to the shock to internally generated cash flows caused by mandatory pension contributions, changes in funded status recognized in the balance sheet may alter financial ratios. Given the complexity of pension information and the fact that important information is often only disclosed in financial statement footnotes, previous studies (e.g., Picconi 2006; Yu 2013; Coronado et al. 2008) argue that the presentation of pension information affects how effectively the information is processed by market participants. Interestingly, relating to the PBO, Picconi (2006) finds that the off-balance sheet component of the PBO is predictive of future returns, supporting the notion that footnote information is not processed in a timely manner. Studies (e.g., Yu 2013; Larcher 2023) also find that previously off-balance sheet pension liabilities are more value-relevant following recognition under Statement of Financial Accounting Standards (SFAS) 158—although less so for firms with higher institutional ownership and analyst following, highlighting the role of sophisticated investors who are more likely to have already incorporated disclosed information (Yu 2013). Jones (2013) also finds that firms respond accordingly to SFAS 158, using plan amendments, freezes, and changes in actuarial assumptions to improve funded status (thereby, reducing the recognized liability).

Because changes in actuarial assumptions significantly affect PBO values, they can impact the balance sheet in a similar way to the recognition of previously off-balance sheet pension liabilities. Changes in actuarial assumptions may also affect pension contributions, especially in the presence of funding requirements. Consistent with the flexible internal financing offered by DB plans, Bartram (2018) finds that contributions and funding levels are lower for firms with less cash, less profitability, and financial distress. Furthermore, Bartram (2018) finds that firms with less cash and lower profit margins use higher discount rates (i.e., PBO-reducing) and higher ERRs (i.e., earnings-increasing) in their pension accounting. Given the strategic use of actuarial assumptions documented in previous studies (e.g., Jones 2013; Kisser et al. 2017; Anantharaman 2017; Asthana 1999), one may expect actuarial assumptions to have implications for market outcomes. However, on the one hand, Hann et al. (2007) finds that actuarial assumption discretion (i.e., abnormal assumptions that affect the PBO) does not impair PBO value relevance for U.S. firms when deriving the PBO into discretionary and non-discretionary components. On the other hand, Breedon and Larcher (2021) finds that investors do make adjustments to reported pension liabilities when examining the value relevance of U.K. pension liabilities. Specifically, they find that U.K. investors value pension liabilities using risk-free discount rates, rather than corporate bond rates (as used in reported numbers), making PBO values higher in their valuations than in reported numbers.

Overall, the impact of actuarial assumptions on debt market outcomes specifically remains underexplored in the literature to-date. Most previous research based on equity markets suggests that investors mainly consider reported pension liabilities without making adjustments, indicating that market outcomes mainly depend on reported plan funding. Therefore, prescribed discount rate increases that reduce PBO values and increase plan funding may affect debt market outcomes. However, Anantharaman and Henderson (2021) finds that equity and debt investors value pension liabilities differently in many cases, highlighting that findings from equity markets may not generalize to debt markets.[70] Furthermore, both Basu and Naughton (2020) and Kalogirou et al. (2021) argue that the credit market anticipates off-balance sheet pension items but suffers from estimation errors. Specifically, Basu and Naughton (2020) finds that, while credit rating agencies adjusted for off-balance sheet pension liabilities before the adoption of SFAS 158, these adjustments did not account for minimum liability adjustments. As a result, firms that recognized additional pension liabilities following the adoption of SFAS 158 received higher credit ratings due to correction of this error. Kalogirou et al. (2021) finds that financially risky firms that reported unexpected pension deficits following IAS 19 adoption in France faced higher borrowing costs. However, this effect did not apply to the predictable component of the deficits, suggesting that debtholders attempt to adjust for information that is not reported in financial statements.

4.2.4 Hypotheses development

Given PBO sensitivity to discount rate changes and funding requirements for Norwegian DB plans, there are likely three outcomes of discounting PBOs based on OMF rates rather than government bond rates. First,

[70] Anantharaman and Henderson (2021) argues that equity holders use a going concern perspective of pension liabilities, as they aim to determine expected contributions over an indefinite horizon. Debt holders, on the other hand, use a settlement perspective that reflects members' current claims at the measurement date, as they are more interested in the loss in the event of default on the debt over its maturity. Their results generally support this argument, but depend on plan duration. For short-duration (long-duration) plans, the settlement (going concern) perspective dominates for both investor groups.

given that increased mandatory pension contributions may lead to higher cost of debt (Campbell et al. 2012), reduced mandatory contributions—that result from applying OMF rates to discount PBOs—may result in reduced cost of debt for Norwegian firms as of 2012. Second, the reduction in PBO values, brought on by applying OMF rates, reduces leverage, which is generally positively viewed by investors. Of note, particularly sophisticated investors may proactively adjust pension liabilities based on pension disclosures (Yu 2013). Third, the OMF introduction may reduce the degree of incomplete accounting information by reducing discount rate discretion (i.e., manipulation) among Norwegian firms. T.-K. Chen et al. (2022) argues, for example, that higher funded status volatility indicates more earnings management and is associated with higher bond yield spread, particularly following SFAS 158 recognition of funded status in balance sheets.[71]

All-in-all, the OMF introduction in Norway specifically affects firms with DB plans, with an impact that depends on the size of the PBO. However, analogous effects of the OMF introduction on cost of debt cannot necessarily be assumed. Firstly, if debtholders make adjustments to reported PBOs based on their own discount rate assumptions (e.g., using high-quality corporate bond rates pre-OMF or government bond rates post-OMF), the OMF introduction would be less impactful. Secondly, updated mortality assumptions for Norwegian PBOs (applicable shortly after the OMF introduction) increase PBO values, attenuating the effects of the OMF introduction to some extent. Thirdly, IAS 19R, effective from January 1, 2013, could have negatively impacted financial statements for DB firms. However, IAS 19R's potentially negative effects should generally be less impactful than the positive balance sheet effects from reduced PBOs following the OMF introduction.[72] Overall, these factors would mainly affect cost of debt through reported or adjusted leverage ratios. In addition to having a greater impact on leverage, the OMF introduction could potentially reduce cost of debt by reducing pension contributions and discount rate dispersion.

Based on the arguments above, I propose the following hypotheses:

H1a: NASB-permitted use of OMF rates leads to lower cost of debt for firms with defined benefit plans.

H1b: The extent of the reduction in cost of debt from NASB-permitted use of OMF rates depends on PBO size.

In previous studies on pension plans and debt market outcomes (e.g., Campbell et al. 2012; Kalogirou

[71] T.-K. Chen et al. (2022) argues that funded status volatility indicates greater (1) asset volatility and (2) degree of incomplete accounting information, both of which increase credit risk.

[72] Because many firms had to recognize previously unrecognized actuarial gains and losses, IAS 19R impacted balance sheets upon adoption. Most firms that used the corridor method to defer AGL recognition had accumulated actuarial losses, so the impact on the balance sheet was mostly negative (i.e., reduction in shareholders' equity). In my sample, the accumulated AGLs to be recognized under IAS 19R is −0.5 percent of total assets on average in 2011 (pre-OMF). In a switch from government bond rates (2.6 percent) to OMF rates (3.8 percent) in 2011, however, the reduction in the average PBO for my sample would be approximately 1 percent of total assets (assuming a "normal" duration)—suggesting a greater impact on balance sheets. However, beyond the immediate impact on balance sheets, IAS 19R could potentially affect credit risk by increasing future balance sheet volatility due to the immediate recognition of AGLs in subsequent periods, by increasing pension expense due to the elimination of the ERR, or by enhancing transparency in general.

et al. 2021; T.-K. Chen et al. 2022), financing constraints typically moderate the impact. Cash needed for mandatory pension contributions may limit firms' abilities to invest in positive net present value projects. Since financially constrained firms are less capable of mitigating this effect by raising external funds, they are more likely to fall below optimal investment levels when more cash is needed to fund pension plans (Rauh 2006; Franzoni 2009). Given their sensitivity to changes in plan funding, financially constrained firms in Norway may experience greater reductions in borrowing costs due to being able to discount PBOs based on OMF rates instead of government bond rates. Consequently, I make the following hypothesis:

H2: Reductions in cost of debt following NASB-permitted use of OMF rates for affected firms are greater for financially constrained firms.

Mechanically, the ability to raise debt at a lower cost post-OMF may depend on whether firms already have a fixed rate on their debt. Since this may apply to firms with outstanding long-term bonds, I make the following hypothesis:

H3: Reductions in cost of debt following NASB-permitted use of OMF rates for affected firms are smaller for firms that have outstanding bonds.

4.3 Research design

4.3.1 Main regression models

To empirically test the general effect of NASB-permitted use of OMF rates to discount PBOs on borrowing costs, I estimate the following regression model:

$$\begin{aligned} ICOST_{i,t+1} = \beta_0 + \beta_1 PP_{i,t} + \beta_2 POST_{i,t} + \beta_3 POST * PP_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 ROA_{i,t} \\ + \beta_7 RISK_{i,t} + \beta_8 TANG_{i,t} + \beta_9 Z_{i,t} + \beta_{10} UAGL_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{7}$$

$ICOST$ is the average borrowing cost.[73] PP is a placeholder variable that aims to capture firms' pension liabilities (thereby, the impact of the OMF introduction) and is defined as DB or PBO.[74] $POST$ is an indicator variable for the fiscal year when OMF rate use was permitted (i.e., 2012). I control for firm size ($SIZE$), leverage (LEV), profitability (ROA), risk ($RISK$), fixed assets ratio ($TANG$), bankruptcy risk

[73]While most studies use bond yield spreads to capture borrowing costs, too few bonds are issued by Norwegian firms for meaningful empirical testing. Consistent with Kalogirou et al. (2021), I measure borrowing cost as interest expense scaled by average total debt at the beginning and end of the reporting period. To capture borrowing costs as precisely as possible, I calculate borrowing costs quarterly, then define annual borrowing costs as the average borrowing costs of all quarters.

[74]To varying degrees, DB and PBO capture the impact of the OMF introduction. While all firms with defined benefit plans ($DB = 1$) are impacted by the OMF introduction, smaller plans may not have a meaningful impact on financial statements. In addition, IAS 19R, which often negatively impacts financial statements, was introduced around the same time, possibly opposing the effect of OMF rates. Consequently, I also use PBOs (PBO) to capture the impact of large pension liabilities.

(Z), and use of the corridor method ($UAGL$). The results are presented in Table 19 and discussed in Section 4.4.2.

To test the role of firms' financial risk and bond debt, I expand Equation (7) by adding three-way interactions between these factors separately, post-OMF, and DB plan, leading to the following equations:

$$\begin{aligned} ICOST_{i,t+1} = \beta_0 + \beta_1 PP_{i,t} + \beta_2 POST_{i,t} + \beta_3 POST*PP_{i,t} + \beta_4 Z_{i,t} + \beta_5 PP*Z_{i,t} + \beta_6 POST*Z_{i,t} \\ + \beta_7 POST*PP*Z_{i,t} + \sum CONTROLS_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{8}$$

$$\begin{aligned} ICOST_{i,t+1} = \beta_0 + \beta_1 PP_{i,t} + \beta_2 POST_{i,t} + \beta_3 POST*PP_{i,t} + \beta_4 BOND_{i,t} + \beta_5 PP*BOND_{i,t} \\ + \beta_6 POST*BOND_{i,t} + \beta_7 POST*PP*BOND_{i,t} + \sum CONTROLS_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{9}$$

$BOND$ is an indicator variable that equals 1 if the firm has bond debt and $CONTROLS$ refers to the control variables ($SIZE$, LEV, ROA, $RISK$, $TANG$, Z, and $UAGL$). The rest of the variables are as previously defined. The idea is that Z captures financial risk and $BOND$ captures the presence of fixed-rate debt. The results are presented in Table 20 and discussed in Section 4.4.2.

4.4 Empirical results

4.4.1 Sample, data, and descriptive statistics

The sample used for the main analysis consists of all Norwegian firms in Compustat Global with non-missing values for all regression variables in fiscal years 2011 and 2012. In addition to retrieving accounting and stock price data from Compustat, I hand-collect pension data from financial statement footnotes. The sample is drawn from 278 firms included in the Compustat dataset in 2011 or 2012. I exclude 186 firms with missing data for the regression variables in any of the periods.[75] Furthermore, I exclude 2 firms that terminated their DB plans in 2012. The final sample constitutes 90 firms (180 firm-years) total, with 63 firms (126 firm-years) that sponsor DB plans and 27 firms (54 firm-years) that do not.

Table 17 presents descriptive statistics before NASB-permitted use of OMF rates (hereinafter, pre-OMF) in Panel A and after NASB-permitted use of OMF rates (hereinafter, post-OMF) in Panel B. Generally, $ICOST$ is lower post-OMF, likely due to lower interest rates in 2012, but possibly also due to the OMF introduction. PBO, which is the main explanatory variable of interest, is slightly lower post-OMF, consistent with PBO reductions brought on by higher discount rates. The reduction in PBOs leads to higher plan funding, increasing average funding ratio (plan assets divided by PBO) from 0.587 pre-OMF to 0.657 post-OMF (untabulated). However, leverage (LEV) remains more or less the same, with only a slight increase

[75] In addition to the 165 firms that were excluded due to missing data, 21 firms were excluded for having complete data for only one of the periods.

post-OMF. Based on PBO, the OMF introduction did not impact balance sheets as much as expected.[76] It is also worth noting $UAGL$ of 0.567 and 0.544 in Panels A and B, respectively, which indicates that IAS 19R adoption after January 1, 2013, was more impactful for about half of the sample (i.e., firms that use the corridor method to account for AGLs).

Table 18 presents the Pearson and Spearman correlations pre-OMF in Panel A and post-OMF in Panel B, respectively. As expected, borrowing cost ($ICOST$) correlates negatively with profitability (ROA) and asset tangibility ($TANG$) but correlates positively with earnings volatility ($RISK$) and bankruptcy risk (negatively with Z) in both panels. Furthermore, $ICOST$ is negatively correlated with firm size ($SIZE$) and having a DB plan (DB). I generally expect leverage to have a positive effect on borrowing costs, but only the Pearson correlation in Panel B is positive and significant, possibly indicating that leverage is more relevant for creditors post-OMF. Interestingly, the Pearson correlation between $ICOST$ and PBO is negative and significant in Panel B.

4.4.2 Main results

Borrowing costs following the OMF introduction (H1a and H1b)

Table 19 presents the results for H1a and H1b, examining the impact of DB plans and relative PBO size, respectively, following the OMF introduction. The results of estimating Equation (7) with PP defined as DB and PBO are presented in columns (1) and (2), respectively, but the coefficient on $POST * PP$ is not significantly different from zero in either case.[77] The signs on the statistically significant control variables are as expected, with leverage (LEV) and earnings volatility ($RISK$) increasing borrowing costs and asset tangibility ($TANG$) reducing borrowing costs. To control for cross-industry variation as well as varying importance of the control variables across periods, I estimate modified versions of Equation (7), including industry fixed effects based on two-digit Global Industry Classification Standard (GICS) codes in columns (3) and (4) and a fully interacted model including $POST * CONTROLS$ in columns (5) and (6). In both columns (4) and (6) where PP is defined as PBO, $POST * PP$ is negative and significant (p-values of 0.070 and 0.002, respectively), suggesting that relative PBO size is associated with a post-OMF reduction in cost

[76] In 2011, the NASB prescribed a discount rate of 2.6 percent for a "normal" PBO with a duration of about 20 years. When OMF rates became applicable to discount rates in 2012, the same PBO could be discounted at 3.9 percent, suggesting a change of −26 percent in the "normal" Norwegian PBO with a 20 year duration ($(2.6\% - 3.9\%) * 20 = -26\%$). However, the average PBO for my sample is only reduced by 9.3 percent post-OMF. Possible reasons for the smaller reduction effect could include greater discount rate discretion pre-OMF as illustrated by Figure 2, making some pre-OMF PBOs unusually low. Firms may also exercise less discretion in other actuarial assumptions post-OMF due to substitution of discretion between different assumptions (Naughton 2019). It is also possible that my sample has shorter PBO durations than usual, and thereby reduced sensitivity to discount rate changes.

[77] Since the actual change in discount rate varies significantly across firms due to greater pre-OMF discretion in general and some government bond rate use post-OMF, I run robustness tests with three alternative measures for PBO: (1) pre-OMF PBO value for the whole sample period, (2) post-OMF PBO value for the whole sample period, and (3) reported PBO adjusted for discount rate deviation from prescribed discount rates (by multiplying the PBO by $1+(DiscountRate_i - DiscountRate_{NASB}) *$ 20). The results of the robustness tests are consistent with the tabulated results; in fact, the statistical significance of $POST * PBO$ increases in most cases. Column (2) in the tabulated results presents the only case when $POST * PBO$ is not significant.

of debt, consistent with H1b. On the other hand, I find no support for H1a, as $POST * PP$ is insignificant in columns (1), (3), and (5) when PP is defined as DB. In fact, the sign on $POST * PP$ is positive (but insignificant) in columns (1) and (3), possibly due to the negative impact of IAS 19R for many firms with DB plans, but becomes negative in column (5) when including $POST * CONTROLS$.

Overall, I find some evidence to support H1b, as $POST * PP$ is negative and significant or marginally significant across all model specifications when PP is defined as PBO. That the OMF introduction reduced borrowing costs is consistent with previous literature, but there are two possible explanations for these results. Firstly, reduced borrowing costs may be due to reduced plan deficits following the OMF introduction, possibly reducing pension contributions (i.e., increasing internally generated cash flows). Campbell et al. (2012) and Kalogirou et al. (2021) underscore this argument: both find increased borrowing costs following perceived increases in cash contributions for plan sponsors. Secondly, reported PBOs and deficits did not change as much as expected, despite the significant increase in prescribed discount rates, indicating that firms may have reduced discretion in other actuarial assumptions (e.g., salary growth, mortality, Norwegian public basic amount, etc.). As shown in Figure 2, discount rate dispersion is significantly higher pre-OMF, with more than half of the firms applying higher discount rates than prescribed. Less actuarial assumption manipulation could, therefore, reduce the degree of incomplete information and thereby reduce credit risk (T.-K. Chen et al. 2022). Furthermore, the OMF introduction may improve financial statement comparability, thereby reducing credit risk (Kim et al. 2013) via (1) reduced discretion in actuarial assumptions and (2) greater alignment of discount rate benchmarks with other jurisdictions that mostly use corporate bond rates.

The role of financial risk and bond debt (H2 and H3)

Table 20 presents the results for H2 and H3, which examine the moderating effects of bankruptcy risk and outstanding bond debt.[78] As seen in the previous test, sponsoring a DB plan ($DB = 1$) does not seem to have an effect on cost of debt, as none of the coefficients related to PP are significant when defined as DB in columns (1) and (3). However, in column (2) where PP is defined as PBO, the coefficient on $POST * PP * Z$ is positive and significant (p-value = 0.060), suggesting that the reduction in cost of debt following the OMF introduction is in fact attenuated by having lower bankruptcy risk. Similarly, the coefficient on $POST * PP * BOND$ is positive and significant in column (4), indicating that the reduced cost of debt was attenuated by having bond debt.

[78]To test the robustness of the results, I include (1) industry fixed effects based on two-digit GICS sector (2) $POST * CONTROLS$ and (3) three alternative measures of PBO, as mentioned previously. The significance of $POST * PP * BOND$ and $POST * PP * Z$ generally increases except when including $POST * CONTROLS$, in which case many coefficients become statistically insignificant.

Overall, my findings support both H2 and H3.[79] Consistent with H2 and previous literature (e.g., Campbell et al. 2012; Kalogirou et al. 2021; T.-K. Chen et al. 2022), the change in borrowing costs is greater for financially risky firms (measured as Z), suggesting that the OMF introduction particularly alleviates firms that may face underinvestment due to external financing constraints. If the OMF introduction reduces pension contributions, more funds are available to invest in positive net present value projects, potentially increasing firm value. Furthermore, the finding that reductions in borrowing costs are greater for firms without bond debt (i.e., firms with less debt with predetermined rates) supports H3 and the notion that credit risk was indeed reduced for firms with larger PBOs, and the lower credit risk materialized when mechanically possible (i.e., when they can raise debt based on the post-OMF state of the firm).

4.4.3 Addtitional tests

Stock market reactions

To complement the main findings, I examine how the stock market reacted to the NASB-permitted use of OMF rates. This aspect of the analysis is particularly important because of the IAS 19R introduction, which poses a significant confounding factor: negatively affecting financial statements in many cases, opposing the positive effect of the OMF introduction. Although my main tests overlap with IAS 19R adoption (due to $ICOST$ leading by one year), possibly having a confounding effect, significant time passed between the publication of IAS 19R on June 16, 2011, and the NASB's OMF rate announcement on November 30, 2012. Because stock market participants anticipate the impacts of such changes and incorporate their predictions in a timely manner, overlap between the effects of the OMF rate and IAS 19R announcements is unlikely; looking at the stock market makes it easier to isolate their effects.

To examine stock market reactions to the NASB-permitted use of OMF rates, I perform an event study and measure cumulative abnormal returns (CAR) for each firm around the time of the OMF rate announcement by the NASB on November 30, 2012. I calculate CAR from one day before to one day after the NASB announcement (i.e., over a three-day window $[-1, +1]$) using the CAPM model (Sharpe 1964) to predict normal returns. Abnormal returns are the residuals from the following model, estimated using returns from 250 trading days up to two days prior to the NASB announcement:

$$r_i = r_f + \beta_m(r_m - r_f) + \varepsilon_i \tag{10}$$

[79] Although Z and $BOND$ do not correlate with each other, they both correlate with $SIZE$, which may capture several other theoretical constructs (Bujaki and Richardson 1997). Therefore, I also examine the three-way interaction between PP, $POST$, and $SIZE$ (untabulated), and the coefficient on $POST * PP * SIZE$ is statistically significant, suggesting that the reduction in borrowing costs is attenuated by larger firm size. Consequently, I cannot rule out that changes in borrowing costs following the OMF introduction depend on other factors related to firm size (e.g., information environment). However, in my additional analysis, I find only bankruptcy risk (Z) to determine the impact of DB plans (DB) on stock market reactions to the OMF introduction, indicating that bankruptcy risk is the main determining factor for investors in general.

r_i is the return on security i, r_f is the risk-free rate, r_m is the market return based on the Oslo Børs All Share Index (OSEAX). I compare average three-day CARs between firms with (1) above-median PBOs, (2) below-median PBOs, and (3) no DB plans. I expect positive stock market reactions for firms with DB plans given that they can reduce their PBOs by using OMF rates, particularly firms with larger PBOs (i.e., greater balance sheet effect of switching to OMF). To control for potential confounding factors that may affect CARs, I also estimate the following regression model in addition to the univariate tests:

$$CAR_i = \beta_0 + \beta_1 PP_i + \beta_2 SIZE_i + \beta_3 LEV_i + \beta_4 ROA_i + \beta_5 BM_i + \varepsilon_i \tag{11}$$

CAR is three-day CAR, BM is the book-to-market ratio, and the rest of the variables (PP, $SIZE$, LEV, and ROA) are as defined previously. In line with the tests from the main analysis, I also extend the model to include interactions between PP and Z and PP and $BOND$, to examine how stock market participants consider bankruptcy risk and bond debt.

The univariate and multivariate analyses are presented in Panels A and B of Table 21, respectively.[80] In Panel A, the mean CARs around the NASB announcement are 1.369, −0.17, and −0.743 for high-PBO, low-PBO, and non-DB firms, respectively. However, only the high-PBO firms have mean CAR that is statistically significant (p-value = 0.033). Furthermore, mean CAR for high-PBO firms is significantly higher than for both non-DB firms (p-value of 0.025) and low-PBO firms (p-value of 0.081). High-PBO firms also have a greater proportion of firms with positive CARs around the NASB announcement (59.6 percent, compared to 43.5 percent of low-PBO firms and 31.7 percent of non-DB firms), further supporting the notion that stock market participants reacted positively to the NASB announcement specifically.

Panel B presents the results of estimating Equation (11). Consistent with the main tests, PP is defined as DB using the full sample in column (1) and PBO using DB firms only in column (2). The positive and significant coefficient on PP (p-value < 0.001) in column (1) indicates that stock market reactions to the NASB announcement were positive mainly for firms with DB plans. Next, while the coefficient on PP is positive in column (2) when defined as PBO, it is not statistically significant. Moreover, the results indicate an interaction effect between having a DB plan and bankruptcy risk, as the negative coefficient on $PP * Z$ is highly significant in column (3) where PP is defined as DB. Specifically, positive stock market reactions to the NASB announcement for firms with DB plans are attenuated for firms with lower bankruptcy risk (higher Z). Stronger market reactions to pension-induced balance sheet changes for firms with higher bankruptcy risk is somewhat consistent with Chiu and Ogudugu (2023); using a similar sample of Norwegian

[80] The samples used in Table 21 are drawn from the same initial Compustat sample as the main analysis, but require less firm-specific data. Since I include all firms with available data, the number of firms in both the univariate (206 firms) and multivariate (188 firms) analyses are larger than that of the main analysis (90 firms).

firms, Chiu and Ogudugu (2023) finds negative stock market reactions to the announcement of IAS 19R, specifically for firms with higher bankruptcy risk that have to recognize previously unrecorded AGLs after the elimination of the corridor method (i.e., a negative balance sheet impact in most cases). Next, the coefficient on $PP * BOND$ in column (5) is negative, but not significant, giving little evidence that stock market reactions were different for firms with bond debt.

Overall, the results in Panel B indicate that the positive stock market reactions to the NASB announcement among DB firms were particularly strong for firms with higher bankruptcy risk, adding to Chiu and Ogudugu (2023), which finds negative stock market reactions to IAS 19R in anticipation of negative impacts for affected firms with higher bankruptcy risk.[81] The main findings of this paper—namely that similar firms (firms with larger PBOs and higher bankruptcy risk) experience lower borrowing costs in the first year of OMF rate adoption—may indicate that stock market participants anticipated lower borrowing costs following the NASB announcement to some extent.[82] However, I cannot rule out that stock market participants reacted to other possible consequences of firms discounting PBOs using OMF rates.

Bond yield spreads

As a final analysis, I investigate whether the OMF introduction had an effect on bonds issued by Norwegian firms during the sample period. Considering that the universe of bonds issued by Norwegian firms with available data is small, I conduct a limited test using Norwegian bond yield spreads as proxies for borrowing costs (instead of interest expense, $ICOST$, used in the main analysis). By applying a methodology commonly used in the literature (e.g., Anantharaman and Henderson 2021; T.-K. Chen et al. 2022; Campbell et al. 2012), I aim to investigate whether inferences analogous to H1b from the main tests can be drawn. Due to the limited universe of Norwegian bonds, I make two methodological compromises to preserve a sample sufficient for analysis. First, since the majority of Norwegian bond issuers with available data are banks (which are not included in the main test sample), I do not control for bankruptcy risk—most accounting measures (e.g., Z) require working capital, which is not available for banks. Second, since the majority of Norwegian bonds have coupon rates based on a fixed margin over the 3-month Norwegian Interbank Offered Rate (NIBOR), I include both fixed and floating coupon bonds, as opposed to fixed coupon bonds only. Otherwise, I use a research design similar to that of the main tests with some additional bond-specific

[81] Whereas Chiu and Ogudugu (2023) considers several announcements leading up to IAS 19R, this analysis is limited in scope and only considers the final announcement by the NASB to permit the use of OMF rates instead of government bond rates. Although this announcement on November 30, 2012 was ultimately the most important one, there was some public discussion (e.g., in the press) leading up to it.

[82] For example, Franzoni (2009) argues that mandatory cash contributions to pension plans pushes financially constrained firms below optimal investment levels, driving negative stock market reactions. That firms with higher bankruptcy risk show stronger positive stock market reactions to the OMF introduction (i.e., mandatory contribution reductions) is consistent with Franzoni (2009).

variables. I estimate the following model to examine the impact of the OMF introduction on bond rates:

$$
\begin{aligned}
SPREAD_{i,t} = \beta_0 + \beta_1 PBO_{i,t} + \beta_2 POST_{i,t} + \beta_3 POST * PBO_{i,t} + \beta_4 AMT_{i,t} + \beta_5 MAT_{i,t} \\
+ \beta_6 FIX_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 LEV_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} RISK_{i,t} + \beta_{11} TANG_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{12}
$$

$SPREAD_{i,t}$ is the coupon rate for bond i at time t (the bond issue date) adjusted for 3-month NIBOR, measuring the same construct as $ICOST_{i,t}$ in the main analysis, but at the bond level. AMT is the natural logarithm of the loan amount, MAT is the maturity of the bond, and FIX is an indicator variable that equals 1 if the bond has a fixed coupon rate. The other firm-specific variables are as defined in previous equations and Appendix A, and measured in the last fiscal year prior to the bond issue. In addition to the firm-specific accounting data from Compustat, I retrieve bond data from Refinitiv Eikon, and estimate the model using a sample of 176 bonds issued by 46 Norwegian firms with DB plans in 2012 and 2013.[83]

The results are presented in Table 22, and as in the main tests, I expect the OMF introduction to reduce bond spreads (i.e., borrowing costs) for affected firms. In column (1), the negative and significant coefficient on $POST * PBO$ (p-value = 0.022) indicates that post-OMF yield spreads are lower for firms with higher PBOs, consistent with H1b and the main results. However, the coefficient becomes insignificant when including industry fixed effects and $POST * CONTROLS$ in columns (2) and (3), indicating that the result in column (1) is potentially driven by industry or changes in the relative importance of other drivers of bond rates. The significant coefficients on the control variables are generally as expected, with the exception of $TANG$, which is positive. A possible reason for this unexpected positive association between asset tangibility and borrowing costs is the high prevalence of financial firms in the sample with both low asset tangibility and $SPREAD$. Overall, the results give some indication that the OMF introduction led to lower bond spreads for firms with larger PBOs. However, because I do not control for bankruptcy or credit risk and there is some inconsistency between model specifications, the results should be interpreted with caution.

4.5 Conclusion

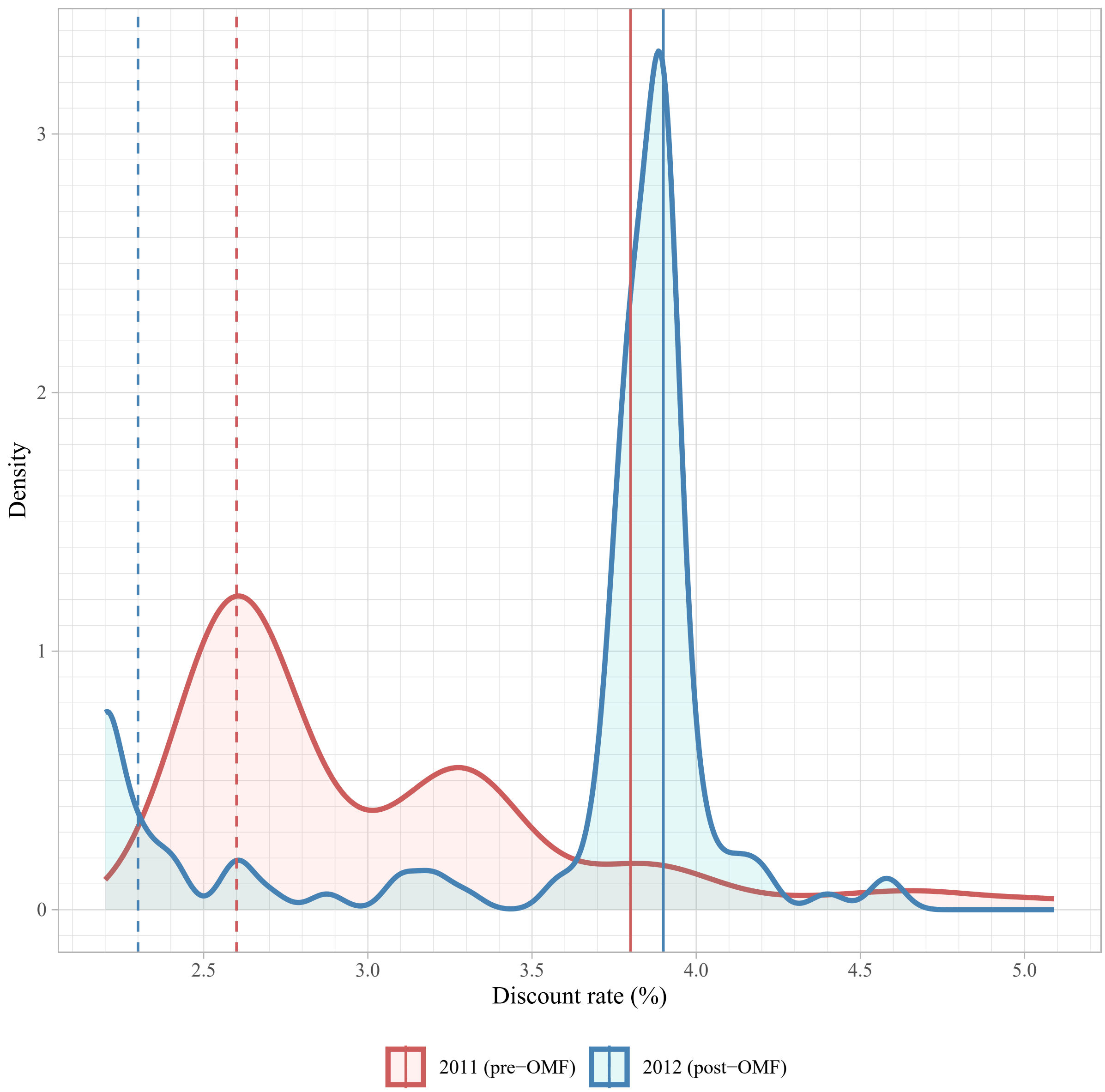
This study documents the impact of changes in actuarial assumptions on borrowing costs. I find weak evidence that firms with larger PBOs experience lower borrowing costs—both when measured as interest expense based on financial statements, and when measured as bond coupon rates—following the

[83]Of the 1921 bonds issued in Norway in 2012 and 2013, 1582 bonds are issued by firms or entities that do not exist in the Norwegian Compustat dataset: mostly government entities, private companies, and foreign companies. Of the remaining 339 bonds, I select unsecured bonds with fixed coupons or fixed margins over index (3-month NIBOR) with no special clauses (i.e., non-convertible and non-callable). Furthermore, I exclude bonds issued by non-DB firms, which totaled to 6 of the remaining bonds (4 firms).

NASB's decision that increased prescribed PBO discount rates and significantly reduced pension liabilities for Norwegian firms. Furthermore, the reduction in borrowing costs is greater for firms with higher bankruptcy risk. I also find strong positive stock market reactions to the NASB announcement for firms with DB plans, particularly those with higher bankruptcy risk, suggesting that stock market participants anticipated the reduced borrowing costs following OMF rate adoption. Overall, this study provides some evidence of benefits that firms may experience from changes in actuarial assumptions that reduce the value and improve the comparability of PBOs. These findings should be of particular interest to regulators, especially given that government bond rates may serve as the reference for discount rates in the absence of a deep market for high-quality corporate bonds, potentially impacting market outcomes and reducing comparability between firms, both locally and internationally. To gain a better understanding of the real effects of accounting regulation, future studies may examine the effects of the OMF introduction on investment efficiency and whether the effects of mandatory pension contributions on investment documented by Rauh (2006) manifests. Future studies may also investigate if my findings are generalizable to other settings, including similar events in other countries (e.g., Sweden) or other market-wide changes in plan funding (e.g., from general interest rate changes).

4.6 Figures

Figure 2: Distribution of discount rates pre- and post-OMF



The vertical lines illustrate prescribed discount rates by the NASB for a PBO of normal duration. The dashed (solid) line is based on government bonds (OMF).

The data is winsorized at the 1st and 99th percentiles.

The the sample used to generate the figure consists of 254 hand-collected firms-years of 127 publicly listed firms in Norway with available discount rate disclosures for both 2011 and 2012.

4.7 Tables

Table 17: Descriptive statistics

Panel A: Pre-OMF (2011 fiscal year)						
	N	Mean	SD	Q1	Median	Q3
ICOST	90	8.187	6.551	4.798	6.109	9.259
LEV	90	0.614	0.163	0.513	0.602	0.685
PBO	63	0.043	0.050	0.007	0.023	0.059
BOND	90	0.522	0.502	0.000	1.000	1.000
RISK	90	7.548	9.318	2.257	4.376	8.116
ROA	90	−3.269	16.767	−3.668	1.008	4.262
SIZE	90	8.152	1.812	6.961	8.368	9.555
TANG	90	0.390	0.299	0.161	0.282	0.676
Z	90	0.696	1.626	0.367	0.981	1.610
DB	90	0.700	0.461	0.000	1.000	1.000
UAGL	90	0.567	0.498	0.000	1.000	1.000
Panel B: Post-OMF (2012 fiscal year)						
	N	Mean	SD	Q1	Median	Q3
ICOST	90	7.352	5.289	4.226	5.967	8.720
LEV	90	0.637	0.188	0.525	0.602	0.710
PBO	63	0.039	0.047	0.008	0.022	0.051
BOND	90	0.533	0.502	0.000	1.000	1.000
RISK	90	6.766	8.985	1.929	3.286	7.381
ROA	90	−4.066	18.951	−5.292	1.083	4.888
SIZE	90	8.112	1.859	6.992	8.449	9.512
TANG	90	0.380	0.295	0.157	0.270	0.649
Z	90	0.469	2.106	0.458	0.973	1.603
DB	90	0.700	0.461	0.000	1.000	1.000
UAGL	90	0.544	0.501	0.000	1.000	1.000

Continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 18: Correlations

Panel A: Pre-OMF (2011 fiscal year)

	ICOST	*LEV*	*PBO*	*BOND*	*RISK*	*ROA*	*SIZE*	*TANG*	*Z*	*DB*	*UAGL*
ICOST		0.167	−0.086	0.007	**0.515**	**−0.552**	**−0.526**	**−0.224**	**−0.634**	**−0.339**	**−0.253**
LEV	0.085		−0.171	0.101	−0.049	−0.157	**−0.181**	0.170	−0.162	0.053	0.081
PBO	−0.031	−0.190		0.207	−0.104	0.191	**0.272**	−0.046	0.160	NA	−0.050
BOND	0.043	0.045	**0.227**		−0.022	0.161	**0.448**	0.152	0.109	**0.345**	**0.241**
RISK	**0.187**	−0.169	**−0.220**	−0.053		**−0.550**	**−0.420**	−0.074	**−0.470**	**−0.308**	**−0.209**
ROA	**−0.258**	**−0.200**	**0.235**	**0.180**	**−0.207**		**0.483**	0.040	**0.773**	**0.210**	0.142
SIZE	**−0.467**	−0.155	**0.302**	**0.451**	**−0.301**	**0.388**		**0.229**	**0.481**	**0.513**	**0.377**
TANG	**−0.195**	0.146	0.019	0.161	0.020	−0.095	**0.268**		−0.106	0.107	**0.187**
Z	**−0.291**	**−0.179**	0.189	0.032	**−0.287**	**0.592**	**0.276**	**−0.337**		**0.352**	**0.199**
DB	**−0.236**	0.036	NA	**0.345**	**−0.286**	**0.190**	**0.512**	0.102	**0.257**		**0.749**
UAGL	**−0.225**	0.038	−0.071	**0.241**	**−0.198**	0.121	**0.395**	0.165	0.081	**0.749**	

Panel B: Post-OMF (2012 fiscal year)

	ICOST	*LEV*	*PBO*	*BOND*	*RISK*	*ROA*	*SIZE*	*TANG*	*Z*	*DB*	*UAGL*
ICOST		**0.387**	**−0.226**	−0.057	**0.628**	**−0.551**	**−0.371**	**−0.269**	**−0.491**	**−0.296**	**−0.187**
LEV	0.161		**−0.216**	0.060	0.153	**−0.483**	**−0.263**	0.112	**−0.432**	−0.138	−0.067
PBO	−0.190	−0.131		0.161	−0.017	−0.029	0.176	−0.055	−0.014	NA	−0.041
BOND	−0.009	0.022	**0.239**		−0.123	0.164	**0.440**	0.171	0.146	**0.311**	**0.218**
RISK	**0.232**	−0.107	−0.042	**−0.194**		**−0.603**	**−0.464**	**−0.290**	**−0.606**	**−0.293**	**−0.218**
ROA	**−0.236**	**−0.327**	0.147	0.165	**−0.284**		**0.445**	0.151	**0.887**	**0.267**	**0.197**
SIZE	**−0.397**	**−0.179**	**0.316**	**0.445**	**−0.358**	**0.316**		**0.310**	**0.512**	**0.494**	**0.355**
TANG	**−0.218**	0.108	−0.001	**0.189**	**−0.362**	−0.046	**0.351**		0.050	0.134	**0.178**
Z	**−0.242**	**−0.209**	0.144	0.043	−0.161	**0.684**	**0.234**	**−0.298**		**0.303**	0.161
DB	**−0.299**	−0.055	NA	**0.311**	**−0.297**	0.120	**0.490**	0.157	**0.215**		**0.716**
UAGL	**−0.231**	−0.034	−0.023	**0.218**	**−0.268**	0.077	**0.380**	**0.177**	0.068	**0.716**	

Pearson (Spearman) correlations are reported above (below) the diagonal.
Values in bold are significant at the 0.10 level.
Continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 19: Effect of the OMF introduction on cost of debt (H1a and H1b)

	(1) *ICOST*	(2) *ICOST*	(3) *ICOST*	(4) *ICOST*	(5) *ICOST*	(6) *ICOST*
Intercept	7.331***	4.971**	8.253**	6.343**	11.113***	10.151***
	(3.049)	(2.074)	(2.615)	(2.198)	(3.752)	(3.624)
PP	−2.223	1.758	−2.332	−1.618	0.220	3.429
	(−1.490)	(0.191)	(−1.606)	(−0.154)	(0.154)	(0.429)
POST	−2.429	0.296	−2.431	0.370	−10.496***	−9.897***
	(−1.644)	(0.593)	(−1.649)	(0.815)	(−2.882)	(−3.423)
$POST * PP$	2.001	−15.940	2.072	−16.833*	−2.056	−17.260***
	(1.299)	(−1.627)	(1.367)	(−1.845)	(−1.510)	(−3.188)
SIZE	−0.128	−0.230	−0.218	−0.368	−0.436	−0.444*
	(−0.625)	(−1.223)	(−0.910)	(−1.559)	(−1.379)	(−1.975)
LEV	6.050**	6.056**	6.707**	6.828***	5.225	4.180
	(2.073)	(2.262)	(2.567)	(2.733)	(1.119)	(1.359)
ROA	−0.018	−0.039	−0.040	−0.035	0.031	−0.006
	(−0.331)	(−0.870)	(−0.785)	(−0.817)	(0.501)	(−0.124)
RISK	0.209***	0.096*	0.173***	0.090**	0.173**	0.052
	(3.581)	(1.679)	(3.138)	(2.000)	(2.588)	(0.895)
TANG	−3.819**	−2.695*	−3.465*	−2.969	−5.583***	−3.191**
	(−2.470)	(−1.799)	(−1.821)	(−1.603)	(−3.207)	(−2.090)
Z	−0.715	0.127	−0.257	0.436	−2.122***	−1.021
	(−1.192)	(0.275)	(−0.352)	(1.040)	(−3.632)	(−1.626)
UAGL	0.173	0.432	0.311	0.746	−0.495	−0.195
	(0.196)	(0.475)	(0.349)	(0.829)	(−0.509)	(−0.219)
$POST * SIZE$					0.583*	0.466*
					(1.675)	(1.952)
$POST * LEV$					2.615	4.151
					(0.526)	(1.525)
$POST * ROA$					−0.089	−0.103*
					(−1.187)	(−1.734)
$POST * RISK$					0.116	0.103**
					(1.578)	(2.273)
$POST * TANG$					3.041*	0.255
					(1.915)	(0.172)
$POST * Z$					2.441***	1.893***
					(3.851)	(3.155)
$POST * UAGL$					1.336*	1.247**
					(1.688)	(2.005)
Industry FE	No	No	Yes	Yes	No	No
$PP =$	*DB*	*PBO*	*DB*	*PBO*	*DB*	*PBO*
Sample	Full	$DB = 1$	Full	$DB = 1$	Full	$DB = 1$
Observations	180	126	180	126	180	126
Adjusted R^2	0.448	0.163	0.458	0.220	0.500	0.177

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 20: Interactions with financial risk (H2) and bond debt (H3)

	(1) *ICOST*	(2) *ICOST*	(3) *ICOST*	(4) *ICOST*
Intercept	7.221***	6.095	8.614***	5.028
	(3.380)	(1.366)	(3.094)	(1.581)
PP	−2.104	15.619	−1.830	32.969
	(−1.383)	(0.969)	(−1.263)	(1.560)
POST	−2.146	0.164	−1.369	1.359*
	(−1.640)	(0.166)	(−1.073)	(1.718)
$POST * PP$	0.709	−35.033**	0.750	−58.603**
	(0.462)	(−2.355)	(0.459)	(−2.085)
BOND			4.281	3.053***
			(1.073)	(2.945)
$PP * BOND$			−2.882	−40.345*
			(−0.729)	(−1.745)
$POST * BOND$			−3.995	−1.446
			(−0.979)	(−1.560)
$POST * PP * BOND$			4.308	53.160*
			(1.019)	(1.824)
Z	−2.172***	−0.329	−0.574	0.315
	(−3.707)	(−0.305)	(−1.020)	(0.616)
$PP * Z$	1.373*	−8.308		
	(1.721)	(−0.698)		
$POST * Z$	1.536**	0.207		
	(2.484)	(0.333)		
$POST * PP * Z$	−0.422	14.797*		
	(−0.460)	(1.917)		
SIZE	−0.231	−0.234	−0.352	−0.453**
	(−1.183)	(−1.080)	(−1.404)	(−2.051)
LEV	7.244**	5.340	4.879*	5.645*
	(2.602)	(1.439)	(1.771)	(1.979)
ROA	0.008	−0.033	−0.038	−0.053
	(0.187)	(−0.713)	(−0.740)	(−1.175)
RISK	0.201***	0.093*	0.181***	0.075
	(3.686)	(1.688)	(2.729)	(1.379)
TANG	−3.409**	−3.340**	−3.826**	−2.934**
	(−2.322)	(−2.439)	(−2.578)	(−2.234)
UAGL	0.339	0.402	0.305	0.632
	(0.380)	(0.458)	(0.358)	(0.681)
Industry FE	No	No	No	No
$PP =$	*DB*	*PBO*	*DB*	*PBO*
Sample	Full	$DB = 1$	Full	$DB = 1$
Observations	180	126	180	126
Adjusted R^2	0.509	0.190	0.459	0.213

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 21: Stock market reactions to the NASB announcing the OMF option

Panel A: Univariate analysis

Subsample	N	% Positive CAR	Mean CAR (%)	t-stat
High PBO	62	59.6	1.369	2.180**
Low PBO	62	43.5	−0.017	−0.036
Non-DB	82	31.7	−0.743	−1.064
Difference High PBO vs. Non-DB			2.112	2.250**
Difference Low PBO vs. Non-DB			0.725	0.858
Difference High vs. Low PBO			1.387	1.758*

Panel B: Multivariate analysis

	(1) CAR	(2) CAR	(3) CAR	(4) CAR	(5) CAR	(6) CAR
Intercept	3.546	4.033	2.681	0.425	3.333	3.359
	(1.366)	(1.244)	(0.938)	(0.125)	(1.136)	(1.029)
PP	3.116***	7.536	2.971***	10.840	3.794***	6.175
	(3.463)	(1.142)	(2.959)	(0.996)	(3.143)	(0.685)
Z			1.454***	0.689		
			(3.293)	(0.997)		
$PP * Z$			−1.102***	−2.347		
			(−2.716)	(−0.494)		
$BONDP$					1.755	−1.095
					(1.399)	(−1.011)
$PP * BONDP$					−1.988	4.026
					(−1.227)	(0.384)
$SIZE$	−0.461	−0.414	−0.572*	−0.394	−0.483	−0.312
	(−1.592)	(−1.559)	(−1.793)	(−1.229)	(−1.498)	(−1.096)
LEV	−3.317*	−0.866	−0.970	3.012	−3.533*	−0.340
	(−1.747)	(−0.423)	(−0.482)	(1.173)	(−1.823)	(−0.162)
ROA	0.001	−0.083*	−0.071**	−0.102	−0.001	−0.083*
	(0.056)	(−1.789)	(−2.004)	(−1.498)	(−0.052)	(−1.736)
BM	0.081	0.205*	−0.107	0.438	0.074	0.235*
	(0.658)	(1.698)	(−0.691)	(1.098)	(0.616)	(1.752)
Industry FE	No	No	No	No	No	No
$PP =$	DB	PBO	DB	PBO	DB	PBO
Sample	Full	$DB = 1$	Full	$DB = 1$	Full	$DB = 1$
Observations	188	118	155	93	188	118
Adjusted R^2	0.058	0.054	0.169	0.053	0.055	0.044

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

Table 22: Effect of the OMF introduction on bond yield spreads

	(1) $SPREAD$	(2) $SPREAD$	(3) $SPREAD$
Intercept	1.877	2.730**	1.986
	(1.199)	(2.548)	(0.902)
PBO	−11.878***	−13.343***	−12.447***
	(−3.920)	(−5.278)	(−3.610)
$POST$	−0.405***	−0.489***	0.484
	(−3.305)	(−5.593)	(0.170)
$POST * PBO$	−17.479**	−7.692	−20.016
	(−2.374)	(−0.979)	(−1.345)
AMT	0.396**	0.034	0.474**
	(2.426)	(0.361)	(2.366)
MAT	0.242***	0.186***	0.282***
	(4.963)	(6.742)	(4.234)
FIX	0.282***	0.504***	0.121
	(2.755)	(6.494)	(0.763)
LEV	−0.688	0.903	−0.753
	(−0.473)	(0.728)	(−0.339)
$SIZE$	−0.256**	−0.059	−0.320***
	(−2.319)	(−0.814)	(−2.682)
$TANG$	3.065***	2.372**	2.956***
	(3.890)	(2.545)	(3.222)
ROA	−7.435	−7.948	−6.503
	(−1.359)	(−1.667)	(−1.012)
$RISK$	0.340***	0.121*	0.343***
	(3.723)	(1.934)	(3.710)
$UAGL$	−0.278	−0.007	−0.251
	(−1.394)	(−0.055)	(−1.155)
$POST * AMT$			−0.163
			(−0.538)
$POST * MAT$			−0.124
			(−1.399)
$POST * FIX$			0.434*
			(1.926)
$POST * LEV$			−0.884
			(−0.337)
$POST * SIZE$			0.137
			(0.827)
$POST * TANG$			0.519
			(0.371)
$POST * ROA$			−5.536
			(−0.691)
$POST * RISK$			−0.121
			(−0.685)
$POST * UAGL$			0.014
			(0.056)
Industry FE	No	Yes	No
Sample	$DB = 1$	$DB = 1$	$DB = 1$
Observations	193	193	193
Adjusted R^2	0.757	0.874	0.756

*, **, and *** indicate significance levels of 0.10, 0.05, and 0.01, respectively.
t-statistics in parentheses are calculated using robust standard errors clustered by firm.
All continuous variables are winsorized at the 1st and 99th percentiles.
All variables are defined in Appendix A.

4.8 Appendix A: Variable definitions

Variable	Definition	Source
AMT	Natural logarithm of issued loan amount in NOK millions (bond-specific).	Refinitiv
BM	Book-to-market ratio, measured as common equity divided by market capitalization.	Compustat
$BOND$	Indicator variable that equals 1 if the firm has bond debt, and 0 otherwise.	Refinitiv
CAR	Three-day cumulative abnormal returns (CAR) estimated using the Capital Asset Pricing Model (CAPM), measured from the day before to the day after the event (i.e., over the window $[-1, +1]$). The coefficients in the CAPM model are estimated using returns from 250 trading days ending two days before the event. Daily abnormal returns are calculated as the difference between the actual return and the return predicted by the model.	Compustat
DB	Indicator variable that equals 1 if the firm has a defined benefit pension plan, and 0 otherwise.	
FIX	Indicator variable that equals 1 if the bond has a fixed coupon rate, and 0 otherwise (bond-specific).	Refinitiv
$ICOST$	Borrowing cost in percentage, calculated as the average ratio of interest expense to average debt for the last four quarters, multiplied by 100.	Compustat
LEV	Leverage, measured as total liabilities divided by total assets.	Compustat
MAT	Maturity of the bond in years (bond-specific).	Refinitiv
PBO	Materiality of the PBO, measured as the ratio of PBO to total assets.	Hand-collected
$POST$	An indicator variable that equals 1 for fiscal years ending on or after December 31, 2012 (i.e., post-OMF adoption), and 0 otherwise.	
PP	A placeholder variable that captures defined benefit plans and takes the value of DB or PBO.	
$RISK$	Standard deviation of ROA in the last three years.	Compustat
ROA	Return on assets, measured as net income, divided by the average of the current and previous year's total assets.	Compustat
$SIZE$	Firm size, measured as the natural logarithm of total assets in NOK millions.	Compustat
$SPREAD$	Coupon rate at the issue date, minus 3-month NIBOR (bond-specific).	Refinitiv
$TANG$	Net property, plant and equipment, scaled by total assets.	Compustat
$UAGL$	An indicator variable that equals 1 for firms that use the corridor method to defer the recognition of actuarial gains and losses, and 0 otherwise.	Hand-collected
Z	Altman's (1968) Z-score, calculated as 1.2 $*$(working capital / total assets) + 1.4 $*$(retained earnings / total assets) + 3.3 $*$(EBIT / total assets) + 0.6 $*$(market value of equity / total liabilities) + (sales / total assets).	Compustat

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