Does the publication or the implementation of IAS 19(R) have real economic consequences?

Abstract

IAS 19(R) abolished the corridor approach and replaced the expected rate of return on pension plan assets with the discount rate. While the abolition of the corridor method did not have a significant impact on UK firms, which were historically using a different method to recognize actuarial gains or losses, the elimination of the expected rate of return was anticipated to have a major impact. We examine whether the elimination of the expected rate of return has real economic consequences for UK firms around the *publication* and *implementation* dates of IAS 19(R). Our findings suggest that UK firms shifted pension investments away from equities following the *publication* and the *implementation* of IAS 19(R). In addition, we find evidence that firms with higher pension deficits and firms that used higher expected rates of return reduced equity investments to a greater extent following the publication of IAS 19(R); interestingly, firms with larger differences between the expected and actual rates of return on pension plan assets reduced equity investments to a greater extent only following the implementation of IAS 19(R). These findings may be of interest to regulators in the context of standard-setting, investment professionals as well as other stakeholders.

Keywords: accounting standard-setting; asset allocation; economic consequences; IAS19(R); pensions

1. Introduction

This study examines whether changes in pension accounting standards for defined benefit (DB hereinafter) plans have real economic consequences by examining the impact on firms' pension asset allocation around the *publication* and *implementation* of IAS 19 revised (IAS 19(R) hereinafter). Pension accounting is inherently complex and requires the utilization of various actuarial and financial assumptions. Under IAS 19, firms used the expected rate of return on plan assets (ERR hereinafter), which is a long-term assumption about pension returns, to compute the expected return on plan assets that was deducted from pension expense. In addition, firms were required to use the discount rate when computing the present value of pension obligations, i.e., the so-called projected benefit obligations. Differences between the assumptions used when accounting for pensions and actual experience give rise to actuarial gains or losses, which were kept off-balance sheet under IAS 19 and were amortized when the 10% corridor (i.e., the larger of the pension plan assets or projected benefit obligations) was triggered.

Following dissatisfaction with accounting for pensions, IAS 19(R) was published in 2011. IAS 19(R) introduced significant changes to pension accounting, most notably (a) the abolition of the corridor approach and the (b) replacement of the ERR on pension plan assets with the discount rate. While the former change was anticipated and even welcomed, several preparers expressed opposition to the replacement of the expected rate of return on plan assets with the discount rate (see also Chircop and Kiosse, 2015). In the context of the ERR, the Board noted that it "sees a possible danger that the subjectivity inherent in determining the expected rate of return could provide entities with an opportunity to manage profit or loss" (IASB, 2010a, b) and hence this was one of the reasons it decided to replace the expected rate of return with the discount rate. Motivated by these important changes to accounting for pensions, we exploit

this setting to examine the real economic consequences of amendments to accounting standards.

This is an interesting setting because the comment letters submitted by preparers to the 2010 Exposure Draft, which culminated in the introduction of IAS 19(R), suggested that if the expected rate of return on plan assets was replaced with the discount rate when computing the expected return on plan assets this would have real economic consequences.[1] In this context, we examine the impact of IAS 19(R) and in particular the elimination of the ERR on pension asset allocation for UK firms. The UK provides a good setting to examine this issue as most companies were not using the corridor approach (which was abolished under IAS 19(R)) and hence any changes to their pension asset allocation can be more easily attributed to the replacement of the expected rate of return with the discount rate.

While IAS 19(R) was issued in 2011, it only became effective in 2013; this provides a unique opportunity to examine the potential impact of IAS 19(R) on pension derisking at two different points in time in the standard-setting process. This is particularly interesting to examine in our setting given the idiosyncrasies associated with making pension asset allocation changes in the context of DB plans in the UK, which involves trustees and other stakeholders and a potentially lengthy process when implementing changes to the pension portfolio. Hence, in this paper we examine potential changes in pension asset allocation around both the *publication* and *implementation* dates of IAS 19(R).[2] The rationale for examining the potential impact of the revised accounting standard during these two distinct periods rests on the fact that if firms decide to change their pension investment strategy due to changes to the pensions

[1] See Zeff (1978) for a detailed discussion of 'economic consequences'.

[2] The phrases 'publication date' and 'issue date' are used interchangeably and refer to the date that IAS 19(R) was published in 2011. Similarly, 'effective date (of IAS 19(R))' and 'implementation date' are used interchangeably and refer to the date that companies were required to use IAS 19(R) in 2013 when accounting for pensions.

accounting standard, it is possible that they start altering their pension asset allocation in 2011 (i.e., when the revised accounting standard was published). This is plausible as firms were already aware of the anticipated changes to pension accounting at that point in time; in fact, companies were aware of the possibility of the elimination of the ERR since 2010 when the Exposure Draft was issued. In addition, given the expected elimination of the ERR firms that were potentially investing a high percentage of pension plan assets on equities to justify a high ERR (Bergstresser et al., 2006; Chuk, 2013) may be inclined to shift pension assets away from equities sooner than later. This is especially the case in our UK setting as it takes time to consult with trustees and other stakeholders and change the pension asset allocation.

Alternatively, firms may wait till the actual effective date of IAS 19(R), i.e., in 2013, before they make any changes to their pension asset allocation given that the revised accounting standard will not have any impact on reported numbers until the actual effective date. In light of prior literature documenting that firms manage the ERR, which was also found not to be based on pension asset allocation or related to actual returns on pension plan assets (Amir and Benartzi, 1998; Li and Klumpes, 2013), it is possible that some firms may only implement changes to their pension asset allocation and reduce investments in equities when the revised standard becomes effective. This is due to the fact that if firms shifted investments in equities when IAS 19(R) was published, continuing to use high ERRs not related to actual rates of return for example would attract the auditor's attention. Hence, we argue that some firms may only shift pension assets out of equities when they are required to implement IAS 19(R), which would provide them with the flexibility to continue employing high ERRs till IAS 19(R) becomes effective. Finally, it is possible that firms may start making changes to their pension asset allocation when IAS 19(R) is published in 2011, but also continue making changes afterwards, i.e., after the effective date in order to achieve the desired shift out of equities and taking into account that changes in pension asset allocation in the UK can take time due to the

involvement of various stakeholders.[3] Hence, our analysis allows us to examine the timing of potential changes in pension asset investment decisions in response to the *publication* and *implementation* of IAS 19(R) and shed light on the impact that changes in accounting standards have on firm investment decision-making.

Using a sample of 1,056 observations for 88 unique UK firms, we examine changes in pension asset allocation to equities around the *publication* and *implementation* of IAS 19(R). Our sample period starts in 2006, the year after IASs were implemented in the EU and ends in 2017, so that our pre-IAS 19(R) publication period and our post-IAS 19(R) effective period are both five years long. Years 2011 and 2012 refer to the period where IAS 19(R) was published but was not effective. We run different specifications designed to examine the impact on pension asset allocation to equities in different periods of time. Importantly, we run all our analyses including firm fixed effects to ensure that firm idiosyncratic characteristics do not bias our results.

Findings for our main analysis show that UK firms reduced their pension asset allocation to equities around both the *publication* and the *effective* date of IAS 19(R). Specifically, we find that the average firm in our sample reduced its pension asset allocation to equities by 20% around the publication of IAS 19(R) and by 36% around the implementation of IAS 19(R). We subject our results to several robustness tests, in which we examine the robustness of the main findings to different research design choices. These tests suggest that our inferences are robust to different specifications.

Further, to disentangle the effect of IAS 19(R) on pension asset allocation to equities from potential confounding effects, we benchmark our results against a sample of US firms.

[3] Given that trustees are ultimately responsible to take decisions about changes to pension asset allocation in the UK and acknowledging that this process may take some time, examining a longer period also allows explicit consideration of this issue in the empirical analysis.

While UK and US firms are highly comparable in terms of their operations, capital structure etc., US firms were not affected by IAS 19(R). To undertake this test, we augment our sample of UK firms with 2,016 observations for US firms for which we have pension asset allocation data. To ensure that our US sample of firms is comparable to our UK sample of firms, we run two sets of analyses. In our first test we run an analysis with entropy balanced covariates, while in our second test we run an analysis using a sample of UK and US firms subject to propensity score matching. Findings for both sets of analyses suggest that UK firms reduced pension asset allocation to equities relative to comparable US firms.

Finally, we carry out cross-sectional analysis to examine the role of (a) pension plan deficits, (b) firms employing high ERR and (c) firms which utilized a higher ERR relative to the actual return on pension plan assets. We find that UK firms with higher pension deficits and those that used a higher ERR reduced their pension plan asset allocation to equities around the publication date more than firms with lower pension deficits and lower ERR, respectively. Interestingly, we also find that UK firms that used a higher ERR relative to the actual rate of return on pension plan assets shifted their pension plan asset allocation to equities around the implementation date more than firms with small differences between the ERR and the actual rate of return. Taken together, these results provide evidence that firms that invested pension plan assets in equities as part of their pension plan investment strategy sought to start reducing their pension plan asset allocation to equities around the publication of IAS 19(R).

Our study makes multiple contributions to extant literature. First, we contribute to prior studies investigating the effects of changes in pension accounting regulations on pension asset allocation, thereby responding to calls in the prior literature to examine factors explaining variations in pension investment strategies given that a significant part of firm level variation in asset allocations is not yet explained (Rauh, 2009). We also contribute to prior studies examining the impact of changes in pension accounting standards. More specifically, Amir,

Guan and Oswald (2010) examine the impact of new disclosure and recognition rules under FRS 17 and IAS 19 in the UK and SFAS 158 in the US. It is important to note that this study focuses on balance sheet effects by examining changes to the pension accounting standards prior to the one examined in this study. Anantharaman and Chuk (2018) examine the impact of IAS 19(R) for a sample of Canadian firms and find that IAS 19(R) resulted in a reduction in risk-taking. Canadian firms were required to employ IFRSs and hence IAS 19 from 2011 onwards and had to use IAS 19(R) from 2013. Given that UK firms were required to use IAS 19 since 2005, the incentives that Canadian firms may have had as well as the institutional setting (e.g., insurance arrangements, previous accounting standards, governance arrangements) differ from UK firms. Hence, it is not straightforward to generalize the findings in the Canadian setting to the UK. Further, Barthelme, Kiosse and Sellhorn (2019) examine the impact of IAS 19(R) on the pension asset allocation of German firms sponsoring defined benefit pension plans that used the corridor method under IAS 19. Their setting differs from ours as a considerable number of German firms used the corridor method under IAS 19 and were then required to abolish it under IAS 19(R), whereas most UK companies already recognized actuarial gains and losses using a different method (i.e., the other comprehensive income, OCI, method) even under IAS 19 for historical reasons (i.e., UK firms were required to use the OCI method under FRS 17). Hence, in contrast to Barthelme et al. (2019), we focus on examining the potential impact of the elimination of the ERR on pension asset allocation, as opposed to the abolition of the corridor method.

Second, in contrast to the accounting method choices made by other European firms under IAS 19, a unique feature of the UK setting is that most firms sponsoring defined benefit pension plans did not use the corridor approach, but rather recognized actuarial gains or losses in OCI (Fasshauer, Glaum, and Street, 2008a, 2008b). This suggests that the abolition of the corridor approach under IAS 19(R) is unlikely to have had an impact on pension asset

allocation in our setting.[4,5] In this respect, the UK represents a particularly clean setting to examine the impact of IAS 19(R) on pension asset allocation as any changes in pension plan asset allocation can be more easily attributed to the replacement of the expected rate of return with the discount rate under IAS 19(R), as opposed to the abolition of the corridor method.

Third, we examine the impact of IAS 19(R) around *both* the *publication* and the *implementation* of the revised standard. In contrast to previous studies (e.g., Anantharaman and Chuk, 2018; Barthelme et al., 2019) that focus solely on the implementation date of new accounting standards, we examine the impact of the revised pension accounting standard when it was published and also when it became effective. It is not clear ex-ante whether firms start making changes to their pension asset allocation following the publication of IAS 19(R) or if they will postpone shifts away from equities till the effective date of IAS 19(R). On the one hand, firms may decide to start making changes to pension asset allocation early on as they are already aware of the impact of the revised accounting standard. In addition, some firms that undertake a higher level of pension risk in order to justify a high ERR (Bergstresser et al., 2006; Chuk, 2013) may decide to start making changes to pension asset allocation as early as the publication date of the revised accounting standard, especially as it takes time to implement changes to the pension portfolio in the UK due to the involvement of trustees and other stakeholders. On the other hand, firms may decide to postpone any pension asset allocation changes till IAS 19(R) is effective as the changes introduced under IAS 19(R) will only have an impact on reported numbers following its implementation. In addition, postponing any shifts

[4] Fasshauer, Glaum, and Street (2008a) note that comment letters submitted to the IASB prior to the 2004 amendment to IAS 19 that introduced the OCI method of recognizing actuarial gains or losses, asserted that "adding options to Standards is not desirable and obstructs comparability" and that "deferred recognition is preferable to immediate recognition" (IAS 19, 2004, Basis for Conclusions, paragraph 48j), which suggests as the authors note that 'few companies would voluntarily adopt full recognition under IAS 19' (p. 114), further reinforcing the motivation for examining this issue in the UK setting.

[5] It is worth noting that US companies were using the corridor approach under SFAS 87 and the FASB only required full recognition of actuarial gains or losses in OCI under SFAS No. 158 (FASB, 2006; Fasshauer et al., 2008a).

away from equities till the effective date of IAS 19(R) would provide firms the flexibility to continue employing high ERRs (which are not related to actual rate of return on pension plan assets), given evidence in the prior literature that some firms employed high ERRs that were not related to pension asset allocation or actual rates of return on the pension portfolio (Amir and Benartzi, 1998; Li and Klumpes, 2013).[6] Hence, the above discussion suggests that it is not clear ex ante whether firms will start making changes to their pension portfolio when the new standard is published, if they will delay such changes till IAS 19(R) is implemented or if they will make changes around both the publication and implementation of the revised accounting standard. This analysis is therefore important as it sheds light on the potential effects of changes in the accounting standards at two stages in the standard-setting process, which may be of interest to standard setters, preparers, and other stakeholders.

Fourth, the consequences of the replacement of the expected rate of return on plan assets with the discount rate flow through the income statement rather than the balance sheet. Examining the real effects of changes flowing through the income statement is interesting as the findings may have implications for pension accounting standards that still require firms to use ERR when computing the return on plan assets, as is the case in the US. Notwithstanding the fact that this item is not currently on the FASB's agenda, the findings may of interest to US standard setters, preparers, and users of financial statements as they shed light on the role of using or eliminating the ERR on pension investment decisions. In addition, the FASB may potentially review the utilization of the ERR in the future in the context of harmonization of IFRS with US GAAP.

[6] This is because if firms reduced investment in equities following the publication of IAS 19(R), they would then have to use lower ERRs as continuing to use high ERRs after shifting pension assets out of equities would attract the auditor's attention.

The rest of the paper is structured as follows. Section 2 provides background information, reviews prior literature, and develops testable hypotheses. Section 3 presents the research design, the sample used in the empirical analysis and descriptive statistics. Section 4 provides an overview of changes in pension asset allocation over time for a sample of companies that submitted a comment letter to the IASB, Section 5 discusses the results of the empirical analysis and Section 6 concludes.

2. Background, literature review and hypotheses development

2.1 Background

IAS 19 governed the accounting for defined benefit pension plans since the introduction of IFRS in the UK in 2005. IAS 19 requires the recognition of pension assets and liabilities on the balance sheet and of pension expense in the income statement. Pension expense is calculated by subtracting the expected return on pension plan assets[7] from the net total of service cost, past service cost, interest cost, actuarial gains or losses and the effect of any curtailments or settlements in profit or loss. §106 of IAS 19 provides guidance on the expected rate of return and notes that "the expected return on plan assets is based on market expectations, at the beginning of the period, for returns over the entire life of the related obligation."

Companies are also required to provide additional disclosures; for example, §120A(l) notes that companies should provide "a narrative description of the basis used to determine the overall expected rate of return on assets, including the effect of the major categories of plan assets" (IASB, 2009). Notwithstanding the guidance provided by the accounting standard, the utilization of the expected rate of return on pension plan assets was rather controversial as there is evidence that firms chose upwardly biased expected rates of return driven by contracting

[7] Expected return on pension plan assets is computed by multiplying the expected rate of return on pension plan assets by the fair value of plan assets.

incentives, ahead of M&A deals and managers exercising stock options (Li and Klumpes, 2013; Bergstresser et al., 2006).

Pension accounting necessitates the utilization of various financial and actuarial assumptions and differences between the actuarial assumptions employed – e.g., discount rates, expected rates of return on plan assets, etc. – and actual experience give rise to actuarial gains or losses. Under IAS 19, companies had the option to either recognize actuarial gains or losses immediately in OCI or profit or loss or alternatively accumulate them off balance sheet and amortize them in profit or loss, if the 10% corridor threshold was triggered, i.e., the larger of the 10% of pension plan assets or projected benefit obligations.

The delayed recognition of actuarial gains or losses as well as the alternative methods available to recognize actuarial gains or losses led to dissatisfaction with IAS 19. To improve the information reported about pensions, the IASB issued an Exposure Draft in 2010, discussing the proposed amendments to IAS 19 (IASB, 2010a) and a revised standard IAS 19(R) was published in June 2011. IAS 19(R), which was effective from January 2013 (IASB, 2011), resulted in the abolition of the corridor approach and required firms to recognize actuarial gains or losses immediately in OCI.[8] This change is unlikely to have had a significant impact on UK companies given that the majority of these companies recognized actuarial gains and losses in OCI even under IAS 19, as this approach was consistent with the previous pension accounting standard in the UK, FRS 17.[9]

[8] See Chircop and Kiosse (2015) for a discussion of the standard-setting process that culminated in the introduction of IAS 19(R).

[9] As Fasshauer, Glaum, and Street (2008a) note "Since the new option is conceptually based on FRS 17, its wider adoption in the UK should not be surprising." (p.118) They continue, "For these companies, the IAS 19 option is "home grown" and consistent with the FRS 17 disclosures provided under UK GAAP prior to adopting IFRS in 2005. Indeed 90% of the UK companies and 76% of the Irish companies utilize a full recognition method in comparison to 29% in other countries." (p.121).

Another important change introduced by IAS 19(R) was the replacement of the expected rate of return on pension plan assets with the discount rate when computing the return on pension plan assets. Hence, companies are essentially required to use the discount rate (specified in §83)[10] to compute both interest cost, by multiplying the discount rate on high quality corporate bonds by the projected benefit obligation, and the return on plan assets, by multiplying the fair value of pension plan assets by the same discount rate. This suggests that companies will now effectively report the net interest expense or income, computed by multiplying the net pension asset or liability by the discount rate.

The rationale underlying this approach rests on the recognition of interest income when the plan is in surplus and interest cost when the plan reports a deficit. In this sense, the net interest cost component includes the part of the return on pension plan assets that arises from the passage of time, in addition to the interest cost on the defined benefit obligation (IASB, 2011).[11] This change was expected to result in increased pension expense and hence lower reported income if companies invest pension assets in equities and other risky investments. It is possible that this change could also result in increased reported income if pension funds invest heavily in government bonds, cash, and low risk investments more generally as in such cases the return on those assets might be lower than the discount rate.

While the change in relation to the abolition of the corridor approach was anticipated and welcomed, there was significant opposition to the replacement of the expected rate of return on plan assets with the discount rate. Comment letters submitted to the IASB by preparers revealed companies' dissatisfaction with the suggested change and some companies

[10] §83 notes that the discount rate shall be determined by reference to yields at the end of the reporting period on high quality corporate bonds, or if there is no deep market in such bonds, yields on government bonds can be used instead. The guidance provided regarding the determination of the discount rate under IAS 19(R) is consistent with that under IAS 19.

[11] The net interest component does not include the part of the return on plan assets that does not arise from the passage of time in the interests of consistency with the principle of separating components of defined benefit cost with different predictive implications (IASB, 2011).

explicitly noted that such a change would have real economic consequences. Appendix 1 provides contextual background information of the views expressed by UK companies to the 2010 Exposure Draft on pensions in relation to the replacement of the expected rate of return on pension plan assets with the discount rate by classifying these views to various categories.[12]

2.2 Literature review and hypotheses development

Prior literature has largely examined the expected rate of return used by firms in the US setting. To better understand whether firms set the expected rate of return on pension plan assets opportunistically, Amir and Benartzi (1998) infer the expected rate of return that firms should have used, while taking their pension asset allocation into account, and compare this to the expected rate of return used by firms. The authors conclude that the firm's choice of expected rates of return is driven by opportunistic incentives given that the expected rates of return used by firms were not based on the allocation of the pension plan assets. In addition, they find that the expected rate of return is not related to actual returns.

Other studies provide evidence that managers use higher expected rates of return to achieve certain earnings-related targets. Bergstresser et al. (2006) find that US firms use higher expected rates of return on plan assets before acquiring other firms and when managers exercise stock options. Li and Klumpes (2013) examine the determinants of the expected rate of return in the UK and find that in attempting to avoid breaching debt covenants, firms use high expected rates of return under both the SSAP 24 and the FRS 17 transitional period, albeit the evidence is stronger during the FRS 17 regime.

Further, Comprix and Muller III (2006) find that managerial compensation is more sensitive to pension income rather than pension expense and in response to this, managers use

[12] See Cocco & Volpin (2007) for additional information about the institutional setting.

higher expected rates of return on plan assets when computing pension income. Other studies show that the incentive to meet or beat analyst forecasts provides incentives to firms to use high expected rates of return (An, Lee and Zhang, 2014; Asthana, 2007). The results of these studies provide evidence that expected rates of return were set opportunistically. However, given that expected rates of return that are out of line may be scrutinized by auditors, it is also alleged that some firms may invest a higher percentage of pension assets in equities to justify higher expected rate of return assumptions. Indeed, Bergstresser et al. (2006) and Chuk (2013) find evidence consistent with the notion that changes in expected rates of return have an impact on pension investment strategy.[13]

IAS 19(R) abolished the incentives some firms may have had to set the expected rate of return on plan assets opportunistically and/or to tilt pension asset allocation towards riskier investments by replacing the expected rate of return with the discount rate. Some companies alleged that this change may have an impact on firms' investment decisions due to the reporting implications of the accounting standard. Indeed, the Lane Clark and Peacock 2011 annual survey suggests that many companies are expected to report lower profits following this accounting change, as they will no longer be allowed to use a higher expected return if pension assets are anticipated to yield higher returns than corporate bonds (LCP, 2011). In this context, we examine the real economic consequences of the revised pensions accounting standard IAS 19(R) by focusing on its potential impact on pension asset allocation when it was *published* and when it became *effective*.

Amir et al. (2010) examine whether the disclosure and subsequent recognition of pension-related numbers on the balance sheet under FRS 17 and IAS 19 (the pension

[13] For the sake of completeness, it is important to note that other studies find that companies did not set the expected rate of return opportunistically (Blankley and Swanson, 1995; Adams, Frank and Perry, 2011). Nonetheless, there is considerable evidence reported in the prior literature consistent with the notion that some firms chose ERR opportunistically, as discussed above.

accounting standard prior to IAS 19(R)) in the UK and SFAS 158 in the US influenced pension investment strategies and whether they resulted in a shift in pension investments from equities to debt securities. Their findings suggest that UK firms shifted pension assets from equities to bonds during the FRS 17 disclosure period; in addition, both UK and US companies shifted pension assets from equities to bonds during the full recognition period under FRS 17/IAS 19 and SFAS 158. Anantharaman and Chuk (2018) find that a sample of Canadian firms reduce risk-taking following the implementation of IAS 19(R). Canadian firms were required to employ IFRS and hence IAS 19 from 2011 onwards and had to use IAS 19(R) from 2013. This suggests that the incentives Canadian firms may have had as well as the institutional setting differ from that for UK firms that were required to use IAS 19 since 2005. Finally, Barthelme et al. (2019) examine the impact of IAS 19(R) on the pension asset allocation strategies of German firms sponsoring defined benefit pension plans and they find that they shift pension assets from equities to bonds. Their setting differs from ours as they focus on the impact of the abolition of the corridor method whereas we focus on the elimination of the ERR. Indeed, as mentioned previously the majority of UK firms were already employing the OCI method as opposed to the corridor method, as this was consistent with a previous accounting standard in the UK, i.e., FRS 17.

Comment letters submitted to the IASB suggest that most respondents to the Exposure Draft opposed the proposed change. Nonetheless, the Board concluded that the net interest cost approach where the same discount rate is used to compute the interest cost and the return on pension plan assets reflects the economics of the pension plan. This is because it reports net interest income if the plan is in surplus or net interest cost when the plan is in deficit and is likely to provide more relevant and understandable information compared to the expected return approach. However, opponents to the proposed approach noted that the return on high quality corporate bonds would be arbitrary and would not reflect the expected return on

different types of pension assets. In addition, it was noted that the net interest approach might lead to reporting different amounts for what are essentially similar defined benefit obligations when there is no deep market in high quality corporate bonds. In this respect, opponents to the proposed approach suggested that this may result in shifts in pension investments from equities to less risky assets.

If firms proceed to shift investments away from equities following the changes in the accounting standard, it is not entirely clear whether (a) they will make changes in the pension portfolio following the publication of IAS 19(R) in 2011, (b) they will wait till its effective date in 2013 or (c) they will make changes in their pension asset allocation after both the publication date and the effective date of IAS 19(R). On the one hand, it is possible that firms shift investments away from equities following the publication of IAS 19(R), but before it is effective as firms understand the requirements of the revised standard at this point in time and the impact these will have. Indeed, given the rather lengthy standard-setting process, firms were aware of the possibility of the elimination of the ERR since the Exposure Draft was issued in 2010 and they had the time to understand and analyse the implications. In addition, making changes to the pension asset allocation may take time. This is especially the case in our setting as in the UK trustee boards are responsible for considering and taking such decisions and given the involvement of other professionals such as investment advisers among others. Hence, firms that may have invested a high percentage of pension assets in equities to justify a high ERR (Bergstresser et al., 2006; Chuk, 2013) may opt to start shifting pension assets away from equities sooner than later.

Based on the discussion above, we expect that on average some firms will start reducing their pension allocation to equities when IAS 19(R) is published. Hence, we formalize our first directional hypothesis as:

H1: UK firms shift pension assets away from equities following the publication of IAS 19(R).

However, it is also conceivable that some firms may defer making any changes to their pension portfolio till they are required to implement the revised standard in 2013. This is for two reasons. First, the revised accounting standard will not have an impact on reported numbers until the effective date of IAS 19(R) in 2013 and hence firms may decide not to make any pension asset allocation changes till they are required to implement the revised accounting standard. Second, firms may not make any changes to pension asset allocation till the actual effective date of IAS 19(R) and hence continue employing high ERRs unrelated to actual rates of return, given evidence in the prior literature that firms manage expected rates of return, which seem not to be related to actual rates of return on plan assets (Amir and Benartzi, 1998). Hence, we argue that some UK firms may decide to continue exercising flexibility when setting the ERR and not reduce investments to equities, which would necessitate using lower ERRs, till the effective date of IAS 19(R) at which point they can no longer use the ERR. We formalize our second directional hypothesis as follows:

H2: UK firms shift pension assets away from equities following the effective date of IAS 19(R).

Finally, we acknowledge that firms may proceed to changes to their pension asset allocation when IAS 19(R) is published in 2011, and they may also continue making changes afterwards. In this case, we would expect to observe shifts in pension asset allocation in 2011 when IAS 19(R) is published, and also following its effective date in 2013.

3. Research design

In the empirical analysis, we first provide an overview of changes in pension asset allocation over time for a sample of UK companies that submitted comment letters to the 2010 Exposure Draft. Second, we present descriptive information about changes in pension asset allocation between 2006-2010 – Exposure Draft period, 2011-2012 – Publication of IAS 19(R) and 2013-2017 – Effective period of IAS 19(R). This analysis is designed to provide some preliminary anecdotal evidence about changes in the composition of the pension portfolio of a sample of companies that submitted comment letters, acknowledging that at this stage we are not controlling for other factors that may influence pension asset allocation strategies. Third, we examine our research question for the period studied in the preliminary analysis above, i.e., 2006-2017, using data for a large sample of FTSE 350 UK companies sponsoring defined benefit pension plans. Our sample period starts one year after the implementation of IASs in the UK in 2005, thereby ensuring that our analysis is not affected by first-year implementation issues. Further, as shown in Figure 1, this sample period ensures that the length of the pre-IAS 19(R) publication period, i.e., 2006-2010, is equal to the length of the post-IAS 19(R) implementation period, i.e., 2013-2017. This sample period allows for sufficient time to examine the effect of changes in the pension regulatory environment on pension asset allocation, while attenuating the risk that confounding factors bias our analysis.

[Insert Figure 1 about here]

To study whether pension asset allocation was influenced by the introduction of IAS19(R), we use multivariate OLS regression models. Eq.1 is designed to examine the effect of the *publication* of IAS 19(R) in 2011 on the percentage of pension assets invested in equities. Eq.2 is used to examine the effect of the *implementation* of IAS 19(R) in 2013 on the percentage

of pension assets invested in equities. Finally, to examine the effect of the *publication* and *implementation* of IAS19(R) contemporaneously, we employ Eq.3. [14]

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_ISSUED_t + \beta_2 MV_t + \beta_3 LEV_t + \beta_4 RISK_t + \beta_5 DIV_t + \beta_6 FUNDSIZE_t + \beta_7 FS_t + \beta_8 FS\hat{}2_t + \beta_9 ROA_t + \beta_{10} HOR_t + \beta_{11} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (1)$$

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_EFFECTIVE_t + \beta_2 MV_t + \beta_3 LEV_t + \beta_4 RISK_t + \beta_5 DIV_t + \beta_6 FUNDSIZE_t + \beta_7 FS_t + \beta_8 FS\hat{}2_t + \beta_9 ROA_t + \beta_{10} HOR_t + \beta_{11} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (2)$$

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_ISSUED_t + \beta_2 IAS19R\_EFFECTIVE_t + \beta_3 MV_t + \beta_4 LEV_t + \beta_5 RISK_t + \beta_6 DIV_t + \beta_7 FUNDSIZE_t + \beta_8 FS_t + \beta_9 FS\hat{}2_t + \beta_{10} ROA_t + \beta_{11} HOR_t + \beta_{12} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (3)$$

where $EQUITY$ is defined as the percentage of pension assets invested in equities. $IAS19R\_ISSUED$, is an indicator variable that takes the value of one for the period following the publication of IAS 19(R), but before IAS 19(R) became effective (i.e., 2011 and 2012), and zero otherwise; and, $IAS19R\_EFFECTIVE$ is an indicator variable that takes the value of one for the period following the effective date of IAS 19(R) in 2013, and zero otherwise. These are the main variables of interest and the sign and statistical significance of β_1 indicates the extent to which investment in equities changed following the issuance (Eq.1) or the effective date (Eq. 2) of IAS 19(R). Eq.3 allows us to run our analysis over the whole sample period, where β_1

[14] There was an 18-month gap between the issue/publication and effective/implementation dates of IAS 19(R). See Appendix 2 for information about the gap between the issue and effective dates of selected IASs/IFRSs. The mean (median) gap between the issue and effective dates of the selected IASs/IFRSs is 20 (18) months when including IAS 19(R) and 20 (16) months when excluding IAS 19(R) from the analysis. Even though the gap between the issuance and effective dates of IAS 19(R) seems to be overall comparable to that of other IASs/IFRSs, as can be seen in Appendix 2 there is a high degree of variability in the gap between the publication and effective dates of various IASs/IFRSs.

(β_2) captures the effect of the publication (implementation) of IAS 19(R) on pension plan asset allocation, while controlling for the effect of the implementation (publication) of IAS 19(R).

Following prior literature, the other independent variables in our model control for pension plan and firm-specific characteristics, which may influence pension plan asset allocation. Specifically, we control for the following pension plan characteristics: pension fund size, $FUNDSIZE$, defined as the natural logarithm of the fair value of pension plan assets and funding status, FS, defined as the fair value of pension plan assets divided by projected benefit obligations. We control for the funding status as the funding requirements and the volatility of future pension contributions may influence pension asset allocation (Amir et al., 2010; Anantharaman and Chuk, 2018; Harrison and Sharpe, 1983; Rauh, 2009; Barthelme et al., 2019). FS^2 is the square of FS and we include it in the model to control for the potential nonlinear relationship between funding status and pension asset allocation (Amir et al., 2010; Anantharaman and Chuk, 2018). Horizon, HOR is defined as the natural logarithm of projected benefit obligations divided by pension service cost. We control for plan horizon, which captures the maturity of the pension plan, as companies are expected to shift pension assets from equities to bonds as their pension plans mature (Amir et al., 2010; Anantharaman and Chuk, 2018).

In addition, we control for the following firm-specific characteristics: market value, *MV*, defined as the log of the market value of the firm (Anantharaman and Chuk, 2018); leverage, LEV, defined as long-term debt divided by total shareholder's equity, as firms with more stringent debt covenants are expected to invest more heavily in bonds (Amir et al., 2010; Anantharaman and Chuk, 2018); return on assets, *ROA*, computed as net income divided by total assets; dividend payments, *DIV*, defined as cash dividends scaled by total assets to control for the fact that firms may have incentives to invest pension assets in bonds to reduce the volatility of pension contributions and hence dividends (Amir et al., 2010; Anantharaman and

Chuk, 2018); risk, $RISK$, calculated as the standard deviation of operating cash flows divided by the average operating cash flows over the prior five-year period to control for the fact that firms may try to offset corporate risk by changing pension asset allocation (Amir et al., 2010); and $MKTRET$, defined as the FTSE 350 annual market return (Anantharaman and Chuk, 2018).[15] All pension and accounting data to compute the required variables are sourced from Worldscope, while market return data are sourced from Datastream. All models include firm-fixed effects to control for time invariant firm characteristics and all models are run with standard errors clustered by year.

4. Preliminary analysis

In this section, we present preliminary descriptive evidence of changes in pension asset allocation for a sample of companies that submitted a comment letter to the IAS 19(R) Exposure Draft. This analysis provides some evidence that while a sample of UK companies that submitted a comment letter to the Exposure Draft reduced their allocation to equities following the publication and effective date of IAS 19(R), other companies increased their equity investments.

Unilever, AngloAmerican, BP, Stagecoach, Astrazeneca, Reed Elsevier and National Grid shifted pension assets away from equities in the IAS 19(R) post-publication and post-implementation periods. Conversely, BT reduced investments in equities from 32% to 25.5% in the IAS 19(R) post-publication period, while it increased equity investments to 27.5% in the IAS 19(R) post-implementation period; equity investments were nevertheless overall lower in the IAS 19(R) post-implementation period. In addition, Tesco increased equity investments from 49% to 54.4% in the IAS 19(R) post-publication period and investments in equities remained at the same level of 54.9% in the IAS 19(R) post-implementation period. This

[15] When we use our US sample, *MKTRET* is the S&P 500 annual market return.

anecdotal evidence suggests that even though most companies seem to have reduced investments in equities after the publication and implementation date of IAS 19(R), there are examples of companies that have increased equity investments after the publication of IAS 19(R). Having provided an overview of average changes in asset allocation around the publication and implementation date of IAS 19(R) of a sample of UK firms that submitted a comment letter to the IASB, we next examine the impact of IAS 19(R) using a large sample of UK firms.

5. Empirical analysis

5.1. Sample selection and descriptive statistics

As shown in Appendix 3, we start our sample selection process for UK firms with FTSE 350 constituents for the period 2006-2017 (4,200 observations). We exclude observations for which pension allocation data are not available (1,932 observations), observations for financial firms (336 observations), and observations with missing data to calculate the control variables (414 observations). Further, to ensure that in our analysis we are comparing asset allocation between different periods for the same companies, we require that firms in the sample have observations for each year in our sample period. This criterion reduces our sample to 1,056 observations for 88 unique firms.

Panel A of Table 1 provides descriptive statistics for our sample of UK firms. The average firm in our sample has 45% of its pension plan assets invested in equities (*EQUITY)*, leverage (*LEV)* of 21%, has 89% of its projected benefit obligations funded by pension plan assets (*FS*) and has a return on assets of 6% (*ROA*). Panel B of Table 1 reports the Pearson correlation matrix for our sample. Interestingly, while *EQUITY* is negatively correlated with both *IAS19R_ISSUED* and *IAS19R_EFFECTIVE*, this correlation is only significant for *IAS19R_EFFECTIVE*, suggesting a reduction in equity investments in the post-19(R) effective

period but not in the post-19(R) publication period. Market value (*MV)*, leverage (*LEV*), pension fund size (*FUNDSIZE*), funding status (*FS* and *FS^2)* and horizon (*HOR*) are significantly negatively correlated with pension plan equity holdings, while dividend payments (*DIV*) and return on assets (*ROA*) are significantly positively correlated with pension plan equity holdings.

<<Insert Table 1 about here>>

We subsequently report descriptive statistics on the percentage invested in equities for the sampled firms for the following three periods: (a) before the publication of IAS 19(R), i.e., between 2006-2010, (b) after the publication of IAS 19(R), but before IAS 19(R) became effective, i.e., between 2011-2012, and (c) after IAS 19(R) became effective, i.e., between 2013-2017 and compare the pension asset allocation (1) before the publication of IAS 19(R) to the period following the publication of IAS 19(R), i.e., (a&b) and (2) the period after the publication of IAS 19(R) to the period following the implementation of IAS 19(R) (i.e., b&c).

Table 2 reports the results. These univariate statistics suggest that UK firms allocate on average a significantly lower percentage of pension plan assets to equities after the publication of IAS 19(R) rather than before the publication of IAS 19(R), i.e., 44% versus 54% (t-stat: 7.59). We then compare the pension asset allocation between the IAS 19(R) publication period and the post-IAS 19(R) implementation date. Investments in equities decrease significantly between the IAS 19(R) publication period and the date IAS19(R) was implemented from an average of 44% to 35% (t-stat: 6.02). It is important to emphasize that these findings are based on the univariate analysis, which does not control for firm characteristics and hence the findings should be interpreted with caution. We next turn to the multivariate analysis, which controls for pension plan and firm characteristics.

<<Insert Table 2 about here>>

5.2. Multivariate analysis

As our baseline analysis, we first examine the impact of the publication of IAS 19(R) for UK firms by estimating Eq.1. Specifically, we regress $EQUITY$ on the variable of interest, $IAS19R\_ISSUED$, and other control variables. To have a clean setting, we only keep observations for the pre-publication of IAS 19(R) (i.e., 2006-2010) and observations for the IAS 19(R) publication period (i.e., 2011 & 2012) for this analysis. In other words, we drop observations for the IAS 19(R) effective period (i.e., 2013-2017) to ensure that any changes in pension asset allocations are solely driven by the publication of IAS 19(R). The results are reported in Table 3 column (1). The coefficient on $IAS19R\_ISSUED$ is -0.08 (t-stat.: -3.69), and is significant at the 5% level, suggesting that UK firms reduce the percentage invested in equities following the publication of IAS 19(R). This finding supports H1 by documenting that UK firms started shifting pension assets out of equities following the publication of IAS 19(R). Overall, it suggests that firms initiated the process of shifting pension assets away from equities, a process which can be lengthy given the involvement of trustee boards and investment advisers, as early as the date following the publication of IAS 19(R).

We subsequently examine the impact of the implementation of IAS 19(R) by estimating Eq.2. Specifically, in this analysis we compare the period in which IAS 19(R) was effective, i.e., 2013-2017, to the period in which IAS19(R) was published but was not effective. Hence, for this analysis we drop observations for the pre-publication of IAS 19(R) period, i.e., 2006-2010. The results are reported in Table 3, column (2). The findings suggest that UK firms reduce the percentage of equity investments following the implementation of IAS 19(R) in 2013, as indicated by the negative coefficient on $IAS19R\_EFFECTIVE$, coeff: -0.07 (t-stat.: -2.98), which is significant at the 5% significance level. This finding supports H2 and is consistent with UK firms reducing investments in equities following the elimination of the ERR. Next, we compare pension asset equity allocation between the pre-IAS 19(R) publication

period and the period following the effective date of IAS 19(R). As shown in Table 3 column (3), there is a significant reduction in pension assets allocated to equities in the post IAS19(R) implementation period (coeff.: -0.16, t-stat.: -6.54). Finally, in Table 3 column (4) we show the results for Eq.3, where we contemporaneously test for changes between the pre-IAS 19(R) publication period and the IAS 19(R) publication and implementation periods. Results for this analysis show a reduction in pension asset allocation to equities around both the publication, *IAS19R_ISSUED* (coeff.: -0.09, t-stat.: -4.32) and implementation, *IAS19R_EFFECTIVE*, periods (coeff.: -0.16, t-stat.: -6.66). Results are not only statistically, but also economically significant. Specifically, the average firm in our sample reduces pension asset allocation to equities by 20% around the IAS 19(R) publication date and by around 36% around the IAS 19(R) implementation date.[16] These findings suggest that IAS 19(R) had real economic, albeit probably unintended, consequences.

<<Insert Table 3 about here>>

We subject our baseline results to several robustness tests. First, we ensure that our results are not driven by time trends by including year-fixed effects in our specification. Second, we cluster standard errors by industry to ensure that the varying number of observations for each industry in our analysis does not drive our results. Third, we run our baseline results with standard errors clustered by firm to ensure that the potential clustering of the publication and implementation of IAS 19(R) for specific firms does not bias our results. We use Eq.3 to run this analysis and the results of these tests are shown in Table 4. Inferences from running Eq.3 when including year fixed effects (column 1), clustering standard errors by industry (column 2) and clustering standard errors by firm (column 3) are similar to those

[16] Economic significance of changes in pension asset allocation for the average firm in our sample around the publication (implementation) of IAS 19(R) is calculated as -0.09 (-0.16) divided by the mean pension asset allocation to equity for our sample: 0.45.

reported in the main analyses, suggesting that our results are not driven by research design choices.[17]

<<Insert Table 4 about here>>

To ensure that our baseline results are not driven by some correlated omitted variable or a confounding effect, we benchmark our baseline results to US firms using Eqs.4-6. UK and US firms operate in a similar institutional and regulatory environment (Leuz, 2022), however unlike UK firms, US firms were not impacted by changes to IAS 19(R). Hence, benchmarking our results for UK firms to US firms allows us to better distinguish the effect of the publication and implementation of IAS 19(R) from any confounding effects. Specifically, we employ a difference-in-differences approach by utilizing the pooled sample of UK and US firms and including interactions between $IAS19R\_ISSUED$, $IAS19R\_EFFECTIVE$ and an indicator variable, UK, which takes the value of one for observations of UK firms, and zero otherwise. All other variables in Eqs. 4-6 are as previously defined.

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_ISSUED_t * UK + \beta_2 IAS19R\_ISSUED_t + \beta_3 MV_t + \beta_4 LEV_t + \beta_5 RISK_t + \beta_6 DIV_t + \beta_7 FUNDSIZE_t + \beta_8 FS_t + \beta_9 FS\hat{}2_t + \beta_{10} ROA_t + \beta_{11} HOR_t + \beta_{12} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (4)$$

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_EFFECTIVE_t * UK + \beta_2 IAS19R\_EFFECTIVE_t + \beta_3 MV_t + \beta_4 LEV_t + \beta_5 RISK_t + \beta_6 DIV_t + \beta_7 FUNDSIZE_t + \beta_8 FS_t + \beta_9 FS\hat{}2_t + \beta_{10} ROA_t + \beta_{11} HOR_t + \beta_{12} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (5)$$

$$EQUITY_t = \alpha_t + \beta_1 IAS19R\_ISSUED_t * UK + \beta_2 IAS19R\_ISSUED_t + \beta_3 IAS19R\_EFFECTIVE_t * UK + \beta_4 IAS19R\_EFFECTIVE_t + \beta_5 MV_t + \beta_6 LEV_t + \beta_7 RISK_t + \beta_8 DIV_t + \beta_9 FUNDSIZE_t + \beta_{10} FS_t + \beta_{11} FS\hat{}2_t + \beta_{12} ROA_t + \beta_{13} HOR_t + \beta_{14} MKTRET_t + FIRM\ F.E. + \epsilon_t \quad (6)$$

[17] Untabulated results from running robustness tests for Eq.1 and Eq.2 are similar to those presented in Table 3.

where a positive (negative) significant coefficient on the interaction terms indicates that UK firms increased (decreased) their pension asset allocation to equities relative to the benchmark US firms. Given that we do not expect benchmark firms to be influenced by IAS 19(R), any observed incremental changes in the pension allocation of UK firms can be attributed to IAS 19(R). Importantly, for this analysis the *UK* main effect is subsumed by the firm-fixed effects.

To run our analysis, we augment our sample of 1,056 UK firm-year observations with 2,016 US firm-year control observations for which we have the required data to calculate the variables needed for this analysis. Further to ensure that idiosyncratic differences between UK and US firms do not influence our results, we adopt two approaches to running Eqs.4-6. First, we use an entropy balancing approach, where co-variates for UK and US firms are weighted on the first moment based on 2006 data to achieve covariate balance between UK and US firms. Table 5 shows the results for this analysis. Column (1) shows the results for Eq.4, where we compare changes in UK firm pension asset allocation to equity relative to US firms between the pre-IAS 19(R) issuance period and the period following the issuance of IAS 19(R). As expected, the coefficient on *IAS19R_ISSUED*UK* is negative, albeit marginally insignificant (coeff.: -0.03, t-stat.: -1.76). Column (2) shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between the period in which IAS 19(R) was published, but not yet effective and the period post-IAS 19(R) implementation date. Column (3) shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between the pre-IAS 19(R) publication period and the post-IAS 19(R) implementation date. In both specifications, the coefficient on *IAS19R_EFFECTIVE*UK* is negative and significant. In column (4), we present the results for Eq.6. We find a negative and significant coefficient on both *IAS19R_ISSUED*UK* (coeff.: -0.03, t-stat.: -1.89) and *IAS19R_EFFECTIVE*UK* (coeff.: -0.06, t-stat.: -6.02), suggesting that UK firms reduced

pension asset allocation to equities around both the publication and implementation of IAS 19(R) relative to US firms.

<<Insert Table 5 about here>>

Second, we use a propensity score matching (PSM hereinafter) technique with no replacement and a caliper of 5% where we match each of the 88 UK firms in our sample with a US firm based on the values for the control variables used in our analysis as at the beginning of our sample period, i.e., 2006. Out of the 88 UK firms, we successfully match 59 firms; hence our final sample of UK firms consists of 708 observations. Panel A of Table 6 presents descriptive statistics for the UK and US sample prior to and following PSM. A comparison of the t-statistics for differences in means between the pre-PSM and the post-PSM samples suggests that PSM reduced differences between the UK and US samples.

We use the PSM matched sample to run Eqs. 4-6. First, we examine the impact of the publication of IAS 19(R) by estimating Eq.4 and hence, similar to our previous analysis we drop observations for the period when IAS 19(R) was effective, i.e., 2013-2017, from our sample. The results reported in Panel B of Table 6, column (1) indicate that UK firms reduced equity investments more around the publication of IAS 19(R) relative to US firms, as indicated by the negative and significant coefficient on *IAS19R_ISSUED*UK* (coeff: -0.03; t-stat.: -2.67). To examine the impact of the implementation of IAS 19(R), we estimate Eq.5 using observations from 2011 to 2017. The results reported in column (2) suggest that UK firms reduced equity investments more compared to the matched US firms following the effective date of IAS 19(R), as the coefficient on *IAS19R_EFFECTIVE*UK* is negative and statistically significant (coeff: -0.06; t-stat.: -5.22). Column (3) shows the results when we compare the period following the effective date of IAS 19(R), i.e., 2013-2017 to the period before IAS 19(R) was published, i.e., 2006-2010. Findings for this specification show that UK firms reduced the

percentage of equity investments relative to US firms following the implementation of IAS 19(R) in 2013, as indicated by the negative and significant coefficient on *IAS19R_EFFECTIVE*UK* (coeff: -0.09; t-stat: -8.85). Column (4) shows the results for Eq.6. In line with the previously discussed results, the coefficients on both *IAS19R_ISSUED*UK* (coeff: -0.03; t-stat.: -2.43) and *IAS19R_EFFECTIVE*UK* (coeff: -0.09; t-stat: -8.28) are negative and significant, suggesting that UK firms reduced the percentage of pension assets invested in equities around both the publication and implementation of IAS 19(R) relative to US firms.

<<Insert Table 6 about here>>

Taken together, the above results provide support for both hypotheses 1 and 2 and suggest that UK firms shifted pension assets away from equities following the *publication* of IAS 19(R) in 2011 and also after its *effective date* in 2013. Hence, the revised accounting standard had real economic consequences for UK firms after it was published in 2011 and following its implementation in 2013, i.e., when the expected rate of return on plan assets was replaced with the discount rate. While these economic consequences are likely unintended, they are economically and statistically significant.

5.3. Further analyses

In this section, we carry out cross-sectional tests to examine the impact of (a) large pension plan deficits, (b) high ERR, and (c) large differences between the expected and the actual rate of return on pension plan assets. The rationale underlying these analyses is to examine whether firms implement shifts away from equities at different points in time conditional on pension-specific characteristics. Specifically, we expect that firms whose pension schemes are in deficit may start shifting assets away from equities as early as the publication date of IAS 19(R) as this would reduce the volatility emanating from returns to equity investments. In

addition, we expect firms that strategically invested a high percentage of pension plan assets in equities to justify higher ERRs to start adjusting their pension plan asset allocation around the publication of IAS 19(R). This is due to the lengthy process of making changes to the pension portfolio, which in the UK involves trustees and other stakeholders. Furthermore, firms that managed the ERR and chose to use ERRs not related to their actual rates of return (Amir and Benartzi, 1998) may wait till IAS 19(R) is effective to make changes to their pension plan asset allocation, since for these firms their pension plan asset allocation is detached from the ERRs they use when accounting for pensions and may wish to continue employing high ERRs till utilization of this assumption is eliminated under IAS 19(R).[18] Alternatively and depending on the percentage of pension assets these firms invest in equities, they may decide to shift assets away from equities when IAS 19(R) is published; hence, we do not have a strong expectation about pension asset reallocations for firms, which employed overoptimistic ERRs not related to actual rates of return.

We use (a) pension plan deficit (*DEFICIT)*, calculated as the difference between pension plan obligations and pension plan assets scaled by pension plan obligations, to capture firms most in need of earning high returns on pension plan assets (b) higher ERRs (*ERR)* to capture firms that strategically allocated a higher percentage of pension plan assets to equities to justify high ERRs, and (c) the difference between the expected and the actual rate of return on pension plan assets scaled by the expected rate of return (*DIFF*) to capture firms for which the ERR is not explained by the actual rate of return on pension plan assets and which likely employed overoptimistic ERRs.

In all cases, we split the sample around the median using 2006 data and code *H_DEFICIT (H_ERR) {H_DIFF}* as one for firms with *DEFICIT (ERR) {DIFF}* above the median

[18] The rationale being that if these firms decided to reduce investments in equities following the publication of IAS 19(R), they would also have to reduce the ERR (as not doing so would attract the auditor's attention) and hence they would not be able to continue using high ERRs till the implementation of IAS 19(R), at which point utilization of the ERR is eliminated.

value, and zero otherwise. We undertake these cross-sectional analyses using Eq.3, which we augment by including interactions between *H_DEFICIT (H_ERR) {H_DIFF}* and *IAS19R_ISSUED* to capture the effect of high *DEFICIT* (ERR) {*DIFF}* on changes in pension plan asset allocation to equities around the IAS 19(R) publication date and interactions between *H_DEFICIT (H_ERR) {H_DIFF}* and *IAS19R_EFFECTIVE* to capture the effect of high *DEFICIT* (ERR) {*DIFF}* on changes in pension plan asset allocation to equities around the IAS 19(R) effective date. In all cases, the main effect *H_DEFICIT, H_ERR* or *H_DIFF* is subsumed by the firm-fixed effects.

Table 7 Panel A presents the results when we examine the effect of pension plan deficits on changes in pension plan asset allocation to equities. In line with the main analyses, the coefficients on constituent terms *IAS19R_ISSUED* and *IAS19R_EFFECTIVE* are negative and significant at the 1%, while the coefficients on the interaction terms *IAS19R_ISSUED*H_DEFICIT* and *IAS19R_EFFECTIVE*H_DEFICIT* are negative, albeit only significant for *IAS19R_ISSUED*H_DEFICIT*. These results suggest that while all firms reduced their pension asset allocation to equities around the publication and effective dates of IAS 19(R), firms with larger pension plan deficits reduced their allocation to equities around the publication date more relative to firms with smaller pension plan deficits.

Table 7 Panel B shows the results when we examine the effect of ERR on changes in pension plan asset allocation to equities. Similar to the results for pension plan deficits, the coefficients on constituent terms *IAS19R_ISSUED* and *IAS19R_EFFECTIVE* are negative and significant at the 1%, while the coefficients on the interaction terms *IAS19R_ISSUED*H_ERR* and *IAS19R_EFFECTIVE*H_ERR* are negative, albeit only significant for *IAS19R_ISSUED*H_ERR*. These results suggest that while all firms reduced their pension asset allocation to equities around the publication and effective dates of IAS 19(R), firms with higher ERR reduced their allocation to equities more around the publication date relative to

firms with lower ERR. This result may be explained by findings in the prior literature (e.g. Bergstresser et al., 2006; Chuk, 2013), which document that some firms invested a higher percentage of pension plan assets in equities to justify higher ERRs. Hence, such firms may initiate the pension reallocation out of equities early, i.e., after the publication of IAS 19(R) at which point it is certain that the ERR will be eliminated, as it may take time to implement changes to pension asset allocation for schemes in the UK given that DB plans are set up in trusts and pension trustees and other stakeholders are involved in pension asset allocation decisions.

Table 7 Panel C shows the results when we examine the effect of the difference between the expected and the actual return on pension plan assets on changes in pension plan asset allocation to equities. In line with previously discussed results, the coefficients on constituent terms *IAS19R_ISSUED* and *IAS19R_EFFECTIVE* are negative and significant at the 1% level. While the coefficients on the interaction terms *IAS19R_ISSUED*H_DIFF* and *IAS19R_EFFECTIVE*H_DIFF* are negative, it is only the *IAS19R_EFFECTIVE*H_DIFF* coefficient that is statistically significant. These results suggest that while all firms reduced their pension asset allocation to equities around the publication and effective dates of IAS 19(R), firms with a larger difference between actual and expected rates of return on pension plan assets reduced their pension asset allocation to equities around the effective date of IAS 19(R) to a greater extent relative to firms with a smaller difference between actual and expected rates of return. This finding may be explained by the fact that firms managing the ERR, as documented by large differences between the ERR and the actual rate of return on pension plan assets, opt to continue managing the ERR till the effective date of IAS 19(R), at which point they are required to switch from the ERR to the discount rate when computing the return on pension plan assets.

<<Insert Table 7 about here>>

Taken together, the above results suggest that firms with pension plans in deficit and those using high expected rates of return on pension plan assets sought to pre-empt the effect of IAS 19(R) by shifting pension plan assets away from equities around the IAS 19(R) publication date. Interestingly, firms that used an ERR that was not justified by the pension plan allocation as captured by the large differences between the expected and actual rates of return waited till IAS 19(R) became effective before making any changes to their pension plan asset allocation. In doing so, these firms could continue to take advantage of the provisions of IAS 19 by utilizing optimistic ERRs not justified by their pension asset allocation until the revised pension accounting standard became effective.

6. Conclusion

This paper examines the impact of the publication and the implementation of the revised pensions accounting standard IAS 19(R) on pension investment decisions. Two key proposed changes set out in the 2010 Exposure Draft were the abolition of the corridor approach and the replacement of the expected rate of return on plan assets with the discount rate. While the abolition of the corridor approach was expected and even welcomed, companies that submitted comment letters to the Exposure Draft expressed their dissatisfaction with the elimination of the ERR and its replacement with the discount rate. They noted that the discount rate does not reflect the return on pension plan assets and that if this change is endorsed it is likely to have an impact on pension asset allocation decisions (see also Chircop and Kiosse, 2015). Despite the opposition, this change was implemented, and the revised standard IAS 19(R) was issued in 2011 and became effective in January 2013.

Our empirical analysis focuses on UK firms as most UK firms were not using the corridor method under IAS 19 and hence the replacement of the ERR with the discount rate is the most important of the two changes in IAS 19(R) affecting firms in our sample. The results of our empirical analyses suggest that UK companies reduced pension investments in equities

following the *publication* in 2011 and the *implementation* of IAS 19(R) in 2013 and highlight an unintended consequence of IAS 19(R). Additional analyses suggests that firms with larger pension plan deficits and firms employing higher ERRs reduced their allocation to equities to a greater extent around the publication date of IAS 19(R); while firms with larger differences between actual and expected rates of return on pension plan assets reduced their pension asset allocation to equities to a greater extent around the effective date of IAS 19(R). These results show that some firms started moving pension plan assets out of equities early on following the publication of IAS 19(R), while others waited till the effective date of IAS 19(R).

Overall, the findings suggest that accounting standards can have real economic consequences, albeit somewhat unintended sometimes, and provide evidence that UK firms started shifting pension assets away from equities following the *publication* and the *implementation* of the revised accounting standard. These findings are likely to have implications for investment professionals and for standard-setting in general and possibly inform accounting for pensions in regimes where the ERR is still permitted such as in the US. Even though review of the ERR is not currently in the FASB's agenda, our findings may be relevant as they document that the decision to allow or not permit utilization of the ERR can have real effects, particularly in the context of pension investment decisions. Finally, the study contributes to prior literature by examining the impact of accounting standards at two stages in the standard-setting process and by showing that changes in the accounting standards can have real economic consequences, even before they become effective.

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Appendix 1

Overview of views expressed by UK companies to the 2010 Exposure Draft on pensions

This appendix provides contextual background information by examining the views expressed by UK companies to the 2010 Exposure Draft on pensions in relation to the replacement of the expected rate of return on pension plan assets with the discount rate. The majority of companies that responded to the Exposure Draft published in 2010 opposed the replacement of the expected rate of return on plan assets with the discount rate and justified their opposition using a number of arguments, which we summarize in the table below.

	Arguments	Company name
Views expressed by companies against the ERR		
Review should be undertaken with the FASB	Long-term interests of all stakeholders will not be served by adopting the 'net interest' approach before a comprehensive review is undertaken with the FASB.	Unilever, BT
	The expected rate of return should be considered as part of a review of pension accounting with the FASB, especially given that the proposed changes are markedly different from existing practice.	Unilever, BT
	This component will be treated differently by the FASB and the IASB, and if the latter endorsed the proposed change, this would result in a lack of consistency between international companies.	Unilever, BT

Unintended consequences	Accounting methods can cause changes in economic behavior.	British American Tobacco
ERR is a more appropriate estimate	The expected return approach under IAS 19 is more consistent with economic reality, reflects the company's best estimate of pension asset returns and the composition of the pension portfolio and is a more reliable indicator of the cost and the company's ability to sustain the existing level of benefits, while the proposed approach does not have sufficient merit or validity to warrant replacing the expected rate of return.	Unilever, BT, British Airways, BP, AngloAmerican, Reed Elsevier, British American Tobacco, Tata Steel
	Given that plan obligations and assets have different characteristics, it is not clear why the same interest rate should be applied to the net balance, especially given that this rate does not reflect the underlying gross pension assets or liabilities. There seem no fundamental accounting principles supporting the proposed approach. Some of the companies that submitted a comment letter noted that they do not find the argument that the proposed approach will provide simplicity and consistency between the treatment of pension assets and liabilities satisfactory and indicated that changes should be made if they provide better and more useful information to stakeholders, a criterion that the proposed approach fails to satisfy.	BT, Tesco, Kesa

	As plans mature, they are more likely to increasingly invest assets in cash and high-quality government bonds in which case using the high-quality corporate bond rate will overstate the investment return.	Balfour Beatty, Stagecoach
	Replacing the expected rate of return with the discount rate would further distance accounting reporting from the actual commercial relationship that has been reached between trustees and sponsoring employers.	Stagecoach
	Using the discount rate to compute the return on plan assets is arbitrary and does not provide information about the company's forward-looking performance in relation to its ability to settle those obligations.	Tesco, AngloAmerican, British American Tobacco, Reed Elsevier
	Reference to 'a high-quality corporate bond' seems to suggest that it is better than the expected rate of return estimate. However, it was noted that judgements and estimates are required on many occasions and that the classification of bonds as high-quality bonds is not set in stone and is relative to other bonds.	Stagecoach

	It was acknowledged that while the proposed change to replace the expected rate of return with the discount rate may target a perceived abuse by some preparers who overstate their expected returns, some companies noted that this will be at the expense of schemes that use an expected return that reflects the return characteristics and the terms agreed between employers, employees and trustees. Hence, given the absence of a strong theoretical basis these companies do not support the proposed change, especially given that enhanced disclosure requirements allow users to assess the reasonableness of the expected rate of return assumption used by companies. If the major concern underlying this proposal to replace the expected rate of return with the discount rate is the utilization of overoptimistic expected rate of return assumptions, then it would be appropriate to be more prescriptive about the rationale underlying the choice of this assumption for each asset class than substituting the expected rate of return with the discount rate.	BP, Tesco, Reed Elsevier, National Grid, British American Tobacco, Stagecoach, AngloAmerican
Lack of comparability	The proposed approach would reduce comparability as the income statement would not reflect the	Tesco, AngloAmerican

	composition of the pension portfolio.	
Reporting and monitoring	The proposed approach will increase the pension cost recognized in the income statement for most entities with funded defined benefit plans.	British Airways
	The proposed approach will require evaluating the surplus or deficit more frequently.	British Airways
Time horizon	Given the volatility underlying the discount rate in the short-term it is not the appropriate rate to use for calculating the finance costs over the long-term.	British Airways
	The proposed change will create a gap between the basis of accounting for postretirement benefits and the basis used by trustees and regulators when making economic decisions as they take long-term rates of return into account when determining the required levels of regular and deficit funding.	Balfour Beatty
Views expressed by companies in favor of the ERR		
Enhances comparability	Even though the proposed approach is not a theoretically perfect solution, the suggested change will enhance comparability as it reduces the number of assumptions that need to be made by companies when calculating net interest cost and also simplifies the required disclosures. Even though one of the companies that submitted a comment	AstraZeneca

	letter agreed with the proposed approach, they nevertheless reiterated the point they made on ED/2009/10 ‘Discount rate for employees’ that the IASB should not allow the utilization of government bond rates when there is no deep market in high quality corporate bonds.	

Appendix 2

Gap between the issuance and effective dates of various IASs/IFRSs

Accounting Standard	Issue date of revised or amended standard	Effective date	Gap between the issue and effective dates (in months)
IAS 19 – Employee Benefits	June 2011	January 2013	18
IAS 2 – Inventories	December 2003	January 2005	12
IAS 16 – Property, Plant & Equipment	December 2003	January 2005	12
IAS 38 – Intangible Assets	March 2004	March 2004	0
IFRS 9 – Financial Instruments	July 2014	January 2018	41
IFRS 13 – Fair Value Measurement	May 2011	January 2013	19
IFRS 16 – Leases	January 2016	January 2019	35

This appendix presents information about the issuance and effective dates of selected IASs/IFRSs.

https://www.iasplus.com/en-gb/standards/ias/ias19
https://www.iasplus.com/en-gb/standards/ias/ias2
https://www.iasplus.com/en/standards/ias/ias16
https://www.iasplus.com/en/standards/ias/ias38
https://www.iasplus.com/en-gb/standards/ifrs-en-gb/ifrs9
https://www.iasplus.com/en/standards/ifrs/ifrs13
https://www.iasplus.com/en-gb/standards/ifrs-en-gb/ifrs-16

Appendix 3

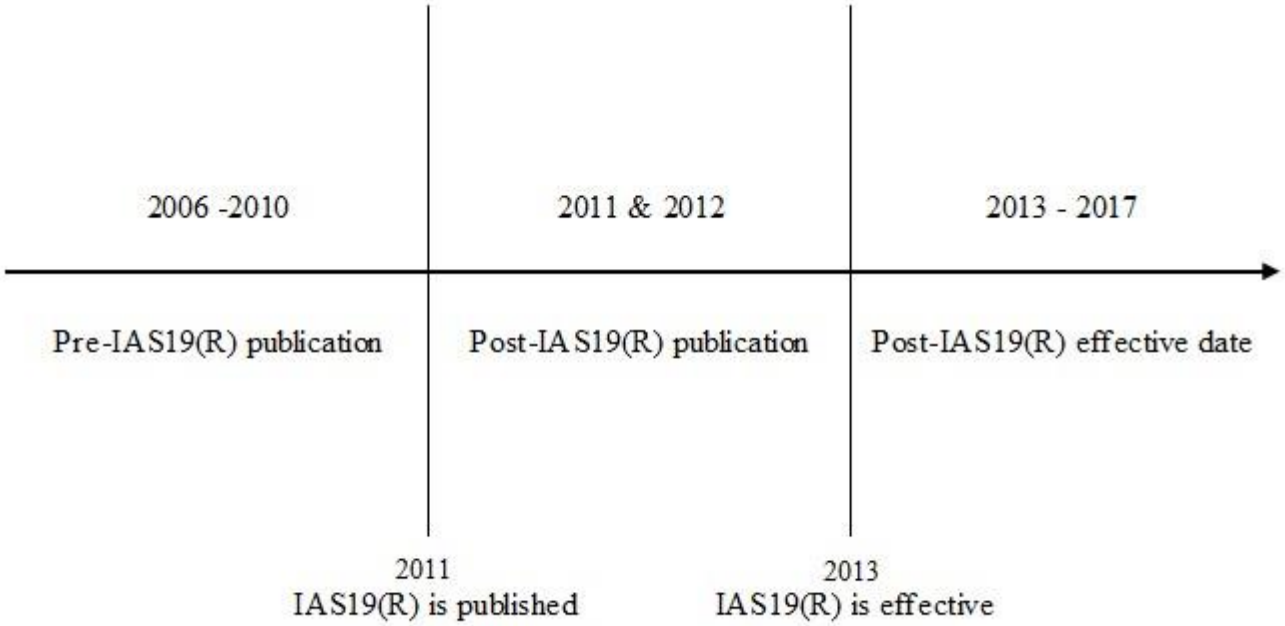
Sample selection

Selection criteria	Observations
FTSE 350 Constituents firm-year observations for 2006-2017	4,200
Drop observations where pension allocation data not available	1,932
	2,268
Drop observations for financial firms	336
	1,932
Drop observations with missing data to calculate control variables	414
	1,518
Drop observations for firms that do not appear each year in our sample	462
	1,056

This appendix provides details of the construction of the sample used in the study.

FIGURE 1

A timeline of the sample period



This figure provides a diagrammatic overview of the timeline examined in this study.

TABLE 1

Summary statistics

Panel A: Descriptive statistics

Variable	P25	MEAN	P50	p75	SD
IAS19R_ISSUED	0.00	0.17	0.00	0.00	0.37
IAS19R_EFFECTIVE	0.00	0.42	0.00	1.00	0.49
EQUITY	0.32	0.45	0.44	0.58	0.18
MV	7.24	8.46	8.29	9.72	1.73
LEV	0.10	0.21	0.18	0.29	0.17
RISK	0.16	0.36	0.25	0.39	1.38
DIV	1.00	0.94	1.00	1.00	0.24
FUNDSIZE	12.52	14.01	14.09	15.39	2.00
FS	0.82	0.89	0.89	0.97	0.11
FS^2	0.67	0.81	0.80	0.94	0.20
ROA	0.03	0.06	0.06	0.09	0.07
HOR	3.90	4.48	4.32	4.89	0.89
MKTRET	0.00	0.04	0.08	0.13	0.22
Observations	1,056				

Panel B: Correlation matrix

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	IAS19R_ISSUED	1.00												
2	IAS19R_EFFECTIVE	-0.38	1.00											
		0.00												
3	EQUITY	-0.02	-0.45	1.00										
		0.46	0.00											
4	MV	0.00	0.11	-0.19	1.00									
		0.96	0.00	0.00										
5	LEV	-0.01	-0.09	-0.08	0.06	1.00								
		0.86	0.00	0.01	0.06									
6	RISK	0.06	-0.01	-0.01	-0.04	-0.08	1.00							
		0.05	0.68	0.80	0.17	0.01								
7	DIV	0.05	0.01	0.08	0.05	-0.23	0.09	1.00						
		0.09	0.70	0.01	0.11	0.00	0.01							
8	FUNDSIZE	0.00	0.08	-0.28	0.80	0.24	-0.05	-0.10	1.00					
		0.96	0.01	0.00	0.00	0.00	0.12	0.00						
9	FS	-0.04	0.10	-0.19	0.12	0.01	-0.02	-0.06	0.14	1.00				
		0.24	0.00	0.00	0.00	0.84	0.50	0.06	0.00					
10	FS^2	-0.04	0.10	-0.19	0.11	0.00	-0.02	-0.06	0.12	1.00	1.00			
		0.20	0.00	0.00	0.00	0.88	0.46	0.04	0.00	0.00				
11	ROA	0.06	-0.04	0.09	0.02	-0.45	0.00	0.19	-0.10	0.03	0.02	1.00		
		0.04	0.20	0.00	0.43	0.00	0.89	0.00	0.00	0.38	0.49			
12	HOR	0.01	0.35	-0.36	-0.25	-0.07	0.00	-0.02	-0.11	0.06	0.06	0.00	1.00	
		0.84	0.00	0.00	0.00	0.02	0.90	0.55	0.00	0.04	0.04	0.98		
13	MKTRET	0.02	0.11	-0.03	0.12	-0.22	-0.02	0.11	0.03	0.09	0.09	0.08	0.04	1.00
		0.54	0.00	0.39	0.00	0.00	0.44	0.00	0.28	0.00	0.01	0.01	0.15	

This table presents descriptive statistics. Panel A presents descriptive statistics for the variables used in the empirical analysis. Panel B presents the Pearson correlation matrix for the variables used in the empirical analysis. *IAS19R_ISSUED* is an indicator variable that takes the value of one for the period after the publication but before the implementation of IAS 19(R), and 0 otherwise. *IAS19R_EFFECTIVE* is an indicator variable equal to one for the period after the implementation of IAS 19(R), and zero otherwise. *EQUITY* is the percentage of pension assets allocated to equities; *MV*, is defined as the log of the market value of the firm; *LEV* is defined as long-term debt divided by total shareholder's equity; *RISK* is calculated as the standard deviation of operating cash flows divided by the average operating cash flows over the prior five-year period; *DIV* is defined as cash dividends over total assets; *FUNDSIZE* is defined as the natural logarithm of the fair value of pension plan assets. *FS* is defined as the fair value of pension plan assets divided by projected benefit obligations and *FS^2* is the square of *FS. ROA* is computed as net income divided by total assets; *HOR* is defined as the natural logarithm of projected benefit obligations divided by pension service cost and *MKTRET*, is defined as the annual market return.

TABLE 2

Descriptive statistics on % invested in EQUITY for UK firms across periods

Panel A: Descriptive information on % invested in EQUITY across periods

	2006-2010 (before publication of IAS 19(R))					2011&2012 (IAS 19(R) publication period)					2013-2017 (IAS 19(R) implementation period)				
Variable	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD
EQUITY	0.44	0.54	0.56	0.65	0.15	0.34	0.44	0.43	0.56	0.16	0.25	0.35	0.35	0.45	0.15
Observations			440					176					440		

Panel B: Univariate statistics of changes in % invested in EQUITY across periods

2006-2010 vs 2011&2012			
Variable	Diff	t-stat	Sig
EQUITY	0.11	7.59	***

2011&2012 vs 2013-2017			
Variable	Diff	t-stat	Sig
EQUITY	0.08	6.02	***

2006-2010 vs 2013-2017			
Variable	Diff	t-stat	Sig
EQUITY	0.19	18.56	***

This table presents descriptive statistics of the percentage invested in equities (Panel A) and two tailed t-tests for differences in means (Panel B) for sampled firms. *EQUITY* is the percentage of pension assets allocated to equities. *** indicates statistical significance at the 1% level.

TABLE 3

Changes in % Equity across periods

	1			2			3			4		
	Pre-publication period (i.e., 2006-2010) and publication period (i.e., 2011 & 2012)			Publication period (i.e., 2011 & 2012) and effective period (i.e., 2013-2017)			Pre-publication period (i.e., 2006-2010) and effective period (i.e., 2013-2017)			IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY			EQUITY			EQUITY			EQUITY		
	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED	-0.08	**	-3.69							-0.09	***	-4.32
IAS19R_EFFECTIVE				-0.07	**	-2.98	-0.16	***	-6.54	-0.16	***	-6.66
MV	-0.03	*	-2.05	0.01		0.9	-0.01		-0.8	-0.01		-0.69
LEV	-0.24	***	-4.44	-0.06		-0.78	-0.24	***	-4.31	-0.21	***	-4.14
RISK	0.00		0.47	0.00		-0.04	0.00		-1.28	0.00		-0.98
DIV	-0.02		-0.71	-0.02		-1.05	-0.02		-0.89	-0.02		-1.01
FUNDSIZE	0.02		1.32	-0.05		-1.1	0.01		1.12	0.01		0.94
FS	0.33		1.14	0.41		1.05	-0.15		-0.72	0.03		0.13
FS^2	-0.28		-1.82	-0.29		-1.17	0.00		0	-0.09		-0.83
ROA	0.06		1.22	0.03		0.48	-0.01		-0.56	0.00		-0.11
HOR	-0.09	***	-5.56	-0.03	*	-2.15	-0.05	***	-6.15	-0.05	***	-5.16
MKTRET	0.01		0.26	0.06		0.59	0.00		0.02	0.00		0.09
Constant	0.81		1.74	1.09		1.55	0.81	**	2.74	0.74	**	2.61
Fixed Effects	FIRM			FIRM			FIRM			FIRM		
Standard Errors clustered by	YEAR			YEAR			YEAR			YEAR		
Observations	616			616			880			1056		
R-squared	0.774			0.827			0.777			0.774		
Adjusted R-squared	0.731			0.795			0.749			0.75		

This table reports results for the multivariate regression models, Eqs. 1-3. Column 1 examines changes in pension asset allocation to equity between the pre-publication (i.e., 2006-2010) and the publication period (i.e., 2011 & 2012) of IAS 19(R). Column 2 examines changes in pension asset allocation to equity between the publication period (i.e., 2011 & 2012) and the effective period (i.e., 2013-2017) of IAS 19(R). Column 3 examines changes in pension asset allocation to equity between the pre-publication period (i.e., 2006-2010) and the effective period (i.e., 2013-2017). Column 4 examines changes around the IAS 19(R) publication and effective dates for the whole sample period. All variables are defined in Table 1. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively. Standard errors are clustered by year.

TABLE 4

Robustness tests

	1 IAS 19(R) publication period and effective period using the whole sample			2 IAS 19(R) publication period and effective period using the whole sample			3 IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY			EQUITY			EQUITY		
	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED	-0.17	***	-35.76	-0.09	***	-11.25	-0.09	***	-8.49
IAS19R_EFFECTIVE	-0.26	***	-42.48	-0.16	***	-12.2	-0.16	***	-12.29
MV	0.00		0.04	-0.01		-0.57	-0.01		-0.5
LEV	-0.08	*	-2.01	-0.21	**	-2.72	-0.21	***	-3.02
RISK	0.00		-1.11	0.00	**	-2.41	0.00		-1.08
DIV	-0.02		-1.28	-0.02		-1.2	-0.02		-1.01
FUNDSIZE	0.01		1.57	0.01		0.74	0.01		0.73
FS	-0.47	*	-2	0.03		0.06	0.03		0.05
FS^2	0.16		1.17	-0.09		-0.33	-0.09		-0.32
ROA	0.01		0.4	0.00		-0.05	0.00		-0.04
HOR	-0.02	***	-3.68	-0.05	***	-5.04	-0.05	***	-5.4
MKTRET	-0.08	***	-12.18	0.00		0.4	0.00		0.35
Constant	0.83	***	7.92	0.74	**	2.38	0.74	**	2.32
Fixed Effects	FIRM & YEAR			FIRM			FIRM		
Standard Errors clustered by	YEAR			INDUSTRY			FIRM		
Observations	1,056			1,056			1,056		
R-squared	0.805			0.774			0.774		
Adjusted R-squared	0.783			0.75			0.75		

This table reports robustness tests for Eq.3. In column 1 we include year fixed effects, in column 2 we cluster standard errors by industry and in column 3 we cluster standard errors by firm. All variables are defined in Table 1. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

TABLE 5

Changes in % Equity across periods relative to US firms – Entropy balancing

	1 Pre-publication period (i.e., 2006-2010) and publication period (i.e., 2011 & 2012)			2 Publication period (i.e., 2011 & 2012) and effective period (i.e., 2013-2017) of IAS 19(R)			3 Pre-publication period (i.e., 2006-2010) and effective period (i.e., 2013-2017)			4 IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY			EQUITY			EQUITY			EQUITY		
	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED*UK	-0.03		-1.76							-0.03	*	-1.89
IAS19R_ISSUED	-0.05	*	-2.19							-0.06	**	-2.72
IAS19R_EFFECTIVE*UK				-0.04	**	-2.81	-0.07	***	-6.08	-0.06	***	-6.02
IAS19R_EFFECTIVE				-0.04	**	-2.5	-0.09	***	-3.58	-0.10	***	-3.64
MV	-0.02		-1.34	-0.02		-1.41	-0.03	**	-3.07	-0.02	**	-2.63
LEV	-0.21	**	-3.55	-0.21		-1.84	-0.29	***	-4.85	-0.26	***	-4.35
RISK	0.00		0.07	0.00		0.31	0.00		-1.48	0.00		-1.24
DIV	-0.01		-0.4	0.00		-0.14	-0.02		-0.97	-0.02		-0.9
FUNDSIZE	0.00		-0.28	0.02		0.59	0.02		1.3	0.02		1.06
FS	0.37		1.52	-0.09		-0.54	-0.05		-0.25	-0.06		-0.35
FS^2	-0.17		-1.23	0.00		-0.04	0.04		0.31	0.04		0.38
ROA	0.00		0.03	-0.03		-0.42	-0.06		-1.48	-0.06		-1.43
HOR	-0.07	***	-4.03	-0.03	**	-2.61	-0.05	***	-6.5	-0.05	***	-5.61
MKTRET	0.02		0.43	0.03		0.24	0.01		0.3	0.02		0.37
Constant	0.98	***	4.6	0.60		1.31	0.79	***	4.11	0.82	***	4.47
Fixed Effects	FIRM			FIRM			FIRM			FIRM		
Standard Errors clustered by	YEAR			YEAR			YEAR			YEAR		

Observations	1792	1792	2560	3072
R-squared	0.744	0.817	0.739	0.742
Adjusted R-squared	0.699	0.785	0.708	0.718

This table reports results for multivariate regression models, Eqs. 4-6 on an entropy balanced sample of observations for UK and US firms. Column 1 shows the results for Eq.4, where we compare changes in UK firm pension asset allocation to equity relative to US firms between the pre-IAS 19(R) issuance period and the period following the issuance of IAS 19(R). Column 2 shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between the period in which IAS 19(R) was published but not yet effective and the period post the IAS 19(R) implementation date. Column 3 shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between pre- IAS 19(R) publication period and the post-IAS 19(R) implementation date. Column 4 shows the results for Eq.6. All variables are as defined in Table 1. *, ** and *** indicate significance at the 10%, 5% and 1% respectively. Standard errors are clustered by year.

TABLE 6

Changes in % Equity across periods relative to US firms – Propensity score matching

Panel A: Differences across control variables pre- and post- PSM

Pre-PSM

Variable	Pooled Sample					UK					US						
	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD	T-stat.	Sig.
MV	7.97	9.04	9.00	10.11	1.56	7.24	8.46	8.29	9.72	1.73	8.37	9.35	9.28	10.21	1.36	14.45	***
LEV	0.10	0.22	0.18	0.31	0.17	0.10	0.21	0.18	0.29	0.17	0.10	0.22	0.18	0.32	0.16	1.51	
RISK	0.15	0.35	0.23	0.36	2.33	0.16	0.36	0.25	0.39	1.38	0.14	0.35	0.22	0.34	2.70	-0.08	
DIV	1.00	0.93	1.00	1.00	0.25	1.00	0.94	1.00	1.00	0.24	1.00	0.93	1.00	1.00	0.26	-1.05	
FUNDSIZE	12.72	14.06	14.03	15.30	1.80	12.52	14.01	14.09	15.39	2.00	12.80	14.08	13.99	15.27	1.68	0.86	
FS	0.75	0.84	0.84	0.94	0.15	0.82	0.89	0.89	0.97	0.11	0.71	0.82	0.81	0.91	0.17	-14.42	***
FS^2	0.56	0.74	0.71	0.88	0.28	0.67	0.81	0.80	0.94	0.20	0.51	0.70	0.65	0.83	0.30	-12.08	***
ROA	0.03	0.06	0.06	0.09	0.06	0.03	0.06	0.06	0.09	0.07	0.03	0.06	0.06	0.09	0.06	0.50	
HOR	3.62	4.15	4.01	4.51	0.83	3.90	4.48	4.32	4.89	0.89	3.51	3.98	3.88	4.27	0.75	-15.76	***
Observations	3,072					1,056					2,016						

Post-PSM

Variable	Pooled Sample					UK					US						
	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD	P25	MEAN	P50	p75	SD	T-stat.	Sig.
MV	7.94	8.98	8.93	9.96	1.40	7.57	8.98	8.92	10.28	1.66	8.20	8.98	8.93	9.76	1.07	0.00	
LEV	0.10	0.22	0.18	0.31	0.17	0.11	0.22	0.18	0.28	0.18	0.09	0.22	0.18	0.33	0.17	0.28	
RISK	0.16	0.38	0.24	0.38	3.01	0.15	0.35	0.24	0.38	1.62	0.16	0.42	0.25	0.38	3.94	0.45	
DIV	1.00	0.93	1.00	1.00	0.26	1.00	0.93	1.00	1.00	0.26	1.00	0.93	1.00	1.00	0.26	0.00	
FUNDSIZE	12.69	14.09	14.05	15.35	1.79	12.52	14.23	14.36	15.68	2.03	12.82	13.96	13.88	14.97	1.49	-2.78	***
FS	0.77	0.86	0.86	0.95	0.13	0.82	0.90	0.90	0.99	0.12	0.74	0.82	0.81	0.90	0.13	-11.29	***
FS^2	0.59	0.76	0.74	0.90	0.22	0.67	0.82	0.81	0.97	0.21	0.55	0.69	0.66	0.81	0.22	-10.86	***
ROA	0.03	0.06	0.05	0.09	0.06	0.03	0.06	0.06	0.09	0.07	0.03	0.06	0.05	0.08	0.05	-0.70	
HOR	3.74	4.13	4.05	4.44	0.67	3.79	4.21	4.12	4.56	0.74	3.69	4.04	3.99	4.35	0.58	-4.86	***
Observa-tions	1,416					708					708						

Panel B: Changes in % Equity across periods relative to US firms – PSM

	1 Pre-publication period (i.e., 2006-2010) and publication period (i.e., 2011 & 2012)			2 Publication period (i.e., 2011 & 2012) and effective period (i.e., 2013-2017)			3 Pre-publication period (i.e., 2006-2010) and effective period (i.e., 2013-2017)			4 IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY			EQUITY			EQUITY			EQUITY		
	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED*UK	-0.03	**	-2.67							-0.03	**	-2.43
IAS19R_ISSUED	-0.06	**	-2.82							-0.07	***	-3.63
IAS19R_EFFECTIVE*UK				-0.06	***	-5.22	-0.09	***	-8.85	-0.09	***	-8.28
IAS19R_EFFECTIVE				-0.02		-1.48	-0.09	***	-3.58	-0.09	***	-3.62
MV	-0.02		-0.95	-0.03		-1.53	-0.03	**	-2.6	-0.03	**	-2.44
LEV	-0.30	***	-4.16	-0.21		-1.9	-0.41	***	-7.41	-0.37	***	-6.12
RISK	0.00		0.11	0.00		-0.2	0.00		-1.01	0.00		-0.89
DIV	0.01		0.38	-0.01		-0.47	-0.01		-0.45	-0.01		-0.39
FUNDSIZE	0.00		0.1	0.08		2.4	0.04	**	2.47	0.04	**	2.25
FS	0.10		0.28	0.37		1.16	0.18		0.58	0.13		0.47
FS^2	-0.03		-0.15	-0.31		-1.78	-0.11		-0.61	-0.09		-0.55
ROA	-0.14		-1.69	0.02		0.38	-0.14	**	-2.37	-0.12	*	-1.98
HOR	-0.06	**	-3.04	-0.04	**	-2.78	-0.05	***	-6.43	-0.05	***	-5.34
MKTRET	0.03		0.6	0.06		0.54	0.02		0.44	0.02		0.53
Constant	0.96	**	3.2	-0.29		-0.79	0.50		1.8	0.53		1.98
Fixed Effects		FIRM			FIRM			FIRM			FIRM	
Standard Errors clustered by		YEAR			YEAR			YEAR			YEAR	
Observations		826			826			1,180			1,416	
R-squared		0.726			0.827			0.725			0.73	
Adjusted R-squared		0.675			0.795			0.691			0.703	

The table reports results for an analysis where UK firms are matched with US firms using propensity score matching. Panel A of Table 6 presents descriptive statistics for the UK and US samples prior to and following PSM. Panel B reports results for multivariate regression models, i.e., Eqs. 4-6, run on a matched sample of UK and US firms. Column 1 shows the results for Eq.4, where we compare changes in UK firm pension asset allocation to equity relative to US firms between the pre-IAS 19(R) issuance period and the period following the issuance of IAS 19(R). Column 2 shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between the period in which IAS 19(R) was published but not yet effective and the period post the IAS 19(R) implementation date. Column 3 shows the results when we compare changes in UK firm pension asset allocation to equities to US firms between pre- IAS 19(R) publication period and the post-IAS 19(R) implementation date. Column 4 shows the results for Eq.6. All variables are as defined in Table 1. *, ** and *** indicate significance at the 10%, 5% and 1% respectively. Standard errors are clustered by year.

TABLE 7

Cross-sectional analysis

Panel A: Deficit

	IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY		
	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED*H_DEFICIT	-0.01	**	-2.35
IAS19R_ISSUED	-0.09	***	-4.02
IAS19R_EFFECTIVE*H_DEFICIT	0.00		-0.1
IAS19R_EFFECTIVE	-0.16	***	-7.43
MV	-0.01		-0.73
LEV	-0.21	***	-4.18
RISK	0.00		-1.05
DIV	-0.02		-0.99
FUNDSIZE	0.01		0.97
FS	0.04		0.17
FS^2	-0.10		-0.89
ROA	0.00		-0.14
HOR	-0.05	***	-5.17
MKTRET	0.00		0.09
Constant	0.73	**	2.55
Fixed Effects	FIRM		
Standard Errors clustered by	YEAR		
Observations	1,056		
R-squared	0.774		
Adjusted R-squared	0.75		

Panel B: Expected rate of return

	IAS 19(R) publication period and effective period using the whole sample		
Variable	EQUITY		
	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED*H_ERR	-0.03	**	-3.07
IAS19R_ISSUED	-0.08	***	-3.77
IAS19R_EFFEC-TIVE*H_ERR	0.00		-0.11
IAS19R_EFFECTIVE	-0.16	***	-6.66
MV	-0.01		-0.68
LEV	-0.21	***	-4.1
RISK	0.00		-1.11
DIV	-0.02		-1.03
FUNDSIZE	0.01		0.93
FS	0.02		0.11
FS^2	-0.09		-0.82
ROA	0.00		-0.18
HOR	-0.05	***	-5.15
MKTRET	0.01		0.09
Constant	0.74	**	2.62
Fixed Effects	FIRM		
Standard Errors clustered by	YEAR		
Observations	1,056		
R-squared	0.775		
Adjusted R-squared	0.751		

Panel C: Differences between expected and actual rate of return

	IAS 19(R) publication period and effective period		
Variable	EQUITY		
	Coeff.	Sig.	T-Stat.
IAS19R_ISSUED*H_DIFF	-0.02		-1.48
IAS19R_ISSUED	-0.10	***	-4.12
IAS19R_EFFECTIVE*H_DIFF	-0.02	**	-2.32
IAS19R_EFFECTIVE	-0.18	***	-6.46
MV	0.00		-0.02
LEV	-0.20	***	-4.09
RISK	0.00		-0.95
DIV	-0.03		-1.16
FUNDSIZE	0.03		0.8
FS	0.25		0.98
FS^2	-0.20		-1.38
ROA	-0.02		-0.8
HOR	-0.04	***	-4.9
MKTRET	-0.01		-0.11
Constant	0.24		0.4
Fixed Effects	FIRM		
Standard Errors clustered by:	YEAR		
Observations	900		
R-squared	0.774		
Adjusted R-squared	0.75		

The table reports regression coefficient estimates and (in parentheses) t-statistics for the cross-sectional analyses. Panel A shows the results for Eq.3 conditional on pension plan deficit, (*DEFICIT*), calculated as the difference between pension plan obligations and pension plan assets scaled by pension plan obligations. Panel B shows the results for Eq.3 conditional on ERR and Panel C shows the results for Eq.3 conditional on the difference between the expected and the actual rate of return on pension plan assets scaled by the expected rate of return (*DIFF*). In all specifications, we split the sample around the median using 2006 data and code *H_DEFICIT* (*H_ERR*) {*H_DIFF*} as one for firms with *DEFICIT* (*ERR*) {*DIFF*} above the median value, and zero otherwise. All other variables are as defined in Table 1. *, ** and *** indicate significance at the 10%, 5% and 1% respectively. Standard errors are clustered by year.