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ASSUMING THE WORST: THE SHIFTING SANDS OF PENSION ACCOUNTING

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ABSTRACT

Accounting for defined benefit pension plans is complex, and given the magnitude of many of these schemes relative to their corporate sponsor, understanding whether pension disclosures are value relevant is key to improving the quality of financial reports. The application of fair value accounting for pensions allows for a high level of managerial discretion with respect to ex ante accounting choices. Utilizing a sample of firms that apply FRS-17, we examine the main determinants of the assumptions managers use to arrive at pension scheme valuations. We find significant differences in the stated assumptions across companies, auditors and actuaries. Further, managers display considerable variation in conservatism when implementing fair value accounting, and this variation is related to scheme-specific characteristics, such as asset allocation and pension plan solvency. Crucially, pension disclosures are found to be value relevant, therefore, managers are able to present pension disclosures in a more favorable light, and this is reflected in prices. As a result of the observed inconsistency in reporting across firms, and the value relevance of these disclosures, this brings into question the efficacy of fair value accounting for assessing pension values.

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INTRODUCTION

Proponents of fair value accounting argue that historical cost valuation obscures the "true" underlying economic position of the firm, and that fair value provides a better measure of fundamental value. Conversely, critics argue the transitory nature of fair value injects additional volatility into financial reports that are already difficult to assess. For example, prior research indicates that market participants are unable to reach a consensus on information (accruals) presented in annual reports, particularly when it is complex (Sloan, 1996; Hirst, 1998). Similarly, pension accounting under fair value has the potential to remain opaque and problematic for users of financial accounts. There are two main reasons for this; first, pension valuation is complex. Any assessment of the liabilities in a pension scheme requires detailed mortality calculations and forecasts on future macroeconomic conditions. Second, fair value accounting for pensions provides considerable discretion to management. The accounting assumptions used in pension valuation are ultimately decided upon by management. Although there are a number of factors that guide these assumptions. The accounting standard itself sets some parameters for these estimates, and they are arrived at under the guidance of the firm's actuary, and are monitored and approved by the firm's auditor. Despite this, they are potentially open to manipulation within broad confidence intervals. For example, if there is a large variation in pension assumptions across firms, fair value accounting fails in one of its key goals — namely the provision of transparent, consistent and informative financial statements.

In the U.S., SFAS-87 has come under increased criticism and pressure from regulators and industry amid calls for a move towards fair value pension accounting. The CFA Institute stated that the SFAS-87 method of accounting *"…imposes a huge and costly burden"* on the users of financial accounts. The U.S. Senate Finance Committee also threatened legislation that would remove the complex smoothing mechanism of actuarial gains and losses under SFAS-87. In 2005, the Securities and Exchange Commission (SEC) concluded that balance sheets are *"… often not transparent as to the true funded status of pension plans"*[1] leading to calls that pension accounting should be reformed by the Financial Accounting Standards Board (FASB). In response, FASB proposed a two-stage process to reform pension accounting, the first part of which was the introduction of FAS-158, which came into effect for fiscal year ends after December 15, 2006.

Most work on pension accounting is focused on the value and credit relevance of fair value footnote disclosures under SFAS-87. Hann *et al*. (2007) for example, found that fair value footnote disclosures did not improve the information quality of financial reports and did not allow for an assessment of how management implements fair value when there is a requirement of full recognition in the balance sheet. Although the U.S. has yet to fully adopt a standard that is equivalent to the fair value requirements of IAS-19, the introduction of FAS-158 has moved US standards closer to full fair value pension accounting and there is evidence that the use of aggressive assumptions by management still exist report despite the fact that almost all the fair value disclosures only appear in the footnotes to the accounts (Grant *et al*., 2007).

Based on the above evidence, and the push for full fair value accounting for pensions in the U.S., we analyze how fair value pension accounting has been implemented in practice based on a sample of FRS-17 disclosures from 2001-2004. This allows for us to not only analyze whether fair value pension accounting provides information about the value and risk of pension schemes, but to do so under changing economic circumstances e.g. falling equity values and changing bond yields; both of which are crucial in fair value pension accounting.

We make four main contributions to the literature. First, we document the variation in assumptions that management apply when accounting for pensions under fair value. One of the fundamental reasons for adopting fair value is to make the information in financial accounts consistent and representative across firms. If there is significant variation in accounting assumptions across firms, this calls into question the decision usefulness of pension disclosures. Second, we analyze the role and impact of auditors and actuaries on managerial discretion by investigating whether the variation in assumptions across firms can be attributed to either of these external groups. Although audit firms and actuarial firms are likely to have similar technologies, there is scope for different firms to have different 'house views' on particular assumptions, and this in turn may influence the choice of the audit or actuarial firm. Conversely, if there is considerable variation in the assumptions used across clients of a particular auditor and/or actuary (i.e. no consistent house view), this suggests that actuaries and auditors adopt the assumption process applied by individual firms.

Third, we consider the determinants of both managerial choice and conservatism in pension accounting and their relation with firm characteristics. Prior research has found strong links between the percentage of pension assets held in equity, the expected return on plan assets and corporate events (Bergstresser *et al*., 2006). Our final contribution is to analyze the value relevance of the assumptions that are used to arrive at the accounting amounts as well as the fair value disclosures presented in the annual report.

Briefly, our results are as follows. We document that the difference in underlying pension assumptions across firms is substantial. Essentially, there are basic economic reasons why discount rates and expected rates of return on pensions should be similar across firms, but this is not what we observe. Further, the differences are not related to the identity of the firm's actuary or auditor, suggesting that different 'house views' is not an explanation. We also report that management have different valuation objectives depending on the solvency of the pension scheme. Companies with the greatest level of solvency i.e. the ratio of pension assets to pension liabilities, have the highest discount rates and discount rate spread assumptions. In addition, we find that firms with large pension scheme deficits, relative to the size of the firm, tend to choose higher equity return and spread assumptions. Management appear to choose assumptions that maximize the level of reported financial income that can be derived from pension scheme assets. Finally, we show that the assumptions underlying the pension calculation impact prices; with pension funding levels, liabilities and assets all affecting share value. One interpretation is that the external market views both the assets and liabilities of the pension scheme as the assets and liabilities of the firm which is consistent with the corporate view of pensions.

The rest of the paper is set out as follows. Section one provides an overview of FRS-17. In section two, we outline our motivation and develop the hypotheses that are tested in the paper. Section three describes the data and the methodology. Section four discusses the empirical results and the last section concludes.

1. BACKGROUND

1.1. Financial Reporting Standard (FRS) 17

The introduction of FRS-17 fundamentally changed how firms account for defined benefit pensions in the UK. Until 2001, pension accounting was governed by the Statement of Standard Accounting Practice 24 (SSAP-24). This standard, however, was widely criticized as not providing useful or comparable disclosure of the underlying risks of company pension schemes. One of the major criticisms was that the Standard afforded management too much discretion in how they accounted for pensions. After wide consultation, the Accounting Standards Board (ASB) issued FRS-17, which applied to all companies reporting financial statements after June, 2001.

The framework for FRS-17 can be split into two broad categories: methodological and disclosure. Unlike previous standards, which allowed the actuary and/or management to select the actuarial method of liability calculation,[2] FRS-17 specified that liabilities must be calculated using the projected unit method[3] — an accrued benefits valuation model which takes account of the right to benefits earned by scheme members by allowing for future increases in the level of

pensionable salaries and the value of pensions in payment. The standard also set out the appropriate discount rate to be applied when calculating the present value of the pension liability; namely, the yield on a high quality (AA-rated) bond of equivalent duration to the pension liabilities. This rate was argued reflect both the time value of money and a premium for the risk of the scheme.[4]

The second focus of the standard was on disclosure, which was broken down into four categories: valuation assumptions, asset return assumptions, pension costs, and recognition. The required valuation assumptions are the rate of inflation, wage growth, pension growth and discount rate. The pension scheme assets were to be recorded at fair (market) value and their valuation does not require actuarial assumptions. The disclosure of the fair value of pension assets was split into four broad asset classes: equities, bonds, property and 'other'. 'Other' assets are generally cash and annuities, although some firms also hold insurance contracts or small exposures to managed funds. The company was also required to disclose the expected rate of return on the various asset classes. While the expected rates of return assumptions do no affect the stated asset values, they do affect the amount of pension income credited to the profit and loss account. In addition to the different assumptions, a detailed disclosure of the costs of the defined benefit scheme —including, current service cost, past service cost, actuarial gains and losses (including the difference between the actual and expected return on scheme assets), and any historical adjustments to pension costs as a result of changes in the level of benefit provision.

The final disclosure is the difference between the values of assets and liabilities of the pension scheme on the balance sheet of the firm. Where the fair value of assets exceeds the present value of the pension liability, the scheme is in surplus on an FRS-17 basis, and a net asset should appear on the balance sheet. Conversely, where the value of scheme assets are less than the present value of the pension liability, a net liability must appear on the balance sheet.

To mitigate the impact of applying market values, the standard separates the normal pension cost and valuation impacts. In so doing, the volatility of market values is lessened as there is a normal pension cost charge against the profit and loss, and any variations that occur year-on-year are included in the Statement of Total Recognised Gains and Loses (STRGL) and taken directly to reserves. Any changes in market values, demographics and other basis measurements are, therefore, accounted for in the STRGL rather than on the face of the profit and loss account. In doing so, the ASB argued that this would allow for a predictable pension charge and that the balance sheet reflects the employer's liability, while at the same time accounting for the true liability of a scheme based upon market values.

1.2. Pension Accounting under FRS-17: An example

Two stylized examples are presented to illustrate the interactions between different pension components, and to show how management could manipulate the assumptions to impact upon the size of the liability faced by the firm, and the income it can derive from the pension scheme assets.

1.2.1. Liability Manipulations

Pension liabilities increase year on year as a function of increases in employee wages, changes to the benefits provided and projections of future mortality and interest rates. If we assume that the present value of this payment is currently valued at £500m[5] based upon a discount rate that is taken from the prevailing AA bond yield (for the example we assume a rate of 5%). The management of the firm may choose to apply a higher discount rate thereby reducing the present value of the reported liability. Consequently, the change in the liability from one year to the next will be underestimated in the annual report. Through the application of an 'actuarial rule of thumb' Bozewicz (2004) highlights the impact of small changes to the chosen discount rate and the present value of the pension liability. Where,

$$New\ Liability = (Old\ Liability) * (1.06^{-4\Delta})$$

and,

$$-4\Delta = (-4) * (Increase/(Decrease)\ In\ the\ Discount\ Rate)$$

From this, if we assume a an increase in the discount rate 5.00% to 5.50% then

$$New\ Liability = (£500m) * (1.06^{(-4)*(0.005)}) = £445m$$

The 0.5% change in the discount rate has therefore reduced the present value of the pension liability by 12%.

1.2.2. Profit and Loss Manipulations

Firms also have considerable scope to manipulate the pension assets for crediting the profit and loss account under other financial income. If we assume that a firm's pension assets are 100% invested in equity with a liability of £100m with assets of £80m this means that there is a £20m deficit in the scheme. Further, the discount rate is assumed to be 5% and the expected return on equity 10%. From one year's unwinding of the scheme, the interest cost will be £5m (5% discount rate multiplied by the £100m pension liability). The expected return on plan assets in the same year will be £8m (10% return on the £80m of plan assets). In reconciling this to the profit and loss statement, there would be an interest charge of (£5m) and a financial income credit of £8m. The profit and loss will therefore be credited with

a net income of £3m. Consequently, when the difference between the discount rate and the expected return on plan assets is increased, then firms can credit the profit and loss with additional income from the pension assets.

2. RESEARCH QUESTIONS

Underpinning pension valuation is the notion that fair value accounting will improve the reporting quality of financial accounts. If this is true, it is to be expected that profit and loss statements will become more meaningful, transparent and comparable. However, the perceived benefits of fair value in theory and its application in practice may differ considerably. We therefore first examine whether the assumptions underlying the calculation of the different pension components are consistent across firms. Where this is so, the application of fair value would address some of the concerns about pension accounting that were raised under SSAP-24. This leads us to the following research question:

RQ1: Is the choice of pension accounting assumptions by management consistent and unbiased across firms?

Another facet of consistency in reporting is the relationship that different advisors and/or external bodies have with the firm. Firms employ actuaries to advise on their scheme and auditors to provide an objective assessment of the quality of their financial reports. It is possible that any patterns observed in the cross-section of assumptions are a function of who advises the firm, since different advisors may hold 'house views' on the various assumptions. Similarly, the auditor may hold a 'house view' on what assumptions are acceptable and represent a fair and true view of a firm's pension liability. Our second research question is therefore:

RQ2: Are the pension accounting assumptions of a firm related to the identity of the firm's actuary and/or the firm's auditor?

Despite the intention for FRS-17 to provide a more prescriptive basis of pension accounting, management still have considerable latitude in the underlying assumptions applied. Bergstresser *et al.* (2006) focus on the sensitivity of firm earnings to the expected return on pension plan assets. Their results show that where a firm's income is sensitive to the expected return on pension assets (for example where pension assets are large relative to firm size), management are more likely to choose higher expected return assumptions. They also find that the adoption of such optimistic assumptions is linked to corporate events such as takeovers or the exercise of share options by management.

In our sample, equity investments account for the vast majority of pension assets with the average pension portfolio in 2001 consisting of 70% equity, 25% bonds and 5% other assets. This high allocation to equity has implications for the

potential for management to manipulate earnings via the assumptions for expected returns on pension scheme assets. Consequently, if management wish to boost reported income from pension assets then they would hold larger amounts of equity in the pension portfolio and use a higher expected return figure for those assets. Our third research question is therefore:

RQ3: Is the expected return on equity assumption related to the proportion of equity in the pension assets?

In the U.S. there has been little scope for management to select a favorable pension discount rate because since 1993 the discount rate has been based upon Moody's AA interest rate index.[6] As a result, previous studies have not considered the determinants of the choice of discount rate. The example provided in section two highlights how sensitive the pension liability is to small changes in the discount rate; and under FRS-17 management have greater discretion over the discount rate. This therefore raises several questions about the behavior of management in exercising this discretion.

The first is there is no consistent relationship between the chosen discount rate and pension scheme characteristics. If this is the case, it implies that management are applying fair value accounting in the spirit of the standard. Under FRS-17 the required discount rate is the yield on an AA-rated corporate bond of equivalent duration to the pension liabilities, which may be a sufficiently prescriptive requirement to limit the exercise of management discretion.

However, the above raises a number of other potential mitigating outcomes that warrant investigation. First, when a firm's pension liability is large relative to the size of the firm then the perception is that the firm is exposed to a significant pension risk. In response, management may elect to apply a higher discount rate to reduce the perceived risk of the firm. Thus research question four is:

RQ4a: Do those firms with the largest relative pension liability select a larger discount rate?

It may be however that the relative size of the pension liability is not what concerns management. It may be the case that management are concerned with the level of scheme solvency. Solvency, measured as pension assets divided by pension liabilities, is the figure that is regularly quoted in the financial press. Scheme solvency is a function of both the increases in the pension liability and/or a reduction in the value of the assets held to meet the pension liability. Where there are large fluctuations in asset values, a scheme will appear to have a volatile solvency level.[7] Management may therefore choose to apply a higher discount rate to present a 'stable' solvency ratio in the annual report.

RQ4b: Does the level of pension scheme solvency determine the choice of discount rate?

Prior studies considered the absolute level of pension accounting assumptions presented in the annual report. However, the example in section two illustrated that the true impact on the profit and loss account or balance sheet comes, not from individual assumptions such as the expected return on equity or the discount rate, but from the differences between them. In particular, the valuation of the pension liability on the balance sheet is affected by the spread between the discount rate and assumed future wage growth and pension growth; while impact on the profit and loss account is affected by the spread between the expected return on scheme assets and the discount rate. A high spread between the discount rate and future wage growth will reduce the pension liability, other things being equal, and a high spread between the assumed return on equity and the discount rate will boost reported financial income.

From these spread variables we obtain a proxy for managerial conservatism. If the assumed spread is large, management are not applying prudent assumptions. Hence, if we observe considerable variation in managerial conservatism this will undermine the usefulness of fair value accounting for pensions, since the economic reality of the true position of the firm is obscured. Research question five is therefore:

RQ5: Is there any relationship between balance sheet conservatism and pension scheme characteristics of liability and solvency?

Management may also opt to derive financial income from pension assets. The spread between the expected return on assets and the discount rate, therefore, measures the degree of manipulation. When the spread is large, the firm incurs a low interest charge from applying a low discount rate, thereby, increasing the return generated from plan assets that can be credited to the profit and loss account.[8] Hence:

RQ6: Is there any relationship between managerial profit and loss conservatism and the value of the pension scheme assets?

Although fair value accounting provides some scope for manipulating the book value of pension assets and liabilities, such actions are only beneficial if they have a tangible effect on the market value of the firm. We are therefore interested in the impact of pension assets and pension liability reporting on the market value of the firm in the spirit of Barth *et al.* (1993) and Weidman & Weir (2004) who analyzed the value relevance of pension disclosures. However, the extent to which the values were reflected depended, to some extent, upon the legal regime in which the firm operates. For example, Barth *et al.* (1993) show that both the assets and liabilities of the scheme are impounded in firm market values for US firms; while

Weidman & Weir (2004), for Canadian companies, report that the market value of firms only reflects pension liabilities. This is related to Canadian law which stipulates that any surplus assets belong to the scheme members and not to the firm. We therefore analyze the value relevance of the pension accounting amounts that are presented in the annual report.

RQ7: Does any uncovered management of pension input variables affect the market value of equity of the firm?

3. DATA AND METHODOLOGY

Our analysis employs two main data sources. Individual firm pension accounting data are collected from FRS-17 disclosures in the financial reports of sample companies. For all other data we use Worldscope. From the FRS-17 disclosures, we collect the value of pension assets and liabilities, the value of the individual asset classes, the expected return assumptions and the valuation assumptions. From Worldscope, we collect the year-end firm market value, total assets, total debt, and the book value of equity. Our sample comprises companies from the FTSE 350 between June 2001 and June 2004. The index is made up of the largest 350 corporations in the UK and is rebalanced quarterly. We include all companies that appear in the index over this time, which amounts to a total of 392 firms.

From the FTSE 350 universe we exclude 44 investment trusts (listed closed end investment funds). For defined contribution schemes there is no balance sheet effect (Cooper *et al.*, 2001) and so we exclude 62 companies that only provide defined contribution schemes to employees. Finally, we drop two firms that did not provide any retirement benefits for employees. The final sample ranges from 206 to 232 companies in each year with a total of 876 firm years.

Two variables are constructed that proxy for scheme size by scaling the total pension liability by firm total assets and by firm market value. The solvency of the pension scheme is defined in several ways. First, we calculate the absolute solvency of the scheme by considering total pension assets and pension liabilities. Where pension assets are greater than/(less than) the pension liability, the scheme is in surplus/(deficit). The gross surplus/(deficit) is scaled by both firm market value and firm total assets. In addition, we calculate the solvency ratio of the scheme—the ratio of plan assets to plan liabilities.

In our analysis on expected returns we only consider the equity component of plan assets, based upon the work of Bergstresser (2006) who finds the expected return on plan assets and the equity component of the pension assets is the significant driver for deriving financial income from pension assets. This is also intuitive due to the composition of pension assets in the UK.[9] Hence, because equity investments are the largest asset in the portfolio, management intent on increasing financial

income, will naturally focus on this asset class. Further, equity also affords management the greatest latitude in choosing a higher expected rate of return.

Finally, all pension assumptions are standardized to a year-on-year level to remove any biases that may occur due to time-varying factors such as changes in the AA bond yield from year to year. For each assumption we calculate:

$$\frac{Assumption_{it} - \mu_t}{StandardError\mu_t}$$

4. RESULTS

4.1. Descriptive statistics

Table 1. **Descriptive Statistics of Sample Companies and UK Company Pension Schemes in 2001**

	Mean	Std	Q1	Median	Q3	Min	Max	μ_{2004}- μ_{2001}
Market Value (£m)	6040.77	16471.72	478.68	1304.59	4060.20	110.77	126124.30	-1036.03
Total Assets (£m)	17654.96	60655.78	683.56	1707.40	5914.20	104.67	477184.70	1101.33
Total Debt (£m)	4050.70	15493.26	140.92	418.40	1552.90	0.00	117507.00	809.74
Liability to Total Assets	27.00	32.00	6.00	17.00	37.00	1.00	265.00	5.00
Surplus to Total Assets	-1.00	5.00	-2.00	0.00	1.00	-12.00	25.00	-4.00
Solvency	97.00	16.00	87.00	94.00	105.00	61.00	110.00	-17.00
Equity Percentage	69.00	16.00	62.00	73.00	80.00	0.00	100.00	-7.00
Discount Rate	5.94	0.20	5.80	6.00	6.00	5.50	7.25	-0.53
Wage Growth	4.14	0.53	4.00	4.00	4.50	0.00	5.80	-0.04
Return on Equity	7.69	0.55	7.30	7.75	8.00	6.12	9.00	-0.02
Return on Bonds	5.29	0.39	5.00	5.25	5.50	4.00	7.25	-0.37
Discount Rate Spread	1.81	0.59	1.50	1.80	2.00	0.20	7.25	-0.49
Equity Return Spread	1.75	0.54	1.41	1.75	2.10	0.25	3.00	0.51

Note: This table presents descriptive statistics for the sample companies in 2001. The table presents the mean, standard deviation, quartile 1, median, quartile 3, minimum maximum, and the change in the means from 2001 to 2004 (μ_{2004}- μ_{2001}). The data items in the table are company market value, total assets, total debt, liability/total assets, surplus/total assets, funding level (pension assets/pension liability), equity percentage, discount rate, wage growth, expected equity return, expected return on bonds, discount rate spread (discount rate-wage growth) and the equity spread (expected equity return-discount rate). All figures not shown as £m are percentages.

Table 1 presents descriptive statistics for the sample companies in 2001. The final column in the table presents the difference between the mean values in year one and the final year. The first section of the table presents firm financial characteristics. It can be seen that the average market value of a firm falls, together with an increase in leverage as the mean total debt of a firm increases. It is also clear that a number of firms had significant pension exposures, both in terms of the magnitude of the pension liability, and from the level of scheme deficits.

In 2001 the mean (median) pension liability was 27% (17%) of total assets,[10] with the mean solvency level (pension assets/pension liabilities) 97% with a median of 94%. As with the size of the pension liability, the minimum solvency level is significantly different from the average at just 61%. To place this into context, the surplus to total assets serves as a more useful illustration of the problem. Where a scheme has a 40% deficit it appears to be at risk. However, it is only at risk when the shortfall in assets is large relative to total firm assets. In examining the surplus to total assets, on average, pension deficits were 1% of firm total assets. However, by 2004 the mean had increased to 5% of total assets. Consequently, it is clear that under fair value accounting the reported pension exposures of UK firms have significantly increased.

An analysis of the range of assumptions provides further insight into managerial conservatism. For the discount rate the median rate was 6.00%. The range was 1.75%, with a minimum of 5.50% and a maximum of 7.25%. It should be noted that the inter-quartile range is only 20 basis points, which suggests firms tend to select the discount rate in a broadly similar way. However, it is also important to focus on the spread between the discount rate and wage growth, which has a more direct impact on the reported pension liability. Here, the range (from 0.20% to 7.25%) and the inter-quartile range (50 basis points) are larger than the comparable figures for the discount rate alone. The large spread in these two inputs means that individual firms are using a wide range of assumptions in estimating the present value of the pension liability, and this may obscure the 'true' liability and thus reduce comparability.

As highlighted by Bergstresser *et al*. (2006), the return assumptions applied by management are subjective. In examining the composition of the equity held in these pension funds it is reasonable to assume that they hold broadly diversified portfolios that proxy the market portfolio.[11] As a result, we would not expect to see much variation in the expected return on equity assumption across firms. From Table 1 the median equity return assumption is 7.25% and the mean is 7.69%, with a substantial range from 6.12% to 9.00%.

4.2. Variation in assumptions

Our first research question relates to the consistency and unbiasedness of pension assumptions. Where fair value is adopted consistently and in an unbiased way by management, there should be little variation in the underlying pension assumptions and these will centre on the mean economic fundamentals on which the assumptions are based. The variation we see across assumptions is considerable and at first glance suggests a good deal of variation. However, the discount rate although important, is more significant when it interacts with other assumptions for manipulating the profit and loss and/or balance sheet.

Table 2 presents results from inference tests on the difference between the stated assumptions. To arrive at expected values we select the average yield on an AA bond; the average wage growth for the private sector in the UK;[12] and take the 50-year historical return on UK equities.[13] We find that inter-quartile ranges are large with statistically significant differences between the expected value and the mean value applied in the financial accounts.

Table 2. **Sign Test for Distribution of Assumptions across Firms**

	Mean	Median	Expected Value	t-Stat
Discount Rate	5.60	5.50	5.48	20.80*
Wage Growth	4.03	4.00	3.70	10.33*
Expected Return on Equity	7.70	7.80	7.10	17.48*
Discount Rate Spread	1.55	1.50	1.78	-8.70*
Equity Return Spread	2.11	2.20	1.62	25.24*

Note: This table presents a pooled firm level cross-sectional analysis of the different pension assumptions. We analyze whether the mean assumption adopted is significantly different from expected values. The table presents the mean assumption across all firms, the median, the average expected value, and the t-statistic for the associated sign-test. Our expected values are the median AA bond yield for the discount rate, average wage growth for the UK, and the historical average return on equity. * indicates significance at 5% level.

The implication being that firms are choosing high discount rates (or discount rate spreads), to understate the level of pension liabilities, and high equity return assumptions (or equity return spreads) to overstate financial income flowing from the pension scheme. When considered jointly, the observed variation, and the differences between expected values and actual values, raise questions about the implementation of fair value in practice—since management are exercising a high degree of selectivity in arriving at their chosen assumptions. We therefore conclude that the choice of assumptions is inconsistent across firms, and that this seems to go beyond scheme specific characteristics.

4.3. The Role of auditors and actuaries

If individual firms of actuaries have 'house views' on key pension accounting assumptions, disclosed assumptions will vary across firms depending on which actuarial firm they use. On the other hand, if assumptions vary widely across the clients of a particular actuary, this suggests that firms may be exerting influence on their actuaries to get them to move away from their house view. A similar analysis applies to auditors who are required to sign off accounts as providing a true and fair view.

Table 3 presents the results of inference tests of differences between the stated assumptions and the historical average economic fundamentals from the four largest accounting firms and five well known actuary firms used by the sample firms. There is consistency in the degree to which assumptions deviate from historical averages across both auditor and actuary groupings. Taking the discount rate first, the average historical yield on AA-rated corporate bonds was 5.48%. Irrespective of the auditor or actuary identities, the actual assumptions that were used on average were at the higher end of the variation in AA bond yields with all t-statistics on the rate applied positive and significantly higher than expected. Similar results for both auditors and actuaries for wage growth, equity return and equity return spread. The exception is the discount rate spread on liabilities which is significantly lower than the expected spread of 1.78%. Thus, we conclude that the pension assumptions of actuaries and auditors have biases similar to the firm bias represented in Table 2 supporting the conclusion that 'house views' do not dominate.

4.4. Cross-sectional determinants of pension assumptions

Our analysis now considers the determinants of managerial choice and conservatism in adopting fair value accounting by applying linear regressions of assumptions on alternative specifications of firm and pension scheme characteristics. All specifications include firm-by-year fixed effects and controls for firm size, book-to-market and the capital structure of the firm. We also add an additional proxy for funding relative to firm size by scaling the gross surplus/(deficit) by total assets (STA).[14]

$$Assumption_{it} = \alpha + \beta_1 Size + \beta_2 BTM + \beta_3 D/E + \beta_4 STA + \beta_5 Solvency + \beta_6 Equity + e_{it} \quad (1)$$

where assumption is calculated by $(Assumption_{it} - \mu_t)/Standard\ Error\mu_t)$ where assumption is the pension assumption from the annual reports (discount rate, expected equity return, discount rate spread (discount rate-wage growth) and the equity spread (expected equity return-discount rate). Book-market ratio is the book value of equity/market value of equity, debt-to-equity is total debt/market value of equity, surplus to total assets is the pension surplus (deficit)/ total assets, funding is measured by pension assets/pension liabilities and the equity percentage is calculated as equity/total pension assets.

Table 3. **Sign Test for Distribution of Assumptions across Auditor and Actuary**

	Discount Rate (5.48%)		Wage Growth (3.70%)		Equity Return (7.10%)		Discount Rate Spread (1.78%)		Equity Return Spread (1.62%)	
	Mean	t-Stat	Mean	t-Stat	Mean	t-Stat	Mean	t-Stat	Mean	t-Stat
Panel A: Auditor comparison										
Auditor (A)	5.62*	7.04	4.04*	4.65	7.58*	4.50	1.58*	-3.48	1.97	1.44
Auditor (B)	5.58*	5.06	4.04*	4.60	7.77*	8.29	1.54*	-4.02	2.20*	6.06
Auditor (C)	5.59*	6.43	3.97*	4.24	7.62*	5.75	1.62*	-3.28	2.03*	2.94
Auditor (D)	5.60*	8.10	4.07*	6.77	7.80*	14.63	1.51*	-6.19	2.21*	10.10
Panel B: Actuary comparison										
Actuary (A)	5.60*	2.55	3.85	1.39	7.91*	6.40	1.75	-0.75	2.31*	4.63
Actuary (B)	5.58*	4.29	4.02*	3.61	7.84*	9.54	1.55*	-3.15	2.26*	7.40
Actuary (C)	5.59*	5.82	4.11*	5.47	7.42	0.60	1.47*	-4.95	1.84*	-2.32
Actuary (D)	5.63*	5.64	3.96*	4.57	7.60*	25.70	1.66*	-3.86	2.00*	19.94
Actuary (E)	5.59*	6.83	4.02*	3.53	8.07*	4.43	1.56*	-2.35	2.48	1.83

Note: This table presents a pooled cross-sectional analysis of the pension assumptions across auditors in Panel A, and actuaries in Panel B. We analyze whether the mean assumption passed is significantly different from expected values. The table presents the mean assumption across auditors/actuaries and the associated t-statistic. Our expected values are the median AA bond yield for the discount rate, average wage growth for the private sector in the UK, and the historical average return on equity. Expected values are given in parenthesis under each assumption. * indicates significant at 95%.

Research questions (RQ's 4-7) ask whether managers use pension accounting to increase reported income from pension scheme assets. The work of Bergstresser *et al*. (2006) finds strong results for management deriving income from pension assets based upon assumed returns, pension portfolio composition and corporate events. Consequently, pension derived financial income that credits the profit and loss increases opaqueness as investors now have more difficulty in estimating the 'fundamental' profitability of the firm.

Table 4. **Regression Analysis of Managerial Choice and Conservatism**

	Equity Return	Discount Rate	Discount Rate Spread	Equity Return Spread
Intercept	-22.51	-9.28	13.75	-18.48
	(-1.81)**	(-0.47)	(1.03)	(-1.34)
Surplus/Total Assets	-36.31	6.27	-3.43	-34.30
	(-2.68)*	(0.29)	(-0.24)	(-2.28)*
Solvency	20.10	54.76	20.44	2.77
	(3.39)*	(5.83)*	(3.23)*	(0.42)
Equity Percentage	17.39	4.80	-2.54	14.42
	(3.27)*	(0.56)	(-0.44)	(2.45)*
Size	-0.31	-5.57	-2.80	1.44
	(-0.23)	(-2.53)*	(-1.89)**	(0.94)
Book-to-Market	-5.43	-0.53	-4.20	-2.67
	(-2.17)*	(-0.13)	(-1.55)	(-0.96)
Debt-to-Equity	2.19	-3.01	1.00	2.01
	(1.24)	(-1.07)	(0.53)	(1.03)

Note: This table presents the results for fixed effects regressions for the determinants of the pension assumptions and managerial conservatism. The table presents the regression coefficient and immediately below is the corresponding t-statistic. * indicates significant at 99%, ** indicates significance at 95% and *** indicates significance at 90%. The dependent variable for each model is presented at the head of each column and the independent variables are presented in the far left column. Size is measured by the log market value the market-to-book ratio is the market value of equity/book value of equity, debt-to-equity is total debt/market value of equity. Surplus to total assets is the pension surplus (deficit)/ total assets, funding is measured by pension assets/pension liabilities and the equity percentage which is calculated as equity/total pension assets. The standardized assumption is calculated by $(Assumption_{it} - \mu_t)/Standard\ Error\mu_t$.

Table 4, column 1, presents our results for the expected return of equity assumption. Results are consistent with Bergstresser *et al*. (2006) in that, where equity is the largest component of the pension portfolio, the assumed return on equity is higher. We therefore find that portfolio composition and expected return assumptions are related. For the discount rate analysis we find that firms that have

the highest funding ratio of pension assets to liabilities apply higher discount rates but the size of the pension liability relative to the firm is not a significant determinant of the discount rate. Further the size of the surplus/deficit is insignificant.[15] This suggests that management are concerned only about the perceived solvency of their pension scheme. The solvency variable is commonly reported in the financial press and, as such, will impact the markets perception of firm risk. Another explanation is that well-funded schemes may be concerned about transitory fluctuations in the solvency of the pension scheme. As a result, the selection of a larger discount rate will understate the 'true' liability and will reduce the impact of large asset fluctuations.

In addition, we examine the level of managerial conservatism that is applied in calculating the present value of the pension liability. The selection of a high discount rate alone is not sufficient to minimize the pension liability. Our discount rate spread variable proxies for the level of conservatism that management are applying in estimating their pension liability. Where the spread is large then management are not applying prudent assumptions. The results in column (3) of Table 4 show that the least conservative estimates are used by firms that have the highest solvency levels. This supports the results in column (2) that managers are concerned about the perceived risk of the firm. As a result, they choose assumptions that understate the liability of the firm. This again supports our assertion that fair value has not improved the transparency of balance sheets as management are systematically understating their pension liability, thus reducing the perceived risk of the firm.

Next we consider the ability of management to derive income from the pension assets by employing a large equity spread. In column (1) of Table 4 our analysis on scheme solvency and the surplus/(deficit) to total assets at first appear to be at odds as those schemes that have high solvency and those schemes that have large deficits relative to firm size both adopt higher expected return assumptions. However, when the spread between the expected and return on equity analysis is considered in conjunction with the expected return analysis in column 1, then the result becomes more intuitive. In the final column of Table 4 it can be seen that for the spread variable, solvency becomes insignificant but the higher the equity percentage the higher the net equity return spread.

This is important, as we find that across management there are two different objectives. For those schemes that are well funded then management are concerned about the perceived risk and solvency of the pension scheme. Where they adopt a higher discount rate and discount rate spread then they will incur a high interest cost. To offset this interest cost the management then assume a higher net expected return for equity to offset the cost. Conversely, where schemes have significant solvency/funding concerns, management do not elect to manipulate the size of the liability/deficit. Instead they choose to maximize the financial income that can be derived for the profit and loss from the assets of the pension scheme. They

therefore adopt lower discount rates, higher expected returns on equity, and maximize the equity return spread.

4.5. Value relevance

Table 5. **Value Relevance Regression Analysis of Pension Assumptions**

	Market Value of Equity			
Intercept	4.78	1.13	4.44	2.98
	(1.62)	(0.64)	(11.12)*	(6.29)*
Discount Rate	-0.18	-	-	-
	-(0.34)			
Equity Return	-	0.34	-	-
		(1.51)		
Discount Rate Spread	-	-	-0.41	-
			-(1.73)***	
Equity Return Spread	-	-	-	0.38
				(1.77)***
Firm Assets	0.06	0.06	0.06	0.06
	(4.82)*	(4.71)*	(4.75)*	(4.70)*
Firm Debts	-0.03	-0.03	-0.03	-0.03
	-(0.82)	-(0.73)	-(0.80)	-(0.72)

Note: This table presents the results for regressions for the value relevance of the pension assumptions. The table presents the regression coefficient and immediately below is the corresponding t-statistic. * indicates significant at 99%, ** indicates significance at 95%, AND *** indicates significance at 90%. The dependent variable is presented at the head of each column and the independent variables are presented in the far left column. The discount rate and Equity return are taken from the FRS-17 disclosures. Discount rate spread is the difference between the discount rate and wage growth. Equity return spread is the difference between the expected return on equity and the discount rate. Firm assets are the total assets of the firm, firm debts is the total debts of the firm and market value of equity (dependant variable) is the balance sheet market value of equity all scaled by the number of common shares outstanding at the balance sheet date.

Table 5 presents value relevance regressions of the disclosed assumptions used for discounting the pension liability and the expected return on scheme assets. Following a similar method to Weidman & Weir (2004) we regress the market value of equity against the different pension assumptions applied.

$$MarketValueofEquity_{it} = \alpha + \beta_1 Assumption + \beta_2 FirmAssets + \beta_3 FirmDebts + e_{it} \quad (2)$$

where the market value of equity is balance sheet market value scaled by common equity outstanding, assumption is the pension assumption from the annual reports,

firm assets and firm debts are the total assets and debts of the firm at the balance sheet date, scaled by common shares outstanding. From Table 5 we can see that individually neither the discount rate nor the expected return on equity has a significant effect on the market value of the firm.

However, when we consider our spread variables they have a weak association with the value of the firm. The discount rate has a negative relationship with the market value of the firm's equity. Firms that apply higher discount rates and lower wage growth i.e. understate the magnitude of the pension liability receive a lower market value. This is consistent management manipulation being associated with higher interest charges that reduces the profitability of the firm. Conversely we find that those firms who apply the highest equity return spread have higher market values. This is again consistent with expectations as higher spreads are associated with lower interest costs from one years unwinding of the pension liability and deriving higher levels of income from pension assets.

Our final set of tests considers the value relevance of the amounts that are disclosed in the annual report, again following Weidman & Weir (2004) where,

$$MarketValueofEquity_{it} = \alpha + \beta_1 Assets_{it} + \beta_2 Liabilities_{it} + \beta_3 Solvency_{it} + Controls_{it} + e_{it} \quad (3)$$

The market value of equity is balance sheet market value scaled by common equity outstanding, assets and liabilities are the pension assets and liabilities scaled by common shares outstanding. We also include firm assets and firm debt scaled by common shares outstanding as controls. From Table 6 it can be seen that pension assets and liabilities, solvency levels and asset composition all have some value relevance. This is itself an important factor in examining managerial discretion and the application of fair value accounting. Managers utilize the discretion that fair value affords as it has a tangible effect on the equity value of the firm. From columns 3 and 4 of Table 6 we can see that pension assets have a positive effect on market value while liabilities have no effect.

However, from columns 5 and 6 when the solvency level in the scheme is controlled for, this relationship becomes insignificant but solvency becomes significant. Consistent with Barth *et al*. (1993) and the corporate finance view of pensions, solvency is positively related to the market value of equity, and so the pension assets and liabilities of the firm are perceived as belonging to the firm. This is contrary to the findings of Weidman & Weir (2004) who find evidence of the labour economics view of pension assets and liabilities i.e. surplus assets belong to scheme members.

Finally in columns 7 and 8 we examine asset composition. Bergstresser *et al.* (2006) showed that equity affords management the greatest scope for generating financial income for the profit and loss. If this is the case, then higher equity

allocations should be associated with higher equity market valuations. Consistent with this we find a significant and positive relationship between the percentage of pension assets invested in equity and the market value of the firm. Interestingly when we control for the solvency level of the scheme we find that the percentage of equity increases in significance and pension liabilities become significantly negative. This suggests that asset allocation and liabilities have a greater bearing on the market value of the firm as opposed to scheme solvency.

Table 6. **Value Relevance Regression Analysis of Pension Assumptions**

	Market Value of Equity/Ords							
Intercept	3.74	3.75	3.62	1.89	1.86	2.34	1.88	2.53
	(25.84)*	(26.09)*	(23.82)*	(2.61)**	(2.56)**	(2.94)*	(2.59)**	(3.51)*
Pension Assets/Ords	0.03	-	0.47	0.03	-	0.30	-	-
	(1.55)		(2.57)**	(1.46)		(1.48)		
Pension Equity/Ords	-	-	-	-	-	-	0.09	1.21
							(2.28)*	(5.66)*
Pension Liabilities/Ords	-	0.02	-0.30	-	0.02	-0.19	-	-0.36
		(1.31)	(-2.44)**		(1.34)	(-1.36)		(-5.34)*
Solvency	-	-	-	2.27	2.33	1.62	2.25	1.04
				(2.60)	(4.29)*	(4.29)*	(2.57)**	(1.17)
Firm Assets/Ords	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	(4.81)*	(4.82)*	(4.59)*	(4.30)*	(4.29)*	(4.29)*	(4.29)*	(4.15)*
Firm Debts/Ords	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	(-0.81)	(-0.82)	(-0.66)	(-0.43)	(-0.43)	(-0.44)	(0.44)	(-0.46)

Note: This table presents the results for regressions for the value relevance of the pension assumptions. The table presents the regression coefficient and immediately below is the corresponding t-statistic. * indicates significant at 99%, ** indicates significance at 95%. The dependent variable is presented at the head of each column and the independent variables are presented in the far left column. Pension assets are the total assets in the pension portfolio. Pension equity is equities held in the pension assets. Pension liabilities are the gross pension liability owed by the firm. Firm assets are the total assets of the firm, firm debts is the total debt of the firm and market value of equity (dependant variable) is the balance sheet market value of equity all scaled by the number of common shares outstanding at the balance sheet date. Funding is the ratio of pension assets to pension liabilities.

CONCLUSIONS

This paper considers fair value accounting for pensions, managerial discretion, and value relevance. In particular we consider whether the adoption of fair value accounting for pensions addresses the concerns that have been voiced about past methods of pension accounting. Using a sample of fair value pension disclosures from the UK fair value pension accounting standard FRS-17, we analyze the way in which fair value has been applied by firms in practice. Our results are as follows. First, they show that the variation in the underlying pension valuation assumptions across firms is significant. This result brings into question the suitability of managerial discretion under fair value as a method of accounting for pensions as financial accounts will remain opaque if management are not consistently reporting across firms.

Second, we find that the variation in the assumptions that are presented in the financial accounts are not explained by the use of different audit or actuarial firms. Consequently, these external bodies do not hold 'house views' on what constitutes a reasonable or prudent assumption. This therefore also raises questions as to the efficacy of fair value accounting for pensions as auditors and actuaries do not seem to be applying the standard in a consistent way.

Third, we consider the determinants of managerial discretion. Our results show that management adopt different assumptions in response to the solvency of the pension scheme. Where scheme solvency is high, management choose to apply higher discount rates in estimating the pension liability — that is, systematically understating the liability. Conversely, where schemes have large deficits, firm managers choose to derive a larger amount of financial income from the assets in the pension scheme. Here management apply the least prudent return assumptions and thereby increasing the profit of the firm.

Finally, we analyze the value relevance of both the assumptions and accounting amounts that are disclosed in the annual report. We find that these amounts are value relevant. This is important as the variations that have been observed in the assumptions and valuation process in the application of the standard allow for managers to undertake window dressing of the pension scheme, and that this is successful as it has a tangible share price impact.

Bringing all of these results together we find that the case for adopting fair value accounting in pension accounting is still unresolved. Advocates of fair value accounting believe that it will make financial accounts more representative of the true economic position of the firm. However, our results show that where management have discretion over how ex ante pension standards applied, financial accounts remain opaque and suitable caveats are required.

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[1] SEC (2005).
[2] SSAP 24 paragraph 18.
[3] FRS-17 paragraph 20.

[4] FRS-17 paragraphs 32-33.

[5] Although we only focus on wage growth, the increase of the pension liability will be a function of pension growth, inflation wage growth and changes to the level of benefits provided. The assumed increase in wages however, is by far the biggest driver of increases in the liability owed by the firm.

[6] In 1993, the SEC's Chief Accountant ruled that this was the appropriate discount rate for calculating the present value of a firm's pension liability.

[7] This is more likely to be the case where equity is the dominant asset in the pension portfolio.

[8] It is also possible that firms will apply a comparable discount rate in their assumptions and then select a much higher expected return on equity to ensure a large spread.

[9] U.S. pension schemes are of a similar composition to UK schemes and on average hold large amounts of equity.

[10] This, in itself, is large and British Telecom, for example, illustrates the magnitude of the problem faced by some firms. Their ratio of pension liability to total assets was 111% with a 70% funding ratio. The size of this scheme liability was also substantial at approximately £30bn in 2001.

[11] This information comes from private correspondence with actuaries and fund managers about the composition of assets in defined benefit pension schemes of large UK corporations.

[12] Data is taken from the Office for National Statistics.

[13] The 50 year historical average is taken from Barclays Capital Equity Gilt Study 2007.

[14] We have only presented a single regression for each assumption. The analysis was carried out over a number of different specifications. The analysis of the size of the pension liability relative to the firm by market value and total assets was insignificant as was the gross surplus/deficit scaled by market value.

[15] Results not reported but are available on request.