Value Relevance of Level-3 Fair Values:
The Case of German Companies' Pension Accounting Information

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Abstract

In this paper, we examine the value relevance of pension accounting information for a sample of German companies for the years 1999 to 2006. Because of a particular regulatory and taxation framework, German companies traditionally do not fund their defined benefit pension obligations externally. Thus, unlike companies from the U.S. or from other Anglo-Saxon countries many German companies show large net pension liabilities in their balance sheets. We make use of this situation and provide an in-depth analysis of the value relevance of German companies' level-3 pension obligation fair values. In line with Barth et al. (1993), and in contrast to Coronado and Sharpe (2003), we find that German companies' financial status related pension accounting information is more closely associated with stock prices than pension cost information. We find only weak direct evidence that fair value information on companies' pension positions are more value relevant than amounts that are smoothed as a result of the application of the corridor approach that used to be allowed under FAS 87 and is still allowed under IAS 19. However, our results also indicate that actuarial gains and losses that have not been recognized in companies' balance sheets because of the corridor approach are incrementally value relevant over the smoothed recognized net pension liabilities. A further key contribution of this study is an investigation into the influence of managerial discretion on the value relevance of level-3 pension fair values. We find that investors make use of pension assumption disclosures and penalize companies with "aggressive" pension assumptions by putting a discount on their market value. Our results indicate that investors are more sensitive to the degree of "aggressiveness" of the salary progression rate than to that of the discount rate. However, when company management has strong incentives to set assumptions opportunistically, we find that investors also react significantly to the "aggressiveness" of the discount rate. More precisely, for companies with completely unfunded pension obligations (zero plan assets), the valuation coefficient on the defined benefit obligation is a function of the absolute difference between the discount rate selected by management and the median discount rate.

Key Words: Pension Accounting, Fair Value, Fair Value Disclosures, Value Relevance, Managerial Discretion

I. Introduction

In this paper, we examine the value relevance of pension accounting information published by German companies from 1999 to 2006. We concentrate on German companies that have adopted International Financial Reporting Standards (IFRS) or U.S. Generally Accepted Accounting Principles (U.S. GAAP) for their consolidated financial statements and therefore apply either IAS 19 "Employee Benefits" or the conceptually very similar FAS 87 "Employers' Accounting for Pensions". Following a debate in the previous literature (Barth et al. 1993, Coronado and Sharpe 2003), we investigate whether information on German companies' periodic pension costs or information on pension obligations are more closely associated with stock prices. Furthermore, we analyse whether pension amounts that are smoothed because of the application of the so-called "corridor method" or fair value estimates are more strongly aligned with stock market valuations (Hann et al. 2007a).

The main objective of our study, however, is to investigate the influence of managerial discretion on the value relevance of pension accounting information. Pension obligations are very long term, and their estimation rests on several financial and demographic (actuarial) assumptions. Because of their long-term nature, small changes in assumptions can cause large changes in the estimates of the obligations (Glaum 2009). Furthermore, the assumptions underlying pension valuation are to a large degree based on company-specific managerial estimations. Thus, according to the terminology of FAS 157 "Fair Value Measurement", estimates of pension obligations can be characterized as "level-3 fair values" (Hann et al. 2007b) . Both practitioners and academics (e.g., Daske 2005, Ball 2006, Hung and Subramanyam 2007, Penman 2007) often raise doubts about the reliability and, thus, about the decision usefulness of level-3 fair values. The pension accounting of German companies is an area that is well suited to investigate whether these doubts are justified. German companies traditionally do not fund their pension obligations externally. Thus, unlike companies from the U.S. or from other Anglo-Saxon countries, many German companies show large net pension liabilities in their balance sheets. We make use of this specific situation and provide an in-depth analysis of the value relevance of German companies' level-3 pension fair values.

More specifically, we investigate whether so-called actuarial gains and losses, i.e., components of pension fair values that have traditionally not been recognized in companies' balance sheets because of the corridor approach, are incrementally value relevant over recognized net pension liabilities. Actuarial gains and losses arise over time as a result of differences between prior actuarial assumptions and actual financial and demographic developments. The treatment of actuarial gains and losses in pension accounting is highly contentious (Glaum 2009). On the one hand, actuarial gains and losses may reflect company management's most current information with regard to pension valuation.[1] On the other hand,

[1] See FAS 87, para. BC104.

as critics of fair value accounting would point out, actuarial gains and losses might reflect short-term, transitory fluctuations of market parameters; furthermore, they may be subject to measurement error and managerial manipulation. If these doubts were justified, one would expect actuarial gains and losses not to be decision useful and, therefore, not to be incrementally value relevant over smoothed recognized pension liabilities.

In a further line of investigation, we analyze whether the value relevance of level-3 pension fair values is affected by the uncertainty pertaining to their estimation and by possible managerial opportunism. As mentioned, the valuation of pension obligations depends on company-specific factors. For instance, the discount rate used to discount expected future pension payments are a function of the age structure of current and past employees, and expectations regarding future salary and benefit trends depend, *inter alia*, on a company's industry, the composition of its workforce, its remuneration policy, and its bargaining power in the labour market. Given their idiosyncratic nature, company management must exert judgment and, consequently, has some scope for discretion when setting these assumptions. Discretion in accounting is not necessarily a bad thing. In principle, managers can use the discretion to convey private information, and this can improve the information value of financial statements (e.g., Dye and Verrechia 1995, Beaver and Venkatachalam 2003). However, prior literature suggests that managers use the latitude afforded to them in pension accounting opportunistically in order to manage earnings (e.g., Godwin et al. 1996, Amir and Gordon 1996, Asthana 1999). If investors are aware of this, this should have an effect on the value relevance of the published estimates of pension obligations. We therefore analyse whether investors make use of disclosures of pension accounting assumptions and correct in their valuations for "aggressive" discount rate and salary progression rate assumptions.

Our empirical analysis is based on hand-collected pension accounting data for a sample of 101 German companies for the years 1999 to 2006. All of the companies had voluntary adopted either IFRS or U.S. GAAP for their consolidated financial statements by the end of 2004. The final sample comprises a total of 598 firm-years. Our main findings can be summarized as follows. We find that for German companies information on pension obligations is more closely associated with stock prices than pension cost information. This is in line with our expectations. German companies typically have large net pension obligations, and it seems rational that investors are more concerned with the impact of these positions on companies' long term stability than with pension expenses. Our results correspond with earlier results for U.S. companies obtained by Barth et al. (1993), and they are in contrast to the results of Coronado and Sharpe (2003) who find that pension income statement information is more relevant for the explanation of share prices of U.S. companies than the

funding status of pension plans.[2] Coronado and Sharpe (2003) however argue that their own findings are a reflection of investors' earnings fixation.

Secondly, we find only weak support for the hypothesis that fair value estimates of companies' pension positions are more value relevant than recognized net pension liabilities that are smoothed because of the application of the corridor method. However, our results thirdly indicate that actuarial gains and losses that remain unrecognized because of the corridor approach are incrementally value relevant over recognized net pension liabilities. Taken together, our evidence is consistent with level-3 pension fair values being generally value relevant and, thus, at least potentially decision useful to investors.

Finally, in line with our expectations we find that investors make use of pension assumption disclosures and penalize companies with "aggressive" pension assumptions by putting a discount on their market value. Our results indicate that investors are more sensitive to the degree of "aggressiveness" of the salary progression rate than to that of the discount rate. We believe this is to be expected given that interest rate assumptions are more transparent and can be challenged more easily by analysts and investors than the salary progression rate assumption. However, when management has strong incentives to set assumptions opportunistically, we find that investors also react significantly to the "aggressiveness" of the discount rate. More precisely, for companies where pension obligations are completely unfunded (zero plan assets), the valuation coefficient on the defined benefit obligation is a function of the absolute difference between the discount rate selected by management and our benchmark rate, the median discount rate.

Our research makes several contributions to the existing literature. We provide evidence on the value relevance of fair value estimates of pension obligations, and on the relationship between managerial assumptions and discretion on the one hand and value relevance of estimates on the other hand. The latter aspect has received only scant attention in the literature so far, and the available evidence furthermore is not conclusive (e.g., Brown 2006, Hann et al. 2007b, Davis-Friday et al. 2007). Moreover, almost all previous studies on pension accounting in general, and on value relevance in particular, have been based on U.S. data (e.g. Landsman 1986, Barth et al. 1992, Barth et al. 1993, Coronado and Sharpe 2003, Hann et al. 2007a).[3] As Glaum (2009) points out, capital market systems, pension systems, and pension accounting traditions differ markedly across countries, and it is therefore not clear, a priori, whether results from U.S. based pension accounting research hold for other countries. The present study shows that pension accounting information is generally value relevant for

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[2] Also see Coronado et al. (2008) who extend the investigation of Coronado and Sharpe (2003) to more recent years (2002 to 2005) and find the same results.

[3] The study of Wiedman and Wier (2004) is based on Canadian data. In other words, this study also relates to an Anglo-Saxon country with accounting standards, pension systems and capital market institutions similar to those of the U.S. Another exception is Fasshauer and Glaum (2008), an earlier, German-language version of the present paper which was narrower in scope and based on a smaller sample size.

companies from a country that, in comparison to the U.S., has a very different corporate pension system (for details see below) and a capital market with much weaker oversight and enforcement (Leuz and Wüstemann 2004).

Furthermore, given that the debate about pension accounting reflects the discussion about the purpose and objective of accounting in general (Glaum 2009), our findings have broader implications. According to the conceptual frameworks of the International Accounting Standards Board (IASB) and the U.S. Financial Accounting Standards Board (FASB), the primary objective of financial reporting is to provide decision-useful information to equity investors, creditors, and other users of financial reporting.[4] To promulgate accounting standards that lead to decision useful reporting, the standard setters over the past years have shifted away from the traditional goal of accounting, the determination of an informative, persistent earnings figure (income approach), and have adopted the asset-liability approach which relies strongly on fair value accounting. Fair value accounting is supposed to provide capital market participants with timely and relevant information about companies' assets and liabilities, and hence, the value of their equity (e.g., Landsman 2007). However, at the same time fair value accounting is subject to criticism because of the uncertainty surrounding the estimations of such values for many assets and liabilities, and because of the volatility they induce into companies' income statements and balance sheets (e.g., Penman 2007).

Against this background, it is interesting that according to our findings level-3 fair value estimates of pension obligations are value relevant, and previously unrecognized actuarial gains and losses are incrementally value relevant, despite the weakness of the German enforcement system. Moreover, our evidence suggests that investors are aware of the uncertainty of pension fair values and the managerial scope for manipulation. It appears that they discriminate between more or less reliable fair value estimates and adjust valuations for companies that apply "aggressive" actuarial assumptions. These findings suggest that capital market participants are able to cope rather well with the fair value measurement of pension assets and liabilities in companies' balance sheets.[5] Thus, overall our results can be interpreted as support for the recent changes in U.S. GAAP pension accounting which have made full recognition of companies' pension obligations in the balance sheet mandatory[6], and for plans of the IASB to adopt similar changes to its own pension accounting standard.[7]

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[4] See SFAC 1, para. 34; IASC Framework, para. 10; IASB, 2008b, para. OB2.

[5] It should be noted that our main results pertain to the measurement of assets and liabilities in the balance sheet. We do not directly address the question of how fair value changes should be presented in the statement of comprehensive income. Hann et al. (2007a) document that that fair-value based pension cost measures are highly volatile and, hence, less value relevant than pension costs that are smoothed with the corridor approach. See below for a more detailed discussion on this point.

[6] See FAS 158 "Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans, an amendment of FASB Statements No. 87, 88, 106 and 132(R)".

[7] See IASB (2008): "Discussion Paper, Preliminary Views on Amendments to IAS 19 Employee Benefits".

The remainder of the paper is structured as follows. The next section provides a brief overview of pension accounting according to IAS 19 and FAS 87, and of the idiosyncratic German pension environment. In Section III, we relate our research to the existing literature and develop our hypotheses. In Section IV, we describe the sample selection process and descriptive statistics. In Section V, we present and discuss our results. Finally, in Section VI, we briefly summarize our conclusions, address limitations of this study and outline perspectives for further research.

II. Institutional background

1. IFRS and U.S. GAAP pension accounting

Current accounting standards distinguish between two forms of corporate pension arrangements, defined contribution and defined benefit pension plans.[8] With defined contribution plans, companies promise to pay contributions into pension accounts held for their employees. The amounts of future payments depend on the contributions and on returns earned over time. The accounting for such pension plans does not pose any problems. The contributions must be expensed as pension costs. Since companies have no legal or constructive obligations beyond the contributions, there are no further costs or liabilities to account for.

In a defined benefit plan, the company promises to make pension payments to employees after their retirement. Depending on the "benefit formula", the promised amounts can depend on the employees' years of service, on their compensation levels before retirement, or on career-average compensation levels. In contrast to defined contribution plans, with defined benefit plans it is the company that bears the financial and the demographic risks of the scheme. Defined benefit pension schemes can be funded or unfunded. With funded schemes, companies set aside pension plan assets to finance the future pension payments. In the case of completely or partially unfunded schemes, companies must finance future pension payments from their cash flows when they are due (pay-as-you-go schemes).

In principle, investors and other interested parties need the following sets of accounting information in order to assess the financial consequences of defined benefit plans: (i) information about the expected future payouts to retirees that have been accrued at year-end (pension liabilities); (ii) information about the plan assets set aside to fund the future pension payments (plan assets); (iii) information about the incremental benefits earned by employees during the past year (pension costs/expenses).

Pension liabilities accrue over time, and a method is needed to model the accrual process. According to IAS 19 and FAS 87, companies must use the projected-credit-unit method.

[8] See IAS 19, para. 25; FAS 87, para. 66.

Based on this method, the estimate of a company's pension obligation at any point in time is the defined benefit obligation (DBO), or, in the terminology of FAS 87, the projected benefit obligation (PBO; in the following, for the sake of simplicity, we will only use the term DBO). It is defined as the "the present value … of expected future payments required to settle the obligation resulting from employee service in the current and prior periods."[9] Estimating the current value of the expected future pension payments requires demographic and financial assumptions (e.g., employee turnover and mortality rates, future salary and benefit trends). Inputs for these assumptions are not readily observable in markets. Instead they reflect, at least partly, the reporting company's own data and expectations. Thus, in the terminology of FAS 157, the DBO can be characterized as a level-3 fair value.[10]

Over time, differences will emerge between a company's previous actuarial assumptions and actual developments of employee turnover, salary levels, life expectancy, interest rates, etc. Re-measuring pension liabilities with updated assumptions leads to actuarial gains or losses. The treatment of actuarial gains and losses is one of the most contentious aspects of pension accounting (Glaum 2009). Immediate full recognition of actuarial gains and losses in the balance sheet and in the income statement could be considered as most straightforward. However, pension liabilities are highly sensitive to changes in assumptions. For instance, according to Blake et al. (2008, p39), changing the assumption about employees' life expectancy by one year, on average leads to a 3 to 4% change in the value of pension liabilities. Moreover, a 1% change of the discount rate will on average decrease or increase the value of the liability by 15%.[11] Hence, relatively small changes in assumptions can have disruptive effects for companies' balance sheets and income statements. Moreover, based on a long-term actuarial perspective, it is often argued that actuarial gains and losses reflect short term, transitory fluctuations that tend to balance out in the long-run.

Using these arguments, during the deliberations of FAS 87 in the mid-1980s constituencies put pressure on the FASB to prevent immediate recognition (Saeman 1995). Eventually, the FASB succumbed to this pressure and developed the corridor approach. Later on, the International Accounting Standards Committee (IASC) faced a similar political situation during the deliberations on a revised version of IAS 19 (Camfferman and Zeff 2007) and consequently also adopted the corridor approach. The corridor approach allows actuarial gains and losses to remain temporarily unrecognised. Their accumulation is tracked outside the main accounts, and IAS 19 and FAS 87 require their recognition only once they exceed a certain threshold, the greater of 10% of the DBO or the fair value of plan assets, respectively.

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[9] IAS 19, para 7; also see FAS 87, para. 17.

[10] See FAS 157, para 30.

[11] See Gohdes and Baach (2004), p2571. Bayer, a German chemical company, reports that a reduction of the discout rate of 0.5% would have increased its total pension obligations by € 1.1 bn or 8.08%; see Bayer AG (2007), p162.

If accumulated gains and losses exceed the corridor, companies can recognize the excess over the remaining work-life of the beneficiaries of the pension plan.[12] The corridor approach thus represents a two-stage mechanism that produces a strong smoothing of pension liabilities in the balance sheet and of pension costs in the income statement. Under IFRS, the application of the corridor approach is optional; IAS 19 allows for faster, or indeed full immediate, recognition on a voluntary basis (the same held true for FAS 87 until 2006, see below).[13]

Over time, accumulated actuarial gains and losses kept outside the main financial statements because of the corridor method can become large (Amen 2007).[14] For this reason, the approach has been criticized sharply. In particular, financial analysts have excoriated IAS 19 and FAS 87 for allowing financial reporting that is incomplete and intransparent.[15] In 2005, the U.S. Securities and Exchange Commission (SEC) also called upon the FASB to reform U.S. GAAP pension accounting. As a result, in 2006 the FASB published FAS 158 which amends FAS 87 so that US companies are now required to fully and immediately recognise actuarial gains and losses in the balance sheet. The counter entry is through shareholders' equity. However, the gains and losses do not remain in equity infinitely; instead they are „recycled" through the income statement using the corridor approach.

The IASB has also reacted to the criticism raised against IAS 19. In 2004, the Board published a revised version of IAS 19 which now gives companies a new, third option for the treatment of actuarial gains and losses: In addition to the corridor approach and to voluntary full recognition through the income statement, companies can now also fully and immediately recognise actuarial gains and losses through shareholders' equity (Fasshauer et al. 2008). However, in contrast to FAS 87, under IFRS the gains and losses permanently bypass the income statement. In a discussion paper published in March 2008, the IASB proposes further changes (IASB 2008). According to this publication, the Board has tentatively decided to abolish the corridor approach and to require companies to recognise their net pension liabilities fully in their balance sheets. No decision has yet been reached on how the changes to pension assets and pension liabilities will have to be presented in comprehensive income.

In comparison to the accounting for pension liabilities, the accounting for plan assets is relatively unproblematic. IAS 19 and FAS 87 require plan assets to be valued at their fair

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12 See IAS 19, para. 93; FAS 87, para. 32.

13 See IAS 19, para. 93; FAS 87. para. 33.

14 For instance, at the end of 2004, Bayer, a large German chemical company, had accumulated unrecognised actuarial losses amounting to € 2.0 bn, representing 14.4% of Bayer's total pension liabilities, see Bayer (2004). In 2005, Bayer decided to adopt the new option provided by IAS 19 (see below) to recognise actuarial gains and losses fully through equity; see Bayer (2005).

15 For example, analysts of Credit Suisse First Boston (2005) have characterized the corridor approach as a „nasty little smoothing mechanism" (p. 63), and the resulting accounting as „confusing" (p. 63) and „misleading" (p. 65). Similar criticisms have been raised by Merrill Lynch (2002) and by JP Morgan (2006).

value at the balance sheet date.[16] Plan assets consist mainly of financial assets, for which IFRS and U.S. GAAP already require or allow fair value measurement under other standards (e.g., IAS 39, FAS 159). Some financial assets are traded in liquid markets so that their fair values correspond to level 1 of FAS 157. For many other types of plan assets standard valuation methods exist and valuation parameters can be observed in markets (level-2 fair values). In other words, the uncertainty and the degree of managerial discretion associated with plan assets are generally lower than for pension liabilities. According to IAS 19 and FAS 87, the net of the DBO and the fair value of plan assets (plus or minus actuarial losses or gains nor realized because of the corridor method[17]) is recognized as the net pension liability in the balance sheet.

Finally, pension expenses presented in the income statement consist mainly of two components, service cost and interest cost. Service cost is the increase of the present value of future pension benefits arising from employee services rendered in the period. Interest cost is the increase in the present value caused by the unwinding of the discounting over time.[18] Pension costs are presented net of the return on plan assets.[19]

2. The German pension environment

In the following we provide a brief overview of the German corporate pension system, and a comparison of this system with pension systems in Anglo-Saxon countries that have been the primary focus of prior pension accounting research. Corporate pension plans are common in Germany. According to Mercer, a consulting company, 90% of German multinational and "leading national" companies offer supplementary pension schemes to their employees; the corresponding rates for the U.K. and for the U.S. are 100% and "close to 100%", respectively (Mercer 2006). A recent OECD study takes a broader perspective and concludes that 57% of German employees are covered by corporate pensions, compared to 43% in the U.K. and 47% in the U.S. (OECD 2007). These figures document that the prevalence of corporate pension plans in Germany is comparable to that of major Anglo-Saxon countries. However, there are two major differences between the German corporate pension system and the pension systems

16 See IAS 19, para. 54 (c) and 102; FAS 87, para. 49.

17 See IAS 19, para. 54; FAS 87, para. 35. In addition, under IAS 19 unvested past service costs may also remain partially unrecognized; see IAS 19, para. 96.

18 Other pension cost components can result from plan settlements and curtailments (see IAS 19, para. 109-110), and from acquisitions, divestments, and exchange rate effects.

19 More precisely, it is not the realised return of the period that is deducted from pension costs, but an expected long-term average return on plan assets; see IAS 19, para. 105-106. Under U.S. GAAP, a further smoothing mechanism exists in this context. According to FAS 87, para. 30, the expected rate of return may be multiplied with either the fair value of plan assets or with a "smoothed fair value", i.e., a moving average of plan asset fair values.

of Anglo-Saxon countries. These differences concern the type of pension plans companies sponsor and the funding of the schemes.

Firstly, while both defined contribution and defined benefit pension plans are wide-spread in the U.S. and in the U.K.[20], pure defined contribution systems are not legally allowed in Germany. German pension law stipulates that contribution based pension schemes must provide for a minimum guaranteed pension level.[21] Thus, according to IAS 19, in principle all German pension schemes are defined benefit schemes.[22]

Secondly, pension funding practices differ across countries. In some countries (e.g., in the U.S. and in the U.K.) companies are legally required to fund pension plans, at least to minimum levels. Consequently, companies in these countries tend to have high funding ratios. For instance, in 2006, the average funding ratio for companies comprising the S&P 500 index was 98% (Standard & Poor's 2007), and in the 1990s, U.S. funding ratios often exceeded 100% (e.g., Coronado and Sharpe, 2003).[23] In other countries, funding requirements do not exist and funding ratios are often much lower. For instance, in Germany, where funding is not mandatory, the average funding ratio of DAX-30 companies in 2005 was 44% (Fasshauer et al. 2008), and for the broader sample analyzed in the present study for the late 1990s and early 2000s, the ratio is even much lower (mean: 23.09%; median: 11.15%).[24]

Variation in funding ratios is not only a result of differences in pension fund regulation. Another driving factor is taxation. For instance, in the U.S. only contributions to funded pension schemes are tax deductable (McGill et al. 2005), and incentives exist for U.S. companies to fund pension plans fully. This is because firms' contributions to funds are tax deductible, whereas earnings in pension funds are tax exempt (e.g., Francis and Reiter 1987). In Germany, on the other hand, until recently tax and other regulations actually discriminated *against* external funding. The rationale behind this regime was to provide companies with a

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[20] Traditionally, defined benefit arrangements have been dominant in the U.S. and in the U.K. However, more recently they are often replaced by defined contribution or hybrid schemes, see Munnell (2006), Kiosse and Peasnell (2009).

[21] See § 1 para. 2 No. 2 BetrAVG. If companies did offer employees pure contribution schemes, according to German labor law these schemes would still be treated as schemes with a minimum guarantee; for further details, see Blomeyer et al. (2006), commentary of § 1 BetrAVG, Tz. 88; Rolfs et al. (2007), commentary of § 1 BetrAVG, Tz. 46.

[22] According to IAS 19, para. 7, all pension plans that do not meet the strict definition of a defined contribution plan are defined benefit plans. In its recent pension accounting discussion paper, the IASB admits that this simple distinction is not adequate. The Board considers developing a new set of definitions and new rules for the recognition and valuation for defined contribution pension promises which, broadly speaking, will be based on the fair value principle. For details, see IASB, (2008a), in particular chapter 7.

[23] The average funding ratio in FTSE-100 companies at the end of 2005 was 98%, see Fasshauer et al. (2008).

[24] The companies comprising our sample are mostly multinational corporations. These companies often operate pension plans not only in Germany but in many countries, Anglo-Saxon countries among them. Analogously, many of the companies making up the FTSE or the S&P 500 have pension plans outside the U.S. or the U.K., some of them in Germany. Therefore, average reported funding ratios may actually downplay true cross-country differences.

form of low-cost long-term debt. This has to be seen in the context of the scarcity of capital in post-worldwar-II Germany and the bank-dominated German financial system with its under-developed capital market (Ahrend 1996; Theissen 2004). From the viewpoint of German companies, internal financing through unfunded pension obligations is advantageous because of the tax benefits and because there are no (or only minimal) information and control rights attached to them (Myers and Majluf 1984).

The rather peculiar legal setting, purposefully designed to foster internal financing, explains why German companies have relatively large pension obligations that traditionally have been, and in some cases continue to be, completely unfunded. The low degree of funding has two consequences. First, in the income statement, pension expenses are usually not reduced (much) by expected returns on plan assets. Whereas for many U.S. or U.K. companies over the past years pension income actually contributed to earnings on a net basis (i.e., expected returns on plan assets exceeded pension costs), this was a very rare occurrence for German companies. Secondly, companies' pension obligations are not offset by plan assets; given the dominance of defined contribution pension schemes, this results in large recognised liabilities on the face of German companies' balance sheet.[25]

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Systematic underfunding of corporate pension plans takes place not only in Germany, but also in other countries. However, as far as we are aware, Germany is the country where the extent of underfunding is the highest. Figure 1 depicts the country medians of the pension funding deficits expressed as a percentage of equity for leading stock-listed companies from 17 European countries. As it can be seen, the ratio is by far the highest for German companies. Similar results are obtained by other studies (OECD 2005) or by reports of consultants or financial analysts. For example, according to a study by JP Morgan (2006), German firms' funding deficits amount to 19% of their market capitalisation; the average for the EU (without U.K.) is 7% (also see Watson Wyatt 2005).

To conclude, from an international perspective, the German pension system is characterized by an extreme degree of underfunding of pension obligations. This makes Germany a highly interesting environment to study the value relevance of pension accounting information. Firstly, it is interesting because prior pension accounting research has concentrated on the U.S. and on other Anglo-Saxon countries. To our knowledge, the equity pricing properties of

[25] Over recent years, large, globally-oriented German companies have been looking for ways to reduce reported pension liabilities in order to comply better with the expectations of Anglo-American analysts, rating agencies and investors. The companies have therefore started to build up pension funds. In order to achieve the qualification as plan assets under IFRS or U.S. GAAP while maintaining the tax advantages under the German code, they have entered into complex legal structures ("contractual-trust-agreements"). However, legally and from a tax perspective, the companies remain the debtors of the pension obligations. For details, see Lovells 2005.

pension accounting information have not been studied before for the German capital market, or indeed for any other country with similar institutional characteristics. Secondly, as mentioned before, the large net pension liabilities provide us with a highly interesting case to analyze in detail the effect managerial discretion has on the value relevance of level-3 fair value estimates. .

III. Literature and hypotheses

1. Financial-position related pension information vs. performance-related pension information

Following prior research our empirical tests will be based on regressions of firms' non-pension and pension accounting information on current security prices. Since the 1980s, it has been shown in several empirical studies that pension accounting information of U.S. companies is generally value relevant. While earlier studies have been based on earnings models (Daley 1984, Barth et al. 1992) or balance-sheet models (Landsman 1986), most recent studies are based on empirical versions of the Ohlson-model (Barth et al. 1993, Corondo and Sharpe 2003, Wiedman and Wier 2004, Hann et al. 2007a, Kiosse et al. 2007).[26] According to the Ohlson-model, firm value can be explained as the sum of the book value of equity and the present value of expected future abnormal earnings (Ohlson 1995, Feltham and Ohlson 1995). In empirical versions, the expected future abnormal returns are usually approximated by analysts' earnings forecasts or, more simply, by realized earnings (e.g., Barth et al. 1998, Collins et al. 1999, Dechow et al. 1999, Lo and Lys 2000).

Our first hypothesis addresses the questions whether the complementary relationship between balance-sheet and performance information that underlies the Ohlson-model holds for pension accounting information, and, if it does not hold, which of the two sets of information, financial-position related pension information or pension expenses, is redundant in explaining security prices. According to Feltham and Ohlson (1995) the complementary relationship between balance-sheet and performance information holds only for operating assets. The reason for this is that operating assets are typically measured conservatively (lower of cost or market) and that companies are generally prohibited from recognizing synergies and other forms of self-generated intangible assets. The income statement helps investors to assess the unrecognised intangibles (goodwill) because past performance indicates companies' abilities to generate future abnormal earnings. However, when assets and liabilities are measured at fair value, and synergies or other intangible assets do not play a role (as is the case for purely financial assets), the complementary role between balance-sheet and performance information

[26] Other studies have addressed the value relevance of the accounting for post-employment benefits other than pensions and the relevance of pension accounting for debt securities ("creditor relevance"). For a comprehensive literature overview of empirical pension accounting, see Glaum 2009.

ceases to exist. Thus, given that pensions information is financial in nature, and given further that companies must recognize (FAS 87) or at least disclose (IAS 19) fair value estimates of pension liabilities and pension assets, it is possible that either financial-position related pension information (net pension liability, funding status) or pension expenses is redundant with regard to the securities pricing (also see Barth et al. 1993 on this point).

Previous research has shown that there is indeed no complementary relationship between financial-position related pension information and pension expenses for explaining security prices. However, prior research is inconclusive on the question of which of the two sets of information is redundant. Barth et al. (1993) find for a sample of 300 U.S. companies for the years 1987 to 1990 that the DBO and the fair value of pension assets are significantly correlated with share price valuations, whereas the incremental explanatory value of pension cost components are not significantly different from zero. Interestingly, a study conducted ten years later by Coronado and Sharpe (2003) arrives at the opposite result. For their sample of U.S. companies comprising the S&P 500 index in the years 1993 to 2001 it is not the funding status of pension plans, but pension income and expenses that turn out to be relevant for the explanation of share prices. As Coronado and Sharpe (2003 p. 324) point out, "the market appears to pay more attention to the flow of pension induced accruals reported in the body of the income statement than to the marked-to-market value of pension assets and liabilities reported in the footnotes."[27] In a recent working paper, Coronado et al. (2008) extend the investigation to the years 2002 to 2005 and find the same results. Coronado and Sharpe (2003) and Coronado et al. (2008) surmise that their results are a reflection of investors' earnings fixation.[28] During the second half of the 1990s, the pension plans of S&P 500 companies were, on average, overfunded, and companies reported, on average, pension income rather than pension expenses because expected returns on plan assets exceeded pension costs.

Our expectation is that in the German underfunding environment financial-position pension information is more closely related to the market value of equity than pension expenses, i.e., we expect to find results in line with the earlier study of Barth et al. 1993 and in contrast to those of Coronado and Sharpe (2003). We believe investors will focus on the high pension funding deficits of German firms rather than on pension costs because the funding deficits are associated with long-term financial risk, potentially even the risk of financial distress. This view is supported by anecdotal evidence from investment analysts' reports that point out to

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[27] Coronado and Sharpe (2003) find that the market prices all components of U.S. companies' pension costs similar to core earnings, including amortization amounts. In contrast, based on an earnings-based valuation model Barth et al. (1992) provide evidence that some parts of pension expenses (e.g., amortization of unrecognized amounts) are transitory and therefore irrelevant for explaining market prices of equity. Also see Hann et al. (2007a) on this point.

[28] Also see Fore (2004) who argues: "[D]uring bull markets, users of financial statements focus more on firm income statements and less on the footnotes. But when times grow difficult and firms are more likely to be in distress, analysts focus more heavily on the footnotes and the balance sheet".

the risks investors face because of German companies' underfunded pension plans (JP Morgan 2006). Findings by Wiedman and Wier (2004) and by Kiosse et al. (2007) also lend support to the notion that the financing status of pension plans has implications for the relative importance of financial status and performance information for the stock market valuations. The study by Wiedman and Wier (2004) is based on data for Canadian companies for the years 2000 and 2001. In 2000, 72% of the sample companies had overfunded plans, and in 2001 the ratio was 41%. Their findings suggest that the DBO and the fair values of plan assets are less value relevant for companies with overfunded plans than for companies with underfunded pension plans. The study by Kiosse et al. (2007) arrives at the same result.[29] Furthermore, our expectation is also supported by non-pension related research that shows that balance-sheet information is more important information compared to income-related accounting information for firms in financial distress situations (Barth et al. 1998; Burgstahler and Dichev 1997, Collins et al. 1999). Thus, our first hypothesis is:

H-1: With regard to German companies, financial-position related pension accounting variables have a stronger explanatory power for the market value of equity than pension expenses.

In line with previous studies, we will test hypothesis H-1 with models that have the following structure:

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_4 NRPL_{it} + \varepsilon_{it}$$

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_5 FS_{it} + \varepsilon_{it}$$

p_{it} is the per-share market value of the equity of company i; BVEbP is the book value of equity before pension obligations, NIbPC is net income before pension cost, PC are pension costs, NRPL are the net recognized pension liabilities, FS is the funding status (the latter two variables will be used alternatively in two model specifications); all accounting variables are divided by the number of shares outstanding. Our hypothesis implies that the valuation coefficient β_4 on NRPL (or FS) is significant while the coefficient on pension costs (β_3) is not.

2. Relative importance of financial-position related pension accounting information: funding status vs. recognized net pension liability

Our second research goal is to find out which type of financial-position related pension accounting information is relatively more important for security prices in the German environment, the funding status, i.e., the difference between the DBO and the fair value of plan assets, or the recognised net pension liability that is smoothed with the corridor mechanism. This question is not addressed in most previous empirical studies, and in the only

[29] See *Kiosse et al.* (2007), Table 7, p55.

study that does address it (Hann et al. 2007a), the results are not conclusive.[30] The reason why financial-position related pension accounting is not the focus of previous research is that for U.S. companies this position is typically rather small because of the high funding of pension plans; in many instances, pension plans are even over-funded, resulting in the recognition of net pension assets. As has already been pointed out, for German companies, on the other hand, the recognised net pension liability or the funding status are often very large. It is therefore interesting to compare directly the relative importance of the two types of financial-position related pension accounting information for valuation in the stock market.

Proponents of the corridor argue that actuarial gains and losses are a result of short-term fluctuations and measurement error that will tend to balance out in the long run. Hence, the smoothed net recognized pension liability is seen as a stable and reliable estimate of the "true" long-term pension obligation (also see FAS 87, para. 173-190; IAS 19, para. BC38-48). Arguments in favor of fair value measurement for pension obligations are, firstly, that it leads to a simpler and more transparent financial reporting than the corridor approach that has often been criticized for being intransparent and misleading (e.g., Merrill Lynch 2002, Credit Suisse First Boston 2005, JP Morgan 2006). Secondly, the fair value reflects all available information at the balance sheet date. The FASB itself explains in the Basis for Conclusion of FAS 87 (para. 104 and 107): "[D]elayed recognition … results in excluding the most current and most relevant information from the employer's statement of financial position. … [I]t would be conceptually appropriate and preferable to recognize the difference between the projected benefit obligation and plan assets … ."[31]

Based on these considerations, in order to investigate with respect of German companies which measure of the pension obligation is more value relevant and, in this sense, potentially more decision useful to investors in the capital markets, we test the following hypothesis:

H-2: The fair-value based funding status (DBO minus fair value of plan assets) has a stronger explanatory power for the market value of equity than the "smoothed" recognized net pension liability.

Hypothesis H-2 will be tested by comparing the R^2s and the regression estimates for β_4 of the following two model specifications:

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_4 NRPL_{it} + \varepsilon_{it}$$

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_5 FS_{it} + \varepsilon_{it}$$

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[30] Barth (1991) also focuses on alternative measures of pension plan obligations and assets, and she finds that the DBO, which includes future salary trends, is not perceived as a less reliable measure compared to the accumulated benefit obligation (ABO), which excludes them. For studies on the reliability of alternative measures of liabilities from other postretirement benefits, such as health care benefits, see Choi et al. 1997; Davis-Friday, et. al. 1999, and Davis-Friday et al. 2004.

[31] FAS 87, para. 107; also see IAS 19, BC.48.

A third research question that is closely related to the second is whether actuarial gains and losses that remain unrecognized as a consequence of the corridor approach are incrementally value relevant over the smoothed recognized net pension liabilities. As mentioned, these gains and losses represent the most recent and possibly the „most relevant“ (FAS 87, para. 104) information regarding the valuation of pension obligations. At the same time, they may reflect transitory short term fluctuations and measurement error. In accordance with hypothesis H-2, we formulate the following hypothesis to test the conflicting arguments:

H-3: Unrecognized amounts are incrementally value relevant over the "smoothed" recognized net pension liability.

Our test of hypothesis H-3 is based on the following equation:

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_8 NRPL_{it} + \beta_9 TURA_{it} + \varepsilon_{it}$$

where $TURA_{it}$ are the total unrecognized pension amounts of company i in period t. Depending on whether TURA are predominantly unrecognized gains or unrecognized losses, we expect β_5 to be either significantly positive (gains) or significantly negative (losses).

3. Managerial discretion and value relevance of pension accounting information

As has been discussed above, pension obligations are highly sensitive to their assumptions so that small changes in assumptions can have highly significant effects on companies' income statements and balances sheets. Determining actuarial assumptions involves judgement. Inputs for the assumptions are not readily observable in markets and therefore reflect at least partly the subjective expectations of company management. In other words, management enjoys a certain degree of discretion to set these parameters and thereby to influence earnings and other key financial ratios. Level-3 pension accounting fair values therefore may not only be subject to short-term fluctuations and measurement error but also to managerial manipulation.

Scope for discretion in financial reporting is however not necessarily a bad thing. For example, Beaver and Venkatachalam (2003) posit that discretion in fair values allows managers to signal private information to investors and thereby improve the information value of financial statements (also see Dye and Verrechia 1995; Healy and Whalen 1999). However, empirical studies do suggest that managers exercise the scope for discretion in pension accounting opportunistically. The results of the studies by Godwin et al. (1996), Amir and Gordon (1996), Amir and Benartzi (1998), Asthana (1999) and Bergstraesser et al. (2006) suggest that managerial choices regarding pension accounting assumptions are influenced, *inter alia*, by funding consequences and related debt and dividend constraints, tax benefits, and management's efforts to smooth earnings.

Accounting information can only be decision useful and value relevant if it is both relevant and reliable (Barth 2000; Barth et al. 2001, Wyatt 2008). It is, therefore, important to ask whether managerial earnings management impairs the decision usefulness of pension accounting information for capital market participants. Earnings management would not impair the decision usefulness if investors were perfectly able to "see through" companies' opportunistic reporting behavior, unravel the effects, and adjust their securities valuations accordingly (Dechow and Skinner 2000). However, if companies' disclosures are not fully transparent, or if investors for other reasons fail to take into account the consequences of biased accounting choices, earnings management is likely to reduce the decision usefulness of financial accounting information.

It is difficult to investigate empirically the reliability effect of managerial discretion in accounting (Wyatt 2008, Glaum 2009), and only few studies so far address this issue with regard to pension accounting.[32] Hann et al. (2007b) estimate a "non-discretionary" DBO measure (DBO-X) for a sample of U.S. companies by replacing companies' actual discount rates and expected rates of salary progression with respective industry medians. They define the difference between companies' reported DBO and DBO-X as estimates of the discretionary DBO component (DBO-D), and they investigate whether DBO-D is value relevant. They find that valuation equations with reported DBO and with the estimated non-discretionary DBO measure have the same explanatory power, and the two estimated regression coefficients are not statistically different. Moreover, further tests indicate that the discretionary component DBO-D is incrementally value relevant over the "non-discretionary" DBO-X, and that the coefficients on DBO-X and DBO-D are not statistically different.

As Hann et al. (2007b) themselves point out, there are at least two interpretations for these findings. Firstly, investors may believe that managers do not abuse the discretion inherent in pension accounting and that choices of assumptions instead convey value relevant information. Alternatively, it could also be that investors simply take the published pension accounting figures at face value without critically evaluating the differing value relevance of non-discretionary and the discretionary components of the DBO. Hann et al. (2007b) lean towards the first interpretation, and they provide additional robustness checks to refute alternative explanations.

A working paper by Brown (2006) arrives at different results. His work is also based on a large sample of US companies for the years 1991 to 2001. He compares companies' discount rates and salary progression rates with respective benchmarks; the sum of the two differences can be thought of as a measure for the "aggressiveness" of companies' pension assumptions. Using a cross-sectional valuation model, Brown (2006) finds that the coefficient on the

[32] In papers unrelated to pension accounting, Barth et al. (1996), Marquardt and Wiedman (2004), and Baber et al. (2006) find evidence consistent with capital-market participants taking earnings management into account when using financial accounting data.

"aggressiveness" measure is significantly negative, indicating that share prices of companies with "aggressive" pension assumptions are systematically reduced. In a further model specification similar to that of Hann et al. (2007b), Brown (2006) regresses both reported DBO and the discretionary component DBO-D on share prices. He finds DBO-D to be incrementally value relevant over the reported DBO. He concludes that investors see through managers' opportunistic pension accounting choices and adjust company valuations accordingly.

In a further working paper, Davis-Friday et al. (2007) concentrate on a special feature of FAS 87 that allows companies to smooth their reported returns on plan assets. According to FAS 87, para. 30, the expected rate of return may be multiplied with either the fair value of plan assets or with a "smoothed fair value", i.e., a moving average of plan asset fair values. Davis-Friday et al. (2007) show that the use of smoothed fair values can have material effects on companies' earnings, and they investigate whether investors detect and correct for the smoothing. They find mixed results. For the pooled sample, the difference between smoothed expected returns and fair value expected returns is significantly associated with share prices. However, in annual regressions the relationship is significant only in some years and for some of the regression techniques applied. In an additional model, annual changes in the differences between smoothed and fair value expected returns are not significantly associated with annual stock returns. The authors conclude that overall their results provide "mixed to limited support" that investors see through companies' earnings smoothing and appropriately adjust share valuations.

To summarize, the evidence on the effects of managerial discretion on the value relevance of pension accounting information is not conclusive. Pension accounting is highly complex, and companies' disclosures are not perfect (Fasshauer et al. 2008). This holds especially in the context of the German capital market which traditionally has been characterized by a lack of capital market supervision and a relatively weak enforcement system (Glaum and Street 2003, Leuz and Wüstemann 2004). Furthermore, papers by Franzoni and Marín (2006) and Picconi (2006) produce evidence that suggests that capital market participants have difficulties processing detailed pension disclosures of U.S. companies and that, as a consequence, stock markets are not fully efficient with regard to pension accounting information.

At the same time, given the intensive discussion of the German pension system and of pension accounting by financial analysts, rating agencies and other observers in recent years, (Gerke et al. 2003) we would expect capital market participants to be generally aware of the scope for discretion and the possibility of managerial manipulation in pension accounting. We therefore assume that, investors can at least partially "see through" and correct for companies' reporting practices. To test these expectations, we formulate the following hypothesis:

H-4: Investors adjust valuations depending on the degree of aggressiveness of companies' actuarial assumptions; that is, all else being equal, we expect that a 1€-increase in pension

obligations is associated with a stronger marginal decrease in the market value of equity (i.e., β_{DBO} will be higher) for companies with aggressive assumptions compared to companies with non-aggressive assumptions.

In order to test hypothesis H-4, we collect information on discount rates and expected salary progression rates applied by our sample companies. Using the yearly medians of these assumptions as simple benchmarks, we group companies into two groups, companies with "aggressive" assumptions and companies with "non-aggressive" assumptions. We then run the following model for both sub-samples:

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_4 DBO_{it} + \beta_5 PLA_{it} + \varepsilon_{it}$$

If investors are able to differentiate between companies with "aggressive" and "non-aggressive" assumptions, we would expect the estimate of β_4 to be larger for the "aggressive" sub-sample of companies, indicating that investors attach a higher multiple to the published DBO of such companies (Petroni and Wahlen 1995, Carroll et al. 2003). If, on the other hand, investors lose confidence in "aggressive" companies' pension accounting practices so that reported pension accounting information completely loses its decision usefulness, we would expect β_4 not to be significant at all.

In a further test we use the following model to test whether investors are aware of the degree of aggressiveness of companies' actuarial assumptions and correct their valuations accordingly:

$$P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_4 DBO_{it} + \beta_5 PLA_{it} + \beta_6 D_{aggr} + \beta_7 D_{aggr} DBO_{it} + \varepsilon_{it}$$

where D_{aggr} is a binary (dummy) variable that has the value 1 for companies with "aggressive" actuarial assumption (otherwise zero). If investors correct valuations for "aggressive" assumptions, we would expect β_6 to be significantly negative, i.e., we expect them to put a discount on their market value, and/or β_7 to be significantly negative, i.e., we expect a higher valuation multiple for such companies' DBO estimate.

Differentiating between two groups of companies, those with "aggressive" assumptions and those with "non-aggressive" assumptions, and partitioning the sample or inserting a dummy variable in the valuation equation, is of course rather crude. In a further, more refined model we assume that the regression coefficient on DBO, β_4, is a linear function of the difference between the actuarial assumptions selected by the companies and benchmark assumptions. More precisely, we substitute the coefficient on DBO with the following function:

$$\beta_4 = \beta_{DBO} = \upsilon + \lambda\, Diff$$

where *Diff* is the difference between company i's actuarial assumption and the median assumption per year. Substituting β_4 in the above equation with ($v + \lambda Diff$) results in:

$$P = \beta_1 + \beta_2 BVEbP + \beta_3 NIbP + \beta_4 PC + vDBO + \lambda(Diff * DBO) + \beta_7 PLA + \varepsilon$$

If investors see through pension accounting practices and correct valuations for "aggressive" actuarial rate assumptions, we would expect λ to be significantly negative, i.e., we would expect the multiple attached to companies' DBO to be a function of the differences between the actuarial assumption selected by company i and the median assumption.

IV. Data, sample and descriptive statistics

All accounting data for this research has been hand-collected from our sample companies' annual reports. Data on security prices and the number of shares outstanding have been acquired from Datastream. We use the share price at end of March the year following the fiscal year end (for all sample firms fiscal year end is December 31). In Germany some firms have issued preferred and ordinary shares. For those firms, the numbers of shares outstanding were added across the two share classes and an average share price, weighted by the shares outstanding of each share class, is used in regressions.

>>> put Table 1 about here <<<

Our sample was selected from the total population of the 369 firms listed in the Prime Standard of the German Stock Exchange as of December 31, 2004. From the beginning of 2003 onwards, firms in this segment of the German capital market were required by the German Stock Exchange to prepare their financial statements according to either IFRS or U.S. GAAP in order to comply with international accounting and transparency standards. However, as mentioned many large, multinational German firms had already voluntarily adopted IFRS or U.S. GAAP in the second half of the 1990s or in the early 2000s. This is a prerequisite for our research because traditional German GAAP pension accounting is very different from IFRS and U.S. GAAP pension accounting, and German GAAP pension related disclosures are much less extensive and informative than those required under either IFRS or U.S. GAAP. We screened the annual reports 2004 of all 369 companies listed in the Prime Standard as of December 31, 2004, so as to identify the maximum number of users of IFRS and U.S. GAAP before IFRS became mandatory for exchange-listed companies, from the year 2005 onwards, following the EU IAS regulation from July 2002. We eliminated all non-German companies, all financial services companies, and all companies that do not have material defined benefit plans or were subject to several other restrictions (see Table 1 for details). The selection process resulted in our final sample of 101 companies. For these companies, we hand-collected non-pension and detailed pension accounting data from IFRS or U.S. GAAP annual reports as far as they were available, going back as far as 1999 and forward to the year 2006. Our total sample is made up of 598 firm-years. The year 1999 was

chosen as the earliest accounting period because from this year onwards a major revision of IAS 19 was applicable. Panel B of Table 1 presents the distribution of our panel sample across years; it shows that the sample steadily increases over the sample period.

In Table 2, we present descriptive statistics on share prices and pension accounting information for our sample companies. Panel A summarizes pension information as reported in companies' annual financial statements, Panel B presents summaries for the per-share data that is being used in our regression analysis.

>>> put Table 2 about here <<<

As has been explained earlier, German firms have low levels of plan assets compared to pension obligations (DBO). The median (mean) DBO is € 27.91 m (€ 1,672.93 m), whereas the median (mean) of plan assets (PLA) is only € 1.10 m (€ 888.14 m). When compared directly, the averages of the funding status (FS) and the net recognised pension liability (NRPL) are relatively similar. Put differently, unrecognised amounts (TURA) are not very large on average (median: € 10.00 m; mean: € 108.03 m). However, behind these figures are firm-years with unrecognized gains and losses which cancel each other out. Secondly, in the last years of the sample period there has been a tendency for TURA to decrease as a result of two factors – the increase in interest rates in 2006, and the full recognition of actuarial gains and losses in equity as required by FAS 158 and allowed by the IAS 19 as revised in 2004. Thirdly, the maximum (€ 8,103.00 m) and minimum (€ -1,463.00 m) numbers document that TURA can become very substantial in some cases. We will provide more details on companies' unrecognized amounts in a later section of the paper.

V. Empirical results

1. Value relevance of alternative pension accounting measures

In order to test the first three of our hypotheses, we follow prior literature (Barth et al. 1993, Coronado/Sharpe 2003, Hann et al. 2007a, Kiosse et al. 2007) and regress non-pension and pension accounting information on current market values of equity by applying the following empirical versions of the Ohlson-model.

Model (1): $P_{it} = \alpha_t + \beta_1 BVE_{it} + \beta_2 NI_{it} + \varepsilon_{it}$

Model (2): $P_{it} = \alpha_t + \beta_1 BVE_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \varepsilon_{it}$

Model (3): $P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_4 NRPL_{it} + \varepsilon_{it}$

Model (4): $P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_5 FS_{it} + \varepsilon_{it}$

Model (5): $P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_6 DBO_{it} + \beta_7 PLA_{it} + \varepsilon_{it}$

Model (6): $P_{it} = \alpha_t + \beta_1 BVEbP_{it} + \beta_2 NIbPC_{it} + \beta_3 PC_{it} + \beta_8 NRPL_{it} + \beta_9 TURA_{it} + \varepsilon_{it}$

All models are on a per share basis. Model (1) is a benchmark model, which includes only the book value of equity and net income, BVE and NI. Model (2) extends model (1) by partitioning net income into income before pension costs, NIbPC, and total pension cost, PC, permitting each component to have different valuation weights.[33] In model (3) and model (4) financial-position related pension accounting variables are separated from the book value of equity, the recognised net pension liability (NRPL, model (3)) and the funding status (FS, model (4)). Model (5) and model (6) differ from model (4) in that they partition the funding status in two ways. In model (5) the funding status is split into the defined benefit obligation (DBO) and in plan assets (PLA). Alternatively, in model (6) we split the funding status into that part that is presented on the face of the balance sheet (NRPL) and the total unrecognised amounts (TURA), i.e., the off-balance-sheet parts of the funding status which are mainly caused by the application of the corridor approach.[34]

We use a panel regression approach based on data for 598 firm-years relating to 101 companies for the years 1999 to 2006. We need to take into account that regression residuals may be correlated across years and/or across firms (Petersen 2007). Therefore we control for possible time effects by using year-dummies (not tabulated), and we use clustered standard errors to control for possible within-firm correlations. These standard errors are also robust to heteroscedasticity in accordance with White (1980).

>>> put Table 3 about here <<<

Table 3 presents summary statistics for our estimations of models (1) to (6). For each model, we present estimated coefficients, standard errors, t- and p-values. All models explain about half of the cross-sectional variance in share prices; the R^2s range between 50.2% and 52.7% which is similar to U.S. studies (e.g., Hann et al. 2007a, Kiosse et al. 2007). For all models, equity book value and income coefficients are, as expected, positive and highly significant. As one might expect, and as is usual in this line of empirical research (see, for example, Landsman 1986, Gopalakrishnan/Sugrue 1993, Choi et al. 1997, Davis-Friday et al. 1999, Davis-Friday et al. 2007), some of our independent variables are highly correlated with each other. Therefore, here and in the following regressions we are concerned that our results

[33] Following prior literature (e.g., Hann et al. 2007a, Kiosse et al. 2007), we allow for the tax deductability of pension costs, using a standard tax rate of 30%. Thus, NIbPC is equal to NI + (1-0.30)PC.

[34] Some of the information used in our regressions is recognised on the face of companies' balance sheets or income statements while other information is disclosed in the notes. In other words, as is common in value relevance research, our research questions on the relative (smoothed corridor measures vs. fair values) and incremental (unrecognized actuarial gains and losses) value relevance of alternative pension measures are linked with a further accounting question, the question whether financial statement users give the same weight to information that is recognised in comparison to information that is disclosed. Research by Davis et al. (2004) indicates that disclosure of information may indeed not be a perfect substitute recognition, and the results of and Picconi (2006) furthermore suggest that analysts and investors are not able to fully understand and process the complex pension accounting disclosures.

might be influenced by multicollinearity. However, inspection of the variance inflation factors (VIF) reveals that multicollinearity does not pose a serious problem. In five of the six estimations, all VIF-statistics are very moderate and not close to the critical value of 10 (Gujarati 1995, p328). Only in model (5) where the funding status is split into the DBO and the fair value of plan assets, one of the VIF-values is higher than 10 (VIF_{DBO}=16.45).

Results for model (2) to (6) indicate that pension accounting information of German firms is generally value relevant. In model (2) the pension cost coefficient is negative, in line with theoretical considerations; it is significant on a 10%-level (t=-1.768, p=0.080). Model (3) separates equity in equity before pension and the net recognised pension liability. As expected, the net recognised pension liability coefficient is negative and significant on a 1%-level (t=-3.070, p=0.003). Model (4) separates equity in equity before pension and the funding status. In accordance with the fact that almost all German companies' pension plans are underfunded the funding status coefficient is also negative and significant on a 1%-level (t=-3.665, p=0.000).

Comparing the estimation results for model (2) to those for model (3) and (4) shows that the coefficient on pension costs loses its significance when we partition financial-position related pension variables from equity. In model (3) and in model (4), and indeed in all further model specifications that comprise separate terms for companies' net pension obligations, the financial-position related pension variables are highly significantly associated with share prices while pension cost does not have any incremental explanatory value. Hence, we cannot reject hypothesis H-1. Our finding is in line with the results of Barth et al. (1993), and it is in contrast to the later results of Coronado and Sharpe (2003). Our results are consistent with investors focusing on the high pension funding deficits of German companies rather than on periodic pension costs.

Regarding our second research question – has the fair-value based funding status a stronger explanatory power for the market value of equity or the "smoothed" recognized net pension liability? – results are not clear-cut. The t-value for the estimated regression coefficient on FS (-3.665) in model (4) is somewhat higher in absolute terms than the t-value of the regression coefficient on NRPL (-3.070) in model (3), which may be taken as an indication for a somewhat stronger share price association of the funding status. However, both regression coefficients are significant at the 1%-level. Furthermore, the explanatory power is higher for all equation models that include the funding status or its components (i.e., models (4) to (6)) compared to model (3) which includes the "smoothed" net recognised pension liability. However, the differences are only minor, with the adjusted R^2 rising from 0.517 for model (3) to 0.522 for model (4) and to a maximum of 0.527 for model (6). Therefore, given that the results do not unambiguously support a stronger value relevance of the funding status compared to the "smoothed" net recognised pension liability, we have to reject hypothesis H-2.

Our third research question asks whether actuarial gains and losses that remain unrecognized because of companies' application of the corridor method are incrementally value relevant over the net recognized pension liability. This question, which is closely related to the above discussed second question, is addressed by model (6). On the one hand, the unrecognized amounts represent the most recent and possibly the „most relevant" (FAS 87, para. 104) information; on the other hand, they may also reflect transitory short term fluctuations and measurement error.

As can be seen in Table 3, the coefficient on TURA is negative and significant on the 10%-level (t=-1.966, p=0.052). The negative sign is in line with our expectations because TURA represent on average unrecognized losses, i.e., pension deficits not recognised in companies' balance sheets. Taken at face value, this suggests that investors regard actuarial gains and losses which are not recognized but disclosed in the notes as relevant to the valuation of companies' stocks.

2. Value relevance of unrecognized actuarial gains and losses: further robustness checks

Given the long-standing debate about the advantages and disadvantages of the income and the asset-liability approach in pension accounting (Glaum 2009), the incremental value relevance of actuarial gains and losses is conceptually important and potentially of interest to standard setters. In the following we therefore examine this issue further. In Panel A of Table 4, we present detailed year-by-year information on companies' total unrecognized gains and losses, and in Panel B we depict data on how companies exercise the recognition option that was offered to them by FAS 87 and still is part of IAS 19. We use this information to test for the robustness of the above discussed results, and to investigate in more detail the value relevance of the off-balance sheet portion of companies' pension deficit, and thereby the potential decision usefulness of pension fair values.

>>> put Table 4 about here <<<

The regression estimation results presented in Table 3 are based on our total sample which includes both firm-years with non-recognised gains and firm-years with non-recognised losses. As shown in Table 4, Panel A, there are 351 firm-years with non-recognised losses and 99 firm-years with non-recognised gains. Lumping together this information in one variable may introduce noise into the estimation of model (6). We therefore split our total sample into firm-years with non-recognised gains and firm-years with non-recognised losses and run the regression for model (6) again separately for both sub-samples. The results are presented in Panel A of Table 5. They are consistent with capital market participants separating and treating non-recognised actuarial gains and losses rationally. In line with theoretical considerations, in the sub-sample with non-recognised losses the coefficient on TURA is

negative, whereas it is positive for the firms-years with non-recognised gains. In both cases the coefficient on TURA is significant, albeit on a higher level of significance for the sample with non-recognised gains. The other results are broadly similar, with the exception of the coefficient for BVEbP for the (much smaller) sub-sample of firm-years with non-recognised gains which is not significant at conventional levels (t=1.547, p=0.129).

>>> put Table 5 about here <<<

In Panels B and C of Table 5 we examine the value relevance of the unrecognised pension amounts of our sample firms in two further directions. As mentioned above, in the last part of our sample period, there has been a tendency for TURA to decrease. As documented in Panel A of Table 4, the decrease is very pronounced for 2006, our last year of observation. While the median (mean) company had non-recognized losses of € 0.79 m (€ 124.54 m) in 2005, this figure drops to € 0.06 m (€ 43.58 m) in 2006. Two factors are behind this development. Firstly, IAS 19 as revised in 2004 has given companies the option to recognize actuarial gains and losses in equity, and FAS 158 has required companies to do so for all financial years ending after December 15, 2006. The accounting method selected by our sample companies is presented in panel B of Table 4. Two companies decided the IAS 19 equity recognition option already in 2004, and by 2006 a total of 27 companies fully recognize all actuarial gains and losses in equity.[35]

A second factor that has contributed to the decline in TURA has been the increase in the interest rate in the year 2006. Actuarial gains (losses) result when over time the market interest rate is higher (lower) than the rates applied by companies in their prospective valuations of their pension obligations. Over the first half of the decade, the average return on corporate bonds shrunk from 6.2% in 2000 to 3.7% in 2005.[36] Given the sensitivity of pension obligations to interest rate changes, this marked interest rate decrease caused a substantial increase in companies' DBO, and it contributed strongly to the accumulation of actuarial losses over that period (see Table 4, Panel A). In 2006, however, bond returns began to rise again. The increase of the average return to 4.2% resulted in actuarial gains, which lead to a reduction of the total accumulated unrecognised losses from the previous years.

Since we are interested to find out how capital market participants perceive and treat unrecognized gains and losses, we exclude the year 2006 from the analysis, that is, we run the regression for model (6) again for the years 1999 to 2005 only. In Panel B of Table 5 results are presented for all companies and for two sub-samples, companies that apply the corridor

[35] A number of other, generally rather smaller companies have been using the option to recognize actuarial gains and losses through income, presumably to avoid the complexities of the corridor method (keeping secondary accounts, amortization over long periods of time, etc.).

[36] See Deutsche Bundesbank, Capital Market Statistics, available online at: http://www.bundesbank.de/volkswirtschaft/vo_beihefte.php. IAS 19, para. 78, prescribes that market yields for high quality corporate bonds have to be used to discount future expected pension payments.

method and companies with non-recognised losses. For all companies, the coefficient on TURA is again negative; and it is significant on slightly higher level (t=-2.219, p=0.029) compared to the earlier results for the total sample as presented in Table 3 (t=-1.966, p=0.052).[37] The next two columns show estimation results for the sub-samples of companies that apply the corridor method and for companies that have non-recognized losses over the years 1999-2005. For both sub-samples, the coefficients on TURA are negative and significant on the 10%-level. We also run the regression again for companies that chose to recognize all actuarial gains and losses, either through the income statement or, since 2004, through equity (see Table 4, Panel A). For these companies, non-recognized amounts do not exist or are very small (they may result from unvested past service costs, IAS 19, para. 96). As expected, in this regression the coefficient on TURA is not significantly different from zero, while all other estimation results are qualitatively similar to the results for the sub-sample of corridor companies (results not tabulated).

Finally, in Panel C of Table 5 we take into consideration that under the corridor approach there is a tendency for non-recognized amounts to accumulate over time (Amen 2007). That is, for companies that have only recently adopted IFRS or U.S. GAAP, non-recognized amounts will normally be small, while companies that have been using IFRS or U.S. GAAP over longer periods of time are likely to build up unrecognized balances, especially when interest rates move relatively steadily in one direction as was the case over the first half of the 2000s. Our earlier results may therefore be biased or at least noisy due to the fact that our total sample is made up of companies that adopted international standards already in the course of the 1990s and other companies that only adopted them in 2004. We therefore exclude all companies that have not applied IFRS or U.S. GAAP for at least four years and estimate model (6) again with the resulting sub-sample of "seasoned" IFRS or U.S. GAAP users. The results are presented in Panel C of Table 5. Again, we present results for all firms, for corridor firms and for firms with non-recognized losses. For all three sub-samples, the results support our previous findings. More specifically, the coefficient on TURA is significantly negative, and all other estimates are similar to the above discussed results for the total sample.

Finally, what is apparent from Tables 3 and 5 is that the valuation multiples investors attach to TURA are higher than the coefficient for NRPL (or for FS). Whereas the absolute values of the estimates for the coefficients on NRPL in the different variants of model (6) range between a minimum of 2.133 and a maximum of 3.192, the values of the estimates for the TURA coefficients are more than twice as high in all model specifications. Conceptually, this

[37] The coefficient on pension costs is significantly positive in this model specification (t=2.081, t=0.040). We do not have a ready explanation for this counter-intuitive result. It is possible that it is due to chance, resulting from the relatively high standard deviation. It may be interesting to note in this context that Barth et al. (1992) in their study on the value relevance of pension cost components find that the coefficient on service cost is measured with a significantly positive sign. Hann et al. (2007a) suggest that the positive relation between service cost and stock prices could be attributable to service cost serving as a proxy for value created by human capital.

is consistent with investors perceiving TURA to be inherently more uncertain than the recognized net pension liability. However, except for firms with acturial gains, formal tests of equality of the coefficients on NRPL and TURA fail to reject the null hypothesis that both components are valued equally by the capital markets (see bottom of Table 5 for test results).

To conclude, while we find only very weak evidence that fair value estimates of companies' pension funding status are more value relevant than "smoothed" recognized net pension liabilities, our initial results presented in Table 3 and further robustness tests provided in Table 5 suggest that actuarial gains and losses that remain unrecognised as a result of the corridor approach are incrementally value relevant over net recognized pension liabilities. Hence, we cannot reject hypothesis H-3. The unrecognized amounts are not shown on the face of companies' balance sheets, they are "only" disclosed in the notes which may let them appear less prominent and less relevant in the eyes of capital market participants (Coronado and Sharpe 2003, Davis-Friday et al. 2004, Picconi 2006). Furthermore, critics have raised doubts concerning their reliability given that they reflect short-term valuation effects and may therefore be subject to measurement error. Despite these concerns, our results suggest that capital market participants perceive these amounts as value relevant and, thus, as decision useful.

Our finding can be interpreted as support for the full recognition of companies' net pension obligations in the balance sheet as mandated by FAS 158 and proposed by the recent IASB pension accounting discussion paper (IASB 2008). However, it should be noted that our results pertain to the measurement of assets and liabilities in the balance sheet. We do not address the question of how fair value changes should be presented in the statement of comprehensive income. This question is currently discussed in the context of the IASB pension accounting project (IASB 2008, also see PAAinE 2008). Hann et al. (2007a) document that that fair-value based pension cost measures are highly volatile and, hence, less value relevant than pension costs that are smoothed with the corridor approach. Moreover, Hann et al. (2007a) and Kiosse et al. (2007) show that recurring pension cost components – service costs, interest costs, expected returns on plan assets – are systematically correlated with stock market valuations, whereas the much more volatile fair value changes of pension assets and liabilities are not. This demonstrates further changes to U.S. GAAP or IFRS pension accounting needs to be coordinated with the standard setters' project on financial statement presentation. In particular, standard setters should be concerned not to promulgate rules that would result in persistent pension cost components being mixed up with transitory components since this would reduce the decision usefulness of the pension cost information and of earnings in general.[38]

[38] See PAAinE, 2008, chapter 8, for further discussion on this point.

3. Value relevance of level-3 pension fair values: the impact of managerial discretion

We now turn to our fourth and fifth hypothesis and investigate whether the value relevance of German companies' level-3 pension fair values is influenced by managerial choices regarding the assumptions underlying the estimates. Our aim is to find out whether the disclosures of the actuarial assumption themselves are value relevant and whether capital market participants perceive and adjust for possible managerial manipulation of valuation estimates. We therefore hand-collected the company-specific discount rates and the estimated rates of future salary increases for each firm-year from the annual reports. Given that German pension law requires companies to index the benefit trend to inflation,[39] companies have relatively little scope for discretion with regard to this assumption. We therefore do not include the benefit trend in our analysis.

>>> put Table 6 about here <<<

Table 6 provides descriptive statistics on discount rates and salary rate assumptions disclosed by the companies. A first observation is that not all companies disclose the interest rate and salary rate assumptions, even though this is required by IAS 19 and FAS 87.[40] A second observation we derive from Table 6 is that the salary rate assumptions display a much higher standard deviation than the interest rate assumptions. The yearly standard deviations for the interest rates range from a minimum of 0.26% in 2006 to a maximum of 0.49 % in 1999. For the salary increases, the yearly standard deviations range from 0.65% in 2002 to 0.96 in 1999. The standard deviation of the salary increases is larger in every year than that of the interest rate, even though the average values are much lower. The higher variance of the salary rate increase assumptions is to be expected. Whereas for the interest rate a market rate serves as an entity-unspecific benchmark (IAS 19, para. 79), no general benchmark exists for the salary rate. Instead, the expected future salary increases for a company's workforce depend, *inter alia*, on its industry, the composition of its workforce, its remuneration policy, and its bargaining power in the labour market. Hence, it is relatively transparent whether and to which degree a company deviates from a market interest rate, while it is much more difficult for analysts and investors, or indeed for auditors, to challenge company management's salary progression assumption. We can conclude that management has a wider scope for discretion when setting the salary progression rate than when setting the discount rate.

In order to gauge whether investors are sensitive to the uncertainty pertaining to the estimation of pension fair values we firstly split our sample into those companies that comply

[39] See § 16 BetrAVG.

[40] See IAS 19, para. 120A (n), FAS 132(R), para. 5 j. Even more companies (141 firm-years) fail to disclose the benefit trend assumption.

with disclose requirements concerning actuarial assumptions (478 firm-years) and those companies that choose not to disclose assumptions fully (120 firm years). Without disclosures, capital market participants cannot evaluate whether valuations are based on reasonable assumptions. Consequently, the uncertainty surrounding the level-3 fair-value estimations increases substantially. We run regressions estimations separately for both sub-samples. Here, and in the following, we use model (5) because we are interested in the effects uncertainty and possible managerial manipulation has, in particular, on the value relevance of the level-3 fair-value estimate of the DBO, i.e. on β_{DBO}.

The results for these estimations are presented in Panel A of Table 7. The first column presents again the results for our total sample of all 598 firm-years. The second column shows the results for the sub-sample of companies that fully comply with IAS 19 and FAS 87 disclosure requirements concerning discount rates and expected rates of salary increases. The results are very similar to the results for the full sample. The third column presents the estimation results for the sub-sample of firm years where assumptions are not fully disclosed. The results indicate that investors are aware of the footnote disclosures and react to the increase in uncertainty resulting from a failure to disclose assumptions by putting a heavy discount on the value of such firms. More specifically, the estimate for the regression coefficient on DBO is about six times higher than the estimate for the subsample of companies that fully disclose required actuarial assumptions. Despite the relatively small sample size, the estimate is significant at the 5%-level (t=-2.690, p=0.012). Furthermore, the estimate for the regression coefficient on plan assets for these companies is not statistically significant.[41]

>>> put Table 7 about here <<<

In order to gain more insight into how capital market participants react to uncertainty, and in particular to the possibility of managerial manipulation, in the following we broadly classify companies into two groups, those that apply "aggressive" actuarial assumptions and those with "non-aggressive" assumptions. Following prior literature (Brown 2006, Hann et al. 2007b), we use the yearly median rates as simple benchmarks. Regarding the interest rate, companies are classified as being "aggressive" if they select an interest rate (r_{it}) above the median interest rate for the respective year (r_t^*), i.e., $r_{it} > r_t^*$. Analogously, for the salary rate a

[41] The estimation results for this regression have to be interpreted with care. Possibly because of the rather small sample size (n=120), a relatively high degree of multicollinearity is present, especially with regard to DBO and PLA (VIF_{DBO}=28.4, VID_{PLA}=30.2). Multicollinearity does not cause biased results, but it leads to high standard errors for regression coefficient whose estimation thus becomes unreliable. However, further analysis reveals that if we net DBO and PLA and run the regression again with the funding status (FS), VIF-statistics are now all lower than the critical value of 10 and our results remain qualitatively unchanged, i.e., the coeffient on FS is statistically significant and it has a much higher value than the coefficient for parallel regression for companies that do fully disclose actuarial assumptions.

company is classified as having an "aggressive" rate if its selects a salary rate (s_{it}) below the median salary rate of the respective year (s_t^*), i.e., $s_{it} < s_t^*$. Companies that apply "aggressive" rates defined in this manner have, *ceteris paribus*, a smaller defined benefit obligation compared to the median firm.

We are aware of the fact that our classification based on deviations of discount rates and salary rates from yearly medians is a rather crude approach. In fact, valid reasons can exist for companies to choose relatively high discount rates or relatively low expected salary rate increases. For example, if the interest-rate term structure is normal and companies have a relatively "young" population of pension plan beneficiaries with, consequently, above-average expected maturities of pension obligations, this would justify an above-average discount rate. Similarly, companies in mature and relatively low-tech industries, where pressure on salary rates is relatively low, companies have reason to apply below-average salary progression rates. However, firstly, investors (or academics) who do not have access to inside information may use comparisons with median rates as a relatively simple way to evaluate whether companies' actuarial assumptions are reasonable. Secondly, noise introduced by erroneously classifying companies as "aggressive" or "non-aggressive" will work against finding significant results in our following regressions.

We again employ model (5) to investigate whether "aggressive" vs. "non-aggressive" firms have different valuation relevance characteristics. As before, our focus lies on the valuation coefficient on the defined benefit obligation (β_4). Results are presented in Panels B (discount rate) and C (salary rate) of Table 7. The first column of Panel B shows the regression results for model (5) for 389 firm-years with "non-aggressive" discount rates. The second column presents the results for model (5) for 202 firms-years with an "aggressive" discount rate. In addition, in the third column of Panel B results are shown for a dummy-variable approach where model (5) is augmented with a binary variable D_{aggr} and an interaction term, D_{aggr} DBO_{it}. The dummy variable has the value 1 for companies with "aggressive" actuarial assumption and 0 for all other companies. Panel C is structured analogously, based on the "aggressiveness" of companies' salary rate assumptions.

Turning to Panel B first, we find that the estimation results are relatively similar across the two discount rate sub-samples. In particular, the estimated coefficients on the DBO are both negative and significant on the 1%-level. Based on the reasoning developed in prior research (e.g., Petroni and Wahlen 1995, Carroll et al. 2003) we can interpret the larger magnitude of the coefficient for the sub-sample of aggressive companies ($\beta_{DBO}^{non\text{-}aggressive}$=-2.099 vs. $\beta_{DBO}^{aggressive}$=-3.803) as a reaction of investors to the higher valuation uncertainty. Put differently, the result is consistent with investors putting a discount, or a risk premium, on the market value of equity of companies with "aggressive" discount rates. However, the difference between the β_4-estimations for "aggressive" and "non-aggressive" companies is relatively small, especially if compared to the large discount for companies that do not fully

disclose actuarial assumptions. In line with this, the results for the dummy variable D_{agg} in the third column of Panel B is not significant (t =0.565, p = 0.574), i.e. the valuation of share prices does not differ systematically between the two sub-samples of companies with "aggressive" and "non-aggressive" discount rates. The interaction term is marginally significant on the 10% level (t=-1.709, p=0.091), indicating again that the valuation multiple for "aggressive" companies is higher. However, the magnitude of this effect is very small, with an estimated β of -0.001.

Panel C presents results for the estimation of model (5) for the two sub-samples of companies with "aggressive" and "non-aggressive" salary rates. A comparison of the two sets of results reveals that investors react more strongly to our categorisation of salary rate assumptions than to that of the discount rate. More precisely, for the sub-sample of 203 firm-years which are categorised as having "aggressive" salary rates, the coefficient on the DBO is no longer significant (t=-1.344, p= 0.184). It is significant, however, for the sub-sample of 275 firm-years with non-aggressive salary rates (t = -2.193, p = 0.032). Moreover, the coefficient on the dummy variable in the last column of panel C has a negative sign and it is significant on a 10%-level (t=-1.953, p=0.054). This suggests that companies which choose an "aggressive" salary rate get penalized by investors. Taking results at face value, a company with an "aggressive" salary rate assumption has a share price that is € 7.4 lower than a company with a "non-aggressive" salary rate assumption. Given that the median (mean) share price of our sample companies is € 18.65 (€ 20.05), this is an economically very significant discount. An argument by Barth (1991) may provide a further explanation for the size of the discount. As she points out, the salary rate projection includes, among other factors such as inflation, a measure of expected future productivity changes. Thus, by choosing an "aggressive" salary rate managers may also convey a signal about below-average expected future productivity changes.

Overall, the evidence presented so far allows us not to reject hypothesis H-4. Our findings indicate that capital market participants adjust valuations depending on the degree of "aggressiveness" of companies' actuarial assumptions. All else being equal, the more "aggressive" the assumptions, the higher the valuation multiple investors put on companies' defined benefit obligation, and the lower is therefore the market value of companies' equity. Our findings also suggest that the sensitivity with which investors react to "aggressive" assumptions differs between actuarial assumptions. Investors react strongly to above-median salary rate assumptions whereas reactions are very moderate to above-median discount rates. This is not surprising because, as explained above, the interest rate assumptions is more transparent and can be challenged more easily by analysts and investors than the salary progression rate assumption. Secondly, below-median salary rates may not only be taken as an indication for an "aggressive" accounting policy but as a signal for below-average future productivity and, hence, operating performance.

4. Value relevance of level-3 pension fair values and managerial incentives

In the following, and final, part of our investigation we want to investigate whether investors are aware of managerial incentives for setting "aggressive" actuarial assumptions. More precisely, we examine how investors adjust their valuations with regard to "aggressive" interest rates when for companies with completely unfunded pension plans, i.e. where PLA=0.

>>> put Table 8 about here <<<

Prior U.S based research suggests that the level of underfunding of pension obligations is a moderator for opportunistic managerial incentives resulting from agency considerations (Asthana 1999, also see Hann et al. 2007b on this point). We expect that this also holds for the German pension system. In Germany, it is not mandatory for companies to fund defined benefit pension plans, not even to minimum levels. As has been mentioned earlier, some companies have voluntarily built up plan assets over recent years to comply better with the expectations of financial analysts, rating agencies and investors in international (Anglo-Saxon) capital markets (Gerke et al. 2003). Table 8 presents yearly summary statistics for plan assets (Panel A) and for the funding ratio (Panel B), i.e., the ratio of plan assets divided by the defined benefit obligation, for our sample companies. Plan asset increase from a median (mean) of € 0.00 m (€ 1,148.24 m) in the year 2000 to a median (mean) of € 3.09 m (€ 1,090.69 m) in the year 2006. The funding status increases from a median (mean) of 0% (19.13%) in 2000 to a median (mean) of 30.60% (33.00%) in the year 2006.

However, setting aside plans assets is costly, both from a value-maximization and a managerial, or agency, perspective (Jensen 1986); it therefore has the potential to be a credible signal from managers to capital market participates (Ross 1977, Masulis 1980). IAS 19 requires that plan assets are legally separated, bankruptcy protected, not returnable to the sponsoring entity.[42] Thus, managers forgo control over cash without any obvious short-term benefit. In other words, the voluntary setting up of pension assets may be viewed as a signal for companies' financial strength as well as for company management's orientation at the interests of international investors. The complete lack of plan assets, on the other hand, may be a signal for relative financial weakness and, therefore, for a higher degree of uncertainty, and for possible opportunistic behavior by company management. Taken together, the management of companies with completely unfunded pension plans may have stronger incentives to manage the valuation of pension obligations downward by choosing more "aggressive" pension assumptions. Our investigation aims at finding out whether investors are aware of the incentives and whether they differentiate in their valuation decisions between

[42] See IAS 19, para. 7; similary FAS 87, para. 19.

companies with funded pension plans on the one hand and companies with completely unfunded pension plans on the other hand.

As mentioned, we are aware that our method of dividing our total sample in two sub-samples, companies with "aggressive" and companies with "non-aggressive" assumptions, is rather crude. In the following, we therefore apply a more refined model. In this model we assume that the regression coefficient on DBO in the model (5), $\beta_{DBO,}$ is a linear function of the difference in absolute terms between the interest rate assumption selected by company i and the median interest rate of a given year.[43] We model the coefficient on DBO, $\beta_{DBO,}$ as:

$$\beta_{DBO} = \beta_4 = \upsilon + \lambda * \Delta r^* \quad \text{where : } \Delta r^* = r_{it} - r^*_t$$

Substituting this expression for β_4 in model (5) results in the following "refined" model (5*):

$$P = \beta_1 + \beta_2 BVEbP + \beta_3 NIbP + \beta_4 PC + \nu DBO + \lambda(\Delta r^* DBO) + \beta_7 PLA + \varepsilon$$

>>> put Table 9 about here <<<

Results for the estimation of model (5*) are presented in Table 9. Results are shown for the complete sample and for the two sub-samples of companies with (partly) funded pension plans (PLA ≥ 0) and of companies with completely unfunded plans (PLA=0). The results do not differ notably for the total sample and the sub-sample of companies with funded pension plans. Both sets of estimation results are very similar to the above results for the "normal" model (5). Most importantly, the coefficient on the interaction term Δr*DBO is not significantly different from zero for the total sample (t=-0.345, p=0.730) and for the sub-sample of companies with funded pension plans (t=0.084, p=0.934). In other words, investors do not systematically adjust valuation multiples on the DBO for companies that (partly) fund their pension plans. In contrast, the coefficient on Δr*DBO is negative and significant at the 5%-level for the sub-sample of companies whose pension plans are completely unfunded (t=-2.329, p=0.024). According to this result, for companies with completely unfunded pension plans capital market participants do not take the reported DBO measure at face value but adjust the multiple on the reported DBO depending on the interest rate aggressiveness set by company management. For a company that chooses a rate that is lower by one percentage point than the median rate, the DBO multiple almost doubles from -1.849 to -1.849 + (-1.650) = -3.499.

In summary, the above results suggest that capital market participants are aware of incentives for opportunistic managerial behavior. They react to the "signal" German companies send out by voluntarily opting to fund pension plans. More precisely, investors appear to accept at face value level-3 estimates of pension fair values from companies with funded pension plans,

[43] Given our earlier finding that an aggressive salary rate leads to a coefficient on the DBO that is statistically not different from zero, we consider it not to be fruitful to apply the model to the salary rate assumption.

whereas they react to estimations of companies with completely unfunded pension plans by adjusting "aggressive" valuations. In this respect our findings are in contrast to those of Hann et al. (2007b) who find that the discretionary component of U.S. companies' reported DBO measures is priced by the stock market in the same manner as the non-discretionary component and that this result is independent from the funding level. Possible explanations for the different findings are, firstly, that the work of Hann et al. (2007) is based on data for U.S. companies that are subject to a more rigorous capital market and accounting enforcement system than our German sample companies. Secondly, Hann et al. (2007) do not differentiate in their analysis between managerial discretion with regard to the discount rate on the one hand and the salary progression rate on the other hand. Thirdly, due to the generally very low funding of pension schemes the management of German companies may face stronger incentives than their U.S. counterparts to make opportunistic use of the discretion they enjoy when setting actuarial assumptions. Of course this holds all the more for companies that do not fund their pension plans at all.

VI. Conclusions and limitations

In this paper we investigate the value relevance of pension accounting information of German companies. German companies traditionally do not fund their pension obligations externally. Thus, unlike companies from the U.S. or from other Anglo-Saxon countries many German companies show large net pension liabilities in their balance sheets. This exposes companies to long-term financial risk and gives rise to specific incentives for opportunistic managerial behaviour. Because of these idiosyncratic factors, the pension accounting of German companies provides for an interesting setting to study the effects of uncertainty and managerial incentives on the value relevance of level-3 pension fair values.

Our study is based on hand-collected pension accounting data for a sample of 101 German companies that have published IFRS or U.S. GAAP financial statements for the years 1999 to 2006. Overall, our evidence is consistent with level-3 pension fair values being value relevant and, thus, at least potentially decision useful to investors. Following a debate in the previous literature (Barth et al. 1993, Coronado and Sharpe 2003) we investigate whether information on German companies' periodic pension costs or information on pension obligations are more closely associated with stock prices. We find that for German companies financial position related information on pension obligations is more closely associated with stock prices than pension cost information. Secondly, we find some weak evidence that fair value estimates for companies' pension funding status are more value relevant than recognized net pension liabilities that are smoothed because of the application of the corridor method. Moreover, our results thirdly indicate that actuarial gains and losses that have in the past not been recognized in companies' balance sheets because of the corridor approach are incrementally value relevant over recognized net pension liabilities.

Finally, we investigate how capital market participants react to the uncertainty pertaining to level-3 estimates of pension fair values, and to the peril of managerial manipulation. This is an issue that so far has only received relatively little attention in the literature, and the limited evidence that is available is inconclusive (Brown 2006, Hann et al. 2007b, Davis-Friday et al. 2007). Our findings indicate that not only "standard" pension accounting measures such as the DBO are value relevant for capital market participants; in addition, the disclosures required by IAS 19 and FAS 158 on actuarial assumption appear to be value relevant by themselves. The disclosures allow investors to evaluate estimations of pension measures. Thereby, they limit the scope management has to set assumptions opportunistically. In the absence of disclosures, the uncertainty pertaining to level-3 pension fair values rises strongly. Investors appear to be aware of these considerations. Our findings suggest that they penalize companies that do not fully disclose assumptions by substantially increasing the valuation multiple on the reported defined benefit obligation measure.

Furthermore, in line with expectations our findings suggest that investors react to "aggressive" pension accounting assumptions by adjusting valuations accordingly. Investors seem to react more strongly to the degree of "aggressiveness" of the salary progression rate assumption than to that of the discount rate. This is to be expected given that interest rate assumptions are more transparent and can be challenged more easily by analysts and investors than the salary progression rate assumption. Finally, the results of our investigation suggest that investors are aware of incentives for opportunistic managerial behavior. According to our results, the voluntarily funding of pension plans by German companies is perceived in the capital market as a signal for financial strength and for an alignment of managerial behavior with investor interests. Consequently, investors accept at face value level-3 estimates of pension fair values from companies with funded pension plans. In contrast, they react to estimations of companies with completely unfunded pension plans by adjusting "aggressive" valuations.

Overall, the evidence provided by our empirical work suggests that investors are able to cope rather well with level-3 estimates of pension fair values. In this sense, our results can be interpreted as support for the recent changes in U.S. GAAP pension accounting which have made full recognition of companies' pension obligations in the balance sheet mandatory, and for plans of the International Accounting Standard Board (IASB) to adopt similar changes to its own pension accounting standard (IASB 2008).

Finally, it has to be pointed out that, like all empirical research, our work is subject to certain limitations and that therefore its findings have to be interpreted with care. In particular, the present study faces two sets of limitations: firstly, limitations inherent in its methodology, and, secondly, limitations related to our sample of German companies. Value relevance studies are one way of investigating whether financial accounting information is decision-useful to capital market participants, as intended by international standard setters (Barth 2000;

Beaver 2002). However, value relevance studies can only provide indirect evidence of decision usefulness. Based on our tests we cannot say whether investors have really made use of the German companies' pension fair values or of the actuarial assumptions disclosed in the notes to their statements. What we observe are associations between companies' market values and financial statement information which allow us to infer only that the financial statement information is consistent with the information set used by investors in their stock market valuation. Furthermore, our tests refer to the potential decision usefulness of pension fair values to stock market valuation, we do not investigate their usefulness for other purposes of financial reporting (e.g., contracting) (Holthausen and Watts 2001).

Turning to the second major source of limitations, as explained, the pension accounting of German companies provides an interesting case to investigate the value relevance of level-3 fair value estimations and the impact uncertainty and potential managerial opportunism has on the value relevance. At the same time, working with accounting and capital market data for German companies imposes certain limitations. An obvious limitation is the relatively small size of the capital market, especially if compared to the U.S. capital market. Given that we furthermore concentrate on companies that have voluntarily adopted international financial reporting standards by the year 2004, the sample size for our empirical study is limited. On the other hand, the limited sample size tends to work against finding results that are statistically significant. Lastly, as mentioned previously, national pension systems, accounting traditions, and capital markets differ across countries. Therefore, it would be interesting to extend our study by including data for companies from other countries and by analysing whether the specific properties of national pension or capital market systems have any bearings on the results. We leave this interesting question to further research.

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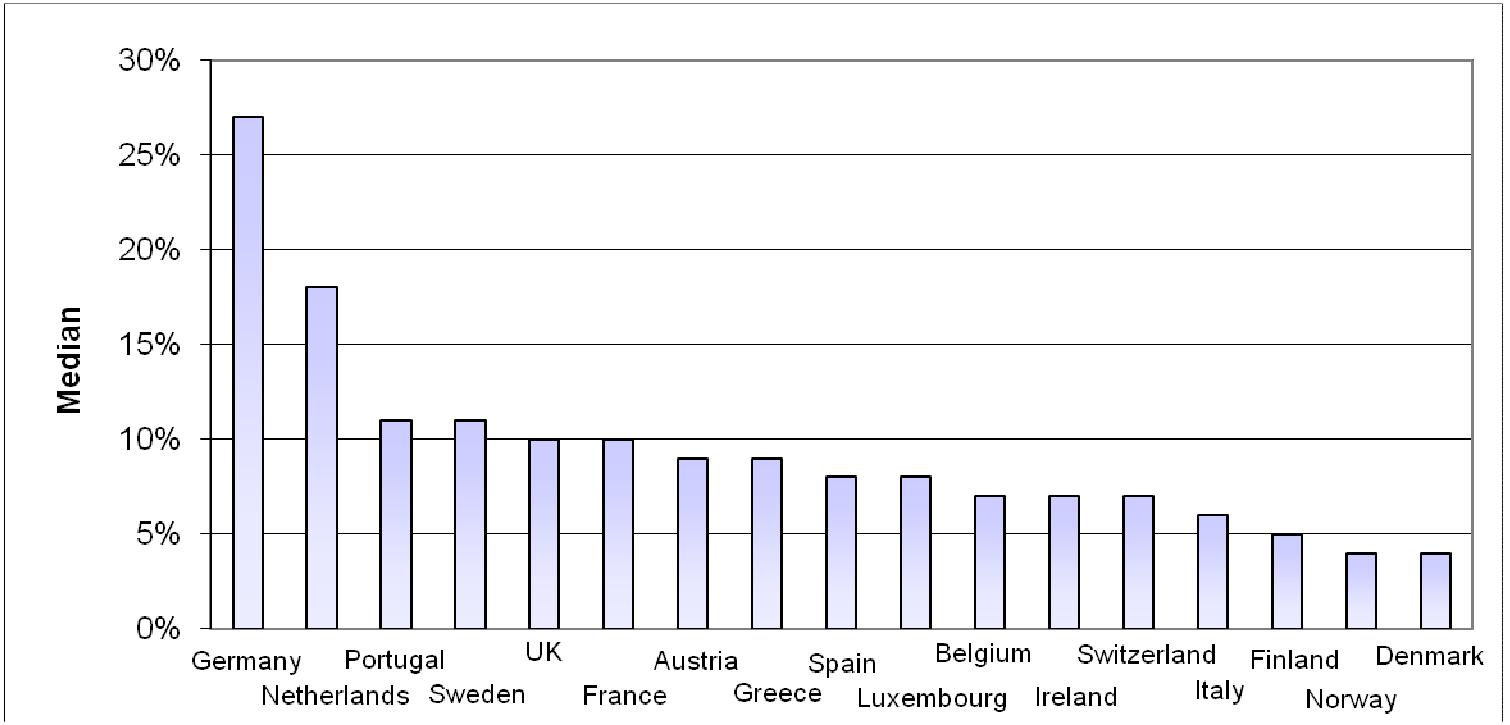

Figure 1: Funding deficits as percentage of equity, national averages (leading stock listed companies, 2005)
Source of data: Fasshauer et al. (2008).

Table 1: Sample Selection

Panel A: Selection of sample firms

	No. of firms
German Stock Exchange Prime All Share Index as of December 31, 2004:	369
- double counting of preferred and ordinary shares	-13
- consolidated by other firms within sample	-6
Independent prime standard firms as of December 31, 2004:	350
- non-German firms	-39
- only preferred shares issued	-11
- financial service sector firms	-27
- end of accounting period not Dec. 31	-38
- German GAAP	-34
- annual reports not available	-2
- no material defined benefit plans	-94
- poor pension disclosures	-4
Sample as per Dec. 31, 2004:	101

Note: The population of the Prime All Share Index of the German stock exchange as of December 31, 2004, was obtained from the German Stock Exchange (see: http://deutsche-boerse.com/ Home > Listing > Market Structure > Transparency Standards > Prime Standard).

Panel B: Selection of firm-year data

Year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
Number of sample firms	25	44	63	87	94	101	101	97	612
Owners‘equity < 0	0	1	0	1	0	2	0	1	5
Missing values for Datastream share price data	6	3	0	0	0	0	0	0	9
Firm-years	19	40	63	86	94	99	101	96	598

Table 2: Descriptive statistics

	N	Mean	Std.dev.	Min.	25 %	Median	75 %	Max.
Panel A: Accounting data as reported by companies, in million €								
BVE	598	2360.72	6413.71	0.35	32.44	178.89	1639.39	47845.00
BVEbP	598	3145.50	8098.90	2.21	37.22	219.45	2056.30	54099.00
NI	598	278.10	829.11	-1631.24	0.39	14.82	168.00	7894.00
NIbPC	598	327.63	918.42	-1507.89	0.57	16.47	195.50	8122.90
PC	598	70.75	189.79	-2.90	0.20	2.11	28.59	1329.00
NRPL	598	676.76	2019.73	-5109.00	1.53	20.23	284.83	13973.00
TURA	598	108.03	525.00	-1463.00	0.00	0.17	10.00	8103.00
FS	598	784.79	2197.98	-2413.00	1.81	23.10	285.30	13887.00
DBO	598	1672.93	5121.59	0.00	2.49	27.91	606.00	41514.00
PLA	598	888.14	3829.74	0.00	0.00	1.10	117.42	35176.00
Panel B: Data per share, in € per share								
Share Price	598	29.05	33.96	0.60	6.34	18.65	38.77	311.92
BVE	598	14.30	14.21	0.07	3.99	9.84	19.93	96.07
BVEbP	598	18.18	18.29	0.36	4.95	12.15	25.39	107.54
NI	598	1.52	3.18	-13.85	0.04	0.91	2.39	27.58
NIbPC	598	1.76	3.33	-12.80	0.07	1.16	2.73	27.73
PC	598	0.34	0.48	-0.19	0.02	0.13	0.48	3.78
NRPL	598	3.50	5.54	-5.01	0.16	1.18	4.49	35.78
TURA	598	0.38	0.94	-2.93	0.00	0.01	0.40	7.95
FS	598	3.87	5.90	-2.38	0.19	1.29	5.27	35.62
DBO	598	6.19	8.88	0.00	0.25	1.66	9.84	54.60
PLA	598	2.32	4.98	0.00	0.00	0.07	2.42	34.55

Note: all accounting data has been hand collected; share price data is from Datastream; BVE is the book value of equity; BVEbP is the book value of equity before funding status; NI is net income; NIbPC is net income before pension cost tax-adjusted, with an assumed standard tax rate of 30%; PC is pension cost, NRPL is the recognised net pension liability; TURA are the total unrecognized amounts (FS – RNPL), unrecognized gains are shown with a negative sign, unrecognized losses with a positive sign; FS is the funding status (DBO – PLA); DBO is the projected benefit obligation; PLA is the fair value of plan assets.

Table 3: Value relevance of pension accounting information

		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Const.	Coef.	13.402***	13.510***	13.806***	13.854***	13.944***	13.670***
	St.dev.	3.716	3.702	3.713	3.732	3.723	3.654
	t-value	3.607	3.650	3.718	3.713	3.745	3.741
	p-value	0.000	0.000	0.000	0.000	0.000	0.000
BVE /	Coef.	0.709***	0.922***	0.909***	0.912***	0.896***	0.930***
BVEbP	St.dev.	0.194	0.167	0.168	0.173	0.193	0.178
	t-value	3.660	5.530	5.404	5.277	4.649	5.237
	p-value	0.000	0.000	0.000	0.000	0.000	0.000
NI /	Coef.	4.791**	4.723***	4.836***	4.863***	4.878***	4.814***
NIbPC	St.dev.	1.872	1.796	1.784	1.776	1.748	1.779
	t-value	2.559	2.630	2.711	2.738	2.791	2.707
	p-value	0.012	0.010	0.008	0.007	0.006	0.008
PC	Coef.		-12.697*	-2.980	2.791	1.914	6.579
	St.dev.		7.180	5.657	5.476	6.065	7.054
	t-value		-1.768	-0.527	0.510	0.316	0.933
	p-value		0.080	0.600	0.611	0.753	0.353
NRPL	Coef.			-1.882***			-2.414***
	St.dev.			0.613			0.669
	t-value			-3.070			-3.608
	p-value			0.003			0.000
FS	Coef.				-2.329***		
	St.dev.				0.636		
	t-value				-3.665		
	p-value				0.000		
DBO	Coef.					-2.258***	
	St.dev.					0.786	
	t-value					-2.874	
	p-value					0.005	
PLA	Coef.					2.363***	
	St.dev.					0.629	
	t-value					3.760	
	p-value					0.000	
TURA	Coef.						-5.667*
	St.dev.						2.882
	t-value						-1.966
	p-value						0.052
N		598	598	598	598	598	598
Adj. R^2		0.502	0.512	0.517	0.522	0.521	0.527

Note: * p < 0,10; **: p < 0,05; ***: p < 0,01. All accounting data has been hand collected; share price data is from Datastream; BVE is the book value of equity; BVEbP is the book value of equity before NRPL in model (3) and before FS in model (4), model (5) and model (6); NI is net income; NIbPC is net income before PC tax-adjusted, with an assumed standard tax rate of 30%; PC is pension cost, NRPL is the recognised net pension liability; TURA are the total unrecognized amounts (FS – NRPL), unrecognized gains are shown with a negative sign, unrecognized losses with a positive sign; FS is the funding status (DBO – PLA); DBO is the projected benefit obligation; PLA is the fair value of plan assets.

Table 4: Unrecognized gains and losses

Panel A: Total unrecognized amounts (TURA) per year (absolute values)

Year	N	mean	Sd	Min	P25	p50	P75	max	No of firms: unrecognized gains	No of firms: unrecognized losses	No of firms: no unrec'd gains/losses
1999	19	22.93	140.53	-88.00	-3.98	0.00	1.20	590.00	9	6	4
2000	40	28.01	490.31	--1463.00	-0.58	0.00	0.62	2643.00	15	18	7
2001	63	167.20	1022.84	-220.00	0.00	0.12	38.07	8103.00	14	35	14
2002	86	124.95	456.18	-246.00	0.00	0.17	42.60	3708.00	15	54	17
2003	94	114.95	431.05	-189.00	0.00	0.13	28.43	3579.00	14	59	21
2004	99	143.42	471.80	-135.00	0.00	0.50	18.20	3358.00	13	66	20
2005	101	124.54	532.99	-86.00	0.00	0.79	13.00	4540.00	7	63	31
2006	96	43.58	193.75	-107.00	0.00	0.06	5.07	1483.00	12	50	34
Total	598	108.03	525.00	-1463.00	0.00	0.17	10.00	8103.00	99	351	148

TURA is the difference between the funding status and the net recognised pension liability on the balance sheet; unrecognized gains are shown with a negative sign, unrecognized losses with a positive sign.

Panel B: Accounting method for actuarial gains/losses per year

Year	Corridor method	Immedate recognition in profit and loss	Immedate recognition in equity	Method not disclosed	Total
1999	16	2	0	1	19
2000	33	4	0	3	40
2001	51	7	0	5	63
2002	70	12	0	4	86
2003	77	13	0	4	94
2004	82	12	2	3	99
2005	68	10	20	3	101
2006	61	8	27	0	96
2006	458	68	49	23	598

Table 5: Value relevance of unrecognized pension gains and losses (Model (6): Robustness checks

		Panel A: Unrecognized gains vs. losses			Panel B: 1999 to 2005			Panel C: "Seasoned" users		
		Total Sample	Firms with non-recognized losses	Firms with non-recognized gains	All firms	Corridor firms	Firms with non-recognized losses	All firms	Corridor firms	Firms with non-recognized losses
Const.	Coef.	13.670***	17.880***	13.444**	15.242***	18.261***	19.381***	19.307**	23.077*	22.879
	St.dev.	3.654	5.912	5.152	3.682	4.513	5.860	9.187	12.114	13.770
	t-value	3.741	3.024	2.609	4.140	4.047	3.307	2.102	1.905	1.662
	p-value	0.000	0.003	0.013	0.000	0.000	0.001	0.038	0.060	0.101
BVEbP	Coef.	0.930***	0.668***	0.358	0.629***	0.438**	0.532***	1.087***	0.664**	0.838***
	St.dev.	0.178	0.167	0.231	0.167	0.205	0.169	0.249	0.307	0.278
	t-value	5.237	4.010	1.547	3.767	2.135	3.148	4.361	2.163	3.014
	p-value	0.000	0.000	0.129	0.000	0.036	0.002	0.000	0.033	0.004
NIbPC	Coef.	4.814***	7.456***	4.990***	6.618***	7.633***	7.197***	4.604**	8.309***	7.833***
	St.dev.	1.779	2.411	1.786	1.874	2.183	2.420	2.035	2.600	2.615
	t-value	2.707	3.092	2.794	3.531	3.497	2.974	2.262	3.196	2.996
	p-value	0.008	0.003	0.008	0.001	0.001	0.004	0.026	0.002	0.004
PC	Coef.	6.579	4.401	6.485	18.253**	14.862	11.009	5.310	2.457	10.061
	St.dev.	7.054	9.171	14.125	8.771	10.525	9.595	7.432	9.555	14.979
	t-value	0.933	0.480	0.459	2.081	1.412	1.147	0.714	0.257	0.672
	p-value	0.353	0.633	0.649	0.040	0.162	0.255	0.477	0.798	0.504
NRPL	Coef.	-2.414***	-2.144***	-1.627*	-2.940***	-2.452***	-2.401***	-2.733***	-2.133*	-3.192**
	St.dev.	0.669	0.789	0.863	0.659	0.804	0.817	0.949	1.088	1.476
	t-value	-3.608	-2.719	-1.886	-4.461	-3.049	-2.939	-2.881	-1.962	-2.162
	p-value	0.000	0.008	0.066	0.000	0.003	0.004	0.005	0.053	0.034
TURA	Coef.	-5.667*	-5.237*	28.923***	-7.338**	-6.922*	-5.071*	-6.041***	-6.467**	-7.524*
	St.dev.	2.882	2.998	5.131	3.307	3.867	2.911	2.284	3.217	3.977
	t-value	-1.966	-1.746	5.637	-2.219	-1.790	-1.742	-2.645	-2.010	-1.892
	p-value	0.052	0.084	0.000	0.029	0.077	0.085	0.010	0.048	0.062
N		598	351	99	502	397	301	392	284	225
Adj, R^2_		0.527	0.554	0.638	0.539	0.522	0.527	0.534	0.565	0.586
Test NRPL = TURA	F-value	0.99	1.51	33.76***	2.30	1.78	1.30	2.51	2.15	1.92
	p-value	0.3760	0.2220	0.0000	0.1327	0.1860	0.2581	0.1162	0.1468	0.1700

Note: * p < 0,10; **: p < 0,05; ***: p < 0,01. Variables are defined as explained in table 2 and table 3. "Seasoned" users are companies that have applied IFRS (or U.S. GAAP) for four or more years.

Table 6: Pension assumptions: Footnote disclosures

Year	N	Mean	St.dev.	Min.	25%	Median	75%	Max.	Not disclosed
Panel A: Discount rate									
1999	18	5.91	0.49	4.50	5.50	6.00	6.25	6.50	1
2000	37	6.20	0.31	5.00	6.00	6.25	6.50	6.50	3
2001	63	5.94	0.31	4.75	5.80	6.00	6.00	6.60	0
2002	85	5.81	0.31	4.75	5.75	5.80	6.00	6.50	1
2003	94	5.55	0.26	5.00	5.50	5.50	5.75	6.50	0
2004	99	5.13	0.34	4.50	4.90	5.00	5.30	6.00	0
2005	100	4.35	0.36	3.85	4.04	4.25	4.50	5.75	1
2006	95	4.44	0.26	3.10	4.30	4.50	4.50	5.35	1
Total	591	5.23	0.72	3.10	4.50	5.35	5.80	6.60	7
Panel B: Expected future salary increases									
1999	17	3.21	0.96	1.90	2.80	3.00	3.50	6.12	2
2000	30	3.10	0.77	2.00	2.50	3.00	3.25	6.12	10
2001	51	2.90	0.68	1.50	2.50	3.00	3.00	6.12	12
2002	67	2.81	0.65	1.20	2.50	3.00	3.00	4.50	19
2003	76	2.61	0.66	1.00	2.29	2.75	3.00	5.10	18
2004	79	2.55	0.70	1.00	2.00	2.50	3.00	4.50	20
2005	80	2.47	0.70	1.00	2.00	2.50	3.00	4.50	21
2006	78	2.40	0.72	1.00	2.00	2.50	2.75	4.75	18
Total	478	2.65	0.73	1.00	2.00	2.75	3.00	6.12	120

Note: All disclosed assumptions have been hand collected form sample companies' annual reports.

*

Table 7: Value relevance of pension accounting information: Compliance with assumption disclosures and aggressive vs. non-aggressive assumptions

		Panel A: Compliance with assumption disclosures			Panel B: Aggressive vs. non-aggressive discount rates			Panel C: Aggressive vs. non-aggressive expected future salary increase rates		
		Total sample	Actuarial assumptions disclosed	Actuarial assumptions not disclosed	Non-aggressive discount rate assumption	Aggressive discount rate assumption	Dummy approach (aggressive =1)	Non-aggressive salary rate assumption	Aggressive salary rate assumption	Dummy approach (aggressive =1)
Const.	Coef.	13.944***	16.867***	0.737	11.049***	24.823	13.472***	21.526**	10.383***	20.329***
	St.dev.	3.723	4.891	2.525	3.227	17.830	3.367	8.864	3.360	6.269
	t-value	3.745	3.449	0.292	3.423	1.392	4.001	2.428	3.090	3.243
	p-value	0.000	0.001	0.773	0.001	0.167	0.000	0.018	0.003	0.002
BVEbP	Coef.	0.896***	0.750***	2.419***	1.017***	0.721***	0.872***	0.539**	1.284***	0.763***
	St.dev.	0.193	0.183	0.691	0.282	0.234	0.200	0.246	0.245	0.182
	t-value	4.649	4.107	3.499	3.601	3.083	4.351	2.191	5.235	4.202
	p-value	0.000	0.000	0.002	0.001	0.003	0.000	0.032	0.000	0.000
NIbPC	Coef.	4.878***	3.257***	8.032***	4.525**	5.855**	4.896***	3.780**	1.870**	3.072***
	St.dev.	1.748	1.016	1.930	1.973	2.685	1.781	1.833	0.818	1.008
	t-value	2.791	3.206	4.162	2.293	2.181	2.748	2.062	2.285	3.046
	p-value	0.006	0.002	0.000	0.024	0.032	0.007	0.043	0.026	0.003
PC	Coef.	1.914	5.459	-6.348**	-2.598	23.765	1.700	9.027	-15.933	4.465
	St.dev.	6.065	7.255	2.565	5.429	15.546	5.773	8.331	10.731	7.189
	t-value	0.316	0.752	-2.475	-0.478	1.529	0.295	1.084	-1.485	0.621
	p-value	0.753	0.454	0.020	0.633	0.130	0.769	0.283	0.143	0.536
DBO	Coef.	-2.258***	-1.864***	-11.819**	-2.099**	-3.803***	-2.175***	-1.755**	-1.469	-1.809***
	St.dev.	0.786	0.680	4.394	0.979	1.311	0.803	0.800	1.093	0.670
	t-value	-2.874	-2.740	-2.690	-2.145	-2.901	-2.710	-2.193	-1.344	-2.702
	p-value	0.005	0.007	0.012	0.034	0.005	0.008	0.032	0.184	0.008
PLA	Coef.	2.363***	2.187***	28.366	2.414***	3.319***	2.496***	1.941**	2.068***	1.975***
	St.dev.	0.629	0.580	19.557	0.633	1.116	0.614	0.745	0.759	0.531
	t-value	3.760	3.769	1.450	3.811	2.974	4.066	2.604	2.726	3.722
	p-value	0.000	0.000	0.158	0.000	0.003	0.000	0.011	0.008	0.000
D_{agg} _	Coef.						1.996			-7.407*
	St.dev.						3.536			3.794
	t-value						0.565			-1.953
	p-value						0.574			0.054
D_{agg}DBO	Coef.						-0.001*			0.000
	St.dev.						0.000			0.000
	t-value						-1.709			0.420
	p-value						0.091			0.676
N		598	478	120	389	202	591	275	203	478
Adj, R^2_		0.521	0.447	0.924	0.541	0.494	0.522	0.385	0.564	0.457

Note: * p < 0,10; **: p < 0,05; ***: p < 0,01. Variables are defined as explained in table 2 and table 3. Under the dummy approach, model (5) is extended with a binary (dummy) variable D_{agg} and an interaction term, defined as D_{agg}DBOit; the dummy variables has the value 1 for companies with "aggressive" actuarial assumption (otherwise zero).

Table 8: Plan assets and funding ratio: descriptive statistics

Year	N	Mean	St.dev.	Min.	25%	Median	75%	Max.
Panel A: Plan Assets								
1999	19	2,091.42	7,515.19	0.00	0.00	11.42	332.35	32,857.00
2000	40	1,148.24	5,450.74	0.00	0.00	0.00	141.25	33,870.00
2001	63	879.66	4,155.49	0.00	0.00	0.00	98.25	31,628.00
2002	86	684.40	2,917.60	0.00	0.00	0.66	104.00	24,544.00
2003	94	680.70	2,966.28	0.00	0.00	0.68	108.87	26,328.00
2004	99	713.70	3,072.02	0.00	0.00	1.10	79.10	27,804.00
2005	101	909.07	3,743.44	0.00	0.00	1.26	102.84	34,348.00
2006	96	1,090.69	4,100.51	0.00	0.00	3.09	156.47	35,176.00
Total	598	888.14	3,829.74	0.00	0.00	1.10	117.42	35,176.00
Panel B: Funding Ratio								
1999	19	26.55%	29.44%	0.00%	0.00%	22.40%	45.21%	100.48%
2000	40	19.13%	28.53%	0.00%	0.00%	0.00%	34.99%	107.67%
2001	63	17.50%	24.61%	0.00%	0.00%	0.00%	28.96%	91.35%
2002	86	17.68%	23.21%	0.00%	0.00%	2.74%	32.00%	82.88%
2003	94	19.98%	25.93%	0.00%	0.00%	2.96%	37.02%	95.88%
2004	99	22.49%	27.58%	0.00%	0.00%	10.09%	39.31%	116.08%
2005	101	26.15%	27.40%	0.00%	0.00%	18.27%	48.46%	90.30%
2006	96	33.00%	31.49%	0.00%	0.00%	30.60%	55.30%	101.40%
Total	598	23.09%	27.57%	0.00%	0.00%	11.15%	40.28%	116.08%

The funding ratio is defined as plan assets divided by the defined benefit obligation (PLA/DBO)

Table 9: Value relevance of pension accounting information and the degree of aggressiveness of pension assumptions under incentives for managerial opportunism

		All firms	funded	unfunded
Const.	Coef.	13.714***	21.611***	6.682***
	St.dev.	3.819	7.814	2.485
	t-value	3.591	2.766	2.688
	p-value	0.001	0.007	0.010
BVEbP	Coef.	0.899***	0.731***	1.147***
	St.dev.	0.202	0.232	0.270
	t-value	4.441	3.150	4.244
	p-value	0.000	0.002	0.000
NIbPC	Coef.	4.874***	4.829**	5.925***
	St.dev.	1.770	1.940	1.366
	t-value	2.754	2.489	4.336
	p-value	0.007	0.015	0.000
PC	Coef.	2.106	9.088	-5.643***
	St.dev.	6.038	7.925	2.119
	t-value	0.349	1.147	-2.663
	p-value	0.728	0.255	0.010
DBO	Coef.	-2.255***	-2.621**	-1.849***
	St.dev.	0.800	1.062	0.668
	t-value	-2.820	-2.467	-2.767
	p-value	0.006	0.016	0.008
PLA	Coef.	2.357***	2.509***	
	St.dev.	0.642	0.750	
	t-value	3.674	3.344 .	
	p-value	0.000	0.001 .	
Δr*DBO	Coef.	-0.159	0.041	-1.650**
	St.dev.	0.461	0.490	0.709
	t-value	-0.345	0.084	-2.329
	p-value	0.730	0.934	0.024
N		591	352	239
Adj, R^2_		0.52	0.447	0.694

Note: * p < 0,10; **: p < 0,05; ***: p < 0,01. Variables are defined as explained in table 2 and table 3.

The model estimated in this table is model (5*) in which the expression $\beta_{DBO} = \beta_4 = \upsilon + \lambda * \Delta r^*$ is substituted into model (5), resulting in: $P = \beta_1 + \beta_2 BVEbP + \beta_3 NIbP + \beta_4 PC + \upsilon DBO + \lambda(\Delta r^* * DBO) + \beta_7 PLA + \varepsilon$, with $\Delta r^* = r_{it} - r_t^*$ being the difference between company i's interest rate per year (r_{it}) minus the benchmark yearly median interest rate (r_t^*).