Research Journal of Finance and Accounting
ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online)
Vol.8 No.24 2017

Value Relevance of Pension Accounting – A Meta-Analysis

Oliver Knospe (Corresponding author)

Chair of Business Administration especially Accounting, Auditing and Taxation

Technische Universität Dresden

Helmholtzstr. 10, 01069 Dresden, Germany

Tel: +49 351 463-34988 Mobil: +49 151 111 424 75

E-mail: oliver.knospe@tu-dresden.de

Abstract

This paper provides a meta-analytic review of empirical research on the value relevance of pension accounting information developed over more than three decades. It goes beyond qualitative reviews by applying a full set of meta-analytic procedures to summarize existing research findings on a quantitative level. Given little evidence from other jurisdictions, the meta-analysis focuses on studies in the United States. Key results are as follows: (1) All items related to the balance sheet are value relevant but all components of pension expenses are not. (2) Amounts related to the balance sheet however are more relevant than amounts related to the income statement when disclosed in the notes but not when recognized. (3) The value relevance of information on pension plans differs in the set of accounting standards applied and the valuation model employed. The findings imply opportunities for future research, that could expand beyond early stages of pension accounting in the US and particularly address pension accounting under IFRS in multi-country settings or vis-à-vis domestic accounting standards. Overall, the results have implications for the ongoing regulatory debate of standard-setters that strive for improvement and convergence of pension accounting.

Keywords: meta-analysis, value relevance, pension accounting, valuation, firm value, post-employment benefits

Acknowledgements

The author is grateful for helpful comments and suggestions of Michael Dobler, Thomas Günther, Thomas Niemand, Melissa Luckner and Martin Gäumann. This paper was developed while the author was research assistant and PhD candidate at the Technische Universität Dresden (TU Dresden), Germany.

1. Introduction

Pension accounting raises debates about adequate accounting rules all over the world (e.g. Amir *et al.* 2010; Barth 1991; Fasshauer & Glaum 2012; Glaum 2009; Ippolito 1985, 1987, 2002; Klumpes 1994, 2000, 2001). In 2006, the International Accounting Standards Board (IASB) and the US Financial Accounting Standards Board (FASB) started a convergence project, which fundamentally reviews all aspects of its current rules of post-employment benefits accounting. In the same year, the FASB issued the revised Statement of Financial Accounting Standard (SFAS) 158 as temporary alignment that particularly eliminated the corridor approach to treat actuarial gains and losses. Likewise, the IASB started a short-term project with a limited scope to provide users with enhanced information about post-employment benefits. On 16 June 2011, the IASB published the amended International Accounting Standard (IAS) 19 Employee Benefits, which is effective from 1 January 2013. The main improvements compromise the abolishment of the deferred recognition, the presentation of gains and losses as well as the enhanced disclosure requirements. These changes foster a longstanding discussion (e.g. Glaum 2009; Klumpes 1994, 2000, 2001; Napier 2009; Whiteford & Whitehouse 2006).

The key objective of the IASB's and the FASB's efforts is to develop accounting standards that provide financial information which is useful for existing and potential investors (FASB 2013; IASB 2013). Valuation research attempts to explain the relationship between accounting amounts and the firm value (Barth 2006; Landsman 1986; Miller & Modigliani 1966; Modigliani & Miller 1958; Ohlson 1995). The contentious debate about pension accounting suggests that pension accounting information presented in financial statement affects investors' behaviour. Empirical research employs earnings discount (e.g. Daley 1984; Feldstein & Morck 1983; Feldstein & Seligman 1981), balance sheet models (e.g. Barth 1991; Gopalakrishnan & Sugrue 1993; Landsman 1986) and variations of the Ohlson model (e.g. Barth et al. 1993; Coronado and Sharpe 2003; Hann *et al.* 2007a). Still, the results are far from conclusive.

The purpose of this paper is to summarize and evaluate the large body of research that has examined the value relevance of pensions over the past 36 years. This meta-analysis evaluates in total 22 studies with 59 regressions and is related to the narrative review by Glaum (2009). However, qualitative reviews have two key limitations. First, subjective interferences can lead to misleading interpretations of research results. Second, they

fail to identify objective moderating variables (Wolf 1986). To mitigate these limitations, this paper uses a whole set of meta-analytical methods. They allow generalizing the characteristics of independent variables included in research studies and to evaluate whether the results represent similar coherence (Hay *et al.* 2006; Hunter & Schmidt 2004; Wolf 1986).

Particularly, this paper aggregates prior research to examine the association of various types of pension accounting information and firm value. First, this study analyzes the value relevance of pension accounting information related to the balance sheet and to the income statement. Second, it compares the value relevance of types of pension accounting information and explores whether amounts that are recognized or disclosed in the notes convey the same information. Third, it explores the effect of different sets of accounting rules and of different valuation models on the value relevance of pension accounting information in empirical research.

Published research studies almost entirely explore pension information under United States Generally Accepted Accounting Principles (US GAAP) (Glaum 2009). (Note1) In consequence, this meta-analysis focuses on these studies and cannot include a moderator for country, legal tradition or non-US accounting regime. Prior studies discuss the transferability of the results of value relevance studies on other accounting regimes. Addressing the accounting rules, Shamrock (2012) argues that US GAAP und IFRS regulation does not differ significantly. In contrast, Glaum (2009) notes that national differences could cause disparity in capital market reactions on equivalent pension accounting information (e.g. Ali & Hwang 2000; Hail & Leuz 2006). While the meta-analysis is restricted to studies on different sets of US GAAP, international findings are included in the discussion.

The key findings of this meta-analysis are as follows: (1) Balance sheet related amounts are generally value relevant and show the expected sign of association with firm value, this does not hold true for amounts related to the income statement, (2) the comparison of the mean effect sizes indicates that amounts related to the balance sheet are more relevant than amounts related to the income statement when disclosed in the notes, (3) the value relevance of pension information differs between sets of US pension accounting regulation and (4) the value relevance of pension information differs between valuation models employed.

The remainder of this paper is organized as follows. Section 2 provides an overview of pension accounting under US GAAP. Section 3 develops the hypotheses. Section 4 presents the methodology employed and Section 5 describes the data. The results of the meta-analysis are presented in Section 6. Section 7 concludes and discusses avenues for future research.

2. Historical and current pension accounting

Pension accounting in the US has had three major steps of development. The *first step* was the implementation of Accounting Principles Board (APB) Opinion No. 8, *Accounting for the Cost of Pension Plans in 1966* (FASB 1966; 1985). Scope of this standard was the reduction of fluctuations in pension cost (Phoenix & Bosse 1967). In subsequent years the importance of information about pensions raised with the increased number of plans and amounts of pension assets and obligations (Feldstein & Seligman 1981). In addition, the legal and economic environment changed and the existing accounting rules became increasingly criticized (FASB 1985).

Given this background, in the *second step*, one of the first projects of the FASB was the development of SFAS 87 *Employers' Accounting for Pensions*, finally published in 1985. The key feature of SFAS 87 was the implementation of a single method for computing the pension cost, called projected unit credit method. Overall SFAS 87 moved pension accounting away from cash basis towards accrual basis (Ali & Kumar 1993). The FASB mentioned that it is '… a worthwhile and significant step in that direction, but it also believes that those conclusions are not likely to be the final step in that evolution.' (SFAS 87.5).

The *third step* is the development of SFAS 158, which was issued in 2006, and is effective for fiscal years ending after the 15 December 2006. Key factor is the elimination of the corridor approach (FASB 2006). The FASB argues that this change provides financial statements that are more complete and easier to understand. This is because information previously reported in the notes will be recognized in an employer's financial statements (FASB 2006). Lately, the FASB integrated the SFAS 158 into the new codification (see Accounting Standards Codification (ASC) 715 *Compensation-Retirement Benefits*) excluding pre-SFAS 158 literature (FASB 2012).

Similar to the FASB the IASB revised its pension accounting rules. Outcome of the project 'Post-employment benefits (including pensions)' is the amended IAS 19 *Employee Benefits*, published in June 2011 (IASB 2011). The improvements of pension accounting in 2006 by the FASB and in 2011 by the IASB shape the first phase of the convergence project *Postretirement Benefit Obligations, Including Pensions* (FASB 2014). A fundamental review of the post-employment benefits accounting is the scope of the second part (FASB 2014).

Currently, the employers assumed risk of the cost of benefits attributed to the employees after retirement explain the recognition of a pension obligation (Bragg 2011; Shamrock 2012). This liability reflects the amount of benefits attributed to the service of the employee in the actual period (Shamrock 2012). According to FASB ASC 715, the portion of the present value of future benefits attributed to past service is referred to as the

projected benefit obligation (PBO). That includes actuarial assumptions (Bragg 2011), like economic (e.g. interest rate, inflation-index) and demographic assumptions (e.g. rate of mortality and date of retirement). Alternative liability measures are accumulated benefit obligations (ABO). In contrast to the PBO, future compensation levels (e.g. progressions of salaries and wages) are not considered by the calculation of the ABO (Bragg 2011). To secure the payment of the pension benefits, the entities provide plan assets that have been segregated and restricted (FASB ASC 715-30-20). If the PBO exceeds the fair value of related plan assets (PLA), adjusted for other components, the employer will recognize, according to the asset-liability approach, a pension liability (PL) in his financial statement. If the PLA exceed the PBO, a pension asset (PA) will be recognized (Coronado and Sharpe 2003; FASB ASC 715-30-25-1).

Moreover, the annual changes of the pension obligation presented in the balance sheet are reflected as pension costs (PC) in the income statement. This comprises current service cost (SVC), interest cost (INT) and is reduced by the expected return on plan assets (RPLNA). The service cost reflects the present value of the pension benefits earned by employees during the year (Coronado and Sharpe 2003). The interest cost shows the increase in the pension obligation that results from the interest due to the long-term horizon (Bragg 2011; Shamrock 2012). Other components, depending on their recognition, may include actuarial gains and losses, past service cost and the effect of any curtailments or settlements (Bragg 2011; Coronado & Sharpe 2003; Shamrock 2012). As a result of the above projects, the pension accounting rules under IFRS have become very similar to the US GAAP rules.

3. Hypotheses development

The key objective of valuation research is to relate accounting amounts to a measure of firm value (Barth *et al.* 2001; Landsman 1986; Modigliani & Miller 1958; Ohlson 1995). Therefore researchers analyze if financial statement information are reflected in the stock market valuation (Barth 2006). Usually they use regression models with share price or other estimates of firm value as the dependent variable and different independent variables derived from the research question (e.g. balance sheet or income statement information as well as its associated disclosed information). As a result, value relevance studies can only provide indirect evidence of the decision-usefulness of financial statements. The methodology does not provide information on whether investors have actually used accounting information in their investment decision (Barth 2006; Beaver 2002). Furthermore, Holthausen and Watts (2001) criticize the requirement of information efficiency and illustrate econometric problems. In contrast, Barth (2000) and Barth *et al.* (2001) argue that value relevance research needs no market efficiency, if the share price reflects the investors' expectations. Because of such limitations, value relevance research is controversial (Barth 2006; Barth *et al.* 2001; Glaum 2009; Holthausen & Watts 2001). Yet, value relevance research is an acknowledged method in accounting research that attempts to operationalize decision-usefulness (Barth *et al.* 2001; Beaver 2002; Glaum 2009).

Especially, the complex accounting of pension produces large and pervasive financial statements effects (Barth 1991; Barth *et al.* 2001; Coronado & Sharpe 2003). Investors' understanding of the disclosures and the incorporation of published pension accounting information in their decisions is questionable (Barth 2000; Glaum 2009). International developments of pension accounting standards and their application constitute numerous empirical studies. Several authors investigate the relationship between share value or other measures of firm value and pension accounting information presented in financial statements (e.g. Amir *et al.* 2010; Barth 2006; Landsman 1986; Modigliani & Miller 1958; Ohlson 1995). Glaum's (2009) narrative review analyses those studies and organizes the extensive information. My meta-analysis complements this narrative review by the quantitative analysis of prior research. In detail, following questions arise:

1. Are pension assets or liabilities and pension costs value relevant?
2. Do the various pension variables differ in the value relevance?
3. Do the results change in time due to changes in accounting methods?
4. Do the results change as a consequence of the valuation models used in the examined studies?

Several studies try to answer the first question in order to find a relation between the balance sheet and income statement information about pensions and the firm value (e.g. Barth *et al.* 1993; Coronado & Sharpe 2003; Daley 1984). The complex pension accounting requires a wide range of disclosures to ensure users understanding (Bragg 2011). This includes the components of pension liabilities or assets, pension costs, and the assumptions needed for their calculations.

The first step of calculating the pension liability is to discount future pension payments that represent the present value of future benefits. The reflected portion of the present value of future benefits attributed to past services is the basis for the calculation of pension asset or liability as well as pension cost. In contrast, accumulated benefits determine the minimum liability under ASC 715-30. Recent studies show the value relevance of both projected and accumulated benefits (Barth 1991; Choi *et al.* 2006). Plan assets, which have been segregated and restricted to provide for pension benefits, show a positive influence on the firm value (Barth 1991; Davis-Friday *et al.* 1999, 2004; Gopalakrishnan & Sugrue 1993). The residual of pension obligation and

fair value of plan assets is the pension asset or liability, subject to the condition that no other deferred components exist (Bragg 2011). Studies show indecisive results in regard to the pension asset or liability on firm value (Barth *et al.* 1996; Feldstein & Morck 1983; Werner 2011).

Annual changes of the pension asset or liability are recognized by pension cost (PC). Early studies imply the value relevance of pension cost (Barth *et al.* 1992, 1993; Bodie *et al.* 1985; Daley 1984). Yet, the results are indecisive for their major components (service cost, interest cost and return on plan assets). Early findings of Barth *et al.* (1993) raise a controversial discussion about the examined positive effect of the service cost component. Later studies partially support this result (Barth *et al.* 1993; Hann *et al.* 2007a). Theory building studies explain this unexpected association with an implicit contract theory of pension agreements (Ippolito 1985, 1987, 2002; Luchak & Pohler 2010) and consider service costs as a proxy for value creation by human capital (Glaum 2009; Hann *et al.* 2007a). Further studies document a negative influence of interest costs and a positive influence of the return on the fair value of plan assets on firm value (Barth *et al.* 1993).

Based on these studies and review results by Glaum (2009), I run a full set of meta-analytical methods. I state my first hypothesis the following way:

H 1: There is an association between pension accounting information and firm value.

In addition to the discussion of the relevance of pension accounting information presented in financial statements for investors' firm valuation, a controversial dialogue raise about differences between various pension variables and their influence on firm value. In this context there are three strands of literature. One part of the studies investigates the influence of various measures of the obligation on the firm value (Barth 1991; Coronado and Sharpe 2003). Other studies analyze the value relevance of recognized items and disclosed pension accounting information (Barth 1991; Coronado & Sharpe 2003; Werner 2011). Another strand considers whether information presented in the balance sheet or the income statement convey redundant suggestion for investors' decisions (Barth 1991; Barth *et al.* 1993; Choi *et al.* 1997).

The first strand of literature finds evidence for differences between accumulated benefit obligations and projected benefit obligations (Barth 1991; Choi *et al.* 1997; Gopalakrishnan & Surgue 1993). As opposed to the accumulated benefit obligation, the projected benefit obligation includes expectations' about future compensation levels. A controversial discussion concerns the use of future benefits based on the present obligation to calculate the projected obligation (Barth 1991; Gopalakrishnan & Surgue 1993). One problem is that future expectations could not constitute a liability since it is not the result of past events (Bragg 2011). Another concern relates the reduction of reliability due to prospective assumption. In contrast, the accumulated benefit obligation could be systematically understated because they ignore future inflation. At the bottom line, a higher influence of PBO suggests that investors include these compensation in their valuations (Barth 1991).

Another important question in accounting research is addressed by the second strand of literature. It analyses whether recognition and disclosures are perfect substitutes (Glaum 2009). For example, Gopalakrishnan (1994) states that investors attach equal importance to pension information disclosed in the footnotes and to those that are recognized. In contrast, several studies find a different assessment of recognized and disclosed amounts by financial statement users. Some studies yield a more effective market valuation of recognized accounting information (Coronado & Sharpe 2003; Mitra & Hossain 2009). Other studies imply that disclosures are superior (Barth 1991; Barth *et al.* 1993; Werner 2011).

The third strand concentrates on differences in the value relevance of pension information presented in balance sheet and income statement. Theory is indecisive. One part of literature identifies differences in equity investor perception (Coronado & Sharpe 2003; Gold 2000). Other articles stated that the information of both statements are redundant and convey identical data of firm value (Barth *et al.* 1993; Hann *et al.* 2007a). Empirical evidence acknowledges the concurrent theories. For example, Barth *et al.* (1993) find that pension balance sheet and income statement information provide very similar information to the price-setting. In contrast, several years later Coronado and Sharpe (2003) achieve a contrary result and show that income statement information is value relevant and balance sheet information has only a marginal influence.

The opposing theoretical and empirical findings create the need for further research of this topic. The second hypothesis states:

H 2: There are different associations between various pension accounting variables and firm value.

The pension accounting in the US has had three major stages of regulatory development. These were periods related to APB 8, SFAS 87 and SFAS 158, respectively. The implementation of SFAS 87 is effective for fiscal years ending after 15 December 2006 and involves the transition from a cash-based to an accrual-based pension accounting (Ali & Kumar 1993; Gopalakrishnan & Sugrue 1993). Accounting literature assessed this change as being an improvement of the pension accounting quality (Coronado & Sharpe 2003; Houmes *et al.* 2012; Werner 2011) and simultaneous a positive effect on firm value (Barth *et al.* 2008; Liu *et al.* 2012). However, early studies find evidence of a greater influence of accounting incentives and therefore a negative influence on investors' firm valuation under SFAS 87 in comparison to APB 8 (Ali & Kumar 1993). Furthermore, Hung (2000) states that the use of accrual accounting affects the overall value relevance of financial statement

information in countries with weak shareholder protection negatively. This leads to the following hypothesis:
H 3: The results differ between the sets of US pension accounting regulation.
Three major approaches of valuation research have developed over time (Glaum 2009; Holthausen & Watts 2001). The different stages compromise the following different valuation models (Barth *et al.* 2001; Holthausen & Watts 2001): earnings discount models (EDM), balance sheet models (BSM), and variations of the Ohlson model (OM). Early studies use variations of earnings discount models based on Modigliani & Miller (1958) (Barth *et al.* 1992; Daley 1984; Feldstein & Seligmann 1981; Hann *et al.* 2007a; Hann *et al.* 2007b; Oldfield 1977). Further studies regresses the market value of firm's equity on accounting measures of pension asset or liability (Davis-Friday *et al.* 1999; Davis-Friday *et al.* 2004; Feldstein & Morck 1983; Gopalakrishnan 1994; Gopalakrishnan & Sugrue 1993; Landsman 1986; Landsman & Ohlson 1990; Mitra & Hossain 2009). Most recent value relevance studies are based on the Ohlson model (Amir 1993, 1996; Amir *et al.* 2010; Barth *et al.* 1993; Coronado & Sharpe 2003; Hann *et al.* 2007a; Hann *et al.* 2007b; Ohlson 1995; Werner 2011).

While all of these models link firm value to firm characteristics, they are based on different approaches to explain the relation (Barth 2006; Glaum 2009; Landsman 1986; Modigliani & Miller 1958; Ohlson 1995). According to prior literature, the valuation models are robust against information inefficiency and other problems (Aboody *et al.* 2002; Barth 2006). Controversy, Holthausen & Watts (2001) states that the adequate model specification is a fundamental step in valuation research. Inappropriate models cause misleading findings. One strand of literature discusses theoretical assumptions of existing models (Barth *et al.* 2001; Beaver & Ryan 2005; Holthausen & Watts 2001). Another strand focuses on differences in their application in empirical valuation research (e.g. Deechow *et al.* 1999; McCrae & Nilsson 2001). In this context, Qi *et al.* (2000) find that testing the Ohlson model in OLS regression, typically used in valuation research, could be inaccurate. Moreover, an underestimation of the firm value, as a result of the Ohlson model, is recognized (e.g. Deechow *et al.* 1999; McCrae & Nilsson 2001; Qi *et al.* 2000). Therefore my last hypothesis states:
H 4: The results differ between various valuation models.

4. Meta-analysis techniques

The methodology of the conducted meta-analysis is divided in three parts. The first part links (*H 1*) the calculation of mean effect size of the influence of pension related variables on the firm value (Hedges & Olkin 2002; Guenther & Gaebler 2014; Hunter & Schmidt 2004; Kuerschner & Guenther 2012; Lipsey & Wilson 2001) and the combination of the results of a number of independent tests which test a common hypothesis (Wolf 1986). The second part (*H 2*) addresses differences of the previous calculated mean effect sizes. In the third part (*H 3-4*), a further moderator analysis examines the influence of sets of US pension accounting regulation and valuation models on the mean effect sizes (Borenstein *et al.* 2009; Hunter & Schmidt 2004; Lipsey & Wilson 2001).

The primary objective of meta-analysis is the comparison of quantitative results provided by various studies. Therefore, the individual results have to be transferred in a comparable measure called effect size (Borenstein *et al.* 2009). One typical effect size is Pearson's correlation coefficient r (Hedges & Olkin 2002; Hunter & Schmidt 2004; Lipsey & Wilson 2001). (Note 2) For an enhanced comparison of effect sizes I use the variance-stabilizing Fisher z-transformation (Hartung *et al.* 2008; Hedges *et al.* 1992).

Unfortunately, the examined studies do not always report the necessary correlation variables. This is commonly solved by converting other statistics into the known effect measure r (Guenther & Gaebler 2014; Hunter & Schmidt 2004; Kuerschner & Guenther 2012; Lipsey & Wilson 2001). Several standard procedures exist for this alteration, for example the transition of $\chi 2$ statistics in *r* (Card & Ahn 2011; Lipsey & Wilson 2001).

However, this meta-analysis focuses on value relevance studies that usually make use of regression models (Glaum 2009). No standard technique exists for the conversion of regression coefficients into the r metric (Aloe & Becker 2011). This approximation is important because estimations only on the basis of available effect sizes causes three major problems (Peterson & Brown 2005): (1) ignoring essential studies to an accurate understanding, (2) increasing sampling error, (3) ignoring research design and specific sample characteristics.

To avoid this exclusion of relevant studies, I use in this meta-analysis the recent approach of Aloe and Becker (2011) for the transformation of regression coefficient in *r*-scores. They present a model which compute the semipartial correlation r_{sp}. This approach is based on the assumption that the semipartial correlation can be expressed as the difference between the following two R^2. One of these variables is R_Y^2 representing the squared multiple correlation for the full model and the other one is $R_{(f)}^2$ describing the squared multiple correlation for a full model without the regression coefficient of interest (Aloe & Becker 2011). According to this idea and after some mathematical rearrangements, r_{sp} can be written as:

$$r_{sp} = \frac{t_f \sqrt{(1 - R_Y^2)}}{\sqrt{(N - k - 1)}}$$

where R_Y^2 is the squared multiple correlation for the full model, t_f represents the results of the *t*-test of the regression coefficient in the multiple regression, *N* reflects the sample size and *k* is the number of predictors in the regression model. Under a ceteris paribus assumption an increasing explanatory power of the regression model (R_Y^2) decreases r_{sp}.

While this current approach has only been adopted by the most recent research (Aloe & Becker 2009; Monforten *et al.* 2012), I also calculate $r_{equivalent}$ to address robustness (Gilpin 2008; Hsu 2005; Kraemer 2005; Rosenthal and Rubin 2003). Additionally, Aloe & Becker (2011) mentioned two major limitations of their approach. First, in the existence of multicollinearity in the underlying studies the resulting semipartial correlation does not equal the bivariate correlation (Aloe & Becker 2011). Furthermore, the hypothesis testing and the interpretation of regression coefficients in studies with high correlation between the independent variables is not powerful (Kennedy 2008; Wooldridge 2013). To consider this restriction, I control for high multicollinearity in the underlying research paper. As a result of this review, there is only little evidence for a serious limitation of the results of this meta-analysis. However, with regard to the interpretation of results this restriction should be considered (Glaum 2009). Second, other work of Aloe and Becker (2009) suggest that r_{sp} is an accurate estimator of the correlation coefficient but only for large samples. To avoid this limitation, my meta-analysis exclusively combines studies with a sample sizes larger than 100 (Aloe & Becker 2009). However, this does not lead to a sample reduction.

The relevant results from each study are estimated with the above approach in such a manner that the resulting values can be further aggregated and compared (Guenther & Gaebler 2014; Kuerschner & Guenther 2012; Schulze 2004). (Note 3) The studies are not precisely identical in their methods and the characteristics of the integrated sample. Hence, a systematic difference among the effect sizes exist, this will lead to the application of a random-effects model (Borenstein *et al.* 2009; Hartung *et al.* 2008; Hedges & Vevea 1998; Lipsey & Wilson 2001; Schmidt *et al.* 2009). To support the choice of the random-effects model, I compute two statistics for heterogeneity Q and I^2 (Borenstein *et al.* 2009; Geyskens *et al.* 2009; Higgins & Thompson 2002; Huedo-Medina *et al.* 2006; Lipsey & Wilson 2001; Schulze 2004). The consideration of study artefacts recommended by Hunter and Schmidt (2004) require no adjustments of correlations coefficients in this meta-analysis. Still, the discussion raised on the legitimacy of valuation research in accounting implicates a systematic variance of the dependent variable firm value (Barth *et al.* 2001; Holthausen & Watts 2001).

In addition to the calculation of mean effect sizes, the *first* part of the meta-analysis combines independent tests. Therefore, I use the Stouffer-test. This test calculates an exact level of significance and is most popular in this context (Hay *et al.* 2006; Hedges & Olkin 2002; Wolf 1986). For calculation of the test statistic, I convert *p*-values in *z*-scores. I first identify all studies and collect the individual *p*-values. If the underlying studies report only a *t*-value, I convert this in a *p*-value. A few studies only report a regression coefficient and the matching standard error. In these cases the regression coefficient divided by its standard error results in the *t*-value. If a study neither reports a *p*- or *t*-value nor a standard error, I use the alpha-level as approximation for the *p*-value as in Daley (1984) and Feldstein & Morck (1983).

The *second* part of this meta-analysis compares the previously calculated mean effect sizes and their influence on the firm value. This procedure is aiming to identify differences between the mean effect sizes, which reflect the influence on investors' decisions. Hence, I use the absolute value of the mean effect sizes and compare them with the following test statistic (Cohen *et al.* 2002).

$$Z = \frac{/z_1/ - /z_2/}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}}$$

The test statistic *Z* represents an amount on the standard normal curve, z_1 (z_2) is the z-transformation of the first (second) correlation coefficient r_1 (r_2) and N_1 (N_2) reflects the sample size.

Third, I analyse the influence of different accounting standards and valuation models on the mean effect sizes and their influence on investors' decision usefulness. Therefore, I run a moderator analysis according to Borenstein *et al.* (2009) and Hunter & Schmidt (2004).

5. Data

Value-relevance research concentrates on regression analysis that uses firm value as dependent variable and pension accounting information as independent variables. Therefore, studies employing such a method are used as a selection criterion for this study. Furthermore, I only include studies using data from the US. Hence, I identify relevant empirical studies with the multi-level procedure based on the common procedure of systematic literature review of White (1994). It consists of five major searching modes: footnote chasing, consultation of experts, searching in subject indexes, browsing and citation search (White 1994). Basis for footnote chasing and citation search is the narrative review of Glaum (2009). His study gives a narrative overview of empirical research on pension accounting. One part concerns the value relevance of pension and divides the empirical

studies in those who use variations of the earnings discount model, balance sheet model or the Ohlson model. Furthermore, Glaum (2009) investigates the managerial discretion and earnings management in pension accounting. The first step of the literature search results in 19 evaluable studies. Eventually, these examinations are the foundation for the search in the Business Source Complete database. (Note 4) This yielded three further studies. In addition, I run the citation search a second time and use additionally the database "web of science" provided by Thomson Reuters, resulting in five further studies. The parts consultation and browsing provide no more results. Finally, 27 primary studies are identified and presented in Panel A of Table 1. I exclude four studies in fact of their missing publication (Brown 2004; Davis-Friday *et al.* 2005; Kiosse *et al.* 2007; Mitchell *et al.* 2009) and one study that use a pooled sample that includes accounting data under SFAS 87 and 158 (Yu 2013). Therefore, the following meta-analysis includes 22 studies published until 31 December 2011. (Note 5.)

Table 1. Overview of literature search and journals publishing examined studies

Panel A procedure of systematic literature review	
Step of literature review	No. of studies
Footnote chasing	19
Consultation of experts	0
Search in subject indexes	3
Browsing	0
Citation search	5
Total no. of studies found	27
Excluded because of missing publication	4
Excluded because of pooled sample (SFAS 87 and 158)	1
Total no. of studies examined	22
Panel B journals publishing articles included in this meta-analysis	
Journal	No. of studies
TAR - The Accounting Review	9
CAR - Contemporary Accounting Research	2
FA - Financial Analysts	2
JAE - Journal of Accounting and Economics	2
AAFSJ - Academy of Accounting and Financial Studies Journal	1
BPEA - Brookings Paper on Economic Activity	1
JBFA - Journal of Business Finance & Accounting	1
JMCB - Journal of Money, Credit & Banking	1
JoF - Journal of Finance	1
RAF - Review of Accounting and Finance	1
RQFA - Review of Quantitative Finance and Accounting	1
Total	22

Panel B of Table 1 summarizes the journals in which the papers included in the meta-analysis have been published. The Accounting Review (9) promulgated most of the evaluated value-relevance studies. A total of ten journals published studies on the value relevance of pension accounting information provided by financial statement in accordance with US GAAP.

Panel A of Table 2 presents the studies included in the meta-analytic review and their characteristics. The 22 studies have been published over 36 years (1977-2013) and use three different valuation models. Nine studies use a balance sheet model, four studies apply an earnings discount model, and nine studies employ variations of the Ohlson model. If a paper reports separate results for individual subsample analyses (e.g. separate years), I treated each set of results as a separate analysis (Hay *et al.* 2006). Consequently, the papers comprise $k = 59$ separate analyses. Most sets of regressions ($k = 37$) analyse the value relevance of pensions concentrating on periods during the validity of SFAS 87 (time category (2)). The overall sample size includes 45,215 observations.

The signs and the level of significance of the examined variables of each study are presented in Panel B of Table 2. Terms in brackets reflect non-significant results. Most studies analyse balance sheet related effects. Particular, studies on plan assets ($k = 22$) and pension liabilities ($k = 22$) are most represented. Followed by the variables related to the income statement which comprise results on interest cost ($k = 7$), service cost ($k = 7$), return on plan assets ($k = 7$) and consolidated pension cost ($k = 17$).

In extension, both working papers and the published study use data collected from IFRS related companies and employ variations of the Ohlson model. Fasshauer and Glaum's (2012) sample consists of 478 firm-years published from 1999 to 2006. Additionally, the second paper includes 91 European listed companies and analyses the value relevance of their presented pension accounting information for the years 2005, 2006 and

2007 (Morais 2008). The published study incorporates a sample of 59 companies listed on Euronext Lisbon between 2004 and 2010 (Paralta 2014).

Table 2. Overview of studies' characteristics examined in this meta-analysis

Panel A									Panel B									
									Analysed variables[a]									
No.	Authors (Year of Publication)	Journal of Publication	Valuation Model	Sample Period	Time Category	Sample Size	Sub-Sample	Sub-Sample Size	ABO	PBO	PLA	PL	PA	INT	SVC	RPL	PC
1	Amir (1996)	TAR	OM	1990-1993	(2)	890						(–)					–
2	Amir (1993)	TAR	OM	1984-1990	(1)	2,014	1984	243				(–)					–
					(1)		1985	266				(–)					(+)
					(1)		1986	289				(–)					(–)
					(2)		1987	298				(–)					+
					(2)		1988	301				–					+
					(2)		1989	304				–					–
					(2)		1990	313				(–)					(–)
3	Barth (1991)	TAR	BSM	1985-1987	(1)	1,934	1985	150	–	–	(–)						
					(1)		1986	702	–	–	+						
					(2)		1987	1,082	–	(–)	(+)						
4	Barth et al. (1992)	JAE	OM	1986-1988	(1)	546	1986	114						(–)	(+)	(+)	(–)
					(2)		1987	216						–	(+)	+	–
					(2)		1988	216						–	+	+	+
5	Barth et al. (1993)	FA	OM	1992-1993	(2)	1,050	1987	249		(–)	(+)			(–)	(–)	(+)	
					(2)		1988	241		–	+			(–)	(+)	(+)	
					(2)		1989	295		–	+			+	(–)	(+)	
					(2)		1990	265		–	+			(+)	(–)	(–)	
6	Barth et al. (1996)	TAR	BSM	1987-1990	(2)	212	1992	103				–					
					(2)		1993	109				(–)					
7	Campbell (2013)	AAFSJ	BSM	1991-1993	(2)	679			–								
8	Choi et al. (1997)	TAR	BSM	1991-1992	(2)	629	1991	336	–		+		+				
					(2)		1992	293	–		+		+				
9	Coronado and Sharpe (2003)	BPEA	OM	1993-2001	(2)	4,369	1993	473				(–)					
					(2)		1994	515					(+)				
					(2)		1995	513					(+)				
					(2)		1996	522					(+)				
					(2)		1997	519					(+)				
					(2)		1998	501					+				
					(2)		1999	471					(+)				
					(2)		2000	433					(+)				
					(2)		2001	412				(–)					
10	Daley (1984)	TAR	EDM	1975-1979	(1)	640	1975	128									–
					(1)		1976	128									–
					(1)		1977	128									–
					(1)		1978	128									–
					(1)		1979	128									–
11	Davis-Friday et al. (1999)	TAR	BSM	1991-1993	(2)	458	1991-1992	292	–	–	+		+				
					(2)		1992-1993	166	–	–	+		+				
12	Davis-Friday et al. (2004)	CAR	BSM	1992-1993	(2)	199			(–)	(+)	(+)		(+)				
13	Feldstein and Seligmann (1981)	JoF	EDM	1976-1977	(1)	310	1976	117				–					
					(1)		1977	193				–					
14	Feldstein and Morck (1983)	FA	EDM	1970-1979	(1)	132						–					
15	Gopalakrishnan (1994)	RQFA	BSM	1988-1990	(2)	1,514	1988	764			+	–					
					(2)		1989	750			+	–					
					(2)		1990	685			+	–					
16	Gopalakrishnan and Sugrue (1993)	JBFA	BSM	1987-1988	(2)	1,398	1987	659		–	+						
					(2)		1988	739		–	+						
17	Hann et al. (2007a)	JAE	OM	1991-2002	(2)	13,610							+				–
18	Hann et al. (2007b)	TAR	OM	1991-2003	(2)	12,567				–	+						
19	Landsman (1986)	TAR	BSM	1979-1981	(1)	1,480	1979	235			(+)	–					
					(1)		1980	621			(+)	–					
					(1)		1981	624			+	–					
20	Landsman and Ohlson (1990)	CAR	BSM	1979-1982	(1)	1,475	1979	187					(+)				
					(1)		1980	426					(+)				
					(1)		1981	431					(+)				
					(1)		1982	431					(+)				
21	Oldfield (1977)	JMCB	EDM	1974	(1)	166						–					
22	Werner (2011)	RAF	OM	1998-2005	(2)	1,198				(–)	–						
			EDM (4)		**(2) = 37**	**48,215**			**positive significant**			**15**		**6**	**1**	**1**	**2**	**3**
			BSM (10)		**(1) = 22**				**negative significant**	**8**	**10**	**1**	**13**		**2**			**10**
			OM (8)						**non-significant**	**1**	**4**	**6**	**9**	**11**	**4**	**6**	**5**	**4**
									total	**9**	**14**	**22**	**22**	**17**	**7**	**7**	**7**	**17**

Notes to Table 2: (a) Panel B shows the signs and the number of the evaluated variables. The signs in brackets show non-significant results.

Variable definitions:

The abbreviations of journals are described in Table 1. EDM = earnings discount models. BSM = balance sheet models. OM = Ohlson model. Time categories: (1) = periods during the validity of APB 8 and (2) = periods during the validity of SFAS 87.
ABO = accumulated benefit obligation. PBO = projected benefit obligation. PLA = plan assets. PL = pension liability, results if the pension obligation exceeds the fair value of plan assets (PLA). PA = pension asset, results if the fair value of plan assets exceeds the pension obligation. INT = interest cost. SVC = service cost. RPLNA = expected returns on plan assets. PC = pension cost, reflects the difference between expenses and RPLNA.

6. Results and discussion

6.1 Value relevance of pension accounting information (H 1)

The first hypothesis (*H1*) states that pension information presented in the balance sheet or income statement are associated with firm value. Table 3 shows the results for a full set of meta-analytical methods. The first column of Table 3 shows the *k*-sets of results. The following columns present the number of significant results, mean effect sizes of the random effects model, *p*-value, Fail-safe-N, and the test for heterogeneity of the combined studies (Higgins & Thompson 2002; Higgins *et al.* 2003). The last columns show the results of the Stouffer Combined test (Wolf 1986).

Early studies stated that pension assets and liabilities are considered as firm assets and liabilities (Barth 1991; Glaum 2009). Findings imply a positive influence of pension related assets and a negative influence of pension related liabilities on firm value (Barth 1991; Barth *et al.* 1996; Feldstein & Morck 1983; Landsmann 1986). The results of the mean effect sizes presented in Table 3 are consistent to these expectations. In detail, the mean effect sizes of obligation (k = 23; mean effect size = –0.075), ABO (k = 9; mean effect size = –0.088), and PBO (k = 14; mean effect size = –0.068) have significant negative signs. Furthermore, the results indicate that the fair value of plan assets shows a positive and significant association with firm value (k = 22; mean effect size = 0.067). Netting of the obligation and the plan assets lead to a pension asset (k = 17) or liability (k = 22). Results are inconclusive. Pension liabilities have an overall significant negative association with the firm value (mean effect size = –0.064) in turn, there is a significant and positive association for pension assets (mean effect size = 0.035). For the net amount the effect is negative but not significant (mean effect size = –0.015). Therefore, the results suggest that investors consider pension accounting information in assessing firm value (e.g. Barth 1991; Daley 1984; Landsmann 1986).

The Fail-safe N estimates whether publication bias is likely to be a problem for this meta-analysis. It shows how many unpublished or new studies would be needed to produce a non-significant mean effect size (Hartung *et al.* 2008; Rosenberg 2005; Wolf 1986). On the one hand, the Fail-safe N indicates stable results for obligation (772 sets of results) and plan assets (627 sets of results). On the other hand, pension liabilities (156 sets of results) or assets (13 sets of results) have a lower Fail-safe N.

However, the conclusions made above are less clear when the included studies are inconsistent. Thus, I establish two methods (Cochran's Q and I^2 statistic) to determine whether there are differences in the underlying studies, which cannot be explained by probability alone (Higgins & Thompson 2002; Huedo-Medina *et al.* 2006). The results imply a low heterogeneity of PBO and obligation, a moderate heterogeneity of ABO, PLA, consolidated amounts and PA as well as total homogeneity of PL. Hence, this corroborates the use of a random-effects model and suggests the existence of further moderator variables, which are analysed below. The last element of analysis addresses the question of combining the results of a number of independent tests which have all been planned to test a common hypothesis (Wolf 1986). Stouffer's combined test confirms this combination of studies testing a common hypothesis for all variables related to the pension assets or liabilities.

An early study of Daley (1984) indicates that pension costs are value relevant. Barth *et al.* (1992) investigate more deeply the value-relevance of pension cost (PC) and separate service cost (SVC), interest cost (INT) and the expected return on plan assets (RPLNA). They find that the influence of interest cost is negative, but not significant and that the influence of the return on plan assets is significantly positive associated with firm value. For INT the meta-analysis confirms the expected negative sign (mean effect size = –0.049). However, this mean effect size is not significantly different from zero (*p*-value = 0.102). The influence of RPLNA is, as expected, positive and significant at the 1% level. Furthermore, Barth et al. (1992) surprisingly find a positive influence of service cost on investors' firm valuation, which was later confirmed by Hann *et al.* (2007a). However, another study finds the expected negative association (Barth *et al.* 1993). Concurrent with Barth *et al.* (1992) and Hann *et al.* (2007a) the meta-analysis computes a positive mean effect size of SVC (mean effect size = 0.003), but it is not significant (*p*-value = 0.908). This result partially supports the idea that pension commitments are perceived as investments in human capital (Hann *et al.* 2007a; Ippolito 1985; Klumpes 2001). Overall, the consolidated pension cost (PC) shows a negative and significant effect on firm value (mean effect size = –0.060; *p*-value = 0.004).

Table 3. Determinants of value relevance: Mean effect sizes and Stouffer combined test (k=59)

		Number of significant results			Random Effects Model			Heterogeneity			Stouffer Combined test	
	k-sets of results	Pos.	Neg.	Non sign.	Mean effect size	*p*-value	Fail-Safe N	Chi-squared (Q)	*p*-value	I² (%)	Z(p)	P
Balance Sheet												
Obligation	**23**	**0**	**18**	**5**	**–0.075*** **	**0.010**	**772**	**28.163**	**0.155**	**14.56**	**–14.625*** **	**<0.001**
ABO	9	0	8	1	–0.088***	<0.001	58	9.034	0.340	0.34	–9.315***	<0.001
PBO	14	0	10	4	–0.068**	0.011	368	19.084	0.121	17.10	–11.277***	<0.001
PLA	**22**	**15**	**1**	**6**	**0.067****	<0.001	**627**	**43.985*** **	**0.002**	**40.64**	**12,267*** **	<0.001
Consolidated	**39**	**6**	**13**	**20**	**–0.015**	**0.153**	**0**	**82.297*** **	**<0.001**	**45.76**	**–3.710*** **	**0.001**
PL	22	0	13	9	–0.064***	<0.001	156	9.972	0.979	0	–7.285***	<0.001
PA	17	6	0	11	0.035**	0.011	13	35.192***	0.004	36.69	2,669***	0.004
Income Statement												
Expenses	**14**	**2**	**2**	**10**	**–0.022**	**0.232**	**0**	**14.343**	**0.350**	**2.38**	**–2.182****	**0.015**
INT	7	1	2	4	–0.049	0.102	0	9.620	0.142	27.05	–2.957***	0.002
SVC	7	1	0	6	0.003	0.908	0	2.843	0.828	0	–0.129	0.449
RPLNA	**7**	**2**	**0**	**5**	**0.050****	**0.046**	**26**	**6.621**	**0.357**	**0**	**2.572*** **	**0.005**
PC	**17**	**3**	**10**	**4**	**–0.060*** **	**0.004**	**163**	**78.270*** **	**<0.001**	**60.54**	**–7.225*** **	**<0.001**

Notes to Table 3: ***, and ** indicates significance at the 1%, and 5% level, respectively.
Variable definitions:
ABO = accumulated benefit obligation. PBO = projected benefit obligation. Obligation = reflects the obligation without a distinction between ABO and PBO. PLA = plan assets. PL = pension liability, results if the pension obligation exceeds the fair value of plan assets (PLA). PA = pension asset, results if the fair value of plan assets exceeds the pension obligation. Consolidated = reflects the difference between the obligation and the plan asset without a distinction between PL and PA. INT = interest cost. SVC = service cost. Expenses = reflects the total effects of pension expenses without a distinction of INT and SVC. RPLNA = expected returns on plan assets. PC = pension cost, reflects the difference between expenses and RPLNA.

The mean effect sizes of expenses, INT and SVC are all not significant different from zero, therefore the related Fail-safe N is zero. No unpublished or new studies would need to be added to the analysis since the mean effect size is already insignificant. The volatile mean effect sizes can be explained by the redundancy of pension information presented in the balance sheet and income statement (Barth *et al.* 1993). Furthermore, the Fail-safe N of the pension cost influence covers 163 sets of results, which is lower than those of the balance sheet concerning the obligation and plan assets. An I² between 0% and 27.05% provides only little evidence for the existence of heterogeneity for the variables expenses, INT, SVC and RPLNA. Only the mean effect size of pension cost indicates a moderate heterogeneity (I² = 60.54%). In addition, the Stouffer combined test consistently shows insignificant results of SVC in the underlying studies. Therefore, all other studies seem to test the common null hypothesis that the effect sizes of the income statement variables are zero.

The comparison of the above meta-analytical results with the IFRS related working papers identify several disparities. For example, Morais (2008) shows a negative correlation between the fair value of pension assets and the firm value. Additionally, Fasshauer & Glaum (2012) find, depending on the examined model, a positive but non-significant regression coefficient for PC. Furthermore, the regression coefficients of INT is positive and of RPLNA is negative, but in both cases non-significant. However, Paralta (2014) finds a consistent negative and significant association between PL and the firm value. Thus, main results of the IFRS related studies are comparable to the findings of this meta-analysis and maintain the value relevance of pension related amounts presented in financial statements provided under IFRS (Fasshauer & Glaum 2012; Morais 2008; Paralta 2014). Hence, the concerns of local differences in value relevance apparently cannot be supported.

6.2 Differences in the effects on investors firm valuation (H 2)
To address the second hypothesis (H2) I compare the mean effect sizes of the pension variables presented in Table 3. Due to differential impact of pension accounting information I only use the absolute values of the mean effect sizes to find differences in the strength of their influence on firm value. To test the null hypothesis that the difference between two absolute mean effect sizes is zero, I employ the test-statistic suggested by Cohen *et al.* (2002). Table 4 presents the computed test-statistic above the diagonal and the related *p*-value below the diagonal. To facilitate the interpretation, I subtract the variables in the columns with the variables in the rows. If the result of the test-statistic is negative, then the mean effect size of the variable presented in the row is higher than of the variable presented in the column.

A first strand of literature finds evidence for differences in the influence on the firm value between the accumulated benefit obligation (ABO) and the projected benefit obligation (PBO) (Barth 1991; Choi *et al.* 1997; Gopalakrishnan and Surgue 1993). A key explanation for the differences relates to the consideration of future expectations based on the present obligation to calculate the PBO in contrast to ABO (Barth 1991; Gopalakrishnan & Surgue 1993). Barth (1991) argues that PBO do not constitute a liability due to lack of past events and likely impair the reliability of the measure. In contrast, the ABO could be systematically understated because future compensations are ignored (Barth 1991). The meta-analysis indicates no significant higher

association of ABO with firm value than PBO, because $z = -1.114$ is non-significant. Thus, investors consider benefit obligation, but do not differentiate between ABO and PBO, irrespective of measurement errors linked to projected benefit obligation (Barth 1991; Gopalakrishnan & Sugrue 1993; Davis-Friday *et al.* 1999).

Moreover, several authors state that market valuation is stronger associated with information about pension plans disclosed as compared to those recognised in the balance sheet (Barth 1991; Glaum 2009; Mitra & Hossain 2009; Werner 2011). In contrast, Gopalakrishnan (1994) finds that investors do not differentiate between disclosures and recognised pension information. To address the issue, I compare the amounts of PL and PA with their calculation factors presented in the notes of the balance sheet (ABO, PBO and PLA). The test statistics for the comparison of the consolidated amounts (PA and PL) and the obligation (ABO and PBO) as well as PLA are overall negative and in most cases significant (not significant are the *z*-statistics of Obligation, ABO, PBO, PLA vs. PL and Obligation vs. PA). Thus, this meta-analysis suggests that investors put more emphasis on disclosed information concerning the balance sheet.

Table 4. Differences in the mean effect sizes (k=59)

	Obligation	ABO	PBO	PLA	Consolidated	PL	PA	Expenses	INT	SVC	RPLNA	PC
Obligation	1	0.734	–0.704	–0.844	–9.975***	–0.833	–0.833	–4.097***	–1.006	–2.781***	–0.968	–1.496
ABO	0.463	1	–1.114	–1.184	– 5.869***	–1.201	–2.958***	–2.735***	–1.306	–2.840***	–1.273	–1.552
PBO	0.481	0.266	1	–0.101	–8.734***	–0.295	–2.434**	–2.405**	–0.730	–2.494*	–0.692	–0.765
PLA	0.399	0.237	0.920	1	–9.036***	–0.227	–3.261***	–2.379**	–0.696	–0.470**	–0.657	–0.695
Consolidated	<0.001	<0.001	<0.001	<0.001	1	6.106***	5.341***	1.977**	2.484**	0.698	2.523***	7.776
PL	0.405	0.230	0.768	0.821	<0.001	1	–2.155**	–1.996**	–0.546	–2.218**	–0.510	–0.293***
PA	0.405	0.003	0.015	0.001	<0.001	0.031	1	–0.681	0.538	–1.229	0.577	2.417
Expenses	<0.001	0.006	0.016	0.017	0.048	0.046	0.496	1	1.560	–0.619	0.914	1.979**
INT	0.314	0.192	0.465	0.487	0.013	0.585	0.590	0.119	1	–1.299	0.028	0.422
SVC	0.005	0.005	0.013	0.014	0.485	0.027	0.219	0.536	0.194	1	1.328	2.182**
RPLNA	0.333	0.203	0.489	0.511	0.012	0.610	0.564	0.361	0.977	0.184	1	0.383
PC	0.135	0.121	0.444	0.487	<0.001	0.769	0.016	0.048	0.673	0.029	0.701	1

Notes to Table 4: ***, **, and * indicates significance at the 1%, 5%, and 10% level, respectively.

I calculate the differences of the absolute mean effect sizes presented in Table 3 by subtracting the variables in the columns with these presented in the rows of Table 4. Furthermore, I use the following test-statistic: $Z = \frac{|z_{column}| - |z_{row}|}{\sqrt{\frac{1}{N_{column}-3}+\frac{1}{N_{row}-3}}}$. The test statistic Z is the standard normal curve. z_{column} (z_{row}) of the correlation coefficient r_{column} (r_{row}) presented in the column (row) and N_{column} (N_{row}) reflects the sample size. The results of the test statistic are presented above the diagonal. In addition, computed p-values are shown below the diagonal.

Variable definitions:

ABO = accumulated benefit obligation. PBO = projected benefit obligation. Obligation = reflects the obligation without a distinction between ABO and PBO. PLA = plan assets. PL = pension liability, results if the pension obligation exceeds the fair value of plan assets (PLA). PA = pension asset, results if the fair value of plan assets exceeds the pension obligation. Consolidated = reflects the difference between the obligation and the plan asset without a distinction between PL and PA. INT = interest cost. SVC = service cost. Expenses = reflects the total effects of pension expenses without a distinction of INT and SVC. RPLNA = expected returns on plan assets. PC = pension cost, reflects the difference between pension expenses and RPLNA.

Another controversial discussion concerns the differences in value relevance of the balance sheet and the income statement amounts (Amir 1996; Barth *et al.* 1993; Coronado & Sharp 2003; Daley 1984; Glaum 2009). The results of this meta-analysis present a more detailed picture of investors' behaviour in firm valuation. First, I compare the mean effect sizes of the disclosed balance sheet related amounts (obligation, ABO, PBO and PLA) with income statement variables (expenses, INT, SVC, RPLNA and PC). The overall negative results presented in Table 4 indicate that the disclosed balance sheet amounts are more value relevant. Second, the results of the comparison of the pension assets (PA) or liabilities (PL) and income statement variables provide mixed evidence. The signs and the significance vary across examined variables. Fasshauer and Glaum (2012), who address this specific topic in the IFRS environment, find that pension accounting variables related to balance sheet positions are more value relevant than income statement amounts. Therefore, findings appear to be transferable to the IFRS accounting regime (Barth *et al.* 2012; Bushman & Piotroski 2006; Glaum 2009; Hail & Leuz 2006).

Findings of the meta-analysis imply that investors prefer disclosed information about the balance sheet amounts for the calculation of the firm value, followed by income statement information. In addition, recognised amounts of pension assets or liabilities play only an inferior role in investors' firm valuation. These findings are consistent with the conclusions of Barth *et al.* (1993) that pension cost component information is largely redundant in explaining share prices, once pension balance sheet variables are included. Overall, the findings partially suggest a superiority of the asset-liability approach, whereat the recognised pension asset or liability seems to have only a minor impact on firm valuation. Above findings partially substantiate the increasing number of disclosure requirements, especially implemented by the amended IAS 19 (amended 2011).

6.3 Influence of various stages of the American pension accounting and valuation models (H 3 and H 4)

Because of missing data, the moderator analysis of accounting periods and valuation models, as required by hypotheses *H3* and *H4*, focuses on a comparison of the consolidated amounts of pension asset or liability and pension cost. The first part addresses the impact of different sets of accounting rules. Particularly, I use the sample date as moderator variable (see Table 2, yielding three phases: (1) samples with fiscal years beginning before 15 December 1986 (7 studies); (2) samples in the period in which the SFAS 87 was valid (fiscal years beginning after 15 December 1986; 15 studies); (3) samples in periods after 2006 that analyse the value relevance of pension accounting under SFAS 158/ASC 715 (no studies). Due to missing data we have to concentrate the moderator-analysis on the first two stages, which represent the most important change in US pension accounting (Ali and Kumar 1993; Gopalakrishnan and Sugrue 1993).

The results of the moderator analysis concerning differences between the sets of pension accounting rules are presented in Panel A of Table 5. The negative influence of the pension liability (PL) decrease over the first two periods (mean effect size $_{\text{before 1987}} = -0.088$ and $k = 10$; mean effect size $_{1987-2006} = -0.045$ and $k = 12$). This effect is significant at the 10%-level. In contrast, the positive effect of pension assets (PA) increases between the periods, but the differences are not significant. In accordance with the results of the pension liability the influence of pension cost on firm value decline significantly in time (mean effect size $_{\text{before 1987}} = -0.137$ and $k = 8$; mean effect size $_{1987-2006} = -0.017$ and $k = 9$). Overall the value relevance of accrued pension information decreases. This effect may be explained by higher accounting perception (Ali & Kumar 1993) and a negative effect of accrual pension accounting information on firm value (Hung 2000). The second aspect expands findings of Hung (2000), who finds a negative effect on the firm value of pension accounting information in countries with a weak shareholder protection, and confirms a negative effect on the firm value in the US, a country with a strong shareholder protection.

Table 5. Moderator-analysis of the mean effect size between different accounting standards (Panel A) and different valuation models (Panel B) (k=59)

		Panel A: Accounting Standards						**Panel B: Valuation model**						
		Before 1987		**1987 - 2006**		***p*-value**		**OM**		**BSM**		**EDM**		***p*-value**
	Sample k	Sample k	mean effect size	Sample k	mean effect size			Sample k	mean effect size	Sample k	mean effect size	Sample k	mean effect size	
Consolidated	39	14	–0.055	25	0.007	0.036		18	–0.021	17	0.012	4	–0.102[a]	0.088
PL	22	10	–0.088	12	–0.045	0.062		10	–0.042	8	–0.082	4	–0.095[a]	0.154
PA	17	4	0.018	13	0.057	0.476		8	0.004	9	0.095			0.021
PC	17	8	–0.137	9	–0.017	0.068		12	–0.024			5	–0.205	0.009

Notes to Table 5: (a) Both results depend on early studies that use a variation of earnings discount models. Glaum (2009) assigns them to the EDM as well.

Variable definitions:

EDM = Earnings discount models. BSM = balance sheet models. OM = Ohlson model. PL = pension liability, results if the pension obligation exceeds the fair value of plan assets (PLA). PA = pension asset, results if the fair value of plan assets exceeds the pension obligation. Consolidated = reflects the difference between the obligation and the plan asset without a distinction between PL and PA. PC = pension cost, reflects the difference between pension expenses and the expected return on plan assets.

As presented in Panel B of Table 5 this meta-analysis finds significant differences of the mean effect sizes caused by different valuation models. Studies using the Ohlson model find the lowest negative association of PL (mean effect size $_{OM} = -0.042$ and $k = 10$) on firm value, followed by the balance sheet models (mean effect size $_{BSM} = -0.082$ and $k = 8$). The strongest association is shown by studies using variations of the earnings discount model (mean effect size $_{EDM} = -0.095$ and $k = 4$). The results concerning the influence of pension assets (PA) on firm value decrease significantly between studies using a balance sheet approach (mean effect size $_{BSM} = 0.095$ and $k = 9$) and the Ohlson model (mean effect size $_{OM} = 0.004$ and $k = 8$). Same result applies to the effect of pension cost (mean effect size $_{OM} = -0.024$ and $k = 12$; mean effect size $_{EDM} = -0.205$ and $k = 5$). In sum, the choice of the valuation model impacts the mean effect sizes of pension asset or liability and pension cost. It can be shown that the Ohlson model causes lower mean effect sizes. The results thus provide evidence for a systematic undervaluation of studies using the Ohlson model and thereby confirm prior findings (e.g. Barth *et al.* 2005; Deechow *et al.* 1999; McCrae & Nilsson 2001; Myers 1999; Qi *et al.* 2000). Explanations for this finding include the inappropriate employment of OLS regression using time-series data (McCrae & Nilsson 2001), investors' undervaluation of current earnings and book values (Choi *et al.* 2006; Deechow *et al.* 1999) and inappropriate links between the accounting numbers and firm characteristics (Holthausen & Watts 2001). Especially the long-range character of pension accounting appears to foster the impact of accounting conservatism (Beaver & Ryan 2005; Hann *et al.* 2007a).

6.4 Robustness check

First, I run the whole set of meta-analytical approaches with the transformation of the regression coefficients according to Rosenthal and Rubin (2003). Table 6 shows higher mean effect sizes of the Rosenthal & Rubin (2003) approach ($r_{equivalent}$) than r_{sp} (except SVC). In particular, the last two columns of Table 6 show the results of a z-test that compares the mean effect sizes calculated in accordance with the Aloe & Becker (2011) and Rosenthal & Rubin (2003). The results indicate no change (1) of the direction of the association between balance sheet and income statement related variables to the firm value and (2) of the other major findings of this meta-analysis.

Second, to test the effect of duplicated studies, I run the approach recommended by Wood (2008). This heuristic indicates 11 duplicated studies with 24 sub-samples due to shared co-authors, and two studies and four sub-samples due to same sample characteristics (year of the sub-sample). To analyze the influence of duplicated studies, I run a moderator analysis that compares the mean effect sizes of duplicated and non-duplicated studies. Because of missing data, the moderator analysis focuses on a comparison of the consolidated amounts of pension asset or liability and pension cost. Untabulated results indicate that all mean effect sizes of non-duplicated studies show the same sign as the main analysis. However, the mean effect sizes of PA (mean effect sizes $_{non\text{-}duplicated}$ = 0.037 and k = 9) and PC (mean effect sizes $_{non\text{-}duplicated}$ = –0.066 and k = 12) are not significant anymore. In particular, the moderator analyses identify no significant differences between duplicated and non-duplicated studies.

Third, to test the effect of the journal quality on the results of the meta-analysis (Murtaugh 2002), I identify all journal rankings of the included studies according to the VHB-JOURQUAL 3 published by the German Academic Association for Business Research (VHB 2015). Then I run a moderator-analysis comparing the results of high ranked (A or A^+) journals with all other journals. Untabulated results point out that all mean effect sizes of studies published in high ranked journals show the same direction as the main analysis. However, the mean effect sizes of INT (mean effect sizes $_{high\ ranked}$ = –0.142 and k = 3) become significant at the 1%-level. Mostly non-significant results of the moderator analysis, except PA, INT, and RPLNA, indicate no consistent differences of the mean effect sizes between high ranked and other journals and, hence, no severe publication bias.

Table 6. Robustness check: Comparison of mean effect sizes between the Aloe and Becker (2011) and Rosenthal and Rubin (2003) approach (k=59)

		Number of significant results			Random Effects Model Aloe and Becker (2011)			Random Effects Model Rosenthal and Rubin (2003)			z-test[(a)]	
	k-sets of results	Pos.	Neg.	Non sign.	Mean effect size	*p*-value	Fail-Safe N	Mean effect size	*p*-value	Fail-Safe N	Z	*p*-value
Balance Sheet												
Obligation	**23**	**0**	**18**	**5**	**–0.075*** **	**0.010**	**772**	**–0.144*** **	**<0.001**	**2,200**	**7.165*** **	**<0.001**
ABO	9	0	8	1	–0.088***	<0.001	58	–0.184***	<0.001	262	3.711***	<0.001
PBO	14	0	10	4	–0.068**	0.011	368	–0.118***	<0.001	957	4.818***	<0.001
PLA	**22**	**15**	**1**	**6**	**0.067** **	**<0.001**	**627**	**0.121*** **	**<0.001**	**1,678**	**–5.639*** **	**<0.001**
Consolidated	**39**	**6**	**13**	**20**	**–0.015**	**0.153**	**0**	**–0.038** **	**0.011**	**6**	**2.402** **	**0.016**
PL	22	0	13	9	–0.064***	<0.001	156	–0.114***	<0.001	489	5.836***	<0.001
PA	17	6	0	11	0.035**	0.011	13	0.046***	0.004	35	-0.679	0.497
Income Statement												
Expenses	**14**	**2**	**2**	**10**	**–0.022**	**0.232**	**0**	**–0.039**	**0.204**	**2**	**0.679**	**0.497**
INT	7	1	2	4	–0.049	0.102	0	–0.086*	0.085	9	1.044	0.297
SVC	7	1	0	6	0.003	0.908	0	0.002	0.946	0	0.028	0.977
RPLNA	**7**	**2**	**0**	**5**	**0.050** **	**0.046**	**26**	**0.089** **	**0.031**	**13**	**–1.101**	**0.271**
PC	**17**	**3**	**10**	**4**	**–0.060*** **	**0.004**	**163**	**–0.096*** **	**<0.001**	**485**	**3.386*** **	**0.001**

Notes to Table 6: ***, **, and * indicates significance at the 1%, 5%, and 10% level, respectively.

(a) I calculate the differences of the mean effect sizes calculated with the Aloe and Becker (2011) approach as presented in Table 3 and the mean effect sizes according to the Rosenthal and Rubin (2003) approach. Furthermore. I use the following test-statistic: $Z = \frac{z_{\text{Aloe and Becker}} - z_{\text{Rosenthal and Rubin}}}{\sqrt{\frac{1}{N_{\text{Aloe and Becker}}-3} + \frac{1}{N_{\text{Rosenthal and Rubin}}-3}}}$. The results of the test statistic are presented in the last two columns.

Variable definitions:

ABO = accumulated benefit obligation. PBO = projected benefit obligation. Obligation = reflects the obligation without a distinction between ABO and PBO. PLA = plan assets. PL = pension liability, results if the pension obligation exceeds the fair value of plan assets (PLA). PA = pension asset, results if the fair value of plan assets exceeds the pension obligation. Consolidated = reflects the difference between the obligation and the plan asset without a distinction between PL and PA. INT = interest cost. SVC = service cost. Expenses = reflects the total effects of pension expenses without a distinction of INT and SVC. RPLNA = expected returns on plan assets. PC = pension cost, reflects the difference between expenses and RPLNA.

7. Conclusions and implications

Using a meta-analytical approach, this paper provides an overview of the body of evidence on value relevance of pension accounting which was developed over more than 30 years. Given few published studies from outside the

US, the meta-analysis focuses on pension accounting under US GAAP and cannot include a moderator for country, legal tradition or non-US accounting regime. Key results of the meta-analysis indicates differences in the value relevance of pension accounting information related to (1) the balance sheet and income statement, (2) to amounts recognised or disclosed in the notes, (3) the set of accounting regulations applied and (4) the valuation model employed.

The meta-analytic results provide ample evidence on the value relevance of information provided on their pension plans. Balance sheet related amounts are generally value relevant and show the expected sign of association with firm value. This does not hold true for amounts related to the income statement. Returns on plan assets and pension cost turn out to be value relevant, while pension expenses do not. The results could be interpreted in favour of an asset-liability approach taken by both the FASB and the IASB.

Comparisons of the mean effect sizes indicate that amounts related to the balance sheet are more relevant than amounts related to the income statement when disclosed in the notes. This pattern does not persist for amounts recognised in the balance sheet or income statement and suggests differential use of information provided in different parts of financial statements. Accumulated benefit obligations have a higher mean effect size than projected benefit obligations that are likely more affected by errors in measurement. Thus, findings suggest that investors do not fully incorporate future expectations as reflected in projected benefit obligations.

Results give reasons to presume that the value relevance of pension information differs between sets of US pension accounting regulation, i.e. between APB Opinion 8 (implying a rather cash basis approach) and SFAS 87 (implying an accrual based approach). Interestingly, the meta-analysis indicates lower value relevance of pension accounting information on investors' firm valuation under SFAS 87. The result seems to partially contradict findings of Hung (2000) and indicate a negative effect on firm value of pension accounting information using accruals in the US.

Finally, results imply that the value relevance of pension information differs between valuation models employed. There are particularly low associations in studies using the Ohlson model. This suggests an undervaluation due to bias on the theoretical (Barth *et al.* 2001; Holthausen & Watts 2001) or the practical level (e.g. Deechow *et al.* 1999; McCrae & Nilsson 2001).

The results should be interpreted with regard to limitations of the meta-analytical approach (Kuerschner & Guenther 2012). Restrictions include the typical issue of potentially comparing 'apples and oranges' (Cortina 2003) by aggregating research findings based on different methodologies, operationalisations and settings. The focus on US studies seems to diminish this issue in part. Another typical limitation is the 'garbage in and garbage out' issue (Rosenthal & DiMatteo 2001) that is related to the inclusion of poor quality studies. The concern is likely mitigated by only including studies that are published in high quality journals. More particularly, this meta-analysis incorporates just 22 studies with 59 regressions. However, methodological papers provide evidence for reliable results of systematic literature reviews including a much smaller number of studies (Herbison *et al.* 2011; Valentine *et al.* 2010).

The findings of this meta-analysis have several implications. Particularly, it highlights gaps in existing research which suggest fruitful avenues for future research. First, research has focused on pension accounting information under US GAAP at two stages of development. Studies evaluating recent changes in US pension accounting are currently not available. It would be of interest to assess whether improvement in terms of value relevance could be realised. Second, there are only few studies from other countries, including Canada and Australia (Ang *et al.* 1999; Wiedman & Wier 2004) that suggest that the value relevance of pension accounting information is affected by the institutional setting. Beyond single-country studies in special settings, e.g. with regard to cultural factors, rule of law, pension regulation, taxation and funding, this suggests that cross-country studies will be warranted. Third, there is surprisingly little research on the value relevance of pension accounting information under IFRS. (Note 6) This offers various opportunities for future research. For example, it would be of interest to see whether and why the value relevance differs between countries that adopted IFRS, or is affected by the amendment of IAS 19. Finally, another approach would be to exploit reconciliations of first time adopters of IFRS or of firms cross-listed in the US (Dobler & Günther 2008). This would allow exploring the relative and incremental value relevance of pension accounting information, which is provided under different accounting regimes by the same sample of firms.

Such results would be warranted by standard-setters such as the FASB and the IASB that strive for further improvement and convergence in the field of pension accounting. The meta-analytic findings suggest that the value relevance depends on the pension accounting regime, that is, pension accounting rules matter to investors. Thus, users and preparers, among others have incentives to influence the development of pension accounting rules and are likely to participate in any upcoming IASB and FASB convergence project on pension accounting. The findings at hand present the lessons learned from US pension accounting and can provide assistance for those involved in the upcoming convergence project.

References

Aboody, D., Jughes, J. & Lui, J. (2002), "Measuring value-relevance in a (possibly) inefficient market", *Journal of Accounting and Economics* **29**, 965-986.

Ali, A. & Hwang, L. (2000), "Country-Specific Factors Related to Financial Reporting and the Value Relevance of Accounting Data", *Journal of Accounting Research* **38**, 1-21.

Ali, A. & Kumar, K.R. (1993), "Earnings Management Under Pension Accounting Standards: SFAS 87 Versus APB 8", *Journal of Accounting Auditing and Finance* **8**, 427-446.

Aloe, A. M. & Becker, B.J. (2009), "Teachers' verbal ability and students' academic achievement: Where is the evidence?", *Educational Researcher* **38**, 612-624.

Aloe, A.M. & Becker, B.J. (2011), "An Effect Size for Regression Predictors in Meta-Analysis", *Journal of Educational and Behavioral Statistics* **37**, 1-20.

Amir E. (1993), "The Market Valuation of Accounting Information: The Case of Postretirement Benefits other than Pensions", *The Accounting Review* **68**, 703-724.

Amir E. (1996), "The Effect of Accounting Aggregation on the Value-Relevance of Financial Disclosures: The Case of SFAS No. 106", *The Accounting Review* **71**, 573-590.

Amir, E., Guan, Y., & Oswald D. (2010), "The effect of pension accounting on corporate pension asset allocation", *Review of Accounting Studies* **15**, 345-366.

Ang, N., Gallery, G. & Sidhu B.K. (1999), "The value relevance of superannuation disclosures by Australian-listed firms sponsoring defined benefit plans", *Accounting & Finance* **39**, 205-228.

Barth, M.E. (1991), "Relative Measurement Errors among Alternative Pension Asset and Liability Measures", *The Accounting Review* **66**, 433-463.

Barth, M.E. (2000), "Valuation-based accounting research: Implications for financial reporting and opportunities for future research", *Accounting & Finance* **40**, 7-31.

Barth, M.E. (2006), "Research, Standard Setting, and Global Financial Reporting", *Foundation and Trends in Accounting* **1**, 71-165.

Barth, M.E., Beaver, W.H. & Landsman, W.R. (1992), "The market valuation implications of net periodic pension cost components", *Journal of Accounting and Economics* **15**, 27-62.

Barth, M.E., Beaver, W.H. & Landsman, W.R. (1993), "A structural analysis of pension disclosures under SFAS 87 and their relation to share prices", *Financial Analysts Journal* **49**, 18-26.

Barth, M.E., Beaver, W.H. & Landsman, W.R. (1996), "Value-Relevance of Banks' Fair Value Disclosures under SFAS No. 107", *The Accounting Review* **71**, 513-537.

Barth, M.E., Beaver, W.H. & Landsman, W.R. (2001), "The relevance of the value-relevance literature for financial accounting standard setting: Another view", *Journal of Accounting and Economics* **31**, 77-104.

Barth, M.E., Beaver, W.H., Landsman, J.R.M. & Landsman, W.R. (2005), "Accruals, Accounting-Based Valuation Models, and the Prediction of Equity Values", *Journal of Accounting, Auditing & Finance* **20**, 311-345.

Barth, M.E., Landsman, W. & Lang, M. (2008), "International Accounting Standards and Accounting Quality", *Journal of Accounting Research* **46**, 467-498.

Barth, M.E., Landsman, W., Lang, M. & Williams, C. (2012), "Are IFRS-based and US GAAP-based Accounting Amounts Comparable?" [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1585404.

Beaver, W.H. (2002), "Perspectives on Recent Capital Market Research", *The Accounting Review* **77**, 453-474.

Beaver, W.H. & Ryan, S.G. (2005), "Conditional and Unconditional Conservatism: Concepts and Modeling", *Review of Accounting Studies* **10**, 269-309.

Bodie, Z., Light, J.O., Morck, R. & Taggart, R.A. (1985), "Corporate Pension Policy: An Empirical Investigation", *Financial Analysts Journal* **41**, 10-16.

Borenstein, M., Hedges, L.V., Higgins, J.P.T. & Rothstein, H. (2009), "*Introduction to Meta-Analysis*", Wiley. West Sussex.

Bragg, S.M. (2011), "*Wiley GAAP 2012: Interpretation and Application of Generally Accepted Accounting Principles*", Wiley-Blackwell. London.

Brown, S. (2004), "The Impact of Pension Assumptions on Firm Value", [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=596666.

Bushman, R.M. & Piotroski, J.D. (2006), "Financial reporting incentives for conservative accounting: The influence of legal and political institutions", *Journal of Accounting and Economics* **42**, 107-148.

Campbell, K. (2013), "Value Relevance of Postretirement Benefit Obligations: An Implicit Contracts Analysis", *Academy of Accounting and Financial Studies Journal* **17**, 57-76.

Card, N.A. & Ahn, S. (2011), "Applied Meta-Analysis for Social Science Research", University of Arizona.

Choi, B., Collins, D.W. & Johnson, W.B. (1997), "Valuation Implications of Reliability Differences: The Case of Nonpension Postretirement Obligations", *The Accounting Review* **72**, 351-383.

Choi, Y.S., O'Hanlon, J.F. & Peter, P.F. (2006), "Conservative Accounting and Linear Information Valuation Models", *Contemporary Accounting Research* **23**, 73-101.

Cohen, J., Cohen, P., West, S.G. & Aiken, L.S. (2002), "*Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*", (3rd edn.), New Jersey: Erlbaum.

Coronado, J. & Sharpe, S. (2003), "Did Pension Plan Accounting Contribute to a Stock Market Bubble?", *Brookings Papers on Economic Activity* **40**, 323-359.

Cortina, J.M. (2003), "Apples and Oranges (and Pears. Oh My!): The Search for Moderators in Meta-Analysis", *Organizational Research Methods* **6**, 415-439.

Daley, L.A. (1984), "The Valuation of Reported Pension Measures for Firms Sponsoring Defined Benefit Plans", *The Accounting Review* **59,** 177-198.

Davis-Friday, P.Y., Folami, L.B., Lui. C. & Mittelstaedt, H.F. (1999), "The Value Relevance of Financial Statement Recognition vs. Disclosure: Evidence from SFAS No. 106", *The Accounting Review* **74**, 403-423.

Davis-Friday, P.Y., Liu C. & Mittelstaedt, H.F. (2004), "Recognition and Disclosure Reliability: Evidence from SFAS No. 106", *Contemporary Accounting Research* **21**, 399-429.

Davis-Friday, P.Y., Miller, J.S. & Mittelstaedt, H.F. (2005), "Market-Related Values and Pension Accounting", [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=656462.

Deechow, P.M., Hutton, A.P. & Sloan, R.G. (1999), "An empirical assessment of the residual income valuation model", *Journal of Accounting and Economics* **26**, 1-34.

Dobler, M. & Günther, N. (2008), "Stand der de facto-Konvergenz von IFRS und US-GAAP – Eine empirische Analyse der Überleitungsrechnungen nach Form 20-F von Unternehmen aus der Europäischen Union", *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung* **60**, 809-845.

FASB (1966), "Opinions of the Accounting Principles Board – Accounting for the Cost of Pension Plans", [Online] Available: http://clio.lib.olemiss.edu/cdm/ref/collection/aicpa/id/64.

FASB (1985), "Summary of Statement No. 87", [Online] Available: http://www.fasb.org/summary/stsum87.shtml.

FASB (2006), "Summary of Statement no. 158", [Online] Available: http://www.fasb.org/summary/stsum158.shtml.

FASB (2012), "FASB Accounting Standards Codification – Notice to Constituents (v4.7)"

FASB (2013) "Facts about FASB", [Online] Available: http://www.fasb.org/facts/index.shtml#mission.

FASB (2014) "Phase II: Postretirement Benefit Obligations. Including Pensions – Project Summary", [Online] Available: http://www.fasb.org/cs/ContentServer?pagename=FASB%2FFASBContent_C%2FProjectUpdatePage&cid=900000011133.

Fasshauer, J.D. & Glaum, M. (2012), "The Value Relevance of Pension Fair Values and Uncertainty", [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1491237.

Feldstein, M. & Morck, R. (1983), "Pension Funds and the Value of Equities", *Financial Analysts Journal* **39**, 29-39.

Feldstein, M. & Seligman, S. (1981), "Pension Funding. Share Prices, and National Savings", *Journal of Finance* **36**, 801-824.

Geyskens, I., Krishnan, R., Steenkamp, J.E.M. & Cunha, P.V. (2009), "A Review and Evaluation of Meta-Analysis Practices in Management Research", *Journal of Managaement* **35**, 393-419.

Gilpin, A.R. (2008), "r equivalent, Meta-Analysis, and Robustness: An Empirical Examination of Rosenthal and Rubin's Effect Size Indicator", *Educational and Psychological Measurement* **68**, 42-57.

Glaum, M. (2009), "Pension accounting and research: A review", *Accounting and Business Research* **39**, 273-311.

Gold, J. (2000), "Accounting/Actuarial Bias Enables Equity Investment by Defined Benefit Pension Plans", *North American Actuarial Journal* **9**, 1-21.

Gopalakrishnan, V. (1994), "The Effect of Recognition vs. Disclosure on Investor Valuation: The Case of Pension Accounting", *Review of Quantitative Finance and Accounting* **4**, 383-396.

Gopalakrishnan, V. & Sugrue, T.F. (1993), "An Empirical Investigation of Stock Market Valuation of Corporate Projected Pension Liabilities." *Journal of Business and Financial Accounting* **20**, 711-724.

Guenther, T.W. & Gaebler, S. (2014), "Antecedents of the adoption and success of strategic cost management methods: a meta-analytic investigation", *Journal of Business Economics* **84**, 145-190.

Hail, L. & Leuz, C. (2006), "International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter?", *Journal of Accounting Research* **44**, 485-531.

Hann, R.N., Heflin, F. & Subramanayam, K.R. (2007a), "Fair-value pension accounting." *Journal of Accounting and Economics* **44**, 328-358.

Hann, R.N., Lu, Y.Y. & Subramanyam, K.R. (2007b), "Uniformity versus Flexibility: Evidence from Pricing of the Pension Obligation", *The Accounting Review* **82**, 107-137.

Hartung, J., Knapp, G. & Sinha, B.K. (2008), "*Statistical Meta-Analysis with Applications*", Hoboken:Wiley.

Hay, D.H., Knechel, R.W. & Wong, N. (2006), "Audit Fees: A Meta-analysis of the Effect of Supply and Demand Attributes", *Contemporary Accounting Research* **23**, 141-191.
Hedges, L.V., Cooper, H. & Bushman, B.J. (1992), "Testing the null hypothesis in meta-analysis: A comparison of combined probability and confidence", *Psychological Bulletin* **111**, 188-194.
Hedges, L.V. & Olkin, I. (2002), "*Statistical Methods for Meta-Analysis*", London: Academic Press.
Hedges, L.V. & Vevea, J.L. (1998), "Fixed- and random-effects models in meta-analysis", *Psychological Methods* **3**, 486-504.
Herbison, P., Hay-Smith, J. & Gillespie, W.J. (2011), "Meta-analysis of small numbers of trials often agree with longer-term results", *Journal of Clinical Epidemiological* **64**, 145-153.
Higgins, J.P.T. & Thompson, S.G. (2002), "Quantifying heterogeneity in a meta-analysis", *Statistics in Medicine* **21**, 1539-1558.
Higgins, J.P.T., Thompson, S.G., Deeks, J.J. & Altman, D.G. (2003), "Measuring inconsistency in meta-analyses", *British Medical Journal* 327(7414), 557-560.
Holthausen, R.W. & Watts, R.L. (2001), "The relevance of the value-relevance literature for financial accounting standard setting", *Journal of Accounting and Economics* **31**, 3-75.
Houmes, R., Boylan, B. & Crosby, W. (2012). "*On the value relevance of SFAS 158*", [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2159976.
Hsu, L.M. (2005), "Some properties of r equivalent: A simple effect size indicator", *Psychological Methods* **10**, 420-427.
Huedo-Medina, T., Sánchez-Meca, J., Marín-Martínez, F. & Botella, J. (2006), "Assessing Heterogeneity in Meta-Analysis: Q Statistic Or I^2 Index?", *Psychological Methods* 11, 193-206.
Hung, M. (2000), "Accounting standards and value relevance of financial statements: An international analysis", *Journal of Accounting and Economics* **30**, 401-420.
Hunter, J.E. & Schmidt, F.L. (2004), "*Methods of Meta-Analysis - Correcting Error and Bias in Research Findings*", Thousand Oaks: SAGE Publications.
IASB (2011), "*Amendments to IAS 19 Employee Benefits - Project Summary and Feedback Statement*", [Online] Available: http://www.ifrs.org/Current-Projects/IASB-Projects/Post-employment-Benefits-(including-Pensions)/Defined-Benefit-Plans/Documents/EmpBenFSIAS190611.pdf.
IASB (2013), "*IASB and IFRS Interpretations Committee Due Process Handbook - Approved by the Trustees January 2013*", [Online] Available: http://www.ifrs.org/DPOC/Documents/2013/Due_Process_ Handbook_Resupply_28_Feb_2013_WEBSITE.pdf. Accessed 16 September 2014
Ippolito, R.A. (1985), "The Labor Contract and True Economic Pension Liabilities", *The American Economic Review* **75**, 1031-1043.
Ippolito, R.A. (1987), "The Implicit Pension Contract: Developments and New Directions", *Journal of Human Resources* **22**, 441-467.
Ippolito, R.A. (2002), "Stayers as 'Workers' and 'Savers'", *Journal of Human Resources* **37**, 275-308.
Johnson, B.T., Mullen, B. & Salas, E. (1995), "Comparison of Three Major Meta-Analytic Approaches", *Journal of Applied Psychology* **80**, 94-106.
Kennedy, P. (2008), "*A guide to econometrics*", (6th edn.), London: Blackwell.
Kiosse, P.M., Lubberink, M.J.P. & Peasnell, K.V. (2007), "*How does the market price pension accruals?*" Working Paper. The Department of Accounting and Finance. Lancaster University.
Klumpes, P.J.M. (1994), "The Politics of Rule Development: A Case Study of Australian Pension fund Accounting Rule-Making", *Abacus* **30**, 140-159.
Klumpes P.J.M. (2000), "Incentives and disincentives for voluntary disclosure by pension funds: evidence. Account Bus Res 30:287-298. doi:10.1080/00014788.2000.9728946
Klumpes, P.J.M. (2001), "Implications of four theoretical perspectives for pension accounting research", *Journal of Accounting Literature* **20**, 20-61.
Kraemer, H.C. (2005), "A Simple Effect Size Indicator for Two-Group Comparisons? A Comment on r equivalent", *Psychological Methods* **10**, 413-419.
Kuerschner, S. & Guenther, T.W. (2012), "Design parameters of the strategic planning process and organizational performance – a quantitative analysis of empirical research", *Journal für Betriebswirtschaft* **62**, 5-44.
Landsman, W. (1986), "An Empirical Investigation of Pension Fund Property Rights", *The Accounting Review* **61**, 662-691.
Landsman, W. & Ohlson, J.A. (1990), "Evaluation of market efficiency for supplementary accounting disclosures: The case of pension assets and liabilities", *Contemporary Accounting Research* **7**, 185-198.
Lipsey, M.W. & Wilson, D.B. (2001), "Practical Meta-Analysis", Thousand Oaks: SAGE Publications.
Liu, C., Yao, L.J. & Yao, M.Y.M. (2012), "Value Relevance Change under International Accounting Standards: An Empirical Study of Peru", *Review of Pacific Basin Financial Markets and Policies* **15**, 1-17.

Luchak, A.A. & Pohler, D.M. (2010), "Pensions as Psychological Contracts: Implications for Work Outcomes", *Industrial Relations* **49**, 61-82.

McCrae, M. & Nilsson, H. (2001), "The explanatory and predictive power of different specifications of the Ohlson (1995) valuation model", *The European Accounting Review* **10**, 312-341.

Miller, M.H. & Modigliani, F. (1966), "Some Estimates of the Cost of Capital to the Electric Utility Industry. 1954-57", *The American Economic Review* **56**, 333-391.

Mitra, S. & Hossain, M, (2009), "Value-relevance of pension transition adjustments and other com-prehensive income components in the adoption year of SFAS No. 158", *Review of Quantitative Finance and Accounting* **33**, 279-301.

Mitchell, O.S., Sharpe, S.A., Nesbitt, S.B. & Coronado, J.L. (2009), "Footnotes Aren't Enough: The impact of Pension Accounting on Stock Values", [Online] Available: http://papers.ssrn.com/sol3/papers .cfm?abstract_id=1327060.

Modigliani, F. & Miller, M.H. (1958), "The Cost of Capital. Corporation Finance and the Theory of Investment *The American Economic Review* **48**, 261-297.

Monforton, J., Vickers, K. & Antony, M.M. (2012), "If Only I Didn't Embarrass Myself in Front of the Class! Social Anxiety and Upward Counterfactual Thinking", *Journal of Social and Clinical Psychology* **31**, 312-328.

Morais, A. (2008), "Value relevance of alternative methods of accounting for actuarial gains and losses", [Online] Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1308526.

Murtaugh, P.A. (2002), "Journal Quality, Effect Size, and Publication Bias in Meta-Analysis", *Ecology* **83**, 1162-1166.

Myers, J.N. (1999), "Implementing Residual Income Valuation With Linear Information Dynamics", *The Accounting Review* **74**, 1-28.

Napier, C.J. (2009), "The logic of pension accounting", *Accounting and Business Research* **39**, 231-249.

Ohlson J (1995), "Earnings, book values and dividends in security valuation", *Contemporary Accounting Research* **11**, 661-687.

Oldfield, G.S. (1977), "Financial Aspects of the Private Pension System", *Journal of Money, Credit and Banking* **9**, 48-54.

Paralta, S. (2014), "Accounting Standards and Market Value of Firms with Pension Plans", *International Journal of Business and Social Research* **11**, 31-42.

Peterson, R.A. & Brown, S.P. (2005), "On the Use of Beta Coefficients in Meta-Analysis", *Journal of Applied Psychology* **90**, 175-181.

Phoenix, J.W. & Bosse, W.D. (1967), "Accounting for the cost of pension plans APB Opinion No. 8", *Journal of Accounting* 124, 27-37.

Qi, D.D., Wu, W. & Xiang, B. (2000), "Stationarity and Cointegration Tests of the Ohlson Model", *Journal of Accounting, Auditing & Finance* **15**, 141-160.

Rosenberg, M.S. (2005), "The File-Drawer Problem revisited: A general weighted method for calculating Fail-Safe Numbers in Meta-Analysis", *Evolution* **52**, 464-468.

Rosenthal, R. & DiMatteo, M.R. (2001), "META-ANALYSIS: Recent Developments in Quantitative Methods for Literature Reviews", *The Annual Review of Psychology* **52**, 59-82.

Rosenthal, R. & Rubin, D.B. (1978) "Interpersonal expectancy effects: the first 345 studies", *Behavioral and Brain Sciences* **1**, 377-386.

Rosenthal, R. & Rubin, D.B. (2003), "r equivalent: A Simple Effect Size Indicator", *Psychological Methods* **8**, 492-496.

Schmidt, F.L., Oh, I. & Hayes, T.L. (2009), "Fixed- versus random-effects models in meta-analysis: Model properties and an empirical comparison of differences in results", *British Journal of Mathematical and Statistical Psychology* **62**, 97-128.

Schulze, R. (2004), "*Meta-Analysis - a Comparison of Approaches*", Combridge: Hogrefe & Huber.

Shamrock, S. (2012), "*IFRS and US GAAP: A Comprehensive Comparison*", West Sussex: Wiley.

Valentine, J.C., Pigott, T.D. & Rothstein, H.R. (2010), "How Many Studies Do You Need? A Primer on Statistical Power for Meta-Analysis", *Journal of Educational and Behavioral Statistics* **35**, 215-247.

VHB (2015), "*Complete list of the journals in VHB-JOURQUAL3 in alphabetical order*", [Online] Available: http://vhbonline.org/en/service/jourqual/vhb-jourqual-3/gesamtliste/

Viechtbauer, W. (2010), "Conducting Meta-Analysis in R with the metafor Package", *Journal of Statistical Software* **36**, 1-48.

Werner, E.M. (2011), "The value relevance of pension accounting information: evidence from Fortune 200 firms", *Review Accounting and Finance* **10**, 427-458.

White, H. (1994), "*Scientific communication and literature retrieval*", In: Cooper H. Hedges LV (ed) The handbook of research synthesis, New York: Russell Sage Foundation, pp 41-56.

Whiteford, P. & Whitehouse, E. (2006), "Pension Challenges and Pension Reforms in OECD Countries", *Oxford Review of Economic Policy* **22**, 78-94.

Wiedman, C.I. & Wier, H.A. (2004), "The Market Value Implications of Post-Retirement Benefit Plans and Plan Surpluses – Canadian Evidence", Canadian Journal of Administrative Science **21**, 229-241.

Wolf, F.M. (1986), "*Meta-Analysis – Quantitative Methods for Research Synthesis*", Thousand Oaks: SAGE Publications.

Wood, J. (2009), "Methodology for Dealing with Duplicate Study Effects in a Meta-Analysis", *Organizational Research Methods* **11**, 79-95.

Wooldridge, J.M. (2013), "*Introductory Econometrics: A Modern Approach*", (5th edn.), Andover: Cengage learning Emea.

Yu, K. (2013), "Does Recognition versus Disclosure Affect Value Relevance? Evidence from Pension Accounting", *The Accounting Review* **88**, 1095-1127.

Notes

Note 1. I identified two published studies focussing on other local GAAP (Ang *et al.* 1999; Wiedman and Wier 2004), and two working papers and one published study using International Financial Reporting Standards (IFRS) data (Fasshauer and Glaum 2012; Morais 2008; Paralta 2014).

Note 2. For example, other effect sizes are based on means or binary data (Borenstein *et al.* 2009).

Note 3. Therefore, I use the metafor package for R (Viechtbauer 2010). I calculate the mean effect sizes according to the Rosenthal and Rubin (1978) approach (Johnson *et al.* 1995).

Note 4. The keywords employed include: capital market, disclosures, financial reporting, firm value, market valuations, pension, pension accounting, pension disclosures, postretirement benefits, share price, stock market valuation, valuation model, value of equities and value-relevance.

Note 5. I choose the end of 2011, because the IASB published the amended IAS 19 as the final part of phase I of the convergence project with the FASB in this year (IASB 2011). The scope of the phase II was a fundamental review of the pension accounting. Actually, the FASB removed the second part of the project "Pensions and Other Postretirement Benefits" from its agenda (FASB 2014). Furthermore, I compare the findings of this meta-analysis with two working papers which analyse the value relevance of pension accounting under IFRS (Fasshauer and Glaum 2012; Morais 2008).

Note 6. Two working papers are included in the discussions of this meta-analysis. Particular, they analyse companies from Germany (Fasshauer and Glaum 2012) or European companies in general (Morais 2008).