Financial Reporting for Defined Benefit Pension Plans

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1. Introduction

Defined benefit (DB) pension plans are once again of special interest to investors, lawmakers, accounting standard setters, and participants, at least in part because of the estimated overall funding shortfall. Historically, the level of general interest in DB plans has varied with the perceived financial health of the plans. Because of the three-year decline in equity markets (2000-2002) and concurrent low interest rates, many DB pension plans migrated from an overfunded status in 2000 to an underfunded status in 2002. DB pension plans are economically significant in the U.S. The Pension Benefit Guarantee Board (PBGC) estimates DB pension assets exceeded $1.6 trillion at the end of 2002 with 44 million participants in more than 32 thousand plans. The PBGC also estimates that all insured DB plans were $185 billion overfunded at the end of 1999 and more than $400 billion underfunded at the end of 2002.

There are two main sources of regulated information about DB pension plans. The first is the firm's financial statements prepared under Generally Accepted Accounting Principles (GAAP) as required by the Securities and Exchange Commission (SEC) for publicly traded firms. DB pension plans are generally reported on a consolidated basis for the entire firm (most firms have multiple DB plans); some firms separately disclose information about non-U.S. plans. The firm's annual report (Form 10-K) is due within 90 days of fiscal year end. The alternative source of information is Internal Revenue Service (IRS) Form 5500 which is prepared at the plan level and is due within 210 days of the fiscal year end of the plan, with a 75 day extension frequently requested and granted. Form 5500 is more detailed than the disclosures required under GAAP but also less timely.[1] During the most recent round of concern over the

[1] In a related research project we compare the data in the Forms 5500 for a subsample of firms with the accounting disclosures under SFAS #87 and SFAS #132 in the corresponding annual report. Because most economic research as well as most policy-based research studies use Form 5500 data, we consider the comparability of the two sources of data an interesting question, recognizing that they are prepared for different purposes. Because accounting for DB pension plans, whether for the SEC, IRS, ERISA, or internal purposes, requires many judgments, estimates, and assumptions, an analysis of the variance in the reporting under GAAP and under ERISA/IRS requirements should be informative for analyzing the extent and impact of these judgments and assumptions.

status of DB pension plans, the major source of information used by government and private entities appears to be the DB sponsors' annual reports. In general, the DB pension plan information provided by plan sponsors is used by capital market participants (investors, potential investors, creditors, etc.) to allocate capital, and by plan participants in making household wealth allocations among retirement assets, non-retirement assets, and consumption.

Because of the economic importance of DB plans, the current level of concern over their financial status, and the regulatory changes since previous studies, in this paper we revisit the issue of how investors incorporate disclosures made under GAAP for DB pension plans into security prices. We first explore whether investors apparently perceive the DB pension obligation and the pension plan assets as liabilities and assets respectively of the sponsor firm. There has been considerable controversy in the literature about whether the property rights to the assets of a defined benefit (DB) pension plan lie with the sponsor firm (i.e., its shareholders) or with the plan's beneficiaries (e.g., Bulow and Scholes 1984; Bodie and Papke 1992). We re-examine prior accounting research results which, using data from the 1970s and 1980s, generally led the authors to infer that investors value the DB pension plan assets and the pension obligation as similar to the firm's other assets and liabilities, thus concluding that the property rights to the DB pension plan assets reside with the plan's sponsor. Secondly, we examine whether components of the reported pension expense and pension expenditure are value relevant for share prices. Relevance is one of the primary qualities necessary for decision-useful information (FASB 1980). We extend prior work, which finds that some but not all components of net periodic pension cost are value relevant. Thirdly, we examine which elements of the current pension disclosures are more highly associated with future cash flows and future earnings. We contrast the predictive characteristics of the reported and recognized net periodic pension cost with those of the disclosed, but not recognized, cash contribution to the pension plan in terms of predicting future earnings and future cash flows. This part of our investigation is likewise motivated by the decision usefulness goal of accounting as articulated in the FASB's conceptual framework.

The financial reporting requirements for DB plans have changed from *Accounting Principles Board* (APB) No. 8 (1967-1986) to *Statement of Financial Accounting Standard* (SFAS) No. 87 (1987-1997) to SFAS No. 132. [2] During the period of these accounting changes, there were also significant changes in the regulatory and tax environments for DB plans, including the passage of the *Employee Retirement Income Security Act of 1974* (ERISA) and the imposition of excise taxes on asset reversions for terminated over-funded pension plans with the *Tax Reform Act of 1986* (TRA '86). The changes in accounting standards were driven by demands by users for more information about DB plans. ERISA reflected a change in public policy toward DB pension plans. The imposition of an excise tax on pension reversions was a political tax imposed to discourage what was perceived at the time as the raiding of overfunded pension plans.

Our sample consists of firms in the S&P500 for the years 1998 – 2002 that report DB pension plans in their SEC filings. There are approximately 340 such firms in each year. We start with 1998 because of the change in the reporting requirements effective for 1998 under SFAS #132, which generally enhanced the disclosures and provided for data not previously available.

Our results indicate that investors, on average, do not value the pension assets and pension obligations as though they are similar to the other assets and liabilities of the sponsor firm. These results hold on both a gross and a net (net overfunded and net underfunded plans) basis. The recognized net periodic pension cost is generally value relevant whereas the recognized accrued (prepaid) pension liability (asset) is not. Interestingly, when the net periodic pension cost is decomposed, none of the components is consistently value relevant. Results are mixed on the value relevance of the firm's cash contribution to the pension plan. In terms of predictive ability for cash flows, the lagged contribution amount is most strongly associated with the contribution and, together with other variables related to the funding

[2] Although SFAS #87 was promulgated as one step in the evolution of pension accounting (¶107), general reconsideration of pension accounting is not on the FASB agenda; the December 2003 revision to SFAS #132 is limited in scope to reporting requirements and does not alter the current measurement and recognition requirements of SFAS #87. The FASB added a project on September 24, 2003 to provide guidance on 'cash balance' pension plans. One of the FASB's (2003b) stated reasons for not beginning a broader-scope project on pension accounting is that the IASB currently has such a project on its agenda and the FASB wants to wait until it can consider the results of the IASB project when it later considers recognition and measurement for DB plans.

decision, explains between 49% and 99% of the current year's contribution (with the exception of 2002). The components of net periodic pension cost also consistently explain a large percentage (between 45% and 74%) of the one year ahead net periodic pension cost.

The remainder of this paper proceeds as follows. Section 2 discusses current pension accounting and prior research. Section 3 provides some background on defined benefit pension plans. The next three sections describe the empirical tests employed to assess the property rights, the value relevance, and the predictive ability of DB pension plan reporting. Section 7 summarizes and concludes.

2. Financial reporting for defined benefit pension plans

DB pension plans represent a well-defined class of economic transactions that are reasonably straightforward in terms of the underlying economics and financial implications. The acknowledged complexities in determining the appropriate accounting for pension plans arise from the measurement issues and the necessity for application of judgment, estimates, and assumptions due to the forward-looking nature of the obligation.

There are two main economic aspects underlying the accounting for pensions. The first is measurement of the current period pension cost and the second is the estimation of the unfunded obligation for pension benefits as of the end of the accounting period. The accounting for pension plan assets is likewise important but less controversial as the assets are measured at market value or a close approximation thereto. We examine both the gross pension liability and the "net" or unfunded pension obligation, the outstanding or remaining pension obligation after subtracting the fair value of the plan assets held by the pension trust. The net unfunded liability assumes that the sponsor has discharged part (or all) of the total obligation by contributing assets to the trust. Accounting standards are not consistent in reporting on a gross or net basis.[3] Justification for the net approach is provided by both ERISA and

[3] For example, capital leases are reported on a gross basis. Equity method consolidations, on the other hand, are reported net.

the Internal Revenue Code (IRC).[4] Part of this justification is also based on the notion of property rights (e.g., Barzel, 1997).[5] There is a long-standing debate in the pension literature about whether the pension plan assets belong to the sponsor (e.g., Bulow and Scholes 1983; Bodie and Papke 1992; Tepper 1981) or to the employees.[6] Recent changes in the tax code dictate that the assets are unlikely to revert to the sponsor. Therefore, we predict, consistent with Bulow (1982), that investors do not value the plan's assets as though they belong to the sponsor. However, we also recognize, consistent with Black (1980), that the performance of the plan assets affects the financial decisions of the plan sponsor. That is, if the plan assets underperform expectations, the sponsor may be required to increase cash contributions to compensate for the shortfall. On the other hand, if plan assets perform better than expected, the plan sponsor may contribute less than anticipated. The lower than anticipated cash outflows to the pension plan have value to the firm, but this is not the same as attributing all plan assets to the firm.

We likewise focus on the pension expense for the accounting period. There are several elements to the pension expense. Service cost is one portion of the cost of the DB pension plan this period as is the interest on the unfunded portion of the pension obligation together with the interest on the funded portion of the plan. The interest on the unfunded portion represents a cost due to the underfunding of the plan whereas the interest expense computed on the funded portion represents the passage of time. There are also gains, losses and various amortizations under SFAS #87 included in the pension expense – the various elements may increase or decrease the expense. The amortizations in this category of expense

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[4] Part 4 of Title I of ERISA requires that "all assets of an employee benefit plan shall be held in trust by one or more trustees." Furthermore, persons and entities that manage and control plan funds are "fiduciaries" and "the assets of a plan shall never inure to the benefit of any employer and shall be held for the exclusive purposes of providing benefits to participants in the plan and their beneficiaries and defraying reasonable expenses of administering the plan." Parts 2 and 3 of Title I contain provisions relating to participation, vesting, funding, and benefit accrual and are generally administered and interpreted by the IRS.

[5] Barzel defines property rights "over a commodity (or an asset) to be the *individual's ability, in expected terms, to consume the good (or the services of the asset)* directly or to consume it indirectly through exchange." (p. 3) He analogizes property rights with residual claimancy (e.g., the residual claimant of an apartment building is its economic owner). He also discusses how property rights are not constant but may shift over time as a function of protection efforts, the capture attempts of others, and governmental interference.

[6] At first consideration, the ownership debate may seem transparent – the plan assets are held by a legal entity separate from the sponsor. However, this legal entity is usually a trust and the beneficiary of the trust is the sponsor, not the employees of the sponsor to whom the pension benefits are promised. In addition, the sponsor is often the administrator of the plan and determines the investment policy of the plan, although not with complete discretion.

contribute to what is commonly referred to as the "smoothing" nature of GAAP for DB pension plans.[7] We also examine an additional, related measure, the contribution to the plan by the sponsor. As a cash outflow that also reduces the net pension obligation, we expect this outflow to be value relevant to investors.

The terms and provisions of the DB plan determine the economic substance of the plan. The plan sponsor, with its actuaries, must determine appropriate estimates of turnover, retirement ages, longevity, inflation, interest rates, investment returns, etc. Actuarial science is applied to the facts and circumstances to determine the appropriate projections of the payment obligation, returns, distributions, and contributions. The current accounting rules focus on two of these assumptions - the discount rate and the expected rate of return.

Although the FASB has stated that it does not want the legal or tax requirements of transactions to dictate the accounting, the economics of the DB pension plan are influenced greatly by ERISA and the IRS. For example, the IRS determines the maximum tax deductible contribution that may be made to the plan in a given year, and ERISA determines the minimum contribution that must be made. Straying outside these boundaries triggers financial penalties. Because there is not a one for one correspondence between reported pension obligations under GAAP and the plan by plan reporting required by the IRS, we use the GAAP reported pension obligation in our tests.

Accounting for defined benefit pension plans is topical, at least partly due to the reported shift by the plans from a reported net overfunded situation in 2000, following the run up in the stock market in the 1990s, to a reported net underfunded situation in 2002, due chiefly to the significant decline in the stock market starting in March 2000 and to concurrently low interest rates. Our data (Table 1, Panel A) indicate that the S&P500 companies went from a roughly $250 billion pension surplus in 1999 to a roughly $218 billion pension deficit in 2002, a change of almost $0.5 trillion. In addition, 2002 financial claims against the PBGC for terminated pension plans were greater than the total claims for all previous years

[7] The FASB (1985) acknowledged that some of the rules are compromises directed at maintaining certain desired characteristics (e.g., smooth income) of the financial statements and reducing the amount of change from past practice.

combined (Testimony by Executive Director of the PBGC before U.S. Congress on September 4, 2003) and the PBGC incurred a record deficit of $3.64 billion in 2002 compared to a 2001 surplus of $7.7 billion.[8] The financial press has drawn analogies between the pension underfunding and the S&L crisis in the late 1980s. The U.S. Congress is currently debating legislation to increase the discount rate for computing pension liabilities from one based on the 30-year treasury bond to one based on a composite index of long term corporate bonds. In addition, Congress may approve a two-year exemption from the required deficit-reduction contribution to DB pension plans for the airline and steel industries.

The accounting is generally not considered a direct causal factor in the difficulties because the structure of a DB pension plan results from union negotiations and is little, if at all, affected by accounting considerations. In other words, unlike some transactions, such as leases, it is difficult to alter the form of the DB pension plan to achieve an accounting goal.[9] However there is evidence that pension funding and investment decisions are influenced by accounting as well as by tax, cash flow, and other financial considerations (Asthana 1999; Brown 2001; Ghicas 1990; Amir and Benartzi 1998). Other accounting-based decisions (e.g., discount rate, expected return on plan assets) may also be influenced by financial reporting incentives (Asthana 1999; Francis and Reiter 1987; Brown 2001).

Prior accounting research on the association between financial reporting for DB pension plans under GAAP and equity market values includes Daley (1984), Landsman (1986), Barth (1991), and Barth, Beaver and Landsman (1992). Daley uses APB #8 data for 1975-1979 to assess which accounting disclosures were most highly associated with equity values. He concludes that the capitalized tax-adjusted reported pension expense is the most consistent with the equity market's valuation process and that the reported pension obligation numbers (unfunded vested benefits and unfunded prior service cost) understate the true obligation. Landsman examines the property rights issue for pension assets and liabilities using SFAS #36 (an amendment to APB #8 requiring more disclosure) data for 1979-1981. He finds mixed results with pension assets not valued by the equity markets in two of the three years and

[8] The PBGC's 2003 deficit is $11.2 billion.

[9] Although, when SFAS #87 was first proposed and later adopted, there were many claims in the financial press that firms abolished their DB pension plans in favor of alternative forms of deferred compensation such as defined contribution pension plans.

valued positively, as expected, in the third. Likewise, the pension liability is valued negatively in two years and not valued in the third. Based on the magnitude of the coefficients, Landsman concludes that his study provides evidence that pension fund assets and pension fund liabilities are valued similarly to other corporate assets and liabilities. Barth (1991) examines the valuation of (gross) pension assets and liabilities under SFAS #87 for the years 1985-1987. Barth likewise finds mixed results with the fair value of plan assets valued in one of the three years and the projected benefit liability valued in two of three years; neither is value relevant in 1987, the first year of required adoption of SFAS #87. Barth, Beaver, and Landsman (1992) report that investors attach different multiples to the components of pension cost under SFAS #87 for equity valuation purposes, as expected, but they also find that service cost is assigned a zero multiple. In sum, the results from these studies of DB pension plan reporting disclosures are mixed and not generally consistent across time periods. These results leave unanswered questions about the equity valuation implications of the pension disclosures.

3. Some background on defined benefit pension plans

DB pension plans in the U.S. currently cover a significant percentage of the labor force although this percentage has decreased since 1979 from more than 80% of covered workers to less than 50% in 1998 (PBGC); approximately 65% of the S&P 500 currently have DB pension plans, despite the migration from such plans in the 1980s and 1990s to defined contribution (DC) plans. Legally, the assets in the DB plan belong to the separate trust. However, the beneficiary of the DB pension plan trust is the sponsor, not the employees, and the administrator of the plan is generally the sponsor. The administrator's primary fiduciary responsibility under the DB plan is to safeguard the assets and to invest them so that they will be sufficient to meet the sponsor's obligations to the employees when they retire. The sponsor is responsible for the payment of the benefits regardless of what happens with the trust. Any shortfall in the accumulated assets is to be covered by the sponsor; in the event that the sponsor is not financially able to provide any shortfall, the plan can be assumed by the PBGC. The PBGC then has a claim on the assets of the sponsor that is capped at 30% of the sponsor's fair market value.

U.S. pension plans are subject to extensive regulation, including reporting requirements, by the IRS of the U.S. Treasury Department, the U.S. Department of Labor (DOL), and the PBGC. The rules and regulations governing DB pension plans are both complex and extensive, similar to the IRC, with many exceptions, conditions, and exemptions. Each agency has different requirements which, while not usually in opposition, are likewise not necessarily congruent. Separate from these regulations are the GAAP accounting rules for reporting by the plan sponsor. In addition, the reporting to the other regulatory agencies is by plan whereas reporting under GAAP is by sponsor.

The plethora of regulations that bear on the financial decisions of the plan sponsor have implications, in turn, not only for the firm but also for plan participants and capital markets. Firms incorporate pension-based tax arbitrage opportunities into their capital allocation decisions (Black 1980; Tepper 1981); contributions are tax deductible (with limits) and earnings on plan assets are nontaxable. A firm may thus incur additional debt in order to make tax deductible pension contributions, thereby changing the nature but not necessarily the quantity of firm leverage (from pension obligation to direct debt obligation). In the limit, the firm has a put option for the DB pension plan to the PBGC.

The Employee Benefits Security Administration (EBSA) of the DOL oversees minimum funding of the plan as provided by ERISA funding requirements. This determination involves approximately 50 different terms and conditions and provides potentially severe penalties for underfunding (Winkelvoss 1993). Penalties for contributions below the minimum required include interest on the deficit, an excise tax of 10% on the deficit that can be increased to 100% if the deficit is not removed within 90 days of notification by the Secretary of the Treasury, and potential civil action. The PBGC can also place a lien on the firm's assets under certain conditions of underfunding. The ERISA-mandated minimum funding requirement is enforced by the IRS.

The IRS imposes limits on the tax deductible contributions to the trust. Starting in 1988, Congress enacted a full-funding limitation on the DB plans such that plans with assets in excess of 150% of the current liability cannot make tax-deductible contributions to the plan. This limit has since been increased to 155% for 1999-2000, 160% for 2001, 165% for 2002, and 170% for 2003 (Kaster et al. 2003). The

penalties for contributing more than the maximum permitted by the IRS can result in a 10% excise tax on the excess contribution in addition to the lack of a tax deduction. The excess contribution can be carried forward as a tax deduction but it is subject to the 10% excise tax for each year that it remains nondeductible (IRC § 404, 4972). Sponsors have incentives to overfund their defined benefit pension plans within legal limits due to the tax deductibility of the contribution and the tax-free accumulation within the plan (Black 1980; Tepper 1981).

A sponsor can terminate a pension plan upon approval from the PBGC and upon purchasing annuities to satisfy legal benefits existing at the termination date. Annuities must be purchased for current, separated, and retired workers irrespective of the type of replacement plan. All unvested benefits automatically vest at plan termination. At plan termination, the law requires that the sponsor provide benefits in relation to the employee's wages at the time, without projections of wage increases to retirement. The Tax Reform Act of 1986 also imposed new rules and taxes on pension reversions such that any reversions of pension assets must represent overfunding and the reversions were taxed with an excise tax of 10% plus the normal (recapture) tax on income. The excise tax rate was increased to 15% in 1988, to 20% in 1989, and to 50% (with some exceptions) in 1990. One exception is that if the sponsor contributes 25% of the reversion amount to the plan, the excise tax drops to 20%. The total tax rate could thus be 85% on the reversion. A termination is less costly for the sponsor when the plan is not overfunded. Although tax laws make it prohibitively expensive for a sponsor to terminate an overfunded pension plan and claim the excess assets, the overfunded plan can serve as financial slack for periods when the firm is either "short on cash" or lacking in taxable income. The purpose of the excess asset reversion laws was to ensure that existing funding for promised pension benefits was maintained. Petersen (1992) reports a decrease of 36% in the number of reversions in 1986, the first year following the imposition of the 10% reversion tax.

However, the laws may have had unintended consequences. Prior to the reversion taxes, the majority of firms had overfunded pension plans consistent with tax arbitrage theory. Firms that did not have excess assets were generally financially distressed, increasing the value of the put option to the PBGC.

Ippolito (2001) estimates that the reversion taxes resulted in an estimated 60% (more than $220 billion) decrease in excess pension assets from 1986 to 1995 with the average DB plan going from 125% overfunded in 1986 to 107% overfunded in 1995.

Prior research suggests that managers exercise discretion in managing the parameters used to estimate the pension obligation (e.g., Asthana 1999; Ghicas 1990). For example, firms with incentives to increase current year contributions adjust the computations (e.g., decrease the discount rate) to facilitate such contribution. Firms with incentives to lower the required contribution adjust the computations in the opposite direction. Accounting rules provide another set of incentives for managers to adjust pension contributions (within legal limits) in order to manage reported earnings and/or balance sheet leverage (Brown 2001). Because of the way in which net periodic pension cost is calculated under SFAS #87, pension income rather than pension expense may result and this income accounts for an estimated $4 billion of the reported net income for the S&P 500 in 2001 (see Table 1).

The next three sections discuss the three sets of empirical tests we perform on the sample. Section 4 describes the test on property rights of the pension obligation and pension assets. Section 5 describes the value relevance tests. Section 6 describes the empirical tests on predicting periodic net pension cost and cash contributions to the pension plan.

4. Empirical Tests – property rights

Our data are for the period 1998 – 2002. The data start in 1998 because the FASB changed the pension disclosure rules effective in 1998 with SFAS #132. Although SFAS #132 generally increased disclosure requirements for DB plans, it also eliminated, among other things, the requirement to report the accumulated benefit obligation and the vested benefit obligation under many circumstances. We include only firms that were in the S&P 500 (and have more than one year of data) because we want to capture a cross-section of firms with DB pension plans. The S&P 500 has broad industry representation and it was impractical to include every publicly traded firm with a DB pension plan because of the hand collection of data. Rather than cut off at plan size or some other arbitrary criterion we focus on the S&P 500. Our

data come from four sources: COMPUSTAT, CRSP, SEC Form 10-K, and IRS Form 5500. Because COMPUSTAT does not include all reported pension data (e.g., actual return on plan assets, contribution), we collect these items from Form 10-K.

Table 1, Panel A contains descriptive statistics for the S&P 500 firms in our data base. There is an average of 343 (69%) S&P 500 firms with DB pension plans during the period of our study. Our sample contains an average of 334 firms per year. DB firms were eliminated from the sample when they lacked key data. For example, Fannie Mae and Freddie Mac are both in the S&P 500 and both have DB pension plans but because they are not required to file annual reports (Form 10-K) for shareholders, information on their pension plans is not available. Firms were also eliminated when mergers or acquisitions rendered the pension data noncomparable from year to year. Firms with DB plans are larger (in terms of assets) than the average S&P 500 firm. The projected pension obligation (PBO) has monotonically increased over the period whereas the fair value of pension assets is less in 2002 than in 1998. Neither the discount rate nor the expected rate of return changed significantly over the period. Panel B compares the industry distribution of the sample firms with that of the S&P 500. The distributions are similar with some over-representation by manufacturing industries in the DB plan sample. Table 2 contains descriptive statistics for the variables used in the empirical tests.

Our first set of empirical tests is motivated by economic (and empirical) arguments debating whether the assets of the defined benefit pension plan are assets of the sponsor or whether they are assets of the covered employees (or some mixture thereof), and whether the pension obligation is a liability of the firm similar to the firm's other liabilities. Barth (1991) refers to this as the "legal form" (the pension plan is a separate legal entity) versus the "economic substance" (the pension plan is an integral part of the firm) argument.[10] There is an extensive finance and economics literature on DB pension plans with respect to these issues but, as noted above, there is no consensus. There are several bases for these arguments—some stem from the nature of the labor contract and some from the issue of legal versus economic

[10] APB 8, which governed pension accounting from 1967 – 1986, was based on the legal form view (Barth, 1991). SFAS #87 takes more of an economic substance perspective but does not accomplish it completely. In this view, the obligations under the pension plan and the plan assets are those of the firm.

liabilities. For example, Bulow and Scholes (1983) argue that the assets belong to the beneficiaries of the plan, not to the firm or its shareholders, based on a long term contracts/human capital view of pensions. In contrast, Feldstein and Seligman (1981) and Tepper (1981) argue (and provide evidence) that the pension obligation is a corporate liability and the pension assets are assets of the firm.

Petersen (1996) points out that the firm makes a pension promise to the workers and the pension plan assets support this promise, but the workers' claims are against the promise, not against the assets. In this view, because the equity holders bear the risk, the firm manages the pension plan assets for the benefit of its shareholders, thus implying that the property rights to the assets, as well as the obligation, lie with the firm. Petersen finds empirical support for this position in that firms manage plan assets as part of the firm's overall risk management. Feldstein and Morck (1983), using data from the 1970s, report that only the net pension obligation or net pension benefit is valued as part of the firm and that the value is asymmetric; that is, $1 of net unfunded obligation has a greater negative impact on firm value than $1 of net overfunded assets has a positive impact on firm value. The FASB (1985) discusses this difference of opinion over the ownership of the assets, concluding that the employer "owns" the assets because: a) the employer bears the risks and enjoys the rewards of the plan asset's investment performance; and b) employers have withdrawn significant assets from the plan (¶111-112). Prior accounting research (Landsman, 1986; Barth, 1991) finds that the pension plan assets and liabilities are valued as though they belonged to the firm (sponsor) in their entirety; that is, not on a netted basis. However, most of the above studies used data prior to several changes in tax code that made the removal of assets from the plan a highly taxed event, and several of these studies used reported accounting data that preceded SFAS #87.

GAAP does not directly recognize the excess plan assets (defined as fair value of plan assets in excess of the pension obligation) as an asset of the firm, although some portion of the excess assets may be recognized as prepaid pension cost because contributions in excess of the net periodic pension cost are recorded as prepayments. GAAP recognizes a minimum pension liability if the net difference between the accumulated benefit obligation (ABO) and the fair value of plan assets on a plan by plan basis is negative. GAAP also recognizes an accrued pension liability for post-SFAS #87 contributions that are

less than the recognized net periodic pension cost. Based on the underlying economics of DB pension plans, we predict that investors perceive the net pension obligation, the obligation (measured here as the PBO) less the fair value of plan assets, as an economic liability of the firm. Likewise, based on the underlying economics of DB pension plans, we predict that investors perceive the fund assets as offsetting an equal portion of the firm's gross pension obligation but that they do not incorporate the excess fund assets into firm valuation as though they were any other operating asset. This prediction is complicated by the fact that the excess assets potentially reduce future cash contributions from the plan sponsor to the plan thus creating value for the sponsor. Regardless of the economic and philosophical arguments as to whether the excess assets belong to the firm or to the employees, changes in the tax laws practically preclude most firms from claiming any excess assets. For example, according to the PBGC (1995 Annual Report), plan sponsors withdrew more than $20 billion from pension funds allocated for their employees' retirement during the 1980s.[11] Our keyword search for pension reversions (by all publicly-traded firms, not just the S&P 500) for the period of our sample yielded 32 examples from 1995 - 2002. The largest reversion was $131 million by Ethyl Corporation in 2000. Of the $131 million, Ethyl kept $54 million after all taxes.

As noted above, Landsman (1986) interprets his results on data for 1979-1981 (pre-SFAS #87) as suggesting that pension fund assets and pension fund liabilities are valued by investors similar to the firm's other assets and liabilities. Barth (1991), extending Landsman with the use of SFAS #87 disclosures, likewise concludes that investors view pension plan assets and liabilities as corporate assets and liabilities.[12] Landsman and Barth both base their test specification on the market value identity — that the firm's market value of equity (MVE) equals the market value of assets less the market value of equity or

$$MVE_{jt} = MVNPA_{jt} - MVNPL_{jt} + MVPA_{jt} - MVPL_{jt} \quad (1)$$

[11] There were few plan terminations with reversions prior to 1980 and the number of terminations for reversion peaked in 1985 at 580 plans (Petersen 1992).

[12] Barth (1991) reports that the projected pension obligation (PBO) and the fair value of plan assets (FVPA) are more closely associated with market values than other GAAP measures of pension assets and pension liabilities.

where MVNPA (MVNPL) is the market value of non-pension assets (liabilities) and MVPA (MVPL) is the fair market value of pension assets (liabilities). Because the market value of non-pension assets and liabilities are not observable, they test the following empirical analog of the above identity:

$$MVE_{jt} = \alpha_0 + \alpha_1 BVNPA_{jt} + \alpha_2 BVNPL_{jt} + \alpha_3 MVPA_{jt} + \alpha_4 MVPL_{jt} + \varepsilon_{jt} \quad (2)$$

where ε_{it} is the disturbance term from an ordinary least squares regression and book values of assets and liabilities proxy for *MVNPA* and *MVNPL*. All variables are deflated by sales (Landsman 1986). In our tests, we first consider *MVPA* and *MVPL* as separate terms, rather than netting, to permit them to have different coefficients. *MVPA* is the fair market value of pension assets as reported in the Form 10-K and *MVPL* is the PBO from the Form 10-K. We subtract any recognized prepaid pension asset from *BVNPA* and subtract any recognized accrued pension liability from *BVNPL*.

From Table 2, we see that, on average, *MVPA* exceeded *MVPL* in 1998 – 2001. *MVPA* decreased as a percentage of total firm assets from 10.3% in 1998 to 6.1% in 2002 (not tabulated). *MVPL* as a percentage of total firm liabilities has been fairly constant for the past three years at approximately 8.6% (not tabulated). The results for equation (2), in Table 3, Panel A, include annual regressions and a pooled regression with year fixed effects; the reported standard errors are computed using White (1980). In general, the results are consistent. The coefficients on *BVNPA* and *BVNPL* are as expected – for each regression they are equal in magnitude and opposite in sign, although the absolute magnitude of the coefficients ranges from 1.3 to 2.5. The coefficients on *MVPA* and *MVPL* are insignificant with the exception of 2002 in which year they are both significant at the 5% and 1% level respectively and are of equal magnitude but opposite sign, and greater in magnitude than the coefficients on *BVNPA* and *BVNPL*. These results are consistent with neither the pension assets nor the pension liabilities valued by investors as assets and obligations of the firm; that is, they are not reflected in firm value, with the exception of the results for 2002, the year of the greatest reported pension underfunding ever. There is significant multicollinearity in the regression.[13]

[13] We ran the five regressions using Zellner's method for estimating seemingly unrelated regressions (SUR) in order to control for the cross-sectional correlation in the data and to be consistent with Landsman (1986) and Barth

These results at first appear inconsistent with the inferences drawn by Landsman (1986), however, Landsman notes (p. 678) that it is not possible to reject the null hypothesis that the coefficient on the pension liability is equal to zero in 3 of the 6 cases; this is likewise the case for 3 of the 6 cases for the coefficient on the pension asset. The regulations governing pensions have changed significantly since Landsman. His data (1979-1981) precede the tax penalties applied to reversions as well as many of the limitations on overfunding, which could significantly affect market valuation.

Because the coefficients on *BVNPA* and *BVNPL* are of equal magnitude but opposite sign, we also estimate the five regressions netting the nonpension assets and liabilities and the pension assets and liabilities. The netting process eliminates the multicollinearity among the variables and distinguishes between DB firms with overfunded pension plans from those with underfunded plans. Panel B, Table 3 contains the results from the following regression:

$$MVE_{jt} = \gamma_0 + \gamma_1 NETASSETS_{jt} + \gamma_2 OVERFUND_{jt} + \gamma_3 UNDERFUND_{jt} + \zeta_{jt} \quad (3)$$

Where: $NETASSETS = BVNPA - BVNPL$

$OVERFUND = MVPA - MVPL$ if $MVPA > MVPL$; 0 otherwise

$UNDERFUND = MVPA - MVPL$ if $MVPA < MVPL$; 0 otherwise

All variables are scaled by sales.

The coefficient on *NETASSETS* is positive as expected in each regression (the mean and median for *NETASSETS* is > 0 in every year). The coefficient on *OVERFUND* is significant only for 2000 when it is unexpectedly negative. *UNDERFUND* is marginally significant in 1999, when it is unexpectedly negative, and significantly positive in 2002.[14] There is no evidence of multicollinearity in the regressions.

The purpose for this specification is to test whether, consistent with our predictions, the net unfunded pension liability is valued as a liability of the firm but that the excess assets are not valued as assets of the

(1991). The results (untabulated) are similar to those reported in Table 3 except that the coefficients on the pension asset and pension liability variables did not approach significance in any year. We also eliminated outliers using the DFITS procedure and the results (untabulated) were similar to those reported in Table 3, Panel A.

[14] We ran the five regressions using SUR in order to control for the cross-sectional correlation in the data. The results (untabulated) are similar to those reported in Table 3, Panel B. We also eliminated outliers using the DFITS procedure and the results (untabulated) were similar to those reported in Table 3, Panel B except that UNDERFUND and OVERFUND are never significant.

firm. This prediction is consistent with the empirical results of Feldstein and Morck (1983) who report that a dollar of unfunded pension obligations has a greater impact of share price than a dollar of excess (overfunded) pension assets; note that their study used data prior to the change in tax rules for reversions so taxes cannot explain their result. Current GAAP treats the difference asymmetrically with excess assets reflected on balance sheet only to the extent they are due to contributions in excess of the computed net periodic pension cost. The unfunded pension liability is reflected on the balance sheet to the extent that plan assets are less than ABO.

In sum, the regression results are consistent with neither pension assets nor pension liabilities being valued by investors as assets and obligations, respectively, of the firm. Because of the severe tax penalties for withdrawing pension assets, the results for assets are consistent with expectations. However, because of the penalties levied by the PBGC and the legal liability for underfunded pension plans, the results for liabilities are not consistent with expectations. There are at least two explanations for this result. The first is based on measurement error. Because we cannot observe the market values of non-pension assets and non-pension liabilities, there is also potential measurement error in the PBO. The actuarial assumptions and computations involved in estimating the pension liability are complex and the reported PBO may be biased (e.g., Asthana 1999). Investors may not perceive the reported liability as reliable. On the other hand, the results may be due to the fact that investors do not perceive the pension assets and liabilities as part of the firm, consistent with Bulow and Scholes (1983). In addition, because DB pension plans are subject to government rules and regulations and effectively can be put back to the PBGC if the firm is financially distressed (or the company can request, and often receives, special allowance such that it does not have to meet its pension obligations), the pension liability may be not perceived as such.[15]

[15] For example, Northwest Airlines received permission from the IRS to postpone $454 million of required pension contributions for 2003 despite the fact that its pension plans were more than $3 billion underfunded at the end of 2002. Northwest was granted permission to make up the funding deficit over five years beginning in April 2004.

5. Empirical tests - value relevance. The models based on the fundamental accounting relation examine the property rights issues of pension obligations and plan assets. Closely related to this question is that of value relevance – which of the pension variables are reflected in security prices? Landsman and Ohlson (1990) extend Landsman (1986) to investigate the value relevance of the net pension asset/obligation for 1979-1982. They find that investors under-react to the valuation information inherent in the pension disclosures. Because we are interested in both balance sheet and income statement implications for equity valuation of DB pension plan disclosures, we investigate the value relevance of both earnings and balance sheet disclosures on firm value. For this specification we rely on variations of the Ohlson (1995) model as used by, among others, Francis and Schipper (1999), Collins et al. (1997), and Harris and Muller (1999):

$$P_{jt} = \beta_0 + \beta_1 X_{jt} + \beta_2 BVE_{jt} + \Sigma \beta_k OTH_{jt} + \nu_{jt} \quad (4)$$

Where:

P_{jt} = firm j's market value of equity at end of year t

X_{jt} = firm j's earnings before extraordinary items for year t

BVE_{jt} = firm j's book value of equity at end of year t

OTH_{jt} = other value relevant information for firm j

Prior work has included off-balance sheet items and unrecognized earnings numbers as part of 'other' (e.g., Aboody 1996, executive stock options) and prior work has decomposed X and BVE and included them in OTH (e.g., Amir 1993, 1996, other post-retirement benefits).

Our formulation includes aspects of both approaches:

$$P_{jt} = \beta_0 + \beta_1 (X_{jt} - PEXP_{jt}) + \beta_2 (BVE_{jt} - RECOG_{jt}) + \beta_3 PEXP_{jt} + \beta_4 CONT_{jt} + B_5 RECOGA_{jt} + B_6 RECOGL_{jt} + \nu_{jt} \quad (5)$$

All variables are deflated by number of shares and:

P_{jt} = firm j's market price per share at end of year t

X_{jt} = firm j's earnings before extraordinary items for year t

$PEXP_{jt}$ = firm j's reported net periodic pension cost (if < \$0 = pension income) for

year t

BVE_{jt} = firm j's book value of equity at end of year t

$RECOG_{jt}$ = firm j's recognized prepaid (accrued) pension asset (liability) amount (positive for an asset and negative for a liability) for year t

$RECOGA_{jt}$ = firm j's recognized prepaid pension asset (> \$0) for year t

$RECOGL_{jt}$ = firm j's recognized accrued pension liability (< \$0) for year t

$CONT_{jt}$ = firm j's cash contribution to the pension plan in year t

We test for the value relevance of each of these items for explaining price. We estimate the above regression on an annual basis and also pooled with year fixed effects.

The results are presented in Table 4. Earnings, net of pension expense/income, are significantly positive in every year, and pooled, with coefficients ranging from 3.4 – 6. However, book value of equity (net of the recognized pension asset/liability) is not significant in two of the years and has a coefficient ranging from 0.25 – 0.40, smaller than anticipated. Net periodic pension cost (PEXP) is negatively significant in three of the five years and pooled, consistent with investors incorporating the recognized pension cost into price at a multiple similar in magnitude to that of earnings (but opposite in sign) for the pooled regression and for 2000, and of larger magnitude for years 1998 and 2001. The recognized pension asset and liability are not consistently significant, similar to the results in the prior section, although RECOGL is significantly negatively in 2001 and the pooled specification. Interestingly, the sponsor's contribution to the pension plan is negatively significant in the 1998, 1999, and the pooled regressions, and *positively* significant in years 2001 and 2002 with large coefficients. Results are similar when we eliminated outliers (with DFITS) and when we estimate the regressions using SUR; although in the latter, PEXP is never significant.

These results are difficult to interpret. Despite the accruals in the recognized net periodic pension cost number, this number is more value relevant than the firms' actual cash contribution to the plan. We do not have a plausible explanation for the switch in signs of the contribution from 1998 and 1999 (when

pensions were overfunded on average) to 2001 and 2002 (when pensions were underfunded on average). We explore the net periodic pension cost numbers further with the next regression.

Related to the models above is the question of whether all or only some (or none) of the expense components of pension cost are perceived by investors as expenses. Following Easton and Harris [1991], we report tests for both the level, and the level and change in, earnings, which they derive as an alternative specification of the book value and earnings model of Ohlson. We decompose earnings into revenues, pension income, non-pension expenses, and pension expenses.

$$R_{j,t} = \alpha_0 + \alpha_1 REV_{jt} + \alpha_2 PENINC_{jt} + \alpha_3 NPEXP_{jt} + \alpha_4 SERV_{jt} + \alpha_5 INT_{jt} + \alpha_6 OTH_{jt} + \alpha_7 EXPRET_{jt} + \alpha_7 CONT_{jt} + \varepsilon_{jt} \quad (6)$$

$$R_{j,t} = \alpha_0 + \alpha_1 REV_{jt} + \alpha_2 \Delta REV_{jt} + \alpha_3 PENINC_{jt} + \alpha_4 \Delta PENINC_{jt} + \alpha_5 NPEXP_{jt} + \alpha_6 \Delta NPEXP_{jt} + \alpha_7 SERV_{jt} + \alpha_8 \Delta SERV_{jt} + \alpha_9 INT_{jt} + \alpha_{10} \Delta INT_{jt} + \alpha_{11} OTH_{jt} + \alpha_{12} \Delta OTH_{jt} + \alpha_{13} EXPRET_{jt} + \alpha_{14} \Delta EXPRET_{jt} + \alpha_{15} CONT_{jt} + \alpha_{16} \Delta CONT_{jt} + \varepsilon_{jt} \quad (7)$$

where

R_{jt}	=	firm j's 12-month cumulative raw return for fiscal year t
$REV_{j,t}$	=	firm j's revenues for fiscal year t
$PENINC_{j,t}$	=	firm j's pension income for fiscal year t; \$0 if net periodic pension cost [(PEXP)] > \$0
$NPEXP_{j,t}$	=	firm j's non-pension expenses for fiscal year t
$SERV_{j,t}$	=	firm j's service cost for fiscal year t
$INT_{j,t}$	=	firm j's interest cost for fiscal year t
$OTH_{j,t}$	=	firm j's other pension costs for fiscal year t (gains, losses, amortization)
$EXPRET_{j,t}$	=	firm j's expected return (\$) on pension assets for fiscal year t
$CONT_{j,t}$	=	firm j's contribution (\$) to its DB plan for fiscal year t

All independent variables are scaled by the market value of equity at the end of fiscal year t-1. The above variables in changes form (with Δ) are computed as the change from year t-1 to year t in each of the variables.

Based on underlying pension economics, we maintain that the total pension cost for the period should be determined as the sum of the service cost and the interest cost on the unfunded portion of the total pension liability. The pension plan, because it exists for the benefit of the employees, does not generate economic income for the sponsor and we expect the coefficient on *PENINC* to be zero. Actuarially, the funded portion should generate sufficient income to cover its own interest cost, leaving only the service cost to be expensed, including any prior service cost components. If the plan is underfunded, the sponsor should recognize as expense the interest (the time value of money) for the portion that is underfunded because there are no corresponding pension plan assets to generate income to cover the interest cost and the firm has arguably benefited from the use of the cash that otherwise would have gone to fund the plan. If the return on pension assets is less than what would be considered interest cost under SFAS #87, the excess becomes an addition to the pension liability. Likewise, if the return on the pension assets exceeds the SFAS #87 interest cost, the 'excess' return decreases the pension liability. In neither case, is the sponsor's net income affected.

Barth et al. (1992) report that investors assign different multiples to the various components of the SFAS #87 reported net periodic pension cost; interestingly, their results indicate that the service cost component is not value relevant (nor is the amortization of the transition asset, but this is consistent with expectations). Reported interest cost (on the entire pension obligation) is valued with a coefficient larger than expected, inconsistent with our expectations.

The results of the above tests for our sample are in table 5. Panel A contains the results for estimating the regression in levels (eq. 6) for each year 1998-2002 and also pooled using year fixed effects. The reported results use raw returns for the 12 month period corresponding to the fiscal year. Easton and Harris use 12-month raw returns for the period beginning 3 months after the fiscal year end. We obtain similar results (not tabulated) when we use their interval and we also obtain similar results (not tabulated) if we cumulate returns over the 15-month period beginning at the end of year t-1. We eliminate outliers (using DFITS) from all estimations and get similar results. We also run the regression (eq. 6) with

seemingly unrelated regressions estimates and find similar (i.e. virtually identical) results (untabulated) in terms of coefficient magnitude, sign, and significance. The results indicate significant multicollinearity.

The only consistent results are for revenues and nonpension expenses. The coefficients for REV and NPEXP are significant each year, and pooled, with similar magnitudes and opposite signs, as expected. None of the other variables are consistently significant. Service cost and other cost are both negative with large coefficients in 2000. Other cost is also negatively significant in 2002 and interest cost is negatively significant in 2001. Contribution is significantly positive in 1999 and pooled (and marginally positive in 2002) and negatively significant in 1998. The results for service cost and contribution are inconsistent with our predictions; we expect the coefficient on *CONT* to be less than 0 and we do not have an interpretation of these results. For example, Amir (1993) finds that the cash payments to retirees for nonpension post-retirement benefits are negatively significant in a similar formulation. The R^2s for 1998 and 1999 are significantly less than for 2000-2002 and pooled. 1999 was the year of the large increase in stock prices – a potential explanation.

Panel B contains the results for estimating the regression in (7) for each year 1999-2002 and also pooled using year fixed effects. The results are generally consistent with those in Panel A, including the R^2, which is also significantly lower in 1999 than in the other years.[16] None of the components of pension expense are consistently significant in either levels or changes. *SERV* and *OTH* are both negatively significant in 2000. Again, we can only surmise that this is due to the significant and unexpected negative returns for most firms in 2000. *PENINC* is never significant. Contrary to expectations, *CONT* is significant only in 2001 when it is unexpectedly positive.

We conclude from the results in Tables 3, 4, and 5 that there is no consistent evidence that reported components for DB pension plans (either balance sheet or income statement) are associated with share

[16] The reported results use raw returns for the 12 month period corresponding to the fiscal year. Easton and Harris used 12-month raw returns for the period beginning 3 months after the fiscal year end. We also used this time period as well as the 15 month time period consisting of the fiscal year and extending to 3 months beyond the end of the fiscal year. Our results for all four periods are similar. We eliminate outliers (using DFITS) from all estimations and get similar results. We also estimate the regressions using SUR and, again, find similar (untabulated) results. There is significant multicollinearity.

prices. This could be due to several reasons. First, there may be significant measurement error in the variables, or, equivalently, investors do not have sufficient confidence in the reliability of the variables to use them in valuation. Second, our tests suffer from misspecification and/or have insufficient power to pick up the pricing significance of the pension variables. Third, investors do not value the pension numbers; that is, they do not consider the pension assets as assets of the firm or the pension liabilities as an obligation of the firm. Furthermore, they do not consider any excess "income" generated by pension assets as inflow to the firm nor do they consider either the pension expense or the contribution to the pension plan as an outflow of the firm. The last point is inconsistent with our hypotheses because we expected the cash outflow (contributions) to the pension plan to be value decreasing.

6. Empirical tests - predictive ability

Our third set of empirical tests assess the performance of the various accounting measures in terms of predicting future pension contributions (cash flows) and future net periodic pension cost. The FASB's conceptual framework states that a primary objective of financial reporting is to provide information to help investors, creditors, and other users assess the amount and timing of future cash flows. Significant prior work has investigated the role of earnings, cash flows, and accruals in predicting firm level cash flows as well as predicting future earnings (e.g., Barth, Cram, and Nelson, 2001; Dechow, Kothari, and Watts, 1998). We focus on one element of reported cash flow and one element of recognized operating earnings – namely, the firm's cash contribution to its DB pension plan and the net periodic pension cost.

If the contribution (CONT) to the DB pension plan followed a random walk, we could express the relation as: $E(CONT_{t+1})_{j,t} = CONT_{j,t} + \varepsilon_{it}$ (8)

However, we know that other considerations affect determination of the amount of contribution to the DB plan. For example, the U.S. Congress imposed a full funding limit in 1988 to limit the amount of overfunding in DB plans. This overfunding limit determines that firms with excess assets (relative to the termination liability) cannot make contributions to the plan. The PBGC imposes a minimum funding requirement. Within these sometimes narrow bounds, the firm has discretion as to the amount of

contribution.[17] Prior work has explored the funding decision by the firm (e.g., Ippolito, 2001; Petersen, 1994) and we include variables found by others to influence the contribution rate, leading us to the following regression:

$$ln\ (1 + CONTRATE_{jt}) = \beta_0 + \beta_1\ ln(FUNDRATIO)_{jt} + \beta_2\ EA_{jt} + \beta_3\ CF_{jt} + \beta_4\ CONTRATE_{jt-1} + \beta_5\ DEBT_{jt} + \beta_5\ RETDIFF_{jt} + \zeta_{jt} \quad (9)$$

where:

$CONTRATE_{jt}$	=	firm j's contribution rate ($ contributed/PBO) to the pension plans in year t
$FUNDRATIO_{jt}$	=	firm j's funding ratio (fair value plan assets / PBO) at the end of year t
EA_{jt}	=	firm j's excess assets (fair value plan assets less PBO) scaled by PBO if fair value plan assets > PBO; $0 otherwise
CF_{jt}	=	firm j's cash flow from operations scaled by total assets at the end of year t
$DEBT_{jt}$	=	firm j's ratio of long term debt to total assets at the end of year t
$RETDIFF_{jt}$	=	the difference between the actual return ($) on plan assets and the expected return ($) on plan assets for year t, scaled by PBO at the end of year t

The results of estimating equation (9) are in Table 6. Because of the need for the lagged contribution ratio in the model, there are results for only 1999-2002 by year and pooled with year fixed effects. The results indicate that the prior year's contribution rate is strongly associated with this year's contribution rate, except in 2002, perhaps because of the large increase in contribution rate in 2002 (see Table 2). However, the coefficients on the lagged contribution ratio vary considerably across years, ranging from 0.02 to 0.67. The funding ratio is negatively significant (as expected) in 1999 and marginally so in 2000; otherwise it is insignificant. The coefficient on excess assets (*EA*) is marginally positive for 2000 (as expected), negative in 2002, and insignificant otherwise. The R^2 is highly variable, ranging from 0.04 in 2002 to 0.99 in 1999 (pooled = 0.84). The return difference is negatively significant in 2001 and pooled and positively significant in 2000; 2000 is the year with the greatest discrepancy, on average, between

[17] The PBGC also has discretion to waive the minimum funding requirement. It has done so chiefly for financially distressed firms.

predicted and actual returns (Table 2). However, the coefficient is small. Eliminating outliers (DFITS) has almost no effect so the results are not driven by outliers.

We also estimated equation (9) using SUR with similar results (untabulated). Notable exceptions are that EA becomes negatively significant in 2001. The R^2 for 1999 decreases to 0.23 for the SUR. There is no evidence of multicollinearity.

The amount of underfunding and the amount of contribution may also be influenced by the financial "health" of the firm. That is, a healthy firm may avoid maximum contributions to the DB pension plan because of alternative uses for available funds. Alternatively, although we hypothesize that investors do not assess the pension plan assets as belonging to the firm, a firm with excess pension assets may be signaling to the markets that it is financially stable and has the financial slack to take advantage of the tax deductions for the pension contributions. Such a firm is not concerned about either pension terminations or the unexpected need for cash (Ippolito 2001). A financially distressed firm, on the other hand, might minimize pension contributions or even seek a waiver from the minimum contribution requirements in order to conserve cash or avoid additional raising of capital. Therefore, we separate our sample firms into two groups – those with investment grade credit ratings and those with below investment grade credit ratings and we estimate the above regressions separately for the two groups. There are 13 distressed firms in 1999 and 2000, 23 in 2001 and 35 in 2002. The indicator variable is not significant in any of the annual regressions but it is significantly negative ($p < 0.01$) for the pooled (with year fixed effects) regression. Because the coefficients on the other variables do not change significantly, we do not tabulate the results.

In addition to assessing the predictive ability of the pension contribution for future contributions, we also assess the predictive ability of the net periodic pension cost numbers for future net periodic pension cost numbers. As noted above, Barth et al. (1992) find that various components of reported pension expense have different coefficients in their valuation model. For this portion of the study, we first assess the predictive ability of the current period net periodic pension cost for the next period's periodic pension cost and then we analyze the components of the pension cost number.

$$PEXP_{j,t+1} = \alpha_0 + \alpha_1 PEXP_{j,t} + \varepsilon_{j,t} \quad (10)$$

$$PEXP_{j,t+1} = \beta_0 + \beta_1 SERV_{j,t} + \beta_2 INT_{j,t} + \beta_3 OTH_{j,t} + \beta_4 EXPRET_{j,t} + \zeta_{j,t} \quad (11)$$

where:

$PEXP_{j,t}$ = firm j's reported net periodic pension cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

$SERV_{j,t}$ = firm j's service cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

$INT_{j,t}$ = firm j's interest cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

$OTH_{j,t}$ = firm j's other pension costs for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

$EXPRET_{j,t}$ = firm j's expected return on pension assets for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

Because the first regression is univariate, we do not tabulate the correlation results. The coefficients for the four years 1999 – 2002 are: 0.961, 1.327, 0.713, 0.503, clearly indicative of the increase followed by the decline in the securities markets. Explanatory power ranges from 0.65 in 1999 to 0.23 for 2002.

The results from estimating equation (11) are reported in table 6, panel B, and are quite consistent. All four explanatory variables are positively significant in each year and pooled with the exception of *OTH* in 1999 and 2001. The magnitudes of the coefficients change over time. *SERV* (positive in sign) increases from 0.87 in 1998 (predicting 1999) to 1.65 in 2001 whereas *OTH* (which can be either positive or negative) decreases from 0.93 to 0.14. *INT* (positive in sign) and *EXPRET* (negative in sign) are collinear and increase in magnitude from 1998-1999 and then decrease from 1999-2001. The coefficient on *SERV* increases from the smallest of the four in 1998 to the largest in 2001. The coefficients on all variables except *OTH* vary from a low of 0.81 to a high of 2.05. In the pooled regression, *SERV, INT,* and *EXPRET* all have similar magnitudes (*OTH* is smaller). These results indicate that the components of net periodic pension cost are all relevant for predicting future net periodic pension cost although we recognize that we are examining a short time period and results might not be generalizable.

7. Summary and conclusions

In this paper we conduct three sets of tests on S&P 500 firms with defined benefit pension plans for 1998-2002. Motivated in part by the lack of consensus in the finance and economic literature as to who "owns" the property rights to pension assets and liabilities, we find no consistent evidence that investors value the firm's pension assets and pension obligation as though they belonged to the sponsor of the plan. Our results are consistent with the mixed results in prior empirical work in accounting. We also find little consistent evidence that components of the pension asset and liability and of the net periodic pension cost are value relevant for security prices. These results are robust to various specifications and measures. However, both the components of net periodic pension cost and the sponsor's contribution to the pension plan are associated with one year ahead measures of the same items, leading to the inference that they have predictive ability. These results do not address the issue of which predictions investors find more useful—predictions of GAAP income or of cash flow.

One potential explanation for these findings is that investors do not consider the reported numbers reliable. All reported numbers involve significant estimation, many assumptions, and future projections. Preliminary results from a companion study comparing the pension disclosures under GAAP with the data reported in Form 5500 indicate significant differences between the two sources of data on DB pension plans. This could be consistent with investor uncertainty over the reliability of the reported numbers.

Table 1 – Sample Descriptive Statistics

The sample consists of all S&P500 firms with defined benefit (DB) pension plans in the years 1998 - 2002.

Panel A

($ millions)	**1998**	**1999**	**2000**	**2001**	**2002**
Number of S&P500 firms with DB plans	332	342	347	346	349
Number of S&P500 firms with DB plans in sample[a]	314	327	338	344	346
Total assets (mean) of S&P500 firms	$ 23,590	$ 27,550	$ 31,882	$ 35,443	$ 37,767
Total assets (mean) of S&P500 firms with DB plans	$ 29,198	$ 33,079	$ 39,326	$ 42,993	$ 44,928
Total assets (median) of S&P500 firms	$ 5,897	$ 6,947	$ 8,209	$ 9,825	$ 10,219
Total assets (median) of S&P500 firms with DB plans	$ 9,082	$ 9,726	$ 12,385	$ 13,324	$ 13,855
PBO – GAAP (mean)	$ 2,706	$ 2,671	$ 2,831	$ 3,060	$ 3,332
PBO – GAAP (median)	$ 866	$ 862	$ 955	$ 1,067	$ 1,145
Fair value pension assets – GAAP (mean)	$ 3,018	$ 3,410	$ 3,468	$ 3,068	$ 2,702
Fair value pension assets – GAAP (median)	$ 917	$ 1,033	$ 1,067	$ 954	$ 886
Discount rate – GAAP (mean ≈ median)	6.79 %	7.50 %	7.51 %	7.20 %	6.69 %
Expected investment return – GAAP (mean ≈ median)	9.18 %	9.18 %	9.24 %	9.23 %	8.70 %
Total net income for S&P500 sample – mean	$ 779	$ 899	$ 1,013	$ 668	$ 643
Total net income for S&P500 sample – median	$ 338	$ 407	$ 422	$ 344	$ 376
Net pension expense for S&P500 – mean	$ 49	$ 43	$ 33	$ 48	$ 60
Net pension expense for S&P500 – median	$ 15	$ 16	$ 13	$ 16	$ 24
Net pension expense as % of net income – mean	3.0 %	6.7 %	6.2 %	- 3.5 %	3.8 %
Net pension expense as % of net income – median	3.3 %	3.6 %	2.7 %	2.3 %	2.9 %
No. of firms with net pension expense	$ 220	$ 227	$ 184	$ 193	$ 255
Net pension income for S&P500 – mean	$ 56	$ 94	$ 114	$ 116	$ 135
Net pension income for S&P500 – median	$ 10	$ 16	$ 20	$ 17	$ 26
Pension income as % of net income – mean	9.5 %	30.2 %	7.6 %	47.7 %	11.5 %
Pension income as % of net income – median	3.0 %	3.3 %	3.6 %	3.2 %	3.8 %
No. of firms with net pension income	91	94	150	149	86
Sponsor's contribution to plan – mean	$ 56	$ 51	$ 46	$ 39	$ 137
Sponsor's contribution to plan – median	$ 9	$ 8	$ 8	$ 11	$ 32

Table 1 – Sample Descriptive Statistics (Cont.')

Panel B - Industry Representation

SIC	Industry	Percent of S&P500 Firms	Percent of DB Plan Firms in S&P500
1000-1999	Mining, drilling, construction	4.60 %	5.20 %
2000-2999	Food, apparel, wood products, paper, chemicals	18.60 %	23.00 %
3000-3999	Rubber, plastics, glass, metals, machinery, electronics	25.40 %	26.72 %
4000-4999	Transportation, telecommunications, transmission	12.60 %	15.33 %
5000-5999	Wholesale and retail	9.80 %	7.81 %
6000-6999	Financial services	17.80 %	18.24 %
7000-7999	Services – business, general	8.80 %	4.41 %
8000-8999	Services – healthcare, legal, educational	1.80 %	0.59 %
9000-9999	Conglomerates	0.60 %	0.89 %

[a] We identified S&P500 firms on COMPUSTAT that had positive values for the projected benefit obligation. Firms were eliminated from the sample when they lacked key data. For example, Fannie Mae and Freddie Mac are both in the S&P500 and both have DB pension plans but because they are not (or were not during the period of the study) required to file annual report (Form 10-K) for shareholders, information on their pension plans was not available and we eliminated them from the sample.

Table 2 – Variables - Descriptive Statistics

The sample consists of all S&P500 firms with defined benefit (DB) pension plans in the years 1998 - 2002. The table contains means for the variables for these firms that are used in the analyses.

($ millions)	1998	1999	2000	2001	2002
BVNPA	$ 29,174	$ 32,888	$ 39,051	$ 42,713	$ 44,570
BVNPL	$ 24,685	$ 27,791	$ 32,992	$ 35,966	$ 38,185
MVPA	$ 3,018	$ 3,410	$ 3,468	$ 3,068	$ 2,703
MVPL	$ 2,706	$ 2,671	$ 2,833	$ 3,060	3,332
NETASSETS (BVNPA – BVNPL)	$ 4,333	$ 5,051	$ 5,998	$ 6,621	$ 6,362
OVERFUNDED (MVPA – MVPL > 0)	$ 674	$ 1,010	$ 1,025	$ 729	$ 380
No. of overfunded firms	177	249	224	112	32
UNDERFUNDED (MVPA – MVPL < 0)	($ 156)	($ 125)	($ 130)	($ 340)	($ 733)
No. of underfunded firms	137	78	114	232	314
X	$ 779	$ 899	$ 1,012	$ 668	$ 643
BVE	$ 4,405	$ 5,177	$ 6,239	$ 6,928	$ 6,713
REV	$ 11,189	$ 12,621	$ 14,427	$ 15,088	$ 13,957
NPEXP	$ 10,365	$ 11,703	$ 13,356	$ 14,361	$ 13,305
PEXP	$ 18.6	$ 2.9	($ 32.8)	($ 23.6)	$ 10.7
PENINC	$ 16	$ 27	$ 51	$ 51	$ 34
PENEXP	$ 35	$ 30	$ 18	$ 27	$ 44
SERV	$ 66	$ 73	$ 70	$ 73	$ 78
INT	$ 172	$ 181	$ 196	$ 203	$ 207
OTH	$ 14	$ 1	($ 7)	$ 6	$ 22
EXPRET	$ 236	$ 261	$ 291	$ 310	$ 297
ACTUAL_RETURN	$ 339	$ 520	$ 162	($ 289)	($ 267)
RECOGA	$ 201	$ 245	$ 346	$ 414	$ 496
RECOGL	$ 4	$ 59	$ 43	$ 46	$ 83
CONT	$ 56	$ 51	$ 46	$ 39	$ 137
FUNDRATIO	1.064	1.203	1.159	0.950	0.776
EA	0.126	0.233	0.204	0.070	0.015
CF	$ 1,376	$ 1,514	$ 1,639	$ 1,752	$ 2,053
DEBT	$ 9,625	$ 11,118	$ 12,561	$ 13,626	$ 14,361
RETDIFF	$ 107	$ 263	($ 132)	($ 600)	($ 564)

Variables definitions:

BVNPA	=	Book value of nonpension assets
BVNPL	=	Book value of nonpension liabilities
MVPA	=	Fair value pension assets
MVPL	=	Projected pension obligation (PBO)
NETASSETS	=	BVNPA - BVNPL
OVERFUNDED	=	Amount by which fair value of plan assets exceeds PBO (if MVPA > MVPL)
UNDERFUNDED	=	Amount by which PBO exceeds fair value of plan assets (if MVPL > MVPA)
X	=	Earnings before extraordinary items
BVE	=	Book value of equity
REV	=	Total revenues
NPEXP	=	Total non-pension expense
PEXP	=	Recognized net periodic pension cost (expense if > $0, income if < $0)
PENINC	=	Net pension income (if net periodic pension cost < 0; 0 otherwise)
PENEXP	=	Net pension expense (if net periodic pension cost > 0; 0 otherwise)
SERV	=	Service cost for DB pension plan
INT	=	Interest cost for DB pension plan
OTH	=	Other components of net periodic pension cost (amortization, gains/losses, etc.)
EXPRET	=	Expected return on pension assets ($ millions)
ACTUAL_RETURN	=	Actual return on pension assets ($ millions)
CONT	=	Contributions to pension plan by plan sponsor
FUNDRATIO	=	Fair value plan assets (MVPA) / PBO (MVPL)
EA	=	Excess assets = [(MVPA – MVPL)/MVPL] if (MVPA – MVPL) > 0; $0 otherwise
CF	=	Cash flow from operations
DEBT	=	Long term debt (including current portion)
RETDIFF	=	Actual return ($) on plan assets less expected ($) return on plan assets

Table 3 - Property Rights Regression

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$MVE_{jt} = \alpha_0 + \alpha_1 BVNPA_{jt} + \alpha_2 BVNPL_{jt} + \alpha_3 MVPA_{jt} + \alpha_4 MVPL_{jt} + \varepsilon_{jt} \qquad (2)$$

Panel A	Year fixed effects	OLS 1998	OLS 1999	OLS 2000	OLS 2001	OLS 2002
Constant	1.304	1.128	1.200	1.195	1.151	0.933
	(0.148)***	(0.155)***	(0.188)***	(0.216)***	(0.172)***	(0.139)***
BVNPA	1.811	1.939	2.228	2.397	1.529	1.300
	(0.199)***	(0.304)***	(0.346)***	(0.302)***	(0.260)***	(0.150)***
BVNPL	-1.850	-1.953	-2.315	-2.474	-1.549	-1.319
	(0.214)***	(0.331)***	(0.370)***	(0.325)***	(0.275)***	(0.158)***
MVPA	-0.602	0.334	-0.515	-1.424	-0.062	2.458
	(0.834)	(1.505)	(1.931)	(1.989)	(1.534)	(0.952)**
MVPL	0.159	-0.566	-0.038	0.584	-0.656	-2.361
	(0.928)	(1.759)	(2.751)	(2.872)	(1.713)	(0.871)***
Observations	1638	303	323	332	341	339
Adjusted R^2	0.21	0.17	0.17	0.21	0.24	0.26

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)
All variables are deflated by sales.

MVE_{jt} = firm j's market value of equity at fiscal year end t

$BVNPA_{jt}$ = firm j's book value of nonpension assets at fiscal year end t, computed by subtracting the prepaid pension asset from the book value of assets

$BVNPL_{jt}$ = firm j's book value of nonpension liabilities at fiscal year end t, computed by subtracting the accrued pension liability from the book value of liabilities.

$MVPA_{jt}$ = firm j's fair market value of pension assets at fiscal year end t from the pension footnote in Form 10-K

$MVPL_{jt}$ = firm j's projected benefit obligation at fical year end t from the pension footnote in Form 10-K.

Table 3 - Property Rights Regression (Cont.')

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$MVE_{jt} = \gamma_0 + \gamma_1 NETASSETS_{jit} + \gamma_2 OVERFUND_{jt} + \gamma_3 UNDERFUND_{jt} + \zeta_{jt} \quad (3)$$

Panel B	Year fixed effects	OLS 1998	OLS 1999	OLS 2000	OLS 2001	OLS 2002
Constant	1.009	1.109	0.954	0.925	0.934	0.916
	(0.073)***	(0.150)***	(0.173)***	(0.168)***	(0.147)***	(0.126)***
NETASSETS	1.736	1.905	2.010	2.257	1.531	1.241
	(0.165)***	(0.231)***	(0.287)***	(0.257)***	(0.229)***	(0.129)***
OVERFUND	-1.347	-0.360	-0.503	-2.053	-0.181	1.893
	(1.045)	(1.621)	(1.231)	(1.031)**	(1.853)	(3.700)
UNDERFUND	0.191	3.037	-31.453	-18.542	-2.118	1.966
	(1.262)	(5.334)	(18.256)*	(15.179)	(3.195)	(0.861)**
Observations	1638	303	323	332	341	339
Adjusted R^2	0.20	0.17	0.17	0.21	0.24	0.26

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)
All variables are deflated by sales.

MVE_{jt} = firm j's market value of equity at fiscal year end t
$NETASSETS_{jt}$ = BVNPA – BVNPL
$OVERFUND_{jt}$ = MVPA – MVPL if MVPA > MVPL; 0 otherwise
$UNDERFUND_{jt}$ = MVPA – MVPL if MVPA < PL; 0 otherwise

Table 4 - Value relevance regression

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$P_{jt} = \beta_0 + \beta_1 (X_{jt} - PEXP_{jt}) + \beta_2 (BVE_{jt} - RECOG_{jt}) + \beta_3 PEXP_{jt} + \beta_4 CONT_{jt} + B_5 RECOGA_{it} + B_6 RECOGL_{jt} + v_{jt} \quad (5)$$

	Year fixed effects	OLS 1998	OLS 1999	OLS 2000	OLS 2001	OLS 2002
Constant	30.916	38.230	32.892	32.836	26.815	21.350
	(0.879)***	(2.455)***	(2.296)***	(2.081)***	(1.673)***	(1.600)***
X_PEXP	4.246	4.119	5.949	5.693	4.108	3.399
	(0.480)***	(1.150)***	(1.122)***	(0.718)***	(0.534)***	(0.541)***
BVE_RECOG	0.256	0.250	0.069	0.023	0.341	0.396
	(0.072)***	(0.133)*	(0.140)	(0.102)	(0.099)***	(0.108)***
PEXP	-3.646	-8.843	-3.815	-5.610	-6.747	-6.752
	(1.641)**	(4.346)**	(2.364)	(2.470)**	(2.358)***	(4.835)
RECOGA	0.343	1.565	-0.746	-0.204	0.309	-0.465
	(0.220)	(0.917)*	(0.475)	(0.723)	(0.148)**	(0.610)
RECOGL	-0.693	0.038	3.715	2.285	-2.834	-0.497
	(0.290)**	(0.865)	(2.958)	(2.278)	(1.096)**	(0.307)
CONT	-0.550	-0.767	-0.797	-3.562	15.262	7.223
	(0.202)***	(0.077)***	(0.287)***	(3.180)	(4.041)***	(3.356)**
Observations	1608	287	318	328	337	338
Adjusted R^2	0.26	0.16	0.13	0.25	0.34	0.40

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)

All variables are deflated by number of common shares outstanding at fiscal year end

P_{jt} = firm j's share price at end of fiscal year t

X_{jt} = firm j's earnings before extraordinary items for fiscal year t

$PEXP_{jt}$ = firm j's reported net periodic pension expense for fiscal year t

BVE_{jt} = firm j's book value of equity at end of fiscal year t

$RECOG_{jt}$ = firm j's recognized pension asset/liability at the end of fiscal year t; positive for an asset and negative for a liability

$RECOGA_{jt}$ = firm j's recognized pension asset for fiscal year t

$RECOGL_{jt}$ = firm j's recognized pension liability for fiscal year t

$CONT_{jt}$ = firm j's cash contribution to the pension plan in fiscal year t

Table 5, Panel A - Elements of pension expense

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$R_{j,t} = \alpha_0 + \alpha_1 REV_{j,t} + \alpha_2 PENINC_{j,t} + \alpha_3 NPEXP_{j,t} + \alpha_4 SERV_{j,t} + \alpha_5 INT_{j,t} + \alpha_6 OTH_{j,t} + \alpha_7 EXPRET_{j,t} + \alpha_8 CONT_{j,t} + \varepsilon_{j,t} \quad (6)$$

Panel A	Year fixed effects	OLS 1998	OLS 1999	OLS 2000	OLS 2001	OLS 2002
Constant	-0.050	0.101	0.025	-0.021	-0.140	-0.194
	(0.014)***	(0.039)***	(0.057)	(0.047)	(0.024)***	(0.020)***
REV	1.515	1.797	2.117	2.877	1.369	1.306
	(0.231)***	(0.556)***	(1.066)**	(0.645)***	(0.407)***	(0.259)***
PENINC	-2.104	7.402	0.790	17.375	-3.957	-1.245
	(2.176)	(12.361)	(9.975)	(10.995)	(2.806)	(3.320)
NPEXP	-1.475	-1.783	-2.189	-2.784	-1.300	-1.317
	(0.233)***	(0.553)***	(1.073)**	(0.654)***	(0.413)***	(0.263)***
SERV	0.520	-17.330	9.391	-26.321	5.433	-1.023
	(2.990)	(12.287)	(9.567)	(11.683)**	(3.364)	(3.040)
INT	-2.318	-7.600	0.941	-15.048	-5.760	0.456
	(3.766)	(9.798)	(16.889)	(9.729)	(2.446)**	(3.455)
OTH	-1.085	-5.407	4.904	-28.424	0.463	-6.718
	(1.366)	(7.829)	(8.305)	(10.229)***	(0.650)	(2.256)***
EXPRET	-1.174	-8.951	3.222	-16.403	-2.582	-1.067
	(2.384)	(7.970)	(12.603)	(9.392)*	(1.748)	(2.191)
CONT	0.109	-0.205	0.350	-0.318	4.460	1.765
	(0.016)***	(0.013)***	(0.023)***	(2.888)	(1.019)***	(0.982)*
Observations	1547	275	301	313	323	335
Adjusted R^2	0.17	0.03	0.04	0.19	0.22	0.26

Table 5, Panel B - Elements of pension expense

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$\begin{aligned} R_{j,t} = {} & \alpha_0 + \alpha_1 REV_{j,t} + \alpha_2 \Delta REV_{j,t} + \alpha_3 PENINC_{j,t} + \alpha_4 \Delta PENINC_{j,t} \\ & + \alpha_5 NPEXP_{j,t} + \alpha_6 \Delta NPEXP_{j,t} + \alpha_7 SERV_{j,t} + \alpha_8 \Delta SERV_{j,t} \\ & + \alpha_9 INT_{j,t} + \alpha_{10} \Delta INT_{j,t} + \alpha_{11} OTH_{j,t} + \alpha_{12} \Delta OTH_{j,t} \\ & + \alpha_{13} EXPRET_{j,t} + \alpha_{14} \Delta EXPRET_{j,t} + \alpha_{15} CONT_{j,t} + \alpha_{16} \Delta CONT_{j,t} + \varepsilon_{j,t} \end{aligned} \quad (7)$$

Panel B	Year fixed effects	OLS 1999	OLS 2000	OLS 2001	OLS 2002
Constant	-0.074	0.065	0.004	-0.165	-0.167
	(0.017)***	(0.060)	(0.046)	(0.033)***	(0.021)***
REV	1.309	-0.117	2.383	2.119	1.160
	(0.253)***	(1.029)	(0.574)***	(0.572)***	(0.231)***
ΔREV	0.264	1.787	0.247	-0.800	0.006
	(0.282)	(0.865)**	(0.502)	(0.382)**	(0.213)
PENINC	-2.744	-5.517	13.780	-6.905	2.667
	(2.480)	(11.398)	(11.592)	(4.182)	(3.326)
ΔPENINC	2.683	10.047	23.301	-3.765	-3.423
	(3.085)	(16.079)	(12.902)*	(7.738)	(3.777)
NPEXP	-1.268	0.074	-2.350	-2.037	-1.189
	(0.255)***	(1.028)	(0.579)***	(0.578)***	(0.234)***
ΔNPEXP	-0.224	-1.917	0.094	0.606	0.089
	(0.290)	(0.824)**	(0.509)	(0.381)	(0.220)
SERV	-0.117	28.228	-23.392	-2.058	-2.091
	(3.017)	(13.534)*	(11.916)**	(5.083)	(3.547)
ΔSERV	-2.437	-34.569	-67.958	15.627	15.231
	(7.129)	(31.641)	(28.612)**	(12.461)	(9.549)
INT	3.374	-2.030	-14.531	-0.296	-1.491
	(3.756)	(16.853)	(13.079)	(5.064)	(3.698)
ΔINT	-7.741	-7.565	25.710	-3.040	-6.252
	(4.794)	(31.120)	(25.084)	(7.642)	(4.673)

OTH	-3.767	18.106	-41.788	-2.454	-8.648
	(1.884)**	(14.628)	(13.547)***	(4.428)	(2.379)***
ΔOTH	0.900	-16.230	1.923	5.200	1.687
	(1.599)	(10.033)	(9.179)	(6.355)	(1.204)
EXPRET	2.475	7.171	-15.043	0.616	-3.499
	(2.629)	(11.962)	(10.917)	(4.106)	(2.673)
ΔEXPRET	-3.762	-18.856	9.717	1.264	-5.089
	(5.459)	(21.482)	(20.592)	(8.974)	(4.435)
CONT	0.304	1.237	3.708	4.162	0.579
	(0.322)	(1.604)	(3.698)	(1.752)**	(1.842)
ΔCONT	-0.107	1.663	-0.960	-0.124	1.763
	(0.618)	(3.087)	(3.095)	(0.909)	(1.217)
Observations	1223	277	307	318	321
Adjusted R^2	0.19	0.05	0.22	0.27	0.31

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)
All independent variables are scaled by market value of equity at the end of fiscal year t-1.

$R_{j,t}$ = firm j's 12-month cumulative raw return for fiscal year t.
$REV_{j,t}$ = firm j's revenues for fiscal year t
$PENINC_{j,t}$ = firm j's pension income for fiscal year t; \$0 if pension expense
$NPEXP_{j,t}$ = firm j's non-pension expenses for fiscal year t
$SERV_{j,t}$ = firm j's service cost for fiscal year t
$INT_{j,t}$ = firm j's interest cost for fiscal year t
$OTH_{j,t}$ = firm j's other pension costs for fiscal year t
$EXPRET_{j,t}$ = firm j's expected return (\$) on pension assets for fiscal year t
$CONT_{j,t}$ = firm j's contribution to its DB plan for fiscal year t

The above variables in changes form (with Δ) are computed as the change from year t-1 to year 1 in each of the variables.

Table 6 - Predictive ability

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$ln\,(1 + CONTRATE_{j,t}) = \beta_0 + \beta_1\, ln(FUNDRATIO)_{j,t} + \beta_2\, EA_{j,t} + \beta_3\, CF_{j,t} + \beta_4\, CONTRATE_{j,t-1} + \beta_5\, DEBT_{j,t} + \beta_5\, RETDIFF_{j,t} + \zeta_{j,t} \quad (9)$$

Panel A	Year fixed effects	OLS 1999	OLS 2000	OLS 2001	OLS 2002
CONSTANT	0.018	0.038	-0.011	0.002	0.058
	(0.006)***	(0.007)***	(0.014)	(0.005)	(0.013)***
FUNDRATIO	-0.103	-0.065	-0.313	-0.004	0.002
	(0.064)	(0.021)***	(0.163)*	(0.014)	(0.018)
EA	0.045	0.013	0.244	-0.028	-0.090
	(0.052)	(0.014)	(0.134)*	(0.018)	(0.039)**
CF	0.068	0.028	0.017	0.084	0.081
	(0.032)**	(0.041)	(0.041)	(0.040)**	(0.063)
LAGCONTRATE	0.016	0.020	0.464	0.672	0.060
	(0.000)***	(0.007)***	(0.172)***	(0.006)***	(0.043)
DEBT	-0.002	-0.031	0.027	0.010	-0.021
	(0.020)	(0.015)**	(0.025)	(0.010)	(0.025)
RETDIFF	-0.001	-0.012	0.001	-0.002	0.040
	(0.000)***	(0.026)	(0.000)***	(0.000)***	(0.043)
Observations	1161	267	291	303	300
Adjusted R^2	0.84	0.99	0.49	0.86	0.04

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)

$CONTRATE_{it}$ = firm j's contribution rate for fiscal year t (contribution / obligation)
$FUNDRATIO_{it}$ = firm j's funding ratio (fair value plan assets / PBO) for fiscal year t
EA_{it} = firm j's excess assets (= fair value plan assets less PBO) at fiscal year end t scaled by PBO if fair value plan assets > PBO; $0 otherwise
CF_{it} = firm j's operating cash flow scaled by total assets for fiscal year t
$DEBT_{it}$ = ratio of firm j's total debt to assets as of the end of fiscal year t
$RETDIFF_{it}$ = difference between the actual return on plan assets and the expected return on plan assets scaled by the pension obligation

Table 6 - Predictive ability (Cont.')

The following regression was estimated for the sample of firms with defined benefit pension plans in the S&P500 during the years 1998-2002:

$$PEXP_{j,t+1} = \beta_0 + \beta_1 SERV_{j,t} + \beta_2 INT_{j,t} + \beta_3 OTH_{j,t} + \beta_4 EXPRET_{j,t} + \zeta_{j,t} \qquad (11)$$

Panel B	Year fixed effects	OLS 1998	OLS 1999	OLS 2000	OLS 2001
Constant	-0.001	0.001	-0.001	-0.000	-0.003
	(0.000)***	(0.000)**	(0.000)	(0.000)	(0.001)**
SERV	1.054	0.873	0.814	1.010	1.646
	(0.335)***	(0.153)***	(0.349)**	(0.107)***	(0.111)***
INT	1.089	1.286	2.054	1.007	1.085
	(0.270)***	(0.151)***	(0.600)***	(0.220)***	(0.326)***
OTH	0.464	0.929	0.426	0.654	0.139
	(0.209)**	(0.156)***	(0.450)	(0.106)***	(0.184)
EXPRET	0.969	1.246	1.792	0.927	0.914
	(0.204)***	(0.149)***	(0.317)***	(0.173)***	(0.267)***
Observations	1252	297	309	320	326
Adjusted R^2	0.45	0.74	0.67	0.68	0.55

(White standard errors); * significant at 10%; ** significant at 5%; *** significant at 1% (two-tailed)

$PEXP_{j,t}$ = firm j's reported net periodic pension cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1

$SERV_{j,t}$ = firm j's service cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1

$INT_{j,t}$ = firm j's interest cost for fiscal year t, scaled by market value of equity at the end of fiscal year t-1

$OTH_{j,t}$ = firm j's other pension costs for fiscal year t, scaled by market value of equity at the end of fiscal year t-1

$EXPRET_{j,t}$ = firm j's expected return on pension assets for fiscal year t, scaled by market value of equity at the end of fiscal year t-1.

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