

THE DETERMINANTS OF ACTUARIAL ASSUMPTIONS UNDER PENSION ACCOUNTING DISCLOSURES

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Abstract

Corporate managers make several assumptions such as the discount rate and the rate of salary progression in calculating the periodic pension expense and pension liabilities. The choice of these assumptions can pose significant problems for financial reporting. This paper examines the following two questions concerning the choice of these assumptions. First, what factors drive these assumptions? and second, are these assumptions dependent on each other? Based on a sample of 300 observations, we find that leverage and pension plan funding play important roles in the choice of these assumptions. More importantly, it appears that these choices are related. The results of our study have important implications for analysts and accounting standard setters.

INTRODUCTION

The Financial Accounting Standards Board (FASB) issued SFAS No. 87, "Employers' Accounting for Pensions" in 1985. Among other things, SFAS No. 87 mandates that firms disclose the following three actuarial assumptions used in calculating the periodic pension expense and pension liabilities: (1) the discount rate (also referred to as the interest rate), is the rate used to calculate the interest component of the periodic pension expense and the present value of the accumulated and projected pension liabilities, (2) the rate of salary progression which represents the expected annual increase in salaries for pension plans where the pension obligations are based on employees' future salary levels and (3) the expected rate of return on pension plan assets. The choice of these actuarial assumptions pose significant problems for financial reporting. First, a change in the discount rate or salary progression or rate of return could have a significant impact on the employers' financial statements particularly, on pension expense and pension liabilities. For example, a 1% increase in discount rate would lower the pension liability by about 20% [6]. Second, changes in the actuarial assumptions could affect comparability of not only intra-firm but also inter-firm financial statement analyses [4].

The objective of this paper is to examine the following two questions: First, what factors drive the choice of these actuarial assumptions particularly, the discount rate and the rate of salary progression? and second, are the choices of the discount rate and salary progression rate dependent on each other? The results of this study would enhance our understanding of how these choices are made and can shed light on how firms behave in response to accounting regulation. The results of our study also have implications for accounting standard setting. Knowledge gained from a study such as this can offer valuable input to accounting policy making to develop more restrictive accounting standards that would offer fewer opportunities for firms to manipulate pension data using these actuarial assumptions.

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WHY DO FIRMS CHOOSE DIFFERENT ACTUARIAL ASSUMPTIONS?

An examination of the footnotes to financial statements for the years 1986 and 1987 reveals that the discount rate (DR) ranges from 7% to 11%. SFAS No. 87 states that the DR is the rate at which the pension obligations can be currently settled. SFAS No. 87 suggests that the DR can be developed from the 'settlement rate' used by the Pension Benefit Guarantee Corporation (PBGC) to estimate the liabilities of pension plans that are terminated. For 1986, the settlement rate used by the PBGC was 8.60% [5]. In other words, it appears that several firms assumed DR that were higher or lower than the above settlement rate. Similarly, there is a wide range of assumptions for salary progression rate (SPR). For 1986 and 1987, the SPR ranges from 3% to 8.50%. Before we can discuss the determinants of DR and SPR, it is important to understand the relationship between pension liability and DR and SPR. The discount rate and pension obligations of a firm are negatively related whereas a positive relationship exists between pension obligations and salary progression rate. We argue that leverage and pension plan funding status play important roles in the choice of these two assumptions.

LEVERAGE

The magnitude of the unfunded pension liabilities combined with the size of the long-term debt of a firm could influence the choice of the actuarial assumptions required under SFAS No. 87. Lending institutions often impose several covenants in the lending agreements entered into between the lenders and the borrowing firms. These debt agreements frequently include accounting-based covenants that are designed to protect the interest of the lenders. These accounting-based covenants are normally based on generally accepted accounting principles. When any one or more of these covenants are violated, that would place the borrowing firm in 'technical default' or renegotiation at costly terms [3]. In other words, firms with accounting-based debt covenants have incentives to minimize the likelihood of committing a technical default by opting for certain accounting practices. For example, the lenders, through bond covenants, frequently impose the maintenance of the following ratios: maximum debt to equity ratio, maximum debt, minimum net worth, minimum current ratio etc. Usually, the lenders regard the unfunded pension liability of a firm as similar to debt and therefore, higher the unfunded pension liability a firm has, closer it is to the constraints imposed by the lender. Therefore, in order to avoid the costly renegotiation process, firms would understate the degree of their unfunded pension liabilities by choosing a higher discount rate or by decreasing the salary progression rate or both.

FUNDING STATUS

The status of the pension plan funding could influence the choice of the actuarial assumptions, particularly the discount rate. Morris, Nichols and Niehaus [4] posit that corporate managers 'clean-up' their balance sheets by increasing the discount rate assumption. In other words, firms decrease the pension obligations disclosed in the footnotes to the financial statements by increasing the discount rate. Using a simple correlation analysis on a sample of 328 firms, they observed a significant negative correlation between the discount rate and the size of the pension liability.

Evidence from the finance and accounting literature indicates that in an efficient market, a firm's unfunded pension liabilities are treated in a manner similar to debt and other liabilities of a firm for equity valuation and also for determining the systematic risk [1, 2]. The presence of a large unfunded pension liability could mean lower credit ratings and higher cost of debt for the firms. Therefore, a large unfunded pension liability could be regarded as undesirable by corporate managers and managers have incentives to understate the magnitude of unfunded projected pension liabilities by increasing the discount rate or by decreasing the salary progression rate or both.

HYPOTHESES

We hypothesize that the choice of the discount rate and the salary progression rate is influenced by leverage and the funding status of the pension plan of a firm. The first two hypotheses relate to leverage based incentives and the next two hypotheses relate to pension plan funding status.

H1: Firms with higher leverage are likely to assume a higher discount rate.

H2: Firms with higher leverage are likely to assume a lower salary progression rate.

Firms with higher leverage have incentives to decrease the size of their reported pension liabilities to minimize the likelihood of committing a technical default and face costly renegotiation process. Therefore, those firms are likely to assume a higher discount rate and a lower salary progression rate both of which would have the effect of decreasing the pension liabilities independently. In other words, we expect a positive relationship between leverage and discount rate and a negative relationship between leverage and salary progression rates.

H3: Firms with large unfunded pension liabilities are likely to assume a higher discount rate.

H4: Firms with large unfunded pension liabilities are likely to assume a lower salary progression rate.

Firms with large pension liabilities have incentives to decrease the size of the reported pension liability by increasing the discount rate. In other words, we expect a positive relationship between the size of the pension liability and the assumed discount rate. Similarly, the rate of salary progression which represents the expected annual increase in salaries for pension plans where the pension obligations are based on employee's future salary levels, is likely to be negatively related to the reported pension liability. Therefore, we posit that firms with large pension liabilities are likely to assume a lower salary progression rate to downplay the size of their pension liability.

METHODOLOGY

We use regression analysis to test our hypotheses. The two 'explanatory' variables of interest to us are leverage and funding status. It is possible that there could be some other unknown factors that could also influence the choice of the discount rate and the salary progression rate. For example, the rate of profitability or the lack of it could affect the choice of these rates. Similarly, these rates could be driven by some industry based factors. We control for these unknown factors by including profitability and industry variables in our analysis.

SAMPLE

We examined the annual reports for the years 1986 and 1987 and searched for firms disclosing the necessary pension related information in the footnotes to the financial statements. We identified a sample of 150 firms (representing 300 observations in total) and consider it adequate to statistically test the above four hypotheses. Some descriptive statistics relating to the sample and the definition of the variables used in our analysis are presented in Table 1.

TABLE 1
Descriptive Statistics
(Number Of Observations = 300)

Variable	Mean	Standard Deviation	Range
Discount Rate (DR)	8.56	0.60	7.00 - 11.00
Salary Progression Rate (SPR)	5.92	0.72	3.00 - 8.50
Funding	0.87	0.22	0.27 - 2.32
Leverage	0.49	0.87	0.10 - 7.66
ROA (Profitability)	0.11	0.07	-0.04 - 0.32

TABLE 1
Descriptive Statistics
(Number Of Observations = 300)

(CONT'D)

Discount Rate (DR) also known as the interest rate is the rate used in calculating the present value of pension obligations. **Salary Progression Rate (SPR)** is used in determining service cost component of pension expense as well as the Projected Benefit Obligation (PBO). Both DR and SPR were obtained from the footnotes to the Annual Reports.

Funding variable = Projected Benefit Obligations/Pension Plan Assets. The PBO was adjusted for differences in DR across firms by multiplying PBO with the ratio of actual discount rate to standardized rate. The mean DR of the sample (8.6%) was used as the standardized rate. This eliminates the relative overstatements and understatements of projected pension liabilities that result from variations in discount rates across firms. This procedure is consistent with Francis (1987).(AR)

$$\text{Leverage} = \frac{(\text{Book Value of Debt}) + (\text{UPBO})(1-T)}{(\text{Market Value of Equity}) - (\text{UPBO})(1-T)}$$

Where UPBO represents the unfunded projected pension liability (PBO-Plan Assets) adjusted for tax. (COMPUSTAT)

ROA = Mean of five year time series of (income before extraordinary items, taxes, interest and pension expense/total assets). (COMPUSTAT)

Sources: COMPUSTAT = Compustat; PC-PLUS database; AR= Pension disclosures from Annual Reports.

The average discount rate for the sample was about 8.60% and the rates ranged from 7% to 11%. The salary progression rate ranged from 3% to 8.5% with an average close to 6%. On the average, the pension plans examined were slightly overfunded. The correlation coefficients (a measure of association between two variables) for the variables of interest are presented in Table 2. The correlation analysis can be viewed as a preliminary analysis before regression analysis.

TABLE 2
Correlation Matrix¹

	DR	SPR	LEVERAGE	FUNDING	ROA
DR	1	0.17***	0.22***	0.32***	-0.05
SPR		1	-0.07	-0.13**	0.06
LEVERAGE			1	0.29***	-0.29***
FUNDING				1	-0.17***
ROA					1

1. Pearson correlation coefficients

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

The correlation coefficients show that there is a strong positive relationship between discount rate and the following variables: salary progression rate, leverage and funding. Similarly, there is evidence of strong negative relationship between the salary progression rate and funding and leverage, as expected. There is no evidence of significant relationship between a firm's profitability and discount and salary progression rates. This suggests that the choice of DR and SPR could be driven by leverage, degree of funding but not by profitability.

RESULTS

The results of the regression analyses are summarized in Table 3.

TABLE 3
Results Of Regression Analysis

$$\text{Model (1): DR} = b_0 + b_1\text{LEVERAGE} + b_2\text{FUNDING} + b_3\text{ROA} + \text{INDUSTRY}$$

$$\text{Model (2): SPR} = b_0 + b_1\text{LEVERAGE} + b_2\text{FUNDING} + b_3\text{ROA} + \text{INDUSTRY}$$

	b₀	b₁	b₂	b₃	I₄	I₅	I₆	I₇
Model (1)	7.810 (49.50)***	0.106 (2.58)***	0.800 (5.15)***	0.412 (0.74)	-0.102 (-1.49)*	0.012 (0.040)	0.236 (0.920)	0.261 (0.650)
Model (2)	6.161 (30.76)***	-0.016 (-0.30)	-0.338 (-1.72)**	0.600 (0.84)	-0.043 (-0.49)	0.131 (0.58)	0.225 (0.69)	0.604 (1.17)

t-statistics in parentheses.

I₄, I₅, I₆ and I₇ are the industry coefficients. The adjusted R² for Models (1) and (2) were 0.13 and 0.03 respectively.

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

As expected, the regression coefficients for the two 'explanatory' variables, leverage and funding are positive and are highly significant. However, the other variables representing profitability and industry factors were not significant. In other words, based on a sample of 300 observations, we conclude that leverage and funding do influence the choice of the discount rate and profitability and industry factors do not. Similarly, in the case of salary progression rate, we observe, as expected, a negative regression coefficient for both leverage and funding. However, the leverage variable is not significant and it appears that the salary progression rate is driven solely by the degree of funding. Also, there is no evidence of profitability and industry factors influencing the choice of the salary progression rate.

ADDITIONAL ANALYSES

Next, we examined the issue of whether firms select a 'package' of actuarial assumptions that are 'favorable' to the firm. For example, a firm with a large unfunded pension liability could choose a high discount rate and a low salary progression rate to minimize the size of the reported unfunded pension liability. In other words, the question of interest to us is: Are the choices of DR and SPR are dependent on each other? The above regression analyses examined the choice of DR and SPR individually and now we introduced SPR as an additional 'explanatory' variable in our model which examines the choice of DR. The results presented in Table 4 indicates that the choice of DR is dependent on leverage, funding and SPR.

Similarly, we introduced, DR as an additional explanatory variable in the choice of SPR. The regression coefficient for DR is significant and it appears that DR does influence the choice of SPR. The above analyses indicate that the choice of actuarial assumptions is not independently made. The above finding differs from the conclusion reached by Stone and Ingram [5] that these actuarial assumptions are independently made. The above results suggest that firms might package the discount rate and salary progression rate in a manner that is favorable to the firm.

TABLE 4
Results Of Additional Regression Analysis

Model (3): $DR = b_0 + b_1SPR + b_2LEVERAGE + b_3FUNDING + b_4ROA + INDUSTRY$

Model (4): $SPR = b_0 + b_1DR + b_2LEVERAGE + b_3FUNDING + b_4ROA + INDUSTRY$

	b₀	b₁	b₂	b₃	b₄
Model (3)	6.690 (21.13)***	0.181 (4.03)***	0.108 (2.71)***	0.857 (5.66)***	0.304 (0.06)
Model (4)	3.883 (6.49)***	0.292 (4.03)***	-0.046 (-0.90)***	-0.570 (-2.85)***	0.478 (0.69)

t-statistics in parentheses.

The four industry coefficients in Models (3) and (4) were not significant and are not reported here. The adjusted R² for Models (3) and (4) were 0.18 and 0.08 respectively.

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

SUMMARY AND CONCLUSIONS

This paper examined two important questions concerning actuarial assumptions involved in pension accounting disclosures. First, what factors drive the choice the actuarial assumptions such as the discount rate and salary progression rate under pension accounting disclosures required by SFAS No. 87. Second, are the choices of these two assumptions dependent on each other? Answers to these questions have important implications to the financial analyst community and accounting standard setting agencies. First, even a one percent change in the assumptions could have a significant impact on the net income and balance sheet. Second, changes in the actuarial assumptions could hinder comparability of financial data.

Based on a sample of 300 observations, we conclude that the choice of discount rate is driven by the magnitude of leverage and funding whereas the choice of the salary progression rate is driven only by the level pension plan funding. In an efficient market, a firm's unfunded pension liabilities are treated in a manner similar to debt and other liabilities of a firm for equity valuation and also for determining the systematic risk. The presence of a large unfunded pension liability could be regarded as undesirable by corporate managers. Higher unfunded pension liability coupled with higher leverage can lead to an increase in the likelihood of technical default. Therefore, firms with large unfunded pension liabilities and leverage are likely to choose higher discount rates to understate the magnitude of the reported liability. Similarly, firms with large unfunded pension liabilities are also likely to assume a lower salary progression rate to downplay the magnitude of the reported pension liability. Because higher rates of salary progression can lead to higher pension obligations. We also conclude that the choice of the discount rate and the salary progression rate are not independent of each other. Our evidence indicates that firms choose a 'package' of actuarial assumptions that are 'favorable' to them. The results of our study will be useful to analysts in understanding the behavior of firms in the context of selection of actuarial assumptions.

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