MARKET VALUATION OF POSTEMPLOYMENT BENEFITS OTHER THAN PENSIONS

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December, 1991

MARKET VALUATION OF POSTEMPLOYMENT

BENEFITS OTHER THAN PENSIONS

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ACKNOWLEDGMENTS

I wish to express sincere appreciation to Dr. Gary Meek and all the members of my committee for their encouragement and support throughout my graduate program. Without the structure and scheduling that Dr. Meek enforced I would surely still be working on my proposal. Special thanks go to Dr. Lee Adkins, Dr. Lanny Chasteen, Dr. Charlotte Wright, and Dr. Anne Gleason for their patience and many ideas that greatly increased the quality of this research. Many thanks also go to Dr. Dennis Patz, Dr. Janet Kimbrell, Dr. Tom Wetzel, Dr. Chuck Ransom, Dr. Kevin Murphy, Dr. Michael Thomas, Dr. Tim Kreibel, and all of the accounting faculty for their inspiration and support during my years at Oklahoma State University.

To my parents, Thomas and June Brockie, I extend thanks for teaching me that nothing is achieved without hard work and persistence. Last but certainly not least, I thank and dedicate this work to my children, Ruth Ann and Elizabeth Jane Askren, who perpetually remind me what life is all about.

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THE RESEARCH QUESTION

Introduction

In 1990 the Financial Accounting Standards Board (FASB) issued Statement of Financial Accounting Standard (SFAS) No. 106, "Employers' Accounting for Postretirement Benefits Other Than Pensions" (FASB, 1990) which requires accrual accounting for the costs of retiree health benefits and life insurance, beginning in 1992. The FASB states in SFAS No. 106 that the Board's conclusions

> . . . result from the view that a defined postretirement benefit plan sets forth the terms of an exchange between the employer and the employee . . . It follows from the view that postretirement benefits are not gratuities but are part of an employee's compensation for services rendered. Since payment is deferred, the benefits are a type of deferred compensation. The employer's obligation for that compensation is incurred as employees render the services necessary to earn their postretirement benefits (p. i).

Earlier accounting standards required that postretirement costs be recorded when paid, with no disclosure of a company's obligation for promised benefits. SFAS No. 81 (FASB, 1984) required firms to disclose: a) a description of the benefits provided and the employee groups covered, b) a description of the employer's current accounting and funding policies for those benefits, and

c) the cost of those benefits recognized for the period. SFAS No. 81 was effective for periods ending after December 15, 1984. The FASB acknowledged that this disclosure did not provide decision makers with adequate information, but deferred further requirements until a task force appointed by the FASB identified and addressed issues related to this obligation. As a result of the research completed by the task force the FASB issued an Exposure Draft of a proposed SFAS, "Employers' Accounting for Postretirement Benefits Other Than Pensions" (FASB, 1989) that would require accrual accounting for the costs of retiree health benefits and life insurance, beginning in 1992. The Exposure Draft was modified and SFAS No. 106, "Employers' Accounting for Postretirement Benefits Other Than Pensions" (FASB, 1990) was issued in December, 1990.

The notion to accrue the Other Postemployment Benefits (OPEBs) obligation is controversial because it could have a dramatically adverse effect on the financial statements of many companies. Concerns expressed by groups such as the Financial Executives Institute (FEI) and the Business Roundtable, assert that accruing OPEBs would be too costly for firms to implement. Actuaries are currently charging small businesses anywhere from $10,000 to $20,000 a year to calculate projected liabilities for retirees' medical costs (Berton, 1991). Aside from the additional operational expense of calculating the obligation, the reported obligation and increase in current expense levels for OPEBs could potentially project a weaker image for many firms.

Lee Seidler, an accounting specialist for and senior managing director of Bear, Sterns and Co., warned that "If this proposal [to accrue postretirement benefits] becomes a rule, it could destroy the balance sheets and income statements of U.S. companies" (Berton, 1989, p. A41).

SFAS No. 106 does provide some flexibility for companies when they adopt the standard for the first time. The liability associated with the unrecognized unfunded accumulated postretirement benefit obligation--the transition obligation--does not have to be immediately accrued, but can either be immediately recognized as an accounting change or it can be amortized over a plan participant's future service periods, not to exceed 20 years. The FASB justifies allowing a choice in treatment of the transitional obligation because of cost-benefit considerations (Wall Street Journal, 12-24-90). However, from the date of adoption onward, companies must recognize each period's OPEBs cost on a full accrual basis.

The Securities and Exchange Commission (SEC) has issued a requirement that employers that can measure what their OPEBs obligation will be in January 1993 must disclose this information to the SEC now (Rosenthal, 1990). Estimates of the obligation vary. The Department of Labor places this liability at $169 billion for all U.S. companies, a report prepared for the House Select Committee on Aging puts the aggregate obligation for the Fortune 500 companies alone at nearly two trillion dollars (Employee Benefit Research Institute, 1987), and the Wall Street Journal reports that

benefits analysts figure that the unfunded liability for potential medical and insurance benefits for all U.S. industries exceeds four billion dollars (Berton, 1989).

Many health benefit plans, a large component of OPEBs, were instituted in the 1960s after the passage of Medicare. At that time the plans were not very costly, but since the 1960s medical costs have risen dramatically. Some of the reasons for these soaring costs are medical costs increasing more rapidly than the overall rate of inflation, decreasing Medicare reimbursements, the aging of the American work force, longer life expectancy, and early retirement programs which promise to pay health costs until Medicare takes effect at age 65. Medicare has raised premiums and deductibles in recent years, shifting more costs to employers. Additionally, in some cases Medicare has become the secondary payer, leaving employers primarily responsible for the health care costs of beneficiaries.

Principal Issues

The FASB has expressed concern that the significant obligation for OPEBs is not reflected in the financial statements of firms that offer these OPEBs. The issues that have yet to be resolved are whether this liability exists in a legal sense (the FASB has determined that it does in an accounting sense), whether the capital market is already including an estimate of these liabilities in stock prices, and whether reliable estimates of this liability can be made (Searfoss and Erickson, 1988).

Legal Issues

The legally enforceable status of these obligations has been contested in courts (e.g., United Steelworkers of America, AFL-CIO v. Canron, Inc., Court of Appeals of New Jersey, 1978; UAW v. Yard-Man, Inc., 1983; Eardman v. Bethlehem Steel, Inc., 1983; Moore v. Metropolitan Life, 1988; Musto v. American General, 1988) and the courts have found the employer's legal commitment to be very much dependent on its verbal and written representations. At this time the legal status of OPEBs is uncertain, as the courts continue to consider the issue on a firm by firm basis.

Rational Expectations and Efficient Markets

The issue of whether capital markets are already including an estimate of this obligation in pricing common stock can be discussed in a rational expectations context. The rational expectations hypothesis (REH) suggests that the subjective probability distributions of economic actors equal the objective probability distributions in the system.

Muth (1961), in formulating the REH, suggests that if the underlying economic system changes, one would expect economic actors, at least after a certain amount of time, to change the way that they form their expectations. Muth's rational expectations hypothesis equates two distinct concepts: (1) the economic actors' subjective,

psychological expectation of economic variables, and (2) the mathematical conditional expectation of those variables. In other words, people's subjective expectations are, on average, equal to the true values of the variable. According to this approach, there is a connection between the beliefs of individual economic actors and the actual stochastic behavior of the system.

Muth also argues that individuals' expectations need not be identical in order for economists to use the REH since individuals' expectations should be distributed around the true expected value of the variable to be forecasted (Sheffrin, 1983).

In this study, the "economic actors" are capital market participants and the "variable to be forecasted" is the "true" value of the firm. In modeling the OPEBs obligation, the valuation at time t is conditional on the information set available at time t-1. Since the current OPEBs expenditure is disclosed by firms, market participants are presumed to estimate the present value of the promised future benefits based on this available information set.

The rational expectations hypothesis has been applied to research in financial markets under the name of the "efficient markets model." The efficient markets model asserts that prices of securities are freely flexible and reflect available information, and that prices are related to conditional expectations (Sheffrin, 1983). If the price of a security today is equal to the conditional expectations of tomorrow's price, then the change in price between today

and tomorrow is analogous to a forecast error, which is uncorrelated with any available information (Fama, 1970). Grossman (1976) terms this a rational expectations equilibrium, where the market clearing price summarizes all the information available to market participants. Market efficiency implies that capital market participants (i.e., buyers and sellers of common stock) quickly incorporate a broad range of publicly available information in setting stock prices. Publicly available information includes--but is not limited to--the information disclosed in corporate financial statements prepared by accountants. Fama (1970) defines three major forms of market efficiency: weak, semi-strong, and strong. There is substantial empirical literature supporting the position the U.S. capital market is efficient in the semi-strong form (e.g., Beaver (1968), May (1971), Ball and Brown (1968), Brown and Kennelly (1972), Beaver, Lambert and Morse (1980), Lev and Ohlson (1982), Patell and Wolfson (1984), and Ball (1990)). However, testing the notion of market efficiency (a market is efficient with respect to particular information if it uses that information to "correctly" set prices) requires a theory and test of the unobservable statistic "correct prices." Critics (e.g., Grossman and Stiglitz, 1980) of some of the studies of market efficiency assert that two models are being jointly tested--the capital asset pricing model (CAPM) and the efficient market model. The CAPM is a model of expected returns that follows a two-parameter asset

pricing procedure (Sharpe, 1964; Lintner, 1965; Mossin, 1966). Anomalies have been found with tests of the CAPM by Black (1972), Roll (1977), Ball (1978) and Watts (1978).

Capital Market Estimation

Cross-sectional capital market research in accounting utilizes two primary models: (1) market models that examine changes in security prices (i.e., returns) as they are related to accounting earnings (e.g., Ball and Brown (1968), Lipe (1990), and Ohlson (1991)), and (2) models that examine levels of security prices as they are related to elements of the firm (e.g., Landsman (1986), Shevlin (1991), and Barth (1991)). The price change models normally rely on the market model (Fama, 1970) to obtain their estimates; the price level models do not (Landsman and Magliolo, 1988). The price-level models measure assets and liabilities on a before-tax basis, as present values of future cash flows. The coefficients obtained by the regressions on some of these variables are used as capitalization rates to obtain an estimate of the market valuation of those variables (Grant, 1989; Shevlin, 1991). This study assumes the semi-strong form of market efficiency, adopts the Miller (1977) model which assumes that the tax advantage of debt need not be incorporated, and utilizes a price level model which estimates the unobservable variable OPEBs as a component of stock price.

Summary

An important implication of capital market studies, such as Landsman (1986), Grant (1990), Shevlin (1991), and Barth (1991), is that market participants price traded stocks according to the market equilibrium value of the components of the firm. The financial statements of firms are a primary source of information about these firm-specific components, but there are alternative sources of information used in the valuation of common stock, such as public announcements by firms in the financial press. As such, there are off-balance sheet elements that the market apparently includes in the valuation process (see, for example, Section 2.1 on pension research) that accounting standards have not always required to be reported because of either measurement uncertainties or conservatism. For example, some accountants have questioned the value and reliability of including the OPEBs obligation on balance sheets, since the computation requires estimates of uncertain future events. Others argue that this corporate liability is both estimable and probable, meeting the requirements for accruing a contingent liability (FASB, 1989) according to SFAS No. 5 (FASB, 1975). In SFAS. No. 106, the FASB acknowledges difficulties in measuring OPEBs, but notes that "best estimates" are superior to implying--by a failure to accrue--that no obligation exists prior to the payment of benefits:

> The board believes that failure to recognize an obligation prior to its payment impairs the usefulness and integrity of the employer's financial statements (p. i).

If capital markets are efficient with respect to information about the obligation for OPEBs, then an estimate of the OPEBs obligation should be included in the valuation of firms by market participants, assuming rational expectations. This study uses a system of equations to estimate the unobservable OPEBs obligation for a sample of 100 firms for the years 1987, 1988, and 1989. It then tests the OPEBs estimate as a component of stockholder's equity, as measured by stock prices. This procedure produces an econometrically consistent estimate of the OPEBs obligation and tests whether this estimate is being used by capital market participants in setting stock prices. The next chapter discusses research related to the issue of valuation of off-balance sheet obligations, specifically pension obligations and OPEBs obligations.

CHAPTER II

RELATED RESEARCH

Pension Research

SFAS No. 106 is similar to the 1985 pronouncement on accounting for pension obligations, SFAS No. 87 (FASB, 1985). Prior to SFAS No. 87, unfunded pension obligations were not accrued as liabilities on corporate balance sheets. Instead, certain characteristics were disclosed in the notes to the financial statements. Accounting Principles Board Opinion No. 8, "Accounting for the Cost of Pension Plans" (APB, 1965) required companies to disclose the excess of the actuarially computed value of vested benefits over the total of the pension fund and any balance-sheet pension accruals, less any pension prepayments or deferred charges. Statement of Financial Accounting Standards No. 36 (FASB, 1980) required that the amount of accumulated vested benefits, the range of actuarial rates used in the valuation, the date of valuation, and any material changes in the actuarial assumptions be disclosed in the notes to the financial statements.

Although these obligations were kept off the balance sheet, financial analysts were incorporating estimates of the pension obligation from firm disclosures in determining

the stock prices of firms with unfunded pension plans (Oldfield, 1977; Gersovitz, 1980; Feldstein and Seligman, 1981; Feldstein and Morck, 1982; Morris, Nichols and Niehaus, 1983; Landsman, 1986).

Oldfield (1977) examines the effect of the unfunded vested benefit obligations (UVB) on the common stock value of the firm and concludes that the UVB is viewed by the capital market as a fairly accurate but somewhat understated representation of the true obligation. Gersovitz (1980) re-estimates Oldfield's model and finds the coefficient for UVB obligations to be significantly higher in absolute value for firms with a net worth sufficiently large to make them liable for the entire unfunded obligation according to the Employees Retirement Income Security Act (ERISA) of 1973. ERISA holds the company liable for up to 30% of total net worth for pension liabilities. Feldstein and Seligman (1981) extend Oldfield's model by utilizing inflation adjusted data for corporate assets for 1976 and 1977. Their estimated model utilizes Tobin's Q (Tobin and Brainard, 1977) where the market value of the firm (including both debt and equity) is proportional to the replacement cost of the underlying assets: $V = Q * A$, where V is the market value of the net assets of the firm, A is the "tangible" assets, or assets on the balance sheet, and the value of Q depends on several factors, including the ability of the firm to provide above-average earnings, the riskiness of the firm, and such off-balance sheet obligations as the unfunded

vested pension liability (UVPL). Their results indicate that pension liabilities reduce the market value of firms.

Feldstein and Morck (1982) examine the interest rate assumptions used by firms to discount future pension benefit obligations. Their study uses the Feldstein and Seligman (1981) model of firm valuation discussed above where the UVPL is re-estimated by using the reported discount rate, a standard discount rate for all firms set to the current Baa bond rate, and an average (for all firms) discount rate. The choice of interest rates by firms reflects the funded status of the firm's pension plan. Firms with underfunded pension plans tend to choose low interest rate assumptions in order to increase the tax advantages of early funding. Investors seem to see through this strategy and value firms as if the obligations are figured at an average interest rate. The market appears to weight underfunded plans more than overfunded plans, which this may be so because the firm is liable for the net obligation but has no property rights on the net assets of an overfunded plan, unless the plan is terminated. Morris, Nichols and Niehaus (1983) also study pension interest rates and find that the firm's pension discount rate is unlikely to be used by the market in calculating value because these rates are chosen by the firms based on their pension fund's level of fundedness and tax considerations. They conclude that the market uses a common cross-sectional interest rate to calculate pension liabilities.

Landsman's (1986) study examines whether pension fund assets and liabilities are valued by the market as corporate assets and liabilities. His results are consistent with the notion that pension fund property rights lie fully with the firm--i.e., the market prices pension fund assets and liabilities as corporate assets and liabilities. His model is based on the accounting identity price levels model rather than on an earnings based model. His model

$$MVE = \alpha_1 MVA + \alpha_2 MVL + \alpha_3 PA + \alpha_4 PL \qquad (2.1)$$

is estimated with

MVE = market value of stockholders' equity (the stock price at year end times the number of common shares outstanding)

MVA = market value of corporate assets estimated by balance sheet values (using both historical and current cost)

MVL = market value of corporate liabilities estimated by balance sheet values (both historical and current cost)

PA = market value of pension assets obtained from the AICPA data base on corporate pensions

PL = pension liabilities obtained from the AICPA data base on corporate pensions, as given and adjusted for a common discount rate of ten percent assuming a 25-year annuity.

Landsman's use of book value of assets as a surrogate for the market value of assets introduces the "errors in variables" econometric problem and as a result his estimates are biased and inconsistent. Landsman also suggests that the presence of a large, non-zero, statistically significant intercept term throughout the study may be capturing the effect of a potentially correlated omitted variable. Since

the OPEBs obligation is correlated with pension obligation, Landsman's intercept term may be incorporating some of the effect of this omitted variable.

In a study related to Landsman, Barth (1991) investigates the degree of measurement error in comparing different measures of pension assets and liabilities. She compares three pension asset alternatives: the fair value of plan assets, the amount of pension asset recognized in the balance sheet before the minimum liability provisions became effective, and the asset to be recognized on the balance sheet per SFAS No. 87, which takes into consideration the additional minimum liability. Pension liability alternative measures are also compared: the accumulated benefit obligation, the vested benefit obligation, the projected benefit obligation, the pension liability recognized on the balance sheet before consideration of the additional minimum liability, and the balance sheet liability per SFAS No. 87 which takes into consideration the additional minimum liability. The measurement error is modeled by first taking Landsman's (1986) assumption that if assets and liabilities were measured without error, then the coefficients from the regression

$$MVE = \alpha_1 MVA + \alpha_2 MVL + \alpha_3 PA + \alpha_4 PL \qquad (2.1)$$

should be +1, -1, +1, and -1 respectively. Following Landsman, she estimates

$$MVE = \delta_1 BVA + \delta_2 BVL + \delta_3 PA_i + \delta_4 PL_i + \varepsilon \qquad (2.2)$$

where BVA and BVL are the book values of total nonpension

assets and liabilities, and PA_i and PL_i are the ith alternative measure of the pension asset and liability, respectively. The estimates of δ_m from equation (2.2) are biased estimates of the theoretical coefficient of 1 due to measurement error. A difference term model developed by Garber and Klepper (1980) is then used to calculate the impact of the measurement error covariance structure on the bias in the estimated regression coefficients. Equation (2.2) is then estimated by setting $\delta_m = 1 - B_m$, where B_m is the coefficient bias derived by the Garber and Klepper difference model. The measurement error variance obtained by each pension measure is then compared to the variance obtained by the other measures. Her conclusions are that (1) footnote disclosures about pensions are closer to those assessed in market valuations than are the measures recognized in the balance sheet and (2) investors appear to include expectations about future salary progression in assessing pension liabilities, but view the projected pension benefit obligation measure as "noisy."

Barth's study directly addresses the issue of the presence of measurement error in using accounting data as a surrogate for economic data. Her study extends Landsman's in that her model uses the valuation model developed by Landsman but takes into account the errors-in-variables problem in her development of a ranking procedure for the pension estimates. The present study also uses the valuation model developed by Landsman and extends the model by developing instrumental variables for the independent

variables that are measured with error. However, unlike Barth, who uses a difference term model, the present study employs a two-stage least squares simultaneous estimation model.

Other Postretirement Benefits Research

Research in the area of OPEBs has just begun. Discussed in this section are Grant's (1989) cross-sectional study of the OPEBs obligation as a component of firm value, and the Financial Executives Research Foundation's (FERF) (1989) field study of the effect of the FASB's 1989 Exposure Draft on 25 companies.

Grant (1989) adapts Landsman's model (i.e., Equation 2.1) to estimate the market's valuation of OPEBs in 1984, 1985, and 1986. She incorporates a measure of off-balance sheet assets developed by Hirschey and Weygandt (1985), along with an estimate of the OPEBs obligation. Her model is also adapted from Feldstein and Seligman's (1981) study referred to earlier, which incorporates Tobin's Q as a measure of off-balance sheet assets. Tobin and Brainard (1977) define the ratio Q as a measure of the firm's potential to earn additional returns based on intangible assets.[1]

Hirschey and Weygandt (1985) hypothesize that the ratio Q is a function of variables representing earnings, growth,

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[1]The term "intangible" used here has a different meaning than it does in a traditional accounting context. It represents off-balance sheet assets, not assets on the balance sheet which lack a physical substance.

research and development, corporate debt, and beta (as a risk measure). Grant utilizes Hirschey and Weygandt's variables for intangible assets in her estimation of Q. According to Grant, Q is considered to be a function of R&D levels, advertising levels, a growth factor, and a risk factor. In her model, the market value of total assets (MVA) is equal to the replacement cost of tangible assets, (MVT), multiplied by a proportionality factor, Q. Then,

$$MVA = (Q) * (MVT), \text{ and } Q = MVA/MVT. \quad (2.3)$$

The market value of the firm's equity (MVE) equals the market value of its total assets (MVA) less its total liabilities (MVL): MVE = MVA - MVL. By substitution,

$$MVE = [(Q) * (MVT)] - MVL. \quad (2.4)$$

Incorporating the estimates for Q in equation (2.4) obtains the model:

$$MVE = [\alpha_0 + \alpha_1(R\&D/Sales) + \alpha_2(ADV/Sales) + \alpha_3(GROWTH) + \alpha_4(RISK) + \varepsilon] * MVT - MVL. \quad (2.5)$$

The market value of the firm's liabilities (MVL) includes all obligations of the firm, both on- and off-balance sheet components. The off-balance sheet long term liabilities include obligations for employee retirement benefits, both the pension obligation (PM) and OPEBs (<u>which she refers to as OPRBs</u>), as well as other off-balance sheet liabilities, which are assumed to be equal to zero. The pension obligation is proxied by two different measures--the annual pension expense and net pension liability, calculated as the projected benefit obligation minus the fair value of pension assets.

Grant estimates her model by the following regression equation. She obtains the equation by assuming that MVT, the replacement cost of tangible assets, equals the book value of tangible assets, BVT, and then dividing equation (2.5) by BVT:

$$\begin{aligned} MVE/BVT = {} & \beta_0 + \beta_1(R\&D/Sales) + \beta_2(ADV/Sales) + \\ & \beta_3(GROWTH) + \beta_4(RISK) + \beta_5(STL/BVT) + \\ & \beta_6(LTL/BVT) + \beta_7(PM/BVT) + \\ & \beta_8(OPRB/BVT) + \varepsilon. \end{aligned} \tag{2.6}$$

where:

MVE/BVT = market value of equity standardized by book value of tangible assets,

R&D/Sales = 5-year sum of research and development expenses divided by 5-year sum of sales,

ADV/Sales = 5-year sum of advertising expenses divided by 5-year sum of sales,

GROWTH = [the 5th root of (current year sales/sales 5 years prior] -1 (the geometric average of the growth of sales),

RISK = 1/coefficient of variation over 5-year period of annual changes in EPS,

STL/BVT = book value of short term liabilities, standardized by book value of tangible assets,

LTL/BVT = the sum of long term liabilities and capitalized preferred stock dividends, standardized by book value of tangible assets,

PM/BVT = pension measure,

OPRB/BVT = OPRB current expenditure standardized by book value of tangible assets, and

ε = error term, assumed to be distributed iid normal.

The two samples selected for her study are firms chosen from the SFAS No. 36 pension data tape (60 firms) for the years 1984, 1985, and 1986, and firms chosen from the 1986 Fortune 100 for the years 1984 and 1985. Overall, her results are consistent with the association of OPRB expenditure disclosures and firm market value. The coefficients of the OPRB measure are consistent with the market's impounding into firm valuation a measure of liabilities for postretirement benefits other than pensions. However, her method of estimating the OPEBs obligation (by using the current year OPEB expense) and her surrogate for the market value of tangible assets (book value of assets) introduce measurement error into her model, which leads to inconsistent and biased estimates of OPEBs. Grant's study is the first empirical investigation into OPEBs as a component of firm value.

The Financial Executives Research Foundation (FERF) (1989) sponsored a field test study conducted by Coopers and Lybrand to assess the impact of accounting for retiree health benefits on the financial statements of firms. The study used retirement benefit and current cost data from 25 companies, each of which had 1988 revenues in excess of $250 million, with most in excess of $1 billion.

The FERF study examines the impact of the Exposure Draft (ED), "Employers' Accounting for Postretirement Benefits Other Than Pensions." Results indicate that for "highly mature" companies with almost as many retirees as active employees, expenses range from less than two, to six

times current pay-as-you-go costs. For "mature" companies (i.e., those with a significant number of retirees), OPEBs expense under the ED ranges from two and one-half to greater than seven times higher than under pay-as-you-go accounting. For "immature" companies with few retirees, pay-as-you-go costs are minimal and the multiple of pay-as-you-go costs is much higher. Higher expense both increases recorded liabilities and decreases net worth, affecting many companies' key ratios, potentially placing them in default of debt covenants and other restrictions. The OPEBs liability is modeled under two scenarios: (1) by using the methodology proposed in the ED, namely prospective recognition of the transition obligation, and (2) by analyzing the effect of immediate recognition of the transition obligation on income, total liabilities and stockholder's equity. The second scenario is consistent with the rational expectations hypothesis that capital market participants view the transition obligation as a liability of the firm, regardless of the accounting treatment. To account for the income tax effect under SFAS No. 96, three alternative assumptions are applied to the three scenarios:

(1) The higher expense under accrual accounting is fully tax-effected using a 34% effective U.S. federal tax rate, ignoring other taxes.

(2) One-half of the higher expense will be tax-effected (34% rate); the other half would go directly to reduce net income, dollar for dollar.

(3) None of the higher expense will be tax-effected but will reduce net income dollar-for-dollar--the so-called "naked debit" situation under SFAS No. 96.

The first assumption assumes that the current year expense is fully tax-deductible in that year. The second assumption assumes that the current year expense for OPEBs is not fully tax-deductible, and reduces net income dollar for dollar.

Hypothetical companies are designed to simulate the two scenarios and the three assumptions. The increase in the companies' total liabilities under the ED ranges from less than 0.5 percent to greater than 2 percent, with the median effect between 0.5 and 1 percent. However, if the entire accumulated postretirement benefit obligation is used, the increase in total liabilities ranges from less than 3 percent to a high of 20 percent. The study finds that immediate recognition of the transition obligation can significantly reduce stockholders' equity and increase a company's debt-to-equity ratio. The impact of the ED approach is less drastic, but still very significant.

Conclusion

The pension related studies in this section are consistent in finding that market participants include the net pension obligation in valuing share prices before it was required to be accrued on corporate balance sheets (Oldfield, 1977; Gersowitz, 1980; Feldstein and Seligman, 1981; Feldstein and Morck, 1982; Landsman, 1986). Research

also suggests that the market weighs the unfunded net pension obligation more than the net pension asset when the pension plan is overfunded (Feldstein and Seligman, 1981; Feldstein and Morck, 1982; Morris, Nichols and Niehaus, 1983). Footnote disclosures about pensions are found to be closer to those assessed in market valuations than are the measures recognized in the balance sheet, and investors appear to include expectations about future salary progression in assessing pension liabilities, but view the projected benefit obligation measure as noisy (Barth, 1991).

The OPEBs related studies attempt to estimate the OPEBs obligation. Grant examines the annual OPEBs expense (used as a surrogate for the OPEBs liability) as a component of firm value in her cross-sectional study for the years 1984, 1985, and 1986. The coefficient for the OPEBs expense ranges from -13.64 to -30.52 but because of measurement error in her model, the coefficients are inconsistent and biased and are therefore suspect.

The FERF study attempts to estimate the obligation on a firm-by-firm basis for a sample of 25 companies, and estimates the effect that the ED would have on the current year's expense and on total liabilities. Many different assumptions and scenarios are modeled with the field test results reported. Both studies illustrate the potential impact that this ED can have on firms' net income and published net worth. The information set available to investors has changed considerably since these studies were completed now that employers are keeping better statistics

on retiree costs and promised benefits (Searfoss and Erickson, 1988).

In this study, the OPEBs obligation is estimated by a system of equations using two-stage least squares. The estimates are then tested for significance as components of firm value. Unlike previous studies (e.g., Landsman (1986), Grant (1989), and Barth (1991)) this estimation procedure yields consistent coefficients of an off-balance sheet liability, the OPEBs measure. The OPEBs obligation is estimated and the market effects are tested for the years 1987, 1988, and 1989.

CHAPTER III

METHODOLOGY

Rationale for Approach

Grant (1989) assumes that capital market participants use book value of tangible assets as the measure of market value and that they use the current year OPEBs expense as the measure of the OPEBs obligation. Using the book value of assets and liabilities and the OPEBs expense as surrogates for economic values results in a measurement error problem. When independent variables in an ordinary least squares (OLS) regression are measured with error, a basic econometric assumption is violated, namely that observations on independent variables can be considered fixed in repeated samples. As a result, Grant's OLS estimator for the OPEBs effect is biased and inconsistent.

When measurement error exists in right-hand-side variables of a regression equation, the observed variables are not independent of the error term. Each regressor consists of two components, one of which is systematic, the other of which is random. If the independent variables are measured without error, then the expected value of the random component of the regressor is zero. The reason for

the lack of consistency is that the observed regressor, X_i, is correlated with the errors of the model. One solution to this problem is to find a set of variables that are correlated with the X_i and uncorrelated with the regression errors. This set of instrumental variables is regressed on the X_i and the predicted values from this equation are used to replace the X_i. This "two-stage" procedure yields consistent and asymtopically unbiased estimates of the effects of X_i on the mean of the dependent variable (Zellner, 1970; Bowden and Turkington, 1984; Pagan, 1984).

The unobservable OPEBs obligation is estimated by relating the unobservable variable to one or more observable variables that are correlated with it. The correlated variables are regressed on the closest measure that we have of OPEBs--the OPEBs annual expense. The predicted value from this equation is used as a measure of the OPEBs obligation. This two-stage least squares procedure provides consistent estimates of the OPEBs obligation on the market value of firms.

The variables in the estimation procedure are items of information that are publicly available. Though the FERF (1989) field study uses company specific private data to measure the OPEBs obligation, capital market participants do not have access to private information relating to OPEBs. Therefore, they must estimate the obligation by using publicly available information, as this study does.

Theoretical Foundation

Equity can be defined as the difference between the assets and liabilities of the firm. When assets and liabilities are measured at market value, the equation becomes:

$$MVE = MVA - MVL \quad (3.1)$$

where

MVE = market value of equity,

MVA = market value of assets, and

MVL = market value of liabilities.

The market value of equity is determined by taking the closing stock price times number of shares of common stock outstanding at a point in time. The market values of assets and liabilities are not observable: book values reported in the financial statements are reported at historical cost rather than at current market value, and may not contain all of the assets and liabilities that the market considers in valuing the firm. The OPEBs obligation is theorized to be one such example of an off-balance sheet item. Since these variables are unobservable, an instrumental variable estimator is used in place of the unobservable variable in order to obtain consistent estimation results. Instrumental variables must be correlated with the unobservable variable, but uncorrelated with other omitted effects and measurement error which are usually captured in the equation's error term.

Prior research has suggested that the valuation of assets is dependent on the present value of cash flows associated with the operations of the firms and many accounting theorists believe that the discounted present value of the expected net cash flows of an asset constitutes the conceptually 'best' measure of an asset (Revsine, 1973). Others have suggested adding factors of "Q," the ability of the firm to provide above-average earnings, to the tangible assets (assets listed on the balance sheet). The most important factors identified in the literature representing "Q" are capitalized R&D expenditures, capitalized advertising expenditures, a growth factor for the firm, and a risk factor. Peles (1970), Picconi (1977), Lindenberg and Ross (1981), and Ross (1983) agree that factors representing excess earnings of the firm, riskiness, R&D expenditures and advertising should be included in the assets of the firm. Hirschey and Weygandt (1985) and Etteredge and Bublitz (1989) examine the relationship between firms' market value and current period advertising and R&D outlays. Both studies conclude that advertising and R&D are long-lived and should be capitalized and amortized over time rather than expensed when incurred. An industry effect is included to account for other off-balance sheet assets particular to industries such as the oil and gas industry. Therefore, the following model for the market value of assets is developed and utilized:

MVA = f(present value of net operating cash flows, capitalized R&D, capitalized advertising expenditures, growth, risk, and industry classification). (3.2)

The market value of liabilities is also unobservable. However, it has been suggested in the literature that the market value of liabilities is a function of the present value of all of the firm's obligations, with an adjustment for the risk class of the firm (Fama, 1972; Revsine, 1973; Landsman, 1986). Corporate bond ratings are used in the literature as a surrogate for credit worthiness, or risk (Horrigan, 1966; Beaver, 1966). Research cited in Section 2.1 has established that the unfunded pension obligation is considered by the market to be a liability of the firm. The following model for the market value of liabilities is utilized:

MVL = f(PV of debt, capitalized interest payments on long-term debt, capitalized preferred stock dividends, corporate bond rating, unfunded pension obligation, and unfunded OPEBs obligation). (3.3)

One component of the market value of liabilities (MVL) is the OPEBs obligation. Since the OPEBs obligation is unobservable and is the variable of interest in this study, instrumental variables must again be used to derive a consistent estimate of the effect of the OPEBs obligation on the market value of liabilities.

The FERF field test found the OPEBs obligation to be dependent on the following factors:

(1) the type of health plan (i.e., Health Maintenance Organization, Preferred Provider Organization, or different levels of benefits offered),

(2) the degree of cost-sharing with retirees (i.e., level of deductibles, maximum annual cost to the retiree, and coinsurance clauses),

(3) Medicare reimbursement method (i.e., carve-out, coordination of benefits, or exclusion),

(4) the age and sex of retirees and dependents,

(5) the health care cost trend,

(6) the discount rate, and

(7) the ratio of the number of active employees to the number of retirees.

The ratio of the number of active employees to the number of retirees was identified by the FERF study as one of the most important factors in determining the magnitude of the OPEBs obligation. The FERF study divided the 25 companies by maturity classes to assess the impact of the FASB's 1989 ED. The three classes were highly mature (less than two actives per retiree), mature (two to six actives per retiree) and immature (more than six actives per retiree). The study found that the smaller the active/retiree ratio, the larger the firm's OPEBs obligation.

Most of the factors identified by the FERF study relating to the OPEBs obligation are not publicly available and rarely available even privately. This is because most companies have third-party administrators (TPAs) who take care of their medical claims, and the TPAs have only collected information from the companies that directly affect the payment of claims. Therefore, because of data restrictions, it is assumed that the market is estimating the OPEBs obligation based on publicly available information only. To estimate the OPEBs obligation it is necessary to relate the unobservable variable, OPEBs, to observable

factors that are correlated with OPEBs. Information concerning the first four factors above are generally unavailable. The health care cost trend rate and the discount rate are not firm-specific factors, and thus are systematic variables that would be constants in a regression. The ratio of retired to active employees is also unavailable but can be estimated by the following factors:

(1) The age of a business - the older a business, the more retirees it is likely to have; therefore, the larger the OPEBs obligation.

(2) The labor intensiveness of a firm - estimated by the proportion of employee compensation expense to total operating expense. The more labor intensive a firm, the larger the OPEBs obligation.

(3) The industry classification of the firm - this effect may be important in estimating the OPEBs obligation because of industry-wide benefit patterns and retiree health costs. For example, industries that expose workers to dangerous chemicals will have higher health costs, and a larger OPEBs obligation.

(4) The unionization of the firm - unions increase the probability that firms offer OPEBs and the level of benefits because of the union's bargaining power on behalf of the employees. The more unionized a firm, the larger the OPEBs obligation.

(5) The current year pension expense - the higher the annual pension expense, the higher the retiree/active employee ratio, and the larger the OPEBs obligation.

Therefore the following model for the OPEBs obligation is utilized:

$$\text{OPEBs obligation} = f(\text{age of business, labor intensiveness, industry, unionization, and pension expense}) \quad (3.4)$$

Econometric Problem

The econometric objective is to use available information to estimate the effect of OPEBs on MVE. By holding MVA constant the effects of OPEBs on MVL can be evaluated. While reliable data on MVE are available, (the closing stock price times common shares outstanding), MVA as well as MVL are not observable. The closest accounting information about MVA and MVL that is available is the book value of assets (BVA) and the book value of liabilities (BVL). Therefore, it can be posited that:

$$MVA = BVA + \text{error} \quad (3.5)$$

and that the error term contains the omitted effects of market value. By rewriting (3.5):

$$BVA = MVA - \text{error} \quad (3.6)$$

the model for MVA is obtained.

MVL is calculated by utilizing the identity:

$$MVE = MVA - MVL, \text{ or}$$

$$MVL = MVA - MVE \quad (3.7)$$

These models are used to estimate the effects of OPEBs on MVE holding MVA constant, and hence the effects on MVL.

The OPEBs obligation is also unobservable. The only data reported by firms that directly relates to the OPEBs obligation is the current year's OPEBs expense. This variable can be used as a measure of the OPEBs obligation, measured with error:

OPEBs obligation = OPEBs expense + error, or

OPEBs expense = OPEBs obligation - error. (3.8)

Econometric Model

The following three equations developed above plus the identity (Equity = Assets - Liabilities) form a model which is estimated using two-stage least squares:

BVA = MVA + error (3.9)

MVL = MVA - MVE (3.10)

OPEBs expense = OPEBs obligation + error (3.11)

Substituting (3.2) into (3.9) yields:

$$(1)\quad BVA = \alpha_0 + \alpha_1(PVCF) + \alpha_2(ADV) + \alpha_3(R\&D) + \alpha_4(IND) + \alpha_5(GROW) + \alpha_6(RISK) + u \qquad (3.12)$$

where:

PVCF = Present value of net operating cash flows, as estimated by operating income,

ADV = Capitalized advertising (5-year sum of advertising expenses)

R&D = Capitalized research and development (5-year sum of research and development expenses),

IND = Industry by dummy variable grouping firms into major industry classes, and

GROW = Geometrical rate of return over 5 years of sales,

RISK = Corporate bond rate,

u = Error term, assumed to be distributed iid with $\mu = 0$ and variance α^2.

MVA is estimated by using the least squares predictions from (3.12), denoted MVA. Research and development expenses and advertising expenses are divided by sales to allow for greater comparability across firms. The corporate bond rate, as reported by COMPUSTAT is used as a measure for risk. The growth in sales of the sample firms is estimated by taking the geometric average rate of return for five years of sales (Grant, 1989). Industry groupings follow the industry classification system on the COMPUSTAT database (see Appendix C). Natural resource firms comprise the first category of industries, computer and software development firms comprise the second category, and all other firms comprise the third category. This categorization attempts to identify industries that may have significant off-balance sheet assets. The error term includes measurement error associated with BVA as well as omitted effects from (3.2) in estimating $\widehat{MVA}$. Table I summarizes variable definitions for the BVA model.

Consistent estimation of the effect of the OPEBs obligation on the market value of the firm requires a measure of OPEBs which is not correlated with the errors in the regression equation in which it appears as an

TABLE I

VARIABLES USED IN INSTRUMENTAL VARIABLE ESTIMATION OF MARKET VALUE OF ASSETS MODEL

VARIABLE	DEFINITION
BVA	Book value of total assets
PVCF	Present value of net operating flows, as estimated by operating income
ADV	Capitalized advertising (5-year sum of advertising expenses)
R&D	Capitalized research and development (5-year sum of research and development expenses)
IND	IND1 = 1 (Categorical variable for natural resource firms), and IND2 = 1 (Categorical variable for firms in high-tech industries)
GROW	Geometrical rate of return over 5 years of sales
RISK	Corporate bond rate
u	Error term, assumed to be distributed iid with $\mu = 0$ and variance

independent variable. The estimation of the OPEBs obligation and the use of this generated regressor as an independent variable in the liability valuation model can be viewed as a two-stage least squares (2SLS) procedure simultaneously estimated. The OPEBs obligation is estimated using the least squares prediction from the following equation:

$$(2)\quad \text{OPEBs expense} = \delta_0 + \delta_1(\text{AGE}) + \delta_2(\text{LABOR}) + \delta_3(\text{IND}) + \delta_4(\text{UNION}) + \delta_5(\text{PENSION}) + w \qquad (3.13)$$

where:

AGE = Age of firm,

LABOR = Labor intensiveness of a firm

IND = Industry by dummy variable grouping firms into major industry class,

UNION = Unionization percentage,

PENSION = Pension expense for the current year,

w = Error term, assumed to be distributed iid with $\mu=0$ and α^2.

The age of the firms are collected from the 1981 through 1990 editions of Moody's Industrial Manual. Labor intensiveness for each firm is estimated by dividing employee expense by total operating income. The companies are grouped into three major industry classifications based on the relative maturity of the industries and are categorized as dummy variables in the regression. These categories are: (OLDIND = 1) for highly mature industries; (OLDIND = 0; NEWIND = 0) for mature industries; and (NEWIND = 1) for immature industries. The Standard and Poor's Industry Index Composites are used to classify the firms.

Appendix B summarizes the assignment of firms to industry classifications based on SIC codes.

Unionization groupings are developed from a study published by Kokkelenberg and Sockell (1985) on union membership in the United States during the years 1973-1981. The study assigns unionship percentages to firms according to their industry categories based on the three-digit SIC code. Since unionship percentages are not given for individual firms, the industry percentage is assigned to firms based on their three-digit SIC code. Pension expense is included because it is highly correlated with the retiree/active employee ratio across firms, which is in turn highly correlated with the level of the OPEBs obligation.

Table II summarizes the variable definitions for the OPEBs model. The predicted value from this regression, $\widehat{OPEBs}$, is then used in (3.14):

$$\widehat{MVA\text{-}MVE} = \beta_0 + \beta_1(PVL) + \beta_2(\widehat{OPEBs}) + v \qquad (3.14)$$

where:

$\widehat{MVA\text{-}MVE}$ = The market value of liabilities as estimated by ($\widehat{MVA}$) minus the market value of equity (closing stock price * common shares outstanding)

PVL = (PV of L-T liabilities) + (current liabilities) + (capitalized interest payments on L-T debt) + (capitalized preferred stock dividends) + (the unfunded pension obligation),

$\widehat{OPEBs}$ = Estimated OPEBs obligation, and

v = Error term, assumed to be distributed iid with $\mu=0$ and α^2.

TABLE II

VARIABLES USED IN INSTRUMENTAL VARIABLE ESTIMATION
OF OTHER POSTEMPLOYMENT BENEFITS OBLIGATION MODEL

VARIABLE	DEFINITION
OPEBs	Other postemployment benefits expense for the current year
AGE	Age of firm
LABOR	Labor intensiveness of a firm - estimated by the proportion of employee compensation expense to total operating income
IND	OLDIND = 1 (Categorical variable for firms in mature industries), and NEWIND = 1 (Categorical variable for firms in immature industries)
UNION	Unionization percentage
PENSION	Pension expense for the current year
w	Error term, assumed to be distributed iid with =0 and

The present value of liabilities is calculated by assuming the long-term debt has a duration of ten years and is discounted at the 10 percent discount rate (Shevlin, 1991; Grant, 1989; Landsman, 1986). Interest payments on long-term debt, as well as preferred stock dividends, are treated as a perpetuity discounted at 10 percent. The unfunded pension obligation is collected as a COMPUSTAT data item. Table III summarizes the variable definitions and expected signs for the $\widehat{MVA}$-MVE model.

It is hypothesized that β_2 will be positive, that an increase in the OPEBs obligation will in turn increase the market's assessment of the liabilities of the firm. The OPEBs obligation represents off-balance sheet debt and should have a direct effect on the market value of the liabilities of the firm. The null hypothesis tested is that the OPEBs obligation has no effect on MVL against the alternative hypothesis that it has a positive effect.

$H_0: \beta_2 = 0$

$H_A: \beta_2 > 0$

TABLE III

VARIABLES USED IN LIABILITY VALUATION EQUATION AND PREDICTED SIGNS OF ESTIMATED COEFFICIENTS

VARIABLE	DEFINITION	EXPECTED SIGN
$\widehat{MVL}$	The estimated market value of liabilities calculated by subtracting the market value of equity (closing price of common stock times shares outstanding) from the estimated market value of assets ($\widehat{MVA}$ - MVE)	
PVL	Present value of liabilities, calculated by adding (current liabilities) + (long-term liabilities and interest payments on long-term debt capitalized at 10% for 10 years) + (preferred stock dividends capitalized as a perpetuity at 10%) + (unfunded pension obligation)	+
$\widehat{OPEBs}$	The estimated value from the other post-employment benefits equation	+
v	Error term, assumed to be distributed iid with $\mu=0$ and α^2	

CHAPTER IV

MODEL ESTIMATION AND RESULTS

Data Collection Procedures and Test Period

One hundred companies (Appendix A) are randomly chosen from the Fortune 500 companies that disclosed the annual OPEBs expense and are listed on the 1990 COMPUSTAT data tape. The 1990 COMPUSTAT data tape is used to gather data for the years 1987, 1988, and 1989, along with the NAARS (Mead Data Central) data base of annual reports for those years. Since the issue of accruing OPEBs is relatively recent, and market analysts have greater access to information about large (Fortune 500) companies, only Fortune 500 companies that are available on COMPUSTAT for the years 1984-1989 are examined. The expenditure for OPEBs is taken from the footnotes to the financial statements which appear on the NAARS database.

Companies are selected by using a random number table limited to the range 1 through 500. If the companies selected do not disclose the OPEBs annual expense they are taken off the list and another random number is selected. Approximately 25% of the companies originally selected in the sample did not disclose the OPEBs expense for the year 1989, and therefore were taken off the list. Since only

companies disclosing OPEBs expense were selected, there is a possibility of selection bias. Further research is needed to address the issue of whether the companies that do disclose the OPEBs expense are systematically different from those that do not. Data are then collected from the 1990 COMPUSTAT database and other published sources (Moody's Industrial Guide, 1990; Kokkelenberg and Sockell, 1985).

Estimation Results

The results of the estimation of the $\widehat{MVA}$ model are summarized in Table IV. The R-square for the $\widehat{MVA}$ model for 1987 is .9484, for 1988 is .9352, and for 1989 is .9474. The F-test indicates that the models were significantly different from zero at the .05 level for all three years.

The results of the simultaneous estimation of $\widehat{OPEBs}$ and $\widehat{MVL}$ are summarized in Table V. The generated regressor for the OPEBs obligation ($\widehat{OPEBs}$) and the market value of liabilities ($\widehat{MVL}$) are estimated simultaneously using the Statistical Analysis System (SAS V.6) procedure MODEL 2SLS. The OPEB model has an R-square of .6696 in 1987, .4051 in 1988, and .3104 in 1989. The F-test indicates the models were significantly different from zero at the .05 level for all three years.

All the variables in the 1987, 1988, and 1989 MVL model are significant at the .05 level except for the intercept, which is not significantly different from zero, and PVL, which is significant at the .10 level for 1988. All the signs are positive, as predicted. The MVL model has an

TABLE IV

COEFFICIENTS FROM THE INSTRUMENTAL VARIABLE ESTIMATION OF MARKET VALUE OF ASSETS

Variable	1987	1988	1989
INTERCEPT	-1368.3100	-1882.3047	-2469.9962
	(749.075)	(1354.264)	(1216.127)
	-1.827	-1.390	-2.031
PVCF	5.3202	7.1900	7.9979
	(0.315)	(0.453)	(0.403)
	16.880	15.855	19.842
ADV	0.5046	0.4744	0.9355
	(0.389)	(0.620)	(0.539)
	1.296	0.765	1.733
R&D	1.2850	0.2909	-0.5540
	(0.246)	(0.462)	(0.401)
	5.218	0.630	-1.381
IND1	4543.0595	-4265.6868	-3540.4629
	(1383.891)	(2320.745)	(2148.393)
	3.283	-1.838	-1.648
IND2	-3050.3777	-2411.1489	740.6446
	(1217.317)	(2255.304)	(2225.049)
	-2.506	-1.069	0.333
GROW	-56.0438	59.9870	67.6122
	(77.068)	(137.302)	(131.244)
	-0.727	0.437	0.515
RISK	147.5917	123.7895	204.7621
	(68.313)	(131.263)	(120.858)
	2.161	0.943	1.694
R-SQUARE	0.9484	0.9352	0.9474
F VALUE $_{7,92}$	241.480	189.835	236.797

Note: Standard errors appear in parentheses with t-statistics directly following the standard errors. The 5% critical value from the $F_{7,92}$ distribution for the MVA model is 2.11.

TABLE V

COEFFICIENTS FROM THE TWO-STAGE LEAST SQUARES ESTIMATION OF OPEBs MODEL AND MARKET VALUE OF LIABILITIES MODEL

Variable	1987	1988	1989
OPEBs Model			
INTERCEPT	7.082	2.373	-78.736
	(24.282)	(37.112)	(59.649)
	0.29	0.06	-1.32
LABOR	1.819	16.617	11.789
	(1.840)	(8.104)	(12.972)
	0.99	2.05	0.91
INDUSTRY			
Highly Mature	10.573	35.777	-3.993
	(17.079)	(26.376)	(42.225)
	0.62	1.36	-0.09
Immature	-23.801	-48.140	-18.738
	(21.217)	(33.795)	(54.203)
	-1.12	-1.42	-0.35
UNION	-0.257	-0.227	-0.441
	(0.359)	(0.555)	(0.903)
	-0.72	-0.41	-0.49
AGE	0.190	0.153	1.677
	(0.239)	(0.356)	(0.575)
	0.80	0.43	2.91
PENSION EXP	0.617	0.607	0.683
	(0.049)	(0.090)	(0.128)
	12.50	6.74	5.33
R-SQUARE	0.6696	0.4051	0.3104
F VALUE$_{6,88}$	29.9923	10.2126	6.7715

TABLE V (Continued)

Variable	1987	1988	1989
Market Value of Liabilities Model			
INTERCEPT	-344.924	-209.978	-1893.570
	(536.413)	(567.548)	(1557.600)
	-0.64	-0.37	-1.22
PVL	0.631	0.191	0.545
	(0.205)	(0.115)	(0.182)
	3.07	1.67	2.99
OPEBs	33.356	112.722	87.938
	(10.849)	(10.800)	(17.729)
	3.07	10.44	4.96
R-SQUARE	0.6780	0.8822	0.3253
F VALUE$_{2,92}$	42.7529	343.1420	233.4410

Note: Standard errors appear in parentheses with t-statistics directly following the standard errors. The 5% critical value from the $F_{6,88}$ distribution for the OPEBs model is 2.20; the 5% critical value from the $F_{2,92}$ distribution for the MVL model is 3.10.

R-square of .6780 in 1987, .8822 in 1988, and .3253 in 1989. The F-test indicates the models were significantly different from zero at the .05 level for all three years.

The R-Square of the OPEBs model decreased for each succeeding year, indicating greater variability in the data for each subsequent year. Perhaps as investors became more aware and concerned about the potential magnitude of the OPEBs obligation to firms, market participants were including additional factors not represented in this model during that time. The estimate for the OPEBs variable also changed from year to year: for 1987 the parameter estimate is 33.356; for 1988 the parameter estimate is 112.722; for 1989 the parameter estimate is 87.938. The rapid increase of the estimate between 1987 and the latter years may be due to the wide reporting of the proposed new accounting standard for accruing other postretirement benefits and rising health care costs. For example, the Wall Street Journal announced on May 5, 1988 that "Company earnings face a big hit from accounting for health benefits" and on May 24, 1988 "Firms are stunned by retiree health costs", and on July 8, 1988 "Burgeoning spending on health care programs alarms budget planners" (Asinof, 1988; Bennett, 1988; Jaroslovsky, 1988). Additionally, on November 22, 1988, the Wall Street Journal reported that LTV Corporation announced a $2.26 billion charge to reflect the potential cost of medical and life insurance benefits for its 118,000 current and retired employees (Blumenthal and Berton, 1988). Perhaps as public awareness of the potential OPEBs

obligation grew in 1988 and 1989, and companies were engaged in re-negotiating employee benefits to reduce their OPEBs obligation, more "noise" was introduced into the estimation procedure in the latter years. Additional research could test this hypothesis as firms are required to disclose their OPEBs obligation in their financial statements.

CHAPTER V

SUMMARY AND CONCLUSIONS

This research project has discussed issues related to the identification of, legality of, and valuation of the other postemployments benefits obligation (OPEBs). These benefits consist primarily of health and life insurance benefits promised to employees after retirement. The FASB has identified the OPEBs obligation as an obligation of the firm and has required firms to estimate and accrue the liability associated with OPEBs for fiscal years beginning after December 15, 1992. The legal obligation of the firm to the retirees is still being decided by the courts on a firm-by-firm basis. The valuation of the OPEBs obligation by investors is difficult because this information is either privately held or not compiled by firms at all. However, assuming efficient markets and rational investors, an estimate of this obligation should be included in the market valuation of firms.

A model is developed of how the OPEBs obligation is being determined by market participants. Using this model, the effect of the OPEBs obligation on the market value of the firm is consistently estimated. Previous research (Landsman, 1986, Grant, 1989) has identified the errors-in-measurement problem in using balance sheet data as a surrogate for the market value of assets and liabilities.

Instrumental variables for assets and liabilities are used in this research to circumvent the errors-in-measurement problem that has existed in prior research. The model developed identifies the variables OPEBs expense, age of the firm, labor intensiveness of the firm, industry maturity classification, percentage of unionship within industries, and pension expense for the current period as those closely associated with the level of the OPEBs obligation. A two-stage least squares regression is utilized to estimate the OPEBs obligation and simultaneously estimate the significance of the OPEBs instrument as a factor in firm valuation. The procedure followed is to first develop a model of the market value of assets. The market value of assets is determined by the book value of assets, the present value of net operating cash flows, capitalized advertising expenditures, capitalized research and development expenditures, industry classification, a growth factor, and a risk factor. These variables are assumed to be closely associated with the capital market's valuation of firm assets, and when regressed against the book value of assets, provide predicted values of the market value of assets that are not correlated with the error term. The market value of stockholder's equity is then subtracted from the market value of assets to obtain the dependent variable, market value of liabilities. The effect of the OPEBs obligation on the market value of liabilities is then estimated by regressing the present value of the balance sheet liabilities and the OPEBs obligation on the market

value of liabilities. This procedure provides consistent estimates of the effect of OPEBs on the market value of the firm.

An empirical estimation is presented of the effect of the OPEBs obligation on the market value of liabilities. Cross-sectional data for 1987, 1988 and 1989 are used to first estimate the market value of assets, and then to estimate a two-stage least squares regression valuation model that simultaneously estimates the OPEBs obligation model and the liability valuation model. The OPEBs obligation is positively and significantly associated with the market value of liabilities for all three years. The estimated coefficients are consistent with the market's assessment of the OPEBs obligation as an obligation of the firm. The size of the coefficients jumps between 1987 and the latter years. During 1988 the press reported the FASB proposal to accrue the other postemployment benefits obligation. At that time, public awareness was focused on the tremendous potential liability that firms had accumulated but not recorded. When this information was fully incorporated in stock prices, it could explain the increase in the size of the OPEBs coefficient.

Future research is indicated to compare the firms that disclose their OPEBs expense with those who do not. A search for systematic differences between the two groups will identify any potential bias inherent in this study. If no systematic difference is found between the two groups, then perhaps an examination of the decision regarding the

materiality of the OPEBs expense and whether or not to disclose this expense is indicated.

This dissertation presents an estimation of the other postemployment benefits obligation and tests the effect of the OPEBs obligation on the market value of the firm. Results are presented that suggest a consistent and significant association between the OPEBs obligation and the market value of the firm. These results implicitly support the notion of market efficiency in that investors and other capital market participants are utilizing publicly available information in estimating the OPEBs obligation for large publicly held firms, and consequently support the requirements of SFAS No. 106 that the OPEBs obligation should be disclosed in the notes to the financial statements and accrued in the statement of financial position.

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APPENDIXES

APPENDIX A

LIST OF SAMPLE FIRMS

COMPUSTAT CNUM	COMPANY NAME	COMPUSTAT CNUM	COMPANY NAME	COMPUSTAT CNUM	COMPANY NAME
22249	ALCOA	423074	HEINZ	867323	SUNDSTRAND
25321	AMERICAN CYANAMID	427056	HERCULES	879335	TELEDYNE
26609	AMERICAN HOME PROD	428236	HEWLETT-PACKARD	881694	TEXACO
31905	AMOCO	459200	IBM	882508	TEXAS INSTRUMENTS
43413	ASARCO	452308	ILLINOIS TOOL WORKS	883203	TEXTRON
44540	ASHLAND OIL & COAL	456866	INGERSOLL-RAND	896047	TRIBUNE CHICAGO
48825	ATLANTIC RICHFIELD	457472	INLAND STEEL	896678	TRINOVA
54303	AVON PROD	470349	JAMES RIVER	905530	UNION CAMP
87509	BETHLEHEM STEEL	492386	KERR-MCGEE	905581	UNION CARBIDE
97383	BOISE CASCADE	539821	LOCKHEED	908640	UNION TEXAS PETRO
99599	BORDEN	502210	LTV	909214	UNISYS
115637	BROWN FORMAN	559177	MAGMA COPPER	902905	USX
121897	BURLINGTON NORTHERN	565020	MANVILLE	960402	WESTINGHOUSE
158525	CHAMPION INTERNTNL	573275	MARTIN MARIETTA	984121	XEROX
166751	CHEVRON	578592	MAYTAG		
171196	CHRYSLER	580037	MCDERMOTT		
181396	CLARK EQUIP	580169	MCDONNEL DOUGLAS		
212363	CONTROL DATA	580645	MCGRAW-HILL		
228255	CROWN CORK & SEAL	589433	MEREDITH		
235851	DANAHER	604059	MINNESOTA MINING & M		
237688	DATA GENERAL	607059	MOBIL		
244199	DEERE & CO	611662	MONSANTO		
247361	DELTA AIRLINES	619331	MORTON		
253849	DIGITAL	620076	MOTOROLA		
260543	DOW CHEMICAL	629853	NALCO CHEMICAL		
261597	DRESSER	638901	NAVISTAR INTER		
269803	EAGLE-PICHER IND	628862	NCR		
277461	EASTMAN KODAK	651192	NEWELL		
278058	EATON	666807	NORTHRUP		
302290	EXXON	701094	PARKER-HANNIFIN		
313549	FEDERAL-MOGUL	718592	PHILLIPS-VAN HEUSEN		
302491	FMC	731095	POLOROID		
351604	FOXBORO	742718	PROCTOR & GAMBLE		
368682	GENCORP	747402	QUAKER OATS		
369550	GENERAL DYNAMICS	747633	QUANTUM CHEMICAL		
369604	GENERAL ELECTRIC	751277	RALSTON PURINA		
370442	GENERAL MOTORS	761695	REYNOLDS & REYNOLDS		
370838	GENERAL SIGNAL	74960L	RJR NABISCO		
440452	GEO A HORMEL	774347	ROCKWELL		
375766	GILLETTE	775371	ROHM & HAAS		
382550	GOODYEAR	824348	SHERWIN-WILLIAMS		
362320	GTE	835495	SONOCO PRODUCTS		
410522	HANNA M A	860000	SQUIBB		

APPENDIX B

INDUSTRY MATURITY CLASSIFICATION OF FIRMS

S & P Industry Composite	SIC Industry Code	# of Firms	Maturity Category
Oil Composite	1311		
	2912		
	2913	6	Highly Mature
Metal Composite	1000		
	1031		
	1042		
	3310		
	3331		
	3334	8	Highly Mature
Machinery/Auto Composite	3511		
	3522		
	3531		
	3533		
	3540		
	3550		
	3554		
	3555		
	3560		
	3711		
	3713		
	3714		
	3717		
	3720		
	3728	16	Highly Mature
Transportation Composite	4011		
	4210		
	4511		
	4700		
	4712	2	Highly Mature
Energy Composite	1211		
	1381		
	2911		
	2912		
	2913		
	3533	4	Highly Mature
Highly Mature Total		36	
Foods Composite	2000		
	2001		
	2010		
	2020		
	2030		
	2063		

S & P Industry Composite	SIC Industry Code	# of Firms	Maturity Category
Foods Composite (cont.)	2065		
	2082		
	2085		
	2086	7	Mature
Textiles/Paper	2200		
	2300		
	2320		
	2400		
	2510		
	2600		
	2650		
	2670		
	2700		
	2711	9	Mature
Health Care Composite	2830		
	2837		
	8050		
	8060	1	Mature
Chemical Composite	2800		
	2851		
	2890	11	Mature
Building Composite	2949		
	2950		
	3241		
	3430		
	3431	0	Mature
Retail Stores Composite	5311		
	5399		
	5411		
	5912		
	5999	0	Mature
Other	2844		
	2851		
	3011		
	3060		
	3221		
	3630		
	3760		
	3823		
	3861		
	4810	17	Mature
Mature Total		45	

S & P Industry Composite	SIC Industry Code	# of Firms	Maturity Category
High Tech Composite	3570 3660 3664 3670 3673 3674 3687 3721 7370	19	Immature
Immature Total		19	
Total Firms		100	

APPENDIX C

INDUSTRY CLASSIFICATION OF FIRMS FOR MARKET VALUE OF ASSETS MODEL

INDUSTRY GROUP	INDUSTRY CODE	# OF FIRMS	INDUSTRY CLASSIFICATION
OIL	1311		
	2912		
	2913		
	1211		
	1381		
	2911		
	2912		
	2913		
MINERALS	1000		
	1031		
	1042		
	3310		
	3331		
	3334		
LUMBER	2400		
	2600		NATURAL RESOURCES INDUSTRIES
HIGH TECH	3570		
	3660		
	3664		
	3670		
	3673		
	3674		
	3687		
	3721		
	7370		HIGH-TECH INDUSTRIES
OTHER	3511	3714	3760
	3522	3717	3823
	3531	3720	3861
	3533	3728	4810
	3540	4011	
	3550	4210	
	3554	4511	
	3555	4700	
	3560	4712	
	3711	3533	
	3713	3630	

VITA

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