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Are Pension Obligations Equivalent to Debt?

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ABSTACT

The primary purpose of this paper is to test whether pension obligations are considered debt equivalents using Hamada's (1972) risk model. The secondary purpose is to determine if adjusting the pension obligation for cross-sectional differences in discount rates provides a pension obligation measure which more closely approximates the information used by equity investors in their assessment of systematic risk. The results suggest that pension obligations are not viewed as debt equivalents and that adjusting the pension obligation for cross-sectional differences in the interest rates does not improve the measure of pension obligations. These results are important because they cast doubt on the underlying assumptions of U.S. GAAP with regards to the reporting of pension liabilities.

JEL Classification: G120

Keywords: pension obligation, pension obligation discount rate, debt equivalent, systematic risk

I. INTRODUCTION

The case for balance sheet disclosure of pension obligations rests on the assertion that the obligations are debt equivalents. Landsman (1986) and others have tested this assertion using equity valuation models. Wang and Zhang (2014) demonstrate that bond ratings are impacted by unfunded pension obligations, suggesting that rating agencies view the pension obligation as a form of debt. And, Balachandran, et al., (2019) found that pension obligations impacted a company's cost of debt. However, only one prior study (Dhaliwal, 1986) has tested the debt equivalency assertion using the risk model developed by Hamada (1972) which relates the firm's systematic risk to its operating risk, financial risk and the effective tax rate. Therefore, the primary purpose of this study is to reexamine the debt equivalency issue using the Hamada risk model.

A firm's pension obligation is measured as the present value of estimated future pension benefit payments. One of the most important assumptions underlying this measurement is the discount rate. However, there is little agreement regarding which interest rate should be used for financial accounting disclosure. Moreover, there has also been significant cross-sectional differences in the reported discount rates (Rauh, 2017). These cross-sectional differences may create measurement errors that would confound our research results, making it more difficult to reach a conclusion regarding the debt equivalence of pension obligations. Therefore, the secondary purpose of this paper is to determine if adjusting the pension obligation for cross-sectional differences in discount rates provides an improved measure of pension obligations.

II. PENSION OBLIGATIONS AS LIABILITIES

Early pension literature questioned whether a liability should be recorded (Hatfield, 1916; Stone 1984). Accounting Principles Board Opinion No. 8 settled the accounting disclosure requirement issue by requiring that unfunded pension liabilities should be reported on the balance sheet (Accounting Principles Board, 1966). Subsequent authoritative pronouncements reaffirmed the liability approach (Financial Accounting Standards Board, 1985, 1991, 2006; International Accounting Standards Board, 1998; Financial Reporting Council, 2000). Current U.S. GAAP standards require reporting a balance sheet liability for the unfunded projected benefit obligation (PBO). Notwithstanding the professional authoritative literature, academic and professional debate continues regarding the debt equivalence of unfunded pension obligations (e.g., Sgouros, 2019). The results of our study cast doubt on the conceptual foundation of the professional standards that require pension obligation disclosure as debt equivalents. Our results also contribute to academic literature regarding the interdependence between pension assets, pension liabilities, and cost of equity (e.g., Jin et al., 2006).

III. THE DISCOUNT RATE

Prior to 1987, Statement of Financial Accounting Standards No. 36 (hereafter *FAS 36*) required use of an interest rate consistent with the return that could be expected on the plan assets. In *FAS 36*, the Financial Accounting Standards Board rejected the use of a benchmark rate for all firms because they believed that each firm had a different risk preference inherent in its investment policy; therefore, different discount rates commensurate with the investment risks were appropriate. Accordingly, each firm could use its own judgement in selecting the rate (Financial Accounting Standards Board, 1980, pars. 189-190).

For fiscal years beginning in 1987, SFAS No. 87 (Financial Accounting Standards Board, 1985, hereafter referred to as *FAS 87*) specified that the primary purpose of the discount rate is to calculate the present value of the pension obligation and the service cost component of the pension plan: "Both of those uses are conceptually independent of the plan's assets" (Financial Accounting Standards Board, 1985, par. 198). Accordingly, the characteristics of the pension liability, not the pension assets, should be the dominant criterial for selecting a discount rate. ASC 715-30-35-43 (Accounting Standards Codification, 2020) requires the discount rate to reflect rates at which the defined benefit obligation could be effectively settled. In the estimation of those rates, it would be appropriate for an entity to use information about rates implicit in current prices of annuity contracts that could be used to settle the obligation. Alternatively, employers may look to rates of return on high-quality fixed-income investments that are currently available and expected to be available during the benefits' period to maturity.

The discount rate guidance contained in ASC 715-30-35-43 provides significant room for management discretion in selecting the rate. Research evidence suggests that entities select pension discount rates for diverse reasons, such as minimizing taxes, minimizing agency costs, earnings management, and credit ratings management (Andonov, et al., 2017, Bergstresser, et al. 2006, Morris et al., 1983; Bodie et al., 1984, Rauh, 2017). As a result of the disparate motivations for discount rate selection, the reported pension obligation may not be the most relevant information for the purpose of assessing risk. Therefore, an efficient market would adjust the reported pension obligation to reflect a more relevant discount rate. If market participants make this type of adjustment, then a corresponding empirical adjustment should result in an improved empirical association between the pension obligation and systematic risk. To approximate the discount rate adjustment made by the market, this paper relies on a linear transformation used by Bulow (1979).[1] The procedure is to multiply reported benefits by the ratio of the rate reported under *FAS 36* to the alternative rate. This study examines two alternative rates which the market may consider more relevant than the *FAS 36* rate:

1. The rate required under FAS 87, and
2. The yield rate on long-term debt.

The *FAS 87* rate is important because it represents the current U.S. generally accepted accounting principles. The yield rate on long-term debt is examined because prior evidence has suggested that pension obligations are equivalent to long-term debt (Landsman, 1986; Dhaliwal, 1986).

IV. MODEL DEVELOPMENT

The Hamada (1972) risk model specifies that systematic risk for firm i (β_i) is a function of operating risk (β_{oi}), tax rates (τ_i) and leverage ($D_i \div E_i$) as follows:

$$\beta_i = \beta_{oi} \left[1 + (1-\tau_i)\left(\frac{D_i}{E_i}\right)\right] \tag{1}$$

where
D_i = the fair market value of debt for the i^{th} firm, and
E_i = the fair market value of equity for the i^{th} firm.

Bowman (1980) has shown that under certain conditions, accounting income beta can be used as a surrogate for operating risk. Substituting accounting beta (β^a_i) for operating risk (β_{oi}), and rearranging, Equation 1 becomes

$$\beta_i = \beta^a_i + \beta^a_i\,(1-\tau_i)\,(\frac{D_i}{E_i})]. \qquad (2)$$

Dhaliwal (1986) modified Equation 2 by including nonpension debt (NPD_i) and pension obligations (PO_i) as separate debt variables as shown below:

$$\beta_i = \beta^a_i + \beta^a_i\,(1-\tau_i)\,(\frac{NPD_i + PO_i}{E_i})]$$

Rearranging, we get

$$\beta_i = \beta^a_i + \beta^a_i\,(1-\tau_i)\,(\frac{NPD_i}{E_i}) + \beta^a_i\,(1-\tau)\,(\frac{PO_i}{E_i}) \qquad (3)$$

In Equation 3, Dhaliwal used the unfunded pension obligation. However, some believe that the gross pension obligation is a more appropriate measure of the firm's debt obligation.[2] Use of the gross obligation is consistent with the requirements of Statement of Financial Accounting Standards No. 76, *Extinguishment of Debt*; i.e., debt is not considered extinguished unless (a) the debtor irrevocably places cash or other essentially risk-free monetary assets in a trust and (b) the possibility that the debtor will be required to make further payments is remote (Financial Accounting Standards Board, 1983). Applying the FAS No. 76 criteria, both the unfunded and the funded portion of the pension obligation are a liability of the firm. Accordingly, this study uses the gross pension obligation measure in Equation 3 and, thus, provides a useful improvement over prior research regarding the debt equivalence of pension obligations.

In order to demonstrate that the overall model is consistent with prior research (Bowman, 1980 and Dhaliwal, 1986) we use empirical data from the same 1982-1985 time period used by those papers. Using the same time frame for sample selection will control for any structural changes in market participants' behavior subsequent to that prior research. During this time frame of 1982-1985, the FAS 36 discount rate is the only rate reported in the financial statements. Therefore, we compare the pension obligation using the FAS 36 discount rate (the reported rate during 1982-1985) with the rate required by FAS 87 and the yield rate on long-term debt.

Equations 4, 5 and 6 each include alternative measures for the gross pension obligation variable: the obligation as reported under FAS 36 (PO^{36}_i), the obligation computed to reflect the FAS 87 settlement rate ($P0^{87}_i$), and the obligation reflecting a discount rate equal to the yield rate on long-term debt (PO^y_i). A summary of the variable definitions in Equations 4, 5 and 6 is shown in Table 1.

$$\beta_i = \alpha_o + \alpha_1\beta^a_i + \alpha_2\beta^a_i\,(LEV_i) + \alpha_3\beta^a_i\,(PEN^{36}_i) + \epsilon_i \qquad (4)$$

$$\beta_i = \alpha_o + \alpha_1\beta^a_i + \alpha_2\beta^a_i\,(LEV_i) + \alpha_3\beta^a_i\,(PEN^{87}_i) + \epsilon_i \qquad (5)$$

$$\beta_i = \alpha_o + \alpha_1\beta^a{}_i + \alpha_2\beta^a{}_i(LEV_i) + \alpha_3\beta^a{}_i(PEN^y{}_i) + \epsilon_i \quad (6)$$

where

LEV_i = the four-year average of $(1-\tau_{it})(NPD_{it} \div E_{it})$, t = 1982, …, 1985,

$PEN^{36}{}_i$ = the four-year average of $(1-\tau_{it})(PO^{36}{}_{it} \div E_{it})$, t = 1982, …, 1985,

$PEN^{87}{}_i$ = the four-year average of $(1-\tau_{it})(PO^{87}{}_{it} \div E_{it})$, t = 1982, …, 1985,

$PEN^y{}_i$ = the four-year average of $(1-\tau_{it})(PO^y{}_{it} \div E_{it})$, t = 1982, …, 1985,

$PO^{36}{}_{it}$ = the pension obligation for firm i at time t as reported under FAS 36,

$PO^{87}{}_{it}$ = the pension obligation for firm i at time t as recomputed at the FAS 87 settlement rate,

$PO^y{}_{it}$ = the pension obligation for firm i at time t as recomputed to reflect the yield rate on long-term debt, and

ϵ_i = random error.

We estimated the pension obligation at the SFAS No. 87 settlement rate (for the computation of $PO^{87}{}_{it}$) and the yield rate on long-term debt (for computation of $PO^y{}_{it}$) as follows:

- $PO^{87}{}_{it}$. The pension obligation computed at the SFAS No. 87 settlement rate ($PO^{87}{}_{it}$) is the product of the reported pension obligation ($PO^{36}{}_{it}$) and the adjustment factor ($r_{it} \div s_{it}$), where r_{it} is the SFAS No. 36 discount rate reported in the financial statement footnotes (COMPUSTAT item #246), and s_{it} is the SFAS no. 87 settlement rate, as measures by the Pension Benefit Guarantee Corporation published settlement rate averages.
- $PO^y{}_i$. The pension obligation computed at the yield rate ($PO^y{}_{it}$) is the product of the reported pension obligation ($PO^{36}{}_{it}$) and the adjustment factor ($r_{it} \div y_{it}$), where r_{it} is the SFAS No. 36 discount rate reported in the financial statement footnotes (COMPUSTAT item #246), and y_{it} is the yield rate on long-term debt (see Table 1).

Table 1
Variable definition summary

1. *Systematic risk* (β_i) was estimated from the market model using a sixty-month holding period from January 1981 through December 1985. Monthly return data was obtained from the CRSP database.
2. *Accounting beta* ($\beta^a{}_i$) is the slope coefficient obtained by regressing the accounting return (X_{it}) for firm i in period t on the accounting return for the market portfolio (X_{mt}) over the 18-year period 1968 through 1985. Accounting return is defined as income before discontinued and extraordinary items (COMPUSTAT #20), taxes (#16), interest (#15), and special items (#17) divided by total assets at the beginning of the year (#6). X_{mt} is the arithmetic mean of X_{it} for a large number of firms acting as a proxy for the market portfolio. All COMPUSTAT firms with sufficient data for 1968 through 1985 were used as a proxy for the market portfolio. This sample comprises 998 firms.
3. The *effective tax rate* (r_{it}) is total tax expense (COMPUSTAT #16) divided by pretax income (#170).
4. *Nonpension debt* (NPD_{it}) is total liabilities (COMPUSTAT #181).
5. The *market value of equity* (E_{it}) is the product of the stock price (COMPUSTAT #24) and the common shares outstanding (#25).

6. The *pension obligation reported under SFAS No. 36* (PO^{36}_{it}) is the vested accumulated benefit obligation (COMPUSTAT #243).
7. The *pension obligation recomputed at the yield rate on long-term debt* (PO^{y}_{it}) is the product of the reported pension obligation (PO^{36}_{it}) and the adjustment factor (r_{it}/y_{it}) The variable r_{it} is the FAS 36 discount rate reported in the financial statement footnotes (COMPUSTAT #246) and y_{it} is the average yield rate on corporate long-term debt of a diversified portfolio of firms, as published in *Moody's Bond Record* (1983, 1984, 1985, 1986).
8. The *pension obligation recomputed at the SFAS No.87 settlement rate* (PO^{87}_{it}) is the product of the reported pension obligation (PO^{36}_{it}) and the adjustment factor (r_{it}/s_{it}). The variable r_{it} is the FAS 36 discount rate reported in the financial statement footnotes (COMPUSTAT #246) and s_{it} is the settlement rate prescribed by FAS 87. For the settlement rate, this study uses the termination annuity rates published by the Pension Benefit Guarantee Corporation (Pension Benefit Guarantee Corporation, 2017) as suggested by FAS 87.
9. The *test period* for computing pension and leverage measures is the four-year period 1982 through 1985.

V. HYPOTHESES

There are two overall purposes for this research: (1) to replicate prior research that suggests that pension obligations are equivalent to debt, and (2) to determine if computing pension obligations using the long-term debt yield rate produces a pension obligation measure that is more relevant than the pension obligation reported under U.S. GAAP. If market participants view pension obligations as debt equivalents, then the coefficients α_3 in models 4, 5 and 6 will be significantly greater than zero. Further, if any one of the models has a larger adjusted R^2, it would imply that its pension measure more closely captures the pension information used by the market in assessing systematic risk.

However, the R^2 criteria only leads to the correct model on the average and is not necessarily a powerful tool for selecting among competing models. Accordingly, additional tests were performed to compliment the R^2 criteria. These tests are applicable for nonnested models, such as Equations 4, 5 and 6. Pesaran (1982) demonstrated that two such nonnested tests, the Cox (1961) N-test and the Davidson and Mackinnon (1981) J-test, were as powerful as the classical f-test when the competing models have the same number of common variables (as in Equations 4, 5 and 6).

The nonnested N-test and J-test artificially nest one of the competing models within the other in order to determine if the first is empirically preferable to the second. The design for applying the nonnested tests of Equations 4, 5, and 6 is shown in Table 2.

Table 2
Nonnested model design

Pension variables compared	N-test and J-test
PO^{36}_{i} versus PO^{y}_{i}	Eq. 4 against Eq. 6
	Eq. 6 against Eq. 4
PO^{87}_{i} versus PO^{y}_{i}	Eq. 5 against Eq. 6
	Eq. 6 against Eq. 5

VI. SAMPLE SELECTION

In order to demonstrate that the overall model is consistent with prior research (Bowman, 1980 and Dhaliwal, 1986) we will use empirical data from the same time frame used by those papers (1982-1985). Within the 1982-1985 timeframe, it is necessary to focus on firms which have a significant pension obligation. The pension obligation was considered significant if its four-year average exceeded 5% of average equity.

In addition, the following screening criteria were applied:

1. Each firm has debt and pension data available on COMPUSTAT from 1982 through 1985.
2. Each firm has accounting earnings data available on COMPUSTAT for the 18-year holding period, 1968-1985.
3. Each firm has monthly market returns available on CRSP from 1981 through 1985.
4. Each firm has a fiscal year ending on December 31.

Two-hundred and thirty-eight firms met all the screening criteria.

VII. RESULTS

The descriptive statistics, shown in Table 3, appear reasonable in comparison with other studies. Descriptions of the interest rates are shown in Table 4. For the test period, 1982 through 1985, the average corporate long-term debt yield rates were consistently greater than the FAS 36 and FAS 87 rates. As a result, the ratio of pension to equity is lowest when pension obligations are measured at the yield rate on long-term debt. Table 5 provides the results of the parametric t tests of the coefficients in Equations 4, 5 and 6. These results appear reasonable in comparison with prior studies by Bowman (1980) and Dhaliwal (1986).

Table 3
Descriptive statistics – regression variable components

Variable from Eq. 4, 5, and 6	Mean	Standard Deviation	Range
β_i	1.080*	.301	0.22 to 1.78
β^a_i	0.899*	.713	-1.09 to 2.99
LEV_i	0.709	.684	-0.60 to 3.17
PEN^y_i	0.181	.252	-0.13 to 1.42
PEN^{36}_i	0.258	.357	-0.21 to 2.21
PEN^{87}_i	0.299	.330	-0.18 to 1.71
Dhaliwal (1986)			
B^a_i	0.93	1.07	0.22 to 3.14
LEV_i	1.11	1.03	0.13 to 5.86

*Not significantly different than 1.0 at the .05 level.

Table 4
Descriptive statistics – discount rate

	Mean of all Sample firms		
	Yield Rate	**SFAS No. 36 Rate**	**SFAS No. 87 Rate**
1982	12.16	7.60	10.25
1983	13.16	8.08	9.50
1984	12.61	8.25	10.00
1985	10.96	8.41	9.00

Table 5
Results of regression analysis
(n = 238)

	Coefficient					
Model	**α_0**	**α_1**	**α_2**	**α_3**	**Overall F**	**Adjusted R^2**
4	.932* (< .001)	.051 (.116)	.062* (.035)	-.050 (.539)	6.355* (< .001)	.063
5	.931* (< .001)	.053 (.105)	.067* (.023)	-.060 (.360)	6.502* (< .001)	.065
6	.931* (< .001)	.051 (.116)	.062* (.035)	-.039 (.541)	6.334* (< .001)	.063
Bowman	.779*	-.030	.234*	na**	not reported	.344
Dhaliwhal	.551*	.132*	.294*	.271*	not reported	.270

Note: The two-tailed probability values are shown in parenthesis.
*Significant at the .05 level.
** Bowman (1980) did not include a pension variable in his model.

Table 6
Nonnested test results
(n = 238)

Pension Measure Tested	**Cox N-test (z score)**	**J-test (t score)**
PEN^{y}_{i} against PEN^{36}_{i}	-1.49*	1.31*
PEN^{36}_{i} against PEN^{y}_{i}	0.96*	1.33*
PEN^{y}_{i} against PEN^{87}_{i}	-1.50*	1.30*
PEN^{87}_{i} against PEN^{y}_{i}	1.09*	1.40*

* Not significant at the .05 level. Therefore, one model cannot be rejected in favor of the other. At the .05 level, the critical N (a normal z distribution) for a one tailed test is -1.65 and the critical *t* for the two tailed J-test is 1.96.

The overall F statistics are significant in all three models indicating that the models provide significant explanatory power. However, the R^2 for the three models are not substantially different from each other, suggesting that adjusting the pension obligation for cross-sectional differences in interest rates does not improve the measure of pension obligations.

The variables of interest in Equations 4, 5 and 6 are the pension-to-debt measures (PEN^y_i, PEN^{36}_i, and PEN^{87}_i). The t tests of the pension variable coefficients, α_3, indicate that none of these measures are significantly greater than zero, suggesting that none of the three pension measures are relevant to the market in the assessment of risk.

Table 6 provides the results of the N-test and J-test. In the comparison of the pension obligation computed at the yield rate (PEN^y_i) against the FAS 36 pension obligation (PEN^{36}_i) the test results indicate neither rate can be rejected in favor of the other. In the comparison of the pension obligation computed at the yield rate (PEN^y_i) to the pension obligation as computed at the FAS 87 rate (PEN^{87}_i), the test results are the same: neither rate can be rejected in favor of the other. Therefore, there is no evidence that either of the two pension measures is empirically preferable to the FAS 36 disclosure.

Although both the t tests and the nonnested N-test and J-test results are inconclusive with respect to identifying a *preferred* model, there is evidence that all three models have significant overall power in explaining the variation in systematic risk. Therefore, these results confirm Hamada's (1972) findings: operating risk and leverage are associated with systematic firm risk. It should be noted, though, that these results do not support prior studies that have suggested that pension obligations are debt equivalents. This result is important because it suggests that additional research is needed in order to provide support for the FASB's assertion that pension obligations are debt equivalents.

There are several possible explanations for the insignificance of the pension measures in the regression models. First, the market may not be efficient in utilizing the pension information. Second, the available data from the sample may be inadequate, the variables may be mismeasured, or the data may suffer from the effects of collinearity. Third, pension obligations may not be considered debt equivalents by equity investors. We believe the first explanation is unlikely considering the amount of empirical evidence which supports market efficiency. The second explanation is possible, but our sample size is large, the data source dependable (Compustat and CRSP), and we applied several rules of thumb to eliminate the possibility of collinearity (Belsley et al., 1980). Therefore, we conclude that market participants do not view pension obligation as debt equivalents. One possible explanation for this result is GAAP accounting mismeasurement of the obligation. Due to the multitude of assumptions included in the pension obligation, market participants may use alternative obligation assessment models that cannot be captured using GAAP accounting information. A second possible explanation is that pension obligations have rarely been the underlying cause of a bankruptcy (Sgouros, p. 13). Debt that matures decades from now is not likely to cause of cash-flow problems in the present, therefore market participants may believe that pension debt does not contribute to default risk. Accordingly, we believe that further research should be conducted to examine the relationship between pension obligations and default risk.

This paper has made three important contributions. First, it has provided additional support for the Hamada (1972) risk model using a methodology – the nonnested N-test (Cox, 1961) and J-test (Davidson and MacKinnon, 1981) – not previously applied to that model. Second, adjusting pension obligations for cross-sectional differences in the discount rate does not appear to improve the measure of the pension obligation. And third, market participants do not appear to treat pension obligations as debt equivalents. These results are important because they cast doubt on the underlying assumptions of U.S. GAAP with regards to the reporting of pension liabilities.

ENDNOTES

[1]In results not reported here, we replicated our analysis using the duration-adjusted conversion used by Rauh (2017) to examine whether the conversion method affected our inferences, and we find that it did not.

[2]For example, see Bulow (1979) and Shivdasani and Stefanescu (2009).

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