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Defined-Benefit Pension Obligations, Actuarial Risk, and Corporate Capital Structure: The Hidden Leverage of Unfunded Pension Liabilities

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Abstract

This paper investigates the capital structure implications of defined-benefit (DB) pension obligations, which represent a form of 'hidden leverage' that is economically equivalent to unsecured long-term debt but is often excluded from standard leverage measures. Using hand-collected pension data for 2,870 firms with DB plans across 16 countries over 2005-2024, we construct an 'augmented leverage' measure that adds the present value of net pension obligations to traditional debt. Our findings reveal that: (1) pension-augmented leverage is, on average, 7.4 percentage points higher than traditional book leverage, with the gap reaching 14.2 pp for firms in the most pension-intensive industries (automotive, airlines, steel, utilities); (2) credit markets price pension leverage as approximately 78% equivalent to financial debt: a $1 increase in net pension obligations raises credit spreads by 78% as much as a $1 increase in financial debt, confirming that pension obligations represent genuine leverage; (3) firms with large pension deficits substitute financial debt with pension debt: a one-standard-deviation increase in pension funding deficit reduces financial leverage by 2.1 pp, reflecting a 'crowding out' effect; (4) pension risk management—including liability-driven investment (LDI), pension risk transfers (buy-ins, buy-outs), and de-risking glide paths—significantly affects both pension-augmented and financial leverage: firms that complete pension risk transfers increase financial leverage by 3.4 pp within two years, as the elimination of pension risk frees debt capacity; (5) the 2022 UK gilt crisis—

triggered by the LDI collateral margin calls that destabilized UK pension funds—provides a natural experiment demonstrating the systemic risk of pension-capital structure interconnections, with affected firms experiencing 2.8 pp deleveraging and 94 bps credit spread widening.

Keywords: *pension obligations; defined-benefit plans; hidden leverage; actuarial risk; liability-driven investment; pension risk transfer; augmented leverage; unfunded liabilities; LDI crisis*

JEL Classification: G32, G23, J32, G30, G12, H55

1. Introduction

Corporate defined-benefit pension plans create obligations that are economically equivalent to long-term debt. The firm promises to pay specified future benefits to employees—a fixed-income obligation that must be funded from corporate resources if pension assets are insufficient. Under modern accounting standards (IAS 19, ASC 715), the net pension obligation (projected benefit obligation minus plan assets) appears on the balance sheet, but it is typically excluded from the leverage ratios used in capital structure analysis, credit rating assessments, and debt covenant calculations.

This exclusion is increasingly untenable. In aggregate, the DB pension obligations of S&P 500 companies totaled approximately $2.1 trillion in 2024, with funding deficits of approximately $180 billion. For pension-intensive firms, the net pension obligation can exceed total financial debt, making pension leverage the dominant form of firm indebtedness.

2. Hypotheses

H1: Pension-augmented leverage is significantly higher than traditional leverage, especially in pension-intensive industries.

H2: Credit markets price pension obligations as approximately equivalent to financial debt.

H3: Pension obligations crowd out financial debt (substitution effect).

H4: Pension risk management (LDI, risk transfers) increases financial debt capacity.

H5: The 2022 UK LDI crisis demonstrates systemic pension-capital structure risk.

3. Data

Variable	Mean	Pension-Intensive Firms	Non-Pension Firms
Book Leverage	24.8%	26.1%	24.2%
Net Pension Obligation / Assets	7.4%	14.2%	3.1%
Augmented Leverage (Debt + Pension)	32.2%	40.3%	27.3%
Pension Funding Ratio	87.4%	82.1%	91.8%
LDI Adoption Rate	34%	48%	22%
Risk Transfer Completion Rate	12%	18%	7%

4. Results

4.1. Credit Market Pricing of Pension Leverage

Variable	(1) Traditional Leverage Only	(2) With Pension Leverage	(3) Pension Equivalence Test
Financial Debt / Assets	4.23*** (0.34)bps	3.87*** (0.33)bps	—
Net Pension Obligation / Assets	—	3.28*** (0.42)bps	—
Pension / Debt Equivalence Ratio	—	—	0.78*** (0.08)
Wald test: Pension = Debt	—	—	p = 0.012 (rejected)
Observations	37,310	37,310	37,310
R^2 (within)	0.342	0.387	0.387

H2 is confirmed: credit markets price pension obligations at 78% of the rate of financial debt (3.28/4.23 = 0.78). The equivalence hypothesis (pension = debt) is rejected (p = 0.012),

indicating that markets do discount pension obligations relative to financial debt—but the discount is modest (22%), confirming that pension obligations represent genuine leverage.

4.2. Pension Risk Transfer and Debt Capacity

Event	N Firms	Financial Leverage Change (pp)	Augmented Leverage Change (pp)	Credit Spread Change (bps)
Full buy-out completed	87	+3.4pp***	-8.7pp***	-34***
Buy-in completed	124	+1.8pp***	-4.2pp***	-18***
LDI glide path implemented	342	+0.8pp**	-2.1pp***	-12***
No pension RM action (control)	1,840	+0.1pp	+0.3pp	+2

H4 is powerfully confirmed. Pension risk transfers create substantial financial debt capacity. Firms completing full pension buy-outs increase financial leverage by 3.4 pp while reducing augmented leverage by 8.7 pp—a net reduction in total economic leverage of 5.3 pp. Credit markets reward these actions with 34 bps tighter spreads.

4.3. UK LDI Crisis Natural Experiment

H5 is confirmed. The September 2022 UK gilt crisis—when rapid interest rate rises triggered collateral margin calls on LDI derivatives that forced UK pension funds to liquidate gilt holdings in a fire sale—demonstrates the systemic risk of pension-capital structure interconnections. UK firms with LDI-exposed pension plans experienced: 2.8 pp deleveraging (precautionary), 94 bps credit spread widening, and 12% decline in market capitalization. The crisis revealed that LDI, while effective for pension risk management under normal conditions, created a new form of systemic risk through the leverage embedded in interest rate derivatives.

5. Conclusion

This study demonstrates that defined-benefit pension obligations represent a significant form of hidden leverage that must be integrated into capital structure analysis. The 7.4 pp gap between traditional and augmented leverage, the 78% credit pricing equivalence, and the 3.4 pp

debt capacity release from pension risk transfers all underscore the importance of pension risk management as a capital structure tool.

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