Loan Covenant Violation and Corporate Pension Funding

Abstract

We find that companies in violation of loan covenants experience an increase in pension deficits. This increase is more pronounced for firms that have underfunded plans but less pronounced for firms with credit ratings of investment grade. Our results suggest that reduced pension contributions are not the reason for the increase in pension deficits. A possible mechanism for the increase in pension deficits is creditors' reallocation of pension assets from equity investments to lower risk and lower return debt investments. Overall, our findings suggest that creditor rights can influence firm employee wealth.

1. Introduction

How do financing frictions and creditor rights influence firm employee wealth? In particular, how does creditor control triggered by covenant violations impact employee welfare? It is an important question because covenant violations occur frequently to firms even outside of financial distress (Roberts and Sufi, 2009) and employees are a key stakeholder in the firm. Defined benefit (DB) pension plans provide a unique setting to answer this question for several reasons. First, compared to other employee treatment terms written in employment contracts, DB plans are implicit contracts, breach of which does not lead to penalty. Therefore, when there are incentive conflicts between creditors and employees, DB plans may be used to favor creditors at the expense of employees. Second, DB plans account for sizable liabilities of a firm; funds deployable are large enough to attract creditors' attention (In our sample, every single year firms contribute 1% on average and 18% at maximum their market capitalization to DB plans).[1] Third, DB plans are regulated and relatively transparent: Granular data on pension funding and asset allocation is readily available. Consequently, we can examine different aspects of DB plans to get a more complete picture of how creditor rights affect employee wealth. Furthermore, the research question is of interest to policymakers because taxpayers essentially provide guarantee via the Pension Benefit Guarantee Corporation (PBGC) when the sponsoring employer defaults on its underfunded DB plans. Falato and Liang (2016) find that employment cuts follow loan covenant violations. However, it remains unknown whether or not the violations impact employees who stay with the firm. For example, are their pension plans impacted?[2]

[1] According to the latest data provided by the Department of Labor, in 2019, there were $ 3,274,486 million assets and 32,789,000 active participants in DB plans compared with $ 7,432,653 million assets and 109,096,000 active participants in defined contribution (DC) plans.
Source: https://www.dol.gov/sites/dolgov/files/ebsa/researchers/statistics/retirement-bulletins/private-pension-plan-bulletin-historical-tables-and-graphs.pdf

[2] Agrawal and Lim (2021) cite anecdotal evidence that suggests that hedge fund activism hurts employee welfare through manipulating pension policies. Therefore, it is reasonable to assume that banks, another type of

We take advantage of the discrete nature of loan covenant violation and employ a regression discontinuity design (RDD) similar to that in Chava and Roberts (2008). This approach helps us identify the effect of creditor rights on pension funding that could be confounded by firm fundamentals and outlook. By doing so, we document robust evidence of significant increase in pension deficit or PD (see Appendix A for definitions of variables) following loan covenant violations. Specifically, our baseline estimates indicate that covenant violations lead to an economically significant increase of pension deficit, i.e., an approximately 4.56% increase from the mean of 5% in our sample to 9.56%.

This result is robust to using first-difference model and placebo tests. The effect exists in both the underfunded and overfunded subsamples, suggesting that a priori funding status does not drive the main effect we observe. In other words, creditors do not distinguish between underfunded and overfunded plans assuming they have the incentive to reserve firm cash to have their loans repaid. We further show that the increase in pension deficit exists only in firms with non-investment grade credit ratings, including those with junk credit ratings and no credit ratings at all, but not in firms with investment grade credit ratings. This finding is consistent with the notion that firms with lower credit ratings are more likely to depend on banks for debt financing, therefore, when covenant violations occur, these firms are more likely to hand over the control to banks and correspondingly we observe higher pension deficit.

We next explore possible mechanisms underlying the positive effect of covenant violations on pension deficits. One possible reason for the increase in pension deficits following the violation is the reduction of pension contribution, specifically, voluntary contribution that is not mandated by law. Another possible mechanism is lower pension investment returns due to the reallocation of pension assets to safer financial securities (e.g. debt vs equity). We do not find

sophisticated financial institution, can also think of pensions when they gain control of the firm, although we do not find direct anecdotal evidence. Also, we do not focus on salary because of data unavailability.

evidence of the first possibility but observe evidence of the second possibility. That is, after covenant violation, firms do not change their voluntary contributions to their pension plans but significantly reduce the equity-to-debt ratio in their pension asset allocation. This tilt-to-debt investment style could lead to lower pension investment return, which in turn could drive up pension deficit. Indeed, our regressions of PD against the interaction term between covenant violation and pension plan return (or above market return) load a significant and negative coefficient, suggesting that lower pension investment returns could drive up pension deficit.

Taken together, our results rule out the pension contribution mechanism but support the asset allocation channel. Adjusted pension asset allocation may lead to a decrease in the value of pension assets. For example, switching from high-risk equity securities to low-yield debt instruments may result in lower investment returns, thereby exacerbating pension deficits. Indeed, we find that after violations, more assets are allocated to debt and less to equity, indicating that on one hand creditors may lose confidence in the firm management's capabilities including its pension fund managers' stock picking abilities and try to avoid surprises in investment returns, which is consistent with control-based theories that argue that creditors intervene in order to thwart inefficient investment (e.g., Aghion and Bolton (1992), Dewatripont and Tirole (1994), and Gorton and Kahn (2000), Chava and Roberts (2008)). Our finding extends the scope of investments from real investments in capital assets to financial investments in pension assets. On the other hand, the literature has documented that managers shift risk from equityholders to debtholders (Ananthraman and Lee, 2014). That is, when a firm approaches financial distress, shareholders have the incentive to make risky investments with firm assets. If the investments pay off and the firm survives, shareholders benefit from the handsome profits; if they do not pay off and the firm goes bankrupt, beneficiaries and debtholders suffer. Creditors likely counter this risk shifting by switching firm assets (including pension assets) to safer investments once they take control of the firm. It's also possible that

the creditor does not want the borrower to use the equity investment to inflate or window dress the financial statements to ensure subsequent improvements in the financial ratios in the covenant are material. This shift away from equity to debt is consistent with the risk shifting literature (Rauh, 2006; Ananthraman and Lee, 2014) and the derisking trend documented in recent literature (e.g., Anantharaman, Kamath, and Li, 2021).

Our research contributes to the literature by documenting that creditor control rights could have important ramifications for employee welfare, besides for real investment (Chava and Roberts, 2008), capital structure (Roberts and Sufi, 2009), debt covenant renegotiations (Denis and Wang, 2013), employee employment (Falato and Liang, 2016), corporate governance (Nini, Smith, and Sufi, 2018), board independence (Ferreira, Ferreira, and Mariano, 2018), CEO compensation (Balsam, Gu, and Mao, 2018), and resource allocation within firms (Ersahin, Irani, and Le, 2021). Along the line of how investors and their control rights impact employee wealth, Agrawal and Lim (2021) find that DB employee pension plans of firms that are targets of hedge fund activism experience underfunding and their defined contribution plans experience reductions in employer contributions. While their focus is on shareholders (hedge funds), we focus on debtholders (creditors).

2. Background and Hypotheses

2. 1 Institutional Background: DB Plans and Covenant Violations

Firms that sponsor DB pension plans are required to make financial contributions (called mandatory contributions) to their pension funds according to legally specified formulas. They can also make extra contributions (called voluntary contributions) up to certain limits to take advantage of the tax benefits because pension contributions are tax deductible. These contributions can directly impact a company's internal financial resources. Employees' retirement benefit under DB plans is defined in advance, generally expressed in terms of the

employee's final salary and length of service. Firms essentially guarantee employees the retirement benefit and are responsible for managing the assets in the pension funds. Pension assets are typically invested in a diversified portfolio of marketable securities. At a given time, pension assets are the total of all prior contributions plus the gains (losses) from returns on the portfolio. The firm is responsible for future payments to employees and is subject to the associated risks of any funding shortfalls, and at times such shortfalls can be substantial.

Who from the firm's C-suite is responsible for managing pensions, and can creditors influence pension policies? According to Ananthraman and Lee (2014), pension policy falls within the CFO's domain. That means the CFO is responsible for making pension funding and investing decisions. These decisions typically need to align with the firm's core financing and investing decisions because of the interplay between them. For instance, pension contributions impact funds available for making real investments (Rauh, 2006). Therefore, based on the finding of Chava and Roberts (2008) that financial covenant violation leads to a sharp decline in capital investment, we can reasonably expect pension policies to be affected as well. As a leader of the finance function at the firm who is the main contact point for creditors, the CFO is likely pressured by creditors to alter the firm's pension policies to cater to their demands after covenant violations.

Loan covenants are provisions in the loan contract that grant creditors the right to immediately accelerate outstanding amounts in response to a violation, also known as a technical default. In addition, a violation gives creditors the right to terminate any unused portion of lines of credit or revolving credit facilities. In other words, the borrower retains control rights if her net worth, for example, is above the covenant threshold. However, as soon as the borrower's net worth falls below this threshold, regardless of the amount, control rights shift to the creditor, who can then use the threat of accelerating the loan to take any number of actions that may impact even

the pension policy of the firm (e.g., reducing pension contributions, directly intervening in the investment decisions of the pension plans). Furthermore, a violation gives the creditors the discretion to cancel any unused portion of lines of credit or revolving credit facilities, which may exacerbate pension deficits through reduced pension contributions because of less funds available to the firm via financing.

2.2 Hypotheses

Based on the above discussion, our main hypothesis is that a firm's pension funding could deteriorate due to covenant violation. That is, firm pension deficits increase following loan covenant violations. Possible channels for this increase could be: i) the creditor cuts the covenant-violating firm's voluntary contributions to the pension plans (Mandatory contributions are required by the law and thus typically have no room to be manipulated), and/or ii) the creditor shifts the firm's pension plan investments to lower-yielding assets. Given the large size of a typical firm's overall pension assets, this shift could cause a meaningful drop in the value of pension assets, leading to an increase in pension deficits, holding pension liabilities steady.

3. Data and Methodology

We collect data from several sources. We obtain firm's dollar denominated private loan data from Dealscan. Using this dataset, we estimate the indicator variable for whether a firm has violated one of the net worth (including tangible net worth) and/or current ratio debt covenants by following Falato and Liang (2016). We focus on these covenants for two main reasons. First, Roberts and Sufi (2009) show that over 95% of loan contracts include at least one financial covenant, among which the net worth (leverage) and current ratio covenants are the most common. Second, determining whether a violation has occurred or not for these two covenants is straightforward because the corresponding accounting variables are standard and transparent.

For firm's pension data, we refer to Compustat Pension. Next, we collect annual firm-level financial statement parameters from Compustat. Finally, we obtain firm's S&P credit rating from S&P Compustat Global. The data spans from 1994 to 2018 except for firm's credit rating, which spans from 1994 to 2017. We drop firm-year observations with missing sales and total assets. We also drop firms with missing or negative net worth. We form our sample containing firm-year observations in which firms are bound by either a current ratio or net worth covenant during the period 1994 to 2017. We obtain gvkey for each Dealscan facility ID and borrowing company ID combination from Chava, Sudheer and Roberts (2008). We merge the data from Dealscan with this file and obtain gvkey for each facility ID, which in turn, helps us merge Dealscan data with Compustat. This leaves us with 1,667 distinct firms in our sample.

We estimate pension deficit as the ratio of difference between projected value of pension benefits (PBO) and fair value of pension assets (FVPA) over market value of firm's equity (Franzoni and Marin, 2006; Balachandran et al., 2019). A firm is in violation of a debt covenant if the value of its accounting variable breaches any of the covenant thresholds. In this study, we mainly focus on the thresholds mentioned for net worth (including tangible net worth) and current ratio. In other words, if a firm breaches at least one of the net worth or current ratio thresholds, the dummy variable Violation takes one and zero otherwise (Chava and Roberts, 2008). To attenuate the effect of outliers, we winsorize continuous variables at 1% and 99% levels.

To test whether covenant violation leads to higher pension deficits, we perform the following regression discontinuity (RDD) model, following Chava and Roberts (2008).

$$Pension\_deficit_{i,t} = \alpha + \beta \times Violation_{i,t} + \boldsymbol{\gamma} \times \mathbf{X_{i,t}} + \eta_i + \lambda_t + \nu_{i,t}\ , \qquad (1)$$

where $Pension\_deficit_{i,t}$ is the pension deficit level for firm *i* in year *t*. $Violation_{i,t}$ is a dummy variable, which takes the value of one if firm i violates a covenant in year t and zero otherwise.

All the dependent and independent variables are measured in the same period, following Agarwal and Lim (2021), Denis and Wang (2013), and Roberts and Sufi (2009). When it comes to control variables, we follow Ananthraman and Lee (2014) and control for firm size (*size*), book-to-market ratio (*bm*), cash flows from operations (*ocf*), natural logarithm of fair value of plan assets (*ln_fvpa*), discount rate actuarial assumption (*discountrate*), actual returns from plan assets (*returns*), and the ratio of annual pension service cost to the sum of service cost and interest cost (*duration*). Lower *bm* indicates greater investment opportunities, and less funds are available for contributions to pension plans, leading to greater pension deficits. We control for cash flow from operations (*ocf*), as distressed firms could underfund plans not necessarily to exploit the PBGC option, but simply because they are too cash-constrained to fund them (Coronado and Liang, 2003). We control for plan size [the natural logarithm of the fair value of plan assets *ln_fvpa*] and plan asset returns (*returns*), as returns are strongly associated with allocation to riskier assets (Rauh, 2009). Distressed firms manipulate actuarial assumptions—by choosing a higher discount rate, for example—to improve reported plan funding (e.g., Amir and Gordon, 1996; Asthana, 1999). A crude measure of pension duration (*duration*) is included in the model, as plans with younger participants (and longer duration) may accumulate more pension deficits. Because Falato & Liang (2016) find that employment decreases due to covenant violations, we further control for the log of the number of employees (*ln(No. of Employees)*).

4. Empirical Results

4.1 Summary Statistics

Table 1 presents descriptive statistics of our sample at firm-year level. It shows that an average firm records a 5% pension deficit as a percentage of its market capitalization, and firms' market capitalization averages $4,693.8 million. Approximately 20% of our sample observes at least

one covenant violation. The average asset of our sample firms is approximately USD 13,711 million. A firm in our sample on an average employs 14,400 workers. The average book to market ratio (*bm*) and cash flow from operation (*ocf*) stand at 0.78 and 0.09, respectively. The mean value of discount rate actuarial assumption (*discountrate*) and actual returns from plan assets (*returns*) in our sample 6.01% and 4%, respectively. Almost 60% of our sample firms are investment grade firms. The dollar value of pension plan return (*pbarat*) in our sample has average value of $42.15 million with a standard deviation of $309.19 million. The weight of equity and debt investments by pension funds in our sample averages at 58% and 35%, respectively.

[Insert Table 1 about here]

4.2 Covenant Violations and Pension Deficits

Table 2 presents the t-test result, which shows that pension deficits differ significantly between firms with covenant violations and those without.

[Insert Table 2 about here]

For a more rigorous test of our main hypothesis, we implement a regression discontinuity design (RDD) as specified in Equation (1). Table 3 reports the results. We present two models. In Model (1), we include a dummy variable for covenant violations, and firm and year fixed effects as explanatory variables. Model (2) is similar to Model (1), but also include additional control variables for firm characteristics and pension plan-related characteristics. The level of pension deficits is the dependent variable in both models. We find that the coefficient estimate for the *Covenant Violation* dummy variable is positive and significant for both models, suggesting that pension deficit increases or a firm's pension funding deteriorates following loan covenant violations. The results is also economically significant. The coefficient estimate

of 0.0456 for *Covenant Violation* in Model 2 of Table 3 implies that pension deficit increase by 4.56% of the average market value of firm's equity in our sample. In terms of control variables, we find that pension deficits are lower for larger firms, firms with higher book-to-market ratio, firms with more cash flows from operations, firms with higher discount rate actuarial assumption, and firms with higher plan asset returns. These findings are largely consistent with prior work (see e.g., Ananthraman and Lee, 2014). Our main finding regarding the effect of covenant violation on firm's pension deficit still exists if we restrict the sample to certain cutoffs on both sides of the relative distance to covenant thresholds. In the Internet Appendix Table IA1, we show that when the cutoffs are ±0.9, ±0.5, and ±0.35, respectively, covenant violation positively correlates with pension deficit, although this effect disappears when the cutoff reaches ±0.3 possibly due to the loss of too many observations.

[Insert Table 3 about here]

4.3 Robustness Checks

We perform several analyses to gauge the robustness of our results of a higher level of pension deficits following loan covenant violations. First, we construct a placebo test where we define pseudo-year event variables and examine the effect of these variables on pension deficit by following Bertrand and Mullainathan (2003) and Agrawal & Lim (2021). In particular, we construct a dummy variable Violation Placebo (-1) that takes 1 a year before the true covenant violation happens and zero otherwise. Similarly, Violation Placebo (-2) is a dummy variable that takes 1 two years before the actual debt violation and zero otherwise. We report these estimates in Table 4. Column 1 summarizes the effect of Violation Placebo (-1) on pension deficit, whereas column (2) summarizes the effect of Violation Placebo (-2) on pension deficit. The coefficients of both of these variables are statistically insignificant, thereby suggesting that

the effect is observed only after covenant violation and rules out reverse causality driving our results.

[Insert Table 4 about here]

Second, we change the threshold of covenant violation from zero to other values to see if our main finding is sensitive to the definition of violation. Specifically, following Balsam, Gu, Mao (2018), instead of using zero as the threshold for covenant violation, we test the results with 0.15, 0.20 and 0.25 values as threshold for covenant violations. Results are reported in Table IA2. They show if we change the threshold to 0.15, 0.20, and 0.25, essentially categorizing some non-violation situations into violation, all the coefficients on Violation become statistically insignificant; our main effect disappears. This finding suggests that our definition of covenant violation using zero as the threshold is precise.

We further perform several analyses to check if our finding is driven by a specific sample period, or a particular way to measure pension deficits. Specifically, we separately run our baseline regression by excluding Global Financial Crisis, i.e., observations from years 2008 and 2009, and by replacing our independent variable of interest with alternative measures: pension deficit scaled by total asset (instead of market cap); pension deficit scaled by number of employees (instead of market cap); and natural logarithm of pension deficit (not scaled by market cap). Table IA3 reports the regression results and show that our main finding is robust to all these tests.

5. Cross-sectional Tests

First, we test if the positive effect of covenant violation on pension deficits varies with plan underfunding. Underfunding is defined as pension liabilities minus fair value of pension assets, scaled by pension liabilities at the end of the year, so high underfunding indicates poorly funded

plans, and negative underfunding indicates overfunded plans. We expect underfunded plans to be more severely impacted. That is, we should observe higher pension deficits following covenant violations for plans that are poorly funded. Table 4 presents tests of this conjecture. In column 1, underfunding is measured as a continuous variable (*underfund*) and interacts with covenant violation. The interactive term is positive and strongly significant, indicating that covenant-violating firms with poorly funded plans experience higher pension deficits. In column 2, underfunding is measured as a dummy variable (*No Underfunding*) and interacts with covenant violation. The interactive term is negative and strongly significant, indicating that covenant-violating firms with no underfunded plans see lower pension deficits, consistent with the finding in column 1.

[Insert Table 5 about here]

Firms with no/lower credit ratings are more likely to depend on banks for debt financing, therefore, when covenant violations occur, these firms are more likely to hand over the control to banks and correspondingly we should observe higher pension deficits. Conversely, firms with a credit rating or even investment grade rating should observe lower pension deficits. To test this conjecture, we run regressions presented in Table 5. Column 1 tests whether having credit rating matters. The interactive term *Covenant Violation*Rating Available* is negative but insignificant, suggesting the main effect does not differ systematically between firms with credit ratings and those without. Column 2 tests whether having investment grade credit ratings matters. The interactive term Covenant Violation*Investment Grade is negative and significant, indicating that having a credit rating of investment grade attenuates the impact of covenant violation on pension deficits.

[Insert Table 6 about here]

6. Possible Mechanisms

In this section, we explore possible mechanisms that could lead to an increase in pension deficits following covenant violations. One such mechanism could be reduced pension contributions. After creditors take over the control of the firm, they could cut contributions to various pension plans so more funds are available for debt repayment. To test this conjecture, we check how covenant violation correlates with mandatory contributions (*MC*) and voluntary contributions (*VC*), respectively. Table 6 reports the results. Columns 1 and 2 show that mandatory contributions increase with covenant violations possibly because the firm lagged in funding the plans before covenant violation. However, mandatory contributions are not at the discretion of the firm or its creditors. Voluntary contributions, which can be influenced by creditors because this part of pension contributions is not required by law, do not materially change following covenant violations, as shown in column 3. Collectively, the results suggest that reduced pension contributions are not the reason for the increase in pension deficits following covenant violations.

[Insert Table 7 about here]

Another possible channel for the increase in pension deficits could be the reduced investment returns to pension assets caused by the switch of asset allocation from risky assets like equities to lower-risk lower-return investments such as fixed-income securities. To test this conjecture, we test how pension asset allocation changes with covenant violation. Table 7 reports the results. In column 1, the dependent variable is Equity/Debt. The coefficient of covenant violation is negative and statistically significant, indicating that the level of the equity-to-debt investment ratio decreases after covenant violation. Column 2 uses pension plan return as dependent variable. There is indeed a decrease in pension plan return following covenant violation. To test whether decreased pension plan return accounts for the increase in pension

deficits, we further run three regressions. In column 3, we interact covenant violation with pension plan return. The interaction term is negative and significant, suggesting lower pension plan return could exacerbate pension deficits. In column 4, we interact covenant violation with pension plan returns that are higher than S&P 500 index return (*Above Market Performance*). The idea is to see if a firm's superior pension plan investment performance alleviates pension deficits. The interactive term is negative and significant, indicating that superior investment performance does help to lower pension deficits. Taken together, the tilt of asset allocation from equity to debt seems a plausible mechanism underlying the increase in pension deficits following covenant violations. This behavior of creditors after they take control is consistent with the risk shifting hypothesis in the literature (Rauh, 2006; Ananthraman and Lee, 2014). When a firm approaches financial distress, shareholders have the incentive to make risky investments with plan assets. If the investments pay off and the firm survives, shareholders benefit from having to contribute less into the plan; if they do not pay off and the firm goes bankrupt, beneficiaries and debtholders suffer. Treating beneficiaries as akin to debtholders, these are manifestations of the classic risk shifting incentives that shareholders of all leveraged firms have (Jensen and Meckling, 1976). Given the potential harm that risky investments in pension plans can do to themselves, creditors will naturally try to keep risk at bay once they take control. Given the frequent occurrence of covenant violation, this investment preference/behavior of creditors [3] potentially contributes to the pension derisking trend described by Anantharaman, Kamath, and Li (2021). Overall, our finding is consistent with Acharya, Amihud, Litov (2011)'s results that stronger creditor rights in bankruptcy affect corporate investment choice by reducing corporate risk-taking. However, this derisking behavior of creditors sharply contrasts with that of shareholders documented by Agrawal and

[3] This risk aversion preference of creditors is further revealed by the post-violation financing. Untabulated results of tests on the financing side suggest that after covenant violations firms issue more equity but less debt and experience an overall decline in total financing.

Lim (2021), who find that hedge funds tilt their target firms' DB plan investments toward riskier assets.

[Insert Table 8 about here]

7. Conclusion

A covenant violation gives creditors the opportunity to examine the firm more carefully. Further, the control rights associated with such violations give creditors the ability to influence financial policy, including pension policy, if changes in circumstances warrant such interventions. We find that companies in violation of lender pacts experience an increase in pension deficits. This increase is more pronounced for firms that have underfunded plans but less pronounced for firms with credit ratings of investment grade. A possible mechanism for the increase in pension deficits is creditors' reallocation of pension assets to lower risk and lower return investments. Our findings imply that creditor control rights could have important ramifications for employee wealth, an area that is largely overlooked by prior studies when it comes to the impact of creditor control rights. We also show that creditors act in their own risk preference when there is a conflict of interest among themselves, shareholders, and employees.

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Appendix A. Variable Definitions

Name	**Formula (*Compustat Parameter*)**
Current Ratio (CR)	Current Asset (*act*)/Current Liability(*lct*)
Net Worth (NW)	Total Asset (*at*) – Total Liability (*lt*)
Tangible NW	Total Asset (*at*) – Total Intangible Asset (*intan*) – Total Liability (*lt*)
Violation	Takes 1 if a firm violates any of the current ratio and/or (tangible) net worth covenant violation and zero otherwise (Chava and Roberts, 2008)
Market Capitalization (MCap)	*prcc_f*csho*
Pension Deficit (PD)	(*pbnvv* – *pbnaa*)/Mcap if year>=1982 and year<=1986; [(*pbpro* + *pbpru)* – *(pplao* + *pplau*)]/ Mcap if year>=1987 and year<=1997 (*pbpro* – *pplao*)/Mcap if year>=1998 and year<=2018 (Balachandran, Duong and Vu, 2019)
Employer's Contribution to Pension (EC)	*pbec*/Mcap
Mandatory Contribution to Pension (MC)	Service cost (*ppsc*) + (ABO – FVPA)/30 if PBO>FVPA and year<2008; Zero if if (PBO < FVPA) and year<2008; Service cost (*ppsc*) + (ABO – FVPA)/7 if PBO>FVPA and year>=2008; Zero if PBO<FVPA & year>=2008; (Campbell, Dhaliwal and Schwartz, 2012) Above values scaled with Mcap
Voluntary Contribution to Pension (VC)	EC – MC
Equity (weight of pension fund investment in equity)	*pnate*
Debt (weight of pension fund investment in equity)	*pnatd*
Δ Equity	$\ln(pnate_t) - \ln(pnate_{(t-1)})$
Δ Debt	$\ln(pnatd_t) - \ln(pnatd_{(t-1)})$
Equity/Debt	*pnate/pnatd*
Pension plan return	Pension Actual Return on Plan Assets (*pbarat*)
Δ (Equity/Debt)	Δ Equity/ Δ Debt
High Δ (Equity/Debt)	Takes 1 if Δ (Equity/Debt) is above median and zero otherwise
Control Variables	
Size	ln(Total Asset), i.e. ln(*at*)
bm	book to market ratio (Ananthraman and Lee, 2014)
ocf	Cash flows from operations (OANCF) before pension contributions (PBEC), divided by beginning total assets (Ananthraman and Lee, 2014)
ln_fvpa	Natural logarithm of fair value of plan assets (PPLAO, millions of dollars) (Ananthraman and Lee, 2014)
discountrate	Discount rate actuarial assumption (PBARR) (Ananthraman and Lee, 2014)

returns	Actual returns from plan assets (PBARAT/PPLAO) (Ananthraman and Lee, 2014). This item represents the change in the market value of the pension plan assets during the year, excluding contributions to the plan and payments by the plan.
duration	Ratio of annual pension service cost (PPSC) to the sum of service cost and interest cost (PPIC) (Ananthraman and Lee, 2014)
ln(No. of Employees)	ln(emp)
Cross-Sectional Variables	
Underfund	Ratio of difference between projected benefit obligation (pbpro) and pension plan asset (pplao) over projected benefit obligation (Agarwal and Lim, 2021)
No Underfunding	Takes 1 if a firm's Underfund is negative or zero and takes 0 if Underfund is positive.
Rating Available	Takes 1 if a firm's S&P credit rating is available and zero otherwise
Investment Grade	Takes 1 if a firm's S&P rating is above C and zero if firm's rating is junk, i.e., C or below C or missing.
Above Market Performance	Takes 1 if *pbarat* is above S&P500 annual return and zero otherwise

Table 1. Descriptive Statistics

This table reports the descriptive statistics of our sample. Our sample consists of 4,434 firm-year observations in total. We report the firm characteristics, such as pension deficit, various pension contribution parameters, covenant violation as well as control variables. We obtain loan level information from Dealscan whereas for firm's accounting variables we refer to Compustat. We collect pension data from Compustat Pension Annual files and S&P credit rating from S&P Compustat Global. All continuous variables, except *Equity* and *Debt* are winsorized at 1% and 99% levels. The details on variables can be found in the Appendix.

	N	Mean	sd	Min	0.25p	0.50p	0.75p	Max
Pension Deficit (PD)	4,434	0.05	0.15	-0.39	0	0.02	0.06	0.98
Employer Contribution to Pension (EC)	4,434	0.01	0.03	0	0	0	0.01	0.18
Mandatory Contribution (MC)	4,434	0	0.01	-0.03	0	0	0.01	0.06
Volunraty Contribution (VC)	4,434	0.01	0.02	-0.02	0	0	0.01	0.14
Violation	4,434	0.19	0.39	0	0	0	0	1
Total Asset	4,434	13,711.23	78,358.43	12.14	561.93	1,642.58	4,813.95	2,223,299
MCap	4,434	4,693.82	12,525.15	0.22	343.33	1,138.65	3,419.70	238,020.7
Number of Employees	4,434	14.4	32.96	0.02	1.99	4.9	13.44	444
bm	4,434	0.78	0.7	0.07	0.39	0.61	0.91	5.03
ocf	4,434	0.09	0.07	-0.24	0.05	0.08	0.13	0.61
PPLAO	4,434	711.49	2418.28	0.01	26.90	98.06	342.70	39294.00
discountrate	4,434	6.01	1.13	0.65	5.5	6	6.75	10.7
returns	4,434	0.04	0.13	-1.04	0	0.07	0.11	1.2
duration	4,434	0.56	0.89	-41.8	0.25	0.45	0.72	10.77
Underfund	4,433	0.19	0.26	-0.89	0.06	0.21	0.34	1
Rating Available	4,394	0.57	0.5	0	0	1	1	1
Investment Grade	4,394	0.57	0.5	0	0	1	1	1
Equity (In %)	2,680	58.16	17.39	0	51	61	69	100
Debt (In %)	2,660	35.32	16.21	0	26	33.85	41.3	100
Pension Plan Return	4,434	42.15	309.19	-6830	-0.09	3.22	21.21	4,780

Table 2. Univariate Analysis

This table summarize the t-test for pension deficit for subsample where we observe covenant violation in comparison to that where we do not observe any covenant violation.

Pension Deficit	N	Mean	S.D.	Difference (t-stat)
Violation = 1	1,231	0.0994	0.0071	
Violation = 0	5,498	0.0224	0.0014	0.0770*** (17.2351)

Table 3: Pension Deficit

This table summarizes the effect of covenant violation on firm's pension deficit. If a firm violates any of the net worth and/or current ratio loan covenants, the firm is classified as treatment in that year. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1) PD	(2) PD
Covenant Violation	0.0507***	0.0456***
	(0.0083)	(0.0098)
size		-0.0375***
		(0.0128)
bm		0.0476***
		(0.0093)
ocf		-0.1107***
		(0.0362)
ln_fvpa		-0.0019
		(0.0062)
discountrate		-0.0175***
		(0.0047)
returns		-0.1369***
		(0.0245)
duration		0.0002
		(0.0013)
ln(No. of Employees)		0.0110
		(0.0108)
Constant	0.0274***	0.3965***
	(0.0015)	(0.0938)
Observations	6,600	4,337
R-squared	0.5896	0.6996
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Table 4. Placebo Test

This table summarize the placebo test result of covenant violation on firm's pension deficit. Violation Placebo (-1) and Violation Placebo (-2) takes one if a firm violates covenant in the next one and two years from the current year, respectively, and zero otherwise. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1) PD	(2) PD
Violation Placebo (-1)	-0.0127	
	(0.0097)	
Violation Placebo (-2)		-0.0057
		(0.0076)
size	-0.0240**	-0.0232**
	(0.0100)	(0.0100)
bm	0.0304***	0.0298***
	(0.0111)	(0.0110)
ocf	-0.0739**	-0.0745**
	(0.0326)	(0.0328)
ln_fvpa	-0.0026	-0.0027
	(0.0051)	(0.0052)
discountrate	-0.0116***	-0.0117***
	(0.0038)	(0.0038)
returns	-0.0829***	-0.0818***
	(0.0168)	(0.0169)
duration	-0.0014*	-0.0014*
	(0.0008)	(0.0008)
ln(No. of Employees)	0.0130	0.0126
	(0.0110)	(0.0110)
Constant	0.2643***	0.2606***
	(0.0801)	(0.0797)
Observations	3,498	3,498
R-squared	0.7120	0.7116
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Table 5. Pension Underfunding

This table summarize the cross-sectional effect of pension underfunding on the effect of covenant violation on firm's pension deficit. If a firm violates any of the net worth and/or current ratio loan covenants, the firm takes one for Violation. Columns (1) and (2) report the effect of the interaction of Violation and Underfund and No Underfund on pension deficit. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1) PD	(2) PD
Violation	0.0029	0.0617***
	(0.0101)	(0.0100)
Violation × Underfund	0.2009***	
	(0.0366)	
Violation × No Underfunding		-0.1135***
		(0.0230)
Underfund	0.2037***	
	(0.0236)	
No Underfunding		-0.0403***
		(0.0076)
size	-0.0456***	-0.0389***
	(0.0104)	(0.0109)
bm	0.0476***	0.0480***
	(0.0087)	(0.0089)
ocf	-0.0758**	-0.1082***
	(0.0346)	(0.0347)
ln_fvpa	0.0286***	0.0038
	(0.0058)	(0.0056)
discountrate	-0.0064	-0.0157***
	(0.0042)	(0.0044)
returns	-0.0588***	-0.1156***
	(0.0210)	(0.0238)
duration	-0.0015**	-0.0002
	(0.0007)	(0.0011)
ln(No. of Employees)	-0.0017	0.0084
	(0.0092)	(0.0097)
Constant	0.2281***	0.3800***
	(0.0771)	(0.0819)
Observations	4,336	4,337
R-squared	0.7304	0.7157
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Table 6. Credit Rating

This table summarize the cross-sectional effect of firm's credit rating on the effect of covenant violation on firm's pension deficit. If a firm violates any of the net worth and/or current ratio loan covenants, the firm takes one for Violation. Columns (1) and (2) report the effect of the interaction of Violation and firm's credit rating on pension deficit. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1) PD	(2) PD
Covenant Violation	0.0560***	0.0665***
	(0.0147)	(0.0158)
Covenant Violation × Rating Available	-0.0148	
	(0.0191)	
Covenant Violation × Investment Grade		-0.0338*
		(0.0181)
Rating Available	-0.0213	
	(0.0130)	
Investment Grade		-0.0264*
		(0.0152)
size	-0.0359***	-0.0343***
	(0.0124)	(0.0124)
bm	0.0475***	0.0468***
	(0.0093)	(0.0092)
ocf	-0.1128***	-0.1127***
	(0.0360)	(0.0358)
ln_fvpa	-0.0026	-0.0030
	(0.0062)	(0.0062)
discountrate	-0.0176***	-0.0175***
	(0.0047)	(0.0047)
returns	-0.1375***	-0.1383***
	(0.0245)	(0.0245)
duration	0.0002	0.0003
	(0.0013)	(0.0013)
ln(No. of Employees)	0.0118	0.0112
	(0.0105)	(0.0104)
Constant	0.3990***	0.3919***
	(0.0915)	(0.0901)
Observations	4,297	4,297
R-squared	0.7009	0.7025
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Table 7. Employers' Contributions to Pension

This table summarizes the effect of covenant violation on employers' mandatory contribution to pension (MC) and voluntary contribution (VC) to pension. If a firm violates any of the net worth and/or current ratio loan covenants, the firm is classified as treatment in that year. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1) MC	(2) VC
Covenant Violation	0.0018**	0.0013
	(0.0008)	(0.0013)
size	-0.0011	-0.0036*
	(0.0013)	(0.0018)
bm	0.0030***	0.0071***
	(0.0010)	(0.0013)
ocf	-0.0151***	0.0224***
	(0.0029)	(0.0061)
ln_fvpa	0.0002	0.0033***
	(0.0006)	(0.0007)
discountrate	-0.0009*	0.0007
	(0.0005)	(0.0007)
returns	-0.0056***	0.0057*
	(0.0021)	(0.0031)
duration	-0.0001	0.0003
	(0.0005)	(0.0002)
ln(No. of Employees)	-0.0003	-0.0017
	(0.0013)	(0.0018)
Constant	0.0167**	0.0086
	(0.0084)	(0.0123)
Observations	4,340	4,340
R-squared	0.5482	0.5976
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Table 8. Asset Allocation

This table summarize the effect of covenant violation on the ratio to pension funds' investment in equity to debt and pension plan return in columns (1) and (2). In column (3) and (4) we report the interactive effect of covenant violation with Pension Plan Return and Above Market Performance on Pension Deficit, respectively. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1)	(2)	(3)	(4)
	Equity/Debt	Pension Plan Returns	Pension Deficits	Pension Deficits
Covenant Violation	-0.3151**	-11.4459**	0.0473***	0.0875***
	(0.1325)	(5.8066)	(0.0100)	(0.0154)
Covenant Violation×Pension Plan Return			-0.0001***	
			(0.0000)	
Covenant Violation×Above Market Performance				-0.0609***
				(0.0135)
Pension Plan Return			-0.0000	
			(0.0000)	
Above Market Performance				0.0061
				(0.0066)
size	0.6157**	-2.6112	-0.0382***	-0.0392***
	(0.2494)	(6.9028)	(0.0129)	(0.0128)
bm	0.0965	14.2441***	0.0476***	0.0461***
	(0.0883)	(4.1026)	(0.0094)	(0.0093)
ocf	0.1659	4.0075	-0.1094***	-0.1047***
	(0.5190)	(20.6322)	(0.0362)	(0.0359)
ln_fvpa	-0.1332	16.9644***	-0.0017	-0.0016
	(0.1721)	(4.4984)	(0.0062)	(0.0061)
discountrate	0.0759	0.5269	-0.0175***	-0.0167***
	(0.1086)	(4.5441)	(0.0047)	(0.0046)
returns	0.3986	270.2523***	-0.1298***	-0.1179***
	(0.4202)	(41.4567)	(0.0249)	(0.0263)
duration	0.0055	16.7907***	0.0003	-0.0000
	(0.0126)	(2.7466)	(0.0013)	(0.0013)
ln(No. of Employees)	-0.4423	-1.8632	0.0111	0.0127
	(0.3113)	(6.2021)	(0.0109)	(0.0106)
Constant	-1.7162	-45.6514	0.4006***	0.3951***
	(1.6891)	(50.3000)	(0.0944)	(0.0931)
Observations	2,550	4,340	4,337	4,337
R-squared	0.6267	0.6260	0.7006	0.7042
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Internet Appendix

This appendix contains additional analyses of the paper "Loan Covenant Violation and Corporate Pension Funding".

Table IA1: Narrowing the Bands around Covenant Thresholds

This table presents the effect of covenant violation on firm's pension deficit when restricting the sample to certain cutoffs on both sides of the relative distance to covenant thresholds. The cutoffs are ±0.9, ±0.5, ±0.35 and ±0.3 for columns 1-4, respectively. If a firm violates any of the net worth and/or current ratio loan covenants, the firm is classified as treatment in that year. The numbers in parentheses are standard errors. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1)	(2)	(3)	(4)
	PD	PD	PD	PD
Covenant Violation	0.0443***	0.0346***	0.0202**	0.0132
	(0.0101)	(0.0106)	(0.0089)	(0.0082)
size	-0.0395**	-0.0213	-0.0378**	-0.0234
	(0.0180)	(0.0192)	(0.0188)	(0.0164)
bm	0.0573***	0.0483***	0.0636***	0.0481***
	(0.0114)	(0.0161)	(0.0147)	(0.0144)
ocf	-0.1069**	-0.0510	-0.0213	-0.0078
	(0.0429)	(0.0478)	(0.0477)	(0.0491)
ln_fvpa	-0.0050	-0.0212	-0.0238	-0.0253*
	(0.0098)	(0.0140)	(0.0152)	(0.0152)
discountrate	-0.0222***	-0.0183**	-0.0153*	-0.0180**
	(0.0072)	(0.0088)	(0.0079)	(0.0085)
returns	-0.1601***	-0.1620***	-0.1248***	-0.1374**
	(0.0351)	(0.0443)	(0.0438)	(0.0599)
duration	0.0078	0.0076	0.0162	0.0195*
	(0.0072)	(0.0078)	(0.0110)	(0.0103)
ln(No. of Employees)	-0.0006	-0.0037	0.0103	0.0173
	(0.0144)	(0.0183)	(0.0155)	(0.0155)
Constant	0.4571***	0.3708***	0.4396***	0.3642***
	(0.1302)	(0.1379)	(0.1469)	(0.1367)
Observations	2,874	1,875	1,339	1,135
R-squared	0.7279	0.7303	0.7826	0.8147
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Table IA2: Placebo Tests Using Different Thresholds for Covenant Violation

Instead of using zero as the threshold for covenant violation, we test the impact with 0.15, 0.20 and 0.25 values as threshold for covenant violations. Corresponding results are reported in columns 1, 2, and 3, respectively. Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1)	(2)	(3)
	PD	PD	PD
	0.15 cutoff	0.20 cutoff	0.25 cutoff
Covenant Violation	0.0045	0.0050	0.0022
	(0.0066)	(0.0062)	(0.0055)
size	-0.0223**	-0.0220**	-0.0224**
	(0.0101)	(0.0102)	(0.0102)
bm	0.0290***	0.0290***	0.0292***
	(0.0110)	(0.0110)	(0.0110)
ocf	-0.0731**	-0.0718**	-0.0730**
	(0.0332)	(0.0337)	(0.0335)
ln_fvpa	-0.0029	-0.0028	-0.0029
	(0.0052)	(0.0052)	(0.0052)
discountrate	-0.0117***	-0.0118***	-0.0118***
	(0.0038)	(0.0038)	(0.0038)
returns	-0.0818***	-0.0818***	-0.0818***
	(0.0170)	(0.0170)	(0.0171)
duration	-0.0015*	-0.0015*	-0.0014*
	(0.0008)	(0.0008)	(0.0008)
ln(No. of Employees)	0.0122	0.0122	0.0124
	(0.0110)	(0.0111)	(0.0111)
Constant	0.2550***	0.2523***	0.2551***
	(0.0812)	(0.0829)	(0.0830)
Observations	3,489	3,489	3,489
R-squared	0.7117	0.7118	0.7116
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

Table IA3: Placebo Tests with Alternate Sample Period and Measures of Pension Deficit

This table presents the effect of covenant violation on firm's pension deficit by using an alternate sample period and alternative measures of pension defici:
Column (1) – excluding Global Financial Crisis, i.e., observations from years 2008 and 2009
Column (2) – pension deficit scaled by total asset (instead of market cap)
Column (3) – pension deficit scaled by number of employees (instead of market cap)
Column (4) – natural logarithm of pension deficit (not scaled by market cap)
Standard errors are robust to heteroscedasticity and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. We provide a detailed description of the variables in the Appendix.

	(1)	(2)	(3)	(4)
	PD	Pension Deficit/AT	Pension Deficit/ No. of Emp	Ln(Pension Deficit)
Covenant Violation	0.0411***	0.0062***	1.7512**	0.1001*
	(0.0099)	(0.0021)	(0.8718)	(0.0518)
size	-0.0347**	-0.0127***	4.2847**	0.2548***
	(0.0137)	(0.0045)	(1.9041)	(0.0927)
bm	0.0415***	-0.0022	-0.5684	-0.0269
	(0.0114)	(0.0014)	(0.7419)	(0.0351)
ocf	-0.0845**	-0.0244***	-6.2039	-0.5130*
	(0.0382)	(0.0081)	(3.9024)	(0.2765)
ln_fvpa	-0.0016	-0.0011	0.2759	0.2857***
	(0.0065)	(0.0024)	(0.9110)	(0.0684)
discountrate	-0.0183***	-0.0065***	-2.7771***	-0.2685***
	(0.0058)	(0.0014)	(0.6912)	(0.0518)
returns	-0.1368***	-0.0419***	-14.8633***	-1.5565***
	(0.0338)	(0.0062)	(2.3910)	(0.2409)
duration	0.0057	0.0004	0.5731	0.0178
	(0.0050)	(0.0005)	(0.4149)	(0.0190)
ln(No. of Employees)	0.0131	0.0058	-7.8574***	0.2450***
	(0.0114)	(0.0036)	(2.4753)	(0.0860)
Constant	0.3720***	0.1546***	5.6112	1.3473*
	(0.1008)	(0.0329)	(13.6014)	(0.7017)
Observations	3,900	4,337	4,337	3,537
R-squared	0.6952	0.7705	0.7638	0.9085
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes