The Dark Side of Hedge Fund Activism: Evidence from Employee Pension Plans

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Current Draft: July 2017

Comments welcome

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Abstract

This study examines whether shareholder wealth gains from hedge fund activism are partly wealth transfers from employees and taxpayers. We find that defined benefit employee pension plans of target firms experience underfunding after activism events. Our identification strategy is to use a difference-in-differences approach using control firms identified using a coarsened exact matching method; firm fixed effects; tests of the underlying mechanism; and tests of alternative hypotheses. We find that employee pension plans suffer from underfunding due to reduced employer contributions to the plans. Our tests reject several alternative hypotheses such as activists' stock-picking skills, voluntary reforms by management, mean-reversion, attrition bias, and financial distress. Our results point to a dark side of hedge fund activism in that the shareholder gains from activism appear to partly come from (1) raiding deferred compensation explicitly promised to rank-and-file employees, and (2) taxpayers via the guarantee provided by PBGC.

Keywords: wealth transfers, hedge fund activism, agency costs, corporate pensions
JEL: G34, G23, G30

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1. Introduction

This paper deals with two questions. First, does hedge fund (HF) activism enhance firm value? While prior studies find that stockholders of target firms earn positive returns, on average, upon announcement of HF activism, other stakeholders in these firms often experience adverse outcomes. Understanding the economic effects of HF activism is important because it is an important external governance mechanism (see, e.g., Brav, Jiang and Kim (2009, 2015b)). This topic is also of interest to policy makers because shareholder activism is highly regulated. Second, what are the factors that affect the financial stability of employee pension plans? This question is important because underfunding of employee pension plans puts a potential burden on (1) taxpayers via the guarantees provided by the Pension Benefit Guarantee Corporation (PBGC) and (2) workers whose promised pensions exceed insurance limits (Cocco, 2014). This paper sheds light on both these issues by examining how employee pensions fare when firms become targets of HF activists.

Shareholder activism is an investment strategy whereby investors such as HFs attempt to use their shareholder rights to intervene in the management of a targeted firm to increase the value of their investment. Shareholders can ask management to take shareholder-friendly actions such as increase dividends or share buybacks, do spinoffs, or be acquired. There are two opposing views about the effects of HF activism. In the first view HF activism creates value for the target firm. In support of this view, prior studies find that stock prices of firms that become

targets of HF activism go up upon such news (see Brav, Jiang and Kim, 2009, 2015b for excellent reviews of this literature). The second view is that shareholder gains from HF activism are due to wealth transfers from other stakeholders (see, e.g., Klein and Zur, 2011, and Coffee and Palia, 2016). Consistent with this view, Brav, Jiang and Kim (2015a) find that HF activism decreases productivity-adjusted wages for workers. Except for this study, empirical evidence on wealth transfers from employees of target firms to shareholders is quite limited.[1] More importantly, to our knowledge, no prior study has analyzed the effect of HF activism on employee pensions.

The purpose of this study is to uncover the role of HF activism on the welfare of other stakeholders. Although prior studies have documented positive stock returns upon news of HF activism, little is known about the sources of the gains from activism. If these gains arise, e.g., from operational efficiencies, HF activism is good firm value and the overall society. On the other hand, if shareholder gains are merely the result of wealth transfers from other stakeholders, the value of such activism is less clear. In this paper, we examine possible wealth transfers in HF activism from employees to shareholders, with a focus on employee pensions. Specifically, we study whether HF activism, as disclosed in Schedule 13D filings, helps or hurts employee wealth as represented by the health of their defined benefit pension plans.

Anecdotal evidence suggests a negative relation between HF activism and employee welfare. A December 2014 story in the *New York Times* offers a vivid example of the dark side

[1] Relatedly, Popadak (2014) finds that shareholder governance decreases employee cooperation and integrity due to a greater focus on results.

of HF activism.[2] An activist shareholder, Relational Investors, forced Timken Corporation, to split into two firms. As reported in the investor presentation by Timken in November 2014, the target firm almost eliminated its employee pension contributions, dropping from a third of cash flow to near zero, while it planned a buyback of 3 million shares by the end of 2016. *Wall Street Journal* quotes this example[3] in pointing out, "if we continue down this road, we won't have the long-term investments in workers and innovation that we need to sustain a higher rate of growth. And that would be bad news for the country."

Consistent with this example, we find that employees of target firms that sponsor defined benefit (DB) pension plans are more likely to suffer from plan underfunding after HF activism. This finding is consistent with the view that HF activists expropriate wealth from employees. We then examine the mechanism that leads to the underfunding of pension plans. We find that targeted firms reduce employer contributions to the pension fund. These firms also tilt the plan investment toward riskier assets such as equity. Despite that, the funds do not experience an increase in returns, let alone alpha.

There are two potential interpretations of our findings. First, HF activists put pressure on managers to increase shareholder wealth and managers respond by raiding employee pension funds. Second, observable and unobservable characteristics of these firms that lead activist HFs to target them also lead the firms to underfund employee pension funds. We address this identification concern in two ways. First, we use firm fixed effects regressions, which remove

[2] Nelson D. Schwartz, How Wall Street bent steel: Timken bows to activist investors and splits in two, *New York Times*, December 6, 2014.

[3] William A. Galston, 'Shareholder Value' Is Hurting Workers: Financiers fixated on the short-term are forcing CEOs into decisions that are bad for the country. *Wall Street Journal*, December 9, 2014.

the effects of time-invariant firm characteristics. Second, we conduct tests of several alternative hypotheses suggested by Brav, Jiang and Kim (2015a) to disentangle the effect of HF activism from mere stock picking. These tests confirm that our results are not driven by alternative hypotheses such as management's voluntary reforms, activists' stock-picking skills, and improvement due to mean-reversion.

Our study contributes to several strands of the literature. First, we provide empirical evidence on a source of shareholder gains from HF activism. Prior studies on HF activism find mixed evidence of wealth transfers from debtholders (see, e.g., Brav, Jiang, Partnoy and Thomas, 2008; Uchida and Xu, 2008; Aslan and Maraachilian, 2009; Huang, 2009; Jiang, Li and Wang, 2009; Brav, Jiang and Kim, 2009, Klein and Zur, 2011; Sunder, Sunder and Wongsunwai, 2015; and Feng, Xu and Zhu, 2016) and some evidence of wealth transfers from employees (see Brav, Jiang and Kim, 2015). Our paper complements this literature by showing that employee pensions suffer in HF activism events. Coupled with consistent prior evidence of shareholder wealth gains from HF activism, our evidence suggests a wealth transfer from employee pensions to shareholders. Second, our study also contributes to the literature that finds that managers aligned with stockholders increase investment risk in employee pensions as their firms approach financial distress (see, e.g., Bergstresser. Desai and Rauh, 2006; Cocco and Volpin, 2007; Phan and Hegde, 2013; Anantharaman and Lee, 2014; and Duan, Hotchkiss and Jiao, 2015). More broadly, we contribute to the literature on shareholder activism as well as the governance role of shareholders (see, e.g., the review articles by Gillan and Starks, 2007; Denes, Karpoff and McWilliams, 2017; and Edmans and Holderness (2016)).

This paper proceeds as follows. Section 2 discusses the related literature. Section 3 details the data and sample. Section 4 presents our baseline results. Section 5 examines the

underlying mechanisms. Section 6 provides additional evidence using a different data source. Section 7 presents identification tests and section 8 concludes.

2. Prior Literature and Main Hypothesis

This paper examines whether HF activism hurts the health of employee DB pension plans, which represents employees' post-retirement wealth. We measure pension plan health using funding levels.

What is meant by underfunding of DB plans and why is it important? A pension plan is an arrangement whereby an employer commits to making future benefit payments to employees for service they have provided during their working time (Kieso, Weygandt and Warfield, 2010). The liabilities of the plan are the pension promises that the firm has made to its employees, and the assets of the plan fund these liabilities. Underfunding implies that a plan's liabilities exceed its assets, i.e., fund assets may be insufficient to keep its promises (Cocco, 2014). Thus, any deterioration in the pension plan such as underfunding in a DB plan can have a significant impact on employees' welfare after retirement. Although most DB pension plans are insured by the PBGC under the Employee Retirement Income Security Act of 1974 (ERISA), underfunding creates problems for employees and for the society. This is because the PBGC guarantees private firm employee pensions up to a certain limit; this limit can change; not all pension plans are protected under the PBGC; and any losses incurred by the PBGC are ultimately borne by taxpayers.[4]

[4] See also an article from *Forbes*, "Is your pension plan underfunded?" at http://www.forbes.com/sites/johnwasik/2014/09/03/is-your-pension-plan-underfunded/ and an

More specifically, pension plan funding is defined as follows:

$$Funding = Fair\ value\ (plan\ assets) - Present\ value\ (plan\ obligations) \quad (1)$$

The present value of plan obligations is the discounted value of expected future payments to retirees. To estimate plan obligations, the employer makes assumptions about the employee's life expectancy, turnover, retirement date, and future salary level. The fair value of plan assets is defined as follows:

$$Fair\ value\ (plan\ assets) = Contibutions\ \left(Minimum + \widetilde{discretionary}\right) + \widetilde{Return\ on\ plan\ assets} \quad (2)$$

The level of regulatory minimum contributions is based on a complex formula that is a function of the plan's normal cost (i.e., additional pension obligation accrued each year due to one additional years' service from employees) plus its deficit reduction contribution (Rauh, 2006). The employer can choose to contribute more than the statutory minimum, which accounts for the discretionary portion of contributions. Once contributions are made in pension assets, the return on plan assets is determined by market fluctuations. Thus, these uncertain discretionary contributions made by the employer and returns on plan assets determined by the market condition can cause underfunding in the defined benefit pension plan. If a plan is underfunded, pension legislation requires employers to make additional contributions to resolve the problem.

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article from the *New York Times*, "Private pension plans, even at big companies, may be underfunded" at http://www.nytimes.com/2012/07/21/business/pension-plans-increasingly-underfunded-at-largest-companies.html?_r=2. In addition, the PBGC is itself severely underfunded. Its net worth is negative $62 billion as of the end of September, 2014, according to the *Wall Street Journal*, "A Federal Guarantee Is Sure to Go Broke" published in November, 2014. So, taxpayers are on the hook.

Does HF activism cause underfunding in defined benefit pension plans for employees in target firms? Prior studies suggest that HF activism can transfer wealth from employees to shareholders. Brav, Jiang and Kim (2015) find that the workers of target firms do not benefit from HF activism. Although labor productivity improves after HF activists target a firm, employees experience a reduction in work hours, and their wages do not keep pace with improved productivity. Using shareholder proposals on governance, Popadak (2015) finds that shareholders realize financial gains such as increases in sales, profitability, and payouts, while target firms suffer from deterioration in customer satisfaction and employee integrity. Coffee and Palia (2016) suggest that wealth transfers from target firms' employees to their shareholders could come from reductions in employees' promised pension payouts. Thus, our main testable hypothesis is that employees of target firms are more likely to experience underfunding of their DB pension plans.

Why does HF activism cause underfunding? Theoretically, the seminal work of Sharpe (1976) and Sharpe and Treynor (1977) show that it is value-maximizing for stockholders to increase pension risk through underfunding and risky asset allocations, using the option pricing model. Firms can transfer their pension liabilities to the PBGC in return for pension fund assets plus 30% of the market value of the firm's net worth. Thus, PBGC insurance serves as a put option where pension liabilities are the underlying asset, while fund assets plus 30% of the firm's net worth is the exercise price. So if the exercise price is less than the pension liability, the firm will exercise the put option.

Activism can be a tool to transfer wealth from employees to shareholders due to agency conflicts. Pension financing decisions are made mostly by executives (Phan and Hegde, 2013; Anantharaman and Lee, 2014; Begley et al. 2015). In the US, the pension fund is an asset of the

sponsoring employer and its trustees are typically the employer's executives (Cocco and Volpin, 2007). Thus, managerial incentives are critical determinants to examine the effect of HF activism on employee pensions as the manager has the overall responsibility for selecting corporate policies. Managers' personal benefits differ depending on the degree of agency conflict between managers and shareholders versus agency conflicts between managers and employees. Managers' decisions on employee pensions will reflect the alignment of CEO interests with firm claimants: employees and shareholders (Begley, Chamberlain, Yang and Zhang, 2015). If managers' personal benefits are more aligned with employees (shareholders), they would choose employee-friendly (shareholder-friendly) corporate policies. Consistent with this prediction, Anantharaman and Lee (2014) find that pension underfunding is lower when an executive's personal stake in the pension plan is larger. Asthana (2009) finds that when executives have more pension benefits, the plan tends to be better funded. Munnell, Golub-Sass, Soto and Vitagliano (2007) find that even financially healthy employers freeze their pensions when managers' interests are less aligned with workers' interests. Consistent with this idea, Choy, Lin and Officer (2014) observe an increase in risk-taking following DB plan freezes that align managers' interests with those of shareholders.

How does HF activism cause underfunding of employee pension plans? Under pressure from shareholder activists, managers can raid employee pension wealth in three ways. First, they can underfund pension plans by reducing employer contributions to the plans, effectively reneging on the firm's promises to employees (Anantharaman and Lee, 2014). Petersen (1992) examines a firm's decision to terminate their overfunded defined benefit pension plans and finds that firms terminate their pension plans to relieve themselves of future benefits promised to workers. Similarly, Petersen (1994) finds that when financial distress is costly, firms select

defined contribution (DC) plans because current contributions to these plans are easier to manage than meeting future obligations to employees under DB plans.

Second, activists can cause underfunding by demanding more cash payouts from the firm. Bean and Bernardi (2000) find a significant positive correlation between the increase in pension liabilities and dividend payments. They argue that the underfunding of pension funds is a unilateral decision by management that effectively transfers risk from stockholders to employees and the society.

Third, HF activism can hurt employee pension health by increasing takeover pressure. Stein (1988) shows that takeover pressure leads managers to sacrifice the firm's long-term interests to boost current profits. Shleifer and Summers (1988) argue that hostile takeovers enable shareholders to transfer wealth from workers to themselves. Cocco and Volpin (2013) find that defined benefit pensions act as takeover deterrents. Pontiff, Shleifer and Weisbach (1990) and Rosett (1990) find that pension plan terminations rise after hostile rather than friendly takeovers, suggesting that wealth transfers from employees are a source of shareholder gains in hostile takeovers. They also find that reversions following takeovers occur primarily in DB plans, where the potential for wealth transfers is the greatest (see also Harper and Treanor, 2014).

3. Data and Methodology

3.1. Institutional Background

3.1.1. Corporate Pension Plans

A pension plan can be either a defined benefit (DB) plan or a defined contribution (DC) plan. A DB plan promises a specified monthly benefit at retirement.[5] The plan may state this promised benefit as an exact dollar amount, such as $1,000 per month after retirement. More commonly, it promises a benefit through a plan formula that considers such factors as salary and service (i.e., 1 percent of average salary for the last 5 years of employment for every year of service with the employer).

A DC plan does not promise a specific amount of benefit at retirement. In these plans, the employee, the employer or both contribute to the employee's individual account under the plan, sometimes at a set rate, such as 5 percent of earnings annually. These contributions generally are invested on the employee's behalf. The employee will ultimately receive the balance in their account, which is based on contributions plus or minus investment gains or losses. The value of the account fluctuates with changes in the value of the investments and contributions. Examples of defined contribution plans include 401(k) plans, 403(b) plans, employee stock ownership plans (ESOP), and profit-sharing plans.

[5] Detailed definitions of DB and DC plans are available at the DOL website: http://www.dol.gov/dol/topic/retirement/typesofplans.htm.

3.1.2. HF activism

When a person or group of shareholders acquires beneficial ownership of more than 5% of a voting class of a company's securities, they are required to file a Schedule 13D with the SEC in accordance with the Securities and Exchange Act of 1934. The initial 13D must be filed within 10 days of the shareholders taking their stake. In general shareholders who acquire greater than a 5% stake and intend to change or influence the control of the target must file a 13D, while those who do not intend to engage in any activism file a 13G instead. A beneficial owner having filed an initial 13D is required to file an amended 13D/A promptly if any material change occurs in the contents disclosed in the initial 13D. The most important section of a 13D filing is the purpose(s) of the transactions reported in Item 4 (Aslan and Kumar, 2015). A 13D filing can indicate multiple purposes.

3.2. Sample Selection

3.2.1. Pension Data

Our first pension dataset comes from Compustat Pension annual data files from 1998 to 2014. For tests of underfunding, our sample starts in 1998 because the Statement of Financial Accounting Standards (SFAS) 132 requires disclosure of actual returns starting that year.

Our second dataset on corporate pension plans is from the Form 5500 Private Pension Plan Research Files, available from the Department of Labor (DOL). Under ERISA and the Internal Revenue Code, most private-sector employer sponsored employee benefit plans are required to provide annual reports on the plan's financial condition, investments, and operations with the DOL, Internal Revenue Service (IRS), and the PBGC. IRS Form 5500 contains pension

asset and liability values, and must be filed annually by pension plan sponsors for plans with greater than 100 participants.

3.2.2. HF activism Data

HF activism data come from the Audit Analytics Shareholder Activism database. Recent research on shareholder activism focuses on HF activism and uses limited, proprietary data. Our data is from a comprehensive database of all initial and amended Schedule 13D filings by all types of investors from 2001 to 2014. We focus on large outside shareholders who are not affiliated with the target. To identify the type of shareholder activist, we use 13D filings, Bloomberg Terminal, Internet sources, and news searches. Item 4 of a 13D filing contains a specific box for any pooled investment fund to identify itself as either a hedge fund, private equity, venture capital, or other investment fund. Bloomberg database is better able to classify these funds and does not suffer from self-reporting bias as most institutional investors such as HFs are customers of Bloomberg and maintain business relationships with it (see, e.g., Bae, Baik and Kim, 2011). We identity 530 HF activists over our sample period that made 2,546 initial 13D filings. After deleting targets whose corporate pension data is not available on Compustat Pension annual data files, our final sample consists of 2,264 HF activism events.

3.2.3. Other Data

Financial accounting and stock return information come from Compustat annual files and CRSR daily files, respectively. Data on other firm characteristics are from Thomson Financial, IBES, and RiskMetrics. Data on CEO incentives is computed from ExecuComp.

Table 1 reports the annual number of HF activism events and the industry distribution of target firms. The number of activism events was at a minimum of 80 in 2001 and reached a maximum of 259 in 2008 over the sample period. Business equipment manufacturers and financial firms are the most frequent targets of HF activism.

3.3. Matching

To address potential selection bias and control for firm heterogeneity, we match our sample of firms targeted by HF activists (henceforth, target firms) with a control sample constructed using the coarsened exact matching (CEM) method (Iacus, King and Porro, 2011; Duygan-Bump, Parkinson, Rosengren, Suarez and Willen, 2013).[6] We match each target firm in year t with a non-target firm from the same year. Matching is based on lag 1 of the following variables: 4-digit SIC industry-adjusted Tobin's Q, leverage, ROA, an indicator of negative ROA, log of market value, log of total assets; and lag 3 of industry-adjusted Tobin's Q.

We report summary statistics comparing the characteristics of the target firms with control firms one year prior to the year of targeting. Table 2 presents the mean values and the number of observations (N) for each of the selected firm characteristics. The last column reports the difference between the two means, most of which are negligible in magnitude; none of them

[6] The CEM method creates a grid from the coarsened support of each variable in observable characteristics of firms, and then exactly matches target firms with non-target firms in the same cells. Iacus, King and Porro (2011) show that the CEM method has several advantages over common matching methods such as propensity score matching (PSM). CEM reduces the imbalance between comparison groups, is independent from the assumption of functional form of the matching system (e.g., the logit score in PSM), avoids extreme counterfactual comparisons for targets without close matches, and considers higher moments of the distribution of observable variables to match treatment and control firms.

is statistically significant. The table suggests that our matching process is reasonable. After merging all the datasets and matching, our sample consists of target and control firms in 2,264 activism events over 2001-2014. The sample contains 1,772 unique target firms.

3.4. Methodology

To test the underfunding hypothesis, we examine the relation between HF activism and corporate pension funding status. The pension sample consists of firm-year level observations from 1998 to 2014, where firms are limited to HF targets and their matched firms over 2001-2014. Following Brav, Jiang, Ma and Tian (2016), our main regression adopts the difference-in-differences (DiD) approach:

$$y_{i,t} = \alpha_0 + \alpha_1 Post_{i,t} + \alpha_2 Target_i \times Post_{i,t} + \underline{\alpha_3} Control_{i,t} + \underline{\alpha_4} Year_t + \underline{\alpha_5} Firm_i + \varepsilon_{i,t} \quad (3)$$

where the dependent variable $Y_{i,t}$ is *Underfund* of firm i at time t. *Target*$_i$ equals one if firm i is a target of activism over the sample period; it equals zero otherwise. *Post*$_{it}$ equals one if the firm-year (i,t) observation falls within $[t+1, t+5]$ years of an activism event or a pseudo-event; it equals zero otherwise. $Control$ is a vector of firm i's controls. Appendix A defines all the variables. We also include year and firm fixed effects to eliminate macroeconomic and firm-specific effects. The regressions do not control for *Target*$_i$ because its effect is subsumed in the firm fixed effect. We report t-statistics based on standard errors clustered at the firm level or firm and year level.

3.5. Dependent Variables

We test our main hypothesis with *Underfund* as the dependent variable. These analyses are at the firm-year level. We define *Underfund1* as pension liabilities minus fair value of

pension assets, all divided by pension liabilities at the end of the year. So a high *Underfund1* indicates a poorly funded pension plan (Anantharaman and Lee, 2014). Our second measure of underfunding, *Underfund2,* is funding level defined as pension liabilities divided by pension assets. We also examine asset allocation, asset returns, and employer contribution measures. Specifically, *%Equity* is pension asset allocation in equity. *Return* is actual return on plan assets. *Contribution* measures employer contributions. We supplement Compustat Pension data with the IRS research file. IRS datasets contain information on pension participants and the freezing status. Using the IRS data, we measure employer contribution per participant and a frozen indicator that equals one for a firm that freezes its defined benefit plans.

3.6. Key independent variables

We test our main hypothesis using a difference-in-differences framework as in equation (3). Our main interest is in coefficient α_2, which compares the change in the level of underfunding in target firms post-activism to that in matched firms.

3.7. Control variables

We control for various plan characteristics such as plan size, the chosen discount rate, and pension duration as these may affect plan funding status (see, e.g., Rauh, 2009; Amir and Gordon, 1996; Asthana, 1999; Sundaresan and Zapatero, 1997). We also control for firm characteristics which might affect funding status and the possibility of being targeted by HF activists. Specifically, we control for firm size, book-to-market ratio as a proxy for investment opportunities, sales growth, leverage, profitability, firm value, and firm age. Finally, we control

for cash flow from operations and its standard deviation because underfunded firms are more likely to be cash-constrained (see, e.g., Coronado and Liang, 2005).

4. Baseline Results

Analyzing pension underfunding is important because it represents partially unfunded future obligations, and thus imposes significant liabilities of target firms. Table 3 reports the results. Our regression results support our main hypothesis that employees of target firms experience underfunding of DB pension plans one year to three years after activism events. In column (1) the underfunding variable is scaled by pension liabilities, and in column (2) pension liabilities is scaled by pension assets of the target. The coefficient of $Target_i$ x $Post_{it}$ is positive in both columns, which shows that firms are more likely to experience underfunding after being targeted by HF activists relative to otherwise similar control firms. In terms of economic magnitude, the coefficient estimate of 0.03 on Target*Post in column (1) implies that DB pension plans of target firms experience an increase in underfunding of 3.0% of projected benefit obligations per year over the years [t+1, t+5], where t is the year of targeting. The corresponding coefficient estimate of 0.147 in column (2) means that the projected benefit obligations of these firms balloon by as much as 14.7% of plan assets per year over the same period. These effects are economically large and statistically significant. This finding is consistent with the view that shareholder activists extract wealth from employees.

5. Underlying Mechanisms

Having shown deterioration in employee pension funding following HF activism, we next try to identify the mechanisms underlying this effect. How does a pension plan of a target company become underfunded? One possible explanation is that funding levels go down over time because sponsors' contributions to the plans do not keep up with additional benefit accruals year-after-year. This hypothesis is consistent with the opening example of Timken Corporation. To test whether underfunding results from reduced employer contributions, we re-estimate the DiD regressions in Table 3 after replacing the dependent variables with three measures of employer contributions to the plans. Specifically, we use the following measures of contribution: *Contribution1* (Employer contribution in $ millions), *Contribution2* (Employer contribution $ / Number of participants), and *Contribution3* (Unexpected contribution = (Employer contribution $ at time t - Expected next year employer contribution at time t-1)/ Total Assets at time t-1. Table 4 reports the results. Consistent with our conjecture, target firms reduce their cash contributions to employee pension plans after being targeted by HF activists. This evidence confirms that employee pension plans suffer from underfunding due to reduced employer contributions to the plans.

Next, we examine whether HF activism affects asset allocation decisions of pension plans because pension funding and asset allocation are closely intertwined. First, funding decisions often determine asset allocation decisions. For example, underfunded plans may be more inclined to invest in risky assets to earn their way out of underfunding. Second, asset allocation decisions can affect funding levels. For example, a good year for the stock market can reduce the level of future contributions needed to maintain plan health for some time. Third, stockholders

are inclined to tilt pension portfolios towards high-risk, high-return assets, so as to provide pension benefits more efficiently and cheaply. Whether such a tilt happens and whether it leads to improved asset performance in terms of actual returns (not alpha) are both empirical questions. We use the DiD approach, replacing the dependent variables in Table 3 regressions with asset allocation to equity, *%Equity*, which measures the percentage of pension assets allocated to equity. Table 5 reports the results. We find that targeted firms tend to invest more in risky assets such as equity. This result is consistent with the view that shareholders prefer riskier investment of pension plan assets. After being targeted by HF activists, target firms tend to take more risk in pension plans.

The next obvious question is that whether this risky investment results in higher performance of plan assets. Although sponsors' contributions to plans do not keep up with additional benefit accruals year-after-year, if pension plans perform better due to risky investment, pension plan funding levels would not be compromised. We use the DiD approach, replacing the dependent variables with pension asset return, *Return*, which measures the actual return on plan assets. Table 6 shows that after being targeted by activists, the firm does not experience superior performance in pension plans.

6. Empirical Evidence using the IRS Research File

So far we have used the Compustat Pension data as our primary data source on employee pension plans. In this section, we shed additional light on our research question using data from the IRS research file. IRS data is at the pension plan level, while Compustat data is at the firm

level; and IRS data indicates the status of defined benefit pension plans (frozen or active), while Compustat does not.

Does HF activism lead to the freezing of defined benefit employee pension plans? We measured pension plan health using underfunding levels so far. While our evidence suggests that firms targeted by activists seeking to improve stockholder value underfund their existing pension liabilities, another avenue is to lower the promised benefit levels. In other words, activism might result in real reductions to the levels of pension benefits provided to employees through benefit freezes, discontinuing plans for new hires, or changes in the benefit formulae to reduce the level of pension benefits accruing for a given period of service.

To test the effect of activism on pension terminations, we examine firms' decisions to freeze additional pension plan benefits. In response to shareholder pressure, managers can transfer wealth from employees to shareholders by freezing defined benefit plans. A freeze means that employees no longer accrue pension benefits from their future service, which is a clear loss of wealth to employees (see, e.g., Comprix and Muller, 2011; Choy, Lin and Officer, 2014; Rauh, Stefanescu and Zeldes, 2016). We define a freeze as the one-time event of frozen DB plans. We obtain freezing status from the IRS database from 2007 to 2014. We use the DiD approach, replacing the dependent variables in Table 3 with an indicator variable for frozen DB plans, *Frozen*. The sample size drops considerably due to missing data on the *Frozen* variable. But based on the limited sample for which data is available, Table 7 shows that firms do not experience significant pension terminations after being targeted by HF activists.

Defined benefit pension plans are becoming rare in the private sector. Over the last several decades, there has been a significant shift from the traditional defined-benefit plan to the flexible defined-contribution plan (see, e.g., Rauh, Stefanescu and Zeldes, 2016). Activists who

push funding down may well accelerate this process. So we examine the extent to which activists are accelerating the shift from DB to DC plans. To test the effect of activism on a possible shift away from DB plans, we use the DiD approach, replacing the dependent variables with an indicator variable for DC plans, *DC*.[7] Table 8 shows that HF activism has no effect on the choice of DC vs. DB plans.

Finally, we examine whether activists change the benefits formulae to reduce the level of pension benefits accruing for a given period of service. Andonov, Bauer and Cremers (2016) find that U.S. public pension funds with a higher level of underfunding per participant, as well as funds with more politicians and elected plan participants serving on the board, take more risk and use higher discount rates. Stefanescu, Wang, Xie and Yang (2016) find that large U.S. companies modify the inputs of benefit formulas of top executives' defined benefit pension plans before plan-related events. Specifically, firms lower plan discount rates by 13–35 basis points when top executives are ready to retire with a lump-sum benefit distribution. However, they find no pension-related bonus boosts or discount rate manipulation at firms with strong corporate governance. We use the DiD approach, replacing the dependent variables with an indicator of *Discountrate*. Table 9 shows that after being targeted by activists, firms increase the pension discount rate used to compute the present value of pension liabilities, though the coefficient estimate of this increase is statistically insignificant.

[7] We use the linear probability model instead of the logit model here. The logit model does not converge because the regression includes firm fixed effects.

7. Identification

Sections 4 and 5 show clear evidence of deterioration in employee pension funding following HF activism. These results support our main hypothesis that firms targeted by HF activists transfer wealth from employees to shareholders. However, these findings are also consistent with other plausible explanations. In this section, we test five alternate interpretations of our findings by way of identification. One concern is that the selection of target firms by HFs is not random. We address this concern by using the CEM method to control for observable attributes of target firms that may attract HF activists. However, our matching approach cannot rule out the possibility that some unobservable factors drive subsequent changes in employee pension funding. We, therefore, use multiple approaches to address this issue and try to rule out several alternative explanations of our findings.

Our first test is designed to address the stock picking skill of HFs. Activists are skilled at picking stocks with improving prospects even if they remain passive shareholders. Following Kim, Kim and Kwon (2009), Brav, Jiang and Kim (2015a), and Aslan and Kumar (2015), we examine the effect of HF activism on underfunding when the HF switches from being a passive, 13G filer, to being an active, 13D filer. If our results are merely driven by the activist's stock picking skill, this switch should have no effect on pension underfunding because both 13G and 13D filings indicate the same stock picking skill that led to the purchase of a 5% stake in the firm. We find 391 cases in our sample where the filer switched from a 13G to a 13D. We then re-estimate our baseline regression in column (1) of Table 3 after adding a triple interaction variable, GD*Target*Post, where GD equals 1 for target firms where the activist switches from 13G to 13D, and equals zero otherwise. The *Post* indicator equals 1 for years [t+1,t+3] , and

equals zero otherwise. Column (1) of Table 10 shows the result. We find a significant positive effect on underfunding of target firms in the three years after an activist switches its filing from 13G to 13D. This finding does not support the idea that the impact of HF activism on pension underfunding is merely due to the activist's stock picking skill.

Our second test examines the possibility that our results merely pick up mean-reversion in pension funding by target firms. Pension funding may decrease after intervention simply due to mean-reversion because it increased before the intervention. We set up a placebo test wherein we define a pseudo-event year and examine the targets' response to this pseudo-event. The pseudo-event is defined as three years before the true activism event year, following Aslan and Kumar (2015). We examine the effect of HF activism on underfunding when target firms experience this pseudo-event. We expect a significantly negative effect of HF activism after the pseudo-event if our results are merely picking some existing trends. Column (2) of Table 10, however, shows an insignificant coefficient on the DiD term. This result does not support the idea that the changes in pension underfunding we observe after activism are simply an artifact of mean-reversion.

Our third test investigates the possibility of voluntary reform by the management of the target firm. This alternative hypothesis suggests that target firms voluntarily change their funding policy on employee pension plans without any pressure from a HF. Hard activism involves disputes between shareholder activists and target management due to management's resistance to the activist's agenda. So for hostile events, it is difficult to attribute any changes to voluntary reforms by management because we know that management in these cases resisted the actions demanded by activists (see Brav, Jiang and Kim, 2015a). Therefore, hard activism rules out the

possibility of voluntary reforms by management. If we find underfunding of pension plans after hard activism, we can safely conclude that the change was not voluntary.

To examine this possibility, we classify activists' approaches based on their stated tactics in 13D filings. Hard activism consists of cases when an activist publicly criticizes the targets or publicly announces a dispute with target management, while in *Soft* activism, an activist adopts a softer approach by communicating privately with management.[8] Managements of firms targeted by hard activism are obviously unwilling to adopt reforms demanded by activists, so we can rule out the possibility of voluntary reforms in this case. In other words, hard activism should not have an effect if our results are merely picking voluntary reforms by target firms. We define an indicator variable Hard, which equals 1 for hard activism and zero for soft activism, and interact it with Target*Post. The voluntary reforms story implies that the coefficient of this interaction term should be zero. But column (3) of Table 10 shows a marginally significant coefficient on the triple interaction term, Hard*Target*Post, implying that targets are more likely to experience underfunding when the pressure from activist shareholders is strong. This finding supports the hypothesis that the underfunding of target firms is due to pressure from HF activists rather than voluntary reforms by target firms.

Our fourth test addresses a potential attrition bias that can affect firms targeted by HF activists. Specifically, our results may be driven by a few targets who delisted after activism. Jiang, Li and Mei (2016) find that target firms are more likely to be sold after activism. Firms

[8] Our full sample includes all types of tactics employed by HF activists. Activists may publicly support or agree with management, while trying to pressure or influence them behind-the-scenes. Activists may also publicly threaten to exit if their demands are not met. To examine the effect of shareholder pressure on target firms, we focus on two of these tactics (hard activism vs. soft activism) for the purpose of this test, which decreases the sample size substantially.

with underfunded pensions are also more likely to go bankrupt (see Duan, Hotchkiss and Jiao, 2015). To address this concern about our main hypothesis, we re-estimate the DiD regression in Table 3 after eliminating firms that are delisted within three years of the onset of activism. Our results (untabulated) continue to hold in terms of both economic and statistical significance. This finding negates the idea that our results can be explained by the delisting of target firms after activism.

Our final test addresses the possibility that reducing pension funding may be the least costly way to restructure a financially distressed firm. To examine this hypothesis, we compute Altman's Z score for each of our sample firms and interact it with our DiD variable, Target*Post. Altman's Z score measures a firm's financial strength; it is an inverse measure of the probability of bankruptcy of a firm. Column (4) of Table 10 shows that the effect of activism on underfunding is stronger when firms are financially healthier. This finding suggests that pension underfunding is not due to target firms' efforts to deal with financial distress.

8. Conclusion

Shareholder gains from activism can come from wealth transfers from workers. Existing empirical evidence in support of this hypothesis is quite limited. Specifically, there is no prior evidence that employee pensions suffer from HF activism. In this paper, we fill this gap by comparing the funding levels of pension plans before and after HF activism. We find that on average, DB employee pension plans of target firms suffer from underfunding after the activism episode. This effect is caused by reduced employer contributions to the pension plans. While targeted firms take more risk when investing pension plan assets, the plans show no

corresponding increases in their returns. We find no empirical support for several alternative hypotheses such as activists' stock-picking skills, voluntary changes adopted by management, mean-reversion, attrition bias, and financial distress. Overall, this paper extends the literature showing that HF activism transfers wealth from other stakeholders to shareholders (see, e.g., Klein and Zur, 2011; Brav, Jiang and Kim, 2015; and Feng, Xu and Zhu, 2016). Our empirical results point to a negative effect of HF activism on workers' welfare. Finally, our findings have important implications for public guarantees and regulation of private pension plans.

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Table 1

Hedge fund activism

The table shows the number of HF activism events by year and by Fama-French 12 industry. An HF activism event represents a 13D filing by a hedge fund. When a person or investor group acquires beneficial ownership of 5% or more of a voting class of a company's securities and intend to change or influence the control of the firm, they are required to file a 13D with the SEC within 10 days of acquiring the stake. The sample consists of 2,264 activism events by 530 HFs during 2001-1014 with data on defined benefit pension plans of target firms available on Compustat Pension annual data files.

Year	Freq.	Percent		Fama-French 12 industries	Freq.	Percent
2001	80	3.53				
2002	89	3.93	1	Consumer NonDurables	86	3.8
2003	119	5.26	2	Consumer Durables	53	2.34
2004	133	5.87	3	Manufacturing	182	8.04
2005	210	9.28	4	Energy	68	3
2006	231	10.2	5	Chemicals and Allied Products	43	1.9
2007	258	11.4	6	Business Equipment	466	20.58
2008	259	11.44	7	Telephone and Television Transmission	78	3.45
2009	137	6.05	8	Utilities	29	1.28
2010	166	7.33	9	Wholesale, Retail, and Some Services	216	9.54
2011	171	7.55	10	Healthcare, Medical Equipment, and Drug	256	11.31
2012	132	5.83	11	Finance	455	20.1
2013	135	5.96	12	Others	332	14.66
2014	144	6.36				
Total	2,264	100		Total	2,264	100

Table 2
Summary statistics for target and control samples

The table compares firm characteristics of target and control firms one year prior to the year of the activism event. We match each target firm to a non-target firm on Compustat from the same year using the coarsened exact matching method. Matching is based on lag 1 of the following variables: 4-digit SIC industry-adjusted Tobin's Q, leverage, ROA, an indicator of negative ROA, log of market value, log of total assets; and lag 3 of industry-adjusted Tobin's Q. For each variable, we report the number of firm-year observations (N), the mean value, and the differences in mean values between the target and matched firms, none of which are statistically significant at the 10% level or better. Appendix A defines all the variables.

	Non-Targets		Targets		
Variables	N	Mean	N	Mean	MeanDiff
Underfund1	535	0.30	589	0.286	0.01
lnFVPA	564	3.59	614	3.761	-0.175
Employer contribution	529	23.03	577	21.609	1.42
OCF	2107	0.02	2127	0.012	0.004
TDA	2137	0.21	2148	0.22	-0.01
ROA	2105	0.03	2118	0.03	0.00
lnMV	2235	5.43	2235	5.36	0.07
lnAge	1207	2.08	1245	2.08	0.00
SIZE	2143	5.86	2152	5.86	0.00
INV	2102	0.05	2123	0.04	0.00
RD	1059	0.11	1171	0.10	0.01
Amihud	2230	-0.02	2219	-0.01	-0.01
FHT	2230	0.01	2219	0.01	0.00
Ind-adj MB	2140	1.29	2150	1.25	0.03
INST	2239	0.48	2239	0.43	0.05
Analyst	2239	3.51	2239	3.72	-0.21

Table 3

Hedge fund activism and defined benefit pension plans

The table documents the dynamics of pension underfunding around HF activism. The sample includes firms targeted by HF activists and control firms as described in Table 2. We use the following difference-in-differences specification:

$$y_{i,t} = \alpha_0 + \alpha_1 Post_{i,t} + \alpha_2 Target_i \times Post_{i,t} + \underline{\alpha_3} Control_{i,t} + \underline{\alpha_4} Year_t + \underline{\alpha_5} Firm_i + \varepsilon_{i,t}$$

where the dependent variable measures underfunding of firm i in year t. In column (1), the dependent variable is Underfund1 = (Projected Benefit Obligation - Pension Plan Assets)/ Projected Benefit Obligation. In column (2) the dependent variable is Underfund2 = Projected Benefit Obligation / Pension Plan Assets. *Target* is a dummy variable equal to one if firm i is a target of activism at year t. *Post* is a dummy variable equal to one if the firm-year (i,t) observation is within [$t+1$, $t+5$] years of an activism event or a pseudo-event year, zero otherwise. *Control* is a vector of firm i's controls. The regressions include year and firm fixed effects. We report t-statistics based on standard errors clustered at the firm level. Appendix A defines the variables. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Underfund1	(2) Underfund2
Target*Post	0.030**	0.147**
	(2.34)	(2.10)
Post	0.003	-0.001
	(0.41)	(-0.03)
lnFVPA	-0.175***	-0.748***
	(-7.22)	(-3.50)
OCF	0.055	-0.020
	(0.84)	(-0.07)
Std_OCF	-0.473***	-0.696*
	(-2.81)	(-1.96)
Discountrate	-0.036***	-0.071
	(-4.64)	(-1.53)
Duration	0.043*	-0.068
	(1.89)	(-0.62)
SIZE	0.045**	0.314***
	(2.24)	(3.25)
ROA	-0.057	-0.621*
	(-0.62)	(-1.65)
TDA	-0.021	-0.173
	(-0.37)	(-0.94)
SaleG	-0.004	0.249
	(-0.31)	(1.63)
lnMV	-0.022*	-0.107*

	(-1.80)	(-1.96)
MB	-0.004	0.047
	(-0.20)	(0.76)
lnAge	0.065***	0.035
	(2.98)	(0.51)
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	3061	2810
R^2	0.441	0.187

Table 4

Employer contribution

The table estimates the effect of HF activism on employer contributions. We use the difference-in-differences specification as in Table 3, and replace the dependent variable with a measure of employer contributions. Contribution1 = Employer contribution in $ millions; Contribution2 = Employer contribution / Number of participants; and Contribution3 = Unexpected contribution = (Employer contribution in year t - Expected next year employer contribution in year t-1)/ Total assets at the end of year t-1. Control variables are as in Table 3. Standard errors are clustered at the firm and year level. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Contribution1	(2) Contribution2	(3) Contribution3
Target*Post	-6.761**	-0.001*	-0.001**
	(-2.07)	(-1.66)	(-2.18)
Post	2.293	0.001	0.001***
	(1.12)	(1.43)	(2.96)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
N	2196	1387	1192
R^2	0.099	0.107	0.048

Table 5

Pension asset allocation

The table estimates the effect of HF activism on employee pension asset allocation. We use the difference-in-differences specification as in Table 3, and replace the dependent variable with %Equity, defined as the pension asset allocation to equity (%). Control variables are as in Table 3. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) %Equity	(2) %Equity	(3) %Equity
Target*Post	0.026**	0.026	0.026*
	(2.24)	(1.52)	(1.66)
Post	-0.018**	-0.018	-0.018*
	(-2.01)	(-1.58)	(-1.70)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Cluster	No	Firm	Firm and Year
N	1521	1521	1503
R^2	0.163	0.163	0.163

Table 6

Pension performance

The table estimates the effect of HF activism on employee pension returns. We use the difference-in-differences specification as shown in Table 3, and replace the dependent variable with Return (=Actual return on pension plan assets / Pension plan assets). Control variables are as in Table 3. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Return	(2) Return	(3) Return
Target*Post	-0.001	-0.001	-0.001
	(-0.13)	(-0.19)	(.)
Post	-0.008	-0.008	-0.008***
	(-1.02)	(-1.56)	(-9.30)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Cluster	No	Firm	Firm and Year
N	4832	6746	5855
R^2	0.274	0.595	0.239

Table 7

Pension plan termination

The table estimates the effect of HF activism on freezing of employee pension plans. We use the difference-in-differences specification as in Table 3, and replace the dependent variable with Frozen, which is an indicator variable that equals one for firms that have their defined benefit pension plans frozen in a given year and equals zero otherwise. Data on pension freezing status are from the IRS for the years 2007 to 2014. Control variables are as in Table 3. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Frozen	(2) Frozen	(3) Frozen
Target*Post	-0.019	-0.019	-0.019
	(-0.72)	(-0.53)	(-0.66)
Post	-0.044**	-0.044	-0.044
	(-2.22)	(-1.54)	(-1.60)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Cluster	No	Firm	Firm and Year
N	849	849	832
R^2	0.161	0.161	0.161

Table 8

Defined contribution plans

The table estimates the effect of activism on the selection of defined contribution (DC) plans. We use the difference-in-differences specification as shown in Table 3, and replace the dependent variable with DC, which equals one for firms choosing defined contribution pension plans in a given year and equals zero otherwise. Data on the type of pension plan chosen by firms are from the IRS for the years 2001 to 2014. Control variables are as in Table 3. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) DC	(2) DC	(3) DC
Target*Post	-8.323	-8.323	-8.323
	(-0.71)	(-0.59)	(-0.65)
Post	-0.494	-0.494	-0.494
	(-0.06)	(-0.10)	(-0.11)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Cluster	No	Firm	Firm/Year
N	1869	1869	1843
R^2	0.027	0.027	0.027

Table 9

Pension discount rate

The table estimates the effect of activism on pension discount rate. We use the difference-in-differences specification as in Table 3, and replace the dependent variable with *Discountrate*. Control variables are as in Table 3, except they omit Discountrate. The *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) Discountrate	(2) Discountrate	(3) Discountrate
Target*Post	0.011	0.011	0.011
	(0.25)	(0.26)	(0.25)
Post	0.019	0.019	0.019
	(0.44)	(0.50)	(0.44)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Cluster	No	Firm	Firm and Year
N	2814	2786	2814
R^2	0.787	0.787	0.787

Table 10

Identification

Each column in the table reports the result of a variant of the regressions in Table 3. Column (1) in the table examines the effects of switches in filing status from Schedule 13G (passive ownership) to Schedule 13D (active ownership). *GD* is an indicator of the switcher. *Target* equals one for a target firm and zero for a control firm. *Post* equals one if a firm is within $[t+1, t+3]$ years after an activism or a pseudo-activism event. Thus, *GD*Target*Post* indicates the effect of the switch on the target firm during $[t+1, t+3]$ years after the switch. Column (2) conducts a falsification test by creating a placebo dummy, *Placebo*. The placebo event year is three years before the actual event date. The dependent variable in column (3) is a dummy variable *Hard*, which equals one if a HF targets a firm with hard activism and equals zero for soft activism. We interact this dummy with the *Post* indicator. This regression is performed on the subsample of hard and soft activism events only. In column (4), we interact Altman's Z-score, which measures the financial strength of a firm, with our DiD variables, *Target*Post*. Control variables are as in Table 3. We also include year and firm fixed effects. We report t-statistics based on standard errors clustered at the firm and year level. Appendix A defines the variables. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep. Var.: Underfunding/ Liabilities	(1) G to D Switcher	(2) Placebo tests	(3) Hard vs. Soft	(4) AltmanZ
{G→D Switchers (1), Placebo (2), Hard (3), or AltmanZ (4)} × Target × Post	0.081***	-0.011	0.106*	0.010***
	(3.22)	(-0.79)	(1.74)	(3.71)
Post	0.012*	0.011	0.033*	0.003
	(1.86)	(1.27)	(1.77)	(0.34)
AltmanZ				-0.009**
				(-2.02)
Target×Post				0.007
				(0.49)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
N	3033	3033	858	2506
R^2	0.441	0.439	0.551	0.454

Appendix A
Variable Definitions

This table defines the variables used in the analysis. L*ag* indicates that a variable is lagged by a year. Names in block capitals are Compustat variable names.

Variable	Definition
Pension	**Data Source: Compustat Pension**
Underfund1	{Pension liabilities (PBPRO) – fair value of pension assets (PPLAO, millions)} / PBPRO
Underfund2	PBPRO / PPLAO
lnFVPA	=ln(PPLAO)
Discountrate	Discount rate actuarial assumption (PBARR)
Returns	Actual returns from plan assets (PBARAT/PPLAO)
%Equity	Pension Asset Allocation – Equity (PNATE/100)
Contribution	Pension Employer Contribution (PBEC) in $ millions
Firm	**Data Source: Compustat**
SIZE	Ln(AT in $ millions)
ROA	Earnings before interest, taxes, depreciation, and amortization (OIBDP) / AT
TDA	(DLC+DLTT)/AT
lnMV	Ln(Market value of equity (PRCC_F× CSHO))
SaleG	(SALE-lag_SALE) / lag_SALE
lnAge	Ln(Fiscal year – IPO year)
INV	CAPX / AT
RD	XRD / AT
AltmanZ	1.2*(ACT-LCT)/AT + 1.4*RE/AT + 3.3*(NI+XINT+TXT)/AT+0.6*CSHO*PRCC_F/LT + 0.999*SALE/AT)
Ind-adj MB	Industry-adjusted market-to-book ratio, based on 4 digit SIC codes
OCF	Cash flows from operations (OANCF) / AT
Std_OCF	Standard deviation of OCF for the current and previous four years.
Institutions	**Data Source: Thomson financial Database on 13F filings**
INST	Total institutional ownership, percent of shares outstanding
INST HHI	Ownership concentration - Herfindahl-Hirschman Index
Analysts	**Data Source: IBES database**
ANALYST	Number of analysts covering the firm
Stock Returns	**Data Source: CRSP daily file**
FHT	2×(Standard deviation of stock returns)×Inverse of Normal distribution of ((1+ZEROS)/2), where ZEROS = zero return days / total trading days in a given year
AMIHUD	= -1000×{∑(Absolute value of (RET)/VOL)/ total trading days in a given year}. all CRSP Items are reported as upper capital
Activism	**Data Source: Shareholder Activism Database from Audit Analytics**
d[t+k]	=1 if the plan belongs to a targeted firm in year t+k where t is the event year.