Shareholder response to pension deficit: evidence from the COVID-19 pandemic

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Abstract

We examine the impact of firms' pre-crisis pension underfunding on stock returns of US firms during the COVID-19 stock market crisis. Unlike the prior studies, our study uses the COVID-19 pandemic as an exogenous shock to pension underfunding and reports that shareholders remain indifferent to firms' pension underfunding. The impact of pension underfunding remains trivial even after considering firms' possible financial constraints, information asymmetry, and mandatory contributions associated with the underfunding. Our findings suggest that shareholders acknowledge pension deficit as a firm's true liability only when pension underfunding contributions start affecting earnings and cash flows in the future.

Keywords COVID-19 · Pension deficit · Stock returns

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The funded status of the nation's largest corporate pension plans fell by eight percentage points during the first quarter of 2020, driven primarily by declines in equity markets…

Willis Towers Watson, 2020[1]

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[1] https://www.willistowerswatson.com/en-US/News/2020/04/covid-19-takes-bite-out-of-us-corporate-pension-plans. Pension plan assets decreased from $1.52 (at the end of 2019) to $1.40 trillion as of March 31, 2020. On the other hand, pension plan liabilities increased from $1.75 (at the end of 2019) to $1.76

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1 Introduction

Over recent years, we have seen growing attention toward the real and stock market effects of pension underfunding of defined-benefit (DB) corporate pension plans Franzoni and Marin 2006; Bergstresser et al. 2006; Jin et al. 2006; Rauh 2006; Cocco and Volpin 2013; Cocco 2014; Comprix and Muller 2011; Balachandran et al., 2019). The earlier studies report mixed evidence on the impact of pension underfunding on shareholder wealth. However, there is a growing consensus that unique regulations and assumptions (like discount rates) applied to compute pension plan liabilities make it difficult for shareholders to ascertain pension underfunding as a true liability of DB pension plan sponsors (Balachandran et al., 2019). For instance, Franzoni and Marin (2006) argue that shareholders underreact to pension underfunding and this eventually gets reflected when pension contributions start affecting firms' earnings and cash flows in the future.

Underreaction implies that shareholders do not fully understand the information contained in pension underfunding, i.e., firms' responsibility to fund pension plan liabilities. The funded status of a DB pension plan can either be underfunded or overfunded. Pension underfunding or deficit arises when pension plan liabilities are greater than pension plan assets. On the other hand, pension overfunding reflects pension plan assets to be greater than pension plan liabilities. If a pension plan is underfunded, firms are required to amortize and perform mandatory contributions to make up for pension underfunding (Franzoni and Marin 2006). Severely underfunded firms are also required to make mandatory contributions as per the provisions of the Employee Retirement Income Security Act (ERISA) 1974. Mandatory contributions and amortizations are performed to ensure a reduction in pension underfunding, but this also affects firms' future earnings and cash flows. Hence, the information contained in pension underfunding reflects the true liability of a DB pension plan.

One thing to note is that the prior studies, e.g., Franzoni and Marin (2006), suffer from endogeneity issues; conversely, this study examines the impact of firms' pre-crisis pension underfunding on stock returns of US firms during the COVID-19-induced stock market crisis from 18th February 2020 to 20th March 2020. During this period, the US stock market witnessed one of the severest falls since 1987 (Bae et al. 2021). The COVID-19 pandemic led to an exogenous shift in pension underfunding in the case of firms that were already observing underfunding in 2019. The pandemic led to an exogenous shift in pension underfunding owing to a decrease in pension plan assets. According to a report by Willis Towers Watson (2020)[2] - a leading global advisory, broking, and solutions company – aggregate pension funded status fell by 8% from 87% at the end of 2019 to 79% as of 31st March 2020, particularly due to a fall in pension plan assets.

Since firms having pension underfunding in 2019 became more vulnerable to this substantial fall in pension plan assets during the first quarter of 2020, we consider

trillion as of March 31, 2020. According to the company, pension funded status (i.e., pension plan assets divided by pension plan liabilities) decreased from 87% at the end of 2019 to 79% as of March 31, 2020.

[2] https://www.willistowerswatson.com/en-US/News/2020/04/covid-19-takes-bite-out-of-us-corporate-pension-plans.

only those firms that had pension underfunding in 2019. It potentially accounts for the selection bias and considers an exogenous shift in pension underfunding for such firms during the COVID-19-induced stock market crisis. Agency conflicts, information asymmetry, or other managerial actions can potentially influence the funded status of DB pension plans (Balachandran et al., 2019). Therefore, we restrict our sample to only those firms that had pension underfunding (in 2019) to account for the selection bias.

We expect firms' pre-crisis pension underfunding to contain value implications for shareholders during the COVID-19-induced stock market crisis from 18th February 2020 to 20th March 2020. As a liability, pension underfunding is expected to be negatively related to stock returns. Alternatively, if shareholders take time in processing information contained in pension underfunding, one can also expect shareholders to remain indifferent to immediate pension underfunding of DB pension plans (Franzoni and Marin 2006). It would be insightful to understand shareholder response to firms' pre-crisis pension underfunding during the COVID-19 stock market crisis while setting aside endogeneity-based concerns. Our findings suggest that shareholders do not pay attention to firms' pension underfunding, using the COVID-19 pandemic as an exogenous shock. The impact of pension underfunding remains trivial even after considering firms' possible financial constraints, information asymmetry and mandatory contributions associated with pension underfunding. Overall, the results suggest that shareholders remain indifferent to firms' immediate pension underfunding, and this eventually gets reflected when pension underfunding contributions start affecting earnings and cash flows in the future – consistent with Franzoni and Marin (2006). Our study contributes to the literature examining the stock market and the real effects of the COVID-19 pandemic (e.g., Baker et al. 2020; Ramelli and Wagner 2020; Bae et al. 2021). It also contributes to the literature that examines shareholders' response to pension underfunding of DB pension plans (e.g., Franzoni and Marin 2006; Jin et al. 2006).

The rest of the paper is organized as follows: Sect. 2 describes the empirical framework, Sect. 3 discusses empirical findings, and lastly, Sect. 4 concludes the paper.

2 Empirical framework

Data related to the annual financial characteristics and stock returns is gathered from the COMPUSTAT and CRSP databases. We exclude micro-cap firms with a market capitalisation of less than $250 million (as of last quarter of 2019) from the sample (Bae et al. 2021). We use firm-level raw and CAPM-adjusted cumulative stock returns during the crisis period from 18th February 2020 to 20th March 2020. During this period, the US stock market experienced one of the severest falls since 1987 (Bae et al. 2021). We expect firms' pre-crisis pension underfunding to contain value implications for shareholders during the COVID-19-induced stock market crisis. CAPM-adjusted abnormal stock returns are computed using CRSP value-weighted market returns in 2019 (Albuquerque et al. 2020). Following Balachandran et al. (2019), we define pension underfunding as a difference between pension plan liabilities (projected benefit obligations) and pension plan assets in 2019 divided by the market

capitalization of firms as of the last quarter of 2019. A positive value denotes pension underfunding, whereas a negative value denotes pension overfunding. We consider firms' pension funded status for one year before the COVID-19 pandemic. Thus, we consider only those firms that had pension underfunding in 2019 to account for the selection bias.

Since we intend to examine the cross-sectional influence of firms' pre-crisis pension underfunding on cumulative stock returns during the COVID-19-induced stock market crisis, we use the cross-sectional regression models (in Eq. (1)) to study this impact while simultaneously controlling for other explanatory variables. Our cross-sectional regression model is specified as follows:

$$R_i = \alpha + \beta_1 PensionUnderfunding_{i,2019} + \sum \beta_k ControlVariables_{i,2019} + \sum \beta_n IndustryFixedEffects + \epsilon_i \quad (1)$$

Where, R_i is the dependent variable, i.e., raw and CAPM-adjusted cumulative abnormal stock returns during the COVID-19-induced stock market crisis from 18th February 2020 to 20th March 2020. *Pension Underfunding$_{i,2019}$* captures pension underfunding of sample firms in 2019. To account for unobserved heterogeneity related to industry variations and other omitted factors, we also append industry fixed effects, and control variables such as the logarithm of market capitalization, Tobin's Q, firm leverage, capital expenditures (CAPEX), R&D, ROA, cash holdings, cash flows, momentum, idiosyncratic risk and market beta (existing in the year 2019) into our regression models. All the variables are winsorized at 1% and 99% levels.

Table 1 Descriptive statistics

Variables	N	Mean	S.D.	p25	p50	p75
Raw Returns	909	-0.4035	0.1637	-0.5049	-0.3974	-0.2997
Abnormal Returns	909	-0.0668	0.2511	-0.2318	-0.0760	0.0791
Pension Underfunding	909	4.1950	7.9981	0.4751	1.4830	3.8598
Log (MV)	909	8.5842	1.6308	7.3171	8.4986	9.7671
Tobin's Q	909	1.7616	1.0405	1.1006	1.3833	2.0272
Leverage	909	0.3254	0.1894	0.1963	0.3217	0.4410
CAPEX	909	0.0362	0.0328	0.0134	0.0272	0.0502
R&D	909	0.0167	0.0330	0.0000	0.0000	0.0185
ROA	909	0.1038	0.0596	0.0699	0.1020	0.1382
Cash Holdings	909	0.0893	0.0999	0.0237	0.0568	0.1196
Cash Flows	909	0.0685	0.0607	0.0351	0.0678	0.1018
Momentum	909	0.2623	0.3093	0.0845	0.2463	0.4234
Idiosyncratic Risk	909	0.0004	0.0004	0.0001	0.0002	0.0004
Market Beta	909	1.0611	0.3876	0.8074	1.0702	1.3032

This table presents descriptive statistics for the undertaken variables. All the variable definitions are provided in the appendix

3 Empirical findings

Table 1 presents descriptive statistics for the undertaken variables. We find that 909 firms had pension underfunding in 2019, i.e., the year before the COVID-19 pandemic. The average pension underfunding as a proportion of market capitalization is 4.20%. Firms witnessed a negative return to the tune of -40% and −6.7% in the case of raw and abnormal returns, respectively, during the COVID-19-induced stock market crisis. Further, Table 2 presents our baseline regression results and captures the impact of pension underfunding on stock returns of US firms during the COVID-19 market crisis period. Without considering the control variables, our results support

Table 2 Baseline regression

Variables	(1)	(2)	(3)	(4)
	Raw Returns	**Raw Returns**	**Abnormal Returns**	**Ab-normal Returns**
Pension Underfunding	-0.00239***	0.0000478	0.00124	0.000322
	(-3.13)	(0.06)	(0.89)	(0.24)
Log (MV)		0.00131		-0.00194
		(0.36)		(-0.37)
Tobin's Q		0.0251***		0.0175*
		(3.91)		(1.89)
Leverage		-0.126***		-0.179***
		(-3.68)		(-3.33)
CAPEX		0.132		0.374
		(0.55)		(0.99)
R&D		0.424**		0.808**
		(2.16)		(2.50)
ROA		0.0561		0.308
		(0.31)		(1.13)
Cash Holdings		0.0138		0.142
		(0.21)		(1.35)
Cash Flows		0.217		0.183
		(1.24)		(0.64)
Momentum		-0.0210		-0.0545*
		(-1.16)		(-1.84)
Idiosyncratic Risk		-25.89		20.37
		(-1.17)		(0.60)
Market Beta		-0.0955***		0.250***
		(-5.48)		(8.67)
Observations	909	909	909	909
Industry FEs	Yes	Yes	Yes	Yes
Adjusted R^2	0.24	0.35	0.21	0.35

This table presents baseline regression results and captures the impact of pension underfunding on stock returns of US firms during the COVID-19 market crisis period. Following Bae et al. (2021), the period from 18th February 2020 to 20th March 2020 is considered as the COVID-19 market crisis period. All the variable definitions are provided in the appendix. *t-statistics* based on robust standard errors are reported in the parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively

a negative relationship between pension underfunding and stock returns. This finding mainly suggests that shareholders acknowledge pension underfunding as a true liability of sample firms. However, after accounting for the control variables, the

Table 3 Pension underfunding and financial constraints

Variables	Firm Size		Firm Age		SA Index	
	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns
Pension Underfunding*Low	0.000316	0.00125	0.0000686	0.000714	0.0000546	0.000266
	(0.34)	(0.74)	(0.06)	(0.41)	(0.06)	(0.16)
Pension Underfunding*High	-0.000391	-0.00119	0.0000290	-0.0000333	0.0000419	0.000371
	(-0.31)	(-0.68)	(0.03)	(-0.02)	(0.04)	(0.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	909	909	909	909	909	909
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.35	0.35	0.35	0.35	0.35	0.35

This table presents the impact of firms' pre-crisis pension underfunding on stock returns during the COVID-19 crisis period, across three different measures of financial constraints, i.e., firm size, firm age, and SA index. Following Bae et al. (2021), the period from 18th February 2020 to 20th March 2020 is considered as the COVID-19 market crisis period. Low and High groups are determined based on the median values of the respective financial constraint measures. All the variable definitions are provided in the appendix. *t-statistics* based on robust standard errors are reported in the parentheses

Table 4 Pension underfunding and information asymmetry

Variables	Discount Rate		Analyst Coverage		Institutional Ownership	
	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns	Raw Returns	Abnormal Returns
Pension Underfunding*Low	-0.000166	0.000583	0.000562	0.00123	0.000606	0.00168
	(-0.17)	(0.35)	(0.63)	(0.81)	(0.52)	(0.97)
Pension Underfunding*High	0.000258	0.000130	-0.000417	-0.000841	-0.000379	-0.000456
	(0.25)	(0.07)	(-0.27)	(-0.37)	(-0.37)	(-0.25)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	909	909	866	866	828	828
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.35	0.35	0.36	0.36	0.36	0.36

This table presents the impact of firms' pre-crisis pension underfunding on stock returns during the COVID-19 crisis period, across three different measures of information asymmetry, i.e., pension plan discount rate, analyst coverage, and institutional ownership. Following Bae et al. (2021), the period from 18th February 2020 to 20th March 2020 is considered as the COVID-19 market crisis period. Low and High groups are determined based on the median values of the respective information asymmetry measures. All the variable definitions are provided in the appendix. *t-statistics* based on robust standard errors are reported in the parentheses

results are statistically insignificant, implying that shareholders remain indifferent to immediate pension underfunding of DB pension plans.

Previous studies suggest that firms that are financially constrained or that operate under an asymmetric information environment are more susceptible to a negative reaction from stakeholders (e.g., Balachandran et al., 2019). Therefore, we also consider firm-level financial constraints and information asymmetry while examining the relationship between pension underfunding and stock returns of US firms. Table 3 reports the results after considering the possible financial constraints faced by firms, i.e., firm size, firm age, and Size-Age (SA) index (Hadlock and Pierce 2010; Opie et al. 2019). We determine 'low' and 'high' groups for the respective measures of financial constraints based on the median values. Pension underfunding remains statistically insignificant in the case of firms with both higher as well as lower levels of size, age and Size-Age (SA) index values.

Similarly, we consider pension plan discount rates, analyst coverage, and institutional ownership as a proxy for firm-level information asymmetry. A higher pension plan discount rate is associated with higher information asymmetry, as firms can manipulate pension plan rates (Balachandran et al., 2019). Lower analyst coverage and lower institutional ownership are also associated with higher information asymmetry (Gillian & Starks, 2007; Yu 2008). Our findings in Table 4 report that information asymmetry is also not related to shareholder response to pension underfunding during times of uncertainty.

In Table 5, we also examine the robustness of pension underfunding and its impact on stock returns of US firms during the COVID-19 stock market crisis. First, we also append mandatory pension contributions as one of our control variables. Second, we consider pension underfunding as a proportion of total assets. Third, we compute an

Table 5 Robustness

Variables	Pension Mandatory Contribution		Pension Under-funding/Total Assets		Average Pension Underfunding		All Firms	
	Raw Returns	Ab-normal Returns	Raw Returns	Ab-normal Returns	Raw Returns	Ab-normal Returns	Raw Returns	Ab-normal Returns
Pension Underfunding	-0.000967	-0.00101	0.000707	0.00109	0.0000512	0.000476	0.00001	0.0004
	(-0.76)	(-0.51)	(0.44)	(0.44)	(0.07)	(0.39)	(0.01)	(0.28)
Mandatory Contribution	0.0102	0.0136						
	(0.71)	(0.64)						
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	665	665	909	909	958	958	1,110	1,110
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.40	0.38	0.35	0.35	0.34	0.34	0.34	0.34

This table presents the robust findings related to the impact of firms' pre-crisis pension underfunding on stock returns during the COVID-19 crisis period. Following Bae et al. (2021), the period from 18th February 2020 to 20th March 2020 is considered as the COVID-19 market crisis period. All the variable definitions are provided in the appendix. *t-statistics* based on robust standard errors are reported in the parentheses

average pension underfunding using pension data from the past five years. Fourth, we also consider all firms irrespective of the funded status of DB pension plans in 2019. In un-reported findings, we also employ stock market returns during the post-crisis period, i.e., from 23rd March 2020 to 5th June 2020. During this period, the US stock market witnessed a recovery of 80% of its lost value over the crisis period (Bae et al. 2021). However, our results remain statistically insignificant across all the cases. Overall, our results imply that shareholders remain indifferent to firms' immediate pension underfunding, and this eventually gets reflected when pension underfunding contributions start affecting earnings and cash flows in the future – consistent with Franzoni and Marin (2006).

4 Conclusions

This study examines the impact of firms' pre-crisis pension underfunding on stock returns of US firms around the COVID-19-induced stock market crisis from 18th February 2020 to 20th March 2020. Our findings suggest that shareholders do not pay additional attention to firms' pension underfunding, using the COVID-19 pandemic as an exogenous shock to pension underfunding of DB pension plans. The impact of pension underfunding remains statistically insignificant even after accounting for firms' possible financial constraints (measured through firm size, firm age, and SA index), information asymmetry (measured through pension plan discount rate, analyst coverage, and institutional ownership), and mandatory contributions associated with pension underfunding. Overall, the results suggest that shareholders remain indifferent to firms' immediate pension underfunding, and this eventually gets reflected when pension underfunding contributions start affecting earnings and cash flows in the future – consistent with Franzoni and Marin (2006).

5 Appendix

Variable	Definition
Raw Returns – Crisis	Cumulative daily raw stock returns −18th February 2020 to 20th March 2020.
Abnormal Returns – Crisis	Cumulative daily CAPM-adjusted abnormal returns −18th February 2020 to 20th March 2020. CAPM-adjusted abnormal stock returns are computed using CRSP value-weighted market returns in the year 2019 (Albuquerque et al. 2020).
Pension Underfunding	Difference between pension plan liabilities (projected benefit obligations) and pension plan assets in 2019 divided by the market capitalization of firms as of the last quarter of 2019.
Log (MC)	Logarithm of the market value of firm, calculated at the end of the year 2019.
Tobin's Q	Market value of assets divided by total assets. Market value of assets is defined as total assets plus the market value of common stock less the book value of common stock.
Leverage	Total debt (long-term plus short-term debt) divided by total assets.
CAPEX	Capital expenditures divided by total assets.
R&D	Research and development expenditures divided by total assets.

Variable	Definition
Cash Flows	Income before extraordinary items plus depreciation and amortization divided by total assets.
ROA	Earnings before interest, taxes, depreciation and amortization divided by total assets.
Cash Holdings	Cash and short-term investments divided by total assets.
Momentum	Daily cumulative raw stock return in 2019.
Idiosyncratic Risk	Variance of the CAPM-adjusted returns in 2019.
Institutional Ownership	Institutional ownership as a percentage of market capitalization in the last quarter of 2019.
Analyst Coverage	Number of analysts following a firm in the month of January 2020.

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