International Review of Economics and Finance 48 (2017) 116–133

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Underfunding or distress? An analysis of corporate pension underfunding and the cross-section of expected stock returns☆

Qizhi Tao[c], Carl Chen[a], Rui Lu[b,*], Ting Zhang[a]

[a] Department of Economics and Finance, School of Business Administration, University of Dayton, Dayton, OH 45469, USA
[b] Lingnan (University) College, Sun Yat-Sen University, Guangzhou 510275, China
[c] School of Finance, Southwestern University of Finance and Economics, Chengdu 610074, China

ARTICLE INFO

JEL classification:
G12
G14
G33

Keywords:
Financial distress
Pension underfunding
Cross-section of stock returns
Expected default frequency

ABSTRACT

The pension underfunding anomaly (Franzoni & Marín, 2006) is mainly concentrated in financially distressed sponsors. The predictability of pension underfunding levels on the cross-sectional stock returns disappears after considering sponsor financial distress. It exists when underfunding is primarily due to poor operating performance and during the initial five years of underfunding; it diminishes when underfunding is due to bad pension investment returns and when firms underfund for more than five years. The potential financial distress inherent in the most underfunded firms and the prospect of intervention by the Pension Benefit Guaranty Corporation make the arbitrage opportunity not entirely risk free.

"The funding shortfall has been the focus of analysts, the rating agencies, (which have treated the shortfall as a form of debt for at least a decade), and regulators…But we are not out of the woods yet."– by Nobel Laureate, Robert Merton (2006).

1. Introduction

Underfunding of corporate defined benefit (DB) pension plans has been a big issue for US firms for a long time. This issue has recently become the focus of regulators, investors, and academic researchers, as both sponsor stock prices and pension fund assets lost substantial value during the financial crisis.[1] A large number of studies have examined whether stock prices fully reflect the risks of corporate pension underfunding; but the evidence is not conclusive.[2]Franzoni and Marín (2006) examine the relation between

☆ Tao acknowledges the financial support by the Fundamental Research Funds for the Central Universities of China (JBK1609160). Lu acknowledges the financial support from China National Natural Science Foundation (71272197). The authors thank Moody's KMV for generously providing the KTM expected default frequency (EDFTM) measures used in this study.

* Corresponding author.
E-mail addresses: lurui@mail.sysu.edu.cn (R. Lu), tzhang1@udayton.edu (T. Zhang).

[1] Pension plans as a whole in OECD (Organization for Economic Co-operation and Development) countries lost over $5.4 trillion, or 23%, of their fund value in 2008 (OECD, 2010) and the aggregate funding shortfall for S&P 500 firms amounted to $400 billion as of 2010 (Credit Suisse, 2011). As of September 2011, US corporate pension plans were underfunded by 30% on average (BNY Mellon, 2011).

[2] Some earlier studies, including Feldstein and Seligman (1981), Feldstein and Morck (1983), Bulow, Mock, and Summers (1987), and Bodie and Papke (1992) generally conclude that relevant pension funding information is priced in the stock market. In contrast, Coronado and Sharpe (2003) show that investors generally misvalue firms with substantial pension liabilities, treating pension earnings as equivalent to firm core operating earnings. Picconi (2006) reports that analysts on average underreact to pension-related information when making earnings forecasts.

http://dx.doi.org/10.1016/j.iref.2016.11.009
Received 6 September 2016; Received in revised form 31 October 2016; Accepted 15 November 2016
Available online 25 November 2016

pension underfunding and cross-sectional stock returns and report an interesting pension underfunding anomaly: sponsors with the most underfunded pension plans have lower expected stock returns than those with healthier pensions for at least 5 years after the first emergence of pension underfunding. Franzoni and Marín (2006) interpret this anomaly as evidence that investors do not fully anticipate the adverse effect of pension underfunding on firm future earnings. When the negative effects of underfunding ultimately hit the bottom line, investors are caught by surprise and they subsequently lower their expectations, resulting in lower future stock returns for the most severely underfunded sponsors.

This pension underfunding anomaly implies that a profitable trading strategy can be constructed to exploit stock mispricing by shorting the most underfunded firms and simultaneously buying overfunded firms, generating a monthly (annual) four-factor alpha of 43 basis points (5.16%) over the succeeding 5 years (Franzoni and Marín, 2006). However, it remains unclear why, if the mispricing is so large and persistent, it has not been exploited by market participants and eventually arbitraged away. Moreover, as shown by Franzoni and Marín (2006), severely underfunded sponsors generally have a high default risk, as measured by both the Altman (1968) Z-score and Ohlson (1980) bankruptcy index. Financial distress is an important factor in understanding the driver behind the pension underfunding puzzle. Garlappi and Yan (2011) develop a theoretical model that links firm financial distress to cross-sectional stock returns. Their model explains lower future stock returns for financially distressed firms, stronger book-to-market effects for firms with high default likelihood, and the concentration of momentum profits among low credit quality firms. Consistently, recent studies report that the profits of several well-documented anomalies (i.e., price momentum, analyst dispersion, idiosyncratic volatility, asset growth, and capital investment) are mainly concentrated in financially distressed firms (Avramov et al., 2012). Given the important role of financial distress in explaining the cross-section of stock returns, it is natural to ask whether financial distress has similar implications for the pension underfunding anomaly.

In this study, we revisit the pension underfunding anomaly after considering sponsor financial distress, pension underfunding sources and persistence, and the low shareholder recovery rate resulting from potential PBGC intervention. We use Moody's KMV EDF (expected default frequency) as a dynamic, market-based measure of firm financial distress, as in Garlappi and Yan (2011), Garlappi et al. (2008), and Bennett et al. (2015). Our sample spans the 1990 to 2011 period.[3] We aim to shed new light on the cross-sectional relation between pension underfunding levels and future stock returns, and provide fresh evidence to help investors to get "out of the woods" (Merton, 2006).

Our major findings are as follows. First, we find that the pension underfunding anomaly is essentially a manifestation of sponsor financial distress. The predictability of pension underfunding levels on the cross-section of expected stock returns is subsumed by sponsor financial distress risk. Pension underfunding profit (both monthly returns and four-factor alphas) exists only for financially distressed firms and disappears for healthy firms. These findings are further confirmed by a Fama-MacBeth regression analysis, and they remain significant after we adjust stock returns by financial distress and after we remove the financial distress information contained in pension underfunding levels. To better understand the economic significance of the effect of sponsor financial distress on pension underfunding profit, we follow Avramov et al. (2009) and simulate the wealth accumulation process by shorting $1 of the most underfunded firms and simultaneously investing the proceeds in the overfunded firms from July 1991 to July 2011. In comparing the wealth accumulated for portfolios consisting of stocks with high and low EDF, we find that the high EDF portfolio generates a total wealth of $8.06 as of July 2011, whereas the portfolio containing the firms with low EDFs accumulates a much smaller wealth of $1.19.

Next, we use voluntary pension contributions and pension fund investment return as sorting variables to determine whether an occurrence of underfunding is associated with poor operating profits or bad pension investment returns. Unlike total or mandatory contributions, voluntary contributions are made by sponsors at their own discretion and reflect a sponsor's willingness and financial capacity to fund its pension plan. Voluntary pension contributions are therefore more informative and relevant for gauging a sponsor's operating performance and financial slack. We find that the pension underfunding anomaly remains for firms in which underfunding is primarily due to poor operating performance, but does not exist for firms in which underfunding is due to bad pension investment returns. This finding is further supported by evidence from investor surprises. Using analyst 1-year annual earnings forecast revisions around the firm earnings announcement date as a proxy of investor surprises, we find that for sponsors with underfunding due to poor financial performance, the difference in analyst earnings revisions between the most underfunded and overfunded portfolios is significantly positive. But for sponsors with underfunding due to bad investment returns these differences become much smaller and insignificant. This evidence not only supports the investor underreaction reasoning proposed by Franzoni and Marín (2006), it also suggests that investors underreact to poor operating-related underfunding more severely than to pension investment-related underfunding. That is, investors are more negatively surprised by firm earnings when underfunding is due to poor operating performance than when underfunding is due to bad pension investment returns.

Furthermore, in examining the effect of pension underfunding persistence, we find that the cross-sectional relation between pension underfunding and the expected stock returns exists for persistently underfunded sponsors during the initial 5 years of underfunding, but diminishes if underfunding continues for more than 5 years. We again use analyst 1-year earnings forecast revisions to examine investor surprises associated with firms with different pension underfunding histories. We find that for sponsors experiencing underfunding for the initial years, the difference in analyst earnings revisions between the most underfunded and overfunded portfolios is significantly positive. But we do not observe the same results for sponsors enduring repeated underfunding over 5 years. These findings imply that although market investors are surprised when new information is first released

[3] We use data for the more recent period, and similar to Franzoni and Marín (2006), 20-plus years of data offer us sufficient number of time variations yet avoid unobserved structure changes. In Section 3.3 we use a sampling period similar to Franzoni and Marin (2006) for robustness check.