Information Content of Pension Plan Status and Long-term Debt

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Abstract

This study verifies if accounting disclosures about defined benefit (DB) pension plans and long-term debt accounts are efficiently incorporated into stock prices. Fama and French three factor (1993) and four factor models results reveal that the market inefficiently incorporates DB pension plan and long-term debt account information. In order to verify if the market is inefficient incorporating pension plan and long-term debt information, this study integrates hedge portfolio tests. Tests' results corroborate that the market overprices firms that have severely negative funding status.

Keywords: pension plans, long-term debt, information content

I. Introduction

It is generally accepted that securities markets were efficient in reflecting information about individual stocks and about the stock market as a whole. As formally stated by the efficient market hypothesis (EMH), asset prices in financial markets should reflect all available information (Fama et al.1969). As a consequence, neither technical analysis nor fundamental analysis would make possible for an investor to outperform a selected portfolio of individual stocks with comparable risk (Malkiel 2003).

In the last decades the EMH have been challenged. Psychological and behavioral elements of stock-price determination began to be discussed. Also, the believe that future stock prices are somewhat predictable on the basis of past stock price patterns as well as some fundamental valuation metrics (Becheey, Gruen and Vickery, 2000, Lo and MacKinlay, 1999 and Lo, Mamaysky and Wang 2000). Thus, concerns about information content of financial information have arisen during the past years.

Pension plan obligations have become a major concern for many. Through the years the Financial Accounting Standards Board (FASB) has demonstrated concern with respect to pension plan disclosures as demonstrated by the changes in disclosure requirements in past years. Efforts to enhance the relevance and understandability of reported pension information also include the enactment of ERISA (Employee Retirement Income System Act of 1974) and the "Pension Protection Act of 2006".

A severely underfunded pension plan has future implications in cash flows and earnings. It is important for investors to assess the pension plan status before making investment decisions. Some studies suggest that the information content of some items included in the financial statements has impact on stock prices (Franzoni and Marín 2006, Godwin and Key 1998). Previous researchers consider managers' choice to overfund or underfund their plans (Phillips 2003), the association of pension plan status and capital expenditures (Rauh 2006) and the association between systematic equity risk and the risk of pension plans (Jin, Merton, Bodie 2006).

Franzoni and Marín (2006) examine whether the market value of the firms sponsoring DB plans reflects their pension liabilities and find significant evidence of overvaluation for firms with severely underfunded pension plans over the last two decades. Some weaknesses can be identified from their investigation. First, they form portfolios and measure returns six months after the end of the fiscal year. Measuring the average returns for one year after portfolio formation, using this six month criteria, may cause an overlapping in reactions to financial information since they include returns from July of year t through June of year t + 1. This way of measuring results does not take into account that the annual report information for year t + 1 may be already incorporated in the returns from March through June. So a measuring problem may occur. Second, they assume the end of the fiscal year for all firms in their sample to be December. This causes a measurement problem because many firms have different fiscal year ends. Third, no statistical tests were performed in order to compare the portfolios with the most overfunded and underfunded statuses. Studies like, Xie (2001) and Sloan (1996) perform hedge-portfolio tests to verify if there is an opportunity to outperform the market by identifying weaknesses in the incorporation of information. Studies that address these weaknesses were not found.

In order to fill this gap in the literature, and by addressing the weaknesses identified earlier, this study examines if pension plan elements convey information that investors use to value firms. Comparisons are made as to the market's evaluation of pension plan and long-term debt information. Also, hedge portfolio tests were performed.

The paper proceeds as follows. Section II discusses the relevant prior literature. Then section III presents the hypotheses development and research methodology.

Section IV presents the sample selection procedure and data analysis. Section V summarizes the empirical findings. Finally, the conclusion is presented in Section V.

II: Related Literature

This section discusses literature related to: information content of financial statements accounts and information included in the notes to the financial statements, the relationship between pension plan information and stock prices, and the information content of different measures of debt.

Foster, Jenkins and Vickers (1986) study the aggregate market reaction to the public release of the annual report to shareholders to find out if it has incremental information content. The results imply no aggregate level of incremental information content for the annual report of the firms considered. Stober (1993) finds evidence on the incremental information content of receivables in predicting future sales, earnings, and profit margins. The author shows that, for manufacturers, receivables provide information useful for predicting future sales, earnings, and margins that are incremental to that contained in total inventory balances. Sloan (1996) investigate whether stock prices reflect information about future earnings contained in the accrual and cash flow components of current earnings. He points out that stock prices are found to act as if investors “fixate” on earnings, failing to reflect fully information contained in the accrual and cash flow components of current earnings until it impacts future earnings.

Stober (1986) studies the share price response to the earnings attributable to LIFO inventory liquidations, information presented in the notes. In opposition, to what he hypothesized, tests on the average share price response to these disclosures did not reveal evidence of any abnormal share price performance at either the earnings announcement date or the financial statement release date. Other studies, like Livnat (1984), examine whether unfunded vested benefits and unfunded past service costs have any information content using a sample of firms that have to disclose information about their pension liabilities. The author argues that evidence suggests that neither of the disclosures tested was sufficiently informative but they improved the information content of the earnings disclosure.

The studies mentioned above find conflicting results in relation to EMH. The information included in the financial statements, the notes to the financial statements and other complementary information should be relevant and reliable. As seen from these studies, concerns about the incorporation of accounting information have arisen through the years. Some elements of accounting information have evolved in terms of importance to the company and investors, and, as a result, the need for better disclosure of information. A clear example for the increasing importance of accounting information disclosures is pension plan accounting.

A review of the literature suggests that the market overvalues firms with severely underfunded pension plans (Franzoni and Marín 2006, Godwin and Key 1998). Furthermore, investors do not anticipate the impact of the pension liability on future earnings, and they are surprised when the negative implications of underfunding ultimately materialize (Franzoni and Marín 2006). Previous studies consider managers' choice to overfund or underfund their plans (Phillips 2003), the association of pension plan status and capital expenditures (Rauh 2006) and the association between systematic equity risk and the risk of pension plans (Jin, Merton, Bodie 2006).

One of the most recent studies is Franzoni and Marín (2006). They examine whether the market value of the firms sponsoring DB plans reflects their pension liabilities and find significant evidence of overvaluation for firms with severely underfunded pension plans. They show that the portfolio with the most underfunded firms earns low raw returns relative to portfolios of firms with healthier pension plans. They interpret this evidence as being due to investors not paying enough attention to the implications of the current underfunding for future earnings and cash flows and being surprised by the negative impact of the underfunding on earnings and cash flows. Carroll and Niehaus (1998) empirically examine the relationship between corporate debt ratings and pension funding. They find evidence that indicates that unfunded pension obligations reduce debt ratings more than an equivalent amount of excess pension assets increase in debt ratings. According to the authors, this relationship is consistent with the view that an unfunded pension obligation is a corporate liability that compares to other debt claims. In accordance with this, Stefanescu (2005) reexamines firms' structure of liabilities and integrate pension plans as fully owned subsidiaries to

corporate balance sheets and finds that firms with pension plans are 35 percent more levered on consolidated accounts.

There are many studies about the information content of long-term debt as well. Two major categories of finance theories on the relationship between the value of a corporation and its financial leverage are the irrelevance and the relevance theorems. The former implies that financial leverage per se has no intrinsic value to the corporation and, therefore, does not affect its market value. Miller and Modigliani (1958) main argument is that, in the absence of corporate taxes, arbitrage processes in the market eliminate differences in valuations due to differences in financial leverage. Miller (1977) introduced taxes to the argument and demonstrates that, even in the presence of corporate taxes, the irrelevance theorem holds if tax rates differ among investors. In contrast, the relevance theorem argues that the value of the corporation changes with changes in financial leverage. The basic arguments of this theorem are the maximum debt theorem, the optimal leverage theorem, and the bad news theorem.

The main argument of the maximum debt theorem is that sock prices increase with increases in debt. The changes in stock prices are attributed to a decrease in the cost of funds due to the tax benefit of bond interest and the signal that changes in financial leverage convey. Ross (1977) shows that the motivation of managers to increase financial leverage is a positive signal as it expresses management's confidence in the corporation's prospects. The optimal leverage theorem states that increases in the value of the corporation due to the tax deductibility of interest will not be infinite because as the corporation increases its financial leverage, the risk of bankruptcy increases. The direction of the change in stock prices, when financial leverage changes, is dependent on the position of the corporation's financial leverage relative to the optimum. The bad news theorem is supported by Miller and Rock (1985) and Myers and Majluf (1984). They present information asymmetry models that suggest unanticipated external financings as negative market signals. Welch (2004) studies whether actual debt ratios behave as though firms readjust to their previous debt ratios or whether they permit their debt ratios to fluctuate with stock prices. The author shows that stock returns are a first-order determinant of debt ratios and that they may be the only well-understood influence of debt ratio dynamics. Also, that many previously used

proxies seem to have helped explain capital structure dynamics primarily because they are correlated with omitted dynamics caused by stock price changes.

Overall, the evidence on the effects of pension plan information reflects some market inefficiencies in pricing firms with severe underfunded plans. However, the revised literature lacks studies that compare the market's reaction to the pension plan status information to the information of other obligations. This study provides additional information regarding DB pension plan information and firm valuation by examining the stock market pricing of firms with different levels of funding ratios. And also compares these results to the stock market reactions to the different levels of debt.

III. Methodology

Hypotheses Development

Based on the findings of studies mentioned above and the weaknesses found in Franzoni and Marín (2006) the following hypotheses were developed. If information portrayed in the financial statements is reflected in stock prices (Stober 1986, 1993, Sloan 1996) then H1(i) can be developed. H1(i) formally states, stock prices reflect pension and retirement expenses information because they appear in the financial statements.

Some studies examine the information content of accounting disclosures in the notes to the financial statements (Livnat 1984, Stober 1986). For example, Stober (1986) no reaction in stock prices is observed do to the effect on earnings of the recognition of information in the notes. Then, if information in the notes to the financial statements is not reflected in stock prices, pension elements that do not appear in the financial statements may convey little or no information. As, H1(ii) formally states, stock prices fail to reflect the information related to the funding status of pension plans that appears in the notes to the financial statements.

As part of the study, a comparison between the reaction to pension plan and long-term debt information is made. Pension plans status may represent either an asset or liability. If underfunded the company may have a non-current obligation. Stefanescu (2005) integrates pension plans as fully owned subsidiaries to corporate balance

sheets. Pensions are integrated as a long-term binding obligation of the firm, similar to long-term debt. If both elements have similar characteristics, differences or similarities, in the way these two types of information affect stock prices should be assess. Existent studies fail to examine if market reactions to pension plan funding information are similar to reactions of information related to different long-term debt levels. Studies mentioned earlier (Franzoni and Marín 2006, Godwin and Key 1998) find that stock prices fail to reflect pension information. Studies about long-term debt information argue that stock prices do reflect long-term debt information (Myers 2001, Leland and Pyle 1977, Diamond 1984, Fama 1985, Boyd and Prescott 1986). Based on these findings H1(iii), that stock prices reflect long-term debt because it appears in the financial statements, is developed.

If the market does not incorporate the information related to pension plan status as soon as it is available, strategies to outperform the market can be implemented. H2 (i) examines this prediction. Formally stated, H2 (i) proposes that a trading strategy taking a long position in the stock of firms reporting relatively high levels of funding ratio and a short position in the stock of firms reporting relatively low levels of funding ratio generates positive abnormal stock returns.

Then, according to the EMH and previous studies about long-term debt, if long-term debt information is incorporated efficiently, then, there should be no opportunities to outperform the market. H2 (ii) examines this prediction. This hypothesis presupposes that a trading strategy taking a long position in the stock of firms reporting lower levels of long-term debt and short position in the stock of firms reporting relatively higher levels of long-term debt will not generate abnormal stock returns.

Variable Measurement

As in Franzoni and Marín (2006), this study uses accounting data to construct the equivalent of two pension plan elements; that is the fair value of plan assets (*FVPA*) and the projected benefit obligation (*PBO*). According to SFAS No. 87, the *FVPA* stands for the fair market value of the assets (stocks, bonds, and other investments) that are set aside and restricted (usually in a trust) to pay benefits when due. Plan assets include amounts contributed by the employer plus amounts earned from investing the

contributions, less benefits paid. The *PBO*, according to SFAS No. 87, represents the actuarial present value of vested and non-vested benefits earned by an employee for service rendered to date plus projected benefits attributable to salary increases. The measurement of the accumulated benefit obligation is based on current and past compensation levels.

The variables of interest correspond to different accounting items. Thus, this accounting data is constructed differently for different periods in the sample. There are two breaks in the way Compustat informs the data related to pension plans that emerge from changes in accounting standards. The first break is caused by the accounting standard SFAS No. 87. It affects the way pension data is presented starting fiscal years beginning after December 15, 1986. The second break, effective for fiscal years beginning after December 15, 1997, is caused by SFAS No. 132.

Another element related to pension plans is the pension and retirement expenses (*PRE*). The *PRE* represents the amount recognized in an employer's financial statements as the cost of a pension plan for a period. It is composed of the service cost, interest cost, actual return on plan assets, gain or loss, amortization of unrecognized prior service cost, and amortization of the unrecognized net obligation or assets existing at the date of initial application of SFAS No. 87. Once the data is organized, the variables of interest are constructed.

In order to measure *PRE*, *FVPA* and PBO, the procedure used by Franzoni and Marín (2006) is used. The same dollar amount of these elements has different impacts for these variables depending on the size of the firm. To solve this problem, the variables are appropriately normalized by dividing them by market capitalization at the end of fiscal year when the elements are measured.

For accounting purposes, and in the rest of this study, a pension plan is defined to be overfunded (underfunded) if the *FVPA* is larger (smaller) than the *PBO*. It is clear that the same dollar amount of underfunding has different effects for these variables depending on the size of the firm. In order to solve this problem, the funding status needs to be appropriately normalized. In order to measure the funding status of the pension plans, the procedure used by Franzoni and Marín (2006) is used. They choose to divide the difference between the *FVPA* and the *PBO* by market capitalization at the

end of fiscal year when the pension items are measured. As them, we label this variable funding ratio (*FR*).[1] This variable is computed as follows:

$$FR_{t-1} = FVPA_{t-1} - PBO_{t-1} / Mkt\ Cap_{t-1} \quad (1)$$

The available data for long-term debt (*LTD*) from Compustat is used to construct the long-term debt ratio (*LTDR)*. It is measured at the end of fiscal year $t - 1$. In formulas, the *LTDR* for year $t - 1$ is:

$$LTDR_{t-1} = LTD_{t-1} / Mkt\ Cap_{t-1} \quad (2)$$

Portfolios created based on *FR* and *LTDR* are constructed in order to analyze the characteristics of firms sponsoring DB pension plans. The portfolio analysis and formation procedure is presented in the following section.

IV. Data Analysis

Firms are sorted into portfolios according to the level of *PRER*, *FVPAR*, *PBOR*, *FR* and *LTDR*. Firms sponsoring DB pension plans are classified as underfunded and overfunded. Eleven portfolios were formed. The first ten portfolios include only underfunded firms (*FR*<0) in a given year. The eleventh portfolio includes overfunded firms (*FR*≥0). A second set of eleven portfolios is formed according to the *LTDR*. For this purpose no restrictions related to sponsoring pension plans is used; so this sample includes a broader number of firms.

Raw returns are calculated for each set of portfolios in order to examine their performance at different horizons after portfolio formation. This study tests portfolios for risk adjusted returns by running time-series regressions of portfolio returns on the

[1] Franzoni and Marín (2006) present some of the limitations of normalizing by market value. One of the drawbacks is that this ratio could capture effects that are related to the company book-to-market (B/M) ratio. This can occur, in particular, for firms with positive *FR*, a higher level of *FR* ratio could correspond to a higher B/M ratio, without necessarily implying a better funding status. Therefore, firms with high (low) and positive (negative) *FR* could earn high (low) returns just because they are value firms.

returns on different factors, including the market. Discrepancies in returns among portfolios could be explained by different factor loadings. In formula, the time-series regression (Fama-French three factor model) for the portfolios is expressed:

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it} \quad (3)$$

where R_{it} is the portfolio excess return. The EXM, HML and SMB factors are constructed as in Fama and French (1993). EXM is the factor that represents the market portfolio minus the risk free rate. The HML factor represents a portfolio long in high book to market (B/M) and short in low B/M firms. The last factor, SMB represents a portfolio long in small and short in large companies. The estimation sample starts in the fourth month after the end of fiscal year 1980 for any firm, and ends in the third month after the end of fiscal year 2005.

This study tests for momentum patterns in returns. Jegadeesh and Titman (1993) find evidence that past winners tend to outperform past losers in the following year. This relationship is tested in order to uncover evidence that may suggest that the most underfunded and levered firms tend to be past losers. Chan, Jegadeesh, and Lakonishok (1996), argue that momentum is a short-lived phenomenon. In order to test for the momentum factor, the regressions is estimated as follows

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + m_i UMD_t + \varepsilon_{it} \quad (4)$$

where UMD_t is the momentum factor. It is constructed as a long investment in past twelve month winners and short investment in past twelve month losers. Its inclusion is justified by the evidence in Jegadeesh and Titman (1993). They found that past winners continue to gain extra returns over past losers within a one year horizon.

Statistical tests are performed to verify if there are statistically significant differences between the risk-adjusted returns of the different portfolios. In order to verify if it is possible to create an investment strategy to outperform the market using this information, hedge-portfolio tests are performed.

Samples

Two sets of portfolios are formed. The set of portfolios formed based on *FR* is comprised by firms that sponsor DB pension plans and the set based on *LTDR* is comprised of all firms with available data for *LTD*. The *FR* sample is composed of all the firm years with available data on the Compustat Annual Industrial and Research files for NYSE, AMEX, and NASDAQ firms. The sample period is the end of fiscal year 1980 to the end of fiscal year 2005. 1980 is the starting point because the pension plan data of interest is initially available starting that year. Firms are included if they have at least two years of accounting data in order to correct for the survival bias induced by the way Compustat adds firms to its tapes (Banz and Breen 1986 and Franzoni and Marín 2006). For the formation of pension plan portfolios, only firms that sponsor DB pension plans are included. There were 52,018 observations (firm-years) before eliminating firms that do not have available information for at least two years. To correct for the effect of outliers, observations for each year in which the *FR* variable is more than five standard deviations away from the annual mean, were dropped from the sample. As a result, there are 51,515 observations that satisfy the criteria mentioned above. Then firms that do not have at least two years of accounting data were eliminated. As a result, 51,441 observations were included in this investigation.

The *LTDR* sample is comprised of all the firm years with available data on the Compustat Annual Industrial and Research files for NYSE, AMEX, and NASDAQ firms. The sample period is the end of fiscal year 1980 to the end of fiscal year 2005. Firms are included if they have at least two years of accounting data in order to correct for the survival bias. There were 187,588 observations before eliminating firms that do not have available information for at least two years. To correct for the effect of outliers, observations for each year in which the *LTDR* variable is more than five standard deviations away from the annual mean, were dropped from the sample. As a result, there are 186,091 observations that satisfy the criteria mentioned above. Then firms that do not have at least two years of accounting data were eliminated. As a result, 185,962 observations were included in this investigation.

Firm returns were obtained from the Center for Research and Security Prices (CRSP), Monthly Stock database.

Trends in Pension Plan Status and Long-term Debt

It is important to look at the historical evolution of the DB pension plan elements and *LTD* accounts to understand the way they are evaluated by the markets. Figure 1 reports the time series of the aggregate funding level for all the companies in Compustat with available pension items and for all firms with available *LTD* information.

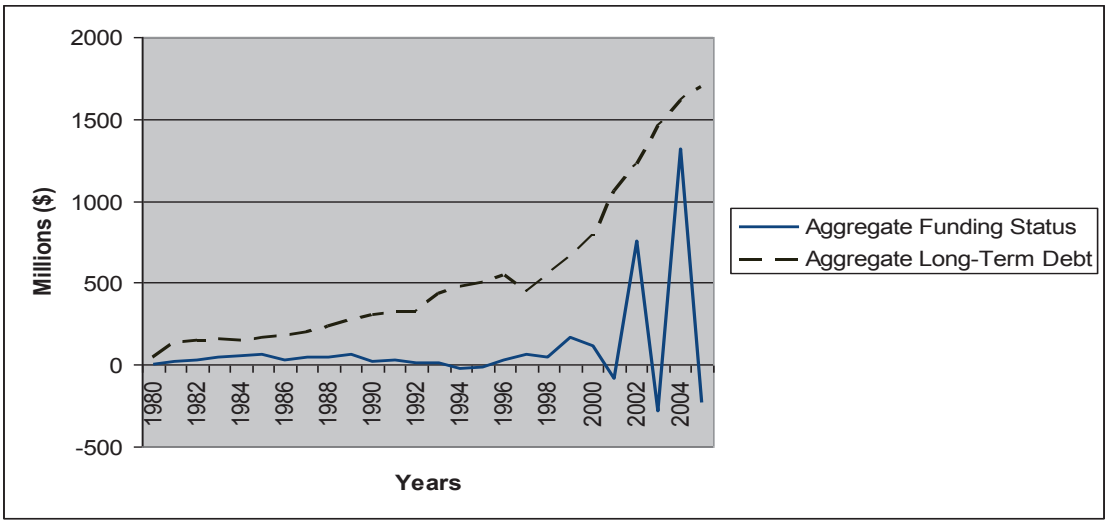

Figure 1. Aggregate Pension Plan Status and Long-Term Debt Levels. The graph reports the difference between aggregate assets (*FVPA*) and aggregate benefits (*PBO*) for the companies in the sample. Also, the aggregate level of long-term debt (*LTD*) for the companies in the sample is presented.

As can be observed from Figure 1, an aggregate underfunding appears, for the first time in our sample, in 1994. In 1996 the funding status of DB pension plans started to improve and in 1997, concurring with the bull market of the second half of the 1990s, pension plan assets grew more than benefits, and peaked in 1999 at about $163 billion. On March of 2000 the Internet bubble exploded causing stock prices to decrease and, as a result, the *FVPA* dropped. In 2001 the gap between the *PBO* and the *FVPA* is of almost $85 million. Major economic events effects arose from September 11, 2001 attacks, with initial impact causing global markets to drop sharply. Then, on 2002, a surplus appears, reaching about $754 million in aggregate overfunding. In 2003, another aggregate underfunding appears. This is in contrast to an aggregate overfunding of $1.3 billion in 2004, the highest aggregate overfunding for the whole

sample period. For 2005, another aggregate underfunding appears; the biggest change in funding status. It reaches almost $1.5 billion in deficit on a year to year basis.

As for *LTD*, a tendency to increase over the years is observed. From 1996 to 1997, the increase in the aggregate level of *LTD* is almost 323%. This is the biggest increase in the level of aggregate debt for the whole sample. It concurred with the bull market associated to the Internet bubble. In 1997 it peaked, reaching an aggregate level of almost $7.5 trillion. Then, in 1998 it started to decrease averaging $6.3 trillion between 1998 and 2005.

Descriptive Statistics

Table 1 provides summary statistics on the main pension and *LTD* items and ratios. The average *FVPA* for the whole sample is about $645 million and the average *PBO* is about $664 million (about 103% of the *FVPA*). The average funding level is -17%, in contrast to the median which is almost 0%. The minimum *FR* is -5940%, while the maximum is 154%. The average *PRE* is about $22.3 million, while the median is about $2.18 million. The minimum *PRE* is -$3.489 billion and the maximum is $3.435 billion.

Table 2 reports descriptive statistics of the *FR* portfolios. The characteristics in Panel A are measured at the end of fiscal year $t - 1$ relative to portfolio formation. For the most underfunded firms the average *FR* is about -515%. In contrast, for the least underfunded firms it is about -0.1% and 8.8% for the portfolio that contains overfunded firms. The most underfunded firms have higher levels of *LTDR*. A consistent decrease in *LTDR* is observed through portfolio ten. The average size of the firms increases almost consistently. Smaller firms are concentrated in the most underfunded portfolio. Firms in portfolio eleven have the second smallest average size of all the portfolios. As for B/M, value firms are concentrated in the most underfunded portfolio. Panel B reports means and standard deviations for the excess returns of underfunded firms' portfolios. Average returns increase as you move from portfolio one through ten. As expected, firms with higher levels of *FR* have the lowest average returns.

Table 3 presents the characteristics for portfolios formed based on *LTDR*. Firms in the first portfolio have highest levels of *LTDR* and firms in the tenth portfolio have lower levels of *LTDR*. The eleventh portfolio contains firms that have no *LTD*. The firms in

the first portfolio have on average *LTDR* of 1276%. In contrast, firms in the tenth portfolio have on average a *LTDR* of 0.4%. The portfolio one contains firms that, on average, are the smallest in size and portfolio eleven contains the smallest firms. As for B/M, portfolios with lower levels of *LTDR* are populated in average with value firms. Panel B reports means and standard deviations for the returns of these portfolios. Average returns increase as you move from portfolio one through ten.

Table 1
Pension Plan Funding and Long-Term Debt over Time

The table reports the mean, median, standard deviation, minimum and maximum for the pension and retirement expenses (*PRE*), and pension and retirement expenses ratio (*PRER*), the fair value of plan assets (*FVPA*), the projected benefit obligation (*PBO*), and the funding ratio (*FR*), long-term debt (*LTD*) and long-term debt ratio (*LTDR*) for all the companies that satisfy the selection criteria. The results are presented for the complete sample period, for the period between 1980 and 1986 (before SFAS No. 87), for the period between 1987 and 1997 (the period after SFAS No. 87) and for the period between 1998 and 2006 (after SFAS No. 132). These amounts are expressed in millions and percentages for the ratios.

	Panel A: 1980-2006			
	FVPA	PBO	FR	PRE
Mean	645.69	664.03	-0.172	22.292
Median	38.71	38.55	0	2.181
SD	3332	3412	29.100	129.74
Min.	0	0	-5940	-3,489
Max.	112,898	109,774	154.05	5,290
	Panel B: 1980-1986			
	FVPA	PBO	FR	PRE
Mean	155.97	117.748	0.044	13.046
Median	9.012	6.372	0.02	1.135
SD	993.046	700.465	1.464	78.352
Min.	0	0	-32.827	-258
Max.	46380.313	26161.305	133.543	3,516.400
	Panel C: 1987-1997			
	FVPA	PBO	FR	PRE
Mean	505.855	482.722	-0.018	13.379
Median	43.914	42.555	0.0002	1.682
SD	2521	2454	2.414	81.843
Min.	0	0	-245.273	-709
Max.	78,360	83,390	90.4	4,300
	Panel D: 1998-2006			
	FVPA	PBO	FR	PRE
Mean	1164.616	1274.331	-0.516	39.851
Median	85.761	102.314	-0.008	4.814
SD	4866	5086.500	49.867	190.955
Min.	0	0	-5940.34	-3,490
Max.	112,898	109,770	154.055	5,290

Table 2
Descriptive Statistics
Pension Plan Portfolios

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are assigned to a set of ten portfolios according to the deciles of the distribution of *FR*. The stocks in portfolios one through ten have underfunded DB pension plans. Firms in portfolio eleven contain firms with overfunded pension plans. *FR* is the difference between the fair value of plan assets (*FVPA*) and the projected benefit obligation (*PBO*) in fiscal year ending in year *t* – 1, divided by the market capitalization at the end of fiscal year *t* – 1. Panel A reports the average of the annual averages of the *FR* of the companies in each portfolio; the average of the annual averages of the *LTDR* of the companies in each portfolio; the average of the annual averages of the market capitalization (in millions of dollars) of the companies in each portfolio at the end of fiscal year *t*; the average of the annual averages of the book-to-market ratio (B/M) of the companies in each portfolio at the end of fiscal year *t* – 1; and the average of the annual number of firms in each portfolio. The sample covers formation periods from April 1981 to April 2006. Panel B reports means and standard deviations of the excess returns (return minus 1 month T-bill rate) of the portfolios.

	Most under									Least under	Over
	1	2	3	4	5	6	7	8	9	10	11
Portfolio Characteristics											
FR	-5.150	-0.119	-0.062	-0.039	-0.025	-0.017	-0.011	-0.007	-0.004	-0.001	0.088
LTDR	63.698	1.128	0.889	0.698	0.595	0.503	0.434	0.437	0.430	0.394	1.908
Size	2,506	3,319	3,417	3,418	5,195	4,376	4,791	5,396	5,226	7,865	3,137
B/M	21.091	0.830	0.786	0.806	0.721	0.679	0.620	0.605	0.562	0.500	2.003
Firms	1,668	2,007	2,057	2,072	2,106	2,141	2,133	2,159	2,151	2,149	22,197
Panel B: Returns											
Mean	-0.003	0.008	0.010	0.010	0.013	0.013	0.015	0.016	0.017	0.020	0.013
SD	0.197	0.140	0.122	0.119	0.118	0.111	0.108	0.117	0.114	0.123	0.111

Table 3
Descriptive Statistics
Long-Term Debt Portfolios

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are assigned to a set of ten portfolios according to the deciles of the distribution of *LTDR*. The stocks in the first portfolio have higher levels of debt and the stocks in the tenth portfolio lower levels of debt. *LTDR* is total long-term debt in fiscal year ending in year *t* – 1, divided by the market capitalization at the end of fiscal year *t* – 1. Panel A reports the average of the annual averages of the *LTDR* of the companies in each portfolio; the average of the annual averages of the *LTD* of the companies in each portfolio; the average of the annual averages of the market capitalization (in millions of dollars) of the companies in each portfolio at the end of fiscal year *t* – 1; the average of the annual averages of the book-to-market ratio (B/M) of the companies in each portfolio at the end of fiscal year *t* – 1; and the average of the annual number of firms in each portfolio. The sample covers formation periods from April 1980 to April 2005. Panel B reports means and standard deviations of the excess returns (return minus 1 month T-bill rate) of the portfolios.

	Highest									Lowest	None
	1	2	3	4	5	6	7	8	9	10	11
Panel A: Portfolio Characteristics											
LTDR	12.76	1.362	0.794	0.513	0.337	0.216	0.130	0.067	0.025	0.004	0.000
LTD	2619	1325	1118.00	806.130	640.810	484.454	339.643	176.160	51.760	4.136	0.143
Size	717	1123	1563	1649	1976	2421	2892	2997	2521	1361	624
B/M	0.105	0.976	0.818	0.763	0.712	0.672	0.586	0.545	0.508	0.413	-0.404
Firms	8,766	10,057	10,224	10,457	10,476	10,579	10,598	10,364	10,126	10,100	21,350
Panel B: Returns											
Mean	-0.007	0.004	0.008	0.011	0.013	0.014	0.017	0.018	0.020	0.025	0.015
SD	0.187	0.152	0.144	0.147	0.148	0.152	0.166	0.184	0.211	0.233	0.217

V. Tests Results

Risk-Adjusted Returns

Time series regressions tests are used to examine the information content of the elements presented above. To explain average returns on these stocks, the Fama and French (1993) three-factor model is used. Table 4 presents the results of the set of portfolios distributed according to *PRER* levels. The results reveal that firms with the lowest levels of *PRER* (portfolio one) are the most undervalued and firms with the highest level of *PRER* (portfolio ten) are the most overvalued. The pension plan elements that appear in the notes to the financial statements are also tested.

Table 5 presents the results for the *PBOR* portfolio. Results suggest that the market is also inefficient in incorporating this information. The firms in the portfolio with the lowest level of *PBOR* (portfolio one) are the most undervalued and the firms in the portfolio with the highest level (portfolio ten) are the most overvalued. As presented in Table 6, firms in the portfolio with the lowest levels of *FVPAR* (portfolio one) appear to be the most undervalued and the firms in the portfolio with the highest levels (portfolio ten) seem to be the most overvalued.

Table 7 *FR* portfolio results reveal that firms with the highest levels of underfunding (portfolio one) are overpriced and firms with the lowest levels of underfunding (portfolio ten) seem to be underpriced. Firms that have overfunded plans (portfolio eleven) appear to be undervalued.

Finally, for comparison purposes the balance in *LTD* that appears in the balance sheet of firms is used. As for the *LTDR*, Table 8 shows portfolio tests results. Apparently, the market overvalues firms with the highest levels of *LTD* (portfolio one) and undervalues firms with the lowest levels (portfolio ten). Unlevered firms (portfolio 11) appear to be undervalued. The results suggest that investors inefficiently incorporate pension plan and *LTD* information in to stock prices. The tests performed for momentum reveal similar results.

Table 4
Time-Series Regressions Results
Pension and Retirement Expense Ratio

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it}$$

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in decile according to the *PRER*. The stocks in the first decile are the firms with the lowest level of *PRER* and the firms in the fifth decile have the highest level of *PRER*. Panel A reports the constant (alpha) from a time-series regression of portfolio excess return on the three Fama-French factors, which are the market excess return (EXM), the return on the HML portfolio, and the return on SMB portfolio. Panel B reports the slopes and adjusted R^2 from the regressions. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. t-statistics are presented in parentheses.

	Lowest									Highest
	1	2	3	4	5	6	7	8	9	10
Alphas	0.015*	0.018*	0.014*	0.010*	0.08*	0.005*	0.003*	0.003	-0.003*	-0.014*
	(13.26)	(15.35)	(15.35)	(11.14)	(10.75)	(6.45)	(4.83)	(0.42)	(-3.10)	(-8.98)
Panel B: Factor Loadings and R^2										
EXM	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.010
	(23.97)	(29.85)	(42.40)	(39.71)	(48.58)	(33.80)	(40.53)	(37.30)	(31.13)	(25.33)
HML	0.002	-0.001	0.007	0.002	0.003	0.003	0.004	0.004	0.005	0.007
	(2.42)	(-3.10)	(1.77)	(6.40)	(8.09)	(7.95)	(11.61)	(8.05)	(6.93)	(8.83)
SMB	0.006	0.009	0.008	0.008	0.007	0.007	0.008	0.008	0.009	0.011
	(10.14)	(20.51)	(19.87)	(18.31)	(22.31)	(19.91)	(23.56)	(18.19)	(15.06)	(11.61)
R2	0.85	0.91	0.92	0.91	0.93	0.91	0.92	0.90	0.86	0.77
Firm-years	3,795	3,790	3,818	3,836	3,829	3,820	3,758	3,739	3,684	3,203

* Alphas significant at the 5 percent level.

Table 5
Time-Series Regressions Results
Pension Benefit Obligation Ratio

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it}$$

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to the *PBOR*. The stocks in the first decile are the firms with the lowest level of *PBOR* and the firms in the tenth decile have the highest level of *PBOR*. Panel A reports the constant (alpha) from a time-series regression of portfolio excess return on the three Fama-French factors, which are the market excess return (EXM), the return on the HML portfolio, and the return on SMB portfolio. Panel B reports the slopes and adjusted R^2 from the regressions. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. t-statistics are presented in parentheses.

	Lowest									Highest
	1	2	3	4	5	6	7	8	9	10
Alphas	0.014*	0.010*	0.009*	0.007*	0.006*	0.006*	0.003*	0.003*	-0.001	-0.012*
	(12.86)	(9.48)	(7.83)	(7.71)	(7.36)	(7.16)	(3.36)	(3.06)	(-0.81)	(-8.26)
Panel B: Factor Loadings and R^2										
EXM	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.009	0.009	0.010
	(26.24)	(20.42)	(19.00)	(22.64)	(19.74)	(20.98)	(25.21)	(22.80)	(26.81)	(32.73)
HML	0.012	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.008
	(1.61)	(3.96)	(4.85)	(6.06)	(6.98)	(7.02)	(9.30)	(7.62)	(11.96)	(14.44)
SMB	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.007	0.009
	(9.76)	(7.74)	(6.62)	(9.01)	(9.21)	(8.05)	(9.98)	(9.44)	(18.78)	(13.35)
R2	0.85	0.81	0.82	0.86	0.84	0.84	0.85	0.84	0.87	0.80
Firm-years	1,914	1,925	1,934	1,921	1,896	1,881	1,856	1,852	1,829	1,570

* Alphas significant at the 5 percent level.

Table 6
Time-Series Regressions Results
Fair Value of Pension Assets

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it}$$

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to the *FVPAR*. The stocks in the first decile are the firms with the lowest level of *FVPAR* and the firms in the tenth decile have the highest level of *FVPAR*. Panel A reports the constant (alpha) from a time-series regression of portfolio excess return on the three Fama-French factors, which are the market excess return (EXM), the return on the HML portfolio, and the return on SMB portfolio. Panel B reports the slopes and adjusted R^2 from the regressions. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. t-statistics are presented in parentheses.

	Lowest									Highest
	1	2	3	4	5	6	7	8	9	10
Alphas	0.014*	0.010*	0.009*	0.007*	0.007*	0.006*	0.004*	0.003*	0.004	-0.012*
	(12.41)	(8.57)	(7.81)	(8.19)	(7.19)	(6.40)	(4.82)	(2.83)	(0.37)	(-8.88)
	Panel B: Factor Loadings and R^2									
EXM	0.010	0.009	0.009	0.009	0.008	0.008	0.008	0.009	0.009	0.010
	(25.63)	(20.24)	(17.36)	(23.24)	(22.41)	(19.58)	(26.13)	(23.33)	(25.64)	(34.84)
HML	0.014	0.003	0.002	0.003	0.004	0.004	0.004	0.005	0.005	0.008
	(1.93)	(3.80)	(3.79)	(6.22)	(7.38)	(7.59)	(7.58)	(8.24)	(11.11)	(14.95)
SMB	0.006	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.006	0.009
	(9.48)	(7.51)	(6.59)	(9.75)	(7.98)	(9.44)	(8.46)	(9.75)	(16.76)	(13.71)
R2	0.85	0.80	0.81	0.86	0.85	0.83	0.85	0.85	0.84	0.82
Firm-years	1,861	1,896	1,883	1,885	1,861	1,854	1,819	1,828	1,808	1,566

* Alphas significant at the 5 percent level.

Table 7
Three Factor Model
Pension Plan Funding Ratio

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it}$$

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to *FR*. The stocks in the first portfolio are the most underfunded and the stocks in the tenth portfolio are the least underfunded. Also, in the fourth month after the end of fiscal year *t*, stocks with positive *FR* at the end of fiscal year *t* – 1 are assigned to portfolio eleven. *FR* is the difference between the fair value of plan assets (*FVPA*) and the projected benefit obligation (*PBO*) in fiscal year ending in year *t* – 1, divided by the market capitalization at the end of fiscal year *t* – 1. Panel A reports the constant (alpha) from a time-series regression of portfolio excess returns on the three Fama and French factors for both sets of portfolios. The factors are the market excess return (EXM), the return on HML portfolio, and the return on the SMB portfolio. Panel B reports the slopes and the R^2 from these regressions. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. T-statistics are presented in parentheses.

	Most under									Least under	Over
	1	2	3	4	5	6	7	8	9	10	11
						Panel A: Alphas					
Alphas	-0.016*	-0.003*	0.000	0.002	0.004*	0.006*	0.007*	0.009*	0.011*	0.013*	0.006*
	(-7.43)	(-2.28)	(-0.11)	(1.69)	(3.10)	(4.06)	(6.75)	(7.12)	(8.76)	(10.73)	(6.48)
						Panel B: Factor Loadings and R^2					
EXM	0.010	0.009	0.009	0.009	0.009	0.008	0.009	0.008	0.009	0.009	0.008
	(21.26)	(18.85)	(17.41)	(18.90)	(19.34)	(17.13)	(19.60)	(16.83)	(13.85)	(27.28)	(22.15)
HML	0.008	0.006	0.005	0.004	0.003	0.004	0.002	0.003	0.002	0.002	0.004
	(11.22)	(10.04)	(6.33)	(5.17)	(5.98)	(5.52)	(3.64)	(3.81)	(2.06)	(3.74)	(7.32)
SMB	0.012	0.008	0.007	0.007	0.006	0.005	0.005	0.005	0.004	0.005	0.004
	(12.50)	(13.93)	(10.42)	(12.50)	(12.32)	(8.35)	(8.37)	(6.67)	(4.70)	(8.51)	(10.30)
R2	0.68	0.76	0.77	0.79	0.79	.072	0.78	0.75	0.73	0.79	0.87
Firm-years	736	902	932	941	953	973	968	977	967	962	9,969

* Alphas significant at the 5 percent level.

Table 8
Three Factor Model
Long-Term Debt Ratio

$$R_{it} = \alpha_i + b_i EXM_t + h_i HML_t + s_i SMB_t + \varepsilon_{it}$$

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to *LTDR*. The stocks in the first portfolio have higher levels of debt and the stocks in the tenth portfolio have lower levels of debt. Firms with no *LTD* are assigned to portfolio eleven. *LTDR* is long-term debt in fiscal year ending in year *t* – 1, divided by the market capitalization at the end of fiscal year *t* – 1. Panel A reports the constant (alpha) from a time-series regression of portfolio excess returns on the three Fama and French factors. The factors are the market excess return (EXM), the return on HML portfolio, and the return on the SMB portfolio. Panel B reports the slopes and the R^2 from these regressions. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. T-statistics are presented in parentheses.

	Highest									Lowest	None
	1	2	3	4	5	6	7	8	9	10	11
						Panel A: Alphas					
Alphas	-0.018*	-0.005*	-0.001	0.002*	0.004*	0.006*	0.009*	0.011*	0.014*	0.020*	0.007*
	(9.83)	(-4.49)	(-0.64)	(2.03)	(4.35)	(6.67)	(10.75)	(11.31)	(22.60)	(9.42)	(5.13)
						Panel B: Factor Loadings and R^2					
EXM	1.056	0.951	0.904	0.937	0.972	0.971	0.955	0.978	1.002	1.090	0.975
	(20.96)	(35.45)	(32.04)	(32.97)	(31.41)	(36.92)	(38.74)	(36.19)	(22.60)	(20.73)	(21.17)
HML	0.741	0.619	0.539	0.535	0.441	0.373	0.225	0.076	-0.017	-0.395	-0.063
	(6.09)	(9.18)	(8.86)	(8.39)	(6.99)	(5.75)	(4.28)	(1.24)	(-2.04)	(-3.87)	(-0.77)
SMB	0.858	0.663	0.623	0.622	0.603	0.612	0.703	0.815	1.027	1.181	1.015
	(9.98)	(12.69)	(13.14)	(11.82)	(9.35)	(9.88)	(15.28)	(13.31)	(16.88)	(16.48)	(13.99)
R^2	0.67	0.81	0.85	0.86	0.87	0.87	0.89	0.87	0.86	0.85	0.82
Firm-years	4,619	5,273	5,379	5,481	5,516	5,506	5,480	5,342	5,167	5,090	11,219

* Alphas significant at the 5 percent level.

Hedge Portfolio Tests Results

To examine if the mispricing can be exploited, a hedge test is performed where monthly portfolio return series are created in each deciles and allocated into groups according to *FR* and *LTDR*. The hedge portfolios are formed by taking: a long position in the tenth portfolio and a short position in the first portfolio; a long position in the eleventh portfolio and a short position in the first portfolio; and, a long position in the eleventh portfolio and a short position in the tenth portfolio. The hedge portfolio returns are examined the year after (t + 1) the formation of the portfolios, two years after (t + 2) and three years after (t + 3).

The results, as presented in Table 9, for the hedge portfolio based on *FR*, taking a long position in the least underfunded firms (portfolio ten) and short in the most underfunded decile (portfolio one), yields positive returns in all three years. The significantly positive returns to the hedge portfolio in years t + 1, t + 2 and t + 3 are consistent with the market overpricing the most underfunded firms in portfolio formation year. When the hedge portfolio is formed based on *FR*, taking a long position in the overfunded firms (portfolio eleven) and short in the most underfunded decile (portfolio one), it yields positive returns in all three years. The significantly positive returns to the hedge portfolio in years t + 1, t + 2 and t + 3 are consistent with the market overpricing the most underfunded firms in portfolio formation year. In contrast, when the hedge portfolio is formed based on *FR*, taking a long position in the overfunded firms (portfolio eleven) and short in the least underfunded decile (portfolio ten), it yields negative returns for all three years. This type of strategy may not be efficient.

In order to compare, hedge portfolios are formed for *LTDR*. The results for the hedge portfolio based on *LTDR*, taking a long position in the least levered firms (portfolio ten) and short in the most levered firms (portfolio one), yields positive returns in all three years. The significantly positive returns to the hedge portfolio in years t + 1, t + 2 and t + 3 are consistent with the market overpricing the most levered firms in portfolio formation year. When the hedge portfolio is formed taking a long position in the unlevered firms (portfolio eleven) and short in the most levered firms (portfolio one), it yields positive returns in all three years. The significantly positive returns to the hedge portfolio in years t + 1, t + 2 and t + 3 are consistent with the market overpricing the

most levered firms in portfolio formation year. In contrast, when the hedge portfolio is formed based on *LTDR*, taking a long position in the unlevered firms (portfolio eleven) and short in the least levered firms (portfolio ten), it yields significantly negative returns for all three years. This type of strategy may not be efficient.

Table 9
Hedge Portfolio Tests

t-statistics of the average monthly returns for each *FR* and *LTDR* portfolio in three years after portfolio formation are calculated. Panel A shows the returns for portfolios formed based on *FR*. The stocks in portfolio one (ten) have higher (lower) levels of underfunding. Firms with overfunded plans are assigned to portfolio eleven. Panel B shows the returns for portfolios formed based on *LTDR*. The stocks in portfolio one (ten) have higher (lower) levels of debt. Firms with no *LTD* are assigned to portfolio eleven. Panel C presents the hedge between portfolios one and ten, one and eleven, and ten and eleven.

Average Returns Per Portfolio						
Portfolio	Panel A: FR Portfolios			Panel B: LTDR Portfolios		
Ranking	Year t+1	Year t+2	Year t+3	Year t+1	Year t+2	Year t+3
1	-0.002	-0.002	0.001	-0.005	-0.004	-0.001
	(0.05)	(0.15)	(0.46)	(0.74)	(0.76)	(1.22)
2	0.007	0.007	0.008	0.005	0.004	0.006
	(-0.18)	(-0.01)	(0.17)	(0.46)	(-0.38)	(0.77)
3	0.009	0.008	0.009	0.008	0.007	0.008
	(-0.16)	(-0.37)	(0.37)	(-0.05)	(-0.46)	(0.40)
4	0.010	0.009	0.009	0.010	0.010	0.010
	(-0.16)	(-0.32)	(0.20)	(-0.45)	(-0.18)	(0.42)
5	0.012	0.011	0.011	0.012	0.011	0.012
	(-0.18)	(-0.22)	(0.06)	(-0.56)	(-0.24)	(0.05)
6	0.012	0.011	0.012	0.013	0.012	0.012
	(-0.39)	(-0.29)	(0.15)	(-0.65)	(-0.84)	(0.24)
7	0.014	0.013	0.013	0.015	0.014	0.014
	(-0.42)	(-0.42)	(0.03)	(-0.78)	(-0.74)	(-0.06)
8	0.015	0.013	0.013	0.017	0.016	0.015
	(-0.31)	(-0.54)	(0.02)	(-0.77)	(-0.66)	(-0.22)
9	0.016	0.015	0.014	0.019	0.017	0.016
	(-0.39)	(-0.25)	(-0.22)	(-0.60)	(-0.91)	(-0.49)
10	0.018	0.015	0.015	0.023	0.021	0.019
	(-0.69)	(-0.68)	(-0.03)	(-1.01)	(-1.26)	(-0.73)
11	0.012	0.012	0.012	0.014	0.014	0.014
	(-0.81)	(-0.66)	(0.28)	(-0.43)	(-0.42)	(0.34)
Panel C: Portfolio Hedge						
Comparison	*FR* portfolios			*LTDR* portfolios		
1 and 10	0.020*	0.017*	0.014*	0.028*	0.025*	0.020*
	(4.81)	(3.81)	(3.02)	(14.98)	(12.31)	(9.57)
1 and 11	0.015*	0.013*	0.011*	0.019*	0.018*	0.015*
	(4.19)	(3.56)	(2.75)	(12.12)	(10.21)	(8.38)
10 and 11	-0.005*	-0.004	-0.003	-0.008*	-0.007*	-0.005*
	(-2.19)	(1.41)	(-1.20)	(-5.60)	(-4.20)	(-2.88)

* denotes significance at the 0.05 level, based on a two-tailed t-test for the time-series (26 years) of annual average returns.

Table 10
FR Portfolios Characteristics

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to *FR*. The stocks in the first portfolio are the most underfunded and the stocks in the tenth portfolio are the least underfunded. Firms with positive *FR* are assigned to portfolio eleven. *FR* is the difference between the fair value of plan assets (*FVPA*) and the projected benefit obligation (*PBO*) in fiscal year ending in year $t - 1$, divided by the market capitalization at the end of fiscal year $t - 1$. Different ratios are presented to describe each *FR* portfolio. First, average change in cash flows, the average net income and the average net sales to total assets ratios are presented. Then, as another measure of profitability, the average net sales to net income ratio results are reported. The average advertising expense to sales, capital expenditures to total assets and research and development ratios are reported. Lastly, the average Altman Z-score, the interest coverage ratio and the average number of employees is reported.

	Most under									Least under	Over
Measure	1	2	3	4	5	6	7	8	9	10	11
CF/TA	-0.004	0.005	0.006	0.005	0.014	0.010	0.006	0.009	0.010	0.026	0.003
NI/TA	-0.073	0.005	0.029	0.031	0.025	0.057	0.071	0.069	0.082	0.062	0.044
Sales/TA	1.490	1.439	1.398	1.416	1.396	1.259	1.296	1.337	1.241	1.140	1.332
Profitability (Sales/NI)	0.063	0.110	0.128	0.133	0.137	0.152	0.172	0.176	0.181	0.163	0.146
AE/Sales	0.032	0.021	0.023	0.025	0.029	0.037	0.038	0.034	0.034	0.037	0.037
CE/TA	0.048	0.045	0.046	0.049	0.048	0.048	0.053	0.052	0.056	0.063	0.071
R&D/Sales	0.018	0.019	0.022	0.024	0.028	0.040	0.033	0.035	0.058	0.066	0.030
Altman Z-Score	1.520	2.436	3.146	3.419	3.612	4.070	4.387	4.770	5.520	5.663	3.656
Interest Coverage	5.609	6.082	10.24	17.309	42.069	40.317	58.261	109.314	361.562	60.794	24.311
Employees	16,808	37,000	17,039	24,166	23,523	27,374	27,810	23,269	18,272	37,893	17,262
Annual tax rate	0.348	0.221	0.217	0.294	0.359	0.300	0.342	0.207	0.396	0.479	0.369

Table 11
LTDR Portfolios Characteristics

In the fourth month after the end of fiscal year *t*, firms with available data at the end of fiscal year *t*-1 are divided in deciles according to *LTDR*. The stocks in the first portfolio have higher levels of debt and the stocks in the tenth portfolio have lower levels of debt. Firms with no *LTD* are assigned to portfolio eleven. *LTDR* is long-term debt in fiscal year ending in year *t* – 1, divided by the market capitalization at the end of fiscal year *t* – 1. Different ratios are presented to describe each *FR* portfolio. First, average change in cash flows, the average net income and the average net sales to total assets ratios are presented. Then, as another measure of profitability, the average net sales to net income ratio results are reported. The average advertising expense to sales, capital expenditures to total assets and research and development ratios are reported. Lastly, the average Altman Z-score, the interest coverage ratio and the average number of employees is reported.

	Highest									Lowest	None
Measure	1	2	3	4	5	6	7	8	9	10	11
CF/TA	-0.003	-0.008	0.001	0.002	-0.004	0.001	0.002	0.016	0.019	0.049	0.011
NI/TA	-0.065	-0.032	-0.016	-0.001	-0.047	0.013	0.017	0.025	-0.013	-0.016	-0.071
Sales/TA	1.437	1.573	1.438	1.382	1.339	1.323	1.305	1.386	1.338	1.225	1.278
Profitability (Sales/NI)	0.076	0.078	0.087	0.010	0.072	0.117	0.122	0.125	0.083	0.080	0.049
AE/Sales	0.036	0.032	0.031	0.029	0.032	0.030	0.033	0.032	0.034	0.036	0.038
CE/TA	0.063	0.073	0.069	0.064	0.062	0.064	0.070	0.069	0.060	0.055	0.048
R&D/Sales	0.015	0.056	0.033	0.048	0.049	0.050	0.066	0.078	0.110	0.016	0.211
Altman Z-Score	1.196	2.123	2.245	2.592	1.686	3.286	3.848	4.462	5.591	9.894	7.552
Interest Coverage	1.877	2.774	4.316	6.692	7.017	11.270	27.738	19.263	31.838	200.79	575.924
Employees	8,507	10,632	11,275	10,005	9,790	20,603	19,173	14,802	9,509	4,405	2,068
Annual tax rate	0.226	0.323	0.553	0.339	0.078	0.207	0.155	0.298	0.164	0.348	0.475

Portfolio Characteristics

To describe the firms in each portfolio different characteristics are presented. Table 10 reveals that the most underfunded and the overfunded firms are smaller and tend to be value firms. The most underfunded firms portray poor financial and operating performance; spend a smaller amount on advertising, research and development and operating assets; and have a higher probability of bankruptcy. The most underfunded firms appear to be overpriced and the overfunded firms appear to be underpriced. Apparently size may have a role on the way market value firms. Smaller firms tend to be less exposed and scrutinized by analysts. Quality and quantity of information available from these firms may have an impact in the way the market evaluates them.

Similarities are observed between *FR* and *LTDR* portfolios. Table 11 presents *LTDR* portfolio characteristics. As the most underfunded and the overfunded portfolios, the most levered and the unlevered portfolios have on average the smallest firms of the set of *LTDR* portfolios. These are also the most overpriced (levered) and underpriced (unlevered) firms for these set of portfolios. In contrast to the *FR* portfolios, the *LTDR* portfolios one and ten portray similarities as to a poor financial and operating performance and spending behavior. In sum, smaller firms may have less access to different sources of financing (for example bond markets). Analysts do not follow smaller firms as closer as they do with bigger firms. This may happen because of less availability of information and less news exposure. Because of their lessen ability to raise funds, smaller firms may be more inclined to underfund their pension plans. Higher underfunding levels may be accompanied by high levels of *LTD* in order to finance the operations and the pension plans.

VI. Conclusions

This study investigates if investors efficiently incorporate DB pension plan information in stock prices. Fama and French three factor (1993) and four factor models results reveal that the market inefficiently incorporates DB pension plan information. The results are consistent with other studies (Franzoni and Marín 2006, Godwin and Key 1998).

The results suggest that investors are not paying enough attention to the implications of the current underfunding for future earnings and cash flows. Furthermore, portfolio characteristics suggest that the most underfunded and the overfunded firms are smaller and tend to be value firms. The most underfunded firms face poor financial and operating performance; tend to spend less on advertising, research and development and operating assets; and have a higher probability of bankruptcy. These characteristics make them comparable to value firms. The most underfunded firms appear to be overpriced and the overfunded firms appear to be underpriced. Apparently, size has an important role in the way firms are evaluated by investors. These findings may suggest that smaller firms face limitations to access different sources of external funds or have exhausted the available sources. Asymmetries of information may have an indirect relation to size. Because of these limitations smaller firms may possibly use underfunding as another source of funds.

In contrast with previous research, investors' reactions to DB pension plan information were compared to reactions to long-term debt ratios. The results reveal that the market is also inefficient incorporating long-term debt information. Similar to the findings of *FR* portfolios, the most levered and the unlevered portfolios have on average the smallest firms of the set of *LTDR* portfolios. Firms in these portfolios are the most overpriced (levered) and underpriced (unlevered) firms. They also portray a poor financial and operating performance and higher bankruptcy risk. Smaller firms may have less access to different sources of financing. As a consequence of information asymmetries, these firms may face more difficulties to raise funds. And, as the sources of funds diminish, firms may be more inclined to underfund their pension plans.

In order to verify if the market is inefficient incorporating pension plan and long-term debt information, this study integrates hedge portfolio tests. Tests' results corroborate that the market overprices firms that have severely negative funding status. Investment strategies short in the most underfunded firms and long in the least underfunded or overfunded firms yield positive returns for at least three years after portfolio formation. These tests also reveal similarities between market valuations of underfundings in DB pension plans and long-term debt information. Investment strategies short in highly levered firms and long in the least or over levered firms yield positive returns. The

identified inefficiencies may result from market's inability to integrate information and to identify future consequences related to long-term commitments. Other studies may offer some explanations to these results. Investors may be focusing in the optimal leverage range for firms (Brigham and Gapenski 1985), debt ratings (Carroll and Niehaus 1998), or they are just "fixating" on earnings figures (Sloan 1996).

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