INFORMATION CONTENT OF CHANGES IN PENSION PLAN FUNDING STATUS AND LONG-TERM DEBT

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ABSTRACT

This study investigates whether investors efficiently incorporate changes in defined benefit pension plan information in stock prices. The sample is comprised of public US companies with available data from 1980 to 2005. Fama and French three factor (1993) and four factor models results reveal that the market inefficiently incorporates changes in defined benefit pension plan information. The results suggest that investors are not paying enough attention to the implications of the changes in funding status for future earnings and cash flows. Investors' reactions to changes in defined benefit pension plan information were compared to reactions to changes in long-term debt account ratios. The results reveal that the market is also inefficient incorporating changes in long-term debt information. Hedge-portfolio tests are performed to verify if there is an opportunity to outperform the market by identifying market inefficiencies. The hedge-portfolio results support the notion that the market overprices firms that have the most negative changes in funding ratio and increases in long-term debt ratio.

JEL: G14, G25, G31, J32

KEYWORDS: long-term debt, defined benefits pension plan, stock prices, four factor model

INTRODUCTION

Accounting information serves different and very critical roles in capital markets. It is vital in providing prospective capital contributors with the necessary means for evaluation of potential investment opportunities and in serving as a monitoring tool for the stakeholders of a company. During the past decade defined benefit pension plan (DBPP) issues have been the center of many debates and research. From markets' efficiency to earnings management, pensions have been of much interest to those who are interested in the reliability of pension disclosures and in maintaining a healthy pension system. Concerns about accounting standards for DBPP have been discussed in different forums during the last decades. Some argue that accounting for pension plans should be easy to prepare and must provide information that is easy for the users to understand. Ironically, it has been regarded as obscure and arcane; too complicated for users to comprehend because of all the estimates and valuation methods involved in the calculations. Through the years, the Financial Accounting Standards Board (FASB) has demonstrated preoccupation with respect to pension plan information disclosures, as confirmed by the changes in disclosure requirements in the last decades.

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", the issuance of Statement of Financial Accounting Standards (SFAS) 36, SFAS 87, SFAS 132, and most recently, the SFAS 158. SFAS 158, effective for fiscal years ending after December 15, 2006, provides new pension disclosure requirements intended to address previous shortcomings. Before the issuance of SFAS 158, pension plan information concerning the pension plan status (PPS) was reported in the notes to the financial statements. One of the most important changes of this statement is the presentation of PPS in the balance sheet.

Under the new statement an underfunded (overfunded) pension plan will report a net pension liability (net pension asset) on the balance sheet. A severely underfunded pension plan has future implications in cash flows and earnings. For this reason, it is important for investors to assess the PPS before making

investment decisions. By moving this information from the footnotes to the balance sheet the intention of the FASB is to improve and create awareness of the importance of PPS information. The FASB changed the disclosures related to pensions based on the belief that moving the information from the footnotes to the financial statements will gain the attention of investors and other users. Obviously, they assume that footnotes were not good enough to satisfy the objective of creating awareness of the impact of pension plans and decided to move PPS information to the balance sheet. Then, we expect that information users efficiently use the information in the balance sheet and that the recognized amounts are reliable and useful. Studies that examine the efficiency of the markets in using information presented in the balance sheet find interesting and contrasting results (Foster, Jenkins and Vickers, 1986; Sloan, 1996). Particularly, those related to long-term commitments (Harper, Mister and Strawser, 1987; Chen, Kim and Nance, 1992; Hirshleifer, Hou, Teoh and Zhang, 2004; Ahmed, Kilic and Lobo, 2006; Bradshaw, Richardson and Sloan, 2006). Some of these studies find that the type of debt issuance and changes in debt ratings impacts investors' perceptions and decisions.

Have the standard setters considered that just moving the information from the footnotes to the financial statements might not be good enough. What we should be asking is if changes in the presentation solve the problem of information awareness and its incorporation in decision-making. Furthermore, we should consider if it is an issue of presentation of information or reliability of information. And, whatever the reasons are, determine what mechanisms can be used to address this issue.If the main reason of the FASB is to create awareness about the impact of pension status over the financial stability of a firm, then, it is important to verify if the market reacts differently to recognized long-term obligations in the financial statements versus long-term commitments disclosed in the footnotes to the financial statements.

This study examines the incorporation of DBPP disclosures before SFAS 158 and LTD information into stock prices. This assessment is done to verify if the market efficiently incorporates information of long-term commitments as represented by pension obligations presented in the footnotes and LTD as presented in the balance sheet. To measure and verify how efficiently the information is used investment strategies are design. The paper proceeds as follows. The first section discusses the relevant prior literature, followed by hypotheses development and research methodology. Then, the sample selection procedure and data analysis are presented. Finally, the empirical findings and the conclusion are discussed.

LITERATURE REVIEW

Pensions

Previous studies find evidence that suggest that before SFAS 158 investors inefficiently used information related to PPS (Godwin and Key, 1998; Franzoni and Marín, 2006). Other studies consider managers' choice to overfund or underfund their plans (Moody and Phillips, 2003), the association of PPS and capital expenditures (Rauh, 2006), earnings management and pensions (Coronado and Sharpe, 2003; Bergstresser, Desai and Rauh, 2006; Asthana, 2008), the incorporation of pension disclosures in investment decisions (Chen, Yao, Yu and Zhang, 2010), and the association between systematic equity risk and the risk of pension plans (Jin, Merton, Bodie, 2006).

Shaw (2008) argues that SFAS 158 significantly changes the balance sheet reporting for DBPP. Coronado, Mitchell, Sharpe and Nesbitt (2008) state that the increased attention to pension disclosures misuse may have influenced the way investors evaluate pensions since the appearance of SFAS 158 and that it will influence investors' decisions. Recent studies evaluate the impact of SFAS 158. Boylan and Houmes (2010) examine the use of higher discount rates to lower the pension benefit obligations and pension liabilities with the intention of portraying a better financial position. Chen et al. (2010) examine the differences in the use of pension disclosures depending on the level of sophistication of users. And find that the level of sophistication is related to the incorporation of information. Beaudoin, Chandar and

Werner (2010) study whether the recognition of pension asset and liability amounts under SFAS 158 is incrementally value relevant in its first year of adoption versus the same amounts previously disclosed to both equity investor and rating decision makers. Findings suggest that DBPP information is used in the same way before and after the issuance of SFAS 158.

The FASB changed the disclosures related to pensions based on the belief that moving the information from the footnotes to the financial statements will gain the attention of investors and other users. Obviously, they assume that footnotes were not good enough to satisfy the objective of creating awareness of the impact of pension plans and decided to move PPS information to the balance sheet. Then, we expect that information users efficiently use the information in the balance sheet and that the recognized amounts are reliable and useful. Studies that examine the efficiency of the markets in using information presented in the balance sheet find interesting and contrasting results (Foster, Jenkins and Vickers, 1986; Sloan, 1996). Particularly, those related to long-term commitments (Harper, Mister and Strawser, 1987; Chen, Kim and Nance, 1992; Hirshleifer, Hou, Teoh and Zhang, 2004; Ahmed, Kilic and Lobo, 2006; Bradshaw, Richardson and Sloan, 2006). Some of these studies find that the type of debt issuance and changes in debt ratings impacts investors' perceptions and decisions.

Long-Term Debt

Chen, Kim and Nance (1992) study the information content of balance sheet items as conveyed by financial leverage. The evidence suggests that data on financial leverage has some information content. The authors argue that the market reacts to changes in financial leverage. Nevertheless, they observe that the direction of this response seems to depend on the position of a corporation's financial leverage relative to its optimal level. Modigliani and Miller (1958) introduced the proposition that the expected return on equity should increase with the amount of debt in a firm's capital structure. On the other hand, empirical research on the relation between financial leverage and expected stock returns is contradictory. Fama and French (1992) find that leverage based on book values has a negative risk premium. In contrast, Bhandari (1988) identifies leverage measured in market values as a separate risk factor. He finds that firms with higher financial leverage consistently earn lower risk-adjusted returns.

In addition, Kayhan, Lei and Lin (2005) find that this results hold for both market and book leverage. In contrast to Fama and French (1992), they also find that the leverage effect on the risk-adjusted returns persists after controlling for firm size and the book-to-market equity ratio (B/M). Chan, Chan, Jegadeesh, and Lakonoshok (2006) investigate various hypotheses to explain the accruals effect and conclude that the effect is largely due to earnings manipulation. Sloan (1996) finds that the accruals effect reflects that investors overestimate the future earnings of firms with high accruals in current earnings.

Millon-Cornett and Travlos (1989) study the information effect caused by a firm's change in capital structure via debt-for-equity and equity-for debt exchange offers. The evidence suggests that the former transactions lead to abnormal stock price increases, while the latter lead to abnormal stock price decreases. However, Brigham and Gapenski (1985) state that it is usually believed that the average cost of capital curve is shaped more like a shallow bowl than like a sharp V. This may be interpreted that over a wide range, the financial leverage does not have a noticeable effect on the average cost of capital and, therefore, on the value of corporations. They also say that if this pan-shaped curve is valid, stock prices of a corporation will not be affected by the change of financial leverage as long as the corporation remains in this region. This means that, if corporations that had financial leverage (and are at the low side of the optimal leverage range) dominate in portfolios, prior to a new issue of debt, a decrease in financial leverage will cause stock prices to decrease. To the contrary, an increase in financial leverage will not have significant impact on stock prices.

Best (1997) examines the stock price reaction to straight debt announcements by differentiating firms on the basis of any subsequent change in their overall default risk. He finds that firms that will within six months of straight debt announcements, undergo debt rating downgrades experience significant negative abnormal stock returns at the time of new debt announcement. On the other hand, firms with bond ratings that are later upgraded show significant positive abnormal returns.

Finally, Bradley, Jarrell and Kim (1984) use a model that synthesizes the modern balancing theory of optimal capital structure. The model incorporates positive personal taxes on equity and bond income, expected costs of financial distress (bankruptcy and agency costs), and positive non-debt tax shields. The evidence suggests that optimal firm leverage is inversely related to expected costs of financial distress and to the amount of non-debt tax shields. They use simulation analysis to demonstrate that if costs of financial distress are significant, optimal leverage is related inversely to the variability of firm earnings.

DATA AND METHODOLOGY

Samples

In order to examine the data different sets of portfolios are formed. The firm selection criteria are different for each set. The set of portfolios formed based on the change in *FR* is comprised by firms that sponsor DBPP. The sets of portfolios formed based on *LTDR* changes are comprised of all firms with available data for long-term debt. As a result, a separate description of both samples is presented. The *FR* 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. 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 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 (firm-years) 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 (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 *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 (firm-years) 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. Firm returns were obtained from the Center for Research and Security Prices (CRSP), Monthly Stock database.

Variable Measurement

The ratios used by Franzoni and Marín (2006) incorporate the balance of the account as measured at the end of year $t - 1$. Some studies, instead of using the account balance presented in the financial statements or in the notes, use the change in the account or accounting element. Xie (2001), Kim, Chen and Nance (1992), Best (1997) use the changes in the accounts of interest for their respective studies. Stober (1986)

investigates first occurrences of LIFO liquidations because they are less likely to be anticipated by the market than later occurrences. Stober argues that if these occurrences are unexpected events, and this component of earnings is not disclosed separately from earnings, they should give rise to the type of positive abnormal share price behavior at the earnings release date that is generally associated with positive unanticipated earnings. Consequently, and in order to verify if the changes in *FR* have predictive power the risk-adjusted returns tests are performed for portfolios formed based on the change in *FR* at the end of fiscal year $t - 2$ to the end of fiscal year $t - 1$.

In order to measure the change in funding status, a similar procedure used by Franzoni and Marín (2006) is used. To solve the problem of the impact that the same dollar amount of underfunding has depending on the size of the firm, the change in funding status needs to be appropriately normalized. The change in funding status is defined as the difference between the fair value of pension assets (*FVPA*) and the pension benefit obligation (*PBO*) in year $t - 1$ minus the difference in fair value of pension assets (*FVPA*) and the pension benefit obligation (*PBO*) in year $t - 2$. The change in funding status is divided by market capitalization (*Mkt Cap*) at the end of the fiscal year $t - 1$. This variable is labeled change in funding ratio (ΔFR). This variable is computed as follows:

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

After calculating the ΔFR, firms-years are sorted into portfolios by ΔFR. Firms sponsoring DBPP are classified as firms with negative changes in *FR* and firms with positive changes in *FR*. Eleven portfolios are formed for these firms. The first ten portfolios include firms with negative changes in *FR* ($\Delta FR < 0$). The eleventh portfolio includes firms with no changes or positive changes in *FR* ($\Delta FR \geq 0$).
As for the change in the long-term debt, ratio it is normalized using market capitalization. The change in long-term debt ratio ($\Delta LTDR_{t-1}$) is computed as:

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

After calculating the $\Delta LTDR$, firms-years are sorted into portfolios by $\Delta LTDR$. Firms are classified as firms with negative changes in *LTDR* and firms with positive changes in *LTDR*. Eleven portfolios are formed for these firms. The first ten portfolios include firms with positive changes in *LTDR* (increase in debt). The eleventh portfolio includes firms with no changes or positive changes in *LTDR* (decrease in debt).The Fama and French (1993) three-factor model is used to calculate each portfolio's excess return. Portfolios are tested for risk-adjusted returns by running time-series regressions of portfolio returns on the 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. This study, as in Franzoni and Marín (2006), 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

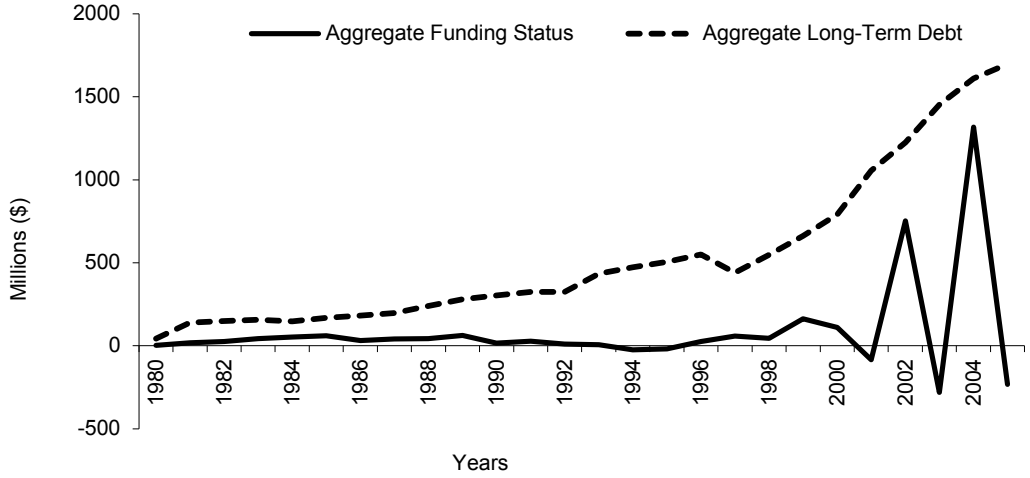
Jegadeesh and Titman (1993). They found that past winners continue to gain extra returns over past losers within a one-year horizon.

Finally, statistical tests are performed to verify if there are statistically significant differences between the risk-adjusted returns of the different portfolios. As in Sloan (1996) and Xie (2001), hedge-portfolio tests are performed to verify if there is an opportunity to outperform the market by creating investment strategies that focus in exploiting the market failure to incorporate the changes in pension plan information. The same tests are performed for the *LTDR* portfolios.

Aggregate Pension Plan Status and Long-Term Debt Historical Trends

The historical evolution of the DBPP status and long-term debt accounts can be helpful in the assessment of any similarities or discrepancies related to the markets' evaluation of stocks. Figure 1 reports the time series of the aggregate funding level for all the companies in Compustat with available pension items. The time series of long-term debt for all firms with available information in Compustat is also presented. The funding level is the difference between the aggregate *FVPA* and *PBO*. As can be observed from Figure 1, an aggregate underfunding appears, for the first time in our sample, in 1994. Starting in 1996 the funding status of DBPP 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 fair value of pension assets dropped. In 2001, the gap between the *PBO* and the *FVPA* appears reaching 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. However, the volatility in the markets is reflected in years to come. In 2003, another aggregate underfunding appears. This is in contrast to an aggregate overfunding of $1.3 billion in 2004. This is the highest aggregate overfunding for the whole sample period. For 2005, the last year in the sample, another aggregate underfunding appears. It represents the biggest change in funding status. It reaches almost $1.5 billion dollars in deficit on a year-to-year basis.

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. In addition, the aggregate level of long-term debt (*LTD*) for the companies in the sample is presented.

As for long-term debt, a tendency to increase over the years is observed. From 1996 to 1997, the increase in the aggregate level of long-term debt represented 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 reports descriptive statistics of the eleven portfolios created according to Δ*FR* and Δ*LTDR*. Panel A shows descriptive statistics for Δ*FR* portfolios. The characteristics are measured at the end of fiscal year $t - 1$ relative to portfolio formation. The change in *FR* is calculated by portfolio. The results show that firms in portfolio one have an average change in *FR* of -210%. As for the other portfolios, the changes range between -6% and 4%. The difference in the level of average *FR* between the portfolio with the firms with the most negative changes and the other portfolios is evident. For portfolio one the average *FR* is about -13.5%. In contrast, for portfolio ten the average level of *FR* is about -0.7%. The average *FR* for portfolio eleven is about 0.5%. The firms with the most negative change (portfolio one) have higher levels of *LTDR*. The rest of the portfolios have considerably less *LTDR* than portfolio one. As for size, the smaller firms are concentrated in portfolio one.

Panel B reports descriptive statistics of the eleven portfolios created according to Δ*LTDR*. The characteristics are measured at the end of fiscal year $t - 1$ relative to portfolio formation. The change in *LTDR* is calculated by portfolio. The results show that, on average, firms in portfolio one have a change (increase) in *LTDR* of 825%. As for portfolios two through ten the changes range between 45% and 0.2%. Portfolio eleven portrays an average reduction of 112% in *LTDR*. For portfolio one the average *LTD* is about $2.5 billion. In contrast, for portfolio ten the average level of *LTD* is about $239 million. The average *LTD* for portfolio eleven is about $395 million. As for size, the smaller firms are concentrated in portfolio one. As for B/M, value firms are concentrated also in this portfolio.

Table 1: Descriptive Statistics for FR and LTDR Portfolios

Panel A: ΔFR Portfolio Characteristics											
	Most (-)									Least (-)	0 or +
	1	2	3	4	5	6	7	8	9	10	11
ΔFR	-2.099	-0.061	-0.033	-0.021	-0.008	-0.009	-0.006	-0.004	-0.002	-0.001	0.039
FR	-0.135	-0.031	-0.018	-0.002	-0.022	-0.02	-0.010	-0.013	-0.008	-0.007	0.005
LTDR	1.168	0.761	0.361	0.434	0.374	0.385	0.398	0.224	0.1778	0.26	0.416
Size	1,406	2,129	3,014	3,070	1,536	4,102	3,633	4,249	3,206	4,431	4,018
B/M	0.268	0.529	0.504	0.453	0.438	0.271	0.462	0.418	0.408	0.404	0.344
Firm-years	1,352	1,664	1,378	1,066	1,092	884	1,118	884	1,040	1,014	8,216
Panel B: ΔLTDR Portfolio Characteristics											
	Most (+)									Least (+)	0 or -
	1	2	3	4	5	6	7	8	9	10	11
ΔLTDR	8.255	0.458	0.259	0.167	0.109	0.07	0.043	0.023	0.009	0.002	-1.12
LTD	2,502	1,587	1,112	1,254	927,1	863,3	759,3	709,2	515,8	238,9	395,2
Size	722.4	1,057	1,213	1,742	1,812	2,253	2,613	3,566	3,535	3,368	1,149
B/M	-1.73	0.24	0.54	0.6	0.43	0.5	0.49	0.52	0.44	0.41	-0.09
Firm-years	6,913	6,927	6,926	6,927	6,928	6,925	6,924	6,930	6,922	6,911	102,262

Two sets of portfolios are examined in this study. 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 two set of eleven portfolios according to the deciles of the distribution of ΔFR and ΔLTDR. . Panel A presents descriptive statistics for ΔFR portfolios. Portfolios one through ten have most negative change in FR. Firms in portfolio eleven contain firms with positive or zero change in FR. Presented are the average annual change in FR, 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. Panel B presents descriptive statistics of ΔLTDR portfolios. Firms in portfolios one through ten have increments in debt from year t-2 to year t-1. Firms in portfolio eleven contain firms with decline or zero change in LTDR. The ΔLTDR is the difference between the balance in the long-term debt account in fiscal year ending in year t -1 and year t-2, divided by the market capitalization at the end of fiscal year t-1. Presented are the average annual change in LTDR, the annual averages of the LTD of the companies in each portfolio; size is measured as 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; and the average of the annual number of firm-years in each portfolio. The samples cover formation periods from April 1981 to April 2006.

EMPIRICAL RESULTS

Risk-Adjusted Returns

Table 2 reports the results for the time-series regressions for the returns of the portfolios formed based on the changes in *FR*. Panel A presents the three-factor model results. Portfolio one has significantly negative alpha loadings. Portfolios three and five through eleven have positive and significant alpha loadings. These results indicate that as the negative change in *FR* decreases the undervaluation increases. Portfolio eleven (positive change and improvement in *FR* status portfolio) results indicate that the investors may not be paying attention to the changes in the account and the information related to pension plans at all. Panel B reports alphas, factor loadings, and R^2 for the four-factor model of each set of portfolios. Panel A shows that portfolios five through eleven have positive and significant alpha loadings. The regressions results show slight improvements when the momentum factor is included. Only portfolios one and nine have significant UMD loadings.

Table 3 reports the results for the time-series regressions for the returns of the portfolios formed based on changes in *LTDR*. Panel A reports the alphas of the three-factor model for the eleven portfolios. It can be observed that returns are significantly positive for portfolios four through nine, and portfolio eleven. This is a signal of undervaluation. A negative relation between the change in *LTDR* and the undervaluation can be observed. In other words, as the change in *LTDR* decreases the undervaluation increases. Note that for portfolio one and two the excess return is negative. This may indicate overvaluation for firms that exhibit higher positive changes (largest increments in debt) in *LTDR*.

Apparently, the magnitude of changes in information related to pension plans and long-term debt conveys no additional information to investors. Panel B reports alphas, factor loadings, and R^2 for the four-factor model of *LTDR* portfolios. The results for *LTDR* portfolios are slightly different when the UMD factor is introduced. Panel A shows positive alphas for portfolios five through eleven; this may be a signal of undervaluation. No significant improvements are seen when momentum is introduced. Apparently, momentum has no impact on the portfolios.

Hedge-Portfolio Tests

The risk-adjusted returns estimated using the Fama and French (1993) three-factor and four-factor models indicate that investors may be overpricing firms with negative changes in their funding status and increases in long-term debt levels. In addition, the results indicate that investors may be underpricing stocks with relatively smaller changes in funding status and long-term debt levels. In order to verify if there are statistically significant differences between diverse sets of portfolios, hedge portfolio tests were performed. Table 4 shows time-series means of the average annual returns for each set of portfolios in three years after portfolio formation.

First, hedge portfolio tests were performed between diverse sets of *FR* portfolios. A portfolio hedge that is long in the most negative change in *FR* portfolio (portfolio ten) and short in the least negative change in *FR* portfolio (portfolio one) was formed. The hedge portfolio yields positive returns for each of the three years after portfolio formation: 2 percent ($t = 4.39$), 1.8 percent ($t = 3.74$) and 1.6 percent ($t = 2.99$), respectively.

Table 2: Three-Factor and Four-Factor Model Results for Changes in Funding Ratio

	Most(-) 1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Least (-) 10**	**Positive 11**
Panel A: Three-Factor Model Results											
						Alphas					
Alphas	-0.013*	-0.002	0.003*	0.002	0.005*	0.006*	0.009*	0.008*	0.011*	0.013*	0.006*
	(-6.46)	(-1.48)	(2.25)	(1.89)	(3.80)	(4.22)	(6.22)	(5.90)	(7.76)	(9.65)	(6.14)
						Three-Factor Model Loadings and R^2					
EXM	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.008
	(15.21)	(15.84)	(16.48)	(15.7)	(15.47)	(15.04)	(12.2)	(13.87)	(13.73)	(21.91)	(18.03)
HML	0.008	0.006	0.005	0.005	0.004	0.004	0.003	0.003	0.002	0.002	0.005
	(10.83)	(10.56)	(6.87)	(6.29)	(7.75)	(5.62)	(4.21)	(4.95)	(2.89)	(3.06)	(9.78)
SMB	0.009	0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005
	(11.14)	(9.91)	(7.05)	(7.33)	(6.74)	(6.19)	(4.77)	(5.50)	(5.19)	(6.69)	(14.12)
R^2	0.68	0.76	0.78	0.73	0.76	0.76	0.71	0.76	0.73	0.78	0.89
Firm-years	816	967	1,003	1,024	1,011	1,039	1,024	1,021	1,045	1,027	8,570
Panel B: Four-Factor Model Results											
						Alphas					
Alphas	-0.014*	-0.004*	0.000	0.001	0.003*	0.005*	0.006*	0.007*	0.010*	0.012*	0.005*
	(-5.60)	(-2.33)	(-0.22)	(1.16)	(2.00)	(3.27)	(5.24)	(6.03)	(7.55)	(9.98)	(5.92)
						Four-Factor Model Loadings and R^2					
EXM	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.009
	(16.78)	(19.53)	(19.02)	(21.37)	(23.12)	(21.75)	(23.62)	(23.56)	(16.66)	(33.42)	(29.94)
HML	0.007	0.006	0.005	0.004	0.004	0.004	0.003	0.004	0.003	0.003	0.005
	(7.25)	(8.65)	(6.52)	(5.78)	(5.74)	(5.59)	(4.10)	(5.58)	(3.54)	(4.03)	(8.20)
SMB	0.012	0.008	0.007	0.007	0.006	0.005	0.005	0.005	0.004	0.005	0.004
	(12.81)	(14.12)	(11.45)	(13.29)	(13.04)	(9.59)	(9.33)	(8.46)	(5.00)	(9.25)	(11.47)
UMD	-0.002	0.003	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(-2.04)	(0.54)	(0.19)	(1.05)	(1.43)	(1.28)	(1.51)	(1.65)	(2.05)	(1.98)	(1.89)
R^2	0.68	0.75	0.77	0.79	0.79	0.72	0.79	0.76	0.74	0.80	0.87
Firm-years	816	967	1,003	1,024	1,011	1,039	1,024	1,021	1,045	1,027	8,570

*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 change in FR. The stocks in the first portfolio have the most negative changes in FR and the stocks in the tenth portfolio have the least negative changes in FR. Also, in the fourth month of year t, stocks with positive or no change in FR at the end of fiscal year t are assigned to an eleventh portfolio. The change in 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 minus the difference between the fair value of plan assets (FVPA) and the projected benefit obligation (PBO) in fiscal year ending in year t -2, 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 the portfolios. The factors are the market excess return (EXM), the return on HML portfolio, and the return on the SMB portfolio. R^2 from these regressions are also presented. Panel B reports the constant (alpha) from a time-series regression of portfolio excess returns on the four Fama and French factors for the portfolios. The factors are the market excess return (EXM), the return on HML portfolio, the return on the SMB portfolio and the return on a momentum portfolio (UMD). R^2 from these regressions are presented. The sample period is from the fourth month after the end of fiscal year 1987 to 2006. t-statistics are presented in parentheses. * Alphas significant at the 5 percent level.*

These results are consistent with the market overpricing firms with the most negative changes in *FR* in the portfolio formation year (year t). The second comparison is between portfolios one and eleven. This comparison is between the portfolio that contains firms with the most negative changes in *FR* and firms that have positive changes. The hedge portfolio yields positive returns for each of the three years: 1.6 percent (t = 5.90), 1.6 percent (t = 3.81) and 1.4 percent (t = 3.12), respectively. The results are consistent with the market overpricing firms with the most negative changes in *FR* in the portfolio formation year (year t). The last comparison for *FR* portfolios is between portfolios ten (smallest negative changes in *FR*) and eleven (no change or positive change in *FR*). The hedge portfolio yields negative returns for the three years after portfolio formation: -0.4 percent (t = -1.43), -0.3 percent (t = -0.87) and -0.2 percent (t = -0.56), respectively. The results suggest this strategy may not be efficient.

Table 3: Three-Factor and Four-Factor Model Results for Changes in Long-Term Debt Ratio

	Most (+)									**Least (+)**	**Zero or -**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Panel A: Three-Factor Model Results											
						Alphas					
Alphas	-0.011*	-0.004*	-0.001	0.002*	0.005*	0.006*	0.008*	0.009*	0.010*	0.017*	0.005*
	(-5.42)	(-3.14)	(-0.51)	(2.11)	(4.97)	(6.32)	(8.33)	(10.12)	(9.70)	(9.48)	(6.38)
						Three-Factor Model Loadings and R^2					
EXM	0.01	0.009	0.008	0.009	0.009	0.009	0.009	0.009	0.01	0.01	0.01
	(17.04)	(19.18)	(22.98)	(21.71)	(23.78)	(27.56)	(26.84)	(34.74)	(36.00)	(23.38)	(39.82)
HML	0.006	0.004	0.003	0.004	0.003	0.003	0.002	0.002	0.009	-0.002	0.002
	(6.28)	(6.53)	(5.63)	(7.04)	(5.13)	(7.43)	(3.89)	(3.98)	(2.09)	(-2.39)	(5.62)
SMB	0.01	0.008	0.008	0.001	0.008	0.007	0.007	0.008	0.009	0.01	0.01
	(10.22)	(14.56)	(16.02)	(13.78)	(16.51)	(16.93)	(15.08)	(15.50)	(15.70)	(14.02)	(16.70)
R^2	0.61	0.80	0.80	0.83	0.83	0.87	0.85	0.85	0.88	0.84	0.89
Firm-years	2,147	2,480	2,599	2,653	2,731	2,730	2,757	2,773	2,794	311	34,495
Panel B: Four-Factor Model Results											
						Alphas					
Alphas	-0.002	0.001	0.0003	0.003	0.006*	0.004*	0.008*	0.009*	0.010*	0.016*	0.007*
	(-0.79)	(0.24)	(0.17)	(1.80)	(3.33)	(2.13)	(5.02)	(6.12)	(5.17)	(5.59)	(3.70)
						Four-Factor Model Loadings and R^2					
EXM	1.06	0.992	0.9	0.978	0.964	0.992	0.921	0.958	1.021	1.051	0.986
	(16.34)	(24.32)	(27.16)	(29.24)	(32.08)	(35.54)	(35.75)	(30.48)	(33.85)	(25.07)	(31.38)
HML	0.581	0.53	0.418	0.467	0.404	0.389	0.256	0.187	-0.006	-0.222	0.174
	(4.71)	(6.67)	(5.43)	(7.55)	(5.78)	(6.93)	(4.52)	(3.07)	(-0.10)	(-2.20)	(2.78)
SMB	0.856	0.713	0.693	0.613	0.676	0.634	0.63	0.703	0.799	0.924	0.866
	(10.55)	(11.93)	(12.34)	(10.42)	(13.76)	(13.16)	(14.80)	(11.76)	(13.99)	(16.88)	(14.34)
UMD	-1.87	-1.23	-0.351	-0.473	-0.423	0.294	-0.163	0.111	0.301	0.289	-0.277
	(-3.40)	(-3.41)	(-0.85)	(-1.36)	(-1.22)	(0.83)	(-0.05)	(0.36)	(0.93)	(0.71)	(-0.77)
R^2	0.58	0.77	0.78	0.82	0.82	0.86	0.85	0.84	0.87	0.84	0.86
Firm-years	2,147	2,480	2,599	2,653	2,731	2,730	2,757	2,773	2,794	311	34,495

*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 change in LTDR. The firms in the first portfolio have higher positive changes in debt. Firms assigned to the tenth portfolio have lower positive changes in debt. Firms are assigned to portfolio eleven if there is no change or a negative change in LTDR. 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. R2 from these regressions are also presented. Panel B reports the constant (alpha) from a time-series regression of portfolio excess returns on the four Fama and French factors. The factors are the market excess return (EXM), the return on HML portfolio, the return on the SMB portfolio and the return on a momentum portfolio (UMD). R2 from these regressions are presented. The sample period is from the fourth month after the end of fiscal year 1980 to 2006. T-statistics are presented in parentheses. * Alphas significant at the 5 percent level.*

In addition, hedge portfolio tests were performed between diverse sets of *LTDR* portfolios. A portfolio hedge that is long in firms that have the least positive changes in *LTDR* (portfolio ten) and short in firms that have the biggest changes (portfolio one) was formed. The hedge portfolio yields positive returns for each of the three years: 2.4 percent (t = 8.93), 2.2 percent (t = 7.74) and 1.9 percent (t = 6.38), respectively. This strategy yields positive returns for each of the three years after portfolio formation. This type of strategy appears to be efficient. It evidences that the market overprices firms with the greater increments in *LTDR* and undervalues firms with the smaller increments in *LTDR* in the year of portfolio formation. The second comparison is between portfolios one and eleven. This comparison is between the portfolio composed of firms that have the highest positive changes in *LTDR* and the portfolio that contains firms that have no changes or negative changes in *LTDR*. The hedge portfolio yields positive returns for each of the three years: 1.5 percent (t = 7.38), 1.4 percent (t = 6.49) and 1.4 percent (t = 6.08), respectively.

Table 4: Hedge Portfolio Tests for Change in Funding and Long-Term Debt Ratios

	Average Returns Per Portfolio					
Portfolio	**Panel A: ΔFR Portfolios**			**Panel B: ΔLTDR Portfolios**		
Ranking	Year t+1	Year t+2	Year t+3	Year t+1	Year t+2	Year t+3
1	-0.003	-0.004	-0.001	-0.002	-0.002	-0.001
	(0.36)	(-0.06)	(0.39)	(0.03)	(0.02)	(0.46)
2	0.005	0.004	0.006	0.004	0.003	0.004
	(-0.10)	(-0.28)	(0.39)	(-0.01)	(-0.44)	(0.32)
3	0.008	0.007	0.007	0.007	0.006	0.006
	(-0.11)	(-0.22)	(-0.01)	(-0.08)	(-0.36)	(-0.00)
4	0.008	0.007	0.007	0.010	0.009	0.009
	(-0.02)	(-0.52)	(-0.02)	(-0.30)	(-0.47)	(0.02)
5	0.011	0.009	0.01	0.011	0.010	0.01
	(0.05)	(-0.36)	(0.01)	(-0.74)	(-0.50)	(-0.11)
6	0.012	0.011	0.011	0.013	0.012	0.011
	(0.01)	(-0.42)	(0.07)	(-0.36)	(-0.47)	(-0.23)
7	0.014	0.012	0.012	0.014	0.013	0.012
	(-0.02)	(-0.50)	(-0.06)	(-0.61)	(-0.47)	(-0.43)
8	0.013	0.013	0.012	0.016	0.015	0.015
	(-0.30)	(-0.30)	(0.04)	(-0.51)	(-0.47)	(0.04)
9	0.015	0.015	0.013	0.017	0.016	0.015
	(-0.13)	(-0.55)	(-0.13)	(-0.48)	(-0.62)	(-0.35)
10	0.017	0.015	0.014	0.022	0.020	0.018
	(-0.31)	(-0.59)	(-0.04)	(-0.86)	(-0.86)	(-0.52)
11	0.013	0.012	0.013	0.013	0.012	0.013
	(-1.67)	(-0.63)	(0.47)	(-1.18)	(-1.28)	(0.83)
	Panel C: Portfolio Hedge					
Comparison	*FR* portfolios			*LTDR* portfolios		
1 and 10	0.020*	0.018*	0.016*	0.024*	0.022*	0.019*
	(4.39)	(3.74)	(2.99)	(8.93)	(7.74)	(6.38)
1 and 11	0.016*	0.016*	0.014*	0.015*	0.014*	0.014*
	(5.90)	(3.81)	(3.12)	(7.38)	(6.49)	(6.08)
10 and 11	-0.004	-0.003	-0.002	-0.009*	-0.005*	-0.005*
	(-1.43)	(-0.87)	(-0.56)	(-4.78)	(-2.53)	(-2.51)

*Time-series means (t-statistics) of the average annual returns for each FR and LTDR portfolio in three years after portfolio formation are calculated. Panel A and B show the returns for portfolios formed based on the change in FR and LTDR, respectively. In Panel A, the stocks in portfolio one (ten) have the most (least) negative change in funding levels. Firms with positive changes are assigned to portfolio eleven. In Panel B, stocks in portfolio one (ten) have the most (least) positive changes in debt (increase in LTDR). Firms with zero or negative changes (decrease in LTDR) are assigned to portfolio eleven. Panel C presents the hedge between portfolios one and ten, one and eleven, and ten and eleven. * denotes significance at the 0.05 level, based on a two-tailed t-test for the time-series (19 for FR portfolios and 26 years for LTDR portfolios) of annual average returns.*

These results are consistent with the market overpricing firms with the biggest positive changes in *LTDR* in the portfolio formation year (year t). The last comparison for *LTDR* portfolios is between portfolios ten (smaller changes in *LTDR*) and eleven (no change or negative change). The hedge portfolio yields negative returns for the three years after portfolio formation: -0.9 percent (t = -4.78), -0.5 percent (t = -2.53) and -0.5 percent (t = -2.51), respectively. It is important to notice that the overvaluation for firms with no change or negative change in *LTDR* is lower than for firms with the smaller positive changes in *LTDR* at portfolio formation year. These results indicate that this type of strategy may be efficient. To summarize, the hedge portfolio results support the notion that the market overprices firms that have the most negative changes in *FR* and greater increases in *LTDR*.

CONCLUSIONS

This study investigates if the use of information conveyed by changes in funding status of pension plans results in a better assessment of firms' pension commitments as reflected in stock prices. This study contributes to the recent discussion by the Financial Accounting Standards Board (FASB) and the release of SFAS No. 158 about the incorporation and importance of more DBPP information in the financial statements. The results suggest that the market does not incorporate efficiently the information related to the changes in funding status as reflected in stock prices. This may signify that the investors are unable to

analyze and interpret the possible implications of increases in the underfunding of pension plans. This may be due to investors having problems in understanding the complex pension accounting calculations and disclosures or the inability to incorporate timely and efficiently the information.

In contrast with previous research, investors' reactions to changes in DBPP information were compared to reactions to changes in long-term debt account ratios. The results reveal that the market is also inefficient incorporating long-term debt information. Further tests were performed to corroborate if investment strategies can be design based on the market inefficiencies suggested by the results of the factor models. Particular to this study is the integration of hedge portfolio tests. Results suggest that strategies to benefit from market inefficiencies may be profitable. These tests also reveal similarities between market valuations of changes in DBPP status and long-term debt information. The results are consistent with Franzoni and Marín (2006) and Godwin and Key (1998). The identified inefficiencies may result from market's inability to integrate information and to identify future consequences related to these long-term commitments. Sloan (1996) argues, investors appear to be "fixating" just on earnings figures. This study uses a sample of US public companies with available DBPP information from 1980 to 2005 but does not include pension data under the new accounting rules (SFAS No. 158). Future studies may focus on periods after the issuance of this new accounting rule.

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