THE MARKET VALUATION EFFECT OF UK NEW PENSION ACCOUNTING RULES

This study analyses the effect of unexpected changes in interest rates on the stock price returns of industry matched pair samples of UK firms that either did or did not voluntarily switch to market based discount rate assumptions as required by new UK pension accounting rules. To examine the incremental value-relevance of market-based valuation assumptions of pension assets and liabilities over their more conservative actuarial-based valuation assumptions, we investigate the effect of unexpected changes in interest rates on the association of stock price returns with the interest-rate sensitivity of firms’ pension asset and liabilities. For both sub-samples, we estimate the relationship between stock price returns against a number of control variables and changes in interest rates – the latter variable being itself a function of discount rate assumptions and the funding status of the pension fund. Consistent with our hypotheses, stock price returns incorporate the effect of unexpected interest changes on sources of pension earnings for switch firms, but not for switch firms. These results suggest that, unless firms voluntarily update their pension discounting assumptions regularly, the UK stock market is unable to discriminate the differential effect of unexpected changes in interest rates on a firm’s sources of pension, financial and core earnings.

Keywords: Pension discount rates, stock market valuation
I. INTRODUCTION

During the 1990s, the UK actuarial profession debated how to value corporate sponsoring firms’ pension exposures. Traditionalists argued for a continuation of the cost-based deferred labour methodology then espoused under then existing UK GAAP (Statement of Standard Accounting Practice 24 (SSAP 24), i.e. cash-flow relationship of assets to liabilities based on long-term funding assumptions). Others argued that valuation assumptions should be more consistent with the principles of financial economics, i.e. based on ‘fair’ valuation principles as required for other types of corporate financial instrument. This debate had serious consequences for the subsequent evolution of UK and IAS pension accounting rules.

Consistent with a cost-based approach, UK GAAP (Statement of Standard Accounting Practice 24 (SSAP 24)) had formerly allowed considerable actuarial discretion over valuation frequency (only every three years). By smoothing pension assets, and discounting pension liabilities using a long-term equity-related expected rate of return, pension costs could be spread over many years. Consequently many employers took advantage of rising stock markets to take ‘contribution holidays’, and recorded accrued pension costs became a meaningless figure.

However, in November 1999, the Accounting Standards Board (‘ASB’) decided instead to adopt a financial economics approach to pension funding and accounting. The ASB subsequently issued Financial Reporting Standard 17 (‘FRS 17’). The required UK firms’ financial statements to reveal their net pension surplus or deficit, based on the difference between pension plan assets recorded on (unsmoothed) market value and liabilities discounted using a standard corporate bond rate. By re-focusing pension accounting from smoothing effects on income statements to their impact on the market value of firms’ balance sheets, FRS 17 therefore
represented a significant departure from pension accounting under SSAP 24. The then ASB Chairman (and current IASB Chairman) explained that the premise underlying FRS 17 is that the ‘pension surplus or deficit should be shown in the balance sheet for investors to see and for management to determine pension policies’ (Tweedie, 2004, 722).

However UK companies voluntarily adopting FRS 17 quickly found that their balance sheets became more volatile due to the need to report all changes in the market values of pension fund assets, much of which was invested in equities. This was exacerbated by rapidly declining stock prices to the point where many of the largest UK companies reported their pension funding ratios below 100%. The net deficits forced firms to either make greater cash contributions, terminate pension plans, or cut dividends (The Business, 5 August 2002). However, due to sustained industry pressure, in July 2002 the ASB indefinitely delayed fully implementing FRS 17. Consequently UK firms were required to continue reporting pension asset and liabilities under both old UK GAAP (SSAP 24 - actuarial-based calculations) and new UK GAAP (FRS 17 - market-based calculations). The IASB is currently deliberating whether IAS 19 should be made more consistent with FRS 17.

The question of whether the UK stock market is sensitive to the effect of changes in pension funding calculation assumptions from a traditional long-term, smoothed valuation perspective towards a spot market or ‘fair value’ perspective should be of central importance to corporate decision-makers, financial economists, and accounting researchers concerned with the association of accounting numbers with stock prices for a number of reasons. If capital markets are sensitive to the effect of unexpected changes in interest rates on pension assets and liabilities and adjust firms’ share prices accordingly, then firms electing to disclose pension exposure
based on market (rather than cost-based) valuation assumptions provide potentially value-relevant information.¹ Further, since FRS 17 also requires immediate write-off of gains and losses against stockholders equity, rather than spread these costs over the lives of employees, the interest rate sensitivity of pension assets and liabilities potentially increases the volatility of the sponsoring firms’ share prices.

This issue highlights the importance of pension exposure for a large number of firms who offer defined benefit pension funds to their employees and whose securities are traded in the UK capital market. Their promised benefits comprise a large portion of the expected retirement income of millions of employees and can represent a sizeable proportion of their total market capitalisation. FRS 17 arose from the perceived need for pension discounting assumptions to be more consistent with those underlying normal corporate securities valuation (Bulow, 1982) and have been incorporated into financial economists’ views of pension valuation (e.g.: Black, 1981; Tepper, 1981).

The measurement of pension exposure is an important issue in the UK because many firms now have significant pension deficits in recent years as a result of equity exposure during stock market declines, low interest rates, and increasing longevity rates. As a result, many firms apparently faced incentives to exploit the loophole afforded by the introduction of new UK GAAP (i.e. to terminate pensions based on a SSAP 24 reported basis rather than on the FRS 17 funding ratios), so as to smooth the impact of regulatory change on the annual pension costs charged against their earnings.

The valuation of pension funds is greatly aided by conceptually viewing pension fund claims in terms of option contracts (Bodie, 1990). Sharpe (1976), Treynor et al. (1976) and Langetieg et al (1982) first introduced the idea of applying
contingent claim pricing theory for pension fund termination. Marcus (1985) extended this research by modelling pension assets, liabilities and firm value using a geometric Brown motion to derive numerical estimates, but these were found to be extremely sensitive to assumptions about actual corporate pension funding behaviour. However, to date problems in developing reliable put option estimates have frustrated efforts to assess their market valuation implications.

This study makes a number of contributions to the literature. First, we show how the value of the pension termination option is sensitive to apparently minor discrepancies between pension exposures when based on either solvency and financial reporting rules. Second, we examine the incremental value-relevance of put option estimates based on alternative funding scenarios to the UK stock market’s assessment of corporate unfunded pension liabilities, by employing a variable effects methodology to account for the impact of unanticipated changes in interest rates. This allows us to test whether there is a differential effect on the stock returns of firms depending on the relative magnitude of discounting rate assumptions underlying firms’ pension termination options. Third, we attempt to explicitly control for industry-related sources of business risk by using industry match-paired sub-samples of UK firms which either did or did not attempt to increase the interest-sensitivity of their reported pension liabilities by voluntarily switching their method for discounting pension liabilities.

The empirical results support the hypothesis that capital market participants’ evaluation of the effect of unexpected interest rate changes on the stock price returns of switch firms incorporate the impact of the estimated pension termination option on UK firms’ reported alternative pension assets and liabilities. We also find that the pension put estimate is sensitive to share price returns for those firms that voluntarily
terminate their pension plan. Financial economists long questioned the value-relevance of the current system of financial accounting (e.g.: Bodie and Merton, 1995; Scholes, 1996). They argue that while accounting can focus on value allocation, it is an ineffective structure for identifying risk allocations. Ryan (1997) points out that prior research has made little effort to use rigorous theory to motivate empirical work on the primitive determinants of systematic risk.

An important exception is Dhaliwal (1986), who investigates the relation between systematic risk whether capital market participants value unfunded vested pension benefit obligations as another form of debt. Based on a sample of 55 US firms which reported unfunded obligations during 1976-1979, he finds that capital market perceptions of debt incorporated the unfunded obligations. Dhaliwal’s study had important policy implications for the subsequent development of SFAS 87 and its requirements for recognition of accrued benefit obligations in the balance sheet. However for a number of reasons caution must be expressed regarding Dhaliwal’s findings. First, he investigated only vested obligations, not unvested. Second, he assumed that firms do not have market power. Chang and Chareonwong (1993) demonstrate that the present value of growth opportunities is an important determinant of systematic risk. Third, he only examined those firms for whom debt was large. Fourth, he did not value firms’ option to terminate pension obligations.

Whereas the question of whether unfunded pension obligations are the liabilities of the employer was a controversial issue facing accounting researchers a decade ago, the focus has now shifted to employer’s implicit put option to terminate pension insurance. Investigating this issue is timely for a number of reasons. First, prior researchers have demonstrated the valuation of pension funds is amenable to option pricing theory (Sharpe, 1976; Treynor et al. 1976; Langetieg et al. 1982).
Second, Marcus (1987) demonstrates that the option to terminate pension insurance is potentially important for firms. Third, prior empirical research has established that the availability of the pension put influences the market valuation of pension liabilities (Bulow et al., 1987).

This evidence is relevant to the contentious issue of whether information about risk and uncertainty is value-relevant to capital market participants (Ryan, 1997). This paper is motivated by the finding that contingent claims analysis (CCA) provides important input to the pricing of systematic risk which are potentially valuable to market participants’ perception of a firm’s debt (Sharpe, 1976). A number of papers have investigated the whether unfunded pension liabilities affect market values and hence influence share prices using standard cross-sectional valuation methodology (e.g.: Oldfield, 1977; Gersovitz, 1980; Feldstein and Seligman, 1983; Landsman, 1986; Barth, 1991; Gopalakrishnan and Sugrue, 1993; Sami and Shahid, 1997). However Bulow et al. (1987) point out a number of severe problems inherent in the cross-sectional valuation methodology. Bodie et. al. (1987) present empirical evidence that the option to terminate PBGC is potentially important to the valuation of firm debt.

The purpose of this paper is to test whether capital market participants incorporate termination insurance values in their assessment of firms’ systematic risk as revealed by their pension liabilities as disclosed under SFAS 87. Systematic risk is the portion of the variance of firm returns that is common to the market, and thus cannot be diversified (by contrast, total risk is the variance of firm returns, and thus includes systematic and idiosyncratic components). The CAPM, which is based on the assumption of perfect markets, states that only systematic risk, as defined under CAPM, should be priced (Ryan, 1997, 86).
Prior research has also demonstrated that the option to terminate pension insurance is a component of the present value of growth opportunities. Reliance on option pricing theory introduces mathematical rigour and facilitates the analysis of the employer’s pension promises in a framework that has been used to examine the pricing of corporate liabilities. Marcus (1987) uses contingent claims analysis to provide an upper and lower-bound value of employer sponsors’ PBGC insurance put. He finds that the option to terminate PBGC is a potentially valuable option, and derives reliable empirical estimates under various scenarios of interest.

This issue is relevant because while Dhaliwal (1986) finds that capital market participants value vested pension liabilities as if they were corporate debt, he did not control for the option to terminate PBGC insurance. obligations on market-perceived risk of the firm is investigated. Dhaliwal (1986) also notes that his results should be treated with caution, as his study assumes that CAPM holds, and fails to recognise that firms also have potentially valuable growth opportunities. These assumptions have been called into question by subsequent empirical results, which suggest that growth opportunities may account for a significant portion of market value of equity and systematic risk.

In considering the pricing of systematic risk, we also adopt an alternative contingent claims procedure for the pricing of firms’ pension liabilities, as suggested by Briys and Varenne (1994). The model allows an assessment of how the market values pension liabilities that includes put option values under both insolvency and voluntary termination scenarios, and pricing of the elasticity of these liabilities.

The remainder of this paper is organised as follows. Section II develops the hypotheses. Section III describes the methodology for undertaking empirical analysis and describes the sample selection and data. Section IV discusses empirical evidence
on the underlying value of this option. Finally, Section V presents a summary and conclusion.

II. HYPOTHESIS DEVELOPMENT

Prior to the issue of new pension accounting rules, UK firms could elect to switch actuarial discount rate assumptions to reflect their underlying pension funding. However subsequent to the issue of FRS 17, updating actuarial discount rate assumptions became mandatory, and failure to do so has in some cases resulted in audit qualifying their opinion of the accounts as not providing a true and fair view of the accounts (e.g. Financial Times, 19 July 2004). Prior research suggests that UK firms’ decisions to switch are associated with financial conditions affecting the funding and investment strategy of the pension fund. These findings imply that the switching decision is driven by long-term pension fund fundamentals, rather than confounded by firms’ short-term funding or earnings characteristics of the sponsoring firm (as implied by the results of prior U.S. research).

Because unexpected changes in interest rates are more likely to impact sources of pension-related earnings than core earnings, we develop and test hypotheses concerning the strength and nature of association between stock price returns, firms’ discretion over switching and termination of pension plans to new employees, and firms’ pension termination options. The impact of pension termination options on the sensitivity of stock prices to unexpected interest rate changes are likely to be particularly evident for UK firms that either voluntarily switch to market-based pension discount rate assumptions as required by FRS 17, or voluntarily terminating their defined benefit pension plans. Our empirical tests examine these predictions controlling for the likely association between firms’ stock returns and the differential
impact of unexpected changes in interest rates on sources of pension, financial and core earnings of firms.

Although UK firms are required to disclose their pension exposure both under FRS 17 and SSAP 24, fund managers have nevertheless exercised discretion over the frequency with which pension discounting assumptions should be updated to reflect current market conditions. If interest rates change rapidly and market conditions are volatile, the sensitivity of reported pension assets and/or liabilities will be potentially value-relevant to capital market participants. Ceteris paribus, firms that voluntarily adopt market based valuation (that are required by FRS 17) allow capital market participants to quickly incorporate unanticipated changes in interest rates into their reported pension exposure. Accordingly, the stock price returns of switch firms are expected to incorporate firm risk associated with the option to terminate pensions.

UK firms are required, during an extended transitional period, to report their pension exposure where pension liabilities are discounted using both the FRS 17-based AAA corporate bond rate, and the SSAP 24-based discount rate that is based on the long-term expected rate of return on pension assets. This difference is likely to be most directly associated with the impact of unanticipated changes in interest rates on stock price returns. Since firms can exercise discretion to update these latter assumptions more frequently in order to enhance the interest-sensitivity of their reported pension assets and liabilities, their stock price returns will also be more sensitive to these differences.

The switching hypothesis of this study is therefore that switch firms’ returns will be negatively associated with the propensity to terminate pensions based on firms’ chosen interest rate used to discount their reported pension assets (liabilities). By contrast, for firms that did not choose to switch to a solvency-based valuation
methodology during the adoption period, stock price returns will be associated with the option to terminate pensions based on a more conservative uniform discount rate as applied by financial reporting rules:

H1: Stock price returns of firms that switched (did not switch) to market-based valuation assumptions will be associated with the option to terminate pension based on financial reporting rules.

III. METHODOLOGY

This section introduces a ‘variable effect’ methodology to study the association between both short-term and long-term stock returns and the interest rate sensitivity of firms’ pension liabilities. We then introduce the experimental design and provide descriptive statistics for the put option termination option and other control variables.

Empirical Modelling Specification

Prior U.S. literature has sought to examine whether stock prices reflect the fair market value of pension assets and liabilities. However this methodology is unable to discriminate among sources of firm income and expenses that are entirely within management control, as opposed to those arising from external events. For instance, unexpected changes in interest rates are likely to directly impact a company’s pensions earnings, its fixed rate bonds and have second order-effects on equity investments and even the prices of a company’s products.

Because these exogenous events are therefore more likely to impact sources of pension-related earnings than core earnings, we develop and test hypotheses concerning whether share price returns are associated with a differential impact of
unexpected changes in interest rates on sources of pension, financial and core earnings of firms. We posit that these differential effects are more transparent for those UK firms that elect to use market-based pension valuation methodologies.

This section introduces a ‘variable effect’ methodology to study the association between both short-term and long-term stock returns and the interest rate sensitivity of firms’ assets and liabilities, including the pension insurance put. Consistent with Bulow et al. (1987, 97) we postulate that the return on firm i, in month t \( r_{it} \) is:

\[
    r_{it} = \alpha_i + B_{it} \Delta R_t + u_{it}, \tag{1}
\]

Where \( \alpha_i \) is the normal required expected return on firm i and \( B_{it} \) reflects its sensitivity to interest rate news, here proxied by the change in the long-term actuarial-based interest rate \( R \), and \( u_{it} \) is a random error term. \( \Delta R_t \) depends on the firm’s characteristics at time t that are subject to unexpected changes in the interest rate sensitivity of funded pension liabilities (FPL), funded pension assets, and long-term debt (LTD).\(^4\) In addition such events will impact \( PA^{A-M} \) and \( PL^{A-M} \), the amount of the difference between long-term actuarial assessed and short-term market-based valuation assumptions on the pension assets and liabilities, respectively.\(^5\) These terms can be deflated by \( V_{it} \), the equity value of firm i in period t\(^6\). It is also assumed that the evolution of the return on the stock is influenced by \( R^M_{it} \), the return on the market portfolio. Including these terms yields the following cross-section time series equation, which provides the basis for our empirical work:

\[
    r_{it} = \alpha_i + \gamma_0 \Delta R_t + \gamma_1 \Delta R_t FPL/V_{it} + \gamma_2 \Delta R_t LTD/V_{it} + \gamma_3 \Delta R_t PL^{A-M}/V_{it} \\
    + \gamma_4 \Delta R_t FPA/V_{it} + \gamma_5 \Delta R_t PA^{A-M}/V_{it} + \gamma_6 R^M_{it} + \epsilon_{it} \tag{2}
\]

Equation (2) can be estimated, given cross-section time series data using ordinary least squares, to yield unbiased estimates of the parameters. This model
specification differs from that suggested by Bulow et al. (1987) by including, in addition to the variables posited to be influenced by unexpected interest rate changes, the market interest rate \( (R_{M_t}^m) \) as well as periodic earnings before interest and pension expense \( (NI/V_{it}) \) that Easton (1999) suggests should be incorporated into share price returns models. Controlling for these explanatory variables of security returns also allows for improved interpretation of the magnitude and significance of the coefficients (Scholes, 1987).\(^7\)

Regarding the signs of the coefficients in (10), consistent with Bulow et al. (1987), \( \gamma_1 \) and \( \gamma_2 \) are expected to be positive, reflecting the capital gains firms earn on their nominal liabilities as interest rates reduce the value of outstanding liabilities. The principal problem in estimating (2) is that some long-term nominal assets or liabilities, which might be correlated with the included variables, are omitted. If these variables have a systematic effect on firms’ pension funding decisions, the results will be biased.\(^8\)

*Sample Selection*

The hypotheses of the previous sections are tested by comparing firms that switched to new market-based valuation methods in their financial reports with industry-matched, non-switch firms that reported their pension funding ratios using traditional actuarial valuation methods. Consistent with the variable-effect illustration described above, industry matching is used in an attempt to control for some industry-related variables that affect pension liabilities.

In examining the posited relationships between stock returns and pension related variables, we employ samples of industry-matched switching and non-switching firms in examining the posited relationships between stock price returns
and pension-related variables that are potentially sensitive to unexpected interest rate changes. This sample selection procedure is appropriate given that relative to non-switch firms, switching firms typically employ more mature workforces and thus are likely to select higher SSAP 24-rates to discount their pension assets and liabilities.9

It seems plausible that pension funds in the same industry use mortality and turnover assumptions (Ghicas, 1990). Two criteria were established to obtain two groups of industry-matched pair firms for comparison of the effect of actuarial valuation on market performance. First, a different valuation policy had to exist between the two groups. In this case, firms switching to market-based actuarial valuation methods that are subsequently endorsed by new UK GAAP can easily be distinguished from those relying on traditional actuarial valuation methods that were sanctioned by SSAP 24. Second, pension exposure had to be a significant factor in a firm’s financial position. In this case, pension liabilities needed to be in excess of 5% of the total market value of the firm as at balance sheet date. The first requirement is important because switch firms can be easily distinguishable from non-switch firms. The latter criterion is required because the pension exposure must be a material component of the firms’ value. These firms reported the SSAP 24 funding ratio, the FRS 17 funding ratio, and a decrease in pension expense arising from the switch. Subsequently, these switches were confirmed in the equivalent pension fund annual report.10 All the switches occurred in the 1995 valuation year.

Firms are matched in the following categories: telecommunications, financial services, electrical manufacturing, steel, utilities, extraction, consumer goods, food manufacturing, travel and entertainment. These firms (i) have complete, relevant financial and actuarial data available on Datastream over the entire study period 1995-98; (ii) sponsor pension funds for which complete and relevant data is available over
the corresponding period (collected by the authors); (iii) are in continuous existence during the study period. The study period was chosen because it represents the period prior to when FRS 17 was implemented. The time frame is therefore unique because firms reported, in the same footnote their pension exposure both in accord with the new pension accounting standard (FRS 17) and with SSAP 24. Table I reports the final sample of 62 industry match paired firms which Klumpes and Whittington (2003) identify as either voluntarily switched pension discounting rates to FRS 17, or not.

Descriptive Statistics - Put Option

We denote PUT₁ as the pension put for firms calculated in accordance with Marcus (1985). The pension put is calculated for two scenarios which firms could exploit: in accordance with both financial reporting rule FRS 17 (i.e. liabilities are discounted using the AAA corporate bond rate – PUT₁) and SSAP 24 (i.e. based on a firm specific expected rate of return assumption – PUT₂). Table II report pension termination put option estimates, under each of these scenarios, for both switch and non-switch samples of UK firms. Consistent with predictions, the put option values are consistently higher when calculated under more conservative FRS 17 rules (i.e. PUT₁ > PUT₂) and are generally higher for switch firms than for non-switch firms, which have attempted to mitigate their unfunded pension obligations by using a higher discount rate in order to reduce their reported pension obligations.
4.4. Descriptive Statistics – Control Variables

Data on pension assets and liabilities are drawn from DATASTREAM. The following variables are used in the study for examining both switching and non-switching firms:

\[ p_{it} = \text{return on firm } i, \text{ in month } t \]

\[ PL_t = \text{actuarially-assessed pension liabilities at the end of year } t, \text{ as reported by the sponsoring firm’s annual report. It should be noted that this figure is reported according to the ratio of actuarial assets (assumed to equal } P_A_t \text{) to actuarially-assessed pension liabilities as required by SSAP 24.} \]

\[ P_A_t = \text{actuarially-assessed pension assets at end of year } t, \text{ as reported by the sponsoring firm’s annual report at a smoothed (i.e. five year average) market value in the pension footnote in accordance with SSAP 24.} \]

\[ LTD_t = \text{long term corporate debt at end of year } t, \text{ obtained from DATASTREAM.} \]

\[ NI_t = \text{net earnings for relevant year, before pension and interest expense, divided by market value of equity in year } t, \text{ obtained from DATASTREAM.} \]

\[ PL^{A-M}_t = \text{difference between actuarial and market-based value of pension fund liabilities during year } t. \text{ The difference is obtained from firms’ pension footnote disclosures of both (a) the discounted pension liabilities when using the actuarial method (SSAP 24), and (b) the most recent 1 year UK corporate bond rate (FRS 17).} \]

\[ PA^{A-M}_t = \text{difference between actuarial and market-based pension asset disclosures in the footnote, i.e. The difference is obtained from firms’ pension footnote disclosures of both (a) the actuarially-assessed (SSAP 24) pension assets; and (b) the current market (i.e. unsmoothed per FRS 17) value of pension fund assets during year } t. \]
\( \Delta R_t \) = unexpected change in interest rates during year \( t \) for firm \( i \), defined as the difference between the market-based interest rate as at the date of the release of the firm’s annual report and the most recent 1 year UK corporate bond rate. However a limitation of the variable-effect methodology developed by Bulow et al. (1987) is that \( \Delta R \) ignores the effect of any stock market-induced longer term changes in either market-based or actuarial-based discount rates on the employer firm’s pension funding policy. It should be noted that FRS 17 also assumes that pension liabilities are discounted at the 1-year corporate bond rate.

Table III provides descriptive statistics for the control variables for both switch and non-switch sample firms. The differences in pension asset and liability rate valuation assumptions as between switching and non-switching firms are also statistically different. This implies that these firms are likely to be relatively more sensitive to the effects of unexpected discount rate changes. These results tentatively confirm our hypotheses that UK firms’ switching decisions therefore impact observed variations in discount valuation rate assumptions. However more sophisticated multivariate tests are needed to establish whether such variations also bear upon the value relevance of these observed differences for each of our sub-sample of switch and non-switch firms.

**Table III**

Except for \( PA/V_{it} \) and \( PL/V_{it} \) for the switching firms and \( PLA-M/V_{it} \) and \( NI/V_{it} \) for the non-switching firms, none of the correlations between these variables are statistically significant at the 1% level.\(^{11}\)

**IV. Empirical Tests**

*Multivariate tests*
The results of estimating equation (2) are reported in Table IV. For switch firms, this equation provides evidence that both the pension put \((PUT1)\) and differences between market and actuarial discount rate assumptions underlying the pension put \((APUT)\) are sensitive to unexpected changes in duration-matched pension liability rates. This result is consistent for non-switch firms. The model for non-switch firms also has a higher goodness of fit than for the switching model (Adj \(R^2 = 0.206\) versus 0.118). Interestingly, only the \(EBIT/V^d\) variable is statistically significant. This result corroborates the findings of prior research that the stock market is unable to discriminate between the impact of unexpected interest rates on pension and core earnings sources for non-switch firms. Moreover, none of the other variables are statistically significant.

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INSERT TABLE IV ABOUT HERE

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Table V repeats the analysis provided in Table IV but with some modification to test the predictions of hypothesis 2. The tests employ a single pooled sample of switch and non-switchers, extend the analysis period from January 1995 to December 2002, and substitute an interaction term for \(PUT1\) which conditions firms’ propensity to put their pension plans with their voluntary decision to terminate their defined benefit plans to new employees.

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The overall test is lower in explanatory power, but is still significant at the 1% level. Consistent with the hypothesis 1, the coefficient for the interaction variable \(TERM*PUT1\) is in the predicted direction and is significant at the 1% level. In addition, coefficients of variables representing earnings (NI) and long-term debt
(LTD) are also statistically significant. These results support the notion that the stock market valuation of firms’ pension termination option is strongly conditioned by firms’ prior election to voluntarily terminate their defined benefit plans to new employees as significant.

**Sensitivity Tests**

Further sensitivity analysis was conducted to increase our confidence about the robustness of our results. We repeated the analyses reported in tables IV and V using a number of modifications. First, we included a number of control variables used in prior value-relevance research in the regressions (e.g. lagged earnings). We first eliminated observations with negative earnings. Potential endogeneity of earnings, market returns and industry match-paired firms was recognised by running two-stage least squared regressions for equation (3). We also eliminated observations of firms in regulated industries, where different accounting standards and disclosure requirements may apply (e.g. banking, life insurance, telecommunications, and utilities). We also repeated the analysis separately for only firms with a minimum net pension liability or asset (i.e. which are less than 1% of market value of equity) and for outlier firms with relatively high and low debt. Finally, we repeated the analyses separately for the years 1999-2000 and 2001-02, when presumably the effects of the long bull stock market may have caused substantially more UK firms to have over funded pension plans. In all cases the regression results are not affected and so are not separately reported.

We also conducted various diagnostic and sensitivity tests in order to examine the robustness and efficiency of our multivariate results. First, we incorporated a number of other control variables, such as lagged earnings and earnings multiplied by the interest rate factor: none of these significantly affected our overall results. Second,
homoscedasticity of the residuals was tested using the White (1980) test for heteroscedasticity to examine correlation of the error terms. The White test rejects the null hypothesis of homoscedasticity for the sample, but the findings are robust to using White heteroscedasticity-consistent standard errors. Based on White standard errors, the null hypothesis is rejected at the 0.01 level for the pooled sample. Therefore, we conclude that our fixed-effects results are not unduly biased by the normality problem.

V. Conclusion

The recent adoption of fair value reporting of pension costs by UK firms highlights the potential value relevance of their option to terminate pension commitments under alternative actuarial assumptions allowed by new UK GAAP. This study analyses whether capital market participants differentiate between alternative methods of discounting pension liabilities and managerial discretion over voluntary pension plan termination in assessing UK firms’ implicit option to terminate their defined benefit pension plans during a period of regulatory uncertainty. This issue is important to public policy makers since FRS 17 represents a significant departure from former UK GAAP (SSAP 24) and because of well-known moral hazard problems associated with the creation of a US-based pension insurance guaranty fund.

This empirical work focuses on the association between stock returns and pension put termination options during an extended transition period when both solvency and financial reporting rules were changing, causing UK firms to report their pension funding ratios simultaneously under both actuarial and market-based pension discount rate assumptions. A unique dataset and institutional environment is therefore available to test the hypothesis that the value relevance of put option
estimates is strongly conditioned by UK firms’ discretion to switch their pension
discount rate assumptions. Our findings are generally consistent with this hypothesis,
even after controlling for other pension and firm related sources of value that are
sensitive to the effect of unexpected interest rate changes on firm stock returns.

This conclusion is reasonably robust because alternative methodological
approaches and data from several different years were used. In particular, consistent
with the earlier equivalent findings reported by Marcus (1985), we demonstrate that
the results are not simply a consequence of weak firm effects. Our results suggest that
the availability of termination and degree of under-funding influences the market
valuation of pension assets and liabilities. The put option estimate is significantly
associated with stock price returns even after controlling for business and economic
factors affecting the interest rate sensitivity of firms’ security prices. For those firms
exercising this discretion by using standard discounting assumptions, the put option
estimate that is premised on pension liabilities estimated consistently with solvency
regulations significantly associated with stock price returns; for other firms the put
option estimate premised on pension liabilities estimated consistent with financial
reporting rules. This suggests that this amount is potentially value-relevant to capital
market participants. Since this difference is not reported in the employer sponsor’s
balance sheet. Assuming that the sponsoring firm ‘owns’ the pension fund surplus,
there is a potentially material misstatement of the accounts where the market value is
not reported in the employer sponsor’s balance sheet.

These empirical results support our prediction that the difference between
(actuarial cost based versus market-based) pension asset values and (equity-linked
versus corporate bond-linked liability) discount rates is potentially value-relevant to
capital market participants for assessing the option to adopt new accounting
standards. Thus, we provide some evidence that market valuation assumptions of firms reflect long-duration contractual liabilities and assets in respect of their workforce.
Footnotes

1. There is empirical evidence that the US stock market under-reacts to pension exposures. Landsman and Ohlson (1990) find that the stock market appears to under-react to the disclosure of information inherent in net pension assets, and conclude that this is caused by market inefficiency. Coronado and Sharpe (2003) find that the market does not value a firm’s ‘pension earnings’ differently from its ‘core earnings’, suggesting that pension earnings are often overvalued.

2. The question of whether long-term, actuarial assessed or short-term, market-based interest rates should be used to discount pension liabilities is also closely related to the broader conceptual issue of how pension liabilities should be defined and measured (e.g. Bodie et al., 1987; Klumpes, 2001).

3. Marcus (1985) has since been extended by Pennachi and Lewis (1999) by recognising that a firm can become insolvent when its value sinks below some fraction of firm value. However this model does not apply in the UK where companies can be only declared bankrupt.

4. Klumpes and Whittington (2003) examine incentives facing UK firms’ decisions to voluntarily switch to actuarial pension valuation methods during the period leading up to the implementation of new pension accounting (FRS 17) and funding (MFR) rule changes. Switch firms more frequently adjusted their footnote disclosure of pension funding ratios each year by showing updated market valuation assumptions of pension assets and changed their pension liability discounting assumptions, in the manner that was subsequently required by FRS 17. They studied the association between the switching decision and various
pension fund and firm characteristics, during this period of regulatory uncertainty (i.e. 1995-1998).

5. FRS 17 requires recognition of both pension assets and liabilities in the corporate firm sponsors’ balance sheet. We therefore incorporate both the pension liability and pension asset figures in this equation. However, under FRS 17, an asset is only recognised to the extant that an employer can “recover a surplus in a defined benefit scheme through reduced contributions and refunds” (para 1(g)).

6. They might, for instance, be related to the amount of long-term debt a firm decides to carry.

7. In selecting a single change in interest rates to capture change in value, Bulow et al. (1987) assume parallel shifts in the term structure. Since this is unlikely to be ever true, the model must incorporate the effects of changes in the shape of the term structure and use the interest rate that most closely measures the change in interest rates for each particular firm.

8. The spread is the difference in the rates of return earned on pension assets to the assumed rate used to discount pension liabilities. Since most pension funds’ asset portfolios comprise equities, it is reasonable to assume that the spread will be positive.

9. We recognise that the procedure of dichotomizing firms in this way only indirectly deals with the likelihood that there might exist significant cross-sectional variation in the term structure of pension liabilities across our sample. An alternative approach would be to explicitly incorporate the term structure of firms’ pension (and other forms of explicit or implicit) liabilities into the valuation equation, which we leave as an issue for further research.
10. None of the Pearson bi-variate correlations among these variables are statistically significant at the 1% level, suggesting the data is amenable to multivariate analysis.
References


<table>
<thead>
<tr>
<th>No.</th>
<th>Industry</th>
<th>Switch Firms</th>
<th>Nonswitch Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Building and Construction</td>
<td>McAlpine</td>
<td>Mowlem</td>
</tr>
<tr>
<td>2</td>
<td>Brewing</td>
<td>Diageo</td>
<td>Whitbread</td>
</tr>
<tr>
<td>3</td>
<td>Engineering</td>
<td>Molins</td>
<td>Ricardo</td>
</tr>
<tr>
<td>4</td>
<td>Food Manufacturing</td>
<td>Assoc. British Foods</td>
<td>James Latham</td>
</tr>
<tr>
<td>5</td>
<td>Medical and Chemical</td>
<td>Imperial Chemical</td>
<td>Smith &amp; Nephew</td>
</tr>
<tr>
<td>6</td>
<td>Publishing and Advertising</td>
<td>B Sky B Television</td>
<td>Pearson</td>
</tr>
<tr>
<td>7</td>
<td>Manufacturing</td>
<td>Bunzl</td>
<td>British Vita</td>
</tr>
<tr>
<td>8</td>
<td>Manufacturing</td>
<td>Cadbury Schweppes</td>
<td>Carr’s Milling</td>
</tr>
<tr>
<td>9</td>
<td>Manufacturing</td>
<td>Pilkington</td>
<td>Smith’s Industries</td>
</tr>
<tr>
<td>10</td>
<td>Manufacturing</td>
<td>Airsprung Furniture</td>
<td>Allied Domeq</td>
</tr>
<tr>
<td>11</td>
<td>Pharmaceutical</td>
<td>GlaxoSmithklineBeecham</td>
<td>Astra-Zeneca</td>
</tr>
<tr>
<td>12</td>
<td>Leisure</td>
<td>Granada</td>
<td>Rank</td>
</tr>
<tr>
<td>13</td>
<td>Retail – food</td>
<td>Boots</td>
<td>Safeway Stores</td>
</tr>
<tr>
<td>14</td>
<td>Retail – household</td>
<td>Dixons Group</td>
<td>Silentnight</td>
</tr>
<tr>
<td>15</td>
<td>Retail – clothing</td>
<td>House of Fraser</td>
<td>Kingfisher</td>
</tr>
<tr>
<td>16</td>
<td>Retail – diversified</td>
<td>Mothercare</td>
<td>Sainsbury</td>
</tr>
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<td>17</td>
<td>Resources</td>
<td>BP-Amoco</td>
<td>Corus</td>
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<td>18</td>
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<td>19</td>
<td>Technology</td>
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<td>20</td>
<td>Telecommunications</td>
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<td>Vodafone</td>
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<td>21</td>
<td>Travel</td>
<td>British Airways</td>
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<td>Utilities – reticulation</td>
<td>Scottish Power</td>
<td>Severn Trent</td>
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<tr>
<td>23</td>
<td>Retail</td>
<td>QMH</td>
<td>James Beattie</td>
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<td>24</td>
<td>Servicing</td>
<td>Sinclair Holdings</td>
<td>Carlton Communications</td>
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<tr>
<td>25</td>
<td>Banking</td>
<td>Bank of Scotland</td>
<td>Britannic</td>
</tr>
<tr>
<td>26</td>
<td>Media</td>
<td>Rentokil Initial</td>
<td>Reuters</td>
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<td>27</td>
<td>Printing</td>
<td>Haynes</td>
<td>Johnston Press</td>
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<tr>
<td>28</td>
<td>Real Estate</td>
<td>Swan Hill</td>
<td>Slough</td>
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<td>29</td>
<td>Printing</td>
<td>DeLaRue</td>
<td>Scottish Media</td>
</tr>
<tr>
<td>30</td>
<td>Personnel recruitment</td>
<td>BNB Resources</td>
<td>Provident</td>
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<tr>
<td>31</td>
<td>Resources</td>
<td>Charter</td>
<td>Aggregate</td>
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Table II
Pension Termination Option Values
(as a percentage of total vested pension benefits)

This table shows estimates of the put option based on Marcus (1985). The put option is estimated on pension liabilities calculated in accordance with either financial reporting rule FRS 17 (i.e. pension liabilities are discounted using the standard AAA corporate bond rate – PUT 1), or SSAP 24 (i.e. pension liabilities are discounted using the expected rate of return on pension assets).

<table>
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<tr>
<th>Year</th>
<th>Statistic</th>
<th>PUT 1 (FRS 17)</th>
<th></th>
<th>MFR PUT 2 (MFR)</th>
<th></th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>Switch</td>
<td>Non-switch</td>
<td>Switch</td>
<td>Non-switch</td>
</tr>
<tr>
<td>1995</td>
<td>Average</td>
<td>0.0905</td>
<td>0.0828</td>
<td>0.0901</td>
<td>0.0917</td>
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<tr>
<td></td>
<td>Median</td>
<td>0.0226</td>
<td>0.0060</td>
<td>0.0230</td>
<td>0.0064</td>
</tr>
<tr>
<td>1996</td>
<td>Average</td>
<td>0.0501</td>
<td>0.0580</td>
<td>0.0513</td>
<td>0.0355</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>0.0479</td>
<td>0.0403</td>
<td>0.0360</td>
<td>0.0323</td>
</tr>
<tr>
<td>1997</td>
<td>Average</td>
<td>0.0879</td>
<td>0.0827</td>
<td>0.0813</td>
<td>0.0764</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>0.0138</td>
<td>0.0010</td>
<td>0.0094</td>
<td>0.0004</td>
</tr>
<tr>
<td>1998</td>
<td>Average</td>
<td>0.1099</td>
<td>0.1270</td>
<td>0.1098</td>
<td>0.1220</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>0.0382</td>
<td>0.0479</td>
<td>0.0563</td>
<td>0.0390</td>
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Table III
Univariate Tests and Descriptive Statistics
Switch Firms (n=31) and Industry-Matched Non-switch (n=31) Firms

The sample comprises 62 UK firms which switched to a market-based actuarial valuation of their pension assets and liabilities during 1995-1998 and an industry matched pair sample of 31 UK firms which either did or did not switch during this period. All data are pooled over all 31 firms for the four pre-switch years between January 1995 and December 1998; and for the extended pre-termination period January 1995 and December 2002.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Period</th>
<th>Switch Firms (1) Mean Std Dev.</th>
<th>Non-switch firms (0) Mean Std Dev.</th>
<th>Matched Pairs t-test</th>
<th>Wilcoxon Pairs test</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTD/Vit</td>
<td>1995-1998</td>
<td>1278 2445</td>
<td>353 431</td>
<td>4.141&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.395</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>1765 6162</td>
<td>1012 2725</td>
<td>4.003&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.657&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>PL/Vit</td>
<td>1995-1998</td>
<td>1546 3606</td>
<td>553 1030</td>
<td>2.968&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.706&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>1695 4242</td>
<td>769 1707</td>
<td>4.463&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.419&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>PL'/Vit</td>
<td>1995-1998</td>
<td>1527 3545</td>
<td>767 1372</td>
<td>3.775&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.768&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>1783 4464</td>
<td>1138 5584</td>
<td>2.416&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-4.899&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>PA/Vit</td>
<td>1995-1998</td>
<td>1666 3691</td>
<td>553 1031</td>
<td>3.525&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-2.571&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>1782 4183</td>
<td>920 2098</td>
<td>4.668&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-4.349&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>PA'/Vit</td>
<td>1995-1998</td>
<td>1764 3776</td>
<td>867 1547</td>
<td>2.627&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-2.940&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>1885 4306</td>
<td>949 2222</td>
<td>4.968&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-4.816</td>
</tr>
<tr>
<td>NI/Vit</td>
<td>1995-1998</td>
<td>637   990</td>
<td>261 286</td>
<td>4.326&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-2.035&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>542   1139</td>
<td>323 1693</td>
<td>4.039&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-3.794&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>PUT1/Vit</td>
<td>1995-1998</td>
<td>0.080 0.134</td>
<td>0.088 0.157</td>
<td>0.161</td>
<td>-0.101</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>0.10  0.182</td>
<td>0.120 0.470</td>
<td>1.109</td>
<td>-1.018</td>
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<tr>
<td>PUT2/Vit</td>
<td>1995-1998</td>
<td>0.060 0.296</td>
<td>0.081 0.153</td>
<td>0.809</td>
<td>-0.801</td>
</tr>
<tr>
<td></td>
<td>1995-2002</td>
<td>0.08  0.261</td>
<td>0.100 0.433</td>
<td>0.852</td>
<td>-0.898</td>
</tr>
</tbody>
</table>

<sup>a</sup> Significant at the 0.01 level of significance for one-tail test
<sup>b</sup> Significant at the 0.05 level of significance for one-tail test
<sup>c</sup> Significant at the 0.10 level of significance for one-tail test

$p_t$ = cumulative monthly return on firm’s share price (adjusted for dividend and firm recapitalisation).
$LTD/Vit$ = total long term debt, divided by market value of equity.
$PL/Vit$ = total pension liabilities discounted by the firms’ chosen expected rate of return on pension assets, divided by market value of equity.
$PL'/Vit$ = total pension liabilities discounted by the rate applicable for high-grade 1 year UK corporate bonds, divided by market value of equity.
$PA/Vit$ = total actuarial funded pension assets, divided by the market value of equity.
$PA'/Vit$ = Total market value of pension assets disclosed by footnote by employer sponsor for equivalent year, divided by market value of equity.
$NI/Vit$ = Annual net income of pension fund for year before pension and interest expense ($I_t - I_{t-1})/I_{t-1}$, divided by the market value of equity.
$PUT1/Vit$ = put option value to terminate pensions assuming an interest rate equal to firm i’s chosen expected return on pension assets, divided by market value of equity.
$PUT2/Vit$ = put option value to terminate pensions, assuming an interest rate equal to high-grade 1 year corporate bonds, divided by market value of equity.
Table IV

Effect of Unexpected Interest Rate Changes on Monthly Stock Returns

This table reports the pooled regression analysis for effect of unexpected interest rate changes, market return and earnings coefficients on monthly stock returns (equation 2). The t-ratio is reported together with the relevant coefficient. The period is from January 1995 to December 2002. Unexpected rates are defined in terms of unexpected changes, relative to the assumed pension plan liability discount rate, of the prime corporate bond rate. The samples are those described in Table 2.

\[ p_t = \alpha_i + \gamma_0 \Delta R_t + \gamma_1 \Delta R_t PL/V_{it} + \gamma_2 \Delta R_t LTD/V_{it} + \gamma_3 \Delta R_t PL^{A-M}/V_{it} + \gamma_4 \Delta R_t PA/V_{it} + \gamma_5 \Delta R_t PA^{A-M}/V_{it} + \gamma PUT_{it} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th>Firm Sample</th>
<th>Switch Firms</th>
<th>Non-Switch Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predicted sign</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Intercept</td>
<td>?</td>
<td>3.068</td>
</tr>
<tr>
<td>( \Delta R_t )</td>
<td>+</td>
<td>3.341</td>
</tr>
<tr>
<td>( \Delta R_t PL/V_{it} )</td>
<td>-</td>
<td>-0.006</td>
</tr>
<tr>
<td>( \Delta R_t PA/V_{it} )</td>
<td>+</td>
<td>0.004</td>
</tr>
<tr>
<td>( \Delta R_t LTD/V_{it} )</td>
<td>-</td>
<td>-0.006</td>
</tr>
<tr>
<td>( \Delta R_t PL^{A-M}/V_{it} )</td>
<td>+</td>
<td>0.016</td>
</tr>
<tr>
<td>( \Delta R_t PA^{A-M}/V_{it} )</td>
<td>+</td>
<td>0.002</td>
</tr>
<tr>
<td>( NI/V_{it} )</td>
<td>+</td>
<td>0.009</td>
</tr>
<tr>
<td>( PUT_{it} )</td>
<td>-</td>
<td>-67.747</td>
</tr>
<tr>
<td>( \Delta PUT_{it} )</td>
<td>-</td>
<td>-60.158</td>
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<tr>
<td>Adj R²</td>
<td>0.118, Overall Model F=2.834</td>
<td>0.206, Overall Model F=3.294</td>
</tr>
</tbody>
</table>

\(^a\)Significant at the 0.01 level of significance for one-tail test
\(^b\)Significant at the 0.05 level of significance for one-tail test
\(^c\)Significant at the 0.10 level of significance for one-tail test
Table V

Effect of Unexpected Interest Rate Changes on Monthly Stock Returns

This table reports the pooled regression analysis for effect of unexpected interest rate changes, market return and earnings coefficients on monthly stock returns (equation 2). The t-ratio is reported together with the relevant coefficient. The period is from January 1995 to December 2002. Unexpected rates are defined in terms of unexpected changes, relative to the assumed pension plan liability discount rate, of the prime corporate bond rate. The samples are those described in Table 2.

\[
p_t = \alpha_i + \gamma_0 \Delta R_{it} + \gamma_1 \Delta R_{it}^{PL/V_i} + \gamma_2 \Delta R_{it}^{LTD/V_i} + \gamma_3 \Delta R_{it}^{PL^A-M/V_i} + \gamma_4 \Delta R_{it}^{PA/V_i} + \gamma_5 \Delta R_{it}^{PA^A-M/V_i} + \gamma_{\text{PUT}it} + \epsilon_{it}
\]

<table>
<thead>
<tr>
<th>Firm Sample</th>
<th>Predicted sign</th>
<th>Coefficient</th>
<th>t-statistic</th>
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<tbody>
<tr>
<td>Intercept</td>
<td>?</td>
<td>3.533</td>
<td>1.033</td>
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<tr>
<td>$\Delta R_{it}$</td>
<td>+</td>
<td>2.112</td>
<td>1.479</td>
</tr>
<tr>
<td>$\Delta R_{it}^{PL/V_i}$</td>
<td>-</td>
<td>0.002</td>
<td>0.088</td>
</tr>
<tr>
<td>$\Delta R_{it}^{PA/V_i}$</td>
<td>+</td>
<td>-0.009</td>
<td>-0.040</td>
</tr>
<tr>
<td>$\Delta R_{it}^{LTD/V_i}$</td>
<td>-</td>
<td>-0.005</td>
<td>-2.499\textsuperscript{a}</td>
</tr>
<tr>
<td>$\Delta R_{it}^{PL^A-M/V_i}$</td>
<td>+</td>
<td>0.016</td>
<td>0.869</td>
</tr>
<tr>
<td>$\Delta R_{it}^{PA^A-M/V_i}$</td>
<td>+</td>
<td>0.002</td>
<td>1.181</td>
</tr>
<tr>
<td>$NI/V_i$</td>
<td>+</td>
<td>0.002</td>
<td>1.843\textsuperscript{c}</td>
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<tr>
<td>$\text{TER}^{\text{PUT}1it}$</td>
<td>-</td>
<td>-33.751</td>
<td>-2.909\textsuperscript{a}</td>
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<tr>
<td>$\Delta \text{PUT}it$</td>
<td>-</td>
<td>-2.026</td>
<td>-0.169</td>
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</tbody>
</table>

*Significant at the 0.01 level of significance for one-tail test
\textsuperscript{a}Significant at the 0.05 level of significance for one-tail test
\textsuperscript{c}Significant at the 0.10 level of significance for one-tail test

Adj $R^2$ 0.032, Overall Model F=2.765\textsuperscript{a}