# WHAT CAUSES A FIRM'S STOCK AND BOND RETURNS MOVE TOGETHER OR DECOUPLE? - A UK MARKET INVESTIGATION

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**Abstract.** This paper investigates the comovement of a firm's stock and bond returns within the classic option pricing framework. Using UK stock market data in the period prior to a firm's trading statement announcement and the period after a firm's financial year-end, we find that returns (earnings) on the firm cause a firm's stock and bond returns to move together, whilst volatility or a change in the volatility of returns (earnings) of the firm (proxying for the firm's business risk) cause the firm's stock and bond returns to decouple and move in opposite directions. In addition, a firm's leverage strategy plays a role in this comovement: a low return (earnings) and high leverage strategy causes stock return goes down but bond return goes up; whereas a high return (earnings) and high leverage strategy causes stock return goes up but bond return goes down. These findings reveal the common and conflict of interests between a firm's stockholders and bondholders.

**Keywords**: Bond and stock returns; Comovement; Returns on assets and business risk; Option pricing theory

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## 1. Introduction

In their seminal work on option pricing theory, Black and Scholes (1973) suggested that a firm's equity can be regarded as a European call option on the firm's asset value (market value of the firm) written by the firm's bondholders for an exercise price equal to the face value of the firm's total debt C at maturity time T. At the maturity of the debt, if the market value of the firm is above C, the stock will have a positive value; otherwise it will be valueless. In this paper, we test the prediction of the option pricing theory by examining the relation between a firm's bond and equity returns.

Merton (1973, 1974) and Galai and Masulis (1976) extend the basic option pricing model and make predictions about the relation between firm value and the value of equity and debt. These theories imply a changeable relation between a firm's stock and bond returns. The purpose of the current paper is to empirically assess these option pricing predictions. When firm asset value changes, holding everything else constant, the firm's stock and bond returns will be positively related. However if the variance of a firm's asset value changes, the firm's stock and bond returns will decouple and exhibit a negative relation. We test these predictions on a sample of UK companies over the period 2000-2011.

The empirical studies on the relation or comovement of firm's stock and bond returns are limited. In particular, to the best of our knowledge, no study has examined the causes of the stock-bond comovement using the predictions of option pricing theory. One reason is the difficulty in measuring firm asset value, due to the difficulty in computing the total market value of a firm's liabilities. Shane (1994) creates an index of 208 low-rated bonds and an index of the stocks of the issuers represented in the bond portfolio. She finds that "significant positive correlations of the all-inclusive, low-grade bond portfolio with the matched equity portfolio." Hotchkiss and Ronen (2002) use 55 high-yield bonds in the US market in January - December 1995 and find positive correlations between bond returns and the issuing firm's

stock returns. Kwan (1996) demonstrates that a firm's stock and bond returns are negatively and contemporaneously correlated in the long run. Alexander et al. (2000) show that a firm's stock and bond returns move together in the long-run, but they exhibit a negative relation on the day of a corporate wealth-transferring event.[2] A shortcoming of these studies is that certain patterns of the comovement are found but without investigating or addressing the causes of the changeable comovement.

This paper is in an attempt to fill the gap in the empirical literature on the comovement of a firm's stock and bond returns within an option pricing framework. Using UK stock market data, we conduct a panel data analysis on stock and bond returns in the period prior to a firm's trading statement (TS, hereafter) announcement day using an appropriate measure of firm asset value. Further, we carry out a cross sectional analysis on the day after the firm's financial year-end in which returns on assets and leverage are used as proxies for earnings (return on firm asset value) and volatility of earnings. Both sets of analyses control for the impact of leverage, market index returns and its volatility.

The contribution of the paper is threefold: first, we investigate the causes of the comovement of a firm's stock and bond returns by controlling for leverage and market risk factors; second, we construct an appropriate measure of firm asset value for the analyses; finally, we relax the assumption of passive firm behaviour on leverage in the option pricing model, and find that leverage plays a role in the comovement of stock and bond returns, In addition, we also provide evidence for the "flight to quality" hypothesis.

The rest of the paper is organized as follows. Section 2 presents the models and Section 3 provides a description of the data. Section 4 reports and interprets the empirical results, and finally in Section 5 we present our conclusions and summarize the findings.

[2] In Alexander et al. (2000), wealth-transferring events refer to the announcements of corporate events that suggest the possibility of a wealth transfer between stockholders and bondholders, e.g., senior debt issuance/redemption, adoption of a risky project, stock issuance/repurchase, changes in short-term liabilities and changes to dividend payments.

## 2. The models

Merton (1973, 1974) develops this idea to price corporate bonds, where the bond price is an increasing function of the market value of the firm, but a decreasing function of the variance of the percentage return of the firm, assuming the firm's capital structure is irrelevant to firm's asset value. Merton (1974) Eq.(15) shows that

$$\frac{\partial D}{\partial V} = 1 - \frac{\partial S}{\partial V}, \quad \frac{\partial D}{\partial \sigma^2} = -\frac{\partial S}{\partial \sigma^2}$$

where $D$ is debt value, $V$ is firm asset value, $S$ is stock value and $\sigma^2$ is the instantaneous variance of percentage returns on $V$.

Combining the option pricing model and the capital asset pricing model, Galai and Masulis (1976) build a theoretically more complete model of corporate security pricing. In line with Merton (1974), they show that the value of the stock is an increasing function of both the market value of the firm and the variance of the percentage return of the firm. Galai and Masulis (1976) Eq. (5) shows that

$$1 \geq \frac{\partial S}{\partial V} \geq 0, \qquad \frac{\partial S}{\partial \sigma^2} > 0$$

We can also express Merton (1974) Eq. (15) and Galai and Masulis (1976) Eq. (5) in a discrete time form as follows:

$$1 \geq \frac{\Delta S}{\Delta V} \geq 0, \qquad \frac{\Delta S}{\Delta \sigma^2} > 0 \qquad \frac{\Delta D}{\Delta V} = 1 - \frac{\Delta S}{\Delta V} \geq 0, \quad \frac{\Delta D}{\Delta \sigma^2} = -\frac{\Delta S}{\Delta \sigma^2} \leq 0$$

This means the relation between stock return and the firm's rate of return is positive; the relation between stock returns and change in the variance of the firm's rate of return is positive; the relation between bond return and the firm's rate of return is positive; and the relation between bond return and change in the variance of the firm's rate of return is negative. Galai and Masulis (1976) also argue that the instantaneous expected rate of return

on equity is a decreasing function of firm's current market value and the variance of the firm's rate of return.[3]

Based on the Merton (1974) and Galai and Masulis (1976) theoretical framework, we examine the causes of comovement on a firm's stock and bond returns within the option pricing framework by looking at two important events in a firm's events' periods - the period prior to firm's TS announcement and the period after a firm's financial year-end. We set up two hypotheses:

**Hypothesis I:** The return (earnings) of the firm have a positive impact on the firm's stock and bond returns simultaneously, hence causing a positive comovement in stock and bond returns.

**Hypothesis II:** The (a change in) volatility of return (earnings) of the firm has a positive impact on the firm's stock returns, but has a simultaneous negative impact on the firm's bond returns, hence causing stock and bond returns to decouple and move in opposite directions.

We first conduct a panel data analysis in the period prior to a firm's TS announcement day. According to FSA rules, firms listed on the London Stock Exchange (LSE) are required to inform the public if there is substantial change in the firm's financial, business or expected performance that is likely to affect the price of their listed securities. The definition and examples of TSs are given in Appendix A. It is well documented that uncertainty about a firm's business and performance is high before the firm releases important information to the market, and until the arrival of this new information resolves this uncertainty. Hence, we presume (a change in) the volatility of return (earnings) on the firm in the pre-TS announcement period is pronounced, therefore its impact on firm's stock and bond returns is

[3] See Galai and Masulis (1976) Eq. (16).

more likely to be captured. Setting each sample firm's TS announcement day as event day *t=0*, the tentative examination period is in the event windows of (-28, -4), (-30, -4) and (-40, -4)[4]. To test Hypotheses I and II we apply the following panel-data models:

$$rs_{it} = \alpha_0 + \alpha_1 rv_{it} + \alpha_2 dvol_rv_{it} + \alpha_3 rm_t + \alpha_4 vol_rm_t + \alpha_5 lev_1_{it} + \varepsilon_{it} \quad (1)$$

$$rb_{it} = \beta_0 + \beta_1 rv_{it} + \beta_2 dvol_rv_{it} + \beta_3 rm_t + \beta_4 vol_rm_t + \beta_5 lev_1_{it} + \eta_{it} \quad (2)$$

where

$rs_{it}$ : ln(stock price at event day *t* / stock price at event day *t-1*)*100%, i.e. return on stock issued by firm *i; i* is the index of the event (i.e. TS announced by firm *i* at day *t=0*, and note that firms can have multiple TS announcements in the sample); *t* is the event day.

$rb_{it}$ : ln(bond price at event day *t* / bond price at event day *t-1*)*100%, return on bond issued by firm *i*.

$rv_{it}$ : ln(market value of firm assets at event day *t* / market value of firm assets at event day *t-1*)*100%, i.e. return on firm asset value. The market value of a firm's assets is the sum of market value of the firm's equity and total liabilities. The market value of the firm's total liabilities is measured by the market-to-book ratio of a long-term bond multiplied by the total liabilities, where the total liabilities are reported in the firm's next financial report released after the current TS announcement. For most of the TS announcements in the sample, the time gap from the previous year-end to the current TS announcement day is much greater than those after the current TS announcement; hence we use the total liabilities reported in the post TS announcement as an appropriate scaling factor in the measurement of firm asset values.

[4] To avoid the sharp changes of firm value on the announcement day cause a biased regression analysis, the examination event window is up to 4 days prior to the TS announcement day.

$dvol_rv_{it}$ : ln(volatility of $rv_{it}$ / volatility of $rv_{i(t-1)}$) *100%, i.e. change in the volatility of returns of the firm. The volatility of $rv_{it}$ at event day *t* is calculated over the event window (*t-5, t*).

$rm_t$ : ln(FTSE100 index price at event day *t* / FTSE100 index price at event day *t-1*)*100%, i.e. return on the FTSE100 index at event day *t*.

$vol_rm_t$ : ln(volatility of $rm_{it}$) *100%, i.e. the volatility of returns on the FTSE100 index. The volatility of $rm_{it}$ at event day *t* is calculated over the event window (*t-5, t*).

$lev_1_{it}$ : ln(market value of firm's total debts at event day *t* / market value of firm's equity at event day *t*.)*100%, i.e. the firm's leverage ratio on event day *t*. The market value of the firm's total debts is measured by the market-to-book ratio of a long-term bond multiplied by the total debts, where the value of the total debts is reported in firm's financial report released after the current TS announcement day.

$\varepsilon_{it}, \eta_{it}$ : composite error term consists of an event specific plus idiosyncratic term.

We expect that $\alpha_1$ and $\alpha_2$ are positive; $\beta_1$ is positive and $\beta_2$ is negative. In equations (1) and (2), $rm$, $vol_rm$ and $lev_1$ are control variables. The Capital Asset Pricing Model (CAPM) predicts that market portfolio returns determine security returns. If a firm (with positive beta) value increases because the market goes up, we should still expect a positive comovement in stock and bond returns. In addition, a high volatility of return on the firm does not necessarily cause a negative comovement of stock and bond returns. If systematic volatility rises, so will the risk premium, which can drive up both stock and bond returns. We therefore include the market index (FTSE100) returns, $rm$, and the volatility of the market index returns, $vol_rm$ to control these two effects.

In the option pricing model, the firm is passive, and its leverage is assumed to be fixed. Leverage measures the level of indebtedness of the firm. In practice, a firm might adjust its leverage as new information is revealed. For example, a firm can choose to retire some of its debts when earnings are high. Alternatively, a firm can be forced to issue more debts when its earnings become more volatile. The classic Miller and Modigliani (1958) capital structure theory indicates that the stock return of a levered firm is equivalent to the stock return of an unlevered firm plus a financial risk premium. In other words, leverage induces transference of financial risk from bondholders to stockholders, resulting in an increase in stock return but a decrease in bond return. We control for this effect by including firm's leverage, $lev_1$ in the regression models.

Further, we test the relation of stock and bond returns with return on the firm and its volatility in Hypothesis I and II in another firm event period – the period after the firm's annual year-end[5]. We treat this as a robust test on Hypothesis I and II. We use two financial indicators as proxies for the return of the firm and its volatility – the earnings ratio (e.g. return on assets) and leverage ratio (e.g. debt to equity). The earnings ratio is a measure of a firm's profitability: how good the management performance has been in using assets to generate earnings. The leverage ratio measures the level of indebtedness of a firm. Bradley et al. (1984) find that the firm leverage ratio is negatively related to the volatility of firm earnings if the costs of financial distress are non-trivial. Hence leverage can be a proxy for the volatility of returns of the firm. We again test Hypotheses I and II by applying the following cross-sectional regression models:

[5] In the UK, listed firms usually release annual financial report to the market two months after the financial year-end. See Acker et al. (2002). Due to the problem that we cannot obtain a reasonable sample of the annual financial report released days, we presume that firms' financial information more or less leaks to the market after the financial year-end day, such as through stock analysts, hence influences on the firm's stock and bond prices. Therefore the financial year-end day event is employed in the current study.

$$rs_i = \gamma_0 + \gamma_1 roa_i + \gamma_2 lev_2_i + \gamma_3 rm_t + \gamma_4 vol_rm_t + u_i \quad (3)$$

$$rb_i = \lambda_0 + \lambda_1 roa_i + \lambda_2 lev_2_i + \lambda_3 rm_t + \lambda_4 vol_rm_t + e_i \quad (4)$$

where

$rs_i$ : ln(stock price at the first trading day after the financial report day / stock price at the previous trading day)*100%, i.e. return on stock issued by firm *i; i* is the index of the event (i.e. financial report released by firm *i* at day *t=0*); *t* is the event day.

$rb_i$ : ln(bond price at the first trading day after the financial report day / bond price at the previous trading day)*100%, i.e. return on bond issued by firm *i*.

$roa_i$ : return on assets (in %), reported in the annual financial report.

$lev_2_i$ : total debts / total equity (in %), reported in the annual financial report.

$rm_t$ : ln(FTSE100 index price at the first trading day after the financial report day / FTSE100 index price at the previous trading day)*100%, i.e. return on FTSE100 index.

$vol_rm_t$ : ln(volatility of $rm_{it}$) *100%, i.e. volatility of returns on FTSE100 index. The volatility of $rm_{it}$ at event day *t* is calculated over the event window (-3,1).

We expect that $\gamma_1$ and $\gamma_2$ are positive; $\lambda_1$ is positive and $\lambda_2$ is negative. In equations (3) and (4), we include $rm_t$ and $vol_rm_t$ are control variables for the reasons explained above. Since the stock and bond returns in the cross sectional models are only one day after the financial report day, we assume leverage is unchanged.

## 3. Data

The original sample of TSs is from two sources: the Bank of England provides an electronic copy of negative TSs containing 2518 TSs released from 2000:1 to 2006:6.[6] The other source

[6] Negative TS is also termed "profit warning". The Bank of England collects negative TSs in order to monitor the market conditions.

of TSs is from PI Navigator database that includes 4,965 TSs released from 2000:1 to 2011:10. We use the following steps to select the final sample:

1) TSs are dropped if firms do not have common stocks and at least one tradable bond listed in the London Stock Exchange (LSE), or if the data of daily returns on stocks and bonds are not available.
2) TSs are dropped if firms are in the banking and general finance sector. The unique capital structure of banks and financial firms makes it difficult to compare their financial returns to firms in other sectors.
3) The chosen bonds must meet the following criteria: a) be a fixed-rate, straight bond denominated in UK sterling pounds; b) cannot be convertible to equity, nor can it contain any equity feature such as a warrant; and c) must have six months of trading from its issuing day and, time to maturity must be greater than one year.[7]

The final sample consists of 165 events for TSs and 165 events for financial year-end. These events relate to 41 stocks and 47 bonds issued by 40 firms listed on LSE over the period of September 2000 to September 2011. These 40 firms are in FTSE100 or FTSE250. The data for the variables in equations (1) to (4) is from Datastream. Tables 1 and 2 present the summary statistics of these variables.

[7] Goldstein and Hotchkiss (2007) show that bonds in the first 3 to 6 months of trading can display unusual liquidity. Bonds very close to maturity are less sensitive to firm specific information.

**Table 1**
Summary statistics of the variables in equations (1) and (2) in event window (-28,-4).

| | N. obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| *rs* | 4125 | -0.0397 | 1.9976 | -39.5756 | 25.915 |
| *rb* | 4075 | -0.0062 | 0.4603 | -10.9287 | 5.7242 |
| *rv* | 3575 | -0.0325 | 1.1575 | -25.0881 | 8.745 |
| *dvol_rv* | 3575 | 0.2157 | 28.9339 | -221.7723 | 250.6898 |
| *rm* | 4125 | -0.0032 | 1.0425 | -8.1777 | 8.4699 |
| *vol_rm* | 4125 | -30.491 | 57.9635 | -203.2693 | 156.0151 |
| *levp_1* | 3675 | -110.0516 | 60.1999 | -279.3735 | 68.3182 |

**Table 2**
Summary statistics of the variables in equations (3) and (4).

| | N. obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| *rs* | 137 | 0.0616 | 1.6158 | -4.7808 | 5.9571 |
| *rb* | 137 | -0.0187 | 0.3543 | -1.4062 | 1.4899 |
| *roa* | 133 | 7.0773 | 7.9206 | -15.64 | 52.88 |
| *lev_2* | 116 | 109.5917 | 199.6599 | 21.45 | 2048.72 |
| *rm* | 137 | 0.2068 | 1.1687 | -3.1872 | 4.9301 |
| *vol_rm* | 137 | -34.5015 | 65.7342 | -193.775 | 120.7287 |

The regression models of equations (1) and (2) are run in three tentative examination event windows: (-28,-4), (-30,-4) and (-40,-4). Table 3 presents the summary statistics of *dvol_rv* in these event windows. There is a trend that the average changes of volatility of returns on the firm goes up when the event window approaches to the TS announcement day.

**Table 3**
Summary statistics of *dvol_rv* in various examination event windows.

| examination event windows | N. obs | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| (-28,-4) | 3575 | 0.2157 | 28.9339 | -221.7723 | 250.6898 |
| (-30,-4) | 3861 | 0.2558 | 28.8237 | -221.7723 | 250.6898 |
| (-40,-4) | 5291 | 0.0836 | 29.4535 | -315.0672 | 289.1386 |

## 4. Results

We first conduct a right-tailed t-test on the average change in the volatility of returns on the firm, *dvol_rv*, between the pre-announcement period of (-28, -4) and the post-announcement

period of (4, 28). The average *dvol_rv* in the pre-announcement period is 0.2157 and statistically greater[8] than that in the post-announcement period, -1.4621, implying that *dvol_rv* declines after the TS announcement day. Therefore, the pre-announcement period with pronounced change in the volatility of returns on the firm is more suitable in the current analysis.

We use fixed effect regression model to estimate Equations (1) and (2) in three event windows: (-28, -4), (-30,-4) and (-40,-4). Table 4 presents the estimation results of equations (1) and (2). In the event window (-28,-4), the coefficient of returns on the firm (*rv*) is 1.21876 and 0.06097 to stock return (*rs*) and bond return (*rb*), respectively. Both coefficients are highly significant at 1% level. This is consistent with Hypotheses I that return on the firm causes a positive comovement of stock and bond returns. In particular, stockholders benefit more from an comovement of stock and bond returns. In particular, stockholders benefit more from an increase in return on the firm comparing to bondholders with a coefficient nearly twice greater than that of the bonds. The coefficient of change in the volatility of returns on the firm (*dvol_rv*) is 0.00296 at 1% significance level to stock return, and is -0.00042 at 10% significance level[9] to bond return. This demonstrates that change in the volatility of returns on the firm induces stock and bond returns decouple and move in opposite way, hence Hypothesis II is supported. In other words, an improvement in firm performance benefits both firm's stockholders and bondholders. But an increase in firm's business risk transfers wealth from stockholders to bondholders.

[8] The p-value of the right-tailed t test is 0.0072.
[9] The p-value is 0.098.

**Table 4**
Estimates of equations (1) and (2) in various event windows.

| | examination event windows | | |
|---|---|---|---|
| | (-28,-4) | (-30,-4) | (-40,-4) |
| Eq.(1) *rs* | | | |
| *constant* | -2.93954 | -1.75072 | -1.66732 |
| | (-5.8)*** | (-4.03)*** | (-5.1)*** |
| *rv* | 1.21876 | 1.24853 | 1.10723 |
| | (86.63)*** | (94.9)*** | (93.56)*** |
| *dvol_rv* | 0.00296 | 0.00291 | 0.00426 |
| | (5.9)*** | (6.15)*** | (9.4)*** |
| *rm* | 0.21336 | 0.20723 | 0.26250 |
| | (14)*** | (14.46)*** | (19.16)*** |
| *vol_rm* | 0.00024 | 0.00020 | 0.00032 |
| | (-0.56) | -0.5 | -0.87 |
| *lev_1* | -0.02623 | -0.01561 | -0.01487 |
| | (-5.8)*** | (-4.02)*** | (-5.1)*** |
| N. groups | 143 | | |
| Eq.(2) *rb* | | | |
| *constant* | 2.01229 | 1.64744 | 0.82903 |
| | (7.86)*** | (7.41)*** | (5.85)*** |
| *rv* | 0.06097 | 0.06019 | 0.04795 |
| | (8.57)*** | (8.94)*** | (9.35)*** |
| *dvol_rv* | -0.00042 | -0.00037 | -0.00024 |
| | (-1.66)* | (-1.52) | (-1.21) |
| *rm* | -0.07802 | -0.08091 | -0.07949 |
| | (-10.13)*** | (-11.03)*** | (-13.38)*** |
| *vol_rm* | -0.00058 | -0.00057 | -0.00049 |
| | (-2.71)*** | (-2.84)*** | (-3.06)*** |
| *lev_1* | 0.01814 | 0.01486 | 0.00745 |
| | (7.93)*** | (7.48)*** | (5.89)*** |
| N. groups | 143 | | |

Notes: Due to missing values of some firms' total liabilities and book-to-market ratio, the sample group is reduced to 143. T-statistics are in parenthesis. ***/**/* indicate the significance level at 1%, 5% and 10%.

In the control variables, the coefficient of market index returns (*rm*) is 0.21336 and -0.07802 at 1% significance level to stock return and bond return, respectively; the coefficient of volatility of market index returns (*vol_rm*) is 0.00024 and insignificant to stock return but, is

-0.00058 at 1% significance level to bond return. This is consistent with the "fly to quality" hypothesis - when stock market goes down and/or becomes more volatile, investors look for relatively safe investment and switch their holdings from stocks to bonds, and *vice versa*. The coefficient of leverage (*lev_1*) is -0.02623 and 0.01814 at 1% significance level to stock and bond returns, respectively. This contradicts the expected result where the coefficient should be positive to stock return but negative to bond return. An explanation is to look at the relation between leverage and return on the firm. Table 5 shows a negative correlation between *lev_1* and *rv* in the event window (-28,-4). This implies that when return on the firm and its volatility is low, firm raises the leverage level. Without a backing of good firm performance, high leverage can cause high default risk, hence high risk premium of bond return; stock return simultaneously goes down when risk transfers from stockholders to bondholders.

**Table 5**
The correlations of *rv* and *lev_1* in the event window (-28,-4).

| | *rv* | *lev_1* |
|---|---|---|
| *rv* | 1 | |
| *lev_1* | -0.0038 | 1 |

The estimations of equations (1) and (2) in the event windows of (-30,-4) and (-40,-4) are robust tests on Hypotheses I and II – we want to see whether the results we find in the event window of (-28,-4) can be generalized. Table 4 shows that the estimation results in the event windows of (-30,-4) and (-40,-4) are very similar to those in the event window of (-28,-4), except that the coefficient of *dvol_rv* to bond return is less significant in longer event windows: the p-value of the t test is 0.128 and 0.227 in event windows of (-30,-4) and (-40,-4), respectively. An explanation is that *dvol_rv* becomes smaller in a longer time period before the TS announcement (see Table 3), hence its impact on bond return becomes less

pronounced.[10] We use robust standard errors in the OLS estimation of equations (3) and (4) to overcome minor heteroscedasticity problem. In addition, we exclude observations with negative *lev_2* since they are not in line with theoretical definition of leverage but simply accounting issue. Hence, the number of groups (i.e. the number of financial year-end events) is reduced to 116. Table 6 presents the estimation results of the cross sectional regression analysis of equations (3) and (4).

**Table 6**
Estimates of equations (3) and (4).

| Eq.(3) *rs* | | | | | |
|---|---|---|---|---|---|
| | *constant* | *roa* | *lev_2* | *rm* | *vol_rm* |
| Coef. | -0.2980 | 0.0218 | 0.0005 | 0.8179 | 0.0015 |
| t | (-1.72)* | (1.69)* | -0.7 | (6.83)*** | -0.9 |
| R-squared | 0.3657 | | | | |
| F-statistics | 12.96*** | | | | |
| N. groups | 116 | | | | |

| Eq.(4) *rb* | | | | | |
|---|---|---|---|---|---|
| Coef. | -0.0727 | 0.0126 | -0.0003 | -0.0890 | -0.0008 |
| t | (-1.82)* | (4.05)*** | (-3.41)*** | (-2.47)* | (-1.78)* |
| R-squared | 0.1616 | | | | |
| F-statistics | 6.23*** | | | | |
| N. groups | 116 | | | | |

The results show that the coefficient of return on assets (*roa*) is 0.0218 at 10% significance level to stock return and, is 0.0126 at 1% significance level to bond return. This is consistent with Hypothesis I that an increase in earnings causes a firm's stock and bond returns go up together. The coefficient of leverage (*lev_2*) is 0.0005 and insignificant[11] to stock return and, is -0.0003 at 1% significance level to bond return. Since firm's leverage ratio is negatively

[10] We use longer examination event windows such as (-4, -50) to test Hypotheses I and II. We obtain similar results except that the coefficient of *dvol_rv* to bond return becomes more insignificant with relatively high p-value.
[11] The p-value is 0.484.

related to the volatility of firm earnings, the estimates of *lev_2* imply that the volatility of firm earnings causes stock return goes down but bond return goes up. But the coefficient of *lev_2* to stock return is insignificant, so it only provides some evidence to support Hypothesis II. Contrary to *lev_1* in equations (1) and (2), the relation of *lev_2* and *roa* is positive in firms' financial year-end (see Table 7). It implies that high leverage level is backed by high earnings of the firm, hence default risk is relatively low, bond return is relatively low and stock return is relatively high.

**Table 7**
Correlations of *roa* and *lev_2* in equations (3) and (4).

| | *roa* | *Lev_2* |
|---|---|---|
| *roa* | 1 | |
| *lev_2* | 0.465 | 1 |

In summary, the estimation results of equations (1) to (4) support Hypotheses I and II. By controlling firm's leverage level, market index return and its volatility, the comovement of a firm's stock and bond returns is determined by firm's return (earnings) and (a change in) volatility of firm return (earnings). Whilst return (earnings) of the firm causes firm's stock and bond returns move together, (a change in) volatility of return (earnings) of the firm induces stock and bond returns decouple and move in opposite direction. This finding is consistent with the option pricing theory. In addition, firm's leverage plays a role in the comovement of stock and bond returns, depending on the firm's leverage strategy: a firm with low return (earnings) but high leverage will have low stock returns but high bond returns; whereas a firm with high return (earnings) and high leverage will have high stock returns but low bond returns.

## 5. Conclusions

The classic option pricing theory implies that the relation between a firm's stock and bond returns depends on return (earnings) of the firm and (a change in) volatility of return

(earnings) on the firm. Under the theoretical framework, we investigate the comovement of a firm's stock and bond returns during the period prior to firm's substantial information release day - TS announcement day and, the period after firm's annual financial year-end in the UK market.

In the panel data analysis during the period prior to firm's TS announcement day, by controlling firm's leverage, market index returns and its volatility, we find that return on the firm causes a positive comovement of firm's stock and bond returns, whilst (a change in) volatility of returns on the firm causes stock return goes up and bond return goes down. Further, the cross sectional analysis in the period after firm's annual financial year-end shows that return on asset (i.e. earnings) of the firm has a positive impact on firm's stock and bond returns; but firm's leverage level (proxying for the volatility of earnings) causes stock return falls but bond return rises. This means that a firm's profitability and (a change in) business risk have opposite impact on the comovement of stock and bond returns, revealing the common and conflict of interests between firm's stockholders and bondholders.

In addition, in both panel data and cross sectional data analyses, we find evidence of "flight-to-quality": when stock market goes down and becomes more volatile, investors reduce holding of stocks and increase holdings of bonds, causing relatively high stock returns and low bond returns. Also, firm's leverage plays a role in firm's stock and bond comovement: low return (earnings) accompanying with high leverage has negative impact on stock returns but positive impact on bond returns; low return (earnings) accompanying with low leverage has positive impact on stock returns but negative impact bond returns.

Certainly the actual comovement of firm's stock and bond returns is a result of the joint-impact of firm earnings and its (changes in) volatility. Whether a positive or negative comovement of stock and bond returns is presented depends on which impact dominates the other.

**Appendix A**

In the UK market, the Financial Services Authority (FSA) requires listed firms to issue TSs under certain circumstance:

Where to the knowledge of a company's directors there is such a change in the company's financial condition or in the performance of its business or in the company's expectation of its performance that knowledge of the change is likely to lead to substantial movement in the price of its listed securities, the company must notify the Company Announcements Office without delay all relevant information concerning the change. [FSA, (2001)].

Two examples of positive and negative TSs are given below.

<u>Positive Trading Statement:</u>

Company: TTP Communications PLC

Released: 12:15 21-Mar-06

Looking to the future, we believe that our AJAR technology provides the company with a unique platform from which to achieve a market leading position in applications software for 2G and 3G feature and low cost phones. We expect volume deployment by our lead customers in the second half of next financial year. In Protocol Stacks and Silicon (our Modem technologies), we expect to see in the coming financial year the results of our re-alignment of the business to focus on a more broadly based approach to distribution. We remain confident that our position in both 2G and 3G and our technology portfolio will create significant value for shareholders going forward.

<u>Negative Trading Statement:</u>

Company: Elevation Events Group PLC

Released: 08:54 17-Mar-06

Elevation Events Group Plc ("Company") announces that it intends to release its results for the 17 month period ended 30 September 2005 on 28March 2006. These results will show a

loss of £1.4 million, compared to a market expectation of a loss of £800,000. The principal reasons are provisions for losses for events scheduled in the next financial year as detailed below...

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**References**

Acker, D., Horton, J., Tonks, I., 2002. Accounting standards and analysts forecasts: the impact of FRS3 on analystsf FRS3 onrds and analysts. Journal of Accounting and Public Policy 21, 193-217.

Alexander, G. J., Edwards, K. A., Ferri, M. G., 2000. What does Nasdaq's high-yield bond market reveal about bondholder-stockholder conflicts? Financial Management (US) 29, 23-39.

Black, F., Scholes, M., 1973. The pricing of options and corporate liabilities. Journal of Political Economy 81, 637-654.

Bradley, M., Jarrell, G.A., Kim, E.H., 1984. On the existence of an optimal capital structure: Theory and evidence. Journal of Finance 39, 857-878.

Galai, D., Masulis, R.W., 1976. The option pricing model and the risk factor of stock. Journal of Financial Economics 3, 53-81.

Goldstein, M.A., Hotchkiss, E.S., 2012. Dealer behavior and the trading of newly issued corporate bonds. Working paper.

Hotchkiss, E. S., Ronen, T., 2002. The informational efficiency of the corporate bond market: An intraday analysis. The Review of Financial Studies 15, 1325-1354.

Kwan, S. H., 1996. Firm-specific information and the correlation between individual stocks and bonds. Journal of Financial Economics 40, 63-80.

Merton, R.C., 1973. Theory of rational option pricing. Bell Journal of Economics and Management Science 4,141-183.

Merton, R.C., 1974. On the pricing of corporate debt: The risk structure of interest rates. Journal of Finance 29, 449-470.

Modigliani, F., Miller, M., 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review 48, 261-297.

Shane, H., 1994. Comovements of low-grade debt and equity returns of highly leveraged firms. The Journal of Fixed Income 4, 79-89.