Graduate School of
Business Administration

KOBE UNIVERSITY

ROKKO KOBE JAPAN

2011-7

The effect of non-financial risk information on the evaluation of implied cost of capitals

Norio Kitagawa
Hyonok Kim
Masatoshi Goto

Discussion Paper Series

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Norio Kitagawa
Graduate School of Business Administration
Kobe University

Hyonok Kim
Faculty of Business Administration
Tokyo Keizai University

Masatoshi Goto
Graduate School of Business Administration
Kobe University

First version: January 2011

[1] This research was partially supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Grant-in-Aid for Scientific Research (Research B: 21330110) and Grant-in-Aid for Young Scientists (Research B: 21730370).

The effect of non-financial risk information on the evaluation of implied cost of capitals

Abstract

The purpose of this paper is to examine the effect of voluntary disclosure of 'business risk' information (hereafter referred to as 'risk information'), which is a significant determinant of the information environment, on estimating the cost of capital. Recently, some studies indicate that the reliability of the cost of capital estimation differs according to the accounting standards and the information environment of the firm (e.g. Chen et al., 2004; Easton and Monahan, 2005). On the basis of their studies, we predict that the cost of capital will be more precise in firms that proactively disclose risk information voluntarily. Our results suggest that the implied cost of capital reflects risk more appropriately in firms with a high 'business risk' disclosure level.

Keywords: implied cost of capital; risk factors; non-financial risk information

The effect of non-financial risk information on the evaluation of implied cost of capitals

1. Introduction

The purpose of this paper is to examine the effect of the 'business risk' information (hereafter referred to as 'risk information') disclosed in Japanese annual reports on the accuracy of the implied cost of capital.

Cost of capital cannot be accurately calculated, because the risk premium cannot be directly observed. Hence, attempts have been made to estimate the cost of capital using various methods, such as those using post-realized returns, and more specifically leading calculations using the Capital Asset Pricing Model (CAPM), the Fama-French Three Factor Model (1992, 1993) or other models. In recent years, a method attracting special attention uses the ex ante earnings, book value of equity of equity and the expected value of the dividend to back calculate the cost of capital from the residual income model and the abnormal earnings growth valuation model. The cost of capital calculated using the latter methods is collectively referred to as the implied cost of capital, because it represents the implicit cost of capital assumed by market participant.

Much concern has been placed in the past on the problem of estimating the most reliable cost of capital using various estimation models, because the true value of the cost of capital is unobservable and the variety of methods used to calculate it. A series of studies triggered by Gode and Mohanram (2003) conducted a comparative analysis on the accuracy of the cost of capital estimated using an alternative model by comparing the correlation between the known risk factor and the realized return. However, the opinions of research to date are divided regarding the merits of the cost of capital. In recent years, some research shows that the reliability of the cost of capital differs depending on the information environment in which it is placed (e.g. Easton and Monahan, 2005). This paper will analyze the effect of voluntary disclosure of risk information, which is a significant determinant of the information environment, on estimating the cost of capital.

Risk information mentioned here is qualitative information that cannot be expressed in figures. It is, for example, the term used to refer to “the risk related to investing in next-generation technology” or “the risk related to shifting to new products.” The financial information used in prior studies is quantitative information, but risk information is voluntarily disclosed non-financial information that is useful when interpreting quantitative information. In other words, the voluntary disclosure of risk information allows more accurate corporate assessments, because private corporate information becomes known to investors. Here, we predict that a more highly reliable cost of capital can be estimated for firms that proactively release risk information.

We evaluate the cost of capital as highly reliable when the following conditions are met. First, the known risk factors significantly correlate with expected sign. Second, the R-square is high in a multiple regression model in which the cost of capital is a dependent variable and the risk factor is an independent variable. The cost of capital uses 1) the model proposed by Gebhardt et al. (2001), 2) the model proposed by Ohlson and Juettner-Nauroth (2005), 3) the EP ratio, 4) the PEG ratio proposed by Easton (2004), and 5) the adjusted PEG ratio proposed by Easton (2004). We selected 1) market beta, 2) unsystematic risk, 3) earnings volatility, 4) leverage, 5) corporate size, 6) long-term earnings growth, and 7) book-to-market ratio in the known risk factors. The results of our analysis show a strong correlation expected sign in the known risk factor and the cost of capital, which was estimated using models based on the abnormal earnings growth valuation model, when comparing firms with a high business risk disclosure level to those with a low disclosure level. Moreover, firms with a high business risk disclosure level demonstrated the higher explanatory power of the multiple regression model, which uses the cost of capital as a dependent variable and the risk factor as an independent variable.

The content disclosed and format details are unspecified by the risk information disclosure laws in Japan and are practically at the discretion of the firm. From the perspective of the capital market, knowing the influence of risk information on the accuracy of the cost of capital estimation will substantiate the significance of risk information disclosure and is expected to contribute to discussions in the planning of a system for more detailed disclosure laws.

The remainder of this paper is organized as follows. Section 2 reviews previous research and develops the hypothesis. Section 3 presents the research design, confirms the five cost of capitals and seven risk factors used in this paper, and explains the method of identifying proactive firms that voluntarily disclose risk information. Section 4 presents the sample and basic statistics. Section 5 reports the main results. Section 6 conducts additional analysis taking into consideration the corporate stance towards risk management. Section 7 summarizes the conclusions and explains the limitations of this paper.

2. Prior studies and hypothesis development

As mentioned above, since the true value of the cost of capital is not observable, it is not possible to compare estimation models for the cost of capital easily. Therefore, the preceding studies compare them in establishing many valuation criteria. To be more specific, the cost of capital are evaluated by measuring the correlation with observable risk factors and realized stock returns. In other words, the cost of capital which shows expected signs and a higher correlation with risk factors and realized stock returns is regarded as desirable. However, their evidence is not consistent.

For example, Gode and Mohanram (2003) compared costs of capital derived from the model of Ohlson and Juettner-Nauroth (2005), the model of Gebhardt et al. (2001), and the model of Liu et al. (2002). They compared costs of capital using the following three methods. First, they examined the correlation with risk factors. Secondly, they examined the correlation with a risk premium computed by multiplying a realized value of risk factors and a coefficient obtained with a regression of the risk premium in the previous year on risk factors in the previous year. Thirdly, they examined the correlation with a realized stock return. And they show that all costs of capital have a positive correlation with conventional risk factors (such as earnings volatility, variability in stock returns, and leverage), and have a negative correlation with analysts coverage. In particular, the correlation of cost of capital derived from the model of GLS model was found to be higher than the model of OJ model, thus they conclude that GLS model is superior to OJ model. [2]

In contrast, Botosan and Plumlee (2005) compared the costs of capital by focusing on differences in assumptions of terminal value. They inferred a cost of capital from five models proposed by Botosan and Plumlee (2002), Gebhardt et al. (2001), Gordon and Gordon (1997), Gode and Mohanram (2003), and Easton(2004).[3] They also measured the correlation with risk factors such as a market beta, leverage, information risks, market value, book-to-market ratio, and growth in expected earnings. As a result, it was suggested that the models presented in Botosan and Plumlee (2002) and Easton (2004) showed the most consistent correlation with risk factors. Meanwhile, it was pointed out that the cost of capital inferred from the model of Gebhardt et al. (2001) did not show a consistent correlation with risk factors.

Recently, some studies indicate that the cost of capital politic differs according to the accounting standards and the information environment of the firm. For example, Chen et al. (2004) compared the cost of capital in the Gebhardt et al. (2001) and the Ohlson and Juettner-Nauroth (2005) models for seven countries (USA, UK, Australia, Canada, Japan, Germany and France). The results showed that the cost of capital in the Gebhardt et al. (2001) method was highly reliable in environments that sustained clean surplus relations in the financial reports. Adversely, the Ohlson and Juettner-Nauroth (2005) model could estimate a valid cost of capital in environments that did not necessarily sustain clean surplus relations. Moreover, Easton and Monahan (2005) compared the cost of capital based on its correlation with the realized return. The subject of the

[2] However, as the result varies depending on whether loss firms are included in the calculation of industry median (Gebhardt et al. 2001) or not (Liu et al. 2002), it is necessary to interpret the superiority of the residual income model to a limited extent. On the contrary, Gode and Mohanram (2008) concluded that the cost of capital inferred from Ohlson and Juettner-Nauroth (2005) shows a more robust result.

[3] Assumptions regarding terminal value in each study are as follows: 1) Botosan and Plumlee (2002): analysts' forecast on terminal value is equal to a market forecast; 2) Gebhardt et al.(2001): ROE exceeding the prediction horizon converges on industry median. 3) Gordon and Gordon (1997): ROE exceeding the prediction horizon approximates a cost of capital. 4) Gode and Mohanram (2003): Corporate abnormal earnings growth converges on the economic level if exceeding the prediction horizon; 5) Easton (2004): Corporate abnormal earnings growth is zero if exceeding the prediction horizon.

analyses is the cost of capital derived from seven models, and all confirm that the correlation with the realized return, contrary to expectations, was negative. From this, it can be concluded that the implied cost of capital has a low reliability as the measured value for expected return. However, they also note the following two points. First, when the analyst consensus regarding the long-term growth forecast is low, the reliability of the cost of capital estimated using the Claus and Thomas (2001) model is higher. Second, when the ex-post calculated analyst forecast error is small, all costs of capital and the realized returns show a positive correlation, as expected. Hence, they concluded that the merit of the cost of capital is influenced by the analyst forecast error.

This paper elaborates on these types of research and verifies that the voluntary disclosure of risk information by firms influences the cost of capital politic. If firms voluntarily disclose information, the degree that this information is effectively reflected in securities prices is higher, because private corporate information becomes known to investors. In other words, the firm's information is rapidly and suitably reflected in stock prices. Hence, we predict that the cost of capital would be more precise in firms that proactively disclose risk information voluntarily.

3. Research design

The research design of our study relies on that of Gode and Mohanram (2003), and Botosan and Plumlee (2005) to compare the cost of capital using the following two methods. In the first method, we calculated the exemplary risk factor that is thought to gain general support and compared its correlative strength with the cost of capital. In the second method, we estimated the multiple regression model in which the cost of capital is a dependent variable and the risk factor is an independent variable, and compared the model's explanatory ability. In this paper, we assessed the ideal cost of capital, which reflects the risk, as one the higher the correlation with the risk factor and the higher the R-square of the multiple regression model.

We also distinguish, in this paper, between firms that disclose many items of business risk-related information from those that disclose few items and verify whether a difference in the aforementioned comparative merits arises between the two. If the disclosure of risk information is useful as supplementary information for estimating risk, the correlation between the cost of capital and the risk factor, and the R-square in the multiple regression model must be high in firms that disclose information.

The following explains the calculation method of the variables used in this paper related to 3.1) the cost of capital, 3.2) the risk factor, and 3.3) the disclosure of risk information.

3.1 Implied cost of capital

1) Gebhardt et al. (2001) Model

As mentioned above, the Gebhardt et al. (2001) model for inferring the cost of capital is based on the residual income model, and can be represented by equation (1) below. Here, P_0 is a stock price at 0, BV_t is forecasted book value per share at period t, $FROE_t$ is forecasted ROE at period t, and x denotes the cost of capital. As forecasted future earnings are available to a limited extent, the forecasted earnings and the earnings growth ratio are used explicitly for three years. The values after this period are assumed to converge on a industry median. The forecast period of 12 years is adopted in this case.

$$P_0 = BV_0 + \frac{FROE_1 - x}{(1+x)} BV_0 + \frac{FROE_2 - x}{(1+x)^2} BV_1 + \sum_{i=3}^{11} \frac{FROE_i - x}{(1+x)^i} BV_{i-1} + \frac{FROE_{12} - x}{x(1+x)^{11}} BV_{11} \qquad (1)$$

GLS model requires forecasted values of ROE, book value per share, and dividend per share. The forecasted ROEs for one year and two years ahead are computed by using the forecasted EPS (reported by IBES). Therefore, when the forecasted EPS at t is defined as $FEPS_t$, the forecasted ROE for i years ahead is expressed as $FEPS_{t+i}/BV_{t+i-1}$. The forecasted earnings for three years ahead, $FEPS_3$, is computed by multiplying the forecasted earnings for two year ahead, $FEPS_2$, and the long-term growth reported by IBES around the same time of this forecasted value. From four terms to 12 years ahead, a certain amount is deducted every year from the forecasted value for three terms ahead to the median of the industry to which the company belongs. Here, the industry median is the median value of values of the industry to which the company belongs (Nikkei industry code is used here) experienced over the past 10 years up to the present date. To be more specific, it is obtained by computing a median for each year over the past 10 years, then calculating the median of that 10-year period. It is incorporated in the model from the viewpoint of measuring how much profitability the company may have in the future by using the industry median.

The forecasted book value per share is obtained by using the clean surplus relationship, adding the forecasted EPS in the next year to the current book value per share, BV_0, and subtracting the forecasted dividend per share. In other words, the forecasted book value for term t is expressed by the following equation: $BV_t = BV_{t-1} + FEPS_t - DPS_t$. At this time, the necessary forecasted dividend per share is computed by using a dividend payout ratio.

Specifically, on the assumption that the dividend payout ratio is invariable, the forecasted dividend is computed by multiplying the dividend payout ratio calculated in the current term and the forecasted EPS. Consequently, the expression to calculate the forecasted dividend per share for term t is $FEPS_t \cdot DPS_0 / EPS_0$.

The cost of capital is computed by solving the above polynomial equation for x. This polynomial equation may have multiple solutions, and in this case is solved using the Muller method.[4]

2) Ohlson and Juettner-Nauroth (2005) Model

[4] The Muller method is described in general textbooks to explain the algorithm. Here, "Scientific and Engineering Computation" by Hayato Togawa, SAIENSU-SHA Co., Ltd. 1992, is referred to. In addition to the Muller method, it can also be solved with the Newton method and the Traub method. The solution of a nonlinear equation can be computed, but it is not possible to limit to only one solution; it is just one of many solutions. Under the Muller method, in cases that multiple solutions are obtained, the smallest one is adopted.

The Ohlson and Juettner-Nauroth (2005) model is expressed as equation (2). The definition of variables are the same as in Gebhardt et al. (2001). Although γ plays an important role in this expression, how to decide its value is not definitively shown, even in Ohlson and Juettner-Nauroth (2005). They refer that, taking the value of EPS for example, the value is $EPS_{t+1} = \gamma EPS_t$, where γ>1.[5] In this study, we assume that γ is 1.03.[6]

$$x = A + \sqrt{A^2 + \frac{FEPS_1}{P_0} \times \left(\frac{\Delta FEPS_2}{\mathrm{FEPS}_1} - (\gamma - 1) \right)} \tag{2}$$

where,

$$A \equiv \frac{1}{2}\left(\gamma - 1 + \frac{DPS_1}{P_0} \right)$$

3) Modified PEG ratio, PEG ratio, and EP ratio in Easton (2004)

In this study, we decided to also examine the modified PEG ratio and PEG ratio proposed by Easton (2004) in order to weigh the impacts of γ and dividends involved in Ohlson and Juettner-Nauroth (2005). The modified PEG ratio can be expressed by equation (3).[7] As seen in this expression, a modified PEG ratio is obtained by hypothesizing $\gamma = 1$ based on the condition that the abnormal earnings growth in the Ohlson and Juettner-Nauroth (2005) model is constant. Furthermore, the PEG ratio is based on the assumption of $DPS = 0$, in addition to the assumption in the modified PEG ratio. The PEG ratio can be expressed by equation (4).

$$x = \sqrt{\frac{FEPS_2 + xDPS_1 - FEPS_1}{P_0}} \tag{3}$$

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[5] However, if $\gamma > 1$, the future value of EPS calculated by $EPS_{t+1} = \gamma\, EPS_t$ diverges.

[6] Ohlson and Juettner-Nauroth (2005) stated that it is possible to unify γ of all firms within the range of 1.03~1.05. They explain as follows (p. 359): "Perhaps the most logical interpretation is that the limit growth should correspond to the very long run steady state in which a firm's growth in expected earnings equals the growth in expected GNP. It follows that one can argue that γ should be the same for all firms in the range of 1.03 to 1.05."

[7] Some preceding studies modify the model by using the forecasted earnings for four and five terms ahead (e.g., Botosan and Plumlee 2005). However, as there are few companies which announce the forecasted earnings for four and five terms ahead, this estimation model is used here.

$$x = \sqrt{\frac{FEPS_2 - FEPS_1}{P_0}} \quad (4)$$

We also examine the EP ratio. The EP ratio is also regarded as a form of the abnormal earnings growth valuation model, and is computed by equation (5). The EP ratio assumes the abnormal earnings growth = 0. In other words, the EP ratio is a model implying that, if forecasted earnings for the next year are available, a satisfactory corporate evaluation is possible.

$$x = \frac{FEPS_1}{P_0} \quad (5)$$

3.2 Risk factors

1) Beta

Prior studies use market beta as a risk factor. Their argument is based on CAPM which predicts a positive association between a firm's market beta and the risk premium. In addition, Several studies show an association between market beta and the risk premium (e.g., Gordon and Gordon 1997; Harris and Marston 1992; Marston and Harris 1993; Harris et al. 2002). According to preceding studies, we estimate market beta (hereinafter referred to as beta), using data on daily stock returns over the past year from the announcement date of analysts' forecasts by IBES.

2) Unsystematic risk

Although some studies find no statistical relationship between unsystematic risk and expected return (see, Pratt and Grabowski 2008, p.169), many prior studies show a positive association between unsystematic risk and future stock returns (e.g., Malkiel and Xu 1997). We extract unsystematic risk with the following procedures. That is, we estimate the regression model in which daily stock returns in the previous year are a dependent variable and stock returns of market portfolios are an independent variable, and used the variance of the residuals obtained from the regression as a proxy for unsystematic risk (hereinafter referred to as Unsyst).

3) Earnings variability

Graham et al. (2007) provide survey evidence that corporate executives prefer smooth earnings, in part because they believe that higher earnings volatility increases the cost of capital. Francis et al. (2004) shows a positive relation between earnings volatility and expected returns. We also predict a positive association between earnings variability and risk premiums. In prior studies, Gebhardt et al. (2001) and Gode and Mohanram (2003) measured earnings variability using the following procedures. First, they computed the following variables expressing earnings variability: 1) the mean absolute error of analyst forecasts over the past five years; 2) the coefficient of variation in EPS; and 3) the dispersion of analysts' forecasts. Then, using factor analysis, they identified a single variable from these three variables, and used it as a criterion in expressing earnings variability. In this study, we measured earnings variability using the standard deviation of earnings over the past five years (hereinafter referred to as Earnvar).

4) Leverage

Modigliani and Miller (1958) demonstrate that the risk premium can be expressed an increasing function of leverage. Fama and French (1992) show a positive association between leverage and realized stock returns. Dhaliwal et al. (2006) also find evidence that the equity risk premium is positively related with leverage. According to preceding studies, we use leverage measured as the ratio of the book value long-term debt to the market value of equity (herein after referred to as Leverage) as a risk factor. We predict a positive association between the risk premium and leverage.

5) Size

Numerous Studies have shown the negative association between market capitalization and realized returns (e.g., Fama and French 1992; Berk 1995). In addition, market capitalization can be a risk factor as a proxy for the information environment, since the information environment is affected by many factors, including trading volume, firm size, bid-ask spreads, and institutional factor, and these factors are highly correlated with each other. Prior studies show that firms that are better connected with information intermediaries, such as analysts and institutional investors, have lower risk premiums because easy availability of information lowers the information asymmetry between a firm and its investors, and lowers the informational risk for investors (e.g., Demsetz 1968; Copeland and Galai 1983; Glosten and Milgrom 1985; Amihud and Mendelson 1986; Diamond and Verrecchia 1991; Brennan and Swaminathan 1993; Handa and Linn 1993; Coles et al. 1995; Clarkson et al. 1996; Botosan 1997; Healy and Palepu 1999).[8] Therefore, we use the firm size measured by the log of the market value of equity (hereinafter referred to as Size) as a risk factor. According to preceding studies, we expect a negative association between the size and the risk premium.

6) Long-term growth in expected earnings

Gebhardt et al. (2001) and Gode and Mohanram (2003) use the long-term growth in expected earnings from IBES as a proxy for market mispricing, and predict a negative correlation between the risk premium and long-term growth. Their argument is based on two phenomena. First, based on La Porta (1996), they argue that analysts are overoptimistic for high-growth firms and their stock prices are too high, which results in a low risk premium. Gebhardt et al. (2001) explain the second reason for a negative association between long-term growth and the risk premium as follows. Residual income models assume that ROE reverts to the industry median ROE. If the industry median ROE is lower than the analysts' estimate of a firm's long-run ROE, then these firms will appear to have a higher price and a lower risk premium. Therefore, a negative association between the risk premium and long-term growth is expected. In this study, we use the forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings (hereinafter referred to as LTG).

7) Book-to-market (BM) ratio

Gebhardt et al. (2001) and Gode and Mohanram (2003) control for the book-to-market ratio as measured by the log of the ratio of shareholders' equity to the market

[8] Based on these arguments, Botosan and Plumlee (2005) use both information risk and firm size as a risk factor. Information risk is measured as the width of the range between Value Line's minimum and maximum price forecasts scaled by the midpoint of range, and firm size is measured as the market value of equity..

value of equity. This is consistent with Fama and French (1992) and Berk et al. (1999). A high book-to-market (BM) ratio could reflect lower growth opportunities and lower accounting conservatism. As argued by Gode and Mohanram (2003), it is difficult to conclude how the combination of these factors will influence the risk premium. According to preceding studies, however, we expect a positive correlation between the BM ratio and the risk premium. In this study, we estimate a variable of book-to-market ratio (hereinafter referred to as BM) as the log of the ratio of shareholders' equity to the market value of equity.

3.3 Risk disclosure level

The business risk disclosure-related variable varies as shown in equation (6) below according to Kim(2008). Here, *Risks* is the number of risk information items disclosed in the annual security report. *Median* is the median number of the risk items in the same industry. In other words, the value calculated by deducting the industry average number of disclosed items from the number of disclosed items by the sample firms is the business risk variable. Subtracting the industry average varies the number of disclosure items by industry and avoids the industry influencing the relevant variable.

The business risk disclosure-related variable used in this paper is slightly different to the one used by Kim(2008) with Risk being divided by total assets. The reason being that the number of disclosed items could represent the size of the firm, assuming that the larger the firm the more thorough their disclosure of non-financial information.

$$RiskDisclevel = \ln\left(\frac{Risks}{Assets}\right) - median\ln\left(\frac{Risks}{Assets}\right) \tag{6}$$

Firms judged to proactively disclose risk have a *RiskDisclevel* value larger than the median, and those that do not have a value lower than the median.

4. Sample and descriptive statistics

4.1 Sample

The sample selection criteria for this paper are as follows.

1) The firm is a listed company between 2004 and 2007 (excluding financial institutions).

2) The IBES simultaneously releases the firm's EPS estimate for the next financial year, and the EPS estimate for the financial year after next, and Long-term Growth estimate.

3) Risk-related information is released in the annual security report.

4) The consolidated financial statements necessary to calculate the cost of capital and the known risk factor, and the stock price data are available.

The industry of the sample firms was identified using the Nikkei industry classification. The IBES EPS estimates are released monthly, but the firms published vary every month. The estimates are published irregularly and it seems they are published when some information became available. Hence, in principal, we used estimate data published in August of each year in our analysis. If the earnings forecast was not released in August, we backtracked from August until the most recent settlement month and substituted the estimate in cases where the relevant information was released. Moreover, we obtained the business risk-related information from the annual security reports. We obtained the data relating to the consolidated financial statements from Nikkei Media Marketing's *Nikkei Financial Data* CD-ROM and DVD editions. We obtained the stock price data from Nikkei Media Marketing's *Nikkei Portfolio Master*.

Using these, we removed from the sample firms for which we could not estimate the cost of capital. In the GEB model, we removed from the sample firms for which we obtained a negative result or multiple results. We also removed from the sample firms for which the polynomial calculation did not converge in the result. On the other hand, firms were excluded if they did not meet the condition stated in the OJ model, PEG ratio and revised PEG ratio that the EPS estimate for the financial year after next be higher than the EPS estimate for the next financial year. Moreover, $\gamma = 1.03$ is set in the OJ model, so some samples did not produce a result. As a result, the final sample was 1,019 firms.

4.2 Descriptive statistics

Table 1 is the basic sample statistics after being processed for outliers.[9] In Panel A, the GEB model cost of capital (hereafter referred to as GLS) is low compared to other costs of capital. Conversely, the OJ model cost of capital (hereafter referred to as OJ) is relatively high. The Easton (2004) PEG ratio (hereafter referred to as PEG) and revised PEG ratio (hereafter referred to as MPEG) levels are lower than OJ by the share ignoring the abnormal earnings growth valuation and allocation, but are higher than GLS.[10] Moreover, when comparing Panel B and Panel C, the cost of capital level in Panel C is larger. This suggests a higher trend in firms with a high business risk disclosure level than ones with a low level.

Table 2 Panel A shows the correlation between the costs of capital. Overall, the costs of capital show a positive correlation, but the correlation with EP shows a negative correlation. Moreover, the correlation between PEG and MPEG is high, but their correlation with OJ is relatively low. The correlation between OJ and GLS remains 3.2%.[11] Conversely, Panel B shows the correlation between the risk factors. Basically, it indicates the expected signexpected sign and the adjusted result, but the correlation with LTG differed from the estimate. Moreover, the size of the coefficient is at the most Beta's and Earnvar 's -0.403.[12]

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[9] In this study, a value which is lower than 1 percentile (higher than 99 percentile) of each variable is regarded as outlier, and it is replaced by 1 percentile (99 percentile).

[10] Other preceding studies also observe such a tendency. In Gode and Mohanram (2003), the mean value of GLS is 3.2% , in comparison with 5.1% of OJ. In Botosan and Plumlee(2005), while GLS is 1.0% and PEG is 5.0%, OJ is 6.6%. In Easton and Monahan (2005), GLS is 10.9%, PEG is 11.0%, and MPEG is 12.2%. In Guay et al. (2006), GLS is 9.9%, PEG is 13.2%, and OJ is 13.4%.

[11] In preceding studies, the correlation between GLS and OJ is quite high. For example, Gode and Mohanram(2003) and Botosan and Plumlee (2005) observed the correlation as high as 36%. In the analysis of this study, the correlation between GLS and OJ is almost 40% in the first half of the sampling period. For this reason, it has been found that the correlation is significantly dependent on the adopted sampling period.

[12] We calculated the VIF (variance Inflation factor) statistics and conclude that there is no problem of multicorrelation in our models.

5. Results

5.1 Univariate analyses

Table 3 Panel A shows the correlation matrix of the risk factor with each cost of capital. There are two variables that are statistically significant and correspond to the expected sign in GLS and OJ. In GLS, Unsyst and Size indicate the expected correlation for the expected sign in Leverage, BM and OJ.[13] Only LTG corresponds to the expected sign in EP.[14] Conversely, when focusing on PEG and MPEG, the six risk factors excluding LTG are statistically significant and correspond to the expected sign, and the correlation is the most coherent. Overall, it is likely that PEG and MPEG indicate the best correlation with the risk factor.

Table 3 Panel B shows the comparative analysis results, splitting the sample into the low risk disclosure level group (LG) and the high risk disclosure level group (HG). Looking at PEG and MPEG, HG has more significantly correlated risk factors than LG. The number does not differ in OJ, but the correlation coefficient is large in HG. This means that the cost of capital of firms with a high business risk disclosure level reflect the appropriate risk. However, the number significant risk factors in GLS are identical, and the correlation coefficient is smaller in HG. Hence, opposite results will be obtained to costs of capital based on the abnormal earnings growth valuation model.

5.2 Multivariate analyses

Table 4 Panel A shows the cost of capital of each model as dependent variables and the estimated results of the multiple regression model in which the seven risk factors are

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[13] Beta and Unsyst in GLS, as well as BM in OJ, show a significant correlation with unexpected sign. In EP, Beta, Unsyst, Earnvars, and Leverage have unexpected signs. We conduct additional examination of Beta and Unsyste, changing the estimation period. We adopted as estimation period 180days prior to forecast data announcement by IBES, and three months prior to its announcement. However, the remarkable differences from main results are not found.

[14] LTG in EP is contrary to the expectation that LTG and the cost of capital mostly have a significant and positive correlation. Although the LTG sign forecast is based on Gode and Mohanram(2003), even in their analysis, the same tendency is observed. Therefore, our result is consistent with preceding studies.

independent variables. GLS has the highest R-square of the five costs of capital. However, these results must be carefully interpreted, because the relatively small number of three risk factors is significantly relevant and matches the expected sign. If we emphasize the integrity of the agreement with the risk factors, we see that MPEG is the best. MPEG has the expected signs for all risk factors, excluding LTG, and is significantly relevant.

Conversely, Table 4 Panel B shows the results, splitting the sample into LG and HG. Excluding GLS, the R-square for HG is higher than LG, and HG is significantly relevant and has more expected signs matching the risk factors. These results suggest that proactive disclosure of risk information increases the reliability of the cost of capital as risk yardstick. The largest difference between LG and HG is MPEG. HG is significant for the three factors—Unsyst, Size, and BM—agreeing as expected, and the R-square is 6.69% higher. This compares favorably with GLS, which has the highest R-square.

6. Additional analyses

Previous research notes that the influence of risk disclosure differs depending on the firm's level of risk management. Kim(2008) shows that investors see through the firm's stance on risk management and assess risk information. In other words, he showed that disclosing risk information eases the asymmetric diversity of information and is connected to a reduction in the cost of capital for firms which are positive towards risk management only.

As additional verification, we split the sample based on the firm's level of risk management, and conducted a comparative analysis as in the previous section. In compliance with Kim(2008), we used the management earnings forecast error with the proxy variable that shows the firm's level of risk management. The specific calculation method is shown in equation (7) below.

$$ForecastError = \left| \frac{FEarnings_{t-1}^{t} - Earnings_{t}}{Assets_{t-1}} - median\left(\frac{FEarnings_{t-1}^{t} - Earnings_{t}}{Assets_{t-1}} \right) \right| \quad (7)$$

FEarnings indicates the earnings forecast for the next financial year (i.e., this financial year) released in the financial results by the firm at the beginning of the year. Earnings is the this year's actual earnings. Assets is the total assets at the beginning of the year. Median is the industry median. The small forecast error group is defined as firms with the Forecast Error in equation (7) falling below the median, and the large forecast error group as firms above the median. If we follow Kim's hypothesis (2009), the former can be regarded as firms with good risk management, and the latter regarded as ones with insufficient risk management.

Table 5 Panel A shows the analysis results using the small forecast error group. The R-square is higher for HG than LG in all models, excluding GLS. However, there is not a large difference in the risk factors significant for agreeing as expected. Conversely, Table 5 Panel B shows the analysis results using the large forecast error group. The R-squares, excluding GLS, are higher for HG. Furthermore, HG has more risk factors significant for agreeing as expected, excluding GLS.

Comparing Panel A with Panel B, the difference in the R-square between LG and HG is larger in Panel B. Moreover, the difference in the number of significant risk factors when comparing LG and HG is larger in Panel B. This suggests that the increase in the accuracy of costs of capital calculated on risk information disclosure is large for firms that are not proactive regarding risk management.

7. Conclusions

This paper examine the influence of risk information disclosure in annual reports on the reliability of estimated implied costs of capital.

Previous research specified that if firms voluntarily disclose information, the level of influence the information has on securities prices is effectively higher, because private corporate information becomes known to investors. Hence, it is assumed that the cost of capital more appropriately reflects the firm's risk through voluntary risk information disclosure. In this paper, we assumed and tested the hypothesis that the costs of capital of firms with high risk disclosure levels was highly reliable in appropriately reflecting risk compared to those with low disclosure levels. We evaluated the reliability of the cost of capital from two perspectives: 1) correlation of known risk factors, and 2) the R-square in the multiple regression model in which the cost of capital is a dependent variable and the risk factor is an independent variable.

Our results show the strong correlations with expected sign between the costs of capital and known risk factors when comparing firms that proactively disclose risk information with those that do not. Moreover, the R-square in the multiple regression model is higher for firms that proactively disclosed risk information. This evidence demonstrates that voluntary risk information disclosure transmits private corporate information to investors and makes it possible to estimate more accurate costs of capital. Furthermore, additional analysis shows that these analysis results are more predominantly seen in firms with large management earnings forecast errors. In other words, our result suggest that the influence of the voluntary risk information disclosure on estimating the cost of capital is larger for firms that do not take a proactive stance towards risk management.

However, some issues in this paper remain unanalyzed. The first issue is the interpretation of the GLS analysis results. We obtained opposite results for costs of capital in GLS. A possible reason is that GLS includes long-term earnings forecasts in the input variables, but we did not obtain evidence that directly suggests this. The second issue is to clarify the interpretation regarding the influence of a firm's stance towards risk management its cost of capital. The analysis in this paper found that the level of improvement risk information disclosure has on the accuracy of the cost of capital is higher in cases focusing on firms that do not take a proactive stance towards risk management. This analysis cannot offer a clear interpretation of these results, so further testing is necessary in the future. Lastly, we present another issue of analysis focusing on an alternative cost of capital. Research in recent years specifies that the problem with the assumptions surrounding the cost of capital to date can be resolved by simultaneously estimating the earnings growth and the discount rate. Future research may also include analyzing how analysis results using this new cost of capital differ from the five types of cost of capital used in this paper.

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References

Ashbaugh-Skaif, H., D.W. Collins, R. LaFond. (2004). Corporate Governance and the Cost of Equity Capital. Working Paper, University of Wisconsin, 2004.

Ashbaugh-Skaife, H., D. Collins, W. Kinney Jr., R. Lafond. (2009). The Effect of SOX Internal Control Deficiencies on Firm Risk and Cost of Equity. *Journal of Accounting Research*, 47(1), 1-43.

Barth, M., J. Elliot, and M. Finn. (1999). Market Rewards Associated with Patterns of Increasing Earnings. *Journal of Accounting Research*, 37(2), 387-413.

Beneish, M.D., M.B. Billings, and L.D. Hodder. (2008). Internal Control Weaknesses and Information Uncertainty. *The Accounting Review*, 83(3), 665-703.

Berk, J., R. Green, and V. Naik. (1999). Optimal Investment, Growth Options, and Security Returns. *The Journal of Finance*, 54(5), 1553-1607.

Botosan, C.A. (1997). Disclosure Level and the Cost of Equity Capital. *The Accounting Review*, 72(3), 323-349.

Botosan, C.A., and M.A. Plumlee. (2002). A Re-Examination of Disclosure Level and the Expected Cost of Equity Capital. *Journal of Accounting Research*, 40(1), 21-40.

Botosan, C.A., and M.A. Plumlee. (2005). Assessing Alternative Proxies for the Expected Risk Premium. *The Accounting Review*, 80(1), 21-53.

Brennan, N. Jegadeesh, M. J. and B. Swaminathan. (1993). Investment Analysis and the Adjustment of Stock Prices to Common Information. *Review of Financial Studies*, 6(4), 799-824.

Cheng, C.S.A., D. Collins, and H.H. Huang. (2006). Shareholder Rights, Financial Disclosure and the Cost of Equity Capital. *Review of Quantitative Finance and Accounting*, 27(2), 175-204.

Cheng, C.S.A., C. Liu, K. Newberry, and K.J. Reichelt. (2008). Should Preferred Stock be Classified as a Liability? Evidence from Implied Cost of Common Equity Capital. Working Paper, Louisiana State University.

Chen, F., B.N. Jorgensen, and Y.K. Yoo. (2004). Implied Cost of Equity Capital in Earnings-based Valuation: International Evidence. *Accounting and Business Research*, 34(4), 323-344.

Chen, K.C.F., Z. Chen and K.C.J. Wei. (2009). Agency Costs of Free Cash Flow and the Effect of Shareholder Rights on the Implied Cost of Equity Capital. *Journal of Financial and Quantitative Analysis*, Forthcoming.

Chen, K.C.W., Z. Chen and K.C.J. Wei. (2009). Legal Protection of Investors, Corporate Governance, and the Cost of Equity Capital. *Journal of Corporate Finance*, 15(3), 273-289.

Chen, Z., D.S. Dhaliwal, H. Xie. (2010). Regulation Fair Disclosure and the Cost of Equity Capital. *Review of Accounting Studies*, 15(1), 106-144.

Claus, J., and J. Thomas. (2001). Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets. *The Journal of Finance*, 56(5), 1629-1666.

Daske, H., "Economic Benefits of Adopting IFRS or US-GAAP – Have the Expected Cost of Equity Capital Really Decreased ?" *Journal of Business Finance and Accounting*, Vol.33, Nos.3-4, April/May 2006, 329-373.

Daske, H., J. Halteren and E.G. Maug. (2009). Evaluating Methods to Estimate the Implied Cost of Equity Capital: A Simulation Study. Working Paper, University of Mannheim.

Desrosiers, S., N. Lemaire and J. F. L'Her. (2007). Residual Income Approach to Equity Country Selection. *Financial Analysts Journal*, 63(2), 76-89.

Dhaliwal, D., S. Haitzman, and O.Z. Li. (2006). Taxes, Leverage, and the Cost of Equity Capital. *Journal of Accounting Research*, 44(4), 691-723.

Dhaliwal, D., L. Krull, and O.Z. Li. (2007). Did the 2003 Tax Act Reduce the Cost of Equity Capital? *Journal of Accounting and Economics*, 43(1), 121-251.

Dhaliwal, D., L. Krull, O.Z. Li, and W. Moser. (2005). Dividend Taxes and Implied Cost of Equity Capital. *Journal of Accounting Research*, 43(5), 675-708.

Diamond, D. and R. Verrecchia. (1991). Disclosure, Liquidity, and the Cost of Equity Capital. *The Journal of Finance*, 46(4), 1325-1360.

Easton, P. (2004) PE Ratios, PEG Ratios, and Estimating the Implied," Expected Rate of Return on Equity Capital. *The Accounting Review*, 79(1), 73-95.

Easton, P. (2006). Use of Forecasts of Earnings to Estimate and Compare Cost of Capital across Regimes. *Journal of Business Finance & Accounting*, 33(3-4), 374-394.

Easton, P. (2009). Estimating the Cost of Capital Implied by Market Prices and Accounting Data," *Foundations and Trends in Accounting*, 2(4), 241-364.

Easton, P., and S. Monahan. (2005). An Evaluation of Accounting Based Measures of Expected Returns. *The Accounting Review*, 80(2), 501-538.

Easton, P., P. Taylor, and T. Sougiannis. (2002). Using Forecasts of Earnings to Simultaneously Estimate Growth and the Rate of Return on Equity Investment. *Journal of Accounting Research*, 40(3), 657-676.

Elton, J.E. (1999). Expected Return, Realized Return, and Asset Pricing Tests. *The Journal of Finance*, 54(4), 1199-1220.

Espinosa, M., and M. Tronbetta. (2007). Disclosure Interactions and the Cost of Equity Capital: Evidence From the Spanish Continuous Market. *Journal of Business Finance and Accounting*, 34(9-10), 1371-1392.

Esterer, F. and D. Schrder. (2006). Implied Cost of Capital Based Investment Strategies – Evidence From International Stock Market. Working Paper, Bonn Graduate School of Economics.

Fama, E. and K. French. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), 427-465.

Francis, J., R. LaFond, P.M. Olsson, and K. Shipper. (2004). Cost of Equity and Earnings Attributes. *The Accounting Review*, 79(4), 967-1010.

Francis, J., D. Nanda, and P. Olsson. (2008). Voluntary Disclosure, Earnings Quality, and Cost of Capital. *Journal of Accounting Research*, 46(1), 53-99.

Francis, J.R., I.K. Khurana, and R. Pereira. (2005). Disclosure Incentives and Effect on Cost of Capital around the World. *The Accounting Review*, 80(4), 1125-1162.

Gebhardt, W.R., C.M.C. Lee, and B. Swaminathan. (2001). Toward an Implied Cost of Capital. *Journal of Accouting Research*, 39(1), 135-176.

Gode, D., and P. Mohanram. (2003). Inferring the Cost of Capital Using the Ohlson-Juettner Model. *Review of Accounting Studies*, 8(4), 399-431.

Gode, D., and P. Mohanram. (2001). What Affects the Implied Cost of Equity Capital? Working Paper, Stern School of Business.

Gordon, J and M. Gordon. (1997). The Finite Horizon Expected Return Model. *Financial Analysts Journal*, 53(3), 52–61.

Graham, J.R., C.R. Harvey, S. Rajgopal. (2005). The Economic Implications of Corporate Financial Reporting. *Journal of Accounting and Economics*, 40(1-3), 3–73.

Guay, W., S. Kothari, and S. Shu. (2006). Properties of Implied Cost of Capital Using Analysts' Forecasts. Working Paper, University of Pennsylvania.

Guedhami, O., and D.R. Mishra. (2009). Excess Control, Corporate Governance, and Implied Cost of Equity: International Evidence. *Financial Review*, 44(4), 489-524.

Hail, L. (2002). The Impact of Voluntary Corporate Disclosures on the Ex-Ante Cost of Capital for Swiss Firms. *European Accounting Review*, 11(4), 741-773.

Hail, L., and C. Leuz. (2006). International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter? *Journal of Accounting Research*, 44(3), 485-531.

Hammersley, J., L. Myers, and C. Shakespeare. (2008). Market Reactions to the Disclosure of Internal Control Weaknesses and to the Characteristics of Those Weaknesses under Section 302 of the Sarbanes Oxley Act of 2002. *Review of Accounting Studies*, 13(1), 141-165.

Harris, R. and F. Marston. (1992). Estimating Shareholder Risk Premia using Analysts' Growth Forecasts. *Financial Management*, 21(2), 63-70.

Healy, A., P. Hutton, and K. Palepu. (1999). Stock Performance and Intermediation Changes Surrounding Sustained Increases in Disclosure. *Contemporary Accounting Research*, 16(2), 485-520.

Hope, O.K., T. Kang , W.B. Thomas, and Y.K. Yoo. (2009). Impact of Excess Auditor Remuneration on Cost of Equity Capital Around the World. *Journal of Accounting, Auditing and Finance*, 24(2), 177-210.

Hribar, P. and N. Jenkins. (2004). The Effect of Accounting Restatements on Earnings Revisions and the Estimated Cost of Capital. *Review of Accounting Studies*, 9(2-3), 337-356.

Hughes, J.S., Jing Liu and Jun Liu. (2009). On the Relation between Expected Returns and Implied Cost of Capital. *Review of Accounting Studies*, 14(2-3), 246-259.

Huang, R., R. Natarajan and S. Radhakrishnan. (2005). Estimating Firm-specific Long-term Growth Rate and Cost of Capital. Working Paper, CUNY Baruch College, University of Texas at Dallas.

Khurana, I.K., and K.K. Raman. (2004). Litigation Risk and the Financial Reporting Credibility of Big 4 versus Non-Big 4 Audits: Evidence from Anglo-American Countries. *The Accounting Review*, 79(2), 473-495.

Khurana, I.K., and K.K. Raman. (2006). Do Investors Care about the Auditor's Economic Dependence on the Client? *Contemporary Accounting Research*, 23(4), 977-1016.

Kim, H. (2008). Disclosure of Risk Factors and the Cost of Equity Capital. *Hitotsubashi Review of Commerce and Management*, 3(2), 55-68. (In Japanese)

La Porta, R. (1996). Expectations and the Cross Section of Security Returns. *The Journal of Finance*, 51(5), 1715-1742.

Lee,C.M.C., D. Ng, and B. Swaminathan. (2009). Testing International Asset Pricing Models Using Implied Costs of Capital. *Journal of Financial and Quantitative Analysis*, 44(2), 307-335.

Liu, Doron Nissim, Jing and Jacob Thomas. (2002). Equity Valuation Using Multiples. *Journal of Accouting Research*, 40(1), 135-172.

Malkiel, B. and Y. Xu. (1997). Risk and Return Revisited. *Journal of Portfolio Management*, 23(3), 9-14.

Marston, F., and R. Harris. (1993). Risk and Return: A Revisit using Expected Returns. *Financial Review*, 28(1), 117-137.

McInnis, J.M. (2010). Earnings Smoothness, Average Returns, and Implied Cost of Equity Capital. *The Accounting Review*, 85(1), 315-341.

Modigliani, F. and M. Miller. (1958). The Cost of Capital, Firm Finance and Theory of Investment. *American Economic Review*, 48(3), 261-297.

Ogneva, M., K. Subramanyam, and K. Raghunandan. (2007). Internal Control Weakness and Cost of Equity: Evidence from SOX Section 404 Disclosures. *The Accounting Review*, 82(5), 1255-1207.

Ohlson, J.A., and Z. Gao. (2006). Earnings, Earnings Growth and Value. *Foundations and Trends in Accounting*, 1(1), 1-70.

Ohlson, J.A. and B.E. Juettner-Nauroth. (2005). Expected EPS and EPS Growth as Determinants of Value. *Review of Accounting Studies*, 10(2-3), 349-365.

Ptratt, S.P., and R.J. Grabowski. (2008). *Cost of Capital 3rd Edition*, Wiley.

Sohn, B.C., and L.S. Hwang. (2008). Equity Value, Implied Cost of Equity, and Shareholders' Real Options. Working Paper, City University of Hong Kong.

Pastor, L., M. Sinha, and B. Swaminathan. (2008). Estimating the Intertemporal Risk-Return Tradeoff Using the Implied Cost of Capital. *The Journal of Finance*, 63(6), 2859-2897.

Verdi, R. (2006). Information Environment and the Cost of Equity Capital. Working Paper, Massachusetts Institute of Technology.

Xu, Najand and Ziegenfuss. (2006). Intra-Industry Effects of Earnings Restatements Due to Accounting Irregularities. *Journal of Business Finance and Accounting*, 33(5-6), 696-714.

Table 1 Descriptive statistics

Panel A: Pooled Sample

	GLS	OJ	EP	PEG	MPEG	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	Score
mean	0.041	0.155	0.045	0.086	0.078	0.964	3.008	2.026	0.403	26.412	15.561	0.642	0.028
sd	0.026	0.285	0.042	0.040	0.048	0.319	1.996	5.345	0.509	1.298	19.339	0.282	0.184
p25	0.028	0.079	0.035	0.063	0.052	0.742	1.734	0.332	0.074	25.457	5.550	0.442	-0.090
p50	0.037	0.100	0.048	0.081	0.073	0.961	2.606	0.631	0.205	26.445	11.300	0.592	0.000
p75	0.047	0.131	0.062	0.101	0.093	1.179	3.709	1.519	0.511	27.301	18.800	0.805	0.099

Panel B: Low Score Sample

	GLS	OJ	EP	PEG	MPEG	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	Score
mean	0.037	0.136	0.045	0.083	0.074	0.951	3.012	2.009	0.365	26.151	15.450	0.639	-0.087
sd	0.017	0.257	0.038	0.034	0.040	0.325	1.898	5.401	0.495	1.197	17.800	0.275	0.085
p25	0.026	0.080	0.036	0.063	0.051	0.723	1.736	0.314	0.064	25.210	5.900	0.438	-0.141
p50	0.035	0.099	0.048	0.080	0.071	0.957	2.632	0.557	0.170	26.083	11.420	0.594	-0.084
p75	0.045	0.124	0.061	0.098	0.089	1.173	3.669	1.341	0.411	27.007	19.000	0.799	-0.025

Panel C: High Score Sample

	GLS	OJ	EP	PEG	MPEG	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	Score
mean	0.045	0.168	0.045	0.088	0.080	0.979	2.912	2.036	0.441	26.699	15.587	0.639	0.142
sd	0.031	0.285	0.044	0.044	0.053	0.312	1.764	5.293	0.521	1.312	20.448	0.283	0.185
p25	0.029	0.078	0.034	0.063	0.053	0.765	1.714	0.359	0.100	25.754	5.300	0.444	0.020
p50	0.038	0.100	0.048	0.082	0.075	0.977	2.546	0.707	0.242	26.711	11.000	0.590	0.098
p75	0.048	0.136	0.063	0.104	0.097	1.188	3.715	1.643	0.584	27.593	18.000	0.800	0.224

Note:
Low Score Sample: sample with a low business risk disclosure level. High Score Sample: sample with a high business risk disclosure level. GLS: the cost of capital inferred using Gebhardt et al.(2001) model. OJ: the cost of capital inferred using Ohlson and Juettner-Nauroth(2005) model. EP: expected earnings to price ratio. PEG: PEG ratio proposed by Easton (2004). MPEG: modified PEG ratio proposed by Easton (2004). Beta: market beta using daily stock returns over the past 1 year from the announcement date of analysts' forecasts by IBES. Unsyst: unsystematic risk as measured by the residual from the regression over the previous year of a firm's daily return on the daily market return. Earnvar: earning variability using the standard deviation of earnings over the past five years. Leverage: leverage as the ratio of the book value long-term debt to the market value of equity. Size: the natural log of the market value of equity. LTG: forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings. BM: book-to-market ratio as the ratio of shareholders' equity to the market value of equity.

Table 2 Correlation among the cost of capitals or risk factors

Panel A: Correlations among the cost of capitals

	GLS	*OJ*	*EP*	*PEG*	*MPEG*
GLS	1.000	0.060	0.085	0.145	0.178
OJ	0.032	1.000	-0.142	0.800	0.520
EP	-0.002	-0.078	1.000	-0.116	-0.117
PEG	0.118	0.143	-0.283	1.000	0.876
MPEG	0.125	0.030	-0.322	0.901	1.000

Panel B: Correlations among the risk factors

	Beta	*Unsyst*	*Earnvar*	*Leverage*	*Size*	*LTG*	*BM*
Beta	1.000	0.257	0.403	0.095	0.159	0.183	-0.283
Unsyst	0.265	1.000	0.198	-0.188	-0.363	0.149	-0.198
Earnvar	0.126	0.043	1.000	0.265	-0.046	0.129	-0.035
Leverage	-0.048	-0.160	0.135	1.000	0.210	-0.015	0.254
Size	0.143	-0.376	-0.019	0.232	1.000	-0.055	-0.300
LTG	0.212	0.130	0.067	-0.023	-0.060	1.000	-0.210
BM	-0.277	-0.158	0.031	0.165	-0.303	-0.156	1.000

Note:
GLS: the cost of capital inferred using Gebhardt et al.(2001) model. OJ: the cost of capital inferred using Ohlson and Juettner-Nauroth(2005) model. EP: expected earnings to price ratio. PEG: PEG ratio proposed by Easton (2004). MPEG: modified PEG ratio proposed by Easton (2004). Beta: market beta using daily stock returns over the past 1 year from the announcement date of analysts' forecasts by IBES. Unsyst: unsystematic risk as measured by the residual from the regression over the previous year of a firm's daily return on the daily market return. Earnvar: earning variability using the standard deviation of earnings over the past five years. Leverage: leverage as the ratio of the book value long-term debt to the market value of equity. Size: the natural log of the market value of equity. LTG: forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings. BM: book-to-market ratio as the ratio of shareholders' equity to the market value of equity.
Spearman (Pearson) correlations are above (below) the diagonal.

Table 3 Correlation matrix between cost of capital and risk factors

Panel A: Pooled sample

	Predicted sign	*GLS*	*OJ*	*EP*	*PEG*	*MPEG*
Beta	(+)	-0.010	-0.064**	0.033	0.059*	0.128***
		(0.73)	(0.04)	(0.25)	(0.05)	(0.00)
Unsyst	(+)	-0.075***	0.154***	-0.195***	0.201***	0.166***
		(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Earnvar	(+)	-0.021	-0.028	-0.082***	0.094***	0.110***
		(0.46)	(0.37)	(0.00)	(0.00)	(0.00)
Leverage	(+)	0.271***	0.047	-0.060**	0.128***	0.132***
		(0.00)	(0.13)	(0.04)	(0.00)	(0.00)
Size	(−)	0.137***	-0.147***	0.048*	-0.222***	-0.114***
		(0.00)	(0.00)	(0.09)	(0.00)	(0.00)
LTG	(−)	0.132***	0.051*	-0.047*	0.144***	0.156***
		(0.00)	(0.10)	(0.10)	(0.00)	(0.00)
BM	(+)	0.179***	0.000	0.015	0.112***	0.073***
		(0.00)	(0.99)	(0.60)	(0.00)	(0.02)
Obs.		1186	1019	1195	1066	1069

Panel B: Comparison between high score sample and low score sample

	Predicted sign	*GLS* Low	*GLS* High	*OJ* Low	*OJ* High	*EP* Low	*EP* High	*PEG* Low	*PEG* High	*MPEG* Low	*MPEG* High
Beta	(+)	-0.104**	0.057	-0.031	-0.109**	-0.018	0.079*	0.042	0.067	0.110**	0.142***
		(0.01)	(0.17)	(0.49)	(0.01)	(0.65)	(0.06)	(0.33)	(0.13)	(0.01)	(0.00)
Unsyst	(+)	-0.110***	-0.103**	0.123***	0.189***	-0.084 **	-0.215***	0.133***	0.204***	0.055	0.191***
		(0.00)	(0.01)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.00)	(0.20)	(0.00)
Earnvar	(+)	-0.041	-0.012	-0.017	-0.040	-0.077*	-0.094**	0.097**	0.081*	0.119**	0.102**
		(0.32)	(0.76)	(0.69)	(0.37)	(0.06)	(0.02)	(0.02)	(0.06)	(0.01)	(0.02)
Leverage	(+)	0.382***	0.226***	0.044	0.068	-0.175***	0.015	0.147***	0.123***	0.170***	0.123***
		(0.00)	(0.00)	(0.32)	(0.13)	(0.00)	(0.72)	(0.00)	(0.00)	(0.00)	(0.00)
Size	(−)	0.064	0.167***	-0.110**	-0.174***	-0.086**	0.124***	-0.174***	-0.263***	-0.006	-0.171***
		(0.12)	(0.00)	(0.01)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.90)	(0.00)
LTG	(−)	0.029	0.188***	0.023	-0.005	-0.099**	0.011	0.143***	0.123***	0.124***	0.129***
		(0.48)	(0.00)	(0.60)	(0.91)	(0.01)	(0.78)	(0.00)	(0.00)	(0.00)	(0.00)
BM	(+)	0.287***	0.111**	-0.015	0.020	0.053	-0.035	0.024	0.190***	-0.016	0.153***
		(0.00)	(0.01)	(0.73)	(0.66)	(0.19)	(0.39)	(0.57)	(0.00)	(0.70)	(0.00)
Obs.		599	587	520	499	604	591	547	519	548	521

Note:
Low Score Sample: sample with a low business risk disclosure level. High Score Sample: sample with a high business risk disclosure level. GLS: the cost of capital inferred using Gebhardt et al.(2001) model. OJ: the cost of capital inferred using Ohlson and Juettner-Nauroth(2005) model. EP: expected earnings to price ratio. PEG: PEG ratio proposed by Easton (2004). MPEG: modified PEG ratio proposed by Easton (2004). Beta: market beta using daily stock returns over the past 1 year from the announcement date of analysts' forecasts by IBES. Unsyst: unsystematic risk as measured by the residual from the regression over the previous year of a firm's daily return on the daily market return. Earnvar: earning variability using the standard deviation of earnings over the past five years. Leverage: leverage as the ratio of the book value long-term debt to the market value of equity. Size: the natural log of the market value of equity. LTG: forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings. BM: book-to-market ratio as the ratio of shareholders' equity to the market value of equity.
t-statistics are provided in parentheses. They are based on White's (1980) heteroskedasticity-consistent standard errors and covariance.
*** Statistically significant at the 0.01 level of significance using a two-tailed t-test. ** Statistically significant at the 0.05 level of significance using a two-tailed t-test. * Statistically significant at the 0.1 level of significance using a two-tailed t-test.

Table 4 The result of the multivariate analyses

Panel A: Pooled sample

	Predicted sign	*GLS*	*OJ*	*EP*	*PEG*	*MPEG*
Intercept	(＋/－)	-0.100***	0.683***	0.094**	0.202***	0.126***
		(-4.36)	(2.65)	(2.38)	(6.33)	(3.08)
Beta	(＋)	0.000	-0.083***	0.016***	0.006	0.016***
		(-0.12)	(-3.08)	(3.58)	(1.51)	(3.24)
Unsyst	(＋)	0.001***	0.020***	-0.005***	0.003***	0.003***
		(2.58)	(2.62)	(-3.63)	(3.73)	(2.76)
Earnvar	(＋)	-0.000***	-0.002***	-0.001**	0.000*	0.001**
		(-3.60)	(-2.80)	(-2.38)	(1.68)	(2.30)
Leverage	(＋)	0.010***	0.056***	-0.006	0.015***	0.015***
		(7.64)	(3.18)	(-1.52)	(4.49)	(4.03)
Size	(－)	0.004***	-0.020**	-0.002	-0.006***	-0.004**
		(5.44)	(-2.30)	(-1.15)	(-4.98)	(-2.44)
LTG	(－)	0.000***	0.001	0.000	0.000***	0.000**
		(3.93)	(0.91)	(-1.07)	(2.82)	(2.54)
BM	(＋)	0.024***	-0.017	-0.001	0.013*	0.014*
		(7.28)	(-0.40)	(-0.10)	(1.72)	(1.63)
Obs.		1186	1019	1195	1066	1069
R-squared		0.1655	0.05	0.063	0.1266	0.0966

Panel B: Comparison between high score sample and low score sample

	Predicted	*GLS*		*OJ*		*EP*		*PEG*		*MPEG*	
	sign	Low	High	Low	High	Low	High	Low	High	Low	High
Intercept	(+/−)	-0.022	-0.144***	0.722*	0.524*	0.135**	0.063	0.234***	0.210***	0.115**	0.147**
		(-1.25)	(-3.73)	(1.86)	(1.84)	(2.08)	(1.35)	(5.72)	(3.99)	(2.25)	(2.29)
Beta	(+)	0.000	0.000	-0.042	-0.130**	0.005	0.020***	0.003	0.010	0.012**	0.023**
		(0.11)	(0.10)	(-1.57)	(-2.57)	(0.95)	(3.38)	(0.82)	(1.52)	(2.49)	(2.65)
Unsyst	(+)	0.000	0.000	0.014	0.033***	-0.003*	-0.007***	0.001	0.004**	0.000	0.004*
		(0.87)	(0.58)	(1.10)	(2.58)	(-1.79)	(-3.85)	(1.39)	(2.52)	(0.40)	(1.86)
Earnvar	(+)	0.000***	0.000**	-0.001	-0.003**	0.000	-0.001**	0.000	0.000	0.001**	0.001*
		(-2.93)	(-1.98)	(-1.32)	(-2.50)	(-1.48)	(-2.05)	(1.35)	(1.18)	(2.01)	(1.74)
Leverage	(+)	0.011***	0.010***	0.039*	0.081**	-0.013*	0.000	0.015***	0.014***	0.016***	0.014**
		(5.30)	(5.44)	(1.89)	(2.57)	(-1.91)	(-0.06)	(3.13)	(3.02)	(3.01)	(2.49)
Size	(−)	0.002***	0.006***	-0.022*	-0.014	-0.003	0.000	-0.006***	-0.006***	-0.002	-0.005**
		(2.60)	(4.42)	(-1.69)	(-1.53)	(-1.29)	(-0.28)	(-4.47)	(-3.39)	(-1.35)	(-2.16)
LTG	(−)	0.000	0.000***	0.000	-0.000	0.000*	0.000	0.000**	0.000	0.000*	0.000
		(1.32)	(3.70)	(0.63)	(-0.29)	(-1.92)	(0.29)	(2.54)	(1.44)	(1.78)	(1.30)
BM	(+)	0.018***	0.025***	-0.040	0.015	0.002	-0.008	-0.007	0.029***	-0.006	0.034**
		(5.54)	(4.69)	(-0.57)	(0.29)	(0.29)	(-0.97)	(-0.71)	(2.72)	(-0.53)	(2.43)
Year Dummy		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.		599	587	520	499	604	591	547	519	548	521
R-squared		0.2127	0.1679	0.0308	0.0843	0.0622	0.0779	0.0966	0.1598	0.0637	0.1306

Note:
Low Score Sample: sample with a low business risk disclosure level. High Score Sample: sample with a high business risk disclosure level. GLS: the cost of capital inferred using Gebhardt et al.(2001) model. OJ: the cost of capital inferred using Ohlson and Juettner-Nauroth(2005) model. EP: expected earnings to price ratio. PEG: PEG ratio proposed by Easton (2004). MPEG: modified PEG ratio proposed by Easton (2004). Beta: market beta using daily stock returns over the past 1 year from the announcement date of analysts' forecasts by IBES. Unsyst: unsystematic risk as measured by the residual from the regression over the previous year of a firm's daily return on the daily market return. Earnvar: earning variability using the standard deviation of earnings over the past five years. Leverage: leverage as the ratio of the book value long-term debt to the market value of equity. Size: the natural log of the market value of equity. LTG: forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings. BM: book-to-market ratio as the ratio of shareholders' equity to the market value of equity.
t-statistics are provided in parentheses. They are based on White's (1980) heteroskedasticity-consistent standard errors and covariance.
*** Statistically significant at the 0.01 level of significance using a two-tailed t-test. ** Statistically significant at the 0.05 level of significance using a two-tailed t-test. * Statistically significant at the 0.1 level of significance using a two-tailed t-test.

Table 5 The result of the multivariate analyses

Panel A: Small forecast error sample

	Predicted	*GLS*		*OJ*		*EP*		*PEG*		*MPEG*	
	sign	Low	High	Low	High	Low	High	Low	High	Low	High
Intercept	(+/−)	-0.006	-0.251***	0.330***	-0.318	0.113**	0.191	0.245***	-0.017	0.163*	-0.100
		(-0.23)	(-3.24)	(3.11)	(-0.86)	(2.57)	(1.20)	(3.17)	(-0.14)	(1.95)	(-0.69)
Beta	(+)	-0.002	-0.008	-0.006	-0.030	-0.003	0.018	-0.005	0.000	-0.002	0.002
		(-0.73)	(-1.02)	(-0.85)	(-0.89)	(-0.57)	(1.07)	(-0.85)	(0.02)	(-0.29)	(0.17)
Unsyst	(+)	0.000	-0.001	0.003	0.035	-0.001	-0.013	0.003	0.014**	0.003	0.016**
		(0.13)	(-0.26)	(1.33)	(1.56)	(-0.97)	(-1.46)	(1.55)	(2.28)	(1.57)	(2.01)
Earnvar	(+)	0.000**	0.000*	0.000	0.000	0.000*	0.000	0.000	0.000	0.000	0.000
		(-2.02)	(-1.70)	(0.96)	(-0.15)	(-1.91)	(-0.36)	(0.79)	(0.22)	(0.97)	(0.27)
Leverage	(+)	0.013***	0.013***	0.013**	0.027**	0.002	-0.004	0.013**	0.017	0.013**	0.019*
		(4.79)	(4.63)	(2.29)	(2.02)	(0.75)	(-0.54)	(2.56)	(1.57)	(2.57)	(1.71)
Size	(−)	0.001	0.010***	-0.009***	0.012	-0.002	-0.005	-0.007***	0.002	-0.004	0.004
		(1.41)	(4.00)	(-2.67)	(0.94)	(-1.35)	(-0.86)	(-2.59)	(0.36)	(-1.39)	(0.85)
LTG	(−)	0.000	0.000*	0.000	0.000	0.000***	0.000	0.000**	0.000	0.000**	0.000
		(0.24)	(1.68)	(1.42)	(-0.85)	(-3.35)	(0.69)	(2.31)	(-0.50)	(2.40)	(-0.71)
BM	(+)	0.009**	0.024***	-0.007	0.046**	0.003	0.007	-0.012	0.022	-0.011	0.024
		(2.45)	(2.60)	(-0.34)	(2.03)	(0.47)	(0.63)	(-0.66)	(1.49)	(-0.58)	(1.51)
Year Dummy		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.		285	238	244	192	286	238	262	207	262	207
R-squared		0.2659	0.2083	0.156	0.2267	0.1079	0.1139	0.1243	0.1701	0.1072	0.1742

Panel B: Large forecast error sample

	Predicted	*GLS*		*OJ*		*EP*		*PEG*		*MPEG*	
	sign	Low	High	Low	High	Low	High	Low	High	Low	High
Intercept	(+/−)	-0.036	0.067	0.345	0.022	0.164**	0.127*	0.188***	0.288***	0.083	0.316***
		(-1.15)	(1.57)	(0.54)	(0.04)	(2.05)	(1.80)	(2.95)	(3.85)	(1.02)	(3.43)
Beta	(+)	0.000	0.007	-0.057*	-0.201**	0.011	0.012*	0.002	0.024**	0.011	0.047***
		(-0.06)	(1.24)	(-1.66)	(-1.96)	(1.52)	(1.79)	(0.30)	(2.43)	(1.30)	(3.35)
Unsyst	(+)	0.001**	0.000	0.019	0.076***	-0.001	-0.006**	0.003***	0.003	0.003**	0.003
		(2.12)	(-0.09)	(0.95)	(2.59)	(-0.73)	(-2.42)	(2.95)	(1.60)	(2.36)	(0.81)
Earnvar	(+)	0.000	0.000	-0.003	-0.006***	0.000	0.000	0.001	0.000	0.001**	0.001*
		(-1.19)	(-1.40)	(-1.31)	(-2.86)	(-0.80)	(-0.55)	(1.31)	(1.12)	(2.17)	(1.91)
Leverage	(+)	0.007**	0.001	0.105	0.284***	-0.011	-0.013	0.009	0.029***	0.005	0.023**
		(2.08)	(0.30)	(1.53)	(3.10)	(-0.81)	(-1.00)	(1.25)	(4.77)	(0.69)	(2.05)
Size	(−)	0.002*	-0.002	-0.008	0.002	-0.005	-0.002	-0.005**	-0.010***	-0.002	-0.012***
		(1.73)	(-1.09)	(-0.35)	(0.09)	(-1.49)	(-0.93)	(-2.05)	(-3.52)	(-0.58)	(-3.53)
LTG	(−)	0.000*	0.000**	0.001	-0.001	0.000	0.000	0.000	0.000	0.000	0.000
		(1.81)	(2.16)	(0.57)	(-0.66)	(-1.19)	(-1.18)	(1.23)	(1.22)	(0.51)	(1.00)
BM	(+)	0.027***	0.015*	-0.054	0.102	0.003	-0.011	0.006	0.023**	0.007	0.018
		(5.43)	(1.92)	(-0.51)	(1.11)	(0.23)	(-1.11)	(0.60)	(2.33)	(0.53)	(1.31)
Year Dummy		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.		279	229	244	209	282	232	252	212	253	214
R-squared		0.246	0.1586	0.0443	0.1962	0.0532	0.085	0.1346	0.2818	0.0836	0.2373

Note:
Small forecast error sample: sample with small management forecast error. Large forecast error sample: sample with large management forecast error. Low: sample with a low business risk disclosure level. High: sample with a high business risk disclosure level. GLS: the cost of capital inferred using Gebhardt et al.(2001) model. OJ: the cost of capital inferred using Ohlson and Juettner-Nauroth(2005) model. EP: expected earnings to price ratio. PEG: PEG ratio proposed by Easton (2004). MPEG: modified PEG ratio proposed by Easton (2004). Beta: market beta using daily stock returns over the past 1 year from the announcement date of analysts' forecasts by IBES. Unsyst: unsystematic risk as measured by the residual from the regression over the previous year of a firm's daily return on the daily market return. Earnvar: earning variability using the standard deviation of earnings over the past five years. Leverage: leverage as the ratio of the book value long-term debt to the market value of equity. Size: the natural log of the market value of equity. LTG: forecasted long-term growth reported by IBES to define variables regarding the long-term growth in expected earnings. BM: book-to-market ratio as the ratio of shareholders' equity to the market value of equity.
t-statistics are provided in parentheses. They are based on White's (1980) heteroskedasticity-consistent standard errors and covariance.
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