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Implied cost of capital over the last 20 years

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Implied cost of capital over the last 20 years

Abstract

The purpose of this paper is to estimate an alternative implied cost of capital inferred from a valuation model, and consider its validity and use. This paper presents interesting evidence in terms of a comparison with U.S. analysis results. While prior studies (e.g., Gode and Mohanram 2003) suggest the superiority of a cost of capital inferred from Gebhardt et al. (2001) model, this paper indicates that the cost of capital inferred from the PEG model and modified PEG model reflects risks more appropriately. Furthermore, we suggest that the correlation between the cost of capital and risk factors varies depending on periods. Although Gode and Mohanram (2003) pointed out that the difference in the cost of capital by industry is important, it is shown that the difference in a time series of cost of capital is more important in Japan.

Keywords: implied cost of capital PEG ratio modified PEG ratio risk factors

1. Introduction

The purpose of this paper is to estimate an alternative implied cost of capital inferred from a valuation model, and consider its validity and use. The cost of capital is "the cost necessary to anchor shareholders to the company" from the company's point of view, and "expected returns on capital investment" from the shareholders' point of view. It can be calculated by adding a risk premium to a risk-free rate, but the risk premium cannot be directly observed. Thus, there have been some arguments about inferring the cost of capital. The argument about inferring the cost of capital, thus far, has focused on the following two approaches. One is the ex post approach using realized returns are estimated by a capital asset pricing model (CAPM) or a three-factor model of Fama and French (1992, 1993). Another is the ex ante approach using earnings, book value of shareholders' equity, and expected value of dividends. In other words, the cost of capital is estimated by inference from a residual income model and an abnormal earnings growth valuation model. Since the cost of capital estimated with the latter approach reflects a cost of capital expected implicitly by market participants at the time of capital investment, it is often called an implied cost of capital. In this study, we focus on the implied cost of capital.

In recent years, many studies using the implied cost of capital have been published, and its validity has been illustrated in many previous studies (e.g., Lee et al. 2009; Pastor et al. 2008).[1] However, there are alternative models to estimate the implied cost of capital, and are also various assumptions. Thus, we became interested in which of the models is the most appropriate to estimate a cost of capital. In this paper, we compare the following major five models: 1) a model proposed by Gebhardt et al. (2001); 2) a model suggested by Ohlson and Juettner-Nauroth (2005); 3) an expected earnings to price ratio (EP ratio); 4) a PEG ratio; and 5) a modified PEG ratio (the last two of which are proposed by Easton [2004]). As for the criteria of valuation in this study, we focused on the following two points. The first is a significant correlation with the risk factors consistent with the expected signs. The second is that the coefficients have the expected sign, and the adjusted R-square is high in the multivariate models in which regress the cost of capital on the risk factors. As a result, we conclude that the PEG ratio and modified PEG ratio are superior to other models.

This paper makes several contributions as follows. First, this is this is the first study in which the

[1] Elton (1999, p. 1199) pointed out that a risk premium estimated by using a realized return is not appropriate as a benchmark of expected return because it is often lower than the risk-free rate. However, a few studies point out that the implied cost of capital is biased.

implied cost of capital are compared in terms of a correlation with risk factors in Japan. As there have been only a few studies in Japan focusing on the implied cost of capital, it had not been fully clarified which is the most superior model to infer the cost of capital. In this paper, we show that the PEG ratio and modified PEG ratio are the most appropriate to the analysis of the cost of capital in Japan. Second, this paper presents interesting evidence in terms of a comparison with U.S. analysis results. While prior studies (e.g., Gode and Mohanram 2003) suggest the superiority of a cost of capital inferred from Gebhardt et al. (2001) model, this paper indicates that the cost of capital inferred from the PEG model and modified PEG model reflects risks more appropriately. Finally, in this paper, we suggest that the correlation between the cost of capital and risk factors varies depending on periods. Although Gode and Mohanram (2003) pointed out that the difference in the cost of capital by industry is important, it is shown that the difference in a time series of cost of capital is more important in Japan. The models considering the abnormal earnings growth, such as Ohlson and Juettner-Nauroth (2005) model, PEG ratio, and modified PEG ratio, have become weaker correlated with risk factors since the second half of the 1990s. On the contrary, the correlation between the model inferred from Gebhardt et al. (2001) and risk factors become stronger. In general, the results of our analysis presents beneficial evidence about the superiority of the model to infer the implied cost of capital in Japanese inherent environment (e.g., financial policies, accounting standards, securities markets, and managements' and analysts' forecasts).

This paper proceeds as follows. In Section 2, we review prior studies which compared the alternative costs of capital. Section 3 indicates a research design. In particular, we explain five models to estimate the cost of capital, and seven risk factors. Section 4 shows the sample and descriptive statistics. The analysis results are reported in Section 5. Finally, in Section 6 we summarize the conclusions.

2. Prior Studies

There are many studies that research, the relationship between various variables and an implied cost of capital . For example, the relationship between the cost of capital and the below-mentioned variables is analyzed: Disclosure level of the information about IR and environment (Botosan 1997; Botosan and Plumlee 2002; Espinosa and Tronbetta 2007; Francis et al. 2005; Francis et al. 2008; Hail 2002), earnings attributes (Francis et al. 2004; Verdi 2006; McInnis 2010), precision of analyst forecasts (Botosan et al.

2004), restatement of financial statements（Hribar and Jenkins 2004; Xu et al. 2006), the effect of the Sarbanes-Oxley Act (Ashbaugh-Skaife et al. 2009; Beneish et al. 2008; Hammersley et al. 2008; Ogneva et al. 2007), and the effect of Regulation Fair Disclosure (Chen et al. 2010).

There are studies which analyzed the impacts of adopting international accounting standards (Daske 2006), securities regulation for investor protection (Hail and Leuz 2006), and various tax factors (Dhaliwal et al. 2005, 2006, 2007) on the cost of capital. Several research show the evidence that some auditing factor influence the cost of capital. For example, economic independence of auditors (Hope et al. 2009; Khurana and Raman 2006); size of auditing firms ("Big Four" and "Non-big Four") (Khurana and Raman 2004), and so on. In the area of finance, there are studies which examine the relationship with the structure of corporate governance (Ashbaugh-Skaife et al. 2005; Guedhami and Mishra 2010), types of shareholder rights (Cheng et al. 2006, 2008; Chen et al. 2009), and which examined validity of using an implied cost of capital in an investment strategy (Desrosiers et al. 2007; Esterer and Schrder 2006).

However, the implied cost of capital used in these preceding studies was not estimated with the identical model. There are many estimation models for the cost of capital according to assumptions regarding earnings growth and dividends, as well as forecast periods. Prior studies generally use the following models: 1) Gebhardt et al. (2001) model, Claus and Thomas (2001) model, and Gordon and Gordon (1997) model based on a residual income model; 2) Ohlson and Juettner-Nauroth (2005) model, called the abnormal earnings growth valuation model; and 3) the PEG ratio and modified PEG ratio, which are one form of abnormal earnings growth valuation model, and suggested by Easton (2004). These models will be presented in section 3. So, we became interested in which model would be the most appropriate to estimate the cost of capital. As stated above, since the true value of the cost of capital is not observable, it is not possible to compare them easily. Therefore, the preceding studies compare these models 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.

Easton and Monahan (2005) compared costs of capital in terms of a correlation with realized stock returns. It was confirmed that all costs of capital derived from seven types of models for analysis have a negative correlation with realized stock returns, contrary to expectation. Consequently, they concluded that an implied cost of capital is less reliable as a measured value of expected return. However, they also pointed out the following two points. First, if analysts' consensus regarding a long-term growth forecast is low, the reliability of the cost of capital inferred from the model of Claus and Thomas (2001) becomes higher. Second, when ex post analysts' forecast error is low, all costs of capital have a positive correlation, as expected. In other words, their result suggests that the superiority of cost of capital is dependent on the analysts' forecast error.

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[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.

Guay et al. (2006) compared the significance of slope coefficients obtained with a regression of future realized stock returns to cost of capital. They use cost of capital derived from each model proposed by Gebhardt et al. (2001), Claus and Thomas (2001), Gordon and Gordon (1997), Ohlson and Juettner-Nauroth (2005), and Easton (2004) were analyzed. They measure realized stock returns from one year ahead to three years ahead. The result shows that any costs of capital have a low correlation with future stock returns. However, they stated that the cost of capital inferred from the model of Gebhardt et al. (2001) show relatively high correlation, and it is an appropriate benchmark to forecast future stock returns.

Chen et al. (2004) compared costs of capital inferred from the models of Gebhardt et al. (2001) and Ohlson and Juettner-Nauroth (2005) in seven countries (U.S., U.K., Australia, Canada, Japan, Germany, and France). As a result, it was illustrated that, under a circumstance in which a clean surplus relationship is maintained in financial reporting, the cost of capital derived from the model of Gebhardt et al. (2001) is more reliable. On the contrary, it was shown that, under a circumstance in which the clean surplus relationship is not necessarily maintained, the model of Ohlson and Juettner-Nauroth (2005) estimates a more reliable cost of capital.

As for the implied costs of capital discussed above, consistent results have not necessarily been obtained. In this study, we attempt to additional empirical evidence for these studies, using data of Japanese companies.

3. Research Design

As stated in the previous section, many alternative models are used to estimate an implied cost of capital. They are generally classified into two types—the model based on the residual income model such as GLS model, and the one based on the abnormal earnings growth valuation model such as OJ model. We will focus on these two models, and summarize their differences. Both are commonly based on a discounted dividend model, but there are some differences as follows.[4]

One difference is an assumption regarding the clean surplus relationship. As seen in the expression below, the model proposed by Gebhardt et al. (2001) requires information on shareholders' equity, in

[4] Features of both models are further described in Ohlson and Gao (2006), Easton (2009), and other papers.

addition to dividends, present stock prices, and expected returns. Meanwhile, the model proposed by Ohlson and Juettner-Nauroth (2005) utilizes only dividends, present stock prices, and expected returns, but does not need information on shareholders' equity.

In the Gebhardt et al. (2001) model, it is required to assume the clean surplus relationship so as to compute the forecasted shareholders' equity. However, the Ohlson and Juettner-Nauroth (2005) model is not necessarily based on the assumption of the clean surplus relationship.

Another difference is the long-term forecast data. In the Gebhardt et al. (2001) model, forecasted ROEs over 12 years ahead and a future dividend payout ratio are needed as information for a long-term forecast. In order to estimate forecasted ROEs over 12 terms, the Gebhardt et al. (2001) model hypothesizes that ROE will converge on the industry median in the long term.[5] Therefore, the numerical value of industry median affects the forecasted ROE. Meanwhile, the Ohlson and Juettner-Nauroth (2005) model involves only the short-term forecasted ROE for two years ahead, and the long-term forecast depends only on γ in the expression, $EPS_{t+1} = \gamma EPS_t$. Consequently, the industry median of ROE is not required.

In this study, we are interested in how an estimated cost of capital is influenced by these differences between the two models. Based on preceding studies such as Gode and Mohanram (2003) and Botosan and Plumlee (2005), we compared costs of capital using the following two methods. First, we computed risk factors considered to be generally supported, and compared the correlation with the cost of capital. Second, we compared the signs of coefficients and explanatory power of the models by estimating a multiple regression model in which the cost of capital is a dependent variable and a risk factor is an independent variable. In this study, it is considered that the higher the correlation is with the risk factors, or the higher an adjusted R-square is with the expected sign of the coefficient of the multiple regression model, the more the cost of capital is preferably reflecting risks. We explain the estimation method of the cost of capital handled in this study and risk factors below:

(1) Inferring the 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,

[5] The validity of said hypothesis is shown in Nissim and Penman (2001) and other papers. However, as with Fairfield et al. (2009), some studies point out that profitability converges on a median of the entire industry of companies.

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.

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

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.[6]

2) Ohlson and Juettner-Nauroth (2005) Model

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 $\gamma>1$.[7] In this study, we assume that γ is 1.03.[8]

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

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).[9] 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

[6] 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.

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

[8] 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."

[9] 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.

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).

$$x = \sqrt{\frac{FEPS_2 + xDPS_1 - FEPS_1}{P_0}} \quad (3)$$

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

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.

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

（２） Measuring risk factors

In this study, We adopt the following seven risk factors: 1) market beta; 2) unsystematic risk; 3) earnings variability; 4) leverage; 5) corporate size; 6) long-term growth in expected earnings; and 7) book-to-market ratio. These are typical risk indicators adopted in prior studies (e.g., Gebhardt et al. 2001; Claus and Thomas 2001; Gode and Mohanram 2003; Easton 2004; Botosan and Plumlee 2005).

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).[10] 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

[10] 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..

measured by the log of the ratio of shareholders' equity to the market 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.

4. Sample and Descriptive Statistics

The sample of this study includes listed firms (excluding financial institutions) which have one-year-ahead and two-years-ahead forecasts and a long-term growth forecast announced simultaneously by IBES during the period from 1987 to 2007.[11] Thus, 4,465 firm-years are extracted as a sample.[12] Earnings forecasts from IBES covers one third of Japanese listed firms. Earnings forecasts for different firms are announced every month. The earnings forecast seems to be irregularly announced only when a certain information is disclosed. In our analysis, we use forecast data announced at August is used. In a case where the earnings forecast in August is not available, and is announced in the nearest accounting month before August, we use it as a substitute.

We use consolidated financial statement data from "Nikkei Financial Data, CD-ROM DVD" of Nikkei Media Marketing, Inc. If data required for estimation of a cost of capital and risk factors are unavailable, the firms are excluded from the sample. Especially, as earnings data over the past five years are required to compute the earnings variability, the sample of which forecast is announced in 1987 needs data since 1983. The industry median of Gebhardt et al. (2001) model is computed by using ROE in the same data of Nikkei Media Marketing and Nikkei industry code. We also obtain daily stock price data from "Daily Japanese stock return data" of Nikkei Media Marketing Inc. Since daily returns over the past year are

[11] Industries are classified by Nikkei industry code.

[12] During the analysis period, 46,292 firm-years announce consolidated financial data. Among them, one-year-ahead forecasts of 21,005 firms and two-year-ahead forecasts of 27,873 firms are unavailable. Although some preceding studies use a three-years-ahead earnings forecast, we use not it but the long term growth forecast for computation in this study. Since data bases of other companies than IBES seldom announce a long-term growth, we have to use data of IBES. However, as many preceding studies in U.S. use forecasts from IBES, it can be said that there is no problem.

required for calculation of beta and Unsyst, firms with a shorter period of listing than required are excluded from the sample. As such, the number of sample firms decreased to 3,976.

Furthermore, a firm of which cost of capital cannot be estimated is excluded from the sample. In the Gebhardt et al. (2001) model, when the solution is negative or multiple solutions are obtained, such a firm is eliminated from the sample. In addition, when a solution cannot be specified or obtained, such a firm is also eliminated from the sample. Meanwhile, in the Ohlson and Juettner-Nauroth (2005) model and the model proposed by Easton (2004), it is required that a two-years-ahead earnings forecast is higher than a one-year-ahead one. A firm which does not fulfill the requirement is excluded from the sample. In the Ohlson and Juettner-Nauroth (2005) model with $\gamma = 1.03$, costs of capital of some firms cannot be estimated.[13] As a result of considering the above-mentioned matters, the final sample consist of 3,517 firm-year observations.[14]

Table 1 provides the descriptive statistics of the sample.[15] As for the cost of capital estimated in the Gebhardt et al. (2001) model (hereafter referred to as GLS), the mean and median are 4.3% and 3.6%, respectively. These points are lower than that of , theOhlson and Juettner-Nauroth (2005) model (hereinafter referred to as OJ)which shows 17.0% and 9.9%, respectively. This is because, in estimating the cost of capital, Ohlson and Juettner-Nauroth (2005) take into account the abnormal earnings growth. In the PEG ratio and modified PEG ratio in Easton (2004) (hereinafter referred to as PEG and MPEG, respectively) which ignore abnormal earnings growth and dividends, the mean values are 8.0% and 6.9%, respectively, and the medians are 8.8% and 7.8%, respectively, which are lower than those of OJ model. However, they are still higher than those of GLS model.[16]

Table 2 shows a change in each cost of capital by year and by industry. Focusing on a change in the cost of capital by year in Panel A, it is found that the level of OJ is high over the entire period. In particular, OJ has increased since 1997, and the difference from GLS and EP has become larger. The PEG

[13] We think it is a big problem. If a cost of capital can not be computed just because a value to be assigned to the expression is limited, it may be argued that only preferable sample firms are selected. Also in this study, about 20% of firms are excluded from the sample due to impossibility of calculation.

[14] The final sample varies depending on the adopted model to estimate a cost of capital As this study focuses on comparison of costs of capital estimated by each model, we conduct analyses with Ohlson and Juettner-Nauroth (2005) model that the final number of samples is the least.

[15] Table 1 provides values after considering the effect of outliers. 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).

[16] 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%.

and MPEG have also increased, but not as remarkably as OJ. The GLS and EP are relatively stable at a low level. On the other hand, Panel B provides the cost of capital by industry.[17] There is not as large a difference in magnitude relationally among costs of capital in any industries. However, the industry that has a high (or low) cost of capital varies depending on which cost of capital is focused on.

Table 3 provides correlation coefficients. Numbers to the left below the diagonal expressed in 1.000 are Pearson correlation coefficients, while numbers to the right above the diagonal are Spearman rank-order correlation coefficients. Panel A represents correlation coefficients among costs of capital. Although the cost of capital has a positive correlation with each other in general, some costs of capital have a negative correlation only with EP. While a correlation between PEG and MPEG is as high as 90%, OJ has a slightly lower correlation with them. The correlation between OJ and GLS is just 5.3%. [18] On the other hand, Panel B represents correlation coefficients among risk factors. While the coefficients have the expected signs in general, the correlation with LTG tends to be different from expectation. Since the maximum coefficient is -0.405 of SIZE and BM, the problem of multicollinearity seems to betrivial.

5. Results

(1) univariate analysis

Table 4 indicates a correlation matrix between each cost of capital and risk factor. Both GLS and OJ have two variables which are statistically significant and have expected signs. Leverage and BM in GLS, as well as Unsyst and Size in OJ, have the expected signs.[19] In EP, only LTG has the expected sign.[20] Meanwhile, PEG and MPEG have the most consistent correlation because six risk factors other than LTG, are statistically significant and have the expected signs. Therefore, PEG and MPEG are considered to

[17] Classification of industries is based on Nikkei industry code.

[18] 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.

[19] 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.

[20] 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.

have the most preferable correlation with risk factors in the entire sample.

Next, we compare the sample, dividing the period into the first half of 10 years and the latter half of 11 years in order to observe tendencies in each period. [21] The result is presented in Table 5. In the first half, OJ, PEG, and MPEG have a more consistent correlation with risk factors than GLS and EP. In concrete terms, four risk factors, including Earnvar, Leverage, Size and BM, have the expected signs. In the latter half, however, while the number of variables with the expected signs increases in PEG and MPEG, only Unsyst and Size have a consistent correlation with OJ. Also in EP, the number of such variables decreases, but in GLS, three variables, as many as in the first half, have expected signs. Consequently, it is suggested that the abnormal earnings growth valuation model has a lower correlation with risks in the latter half of analysis period.

Furthermore, Table 6 summarizes the results by year of correlation between the cost of capital and risk factors. [22] Leverage and BM in GLS have the expected sign and a significant correlation over the almost entire period. The correlation with Earnvar and Size is significant in more years in the latter half. On the other hand, in OJ, Unsyst, Leverage, Size and BM have the expected signs in many years. However, as with Earnvar, the correlation with leverage has tended to be insignificant since 2000. In contrast to expectation, the correlation with BM since 2003 has tended to be significantly negative in the latter half. Meanwhile, in PEG and MPEG, it is found several variables have the expected signs and significant correlations over the entire year. These tendencies imply that the results of Table 5 and 6 are not caused by the effects in specific years.

As the summary of results above, we can argue as follows. According to the result of the entire sample, the correlation of PEG and MPEG with risk factors is the most consistent with the expected signs. Only in the first half of analysis period, OJ is comparable to PEG and MPEG. However, in the latter half, the number of risk factors with expected signs decreases. While GLS is stable without a significant variation over the entire period, less risk factors show expected correlations in general, compared with PEG and MPEG. Consequently, in the correlation analysis, PEG ratio and modified PEG ratio are considered advantageous.

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[21] In dividing the sample, it is possible to examine a structural change. However, as confirmed in Table 2, the increasing variation in levels of cost of capital was observed around 1997, and so the way to divide the sample adopted here is deemed valid to some extent. We conducted a similar verification after dividing the sample into two around 2000. While the difference in adjusted R-squares among subsamples became smaller slightly, there were not the remarkable difference in analysis results.

[22] Although we conducted analysis of correlation by industry, notable tendencies could not be found.

(2) Multivariate analysis

Table 7 shows the estimation result of a multiple regression model in which costs of capital estimated by each model are dependent variables and seven risk factors are independent variables. In order to control effects of year and industry, we regress the model including dummy years and dummy industries. According to the result of Table 7, the adjusted R-square of GLS is the highest, 31.9%. However, among risk factors included in independent variables, only coefficients of Leverage and BM have the expected signs, and this result should be interpreted carefully. On the other hands, as for OJ, three risk factors including Unsyst, Leverage and Size have the expected signs and significant values, but the adjusted R-square is about 12%, lower than other models. According to the results of PEG and MPEG, five risk factors, including Unsysts, Earnvar, Leverage, Size and BM, have the expected signs and significant values. The R-squares are respectively 22.7% and 18.8% , higher than the one of OJ model. As with the result of correlation matrix, from the viewpoint of the correlation with individual risk factors, PEG ratio and modified PEG ratio appear to be advantageous.

Gode and Mohanram (2003) compared GLS and OJ, and obtained the result that there are hardly differences between them. However, our analysis result is different from theirs, in terms of the considerable variation in signs of estimated coefficients and their levels of significance.

In order to analyze this tendency in detail, as with the correlation analysis, we regress the model by dividing the period into 10 years in the first half and 11 years in the latter half. The result is shown in Table 8. As for any costs of capital, the adjusted R-square in the first half is higher than in the latter half. It is also found that values of cost of capital more reflect risks in the first half. Especially, the R-squares of EP and PEG are respectively 51.9% and 44.7%, higher than 42.0% of GLS. Briefly, the reason why the R-square of GLS is high in the analysis with the entire sample is a relatively higher power of explanation of the model in the latter half. The regression result by year is as indicated in Table 9.[23] In comparison of R-squares, it is found that OJ, PEG, and MPEG are high in the first half, and GLS is high in the latter half. The result in Table 8 is not affected by a specific year. Focusing on signs of coefficients and levels of significance, the following tendency can be pointed out. Specifically, as GLS has a positive and significant correlation with leverage in 15 years of 20-year period, and with BM in 17 years, its result is

[23] In 1987, as there were few samples and the reliable estimation was impossible, the result of 1987 is not presented. Although we conducted the regression analysis by industry, notable tendencies could not be found, like the correlation analysis. The presentation of said analysis is omitted due in part to limitations of space.

stable. On the other hand, OJ has a positive and significant correlation with Unsyst in 8 years, relatively more years than other models. In PEG and MPEG, several variables except LTG have the expected signs and significant values over the entire period. In EP, there are few variables which have the expected signs and significant values over the entire period. These results are consistent with the correlation analysis.

The results in this section are summarized as follows. We find that GLS is the indicator which has the highest R-square and reflects risks the best in the entire sample. This tendency shows especially in the latter half. However, in the first half, the R-squares of EP and PEG are higher. Furthermore, in consideration of the entire sample, it is still controversial that there are several coefficients with unexpected signs. Costs of capital which show preferable results in terms of R-square, a sign, and significance over the entire period are PEG and MPEG. For this reason, PEG ratio and modified PEG ratio appear to be advantageous.

6. Conclusion

In this study, we estimate an alternative an implied cost of capital inferred from a valuation model, and consider its validity.

Many valuation models have been proposed to estimate the implied cost of capital, and their results vary depending on assumptions on earnings growth, a dividend, and a forecast period. Among them, we compare the following models; 1) the model proposed by Gebhardt et al. (2001), 2) the model proposed by Ohlson and Juettner-Nauroth (2005), 3) EP ratio, and 4) PEG ratio and 5) modified PEG ratio which are proposed by Easton (2004). As criteria to evaluate their models, we focus on the following two points. One is a significant correlation with risk factors in consistency with the expected sign. Another is that variables have the expected signs and the adjusted R-square is high in the multiple regression model in which a cost of capital is a dependent variable and a risk factors are independent variable. We use following seven risk factors; 1) Beta, 2) Unsystematic risk, 3) Earnings variability, 4) Leverage, 5) Size, 6) Long-term growth in expected earnings, and 7) Book-to-market ratio.

As the result of univariate analysis, the PEG ratio and the modified PEG ratio are found to show a significant correlation in consistency with the expected sign. Although the cost of capital inferred by

Ohlson and Juettner- Nauroth (2005) model also shows a preferable correlation just in the first half of analysis period, the one in the latter half is not as correlative as expected. The cost of capital estimated by Gebhardt et al.(2001) model has the expected correlations with just a few risk factors over the entire period.

In the multiple regression analysis, Gebhardt et al. (2001) model shows the highest R-square. However, in Gebhardt et al. (2001) model, there are few coefficients of independent variables which are consistent with the expected sign. In the first half of analysis period, the R-squares in EP ratio and PEG ratio are rather higher. Furthermore, in PEG ratio and modified PEG ratio, the most coefficients have the expected signs.

We conclude that PEG ratio and modified PEG ratio reflect risk factors most appropriately, and are superior to other models. The estimated value of cost of capital can be used for valuation and forecast of risks associated with capital investment. The result suggests that more appropriate risk valuation and forecast will be enabled by using PEG ratio and modified PEG ratio as a form of the abnormal earnings growth valuation model.

However, there are some problems left in this study. The result obtained here implied that the cost of capital can be appropriately estimated in Japan by assuming that the abnormal earnings growth is zero in the abnormal earnings growth valuation model. In preceding studies, however, it has been argued that PEG ratio and modified PEG ratio cause a downward bias in general due to the assumption that the abnormal earnings growth and dividends are zero. This argument is inconsistent with our result. We have to examine such inconsistent result in detail. Furthermore, some recent preceding studies have argued that the correlation with risk factors should be analyzed not at the firm level, but at the portfolio level. While we analyze at the firm level in order to ensure the comparability with many preceding studies, it is required to analyze at the portfolio level in the future.

[2010.12.21 1015]

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Table 1 Descriptive statistics

	GLS	OJ	EP	PEG	MPEG	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
mean	0.043	0.170	0.032	0.088	0.080	0.883	4.792	2.190	0.568	26.107	0.136	0.726
s.d.	0.033	0.359	0.059	0.050	0.058	0.362	3.476	5.941	0.876	1.402	0.165	0.437
p10	0.018	0.057	-0.002	0.041	0.027	0.422	1.549	0.196	0.025	24.271	0.001	0.298
p25	0.027	0.075	0.021	0.057	0.047	0.618	2.394	0.315	0.084	25.133	0.050	0.430
p50	0.036	0.099	0.038	0.078	0.069	0.870	3.842	0.592	0.256	26.055	0.100	0.633
p75	0.048	0.139	0.055	0.105	0.096	1.124	6.127	1.506	0.645	27.108	0.176	0.897
p90	0.066	0.219	0.076	0.143	0.139	1.367	9.295	4.149	1.420	27.973	0.306	1.262

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

Figure 1 Time series median of the cost of capital

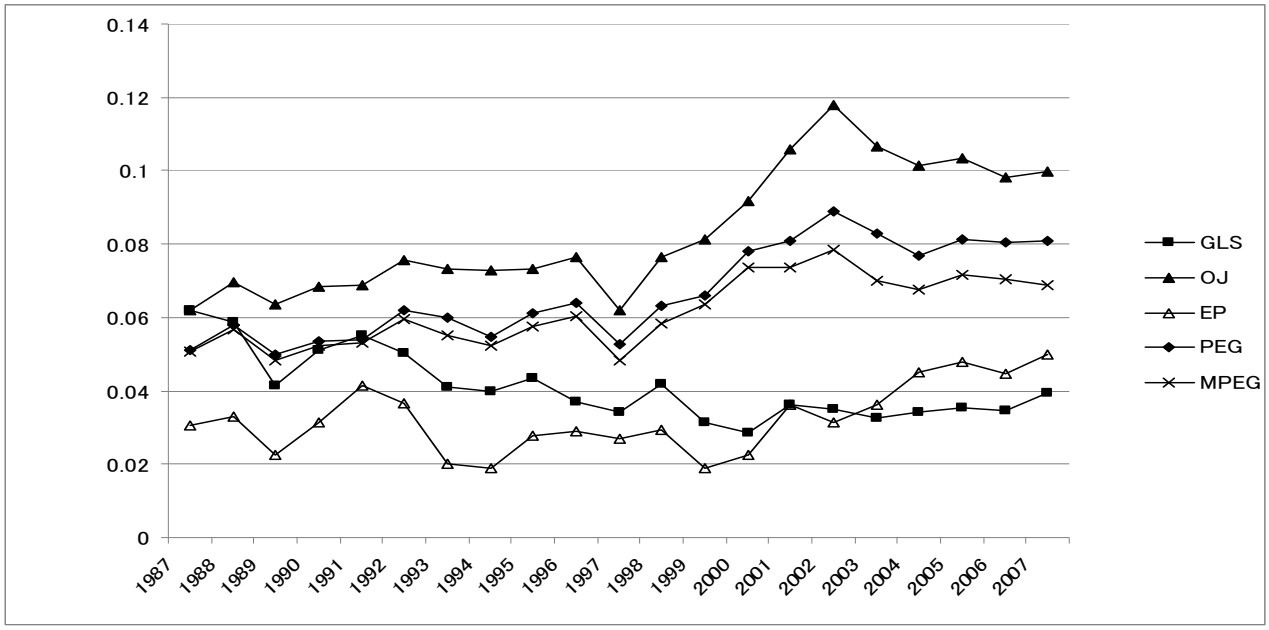

Table 2 Descriptive statistics for the cost of capital by year and by industry

Panel A: Descriptive statistics for the cost of capital by year

	GLS		OJ		EP		PEG		MPEG		
year	mean	median	mean	median	mean	median	mean	median	mean	median	N
1987	0.062	0.062	0.064	0.062	0.030	0.031	0.052	0.051	0.051	0.051	7
1988	0.065	0.059	0.073	0.070	0.041	0.033	0.063	0.058	0.060	0.057	12
1989	0.054	0.041	0.070	0.064	0.027	0.023	0.057	0.050	0.055	0.048	35
1990	0.075	0.051	0.080	0.068	0.032	0.032	0.044	0.053	0.043	0.052	13
1991	0.085	0.055	0.094	0.069	0.052	0.041	0.071	0.054	0.069	0.053	27
1992	0.072	0.050	0.080	0.076	0.040	0.036	0.062	0.062	0.058	0.060	49
1993	0.063	0.041	0.093	0.073	0.019	0.020	0.068	0.060	0.066	0.055	47
1994	0.063	0.040	0.106	0.073	0.027	0.019	0.063	0.055	0.064	0.052	47
1995	0.063	0.044	0.114	0.073	0.026	0.028	0.076	0.061	0.075	0.058	38
1996	0.058	0.037	0.089	0.076	0.029	0.029	0.074	0.064	0.068	0.060	56
1997	0.049	0.034	0.080	0.062	0.029	0.027	0.065	0.053	0.063	0.048	69
1998	0.057	0.042	0.098	0.076	0.010	0.030	0.079	0.063	0.077	0.058	54
1999	0.045	0.031	0.106	0.081	0.012	0.019	0.087	0.066	0.083	0.063	72
2000	0.030	0.029	0.113	0.092	0.016	0.023	0.091	0.078	0.094	0.074	136
2001	0.039	0.036	0.148	0.106	0.026	0.036	0.093	0.081	0.085	0.073	534
2002	0.039	0.035	0.164	0.118	0.013	0.031	0.104	0.089	0.096	0.078	522
2003	0.035	0.032	0.209	0.107	0.027	0.036	0.092	0.083	0.081	0.070	404
2004	0.034	0.034	0.205	0.101	0.042	0.045	0.080	0.077	0.070	0.068	340
2005	0.036	0.035	0.201	0.104	0.046	0.048	0.092	0.081	0.083	0.072	366
2006	0.038	0.034	0.209	0.098	0.046	0.045	0.085	0.081	0.073	0.070	335
2007	0.044	0.039	0.203	0.100	0.046	0.050	0.085	0.081	0.075	0.069	354
total	0.043	0.036	0.170	0.099	0.032	0.038	0.088	0.078	0.080	0.069	3517

Table 2 Continued

Panel B: Descriptive statistics for the cost of capital by industry

	GLS		OJ		EP		PEG		MPEG		
Industry code	mean	median	mean	median	mean	median	mean	median	mean	median	N
1	0.041	0.036	0.102	0.075	0.028	0.032	0.067	0.057	0.061	0.048	197
3	0.023	0.019	0.103	0.094	0.026	0.034	0.087	0.082	0.085	0.075	61
5	0.046	0.028	0.421	0.160	0.035	0.033	0.131	0.125	0.100	0.097	28
7	0.037	0.035	0.100	0.092	0.032	0.040	0.086	0.079	0.081	0.074	244
9	0.047	0.041	0.092	0.082	0.046	0.040	0.073	0.066	0.071	0.062	159
11	0.051	0.050	0.125	0.114	0.055	0.049	0.088	0.080	0.085	0.076	11
13	0.043	0.042	0.110	0.103	0.052	0.061	0.101	0.095	0.096	0.082	29
15	0.031	0.027	0.105	0.100	0.039	0.034	0.088	0.086	0.085	0.084	50
17	0.032	0.020	0.125	0.110	0.027	0.046	0.105	0.096	0.104	0.096	55
19	0.035	0.031	0.122	0.104	0.031	0.045	0.099	0.089	0.099	0.088	92
21	0.035	0.028	0.121	0.106	0.027	0.039	0.092	0.085	0.086	0.079	260
23	0.048	0.036	0.132	0.094	0.021	0.032	0.090	0.080	0.086	0.075	575
25	0.063	0.065	0.130	0.124	0.022	0.036	0.100	0.107	0.099	0.107	5
27	0.058	0.050	0.115	0.093	0.043	0.056	0.097	0.082	0.093	0.077	167
29	0.020	0.016	0.073	0.072	0.046	0.044	0.051	0.053	0.047	0.049	4
31	0.036	0.034	0.111	0.096	0.025	0.034	0.091	0.084	0.084	0.075	87
33	0.037	0.033	0.110	0.101	0.038	0.043	0.081	0.077	0.068	0.061	74
35	0.042	0.045	0.086	0.069	0.025	0.022	0.069	0.054	0.065	0.054	8
37	0.030	0.029	0.177	0.165	0.046	0.046	0.052	0.046	0.031	0.034	4
41	0.049	0.043	0.125	0.100	0.013	0.033	0.102	0.081	0.099	0.073	102
43	0.043	0.039	0.249	0.122	0.037	0.046	0.095	0.085	0.078	0.067	201
45	0.043	0.035	0.161	0.097	0.033	0.037	0.087	0.075	0.077	0.064	270
53	0.046	0.040	0.260	0.110	0.039	0.036	0.099	0.077	0.094	0.073	86
55	0.020	0.014	0.242	0.202	0.034	0.040	0.069	0.072	0.042	0.026	43
57	0.060	0.056	0.132	0.097	0.020	0.040	0.087	0.070	0.077	0.058	55
59	0.059	0.058	0.117	0.112	0.064	0.056	0.095	0.078	0.094	0.077	16
61	0.040	0.006	0.117	0.103	0.005	0.020	0.104	0.093	0.104	0.093	10
63	0.051	0.048	0.097	0.075	0.048	0.049	0.070	0.061	0.064	0.055	29
65	0.043	0.040	0.398	0.187	0.017	0.031	0.089	0.069	0.073	0.034	73
67	0.059	0.057	0.090	0.082	0.059	0.055	0.075	0.069	0.071	0.063	50
69	0.060	0.060	0.097	0.096	0.054	0.057	0.078	0.083	0.076	0.080	15
71	0.037	0.033	0.395	0.119	0.031	0.036	0.086	0.077	0.067	0.056	378
total	0.043	0.036	0.170	0.099	0.032	0.038	0.088	0.078	0.080	0.069	3517

Note:

This table shows a descriptive statistics for each cost of capital by year and by industry. Panel A shows descriptive statistics for the cost of capital by year, and Panel B shows by industry.

N: the number of firms

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)

The category of Industry is based on Nikkei industry code. Banks, securities firms, insurance firms, and other financial institutions are eliminated from the sample.

Table 3 Correlations matrix among the cost of capitals or risk factors

Panel A: Correlations among the cost of capitals

	GLS	OJ	EP	PEG	MPEG
GLS	1.000	0.118	0.162	0.178	0.173
OJ	0.053	1.000	-0.057	0.834	0.585
EP	0.050	-0.034	1.000	-0.073	-0.135
PEG	0.200	0.164	-0.274	1.000	0.874
MPEG	0.153	0.003	-0.330	0.900	1.000

Panel B: Correlations among the risk factors

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
Beta	1.000	0.118	0.262	0.018	0.241	0.088	-0.205
Unsyst	0.161	1.000	0.172	-0.095	-0.373	0.137	-0.044
Earnvar	0.076	0.045	1.000	0.284	-0.114	0.112	0.066
Leverage	-0.008	0.008	0.101	1.000	0.050	-0.125	0.389
Size	0.236	-0.349	-0.047	-0.028	1.000	-0.065	-0.363
LTG	0.135	0.136	0.041	-0.087	-0.066	1.000	-0.216
BM	-0.197	-0.028	0.078	0.336	-0.405	-0.109	1.000

Note:

This table shows the correlations matrix. Numbers to the left below the diagonal are Pearson correlation coefficients, while numbers to the right above the diagonal are Spearman rank-order correlation coefficients. Panel A represents correlation coefficients among costs of capital. On the other hand, Panel B represents correlation coefficients among risk factors.

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 4 Correlation matrix between cost of capital and risk factors

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
GLS	-0.056***	-0.105***	-0.004	0.273***	-0.007	-0.022	0.372***
	(0.001)	(0.000)	(0.800)	(0.000)	(0.663)	(0.163)	(0.000)
OJ	0.023	0.218***	0.001	0.008	-0.198***	0.109***	-0.035**
	(0.180)	(0.000)	(0.951)	(0.640)	(0.000)	(0.000)	(0.038)
EP	-0.113***	-0.229***	-0.148***	-0.114***	0.014	-0.039**	-0.015
	(0.000)	(0.000)	(0.000)	(0.000)	(0.362)	(0.013)	(0.332)
PEG	0.093***	0.152***	0.139***	0.276***	-0.109***	0.060***	0.245***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MPEG	0.058***	0.192***	0.126***	0.279***	-0.238***	0.095***	0.276***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note:
This table shows the correlations matrix between each cost of capital and risk factors. There are 3,517 observations in the sample from 1987-2007. P-values are in parentheses.
*** 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.
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 5 Correlations matrix dividing into two periods

Panel A: The first half of ten years (1987-1996)

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
GLS	0.009	-0.103**	-0.007	0.414***	0.035	-0.086*	0.548***
	(0.867)	(0.047)	(0.886)	(0.000)	(0.501)	(0.095)	(0.000)
OJ	0.031	-0.032	0.093*	0.460***	-0.244***	0.027	0.419***
	(0.571)	(0.567)	(0.090)	(0.000)	(0.000)	(0.620)	(0.000)
EP	-0.245***	-0.025	-0.290***	0.347***	-0.287***	0.182***	0.628***
	(0.000)	(0.630)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PEG	0.004	-0.080	0.185***	0.562***	-0.264***	0.026	0.602***
	(0.944)	(0.136)	(0.001)	(0.000)	(0.000)	(0.633)	(0.000)
MPEG	0.019	-0.080	0.184***	0.525***	-0.214***	0.012	0.522***
	(0.732)	(0.138)	(0.001)	(0.000)	(0.000)	(0.822)	(0.000)

Panel B: The latter half of eleven years (1997-2007)

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
GLS	-0.079***	-0.075***	0.012	0.257***	-0.059***	0.013	0.368***
	(0.000)	(0.000)	(0.478)	(0.000)	(0.000)	(0.425)	(0.000)
OJ	0.025	0.212***	-0.005	-0.005	-0.192***	0.103***	-0.053***
	(0.171)	(0.000)	(0.795)	(0.796)	(0.000)	(0.000)	(0.003)
EP	-0.107***	-0.240***	-0.143***	-0.149***	0.033**	-0.047***	-0.064***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.049)	(0.005)	(0.000)
PEG	0.067***	0.184***	0.116***	0.252***	-0.216***	0.081***	0.236***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MPEG	0.101***	0.147***	0.132***	0.255***	-0.086***	0.050***	0.215***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)

Note:

This table shows the result of correlations matrix dividing into two periods. Panel A shows the result of first half of ten years, and Panel B shows the result of last half of eleven years. P-values are in parentheses.

*** 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 0.10 level of significance using a two-tailed t-test.

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 6 Correlations matrix by year

Panel A: GLS Model

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
1987	-0.356	0.667	-0.395	0.408	-0.287	0.721*	0.284
	(0.433)	(0.102)	(0.381)	(0.364)	(0.532)	(0.067)	(0.537)
1988	0.299	0.404	0.225	0.288	-0.325	0.085	0.869***
	(0.321)	(0.171)	(0.461)	(0.341)	(0.279)	(0.782)	(0.000)
1989	0.218	-0.114	0.260	0.435***	-0.003	0.284*	0.611***
	(0.176)	(0.486)	(0.105)	(0.005)	(0.987)	(0.076)	(0.000)
1990	-0.053	-0.324	-0.127	0.059	0.387	-0.073	0.357
	(0.833)	(0.189)	(0.616)	(0.817)	(0.112)	(0.774)	(0.146)
1991	-0.262	-0.233	-0.120	0.443**	0.042	-0.158	0.512***
	(0.178)	(0.233)	(0.542)	(0.018)	(0.831)	(0.423)	(0.005)
1992	-0.196	-0.332***	-0.100	0.544***	0.234*	-0.149	0.623***
	(0.134)	(0.010)	(0.448)	(0.000)	(0.072)	(0.256)	(0.000)
1993	0.218	-0.156	0.441***	0.333**	0.234*	-0.016	0.436***
	(0.117)	(0.264)	(0.001)	(0.015)	(0.092)	(0.911)	(0.001)
1994	0.029	-0.191	-0.103	0.586***	-0.131	-0.020	0.520***
	(0.838)	(0.179)	(0.472)	(0.000)	(0.359)	(0.887)	(0.000)
1995	-0.010	-0.100	-0.137	0.528***	-0.051	-0.034	0.515***
	(0.952)	(0.535)	(0.394)	(0.000)	(0.754)	(0.835)	(0.001)
1996	0.016	-0.058	0.048	0.331***	-0.138	-0.270**	0.722***
	(0.900)	(0.649)	(0.704)	(0.007)	(0.275)	(0.028)	(0.000)
1997	0.040	-0.111	-0.155	0.397***	0.054	-0.206*	0.502***
	(0.735)	(0.346)	(0.187)	(0.001)	(0.649)	(0.078)	(0.000)
1998	-0.059	-0.092	-0.102	0.110	-0.046	-0.214*	0.526***
	(0.630)	(0.450)	(0.403)	(0.368)	(0.709)	(0.078)	(0.000)
1999	-0.048	0.001	-0.082	0.520***	-0.264**	-0.041	0.671***
	(0.662)	(0.993)	(0.452)	(0.000)	(0.014)	(0.708)	(0.000)
2000	-0.522***	-0.251***	0.036	0.437***	-0.347***	-0.104	0.702***
	(0.000)	(0.002)	(0.672)	(0.000)	(0.000)	(0.214)	(0.000)
2001	-0.216***	-0.112***	0.031	0.195***	-0.246***	-0.037	0.462***
	(0.000)	(0.005)	(0.446)	(0.000)	(0.000)	(0.359)	(0.000)
2002	-0.088**	-0.017	0.016	0.219***	-0.167***	0.020	0.403***
	(0.038)	(0.683)	(0.696)	(0.000)	(0.000)	(0.637)	(0.000)
2003	-0.072	-0.131***	0.085*	0.321***	0.005	-0.103**	0.364***
	(0.139)	(0.007)	(0.076)	(0.000)	(0.917)	(0.031)	(0.000)
2004	0.001	-0.119**	0.102**	0.336***	0.136***	0.057	0.240***
	(0.982)	(0.016)	(0.038)	(0.000)	(0.006)	(0.247)	(0.000)
2005	0.058	-0.083*	-0.008	0.352***	0.140***	0.074	0.264***
	(0.239)	(0.089)	(0.867)	(0.000)	(0.004)	(0.125)	(0.000)
2006	-0.096*	-0.047	-0.043	0.305***	0.141***	0.149***	0.235***
	(0.071)	(0.377)	(0.411)	(0.000)	(0.007)	(0.004)	(0.000)
2007	-0.021	0.026	0.004	0.169***	-0.080	0.149***	0.209***
	(0.684)	(0.606)	(0.934)	(0.001)	(0.109)	(0.003)	(0.000)

Table 6 Continued

Panel B: OJ Model

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
1987	-0.182	0.731*	-0.484	0.357	-0.299	0.805**	0.268
	(0.696)	(0.062)	(0.271)	(0.431)	(0.514)	(0.029)	(0.561)
1988	0.048	0.488	0.120	0.432	-0.660**	0.272	0.869***
	(0.881)	(0.108)	(0.710)	(0.161)	(0.020)	(0.393)	(0.000)
1989	0.206	0.000	0.627***	0.516***	-0.365**	0.651***	0.551***
	(0.235)	(1.000)	(0.000)	(0.002)	(0.031)	(0.000)	(0.001)
1990	0.025	-0.507*	-0.274	0.010	0.218	0.035	-0.164
	(0.935)	(0.077)	(0.365)	(0.975)	(0.475)	(0.911)	(0.593)
1991	-0.185	-0.132	0.149	0.135	-0.136	0.024	0.323
	(0.356)	(0.513)	(0.459)	(0.502)	(0.498)	(0.905)	(0.100)
1992	-0.221	-0.274*	-0.149	0.608***	-0.187	-0.076	0.632***
	(0.127)	(0.057)	(0.307)	(0.000)	(0.197)	(0.606)	(0.000)
1993	0.245	0.033	0.415***	0.379***	0.035	-0.017	0.245*
	(0.101)	(0.829)	(0.004)	(0.009)	(0.816)	(0.909)	(0.097)
1994	-0.160	0.046	-0.005	0.860***	-0.377***	0.155	0.474***
	(0.288)	(0.761)	(0.971)	(0.000)	(0.009)	(0.299)	(0.001)
1995	0.082	0.159	-0.033	0.627***	-0.346**	0.025	0.428***
	(0.623)	(0.341)	(0.844)	(0.000)	(0.033)	(0.882)	(0.007)
1996	0.035	0.210	0.416***	0.644***	-0.319**	-0.085	0.657***
	(0.799)	(0.125)	(0.001)	(0.000)	(0.016)	(0.532)	(0.000)
1997	-0.046	0.518***	0.213*	0.116	-0.295**	-0.019	0.354***
	(0.710)	(0.000)	(0.079)	(0.344)	(0.014)	(0.875)	(0.003)
1998	0.103	0.170	0.024	0.447***	-0.354***	-0.034	0.610***
	(0.461)	(0.218)	(0.864)	(0.001)	(0.009)	(0.809)	(0.000)
1999	0.278**	0.481***	0.024	0.539***	-0.248**	-0.120	0.341***
	(0.018)	(0.000)	(0.839)	(0.000)	(0.035)	(0.315)	(0.003)
2000	-0.293***	-0.009	0.025	0.347***	-0.219***	-0.006	0.392***
	(0.001)	(0.917)	(0.774)	(0.000)	(0.010)	(0.944)	(0.000)
2001	0.044	0.226***	0.009	0.044	-0.141***	0.209***	0.028
	(0.315)	(0.000)	(0.830)	(0.309)	(0.001)	(0.000)	(0.519)
2002	-0.016	0.215***	0.003	0.036	-0.138***	0.113***	0.019
	(0.721)	(0.000)	(0.945)	(0.416)	(0.002)	(0.010)	(0.664)
2003	-0.068	0.304***	-0.009	-0.047	-0.223***	0.035	-0.132***
	(0.182)	(0.000)	(0.855)	(0.349)	(0.000)	(0.488)	(0.008)
2004	0.165***	0.448***	0.010	-0.048	-0.196***	0.072	-0.164***
	(0.003)	(0.000)	(0.853)	(0.373)	(0.000)	(0.184)	(0.002)
2005	0.038	0.298***	-0.040	-0.001	-0.184***	0.108**	-0.108**
	(0.474)	(0.000)	(0.447)	(0.982)	(0.000)	(0.040)	(0.039)
2006	0.057	0.345***	-0.033	-0.008	-0.284***	0.108**	-0.105*
	(0.305)	(0.000)	(0.543)	(0.885)	(0.000)	(0.048)	(0.056)
2007	-0.076	0.331***	0.011	0.021	-0.280***	0.127**	-0.024
	(0.161)	(0.000)	(0.832)	(0.697)	(0.000)	(0.017)	(0.658)

Table 6 Continued

Panel C: EP Ratio

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
1987	-0.447	0.335	-0.659	-0.581	-0.339	0.358	0.785**
	(0.314)	(0.463)	(0.108)	(0.171)	(0.458)	(0.431)	(0.037)
1988	0.013	0.284	-0.010	0.292	-0.665**	0.113	0.971***
	(0.965)	(0.346)	(0.974)	(0.333)	(0.013)	(0.714)	(0.000)
1989	0.088	-0.011	-0.162	0.780***	-0.399**	0.075	0.904***
	(0.588)	(0.949)	(0.317)	(0.000)	(0.011)	(0.647)	(0.000)
1990	-0.128	-0.398	0.002	0.266	0.348	0.473**	0.664***
	(0.612)	(0.102)	(0.995)	(0.286)	(0.158)	(0.047)	(0.003)
1991	-0.364*	-0.238	-0.272	0.667***	-0.276	-0.122	0.925***
	(0.057)	(0.224)	(0.161)	(0.000)	(0.156)	(0.535)	(0.000)
1992	-0.373***	-0.148	-0.186	0.771***	-0.386***	0.310**	0.864***
	(0.003)	(0.259)	(0.154)	(0.000)	(0.002)	(0.016)	(0.000)
1993	-0.468***	-0.142	-0.541***	-0.440***	-0.206	0.325**	0.254*
	(0.000)	(0.312)	(0.000)	(0.001)	(0.136)	(0.017)	(0.064)
1994	-0.513***	-0.228	-0.219	0.549***	-0.572***	0.346**	0.847***
	(0.000)	(0.108)	(0.119)	(0.000)	(0.000)	(0.012)	(0.000)
1995	-0.303*	-0.018	-0.547***	0.509***	-0.279*	0.171	0.557***
	(0.054)	(0.910)	(0.000)	(0.001)	(0.077)	(0.286)	(0.000)
1996	-0.248**	0.095	-0.300**	-0.309**	-0.083	0.200	0.233*
	(0.049)	(0.455)	(0.015)	(0.012)	(0.512)	(0.111)	(0.062)
1997	-0.139	-0.233**	-0.318***	0.195*	-0.040	-0.086	0.390***
	(0.237)	(0.046)	(0.006)	(0.095)	(0.735)	(0.468)	(0.001)
1998	-0.299**	-0.349***	-0.133	-0.556***	0.071	0.051	0.193
	(0.013)	(0.003)	(0.277)	(0.000)	(0.563)	(0.675)	(0.113)
1999	-0.265**	-0.437***	-0.173	-0.103	-0.083	-0.008	0.239**
	(0.013)	(0.000)	(0.109)	(0.343)	(0.445)	(0.940)	(0.026)
2000	-0.030	-0.054	-0.268***	-0.074	-0.081	-0.095	0.144*
	(0.717)	(0.520)	(0.001)	(0.374)	(0.326)	(0.249)	(0.081)
2001	0.020	-0.101**	-0.104***	-0.170***	0.060	-0.055	-0.092**
	(0.629)	(0.012)	(0.010)	(0.000)	(0.133)	(0.170)	(0.022)
2002	-0.340***	-0.217***	-0.212***	-0.129***	-0.042	-0.068	-0.076*
	(0.000)	(0.000)	(0.000)	(0.002)	(0.309)	(0.102)	(0.066)
2003	-0.395***	-0.275***	-0.209***	0.021	0.008	-0.139***	-0.051
	(0.000)	(0.000)	(0.000)	(0.655)	(0.868)	(0.003)	(0.284)
2004	-0.234***	-0.142***	-0.112**	-0.049	-0.037	-0.160***	0.102**
	(0.000)	(0.004)	(0.022)	(0.315)	(0.455)	(0.001)	(0.036)
2005	-0.059	-0.226***	-0.034	-0.017	0.046	-0.122**	0.164***
	(0.225)	(0.000)	(0.476)	(0.722)	(0.333)	(0.011)	(0.001)
2006	0.056	-0.113**	-0.055	0.131**	-0.031	-0.053	0.140***
	(0.289)	(0.032)	(0.290)	(0.012)	(0.557)	(0.313)	(0.007)
2007	0.142***	-0.337***	-0.159***	-0.194***	0.047	0.032	-0.077
	(0.005)	(0.000)	(0.001)	(0.000)	(0.344)	(0.525)	(0.123)

Table 6 Continued

Panel D: PEG Ratio

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
1987	-0.231	0.739*	-0.548	0.261	-0.346	0.844**	0.348
	(0.618)	(0.058)	(0.203)	(0.572)	(0.448)	(0.017)	(0.444)
1988	0.071	0.465	0.107	0.436	-0.640**	0.265	0.901***
	(0.828)	(0.128)	(0.741)	(0.156)	(0.025)	(0.405)	(0.000)
1989	0.231	0.016	0.610***	0.508***	-0.281*	0.676***	0.529***
	(0.175)	(0.927)	(0.000)	(0.002)	(0.098)	(0.000)	(0.001)
1990	-0.785***	-0.331	0.392	-0.216	0.616***	0.465*	0.008
	(0.000)	(0.194)	(0.120)	(0.406)	(0.009)	(0.060)	(0.976)
1991	-0.234	-0.150	-0.059	0.485***	-0.371*	0.100	0.841***
	(0.241)	(0.456)	(0.770)	(0.010)	(0.057)	(0.620)	(0.000)
1992	-0.235*	-0.376***	-0.096	0.445***	-0.119	-0.058	0.531***
	(0.084)	(0.005)	(0.484)	(0.001)	(0.388)	(0.677)	(0.000)
1993	0.299**	0.086	0.536***	0.504***	-0.013	-0.226	0.345**
	(0.035)	(0.551)	(0.000)	(0.000)	(0.928)	(0.111)	(0.013)
1994	-0.155	0.132	0.052	0.884***	-0.364***	0.013	0.588***
	(0.288)	(0.364)	(0.718)	(0.000)	(0.009)	(0.930)	(0.000)
1995	-0.114	0.206	0.019	0.875***	-0.561***	0.059	0.848***
	(0.495)	(0.215)	(0.911)	(0.000)	(0.000)	(0.724)	(0.000)
1996	0.007	0.097	0.433***	0.616***	-0.234*	-0.067	0.620***
	(0.960)	(0.476)	(0.001)	(0.000)	(0.081)	(0.621)	(0.000)
1997	-0.096	0.339***	0.309***	0.245**	-0.225*	0.010	0.325***
	(0.417)	(0.003)	(0.008)	(0.037)	(0.056)	(0.935)	(0.005)
1998	0.119	0.179	0.028	0.453***	-0.372***	-0.063	0.572***
	(0.376)	(0.178)	(0.837)	(0.000)	(0.004)	(0.637)	(0.000)
1999	0.278**	0.445***	0.028	0.620***	-0.261**	-0.134	0.390***
	(0.014)	(0.000)	(0.811)	(0.000)	(0.022)	(0.244)	(0.001)
2000	-0.307***	-0.065	0.043	0.216***	-0.215***	-0.050	0.321***
	(0.000)	(0.447)	(0.607)	(0.010)	(0.010)	(0.550)	(0.000)
2001	0.066	0.125***	0.081*	0.219***	-0.160***	0.056	0.170***
	(0.124)	(0.003)	(0.057)	(0.000)	(0.000)	(0.192)	(0.000)
2002	0.264***	0.245***	0.175***	0.312***	-0.184***	0.133***	0.297***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
2003	0.166***	0.165***	0.158***	0.177***	-0.121**	0.093*	0.147**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.014)	(0.058)	(0.003)
2004	0.043	-0.041	0.109**	0.183***	-0.054	0.174***	0.070
	(0.425)	(0.450)	(0.038)	(0.001)	(0.304)	(0.001)	(0.183)
2005	0.036	0.134***	0.045	0.105**	-0.189***	0.125**	0.142***
	(0.486)	(0.010)	(0.374)	(0.040)	(0.000)	(0.014)	(0.005)
2006	0.142***	0.471***	0.190***	0.126**	-0.316***	0.106**	-0.044
	(0.009)	(0.000)	(0.000)	(0.019)	(0.000)	(0.050)	(0.414)
2007	-0.043	0.395***	0.170***	0.207***	-0.358***	0.103**	0.272***
	(0.417)	(0.000)	(0.001)	(0.000)	(0.000)	(0.049)	(0.000)

Table 6 Continued

Panel E: Modified PEG Ratio

	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM
	(+)	(+)	(+)	(+)	(−)	(−)	(+)
1987	-0.184	0.746*	-0.550	0.325	-0.262	0.808**	0.291
	(0.694)	(0.054)	(0.201)	(0.477)	(0.571)	(0.028)	(0.527)
1988	0.097	0.463	0.123	0.403	-0.599**	0.273	0.886***
	(0.765)	(0.130)	(0.705)	(0.194)	(0.040)	(0.391)	(0.000)
1989	0.252	0.007	0.664***	0.457***	-0.252	0.702***	0.470***
	(0.139)	(0.968)	(0.000)	(0.005)	(0.138)	(0.000)	(0.004)
1990	-0.766***	-0.342	0.387	-0.203	0.631***	0.463*	0.001
	(0.000)	(0.180)	(0.125)	(0.435)	(0.007)	(0.061)	(0.997)
1991	-0.221	-0.173	-0.047	0.394**	-0.311	0.086	0.783***
	(0.268)	(0.389)	(0.817)	(0.042)	(0.115)	(0.669)	(0.000)
1992	-0.220	-0.406***	-0.087	0.390***	-0.053	-0.096	0.486***
	(0.106)	(0.002)	(0.527)	(0.003)	(0.700)	(0.486)	(0.000)
1993	0.326**	0.079	0.528***	0.488***	0.046	-0.230	0.299**
	(0.021)	(0.587)	(0.000)	(0.000)	(0.750)	(0.105)	(0.033)
1994	-0.107	0.209	0.028	0.843***	-0.396***	0.027	0.512***
	(0.466)	(0.150)	(0.848)	(0.000)	(0.004)	(0.854)	(0.000)
1995	-0.097	0.222	0.015	0.916***	-0.528***	0.052	0.826***
	(0.564)	(0.181)	(0.927)	(0.000)	(0.001)	(0.758)	(0.000)
1996	0.037	0.029	0.507***	0.545***	-0.062	-0.087	0.392***
	(0.785)	(0.832)	(0.000)	(0.000)	(0.647)	(0.520)	(0.003)
1997	-0.058	0.396***	0.293**	0.173	-0.188	0.004	0.249**
	(0.627)	(0.001)	(0.012)	(0.144)	(0.111)	(0.974)	(0.034)
1998	0.106	0.162	0.040	0.474***	-0.308**	-0.064	0.520***
	(0.427)	(0.225)	(0.767)	(0.000)	(0.019)	(0.635)	(0.000)
1999	0.327***	0.468***	0.025	0.534***	-0.171	-0.134	0.237**
	(0.004)	(0.000)	(0.827)	(0.000)	(0.137)	(0.244)	(0.038)
2000	-0.250***	-0.044	0.259***	0.204**	-0.219***	-0.097	0.306***
	(0.003)	(0.608)	(0.002)	(0.014)	(0.009)	(0.248)	(0.000)
2001	0.106**	0.075*	0.083*	0.246***	-0.066	0.039	0.158***
	(0.013)	(0.081)	(0.052)	(0.000)	(0.124)	(0.364)	(0.000)
2002	0.294***	0.248***	0.183***	0.302***	-0.093**	0.084*	0.280***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.031)	(0.052)	(0.000)
2003	0.220***	0.063	0.177***	0.190***	0.051	0.047	0.142***
	(0.000)	(0.210)	(0.000)	(0.000)	(0.299)	(0.343)	(0.004)
2004	0.052	-0.146***	0.101*	0.211***	0.172***	0.130**	0.070
	(0.333)	(0.006)	(0.055)	(0.000)	(0.001)	(0.013)	(0.188)
2005	0.070	0.067	0.051	0.116**	-0.081	0.087*	0.144***
	(0.174)	(0.192)	(0.315)	(0.023)	(0.113)	(0.088)	(0.005)
2006	0.165***	0.253***	0.210***	0.128 **	-0.045	0.036	-0.047
	(0.002)	(0.000)	(0.000)	(0.017)	(0.406)	(0.500)	(0.380)
2007	0.088*	0.292***	0.160***	0.235***	-0.157***	0.134***	0.203***
	(0.095)	(0.000)	(0.002)	(0.000)	(0.003)	(0.010)	(0.000)

Note:

This table shows the correlations matrix by year. Panel A shows the correlation between GLS and risk factors. From Panel B to E shows the result of OJ, EP, PEG, and MPEG, respectively. P-values are in parentheses.

*** 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 0.10 level of significance using a two-tailed t-test.

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 7 The result of pooled regression

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R^2
	(?)	(+)	(+)	(+)	(+)	(−)	(−)	(+)	
GLS	-0.064***	-0.004***	0.000	0.000	0.007***	0.003***	0.000***	0.032***	0.319
	(0.000)	(0.005)	(0.483)	(0.152)	(0.000)	(0.000)	(0.000)	(0.000)	
OJ	1.110***	-0.030	0.022***	-0.001	0.024***	-0.032***	0.100***	-0.029	0.124
	(0.000)	(0.142)	(0.000)	(0.336)	(0.005)	(0.000)	(0.001)	(0.102)	
EP	0.157***	-0.005	-0.004***	-0.001***	-0.011***	-0.003***	0.000	0.003	0.133
	(0.000)	(0.110)	(0.000)	(0.000)	(0.000)	(0.000)	(0.181)	(0.205)	
PEG	0.142***	0.001	0.003***	0.001***	0.017***	-0.004***	0.000***	0.019***	0.227
	(0.000)	(0.602)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
MPEG	0.009	0.005*	0.003***	0.001***	0.019***	0.001	0.000***	0.023***	0.188
	(0.708)	(0.095)	(0.000)	(0.000)	(0.000)	(0.454)	(0.003)	(0.000)	

Note:
This table shows the result of pooled regression. There are 3,517 observations in the sample from 1987-2007. Indicator for the year and the industry are included but not reported. P-values are in parentheses.
*** Statistically significant at the 0.01 level of significance using a two-tailed t-test.
* Statistically significant at the 0.10 level of significance using a two-tailed t-test.
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 8 The result of regression dividing into two periods

Panel A: The first half of ten years (1987-1996)

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R^2
	(?)	(+)	(+)	(+)	(+)	(−)	(−)	(+)	
GLS	-0.516***	0.008	0.002	-0.001	0.009***	0.019***	0.000	0.070***	0.420
	(0.000)	(0.331)	(0.189)	(0.176)	(0.002)	(0.000)	(0.239)	(0.000)	
OJ	0.136	0.024	-0.004	0.002*	0.027***	-0.004	0.000	0.036***	0.241
	(0.258)	(0.134)	(0.229)	(0.061)	(0.000)	(0.377)	(0.403)	(0.003)	
EP	-0.019	-0.016***	0.000	-0.002***	-0.005**	0.001	0.001***	0.056***	0.519
	(0.632)	(0.002)	(0.979)	(0.000)	(0.019)	(0.448)	(0.000)	(0.000)	
PEG	0.001	0.012*	-0.002*	0.002***	0.012***	0.001	0.000	0.041***	0.447
	(0.984)	(0.089)	(0.072)	(0.000)	(0.000)	(0.654)	(0.173)	(0.000)	
MPEG	-0.012	0.012*	-0.002	0.002***	0.013***	0.001	0.000	0.036***	0.387
	(0.832)	(0.087)	(0.103)	(0.000)	(0.000)	(0.504)	(0.397)	(0.000)	

Panel B: The latter half of eleven years (1997-2007)

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R^2
	(?)	(+)	(+)	(+)	(+)	(−)	(−)	(+)	
GLS	-0.033***	-0.001	0.000***	0.000*	0.005***	0.002***	0.000***	0.025***	0.191
	(0.002)	(0.265)	(0.010)	(0.090)	(0.000)	(0.000)	(0.000)	(0.000)	
OJ	1.468***	0.016	0.014***	-0.001	0.018**	-0.051***	0.001***	-0.104***	0.076
	(0.000)	(0.380)	(0.000)	(0.350)	(0.026)	(0.000)	(0.000)	(0.000)	
EP	0.165***	-0.008***	-0.004***	-0.001***	-0.007***	-0.003***	0.000**	-0.012***	0.099
	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.021)	(0.000)	
PEG	0.170***	0.013***	0.002***	0.001***	0.012***	-0.005***	0.000***	0.018***	0.146
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
MPEG	0.019	0.016***	0.002***	0.001***	0.012***	0.000	0.000***	0.026***	0.122
	(0.404)	(0.000)	(0.000)	(0.000)	(0.000)	(0.714)	(0.001)	(0.000)	

Note:

This table shows the result of regression dividing into two periods. Panel A shows the result of first half of ten years, and Panel B shows the result of last half of eleven years. Indicator for the year and the industry are included but not reported. P-values are in parentheses.

*** Statistically significant at the 0.01 level of significance using a two-tailed t-test.

* Statistically significant at the 0.10 level of significance using a two-tailed t-test.

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 9 The result of regression by year

Panel A: GLS Model

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R2
	（?）	（+）	（+）	（+）	（+）	（−）	（−）	（+）	
1988	-0.339*	-0.024	-0.003	0.037*	0.006*	0.014*	-0.023	0.064***	0.871
	(0.082)	(0.522)	(0.437)	(0.095)	(0.087)	(0.072)	(0.882)	(0.002)	
1989	-0.786***	0.016	0.009	0.025***	0.002	0.028***	-0.011	0.109***	0.656
	(0.000)	(0.397)	(0.136)	(0.006)	(0.737)	(0.000)	(0.896)	(0.000)	
1990	-0.666	-0.028	-0.004	-0.053	0.004	0.029	-0.555	0.118	-0.111
	(0.431)	(0.878)	(0.823)	(0.555)	(0.895)	(0.286)	(0.357)	(0.418)	
1991	-0.908**	-0.097	0.008	0.065	0.030*	0.037**	-0.195	0.053	0.352
	(0.050)	(0.239)	(0.462)	(0.265)	(0.082)	(0.020)	(0.347)	(0.126)	
1992	-0.609***	-0.008	-0.001	0.000	0.019*	0.024***	-0.003	0.045*	0.532
	(0.001)	(0.748)	(0.822)	(0.991)	(0.073)	(0.001)	(0.970)	(0.071)	
1993	-0.619***	0.050	0.000	0.017	-0.001	0.022***	0.137	0.075***	0.377
	(0.002)	(0.125)	(0.938)	(0.140)	(0.921)	(0.004)	(0.197)	(0.000)	
1994	-0.303	0.065**	-0.007	0.000	0.035***	0.010	0.037	0.040**	0.429
	(0.109)	(0.044)	(0.360)	(0.978)	(0.001)	(0.118)	(0.763)	(0.021)	
1995	-0.471	0.047	-0.005	-0.002	0.031*	0.017	-0.033	0.047	0.330
	(0.121)	(0.164)	(0.625)	(0.132)	(0.058)	(0.102)	(0.826)	(0.120)	
1996	-0.270*	0.017	-0.008	0.000	-0.012**	0.010**	-0.108***	0.107***	0.577
	(0.054)	(0.246)	(0.252)	(0.738)	(0.035)	(0.048)	(0.004)	(0.000)	
1997	-0.370***	0.009	-0.003	-0.001*	0.009**	0.014***	-0.022	0.077***	0.455
	(0.001)	(0.485)	(0.267)	(0.081)	(0.049)	(0.001)	(0.584)	(0.000)	
1998	-0.348**	-0.004	0.000	0.000	0.002	0.013**	-0.023	0.065***	0.329
	(0.035)	(0.848)	(0.979)	(0.685)	(0.633)	(0.021)	(0.467)	(0.000)	
1999	-0.383***	-0.018	0.000	0.000	0.009**	0.014***	0.010	0.078***	0.515
	(0.003)	(0.198)	(0.881)	(0.868)	(0.045)	(0.002)	(0.594)	(0.000)	
2000	-0.019	-0.010***	0.000	0.000	0.002**	0.002	0.010	0.021***	0.545
	(0.546)	(0.001)	(0.854)	(0.567)	(0.027)	(0.141)	(0.143)	(0.000)	
2001	0.027	-0.008***	0.000	0.000	0.003***	0.000	0.015**	0.023***	0.233
	(0.299)	(0.006)	(0.509)	(0.446)	(0.005)	(0.920)	(0.041)	(0.000)	
2002	-0.019	-0.009**	0.001	0.000	0.004***	0.001	0.016*	0.024***	0.195
	(0.557)	(0.014)	(0.145)	(0.862)	(0.001)	(0.227)	(0.066)	(0.000)	
2003	-0.010	-0.003	0.000	0.000	0.008***	0.001	-0.006	0.021***	0.216
	(0.722)	(0.284)	(0.678)	(0.291)	(0.000)	(0.277)	(0.327)	(0.000)	
2004	-0.056**	-0.001	0.000	0.000	0.008***	0.003***	0.016***	0.019***	0.167
	(0.029)	(0.684)	(0.453)	(0.294)	(0.000)	(0.002)	(0.002)	(0.000)	
2005	-0.077***	0.001	0.001**	0.000	0.011***	0.003***	0.012**	0.023***	0.205
	(0.002)	(0.763)	(0.024)	(0.290)	(0.000)	(0.000)	(0.015)	(0.000)	
2006	-0.096***	-0.009**	0.001**	0.000	0.010***	0.004***	0.030***	0.023***	0.190
	(0.001)	(0.027)	(0.012)	(0.889)	(0.000)	(0.000)	(0.000)	(0.000)	
2007	-0.053	0.001	0.001	-0.001	0.007**	0.002*	0.031***	0.035***	0.126
	(0.191)	(0.786)	(0.169)	(0.111)	(0.027)	(0.092)	(0.000)	(0.000)	

Table 9 Continued

Panel B: OJ Model

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R2
	（?）	（+）	（+）	（+）	（+）	（−）	（−）	（+）	
1988	-0.002	-0.022	0.002	0.007	0.003	0.002	0.207	0.033	0.545
	(0.994)	(0.741)	(0.738)	(0.821)	(0.545)	(0.891)	(0.580)	(0.147)	
1989	-0.047	-0.005	0.003	0.032***	0.007*	0.002	0.144**	0.044***	0.821
	(0.698)	(0.681)	(0.548)	(0.000)	(0.094)	(0.619)	(0.025)	(0.001)	
1990	0.348	-0.137	-0.046	-0.041	0.075	0.005	-0.558	-0.194	-0.223
	(0.860)	(0.566)	(0.274)	(0.758)	(0.802)	(0.946)	(0.634)	(0.329)	
1991	0.778	-0.074	-0.036*	0.212**	-0.019	-0.023	0.216	0.040	0.113
	(0.331)	(0.611)	(0.064)	(0.037)	(0.494)	(0.380)	(0.536)	(0.503)	
1992	0.363**	0.006	-0.009*	-0.002	0.009	-0.011	-0.086	0.030	0.404
	(0.041)	(0.816)	(0.065)	(0.682)	(0.398)	(0.105)	(0.272)	(0.228)	
1993	-0.205	0.067	0.000	0.038**	0.012	0.007	0.125	0.030	0.200
	(0.444)	(0.170)	(0.989)	(0.017)	(0.418)	(0.469)	(0.382)	(0.221)	
1994	0.359	0.130**	-0.010	-0.003	0.182***	-0.016	0.421**	-0.051*	0.785
	(0.259)	(0.036)	(0.472)	(0.585)	(0.000)	(0.156)	(0.048)	(0.090)	
1995	0.467	0.078	-0.014	-0.001	0.108***	-0.016	0.057	-0.038	0.302
	(0.512)	(0.303)	(0.519)	(0.540)	(0.004)	(0.518)	(0.879)	(0.573)	
1996	0.066	0.028*	-0.002	0.005***	0.012**	-0.003	0.014	0.083***	0.745
	(0.654)	(0.074)	(0.741)	(0.000)	(0.041)	(0.598)	(0.740)	(0.000)	
1997	-0.158	-0.066**	0.029***	0.003**	0.011	0.006	-0.019	0.044	0.341
	(0.472)	(0.025)	(0.000)	(0.015)	(0.298)	(0.415)	(0.821)	(0.133)	
1998	-0.148	-0.011	-0.002	0.001	0.027***	0.006	0.098	0.103***	0.480
	(0.590)	(0.757)	(0.603)	(0.577)	(0.000)	(0.552)	(0.116)	(0.000)	
1999	0.038	0.027	0.007**	-0.002	0.018*	-0.001	-0.019	0.021	0.311
	(0.877)	(0.326)	(0.031)	(0.354)	(0.052)	(0.922)	(0.598)	(0.483)	
2000	-0.150	-0.034**	0.004**	0.000	0.018**	0.007	0.056	0.050***	0.187
	(0.414)	(0.037)	(0.036)	(0.672)	(0.018)	(0.247)	(0.179)	(0.009)	
2001	1.851*	-0.135	0.011	0.002	0.008	-0.061	0.433	-0.173*	0.007
	(0.072)	(0.257)	(0.425)	(0.801)	(0.867)	(0.109)	(0.165)	(0.091)	
2002	2.058*	-0.065	0.014	0.000	0.015	-0.070	0.278	-0.178	0.004
	(0.094)	(0.645)	(0.423)	(0.950)	(0.736)	(0.129)	(0.394)	(0.102)	
2003	6.932**	-0.362	0.066*	0.005	0.046	-0.237**	0.091	-0.711**	0.054
	(0.015)	(0.226)	(0.092)	(0.731)	(0.749)	(0.025)	(0.876)	(0.024)	
2004	0.925	-0.050	0.086***	-0.002	0.073	-0.037	-0.190	-0.063	0.129
	(0.384)	(0.702)	(0.000)	(0.735)	(0.259)	(0.340)	(0.401)	(0.716)	
2005	2.938*	-0.062	0.095**	-0.009	0.114	-0.106*	0.079	-0.200	0.037
	(0.067)	(0.794)	(0.017)	(0.425)	(0.353)	(0.075)	(0.808)	(0.376)	
2006	6.346**	-0.254	0.074*	-0.018	-0.013	-0.218**	-0.074	-0.463	0.047
	(0.012)	(0.452)	(0.085)	(0.422)	(0.947)	(0.015)	(0.891)	(0.278)	
2007	5.390	-0.771*	0.213**	-0.004	-0.026	-0.174	0.594	-0.819	0.047
	(0.154)	(0.087)	(0.014)	(0.935)	(0.938)	(0.190)	(0.430)	(0.159)	

Table 9 Continued

Panel C: EP Ratio

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R2
	（?）	（+）	（+）	（+）	（+）	（−）	（−）	（+）	
1988	-0.087	-0.045	-0.005	0.014	0.002	0.005	-0.014	0.080***	0.927
	(0.621)	(0.273)	(0.179)	(0.492)	(0.511)	(0.448)	(0.931)	(0.001)	
1989	-0.141*	0.017**	0.000	-0.004	0.006***	0.005*	0.001	0.055***	0.854
	(0.056)	(0.037)	(0.868)	(0.311)	(0.010)	(0.054)	(0.967)	(0.000)	
1990	-0.008	-0.001	-0.003	0.010	0.000	0.000	0.199**	0.063***	0.564
	(0.947)	(0.976)	(0.334)	(0.452)	(0.940)	(0.996)	(0.036)	(0.010)	
1991	-0.270**	-0.033	0.007**	-0.013	0.001	0.011***	-0.107**	0.074***	0.904
	(0.021)	(0.114)	(0.017)	(0.346)	(0.842)	(0.007)	(0.045)	(0.000)	
1992	0.116*	-0.006	-0.002	-0.003**	-0.005	-0.004*	0.150***	0.073***	0.851
	(0.088)	(0.509)	(0.319)	(0.041)	(0.176)	(0.079)	(0.000)	(0.000)	
1993	0.111	-0.022*	-0.002	-0.014***	-0.032***	-0.003	0.037	0.042***	0.745
	(0.125)	(0.065)	(0.251)	(0.001)	(0.000)	(0.300)	(0.342)	(0.000)	
1994	0.221**	-0.028*	-0.008**	-0.002	0.000	-0.007**	0.112**	0.046***	0.812
	(0.012)	(0.057)	(0.023)	(0.142)	(0.977)	(0.022)	(0.049)	(0.000)	
1995	-0.016	-0.013	-0.004	-0.003***	0.024**	0.001	0.147	0.017	0.579
	(0.932)	(0.518)	(0.475)	(0.000)	(0.019)	(0.831)	(0.118)	(0.365)	
1996	-0.105	-0.021	0.004	-0.001	-0.032***	0.005	0.021	0.070***	0.488
	(0.422)	(0.137)	(0.554)	(0.208)	(0.000)	(0.334)	(0.541)	(0.000)	
1997	-0.094	0.002	-0.007**	-0.002***	0.002	0.004	0.021	0.044***	0.308
	(0.302)	(0.829)	(0.014)	(0.003)	(0.598)	(0.206)	(0.541)	(0.000)	
1998	-0.259	0.014	-0.005	0.000	-0.041***	0.010	0.027	0.076***	0.369
	(0.436)	(0.710)	(0.402)	(0.992)	(0.000)	(0.408)	(0.670)	(0.003)	
1999	0.112	0.000	-0.009***	-0.001	-0.008	-0.002	-0.005	0.046**	0.247
	(0.589)	(0.998)	(0.001)	(0.351)	(0.262)	(0.735)	(0.859)	(0.038)	
2000	0.061	0.010	0.000	-0.002***	-0.006	-0.002	-0.035	0.023*	0.086
	(0.631)	(0.383)	(0.800)	(0.001)	(0.161)	(0.672)	(0.200)	(0.071)	
2001	0.146*	0.016*	-0.003***	-0.001**	-0.011***	-0.003	-0.046**	-0.014**	0.055
	(0.052)	(0.074)	(0.001)	(0.018)	(0.000)	(0.245)	(0.033)	(0.039)	
2002	0.196**	-0.060***	-0.004***	-0.002***	-0.006*	-0.003	-0.036	-0.017**	0.175
	(0.022)	(0.000)	(0.001)	(0.000)	(0.062)	(0.339)	(0.116)	(0.018)	
2003	0.190***	-0.046***	-0.003***	-0.001***	0.006*	-0.003	-0.037**	-0.028***	0.235
	(0.006)	(0.000)	(0.002)	(0.000)	(0.070)	(0.226)	(0.012)	(0.000)	
2004	0.094**	-0.016***	-0.001	0.000*	-0.003	-0.001	-0.018*	0.001	0.059
	(0.047)	(0.005)	(0.368)	(0.090)	(0.357)	(0.503)	(0.063)	(0.927)	
2005	0.054	-0.002	-0.005***	0.000	-0.006	0.000	-0.012	0.016**	0.056
	(0.323)	(0.846)	(0.001)	(0.757)	(0.132)	(0.985)	(0.288)	(0.045)	
2006	0.135**	0.026***	-0.003***	-0.001	0.010**	-0.004**	-0.005	0.018*	0.054
	(0.025)	(0.001)	(0.004)	(0.257)	(0.034)	(0.045)	(0.710)	(0.083)	
2007	0.286***	0.033***	-0.011***	-0.001**	-0.011***	-0.008***	0.006	-0.013	0.217
	(0.000)	(0.000)	(0.000)	(0.037)	(0.010)	(0.000)	(0.592)	(0.135)	

Table 9 Continued

Panel D: PEG Ratio

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R2
	(?)	(+)	(+)	(+)	(+)	(−)	(−)	(+)	
1988	-0.105	-0.037	0.000	0.006	0.004	0.005	0.248	0.039*	0.684
	(0.650)	(0.508)	(0.929)	(0.827)	(0.344)	(0.564)	(0.426)	(0.056)	
1989	-0.197*	-0.002	0.005	0.029***	0.008**	0.007*	0.184***	0.045***	0.820
	(0.093)	(0.847)	(0.245)	(0.000)	(0.047)	(0.096)	(0.003)	(0.001)	
1990	-0.079	-0.082*	-0.004	0.038	-0.016	0.007	0.103	-0.021	0.626
	(0.686)	(0.092)	(0.426)	(0.133)	(0.730)	(0.255)	(0.444)	(0.549)	
1991	0.064	0.041	-0.005	0.022	-0.021***	-0.003	0.116	0.086***	0.774
	(0.735)	(0.239)	(0.250)	(0.347)	(0.004)	(0.581)	(0.170)	(0.000)	
1992	0.381**	0.046*	-0.014***	-0.001	-0.005	-0.013*	-0.009	0.052**	0.355
	(0.036)	(0.084)	(0.002)	(0.769)	(0.624)	(0.056)	(0.923)	(0.041)	
1993	-0.100	0.038	0.003	0.029***	0.010	0.003	-0.053	0.029**	0.429
	(0.507)	(0.144)	(0.589)	(0.001)	(0.225)	(0.530)	(0.517)	(0.041)	
1994	-0.116	0.012	0.008*	0.000	0.049***	0.004	-0.006	0.014	0.781
	(0.225)	(0.455)	(0.059)	(0.959)	(0.000)	(0.183)	(0.920)	(0.122)	
1995	0.125	0.014	0.001	0.000	0.029***	-0.005	0.066	0.050***	0.835
	(0.387)	(0.349)	(0.843)	(0.452)	(0.000)	(0.354)	(0.388)	(0.001)	
1996	0.008	0.017	-0.007	0.004***	0.011*	0.000	0.021	0.075***	0.706
	(0.953)	(0.243)	(0.321)	(0.000)	(0.056)	(0.965)	(0.595)	(0.000)	
1997	-0.139	-0.044**	0.015***	0.003***	0.009	0.006	0.001	0.030*	0.299
	(0.330)	(0.014)	(0.000)	(0.001)	(0.136)	(0.216)	(0.989)	(0.084)	
1998	0.037	-0.002	-0.002	0.001	0.020***	-0.001	0.053	0.059***	0.409
	(0.861)	(0.951)	(0.555)	(0.595)	(0.001)	(0.921)	(0.288)	(0.000)	
1999	-0.014	0.022	0.005*	-0.001	0.020***	0.001	-0.020	0.018	0.390
	(0.945)	(0.311)	(0.054)	(0.429)	(0.004)	(0.898)	(0.485)	(0.412)	
2000	0.065	-0.028**	0.001	0.000	0.004	0.001	0.016	0.023	0.092
	(0.667)	(0.042)	(0.613)	(0.886)	(0.369)	(0.904)	(0.633)	(0.118)	
2001	0.133**	0.010	0.002**	0.000	0.010***	-0.003	0.023	0.011*	0.067
	(0.029)	(0.149)	(0.040)	(0.309)	(0.000)	(0.170)	(0.222)	(0.078)	
2002	0.156**	0.040***	0.003***	0.001***	0.014***	-0.005**	0.057***	0.021***	0.276
	(0.011)	(0.000)	(0.002)	(0.004)	(0.000)	(0.016)	(0.001)	(0.000)	
2003	0.143**	0.018***	0.001	0.001**	0.007**	-0.004	0.019	0.017**	0.104
	(0.021)	(0.006)	(0.216)	(0.019)	(0.019)	(0.113)	(0.138)	(0.012)	
2004	0.148***	0.004	-0.001	0.000	0.009***	-0.003*	0.037***	0.004	0.068
	(0.003)	(0.499)	(0.133)	(0.252)	(0.002)	(0.082)	(0.000)	(0.604)	
2005	0.190***	0.012	0.004**	0.000	0.015***	-0.006**	0.024*	0.029***	0.078
	(0.006)	(0.260)	(0.030)	(0.873)	(0.006)	(0.031)	(0.097)	(0.005)	
2006	0.143***	-0.006	0.005***	0.002***	0.012***	-0.003**	0.001	0.002	0.285
	(0.001)	(0.283)	(0.000)	(0.000)	(0.001)	(0.045)	(0.916)	(0.814)	
2007	0.128***	-0.001	0.006***	0.001*	0.015***	-0.003**	0.019*	0.033***	0.291
	(0.007)	(0.830)	(0.000)	(0.074)	(0.000)	(0.038)	(0.054)	(0.000)	

Table 9 Continued

Panel E: Modified PEG Ratio

	Intercept	Beta	Unsyst	Earnvar	Leverage	Size	LTG	BM	adj.R2
	（?）	（+）	（+）	（+）	（+）	（−）	（−）	（+）	
1988	-0.113	-0.035	0.001	0.005	0.003	0.006	0.231	0.035*	0.608
	(0.613)	(0.517)	(0.902)	(0.850)	(0.418)	(0.527)	(0.438)	(0.068)	
1989	-0.159	-0.001	0.004	0.028***	0.007*	0.006	0.163***	0.035***	0.825
	(0.117)	(0.897)	(0.261)	(0.000)	(0.055)	(0.109)	(0.002)	(0.002)	
1990	-0.116	-0.078	-0.004	0.039	-0.013	0.008	0.106	-0.026	0.611
	(0.575)	(0.121)	(0.425)	(0.139)	(0.790)	(0.209)	(0.452)	(0.480)	
1991	0.058	0.047	-0.006	0.028	-0.024***	-0.003	0.125	0.085***	0.737
	(0.765)	(0.194)	(0.179)	(0.238)	(0.002)	(0.594)	(0.154)	(0.000)	
1992	0.333*	0.049*	-0.014***	-0.001	-0.006	-0.011*	-0.013	0.050**	0.330
	(0.062)	(0.064)	(0.001)	(0.848)	(0.551)	(0.092)	(0.879)	(0.046)	
1993	-0.145	0.040	0.003	0.029***	0.012	0.005	-0.050	0.026*	0.414
	(0.348)	(0.140)	(0.584)	(0.002)	(0.186)	(0.368)	(0.547)	(0.078)	
1994	-0.053	0.025	0.012**	-0.001	0.061***	0.001	0.038	0.004	0.719
	(0.691)	(0.274)	(0.038)	(0.510)	(0.000)	(0.776)	(0.664)	(0.780)	
1995	0.042	0.016	0.002	0.000	0.044***	-0.002	0.052	0.043***	0.866
	(0.773)	(0.305)	(0.656)	(0.755)	(0.000)	(0.732)	(0.501)	(0.004)	
1996	-0.040	0.014	-0.007	0.004***	0.013**	0.002	0.008	0.058***	0.686
	(0.758)	(0.314)	(0.290)	(0.000)	(0.016)	(0.670)	(0.816)	(0.000)	
1997	-0.174	-0.046**	0.019***	0.003***	0.007	0.007	-0.010	0.022	0.278
	(0.273)	(0.019)	(0.000)	(0.002)	(0.252)	(0.190)	(0.873)	(0.237)	
1998	-0.053	-0.009	-0.002	0.001	0.025***	0.002	0.059	0.065***	0.375
	(0.830)	(0.794)	(0.661)	(0.577)	(0.000)	(0.776)	(0.315)	(0.001)	
1999	0.005	0.027	0.006**	-0.001	0.019***	0.000	-0.022	-0.003	0.326
	(0.982)	(0.233)	(0.032)	(0.410)	(0.010)	(0.963)	(0.455)	(0.901)	
2000	0.107	-0.018	0.000	0.003***	0.003	-0.001	0.004	0.028	0.113
	(0.555)	(0.268)	(0.993)	(0.007)	(0.585)	(0.874)	(0.913)	(0.114)	
2001	0.013	0.017**	0.001	0.000	0.012***	0.001	0.018	0.015**	0.064
	(0.848)	(0.031)	(0.149)	(0.236)	(0.000)	(0.689)	(0.371)	(0.020)	
2002	-0.004	0.044***	0.004***	0.001***	0.014***	0.000	0.043**	0.032***	0.269
	(0.959)	(0.000)	(0.000)	(0.003)	(0.000)	(0.868)	(0.023)	(0.000)	
2003	-0.041	0.023***	0.001	0.001***	0.005	0.003	0.011	0.025***	0.100
	(0.555)	(0.002)	(0.334)	(0.004)	(0.113)	(0.289)	(0.442)	(0.001)	
2004	-0.044	0.005	-0.002*	0.000	0.009**	0.004*	0.042***	0.011	0.086
	(0.448)	(0.475)	(0.075)	(0.256)	(0.015)	(0.072)	(0.001)	(0.231)	
2005	0.095	0.018	0.003	0.000	0.015**	-0.003	0.017	0.033***	0.042
	(0.250)	(0.133)	(0.101)	(0.631)	(0.020)	(0.407)	(0.316)	(0.006)	
2006	-0.010	0.003	0.004***	0.002***	0.010**	0.002	-0.009	0.002	0.116
	(0.858)	(0.684)	(0.000)	(0.000)	(0.018)	(0.290)	(0.479)	(0.837)	
2007	-0.009	0.015*	0.007***	0.002*	0.021***	0.000	0.037***	0.043***	0.186
	(0.901)	(0.088)	(0.000)	(0.091)	(0.001)	(0.922)	(0.009)	(0.000)	

Note:

This table shows the result of the regression by year. Panel A shows the result of the regression on GLS. From Panel B to E shows the result of OJ, EP, PEG, and MPEG, respectively. P-values are in parentheses.

*** 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 0.10 level of significance using a two-tailed t-test.

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