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Implied Cost of Capital Estimation: Evidence from the Stock Exchange of Thailand

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ABSTRACT

Cost of capital is very important in firm valuation. It represents financial cost that each firm needs to pay back to supplier of fund, in other words, expected return from investment. Since the ex-ante cost of capital is unobservable, it has to be estimated through other reliable proxies. Recent studies propose the implied cost of capital (ICC) as an alternative method for the estimation of expected returns. ICC could be estimated by several methods which vary in calculation, timing, and assumption. In the context of the Stock Exchange of Thailand, there is limited evidence in the application of ICC leading to research question that which estimation methods is the best measurement of ICC.

Empirically, five commonly used ICC estimates are compared. Our analysis is based on a sample of companies listed on the Stock Exchange of Thailand (SET) from 2009 to 2013. Specifically, for each year, the earnings are estimated from the pooled cross-sectional regression approach using previous ten years of data. The forecast horizons comprise one- to five- years ahead earnings. We find that the Ohlson and Juettner-Nauroth (OJ, 2005) model outperforms another ICC estimates because it captures a persistent component of expected returns and maintains strong predictive power across forecast horizons.

Keywords: Cost of Capital, Implied Cost of Capital, Cross-sectional model

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การประมาณการต้นทุนเงินทุนโดยนัย : หลักฐานจากตลาดหลักทรัพย์แห่งประเทศไทย

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บทคัดย่อ

ต้นทุนเงินทุนมีความสำคัญอย่างมากต่อการประเมินมูลค่าบริษัท ต้นทุนเงินทุนคือต้นทุนสำหรับกิจการที่ต้องจ่ายผลประโยชน์ให้กับเจ้าของเงินทุนเพื่อตอบแทนการได้เงินทุนมาใช้ในกิจการ ต้นทุนเงินทุนถือเป็นผลตอบแทนสำหรับเจ้าของเงินทุน ต้นทุนเงินทุนเป็นค่าที่ไม่สามารถสังเกตได้โดยตรงจึงต้องคำนวณผ่านตัวแปรอื่น ซึ่งหนึ่งในนั้นคือต้นทุนเงินทุนโดยนัย ต้นทุนเงินทุนโดยนัยสามารถประมาณการได้หลายวิธี แตกต่างกันด้วยวิธีการคำนวณ ระยะเวลาและสมมติฐาน จึงเกิดคำถามที่ว่าวิธีการใดสามารถประยุกต์ได้กับบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทยซึ่งเป็นที่มาของงานวิจัยนี้

การศึกษานี้ทำการประมาณการต้นทุนเงินทุนโดยนัยโดยอ้างอิงจากแบบจำลองการพยากรณ์ทั้งหมด 5 วิธี ด้วยการพยากรณ์กำไรจากแบบจำลองการพยากรณ์ภาคตัดขวางซึ่งคำนวณจากข้อมูลในอดีตของตัวแปรอิสระ 10 ปีก่อนหน้าและข้อมูลตัวแปรตามคือกำไรที่เกิดขึ้นจริง 5 ปีข้างหน้าโดยทดสอบกับหลักทรัพย์ในตลาดหลักทรัพย์แห่งประเทศไทยช่วงปี พ.ศ. 2552-2556 ผลการศึกษาพบว่าวิธีการของ Ohlson and Juettner-Nauroth (2005) สามารถใช้เป็นตัวแทนเพื่อคาดการณ์ผลตอบแทนที่เกิดขึ้นจริงในอนาคตได้ดีที่สุด เมื่อเปรียบเทียบกับแบบจำลองอื่น ๆ โดยแบบจำลองดังกล่าวมีความสามารถในการคาดการณ์ผลตอบแทนที่เกิดขึ้นจริงในอนาคตและเป็นตัวแทนที่ดีในการพยากรณ์ต้นทุนเงินทุนในอนาคต

คำสำคัญ: ต้นทุนเงินทุน ต้นทุนเงินทุนโดยนัย แบบจำลองการพยากรณ์ภาคตัดขวาง

1. Introduction

Cost of capital is financial cost that a firm has to pay the provider of capital in order to fund its operations. Since the ex-ante cost of capital is unobservable, it has to be estimated through other reliable proxies. The majority of prior studies applied ex-post realized returns to measure ex-ante expected returns. However, a number of researchers argued that realized return is an inappropriate proxy. Elton (1999) finds weak correlation between average realized returns and expected returns. Fama and French (1997) point out that cost of equity estimated from realized returns is imprecise for both the Capital Asset Pricing Model (CAPM) and the three-factor model of Fama and French (1993) due to uncertainty of risk premiums and loadings of risk factors. Limitations of the use of realized returns for equity valuation lead to demand for alternative approach to estimate cost of capital. Consequently, recent studies propose the implied cost of capital (ICC) as an alternative method for the estimation of expected returns.

The use of implied cost of capital (ICC) as the estimator of unobservable cost of capital has received increasing attention in the capital markets research over the last decade. Academics in accounting and finance have developed several valuation model of the ICC. ICC can be explained as the internal rate of return that equates current stock price to the present value of expected future cash flows. ICC plays an important role in investment and portfolio management such as investment planning, financial performance evaluation, risk management, and investment analysis. ICC is found to be more reliable estimators because it derives expected returns directly from stock price and expected future cash flows. In addition, ICC does not depend on noisy realized returns or any specific asset pricing model (Hou, Dijk, & Zhang, 2012).

There have been an increasing number of studies in accounting and finance that apply the ICC as a proxy for the expected returns. However, majority of prior empirical studies of ICC are U.S. based studies. A number of previous studies in U.S. companies have verified that earning based valuation models of ICC are the reliability estimators of the ex-ante cost of capital, however, it remains uncertain that ICC measures would still be applicable for non-U.S. companies. In the case of Thailand, there has been no prior empirical study on the earning based valuation models of ICC. The results from this study will be beneficial for both practitioners and academics in choosing reliable proxy for the cost of capital estimation.

The remainder of the paper proceeds as follows. In section 2, we review the related literature and describe commonly approaches to calculate ICC. Criteria for evaluating the quality of the ICC are presented in section 3. Section 4 describes our research design, variables, and methodology. Following this, empirical results are presented in section 5. The last section concludes the article.

Literature Review

2.1 The Implied Cost of Capital Estimation

The implied cost of capital (ICC) could be estimated by several valuation models which vary in forecasting methods, forecasting horizon, and underlying assumptions. Although several valuation models have been constructed, there are arguments in pros and cons of each model and a lack of consensus on the most reliable valuation technique. The commonly used models are based on a residual-income model (e.g. Ohlson, 1995; Claus & Thomas, 2001; Gebhardt et al. 2001) and abnormal-earning growth model (e.g. Easton, 2004; Ohlson & Juettner-Nauroth, 2005; Botosan et al. 2011).

In order to investigate the reliability of ICC, this study applies the the residual income valuation by Claus and Thomas (CT, 2001), two models based on abnormal growth in earnings by Ohlson and Juettner-Nauroth (OJ, 2005) and Easton (modified price-earnings growth, MPEG, 2004), Gordon growth model based on Gordon and Gordon (1997), and equal-weighted average of the four ICC estimates.

2.2 The Residual Income Valuation Model

Ohlson (1995) develops model to estimate equity value in terms of book value of equity and the present value of expected future residual income by imposing clean surplus relation on the dividend discount model. The dividend discount Model, residual income valuation model, and the abnormal earnings growth model are, theoretically, per definition equal and yield identical results for the ICC (in the case of the residual income valuation, only if the clean surplus relation applies).

This study follows the methodology of Claus and Thomas (CT, 2001) for estimation of a firm's expected rate of returns from the residual income valuation model with a five-year detailed plan horizon. Earnings forecasts for the future 4th and 5th years are derived from earnings forecasts for the 3rd year along with the long-term earnings growth rate. Book value of equity is calculated in accordance with clean surplus relation indicates that the change in book value of equity between two dates is equal to comprehensive income minus dividends.

CT: Claus and Thomas (2001)

$$M_t = B_t + \sum_{k=1}^{5} \frac{E_t[(ROE_{t+k} - R) \times B_{t+k-1}]}{1 + R^k} + \frac{E_t[(ROE_{t+5} - R) \times B_{t+4}](1+g)}{(R-g) \times (1+R)^5}$$

where

B_{t+k} = $B_{t+k-1} + E_{t+k} - D_{t+k}$

M_t = market value of equity in year t

R = Implied Cost of Capital (ICC)

B_t = book value of equity

ROE_{t+k} = earnings forecast in year $t+k$ divided by B_{t+k}

E_{t+k} = earnings in year $t+k$

D_{t+k} = dividend in year $t+k$ computed using the current dividend payout ratio for firm with positive earnings and using $\frac{\text{current dividend}}{0.06 \times \text{total assets}}$ for firms with negative earnings

g = current risk-free rate minus 3%

2.3 The Abnormal Growth in Earnings Valuation

Beginning with the work of Easton (2004) the abnormal earnings growth model based on a two-year time horizon has been applied by a broad range of researchers (Botosan, Plumlee, & Wen, 2011; Guay, Kothari, & Shu, 2011; Hail & Leuz, 2006). Based on the premise of capitalized one-year-ahead earnings, abnormal earning growth models capitalize next year forecasted earnings by estimating the present value of the abnormal growth. A standard model is as follow:

$$P_t = \frac{eps_{t+1}}{r_E} + \sum_{i=2}^{T} \frac{agr_{t+i}}{(1+r_E)^{i-1} \times r_E} + \frac{agr_{t+T} \times (1+g_{agr})}{(r_E - g_{agr})(1+r_E)^{T-1} \times r_E}$$

$$agr_t = [eps_t + r_E \times dps_{t-1} - (1-r_E) \times eps_{t-1}]$$

where

agr_t = abnormal earnings growth in year t

P_t = current stock price in year t

eps_t = earnings in year t

r_E = Implied Cost of Capital (ICC)

dps_t = dividends in year t

g_{agr} = growth rate of the abnormal earnings

We apply two models based on abnormal growth in earnings valuation following Ohlson and Juettner-Nauroth (2005) and Easton (2004).

1) The OJ Model: Ohlson and Juettner-Nauroth (2005)

The OJ model (Ohlson & Juettner-Nauroth, 2005) is similar to the residual income valuation (RIV) model in the principle that the firm equity value is determined by the present value of expected dividends per share. A number of prior studies conclude that the OJ model is more reliable than the RIV model because the valuation does not require the clean surplus relation which accounting earning construct often violates this assumption (Chen et al., 2004). Accounting conservatism and financial reporting standards resulted in biased estimates from the RIV model is also pointed out in studies by Skogsvik and Juettner-Nauroth (2009). The OJ model, on the contrary, seems to be advantageous in that it replaces book value in the estimation with capitalized next-period earnings and only require subsequent abnormal earnings growth to determine a firm's value.

The procedures introduce by Gode and Mohanram (2003) are applied in this model, an estimate of short-term growth (g) is derived from the average of forecasted near-term growth and five-year growth.

$$R = A + \sqrt{A^2 + \frac{E_t\,[E_{t+1}]}{M_t} \times (g - (\gamma - 1))}$$

where

A = $0.5\left((\gamma - 1) + \frac{E_t\,[D_{t+1}]}{M_t}\right)$

g = $0.5\left(\frac{E_t\,[E_{t+3}] - E_t\,[E_{t+2}]}{E_t\,[E_{t+2}]} + \frac{E_t\,[E_{t+5}] - E_t\,[E_{t+4}]}{E_t\,[E_{t+4}]}\right)$

M_t = market value of equity in year t

R = Implied Cost of Capital (ICC)

E_{t+1} = earnings in year t+1

D_{t+1} = dividend in year t+1 computed using the current dividend payout ratio for firm with positive earnings and using $\frac{\text{current dividend}}{0.06 \times \text{total assets}}$ for firms with negative earnings

g = short-term growth rate

γ = current period's risk-free rate minus 3%

2) MPEG: Easton (2004)

Easton (2004) proposes Price-Earnings-Growth (PEG) and MPEG (Modified PEG) models for short-term (one and two year) earnings forecasts. PEG ratio is reduced in the standard abnormal growth illustrated by Easton (2004) in the special case where $t = 2$, and change in growth rate (g_{agr}) = 0. MPEG ratio is computed under the additional assumption that $D_{t+1} = 0$.

$$M_t = \frac{E_t\,[E_{t+2}] + R \times E_t[D_{t+1}] - E_t[E_{t+1}]}{R^2}$$

where

Mt = market value of equity in year t

R = Implied Cost of Capital (ICC)

E_t [ ] = denotes market expectations based on information available in year t

E_{t+1} = earnings in year $t + 1$

E_{t+2} = earnings in year $t + 2$

D_{t+1} = dividend in year t+1 computed using the current dividend payout ratio for firm with positive earnings and using $\frac{\text{current dividend}}{0.06 \times \text{total assets}}$ for firms with negative earnings

2.4 The Gordon Growth Model

Based on the work of Gordon and Gordon (1997), firm value is defined as the present value of expected dividends, whereby the terminal period dividend is assumed to be the capitalized earnings in the last period. Future earnings forecasts are based on Hou et al. (2012) regressions, and forecasted dividends are derived from historical dividend payout ratio.The Gordon Growth model (case of the finite-horizon version of the Gordon Growth Model) is as followed:

$$M_t = \frac{E_t\,[E_{t+1}]}{R}$$

where

M_t = market value of equity in year t

R = Implied Cost of Capital (ICC)

E_t [ ] = denotes market expectations based on information available in year t

E_{t+1} = earnings in year $t + 1$

2.5 The Cross-sectional Earnings Model

Recent accounting and finance studies (Fama & French, 2000, 2006; Hou et al., 2012) develop cross-sectional regression techniques to generate earnings forecasts. Hou et al. (2012) demonstrate a substantial amount of the variation in earnings performance captured by a pooled cross-sectional earnings model. They find that the ICC estimates by the cross-sectional model is more reliable than the ICC derived from analyst-based model. In addition, the use of cross-sectional earnings model allows larger possible sample because it does not rely on analyst earnings forecasts which could also avoid forecast biases. Using model-based approach allows several years of earnings forecasts. To estimate future earnings for all ICC measures in this study, we apply the cross-sectional regression technique introduced by Hou et al. (2012):

$$E_{i,t+\tau} = \alpha_0 + \alpha_1 A_{i,t} + \alpha_2 D_{i,t} + \alpha_3 DD_{i,t} + \alpha_4 E_{i,t} + \alpha_5 NegE_{i,t} + \alpha_6 AC_{i,t} + \varepsilon_{i,t+\tau}$$

where

$E_{i,t+\tau}$ = earnings of firm i in year $t+\tau$ ($\tau = 1$ to 5)

$A_{i,t}$ = total assets of firm i in year t

$D_{i,t}$ = dividend payment of firm i in year t

$DD_{i,t}$ = dummy variable that equals 1 for dividend payers, and equals 0 for non-payers

$E_{i,t}$ = earnings of firm i in year t

$NegE_{i,t}$ = dummy variable that equals 1 for companies with negative earnings, and equals 0 otherwise

$AC_{i,t}$ = accruals of firm i in year t

3. Hypotheses Development

Lee, So, and Wang (2010) propose a two-dimensional scheme for evaluating the quality of the ICC comprising predictability power for returns and tracking ability. Under fairly general assumptions, high-quality ICC estimates should exhibit both characteristics.

3.1 Predictability Power for Returns

Under predictability assumption, expected returns and realized returns should be positively correlated in order to show how well ICC estimates predict future stock returns. Predictability power could be explained by following equation:

$$F_{t+\tau} = \beta_0 + \beta_1 ICC_t + \varepsilon_{t+\tau}, \tau \in \{1,2,3\}$$

where

$F_{t+\tau}$ = actual returns in year $t+\tau$

ICC_t = Implied cost of capital in year t

Hypothesis 1: Predictive Power for Returns

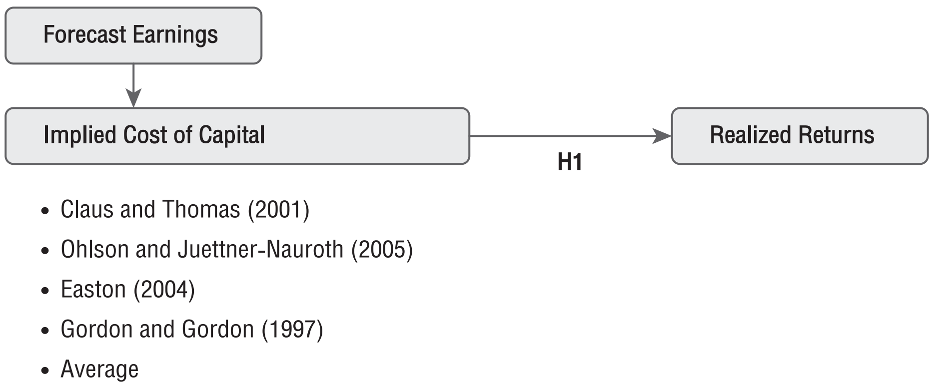

Figure 1 Predictive Power

3.2 Tracking Ability

Under the assumption that investors are also interested in how well today's ICC estimates predict future ICC estimates, good ICC estimates should track themselves over time. According to Lee et al. (2010), the cross-sectional relation between this period's expected returns and future expected returns could be explained by following equation:

$$(ICC_{i,t+\tau} - rf_{t+\tau}) = \beta_0 + \beta_1(ICC_{i,t} - rf_t) + \varepsilon_t, \tau \in \{1,2,3\}$$

where

$ICC_{i,t+\tau}$ = Implied cost of capital in year $t+\tau$

$ICC_{i,t}$ = Implied cost of capital in year t

rf_t = risk-free rate in year t

The value closer to 1 of β_1 represents the better tracking ability of ICC estimates, leading to the second hypothesis:

Hypothesis 2: Tracking Ability

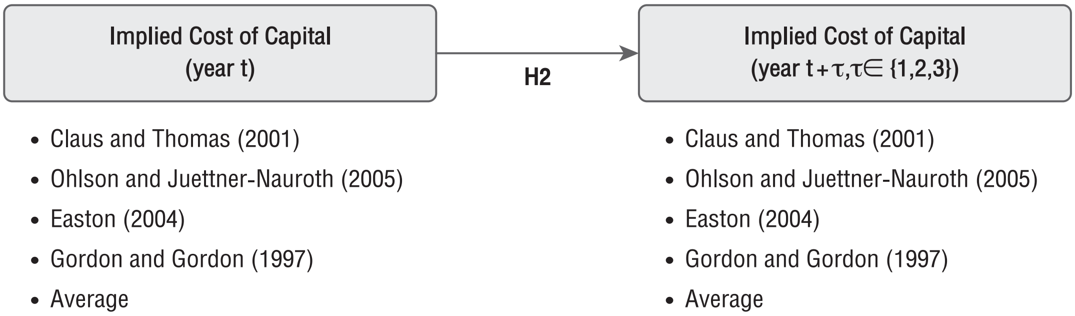

Figure 2 Tracking Ability

4. Research Design and Variable Measurement

4.1 Data and Sample Selection

Our empirical analysis is based on a sample of companies listed on the Stock Exchange of Thailand (SET) from 2009 to 2013. We obtain annual accounting and stock returns data from the SET Market Analysis and Reporting Tool (SET Smart) database and market-related data from Bloomberg. To be included in the sample, each firm-year observation must have the information on stock price, share outstanding, book values, earnings, and dividends disclosed publicly. Previous ten years of accounting data are required for cross-sectional earning forecasts base on Hou et al. (2012). Companies in financial industry group and property fund & real estate investment trusts sector are excluded from the sample due to difference in financial reporting standards and specific regulations. The final sample consists of 792 firm-year observations from 175 firms. One-Year Treasury Bill Index (TBD1Y Index) is used as a proxy for the risk-free rate. The core inflation rate is obtained from the Office of Policy and Strategic Trade, Ministry of Commerce.

4.2 Research Design

4.2.1 Earnings forecast from cross-sectional forecasting model

Following Hou et al. (2012) explained in section 2.5, the earnings forecast is derived from the cross sectional forecasting model. Specifically, for each year between 2009–2013, the earnings are estimated from pooled cross-sectional regressions using previous ten years of data. The regression is as follows:

$$E_{i,t+\tau} = \alpha_0 + \alpha_1 A_{i,t} + \alpha_2 D_{i,t} + \alpha_3 DD_{i,t} + \alpha_4 E_{i,t} + \alpha_5 NegE_{i,t} + \alpha_6 AC_{i,t} + \varepsilon_{i,t+\tau} \quad (1)$$

where

$E_{i,t+\tau}$ = earnings of firm i in year $t+\tau$ ($\tau = 1$ to 5)

$A_{i,t}$ = total assets of firm i in year t

$D_{i,t}$ = dividend payment of firm i in year t

$DD_{i,t}$ = dummy variable that equals 1 for dividend payers, and equals 0 for non-payers

$E_{i,t}$ = earnings of firm i in year t

$NegE_{i,t}$ = dummy variable that equals 1 for companies with negative earnings, and equals 0 otherwise

$AC_{i,t}$ = accruals of firm i in year t

Accruals computed from

$$\frac{(\Delta\text{current assets} - \Delta\text{cash}) - (\Delta\text{current liabilities} - \Delta\text{short-term debts} - \Delta\text{taxes payable}) - \text{depreciation}}{\text{Total assets}}$$

Remarks: To avoid the effect of outliers, regressors in each year are winsorized at 0.5% and 99.5%.

4.2.2 Implied cost of capital estimation

As explained earlier in section 2, the ICC estimation in this study is based on five valuation methods (Table 1). The earnings forecasts from the cross-sectional model are discounted by the ICC, i.e., the expected returns, and compared with stock price at the end of accounting period.

Table 1 Implied cost of capital estimates

ICC	Source	Formula
CT	Claus and Thomas (2001)	$M_t = B_t + \sum_{k=1}^{5} \frac{E_t[(ROE_{t+k} - R) \times B_{t+k-1}]}{1+R^k} + \frac{E_t[(ROE_{t+5} - R) \times B_{t+4}](1+g)}{(R-g) \times (1+R)^5}$ (2)
OJ	Ohlson and Juettner-Nauroth (2005)	$R = A + \sqrt{A^2 + \frac{E_t[E_{t+1}]}{M_t} \times (g - (\gamma - 1))}$ (3) where $A = 0.5\left((\gamma - 1) + \frac{E_t[D_{t+1}]}{M_t}\right)$ $g = 0.5\left(\frac{E_t[E_{t+3}] - E_t[E_{t+2}]}{E_t[E_{t+2}]} + \frac{E_t[E_{t+5}] - E_t[E_{t+4}]}{E_t[E_{t+4}]}\right)$

Table 1 Implied cost of capital estimates (Cont.)

ICC	Source	Formula	
MPEG	Easton (2004)	$M_t = \dfrac{E_t[E_{t+2}] + R \times E_t[D_{t+1}] - E_t[E_{t+1}]}{R^2}$	(4)
Gordon	Gordon and Gordon (1997)	$M_t = \dfrac{E_t[E_{t+1}]}{R}$	(5)
Average	Equal-weighted average of CT, OJ, MPEG, Gordon	$R_A = \dfrac{R_{CT} + R_{OJ} + R_{MPEG} + R_{GORDON}}{4}$	(6)

Earnings forecasts from the cross-sectional model in section 4.2.1 are used for calculation of the five ICC estimates (equation (2) to (6)). The estimation procedure is explained in Figure 3.

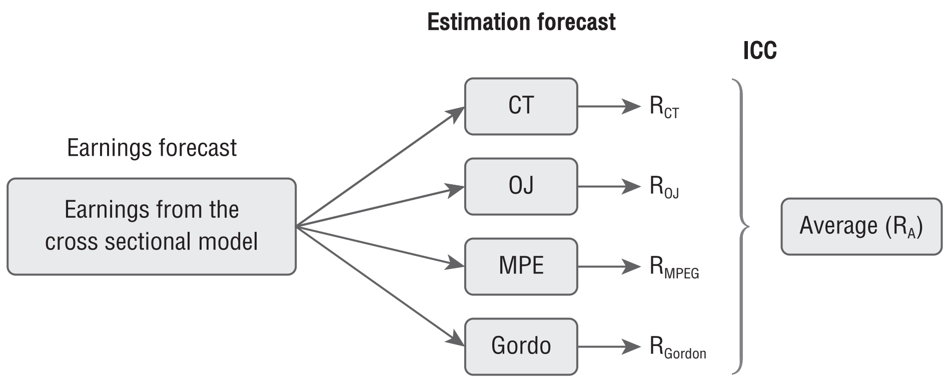

Figure 3 ICC estimation procedure

4.2.3 Evaluating the efficiency of each estimation method

The efficiency of each ICC estimations is evaluated by ranking the ICC derived from each model into equal-weighted decile portfolio. In order to evaluate predictive power, the Ordinary Least Square regression of the ICC from each model as dependent variable and realized returns as independent variables is performed. A positive correlation between the ICC and realized returns indicates that measurement errors are small.

The second criteria in evaluating the efficiency of the ICC estimations, the tracking ability, is examined through the relationship between this period's expected returns and future expected returns as mentioned earlier in section 3.2. The good ICC estimations must encompass both predictive power and tracking ability.

5. Empirical Results

5.1 Descriptive Statistics

Table 2 presents descriptive statistics of variables included in earnings estimation from cross-sectional models. The time-series averages of the cross-sectional mean, median, standard deviation, and select percentiles are presented.

Table 2 Descriptive statistics of variables

Variable	Description	Mean	1%	25%	Median	75%	99%	SD
E	Earnings	1.86	–3.78	0.05	0.23	1.06	43.94	7.76
A	Total Assets	29.00	0.20	2.12	5.71	18.20	478.42	111.85
D	Dividend Payment	1.03	0.00	0.01	0.11	0.51	27.22	3.98
AC	Accruals (Unit: Million Thai Baht)	–0.40	–31.65	–0.49	–0.05	0.26	10.73	5.19

Table 3 reports the average regression coefficients and their time series t-statistics from annual pooled regressions of one-year-ahead through three-year-ahead earnings on a set of variables hypothesized to capture differences in expected earnings across companies. Specifically, for each year from 2009–2013, the earnings are estimated from the pooled cross-sectional regression using previous ten years of data. The independent variables of the pooled regressions are total assets (A), dividend payment (D), dummy variable for dividend payers (DD, equals 1 for dividend payers and 0 otherwise), earnings (E), dummy variable for negative earnings (Neg E, equals 1 for companies with negative earnings, and 0 otherwise), and accruals (AC).

The average coefficients for all of independent variables show the same sign across forecast horizons. Earnings and total assets are significantly positively related to future earnings. Companies with higher dividend payouts and lower accruals are inclined to have higher future earnings. The coefficients of both dividend payers and negative earnings dummy are positive but not significant for all three horizons. It can be seen that the model captures a substantial part of the variation in future earnings performance with average Adjusted R^2 of 74%, 71%, and 69% for the one, two, and three-year ahead forecasts, respectively.

Table 3 Coefficient estimates of the cross-sectional earnings model

LHS		Intercept	A	D	DD	E	Neg E	AC	Adj.R^2
t+1	Coefficient	–99428.78	0.03	0.12	74452.64	0.50	80983.31	–0.14	0.74
	t-stat	(–0.70)	(14.16)	(2.35)	(0.46)	(17.40)	(0.44)	(–10.38)	
t+2	Coefficient	–79696.01	0.03	0.16	77920.14	0.54	102243.30	–0.12	0.71
	t-stat	(–0.54)	(11.65)	(2.81)	(0.43)	(17.12)	(0.52)	(–8.93)	
t+3	Coefficient	–2904.00	0.03	0.26	40424.43	0.49	29889.02	–0.11	0.69
	t-stat	(–0.20)	(10.40)	(4.12)	(0.28)	(15.53)	(0.27)	(-8.26)	

Table 4 presents the Pearson correlations between five ICC measures derived from five valuation models: CT (Claus & Thomas, 2001), OJ (Ohlson & Juettner-Nauroth, 2005), MPEG (Easton, 2004), Gordon (Gordon & Gordon, 1997), Average (equal-weighted average of the four valuation models). The five ICC measures are not found to be correlated with each other, except for the correlation between MPEG and the average ICC, where the correlation is at the highest of 0.88.

Table 4 Correlation between ICC Measures

	CT	OJ	MPEG	Gordon	Average
CT	1.00				
OJ	–0.03	1.00			
MPEG	–0.03	0.11	1.00		
Gordon	0.57	–0.09	–0.01	1.00	
Average	–0.03	0.54	0.88***	–0.02	1.00

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.2 Inferential Statistics

5.2.1 Predictability Power for Returns

Table 5 reports predictability power for returns of each ICC model measured by regressions of the ICC on realized returns. Among the five ICC valuation models, only OJ model has significant predictive power for one-year-ahead returns. OJ model exhibits the highest level of predictive power for future returns for all three horizons, followed by MPEG and Gordon model which fail to be significant in one-year ahead returns but showing predictive power for two- and three- years ahead returns. The evidence of earnings predictability is much weaker for CT and Average models.

Table 5 Predictability Power for Returns of each ICC Model

Model	CT			OJ			MPEG			Gordon			Average		
Year	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3
2009	–1.53	2.04*	1.17	–0.79	0.76	1.16***	–0.39	0.28	2.01***	–1.80	0.57	2.33*	0.54	3.43	2.50
2010	–0.35	2.82	–0.66	2.25*	3.44	1.79**	0.22	4.48***	–1.44	3.85	5.00	1.41	0.54	3.63**	1.47
2011	–0.28	1.39	1.34	7.52*	3.42***	–3.06*	2.92	–2.92**	0.07	2.67	2.41***	–2.76*	3.43	1.00	–1.04
2012	–0.21	–1.19	–0.03	0.53	–0.80	–0.30	0.89	0.33	–0.16	0.13	–1.49	1.91	0.21	–0.69	1.23
2013	–0.49	0.26	–0.39	1.42	–0.28	–0.35	–0.14	0.66	–0.78*	–0.48	0.30	–0.29	–0.13	0.28	-0.01

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.2.2 Tracking

Tracking abilities of each ICC estimator are reported in Table 6 and Table 7. Table 6 presents annual regression coefficients (β_1) from prediction of future risk premia and Table 7 shows average annual adjusted R-squared. Among 5 ICC models, OJ seem to have the highest level of tracking. Adjusted R-squared shows that OJ maintains strong predictive power along the forecasting horizon.

Table 6 Tracking Ability: Regression Coefficients of each ICC Model

Model	CT			OJ			MPEG			Gordon			Average		
Year Ahead	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3	t+1	t+2	t+3
1	–0.08	0.20	–0.15	–0.17	0.10	0.28***	–0.14	0.26	0.03	–0.24	0.32**	0.22	–0.23	0.27	0.40**
2	0.11	0.60***	0.49	–0.10***	0.16**	–0.11***	0.20***	0.21*	–0.00	–0.16*	0.10	–0.06	–0.17	–0.06	–0.17
3	–0.18	0.10	–1.07	–0.27*	–0.33	–0.05	0.08	0.14	0.35	–0.21	–0.23	0.05	–0.40*	–0.27	–0.18
4	–0.21	-0.88	–1.01	–0.15*	0.02	–0.05	0.11	–0.12	–0.32	0.03	–0.29	–0.44	–1.04	–0.13	–0.12

***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7 Tracking Ability: Average Annual Adjusted R-Squared

Years Ahead	CT	OJ	MPEG	Gordon	Average
T+1	–0.09735	0.13790	0.05317	–0.04773	0.02285
T+2	0.09050	0.10183	0.00687	0.05622	–0.10165
T+3	0.04222	0.27327	–0.0225	–0.02024	0.01333

5.2.3 Graphic Representation of the Main Results

Graphic representations of the assessment of each ICC model when forecasting one- to three-years ahead are shown in figure 4A ,4B, and 4C, respectively. The X axis represents average annual hedge returns from going long the 10th ICC decile and short the 1st ICC decile. Hedge portfolio returns are computed using Newey-West HAC estimators. The Y axis represents the Goodness-of-Fit through the average adjusted R-squared from forecasting future actual cost of capitals (the adjusted R-squared reported in Table 7).

According to Lee et al. (2010), predictive power and tracking ability are desirable properties of ICC estimates, therefore, superior ICC estimates should located in the upper-right corner of each plot. It can be seen from Figure 4A that OJ has the highest returns predictability in one-year ahead earnings but not with the best tracking ability. The results of two- and three- years ahead earnings reported in Figure 4B and 4C show improve in tracking ability of the OJ model. Therefore, the OJ model seems to be the best ICC estimators along forecasting horizon.

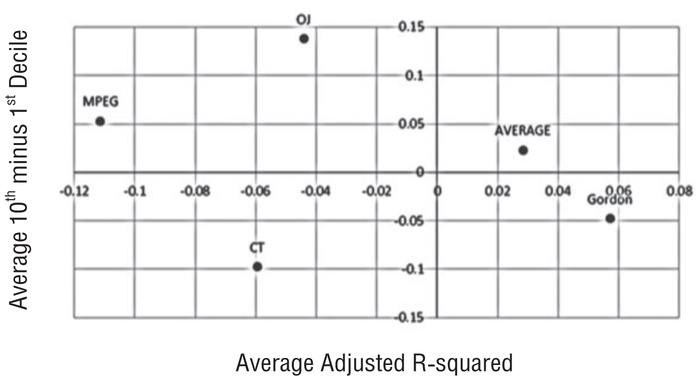

Figure 4A Assessment of each ICC estimation: One-Year-Ahead earnings

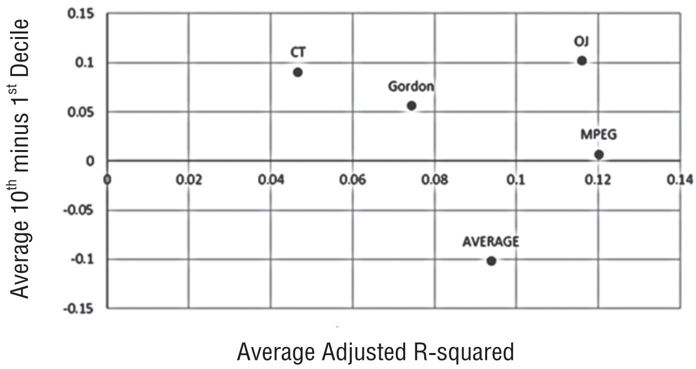

Figure 4B Assessment of each ICC estimation: Two-Year-Ahead earnings

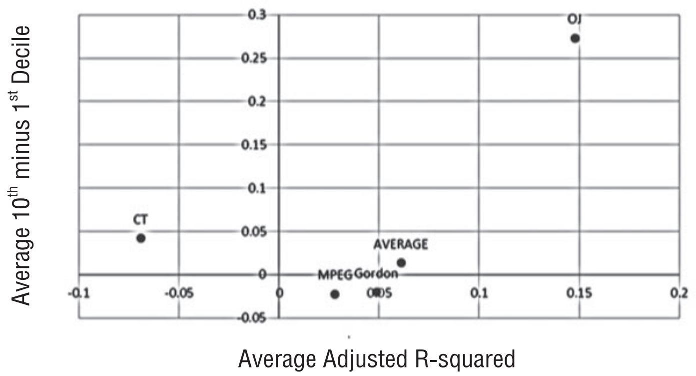

Figure 4C Assessment of each ICC estimation: Three-Year-Ahead earnings

5. Conclusions

This study provides empirical evidence for the use of earnings based valuation models to estimate implied cost of capital of Thai listed companies. Five commonly used cross-sectional models ICC estimates have been meticulously compared. The ICC estimates comprise the residual income valuation by Claus and Thomas (CT, 2001), two models based on abnormal growth in earnings by Ohlson and Juettner-Nauroth (OJ, 2005) and Easton (modified price-earnings growth, MPEG, 2004), Gordon growth model based on Gordon and Gordon (1997), and equal-weighted average of the four ICC estimates. Earnings are estimated from the pooled cross-sectional regression approach of Hou et al. (2012) using previous ten years of data. Our empirical results offer support for the ICC from the abnormal growth in earnings model by Ohlson and Juettner-Nauroth (OJ, 2005)

Results from this study could assist academics and practitioners in understanding measurements of accounting properties and their important construct. This study provides new insights into unobservable ex-ante cost of capital, especially for Thai companies that there is no previous empirical test on proxy for the ex-ante cost of capital by the use of cross-sectional earnings based valuation models. Measurement-error properties of each valuation model should be further investigated. Larger dataset might reveal better insight into variation in expected returns.

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