Research Article

The Role of Accounting and Other Information in Equity Valuation: Evidence from Listed Companies on the Stock Exchange of Thailand

Dr.Chitrath Changlaw

Lecturer of School of Accountancy,

University of the Thai Chamber of Commerce (UTCC)

Received: *May 11, 2024*

Revised: *July 11, 2024*

Accepted: *July 19, 2024*

ABSTRACT

The objective of this study is to examine the relationship between stock prices, accountings data and "other information". In particular, it tests empirical implication of Ohlson (1995) model, the accounting-based valuation model that expresses stock prices as a function of book value of equity, residual income and other information. The "other information" variable is measured using analysts' forecast-based prediction of residual income as suggested in Ohlson (2001). This study uses regression analysis and price-prediction analysis on data of listed companies on the Stock Exchange of Thailand from year 2003 to 2022.

The results suggest that Ohlson (1995) model is shown to have substantial empirical validity in Thailand. Book value of equity, residual income, and analysts' forecast based other information are positively priced consistent with the theoretical prediction of Ohlson (1995) model. However, values estimated from the model are significantly lower than stock prices. The results also suggest that incorporating the other information into research design improves empirical validity of the model and reduces valuation error.

Keywords: Equity Valuation, Other Information, Ohlson (1995), Residual Income, Linear Information Dynamics, Analysts' forecasts

บทความวิจัย

บทบาทของข้อมูลทางการบัญชีและข้อมูลอื่นในการประเมินมูลค่าหลักทรัพย์ : หลักฐานจากบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย

ดร.จิตรัตน์ ช่างหล่อ
อาจารย์ประจำคณะบัญชี
มหาวิทยาลัยหอการค้าไทย

วันที่ได้รับต้นฉบับบทความ : *11 พฤษภาคม 2567*
วันที่แก้ไขปรับปรุงบทความ : *11 กรกฎาคม 2567*
วันที่ตอบรับตีพิมพ์บทความ : *19 กรกฎาคม 2567*

บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์ เพื่อทดสอบความสัมพันธ์ระหว่างราคาหลักทรัพย์ ข้อมูลทางการบัญชี และ “ข้อมูลอื่น” โดยเป็นการทดสอบนัยเชิงประจักษ์ของทฤษฎีตัวแบบ Ohlson (1995) ซึ่งเป็นตัวแบบการประเมินมูลค่าหลักทรัพย์ที่อธิบายราคาหลักทรัพย์ด้วยมูลค่าตามบัญชี กำไรส่วนเพิ่ม และข้อมูลอื่น “ข้อมูลอื่น” วัดค่าจากข้อมูลการคาดการณ์กำไรส่วนเพิ่มของนักวิเคราะห์ตามที่ Ohlson (2001) เสนอแนะไว้ งานวิจัยนี้ใช้วิธีการวิเคราะห์การถดถอย และการคาดการณ์ราคาหลักทรัพย์ โดยใช้ข้อมูลจากบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย ระหว่างปี ค.ศ. 2003 ถึง ค.ศ. 2022

ผลการศึกษาพบว่า ทฤษฎีตัวแบบ Ohlson (1995) มีนัยเชิงประจักษ์เมื่อทดสอบในประเทศไทย มูลค่าตามบัญชี กำไรส่วนเพิ่ม และข้อมูลอื่น ซึ่งอิงจากข้อมูลการคาดการณ์ของนักวิเคราะห์ มีความสัมพันธ์เป็นบวกกับราคาหลักทรัพย์ ตามที่ทฤษฎีตัวแบบ Ohlson (1995) ได้คาดการณ์ไว้ อย่างไรก็ตามมูลค่าหลักทรัพย์ที่ประเมินได้จากตัวแบบน้อยกว่าราคาหลักทรัพย์อย่างมีนัยสำคัญทางสถิติ ผลการศึกษายังพบว่า การนำข้อมูลอื่นเข้ามาร่วมในการออกแบบงานวิจัยช่วยเพิ่มนัยเชิงประจักษ์ของตัวแบบ และลดความคลาดเคลื่อนในการคาดการณ์ราคาหลักทรัพย์

คำสำคัญ: การประเมินมูลค่าหลักทรัพย์ ข้อมูลอื่น ทฤษฎีตัวแบบ Ohlson (1995) กำไรส่วนเพิ่ม พลวัติเชิงเส้นของข้อมูล การคาดการณ์ของนักวิเคราะห์

1. INTRODUCTION

Capital market research in accounting explores the relationship between capital markets and financial statement information. Among those capital market studies concerned with fundamental analysis and valuation, the theoretical analysis of Ohlson (1995) and Feltham and Ohlson (1995) have been seminal. The theories provide an important foundation for market-based accounting research that leads us away from an emphasis on explaining stock price behavior towards a focus on predicting fundamental accounting data and using such accounting data to explain stock price (Bernard, 1995; Lo & Lys, 2000; Penman, 1992; Walker, 1997). Specifically, Ohlson (1995) combines the residual income valuation model, which expresses price as the sum of book value of equity and the present value of expected future residual income (Edwards & Bell, 1961; Peasnell, 1982), and linear information dynamics, which project expected future residual income as a linear function of current residual income and information not yet reflect in accounting numbers (Ohlson, 1989; Ohlson, 1995), and expresses price as a function of current book value of equity adjusted for current residual income and the "other information", information not yet reflect in accounting numbers but modified the prediction of future profitability.

While theoretical models such as Ohlson (1995) and Felthem and Ohlson (1995) all consider other information, prior empirical studies have either disregarded or failed to incorporate all the relevant other information variables. For instance, substituting specific information, such as order backlog or next period earnings, as the other information variable or failing to incorporate all types of other information into their model specifications (Ahmed, Morton & Schaefer, 2000; Aston & Wang 2013; Myers, 1999). This presents a potential omitted variables problem, which may lead to estimation and inference errors (Callen and Segal 2005). Hence, in order to construct the empirical research that is more accurate, ones need to find an appropriate approach to incorporate other information into their empirical research design.

"Other information" is defined as information other than current earnings that influences forecast of subsequent earnings. The information is an additive shock to the next period's earnings and these shocks flow through future earnings autoregressively (Lundholm, 1995; Ohlson, 1995). Such information can be qualitative and supplementary quantitative data that complement past earnings information such as macroeconomics condition, industry trends, market sentiment, management quality, risk factors, corporate governance practices, and firm specific events (e.g. a new contract). Ohlson (2001) suggests that although the other information can not directly observable, one can infer the other information from its influence on expectations and analysts' consensus forecast of next year earnings appears to be the most reasonable measure of expected earnings. As a result,

one can measure other information as analysts' consensus forecasts of future earnings that based on all available information minus earnings forecast that based purely from past financial statements.

It is well documented that analysts' earnings forecasts capture forward-looking information about firm's fundamentals from sources other than financial statements (Cheng, 2005; Kothari, 2001). Their forecast of next year earnings is superior to the forecasts from time-series model because of their timing and information advantages (Brown, Griffin, Hagerman & Zmijewski, 1987; Brown, Richardson & Schwager, 1987). Dechow, Hutton and Sloan (1999), Hand and Landsman (2005) and Choi, O'Hanlon and Pope (2006) incorporates analysts' forecast based other information in linear information dynamics of residual income and equity valuation and found that the incorporation of other information variable improves the accuracy of the models. Shan, Tayler and Walter (2014) proposes that other information in analysts' forecasts is a legitimate proxy of future cash flow and confirms the incremental role of other information in explaining stock return volatilities. Recent literatures, for example, Tan (2014) and Roger (2024), suggest that financial analysts do incorporate non-financial information regarding corporate governance and environmental, social and governance (ESG) on their analysis. It is clear that analysts' forecast can be served as a proxy of the other information.

Previous literatures that incorporate other information variable into accounting-based valuation model have been done in the US or other western countries, for example, Dechow et al. (1999), Myers (1999), Hand and Landsman (2005) and Choi et al. (2006). There is, however, limited research on equity valuation in emerging market, particularly in Thailand. Apart from industry population, structure, accounting practices and bias (conservatism) that are different across countries (Graham & King 2000; King & Langli 1998), emerging countries face unique challenges in several ways as they face greater risks and obstacles. The risks may include high level of inflation, accounting transparency, corruption and governance, macroeconomic volatility, capital controls and investment flows (Bruner, Conroy, Estrada, Kritzman & Li, 2002; Jame & Koller, 2000). In addition, the rapid growth of Asian economies in term of market capitalization during the 2000s has generated great interest among local and foreign investors in Asian capital markets (Eng, Sun & Vichitsarawong, 2013). It is interesting to implement the study in Thailand because the capital market in Thailand has strong regulatory framework. Following the 1997 financial crisis, Thailand adopt International Financial Reporting Standard (IFRSs) as main concept of Thai Financial Reporting Standard (TFRSs) and has been continually improved over the years. This alignment with global standards results in accurate and transparent statements which better reflect company's situation and performance (Srijunpeth, 2006; Tungsriwong, 2022). Acaranupong (2021) found that Thailand is one of two countries in ASEAN that both earnings and book value are value relevant and ranks second in highest combined value relevance of earnings and book values. While

the evidence of value relevance of accounting information in Thailand following the IFRS adoption is well documented in many literatures (Acaranupong, 1997, 2021; Tungsriwong, 2022; Vichitsarawong, 2011), very limited research extends to capture the other information.

The study aims to fulfill this important gap in the related literatures by providing more evidence of the determinants of firms' value in Thailand regarding the "other information". In particular, this study tests the empirical implications of the Ohlson (1995) model, an accounting-based valuation model that expresses price as a function of current book value of equity, current residual income and the other information. I model the other information variable using analysts' forecast-based prediction of residual income as suggested in Ohlson (2001). In this study, I first adopt the analysts' forecast based approach to measure the other information. I then incorporate the other information variable in testing the empirical implications of the Ohlson (1995) model. The samples of the study are firms listed on Stock Exchange of Thailand during the year 2003–2022. This study contributes to the regulatory body, Thai Securities and Exchange Commission, allowing for further improvement in their disclosure guidelines regarding the other information.

2. LITERATURE REVIEW

Capital market research in accounting explores the relationship between capital markets and financial statement information. This area of research originated with the publication of Ball and Brown (1968) and has grown rapidly over the past five decades. This research area encompasses several different topics. Areas of current research interest include tests of market efficiency with respect to accounting information, fundamental analysis and valuation, and value relevance of financial reporting (Kothari, 2001). The principal focus of fundamental analysis and valuation is on determining firms' intrinsic value and identifying mispriced securities. It entails the use of information in current and past financial statements such as book value of equity and earnings, in conjunction with non-financial information such as industry and macroeconomic data, to arrive at firms' intrinsic value. A difference between the current price and the intrinsic value is an indication of the expected rewards for investing in the security.

2.1 Theoretical Framework

Among those capital market studies concerned with the fundamental analysis and equity valuation, the accounting-based valuation model of Ohlson (1995) was a major breakthrough (Bernard, 1995). The essence of Ohlson (1995) model is that it combines the residual income valuation model and linear information dynamics and suggests that the firm's market value equals the book value of

equity adjusted for 1) the current profitability as measured by residual income and 2) the other information. Such other information refers to the information that has yet to be captured in current financial statements but modifies the prediction of future profitability.

By applying the clean surplus relation, one can shift the dividend-discounted model, which expresses security price as a function of expected payoff or dividend, to residual income valuation model (RIV hereafter). The RIV expresses value of the firm as the sum of current book value adjusted for its future profitability as measured by the present value of expected residual income, where residual income is defined by earnings minus a charge for the use of capital as measured by beginning-of-period book value multiplied by the cost of capital. The RIV has long been known in the accounting literature, see for example Edward and Bell (1961) and Peasnell (1981, 1982) and can be expressed algebraically as:

$$P_t = bv_t + \sum_{\tau=1}^{\infty} \frac{E_t[x^a_{t+\tau}]}{R^{\tau}}$$

where P_t is market value of equity at time t, bv_t is book value of equity at time t, the residual income for the period t is given by $x^a_t = x_t - rbv_{t-1}$ where x_t is earning for the period t, $R = 1 + r$ is one plus cost of capital and $E_t[.]$ is the expected value operator conditioned on the period t information.

Linear information dynamics (LIM hereafter) describes the time-series behavior of residual income and other information. Linear information dynamics that link future expected residual income with observable current residual income is recognized as the key contribution of Ohlson's model. The LIM suggests that future residual income can be predicted from current residual income and other information and that both residual income and other information are autoregressive, which means that they persist for sometimes in the future before market competitors force the returns toward cost of capital in long run or firms experiencing below-normal rates of return eventually exit. The LIM states:

$$x^a_{t+1} = \omega x^a_t + v_t + \varepsilon_{t+1}$$

$$v_{t+1} = \gamma v_t + \varepsilon_{t+1}$$

where v_t is other information that modifies belief about future earnings, ε_t is zero-mean unanticipated error, and ω and γ are persistence parameters of residual income and the other information. It is restricted that $0 \leq \omega < 1$ and $0 \leq \gamma < 1$, if accounting is unbiased.

Further, the LIM above emphasizes the existence of the other information. The other information can be completely unpredictable, $\gamma = 0$, or partially predictable, $\gamma < 1$, but it must become part of next period's residual income that flow through residual income in the following period going forward.

Combining the two models yield Ohlson (1995) model that expresses stock price as a function of current book value, current profitability as measured by residual income, and the other information.

$$P_t = bv_t + \alpha_1 x_t^a + \alpha_2 v_t \quad (1)$$

where

$$\alpha_1 = \frac{\omega}{R - \omega} \geq 0$$

$$\alpha_2 = \frac{R}{(R - \omega)(R - \gamma)} > 0$$

In the setting of unbiased accounting, the persistence parameter of both residual income and other information are restricted to be non-negative and less than one. Thus, the residual income of the next period is less in absolute terms than those of the current period and it dissipates to zero over time. It follows that expected unrecorded goodwill, which is the difference between market value and book value, equals zero in long term: $E_t[P_{t+\tau} - bv_{t+\tau}] \to 0$ as $\tau \to \infty$. This property refers to as unbiased accounting.

From the model, the unrecorded goodwill is determined by current residual income and other information. Since the valuation multiple of residual income (α_1) and other information (α_2) is based on the persistence parameters for residual income and other information (ω, γ), the speed at which the unrecorded goodwill converges to zero depends on the degree to which the earnings process has transitory elements. The higher the persistence parameters, i.e. closer to one, the slower the convergence, and thus the greater impact does the residual income and other information have on the unrecorded goodwill.

In summary, Ohlson (1995) model suggests that the firm's market value equals the current book value adjusted for current residual income and other information. Under the property of unbiased accounting, future abnormal earning and other information are expected to converge to zero over time hence making expected market value equal to book value in long term.

2.2 Empirical Analysis

2.2.1 Empirical Test of Ohlson (1995) Model

Since the works of Ohlson (1995) has a profound impact on capital market research, numerous studies attempt to provide empirical assessment of the model. However, while referring to the Ohlson (1995), some studies appear to be only testing RIV, for example, Bernard (1995), Penman and Sougiannis (1996), and Frankel and Lee (1998). A few studies, e.g. Dechow et al. (1999), Myers (1999) and Hand and Landsman (2005), have attempted to explicitly evaluate the empirical validity of the Ohlson (1995) model. They are considered as a test of Ohlson (1995) because they increment the test of RIV in two important aspects i) they consider linear information dynamics properties in their empirical implementation ii) they consider the effect of other information in predicting future residual income. The three studies are done in the US. To my knowledge the test of Ohlson (1995) have not been done in Thailand.

The empirical implementation of Dechow et al. (1999) is claimed to be much closer to the theoretical model compared to that of other empirical studies (Lo & Lys, 2000; Ohlson, 2001). Central to their analysis is the incorporation of the residual income information dynamics. The study is conducted using US data during 1976 to 1995. Their incorporation of other information is consistence with the suggestion in Ohlson (2001) introduced here in section 3.1. Consistence with Ohlson's information dynamics, they find that residual income follows a means reverting process. They also found that incorporating the analysts' forecast based other information into information dynamics increases accuracy of the forecast of future residual income. In addition, Dechow et al. (1999) tests the relative ability of the computing valuation model to explain cotemporaneous stock price. Their results report that the valuation model generates negative mean forecast error indicating that Ohlson (1995) model undervalue equities relative to stock price. Moreover, when the other information is ignored, the undervaluation is larger compared to when the other information is incorporated.

Myers (1999) performs the test of Ohlson (1995) and Feltham and Ohlson (1995, 1996) model. The study conducts using data of US non-financial firms during 1975 to 1996. He suggests that the obvious candidates for the 'other' information are new patents, regulatory approval of new drug for pharmaceutical companies, new long-lived contracts and order backlog. However, he uses order backlog alone as a proxy of the other information because it is the only information that readily available. Consistence with Ohlson's information dynamics, he finds that residual income and other information follows a means reverting process that is the parameter fall between zero and one as suggested in the Ohlson (1995). In addition, applying the LIM parameter to valuation to estimate firm's value, they find that the estimated value positively correlates with stock price. However, the

ratio V/P (intrinsic value to actual price) ratio is reported relatively low suggesting that Ohlson (1995) model significantly understate firm value.

The study of Hand and Landsman (2005) aims to explain the positive coefficient of dividend in equity valuation model based on Ohlson (1995) model. They use the samples are US firms during the period of 1984–1996 and use one-year-ahead analysts' earnings forecast to infer other information. The results suggest that both residual income and other information are autoregressive. The coefficient of other information in the linear information dynamic of residual income is significant positive and the adjusted R^2 is increased when the other information is incorporated into the model suggesting that other information convey additional information about future residual income. Consistent with earlier empirical studies regarding the pricing of dividend, they find that dividends are significantly positively priced. The coefficients of book value, current earnings, dividend, net capital contribution and other information are all significant positive. All coefficients except for the significant positive of dividend and net capital contribution are consistent with Ohlson's model.

2.2.2 Value Relevance Research in Thailand

Value relevance research examines the association between accounting numbers, such as book value and earnings, and equity market value. Empirical models used for value relevance research are usually based on Ohlson (1995). Accounting information is value relevant when it correlates with the entity's securities price, which is one of the qualitative characteristics of financial statement information (Barth, Beaver & Landsman, 2001; Francis & Schipper, 1999; Kothari, 2001).

Previous studies both in developed markets and developing markets have found that accounting information is value relevant (Acaranupong, 2021; Barth et al., 2001; Dechow et al., 1999; Francis & Schipper, 1999; Graham & King, 2000; Vichitsarawong, 2011). Few prior research investigated the value relevance of accounting information in Thailand. Graham, King and Bailes (2000) examines the value relevance of accounting information in Thailand during the 1997 decline the value of Thai Baht. Their results suggest a decline in the value relevance of Thai book value and earnings following the devaluation. They further suggest that the change in value relevance may be attributable to the volatility of the foreign exchange gains and losses following the devaluation. Vichitsarawong (2011) compares value relevance of earnings and cash flow in Thailand three different period surrounding the 1997 financial crisis: pre-crisis (1995–1996); crisis (1997–1998); and post-crisis (1999–2000). The results indicate that earnings better explain stock return during the pre-crisis period. However, the ability of earnings to explain stock return dramatically declines during the crisis period. In contrast, the ability of cash flow to explain stock return is low during the pre-crisis, but significantly increases

over the periods. The study suggests that the management discretion to opportunistically manage earnings and the accrual may make earnings become less reliable measure and many users of financial statement turn to use cash flow information during financial crisis. Acaranupong (1997) examine and compare the value relevance of book value, earnings and cash flows of companies listed on SET 100 during 2011–2015. The results suggest that book value, earnings and cash flows are value relevant information and that the combined value relevance of book value and earnings is greater than the value relevance of book value and cash flows. In addition, the study suggests that earnings are the best value relevant information compared to book value and cash flows and this may be because earnings are performance measure and they are directly linked to the dividend received by investors.

Value relevance research in Thailand from 2020 onwards become more specific. For example, Phakdee and Srijunpetch (2020) examine value relevance of book value and earnings of SET listed firms in financial sector for 15-year period from 2004 to 2018 as firms in financial industry are usually omitted in other research because they are under specific financial regulations. Their results suggest that book value and earnings are value relevant. Arunrungsirilert, Sangiumvibook-Howell and Kitticharoenrerk (2022) examine which types of accounting profit, which include 1) gross profit 2) earnings before interest, taxes, depreciation, and amortization (EBITDA) 3) earnings before interest and taxes (EBIT) 4) net income 5) comprehensive income, are more value relevant. Their results suggest that net income, which is the bottom-line profit that represents the net operation of a firm, is the best value relevant information followed by comprehensive income. Tungsriwong (2022) examines value relevance of accounting information following Thailand adopt of IFRS in 2009. Their study of trend change in value relevance reveals that following the IFRS adoption, the value relevance of book value decreased, in contrast to that of earnings throughout the period of study from 2009–2019. Lastly, Acaranupong (2021) extend to examine value relevance of accounting information of top treading volume listed companies in five ASEAN countries, which are Indonesia, Malaysia, the Philippines, Singapore and Thailand, after the IFRS adoption period. The results demonstrate that earnings are value relevant information in four countries (Indonesia, Malaysia, the Philippines and Thailand) while book value of equity is value relevant information in three countries (Indonesia, Singapore and Thailand).

Previous studies shown that there is significant improvement in value relevance literatures in Thailand. None of the previous studies, however, extend to capture the “other information”.

3. RESEARCH DESIGN

3.1 Model Development

The empirical version of the Ohlson (1995) model, model (1), is shown below:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E^a_{it} + \alpha_3 OI_{it} + \varepsilon_{it} \quad (2)$$

where

$$\alpha_1 = \frac{\omega}{R - \omega} \geq 0$$

$$\alpha_2 = \frac{R}{(R - \omega)(R - \gamma)} > 0$$

where P_{it} is market value of equity at time t, BV_{it} is book value of equity at time t, the residual income for the period t is given by $E^a_{it} = E_{it} - rBV_{it-1}$ where E_{it} is earning for the period t and $R = 1 + r$ is one plus cost of capital.

While accounting variables are readily available, the other information variable is different because there is no raw input and usually viewed as the limitation of the model from the empirical perspective (Dechow et al., 1999; Myers 1999). In this study, I adopt the theoretical analysis of Ohlson (2001).

The theoretical analysis of Ohlson (2001) suggests that if one presumes that the forecasts of accounting numbers are no less observable than are realization, the other information can be inferred from its influence on expectations that based on all available information where analysts' consensus forecasts seem to be the most reasonable measure. Hence, since analysts' forecast is based on all available information, i.e. both accounting information and other information, one can define other information as the difference between the analysts' forecast of one-year-ahead residual income and the forecast of one-year-ahead residual income that based purely from time-series model of accounting data, i.e. the linear information dynamics of residual income. From this rationale and LIM stated earlier, the other information (OI_{it}) can be obtained as:

$$OI_{it} = F^a_{it+1} - \omega_{1t} E^a_{it} \quad (3)$$

where F^a_{it+1} is analysts' forecast at year t of the residual income in year t+1 and is given by $F^a_{it+1} = F_{it+1} - rBV_{it}$ where F_{it+1} is analysts' forecast at year t of earning for the period t+1, BV_{it} is book value of equity at time t and $R = 1 + r$ is one plus cost of capital. ω_{1t} are time series parameters that derived from linear information dynamics of realisation accounting numbers.

I perform two-step approach. First step is to measure the other information variable (OI_{it}) from model (3). The time-series forecast requires estimation of time series parameters (ω_{1t}). To derive the time series parameters, I estimate the following regression annually:

$$E^a_{it+1} = \omega_0 + \omega_{1t} E^a_{it} + \varepsilon_{it+1} \quad (4)$$

The above regression is the empirical version of LIM presented in section 2.1 disregards of other information. For each year, the time series parameters ω_{1t} is then applied in model (3) together with corresponding current realization of accounting numbers in order to measure the other information (OI_{it}).

The second step is to incorporate the other information variable (OI_{it}) derived from the first step into model (2) together with corresponding current realization of accounting numbers in order to test whether Ohlson (1995) model has empirical validity.

In addition, I also regress linear information dynamics of the other information to test its autoregressive properties suggested in Ohlson (1995). The empirical version of the LIM of other information is presented below:

$$OI_{it+1} = \gamma_0 + \gamma_{1t} OI_{it} + \varepsilon_{it+1} \quad (5)$$

The annual estimations of linear information dynamics of residual income, model (4) and linear information dynamics of the other information, model (5), include industry fixed effect because samples are non-financial firms from different industries. The estimation of valuation model, model (2), includes industry and year fixed effect. Size, which defined by the logarithm of firms' total asset, is included in all estimation as controlled variable.

3.2 Hypothesis Development

I test two research questions. The first question is whether Ohlson (1995) model has empirical validity. The second question is whether other information variable improve the empirical validity of the Ohlson (1995) model.

I use regression approach to test the first research question. Regressions are estimated cross-sectionally and I test the empirical validity of the model by reference to the signs of coefficients of accounting and other information variables in the theoretical model. If the Ohlson (1995) model has empirical validity, the signs of the estimated coefficients of the variables should be consistent with the signs expected in the theoretical model. A summary of the expected signs of variables coefficients are refer to the theoretical model of Ohlson (1995) are:

- The coefficient of book value of equity (α_1) is positive and is restricted to one as it is the valuation anchor.
- The coefficient of residual income (α_2) is positive and is an increasing function of the persistence parameter of residual income (ω_1). It determines the value added of current residual income to firm value.
- The coefficient of other information (α_3) is positive and is an increasing function of the persistence parameter of residual income (ω_1), in addition to its own persistence (γ_1). The other information that is good news about future income would reflect positively in the market value.
- The persistence parameter of residual income (ω_1) is non-negative and less than one ($0 \leq \omega_1 < 1$). The higher the persistence parameter, i.e. closer to one, the greater impact does the residual income and other information have on valuation model.
- The persistence parameter of other information (γ_1) is non-negative and less than one ($0 \leq \gamma_1 < 1$). The higher the persistence parameter, i.e. closer to one, the greater impact does the other information has on valuation model.

In the second research question, I test whether other information variable improve the empirical validity of the Ohlson (1995) model. Doing so, I compare two valuation models, one includes the other information variable and the other one ignore the other information variable and investigate which of the two models has more empirical validity. I use both cross-sectional analysis and forecasting approach to test this research question.

In the cross-sectional analysis, I investigate evidence of empirical validity of the two models and compare their explanatory power (adjusted R^2). If the other information variable improves the empirical validity of Ohlson (1995) model, the valuation model that includes the other information variable should display evidence of empirical validity and reports the adjusted R^2 that is relatively higher than the model that ignores other information variable (Dechow et al., 1999; Myers, 1999).

Under forecasting approach, I investigate the relative ability of the valuation models to explain contemporaneous stock prices. If the other information variable improves the empirical validity of Ohlson (1995) model, the valuation model that includes the other information variable should have higher forecasting ability than the model that ignores the other information variable (Callen & Segal, 2005; Choi et al., 2006; Dechow et al., 1999). Under this approach, I use the linear information dynamics parameters estimated from regressing model (4) and model (5) to estimate valuation multiples and intrinsic value. The intrinsic values are then compared with the actual market price in order to evaluate the forecasting ability of the model. Following the prior literature, the forecasting ability of

a valuation model is measured by valuation bias (signed valuation error) and valuation inaccuracy (absolute valuation error). One model has higher forecasting ability than the others if it produces less valuation bias and less valuation inaccuracy. For each observation, valuation error is measured as:

$$e_{it} = \frac{V_{it} - P_{it}}{P_{it}}$$

where e_{it} is valuation error of firm i at time t, P_{it} is actual market price per share of firm i at time t, and V_{it} is intrinsic value of firm i at time t that estimates from proposed valuation model.

3.3 Data and Variable Measurement

Data used in this study are obtained from three databases. Accounting data are obtained from the Worldscope. The market data are from the Datastream, and analysts' earnings forecast data are from the I/B/E/S. All databases are accessed via Eikon & Datastream database. The initial population of firms consists of all non-financial firms listed on the Stock Exchange of Thailand from fiscal year 2003 to 2022 including both 'live' and 'dead' companies in order to mitigate possible survivorship bias. Firms entered in the initial population must report financial statement in Thai Baht and fiscal year ended at 31 December. All data, except for total assets, are collected in per share basis.

Table 1 Summary of Number of Observations used in Estimated Equity Valuation Model

Initial population: non-financial firms listed on the Stock Exchange of Thailand during 2005–2022 (data in 2003 and 2004 is lost because of the estimations of the other information variables required data for lag years)	9,957	100.00%
Less Cases with missing value of following market and accounting variables: P_{it}, BV_{it}, E_{it}, BV_{it-1} and TA_{it}	1,226	
Cases of with complete market and accounting variables	8,731	87.69%
Less Cases not meeting logical check, which are MV_{it}, BV_{it} and BV_{it-1} are positive	278	
Cases of with complete and logical market and accounting variables	8,453	84.90%
Less Cases with missing value of I/B/E/S one-year ahead forecasts of earnings	5,918	
= Total number of observations in the sample	**2,535**	**25.46%**

Notes: P_{it} is price at time t measured three months after fiscal year end, BV_{it} is book value of equity at time t, E_{it} is the earnings for the period t and TA_{it} is total assets at time t.

Table 1 summarizes the sample formation procedure. I lost two years of the data (data of 2003 and 2004) because the estimation of abnormal earnings variable requires lag year book value of equity and the estimation of other information variable requires lag year abnormal earnings (see measuring variables in table 2). Population, therefore, is from year 2005 to 2022 and is reduced to 9,957 observations. I, then, remove firms with missing data and firms not meeting logical checks. The other information variables are limited by the availability of I/B/E/S analysts' forecast. The availability of analysts' one-year-ahead earnings forecasts that is required in measuring the other information reduces the sample to 2,535 observations or 25.46% of the population. It is worth highlighting that the number of samples in the final dataset is small in comparison to other empirical studies and bias towards bigger firms because of the requirement of analysts' forecast based other information variables. The observations are distributed widely across eighteen years, all industries and range from a very small firm to a big firm.

Table 2 reports variable definitions with include the summary of all variables used in this analysis, their label and their definitions. It is important to highlight the definition of the following variables. Price is taken three months after fiscal year-end to ensure the availability of earnings information to market participants. Similar definition of price is used in Thailand in Acaranupong (2017, 2021) and Tungsriwong (2022). Analysts' consensus forecast of financial year t+1 are taken six months after fiscal year-end. The delay is necessary to ensure that analysts' forecast data is appropriately specified. All data, except total assets which represent size of firm, are collected in per share basis.

Table 2 Variable Definitions

Variable	Label	Definitions
Price	P_{it}	Closing price per share of firm i three months after fiscal year ended t
Book value of equity	BV_{it}	Book value of equity per share of firm i at fiscal year ended t
Valuation goodwill	GW_{it}	Valuation goodwill per share of firm i year t and is given by $GW_{it} = P_{it} - BV_{it}$
Residual income	E^{a}_{it}	Residual income per share of firm i for year t and is given by $E^{a}_{it} = E_{it} - r_{et}BV_{it-1}$
Earnings	E_{it}	Earnings per share of firm i for the fiscal year t

Table 2 Variable Definitions (Cont.)

Variable	Label	Definitions
Cost of capital	r_{et}	An annual average of Thai ten-year government bond reported by Bank of Thailand plus average risk premium rate of 6% is used in the main results. It is cross sectional-constant but vary each year. The firm specific cost of capital that derived from the capital asset pricing model (CAPM) and the constant rate of 10% is used for sensitivity analysis.
One-year-ahead analysts' forecast of residual income	F^{a}_{it+1}	Analysts' forecast of residual income per share of firm i at year t for year t+1 and is given by $F^{a}_{it+1} = F_{it+1} - r_{et}BV_{it}$
One-year-ahead analysts' forecast of earnings	F_{it+1}	Mean value of analysts' forecast of EPS of firm i at year t for year t+1. The EPS forecast is revised monthly. The figure used is the forecast at six months after the fiscal year end.
The other information	OI_{it}	The other information of firm i for year t and is given by $OI_{it} = F^{a}_{it+1} - \omega_{1t}E^{a}_{it}$ where ω_{1t} are time series parameters that derived from linear information dynamics of residual income. (see section 3.1)
Firm size	$SIZE_{it}$	Size of firm i year t and is measured by the natural logarithm of total assets of firm i at year ended t
Total assets	TA_{it}	Total assets of firm i at year ended t

4. RESULTS

4.1 Descriptive Statistics

Table 3 reports the descriptive statistics of all variables included in the analysis. The descriptive statistics includes number of observations, mean, standard deviation, minimum and maximum. The results show high standard deviation for stock price which indicates the wide range between the minimum (0.05 baht) and maximum stock price (540 baht). The wide range of book values of equity is also shown in the sample firms. Mean of market price and book value of equity are 21.8519 baht and 11.1545 baht, respectively. This shows that market value of equity is higher than book value of equity for SET listed firms on average. Mean of earnings per share and residual income per shares are 1.3724 baht and 0.4016 baht, respectively. The minimum values of earnings per share and residual income have negative signs. This indicate that some listed companies have operating losses or earn less than their charge for the use of capital. Mean of analysts' forecast based other information is

0.4253. The wide range between the minimum (–19.7131 baht) and maximum (21.8431 baht) indicates that some other information is good news and some is bad news. The wide range of total assets indicate that sample firms range from a very small firm to a very big firm.

Table 3 Descriptive Statistics of Variables

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
P_{it} (Baht per share)	2,535	21.8519	45.3891	0.0500	540.0000
BV_{it} (Baht per share)	2,535	11.1545	26.7800	0.0500	311.8790
GW_{it} (Baht per share)	2,535	10.6974	30.2614	(198.2480)	370.6780
E_{it} (Baht per share)	2,535	1.3724	3.9985	(24.3830)	46.7370
E^{a}_{it} (Baht per share)	2,535	0.4016	2.7153	(33.2360)	32.6837
F_{it+1} (Baht per share)	2,535	1.5980	3.9921	(3.8500)	45.9900
F^{a}_{it+1} (Baht per share)	2,535	0.5789	2.0312	(10.8702)	27.2780
OI_{it}	2,535	0.4253	1.6401	(19.7131)	21.8431
TA_{it} (Million Baht)	2,535	60,988.67	190,851.50	79.40	3,364,873.00
$SIZE_{it}$	2,535	10.1849	0.6899	7.8998	12.5270

Table 4 reports the correlation between variables in the equity valuation model. Correlation shows the positive and significant correlation between stock price and all variables. Specifically, stock price is positively and significantly related to accounting information (book value of equity, earnings and residual income) and other information. Book value of equity is positively and significantly related to earnings, residual income and other information. Residual income is also positively and significantly related to other information. In addition, the larger firms will have higher stock prices, higher book value, higher residual income and higher other information than those of small firms.

There was no correlation between independence variables that have value greater than 0.8 indicating that there is no multicollinearity problem. In addition, VIF is tested in all regressions and no VIF value is shown to be greater than two. The VIF value is reported in table 4 where regression results are reported. Inference on all regression estimations is based on the Newey-West (1987) standard error to correct for heteroscedasticity and autocorrelation.

Table 4 A linkage of the three approaches

	P_{it}	BV_{it}	GW_{it}	E^{a}_{it}	OI_{it}	$SIZE_{it}$
P_{it}		0.780***	0.730***	0.510***	0.364***	0.454***
BV_{it}	0.766***		0.255***	0.693***	0.269***	0.524***
GW_{it}	0.822***	0.264***		0.553***	0.316***	0.197***
E^{a}_{it}	0.604***	0.367***	0.581***		0.329***	0.132***
OI_{it}	0.572***	0.468***	0.444***	0.725***		0.048***
$SIZE_{it}$	0.377***	0.323***	0.279***	0.304***	0.178***	

*** = significant level at 0.01 level, ** = significant level at 0.05 level, * = significant level at 0.10 level

4.2 Empirical Results

4.2.1 Linear Information Dynamics (LIM) Parameter Estimates

Table 5 reports mean of yearly estimates of linear information dynamics (LIM) parameters. Panel A reports results of linear information dynamics of residual income that estimates as part of measuring the other information variables. Once the other information is measured, I estimate linear information dynamics of the other information. The results of linear information dynamics of the other information are reported in Panel B. The linear information dynamics are estimated annually. The table reports the mean of annual estimated coefficients that based on Fama Macbeth approach (Fama-MacBeth, 1973).

Panel A reports that, as expected, the mean of annual LIM parameters of current residual income is significant positive. Specifically, the coefficients of current residual income of 15 out of 18 years are reported significant positive and the mean of yearly estimated coefficients is reported at 0.375, significant at 0.01 level, with mean of annual adjusted R-square of 24.2%. The LIM parameter of residual income that is range between zero and one is consistence with Ohlson (1995) and suggests that residual income is autoregressive meaning that current residual income persist for sometime in the future until the market competition forces the return towards cost of capital or firms experience income below cost of capital eventually exit. The findings of the coefficients of current residual income that is range between zero and one is also consistence with prior empirical studies, e.g. Dechow et al. (1999), Myers (1999), Barth et al. (1999, 2005), Ahmed, Morton and Schaefer (2000), Hand and Landsman (2005) and Ashton and Wang (2013). The mean coefficient of size, which put in as controlled variable, is reported at 0.294, significant at 0.01 level.

Table 5 Mean of Yearly Estimates of Linear Information Dynamics (LIM) Parameters

Panel A: Linear information dynamics of residual income

$$E^{a}_{it+1} = \omega_0 + \omega_{1t}E^{a}_{it} + \omega_{2t}SIZE_{it} + \varepsilon_{it+1}$$ Model (1)

	constant	E^{a}_{it}	$SIZE_{it}$	N[1]	Adj. R^2
Coefficients	–2.736***	0.375***	0.294***	8,936	0.242
t statistics	(–4.570)	(5.461)	(4.433)		
Number of positive estimates	0	15	7		
Number of negative estimates	4	0	0		

Panel B: Linear information dynamics of other information

$$OI_{it+1} = \gamma_0 + \gamma_{1t}OI_{it} + \gamma_{2t}SIZE_{it} + \varepsilon_{it+1}$$ Model (2)

	constant	OI_{it}	$SIZE_{it}$	N[2]	Adj. R^2
Coefficients	–1.340	0.588***	0.155	2,038	0.402
t statistics	(–1.487)	(4.348)	(1.571)		
Number of positive estimates	0	14	2		
Number of negative estimates	2	1	0		

*** = significant level at 0.01 level, ** = significant level at 0.05 level, * = significant level at 0.10 level.

Notes: Coefficients are means of annual regressions estimated with industry fixed effect. T-statistics is presented in parentheses and is based on the standard error of the mean (Fama-MacBeth, 1973). The number of positive or negative estimates are the number of estimates among 18 yearly estimates. An estimate is designated as positive or negative only if it is significant different from zero at 0.05 level.

[1] Linear information dynamics of residual income is regressed on 8,936 observations, which are all logical observations with complete data for E^{a}_{it}, E^{a}_{it+1} and $SIZE_{it}$

[2] Linear information dynamics of other information is regressed on 2,038 observations, which are all logical observations with complete data for OI_{it+1}, OI_{it+1} and $SIZE_{it}$.

Panel B reports that, as expected, the mean of annual LIM parameters of other information is significant positive. Specifically, the coefficients of the other information of 14 out of 17 years are reported significant positive and the mean of yearly estimated coefficients is reported at 0.588, significant at 0.01 level, with mean of annual adjusted R^2 of 40.2%. The LIM parameter other information that is range between zero and one suggests the autoregressive properties of the other information and is consistence Ohlson (1995). It is also consistence with the empirical results found in Dechow et al. (1999), Hand and Landsman (2005), and Choi et al. (2006). The mean coefficient of size, which put in as controlled variable, is also significant positive.

4.2.2 Results of Regression of Valuation Model

Table 6 reports the results of the equity valuation model. I regress the equity valuation model in order to test the research question of whether Ohlson (1995) model has empirical validity. Size is put in all regressions as controlled variable. Panel A reports the results of Model (3) – Model (6) that regress on stock prices, i.e. regression of stock price on book value, current residual income and other information. Model (6) is the full model. Model (3) – Model (5) are the restricted version of the model where some accounting and other information variables are omitted given for an ease of comparison. Panel B reports the result of Model (7) and Model (8) that regress on valuation goodwill, i.e. regression of valuation goodwill on current residual income and other information. It is important to note that I move book value to left hand side and regress on valuation goodwill rather than stock price in order to restrict the coefficient of book value to one as suggested in the theoretical model. This similar approach is used in Ahmed et al. (2000) and Begley and Feltham (2002). Model (8) is the full model and Model (7) is the restricted version of the model where the other information is omitted. All regressions are estimated on pooled data with industry and year fixed effects. T-statistics is based on the Newey-West (1987) standard error to correct for heteroscedasticity and autocorrelation.

Panel A shows that F statistics of model (3) – model (6) are significant at 0.01 level. I first discuss the result of model (5) and model (6). As predicted, the estimated coefficient of book value and current residual income is significant positive in both the restrict model, model (5), and the full model, model (6). The estimated coefficient of book value is reported at 1.022 for restrict model and at 0.875 for the full model. The estimated coefficient of current residual income is reported at 5.804 for the restrict model and 5.340 for the full model. All are significant at 0.01 level. This suggests that book value is an anchor of valuation function and current residual income, which is expected to persist to the future period, is value added. This finding is consistence with theoretical Ohlson (1995) and with prior empirical literatures that attempt to test the models. For example, Myers (1999), Ahmed et al. (2000), Begley and Feltham (2002), Barth et al. (1999 and 2005), and Choi et al. (2006).

The result of the full model reports that the coefficients the other information variable is significant positive, as predicted. The coefficient of the other information is reported at 5.992 significant at 0.01 level. The inclusion of the other information increases the adjusted R-square to 78.9% compared to 75.5% in restricted model where the variable is omitted. The significant positive coefficients and the increase in adjusted R-square (the increase in R-square is, however, needed to be statistically confirmed) suggest that the other information is value relevant and that the impacts of other information variables on market value are substantial consistence with the findings of Myers (1999), Dechow et al. (1999), Begley and Feltham (2002) and Callen and Segal (2005).

In addition, the results of model (3) and model (4) indicate the analysis between stock price and key accounting variables, which are book value and current residual income. The results of the two models indicate the same findings that is book value and current residual income, each of them is positively and significantly related to stock price. The two accounting variables form the core of valuation function. The adjusted R-square of model (3) and model (4) are 65.4% and 49.2%, respectively. The mean coefficient of size, which put in as controlled variable, is also significant positive in all models.

Panel B reports the results of model (7) and model (8) that regress on valuation goodwill in order to restrict the coefficient of book value to one. The results are qualitatively similar to model (5) and model (6) reported in Panel A. F statistics of model (7) and model (8) are significant at 0.01 level. The estimated coefficient of current residual income is reported at 5.870 for the restrict model, model (7), and 5.070 for the full model, model (8). All are significant at 0.01 level. The coefficients the other information variable in model (8) is 5.289, significant positive at 0.01 level, as predicted. The inclusion of the other information increases the adjusted R-square to 51.9% compared to 44.9% in restricted model where the variable is omitted. The mean coefficient of size, which put in as controlled variable, is also significant positive in all models.

Table 6 Regression Results of Equity Valuation Model

Panel A: Regression results of Model (3) – Model (6)

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 SIZE_{it} + \varepsilon_{it} \quad \text{Model (3)}$$

$$P_{it} = \alpha_0 + \alpha_1 E^a_{it} + \alpha_2 SIZE_{it} + \varepsilon_{it} \quad \text{Model (4)}$$

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E^a_{it} + \alpha_3 SIZE_{it} + \varepsilon_{it} \quad \text{Model (5)}$$

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E^a_{it} + \alpha_3 OI_{it} + \alpha_4 SIZE_{it} + \varepsilon_{it} \quad \text{Model (6)}$$

		constant	BV_{it}	E^a_{it}	OI_{it}	$SIZE_{it}$	N	Adj. R^2	F stat
Model (3)	Coeff.	–96.642	1.231			10.279	2,535	0.654	25.110***
	t-stat	–7.420***	12.860***			7.550***			
	VIF		1.260			1.830			
Model (4)	Coeff.	–199.187		8.877		21.496	2,535	0.492	16.160***
	t-stat	–10.600***		7.150***		11.340***			
	VIF			1.080		1.690			
Model (5)	Coeff.	–85.601	1.022	5.804		9.212	2,535	0.755	38.510***
	t-stat	–8.430***	14.650***	7.090***		8.850***			
	VIF		1.410	1.210		1.830			
Model (6)	Coeff.	–82.500	0.875	5.340	5.992	8.605	2,535	0.789	41.40***
	t-stat	–8.040***	13.240***	7.400***	6.190***	8.360***			
	VIF		1.630	1.230	1.400	1.830			

Table 6 Regression Results of Equity Valuation Model (Cont.)

Panel B: Regression results of Model (7) – Model (8)

$GW_{it} = \alpha_0 + \alpha_1 E^a_{it} + \alpha_2 SIZE_{it} + \varepsilon_{it}$ Model (7)

$GW_{it} = \alpha_0 + \alpha_1 E^a_{it} + \alpha_2 OI_{it} + \alpha_3 SIZE_{it} + \varepsilon_{it}$ Model (8)

		constant	E^a_{it}	OI_{it}	$SIZE_{it}$	N	Adj. R^2	F stat
Model (7)	Coefficients	–88.055	5.870		9.477	2,535	0.449	12.290***
	t-stat	–8.660***	7.430***		8.970***			
	VIF		1.080		1.690			
Model (8)	Coefficients	–70.848	5.070	5.289	7.377	2,535	0.519	14.030***
	t-stat	–8.050***	7.370***	5.130***	8.470***			
	VIF		1.160	1.210	1.730			

*** = significant level at 0.01 level, ** = significant level at 0.05 level, * = significant level at 0.10 level.

Notes: All regressions are estimated on pooled data with industry and year fixed effects. T-statistics is based on the Newey-West (1987) standard error to correct for heteroscedasticity and autocorrelation.

4.2.3 Valuation Errors From LIM-Based Valuation Models

As noted earlier, I use forecasting approach to conduct price prediction analysis. In particular, I use the mean of annual estimated linear information dynamics parameters reported in table 5 to estimate valuation multiples. Valuation multiples is, then, applied in Ohlson (1995) model together with corresponding current realization of accounting numbers and other information variable in order to get intrinsic value. For each observation, the intrinsic values are then compared with the actual market value in order to evaluate the predictive ability of the model.

Table 7 reports the predictive abilities, the medians and means of valuation bias (signed valuation error) and valuation inaccuracy (absolute valuation error) for the prediction of each observation, for Ohlson (1995) model that incorporates the other information and for the model that ignores the other information. Comparing between the two models, the median and mean valuation bias (signed valuation error) is reported as being significant smaller, at 0.01 level, for the model incorporating the other information compared with model ignoring the other information. The median (mean) valuation bias for the model incorporating the other information is reported at –0.381 (–0.207), compared with –0.443 (–0.227) for the model ignoring the other information. The median and mean valuation inaccuracy (absolute valuation error) for the model that incorporates other information is also reported as being smaller, at 0.10 level, compared with model that ignores other information. It

is reported at 0.491 (0.559) for the model incorporating the other information, compared with 0.532 (0.571) for the model ignoring the other information.

The results indicate, as predicted, that the model that incorporates other information has a higher predictive ability compared to the one that disregards other information. This is consistent with Dechow et al. (1999), Hand and Landsman (2005) and Choi et al. (2006). In addition, the significant negative valuation bias for the Ohlson (1995) model found here is consistent with earlier studies, e.g. Dechow et al. (1999), Myers (1999), Callen and Segal (2005) and Choi et al. (2006) and are consistent with the restricted assumption of the Ohlson model that accounting is unbiased, while the present GAAP is biased toward conservatism where market value is higher than book value on average.

Table 7 Bias and Inaccuracy in Valuation Estimates

	N[3]	Value estimates for model incorporating "other information"	Value estimates for model ignoring "other information"
Bias (signed valuation error)			
Median	2,386	–0.381***	–0.443***
Mean	2,386	–0.207***	–0.277***
			(0.000)
Inaccuracy (absolute valuation error)			
Median	2,386	0.491***	0.532***
Mean	2,386	0.559***	0.571***
			(0.081)

[3] Cases in year 2005 is lost because the estimations of LIM parameters of other information (γ) require lag year of other information. Therefore, the number of observations is reduced by 149 cases of year 2005 compared to the main dataset of 2,535 observations.

Table 7 Bias and Inaccuracy in Valuation Estimates (Cont.)

Notes: Valuation errors are measure as the intrinsic value estimate less actual market price measured three months after fiscal year ended, all scaled by market price.
The valuation models are as follow:

Model incorporating "other information": $V_{it} = BV_{it} + \frac{\omega}{1+r+\omega} E^a_{it} + \frac{1+r}{(1+r+\omega)(1+r-\gamma)} OI_{it}$;

Model ignoring "other information": $V_{it} = BV_{it} + \frac{\omega}{1+r+\omega} E^a_{it}$;

where V_{it} is intrinsic value per share of firm i year t, BV_{it} is book value of equity per share of firm i year t, E^a_{it} is the residual income of firm i for the period t and is given by $E^a_{it} = E_{it} - rBV_{it-1}$ where E_t is income of firm i for the period t, r is cost of capital, OI_t is analysts' forecast based other information of firm i year t (see section 3.1), ω is LIM parameters of residual income and γ is LIM parameters of the other information. The LIM parameters are presented in table 5.
For each of the two models bias metrics, I test the null hypothesis that the mean is zero, using t-test, and the null hypothesis that the distribution is centred on zero, using nonparametric signed rank test (Wilcoxon). For the cases that are presented with ***, I reject the null hypothesis at 1 percent level. For each bias and inaccuracy metrics, I test the null hypothesis that the difference between model incorporating "other information" metric and model ignoring "other information" metric is zero using a t-test.

4. CONCLUSION AND DISCUSSION

Using data of listed companies on the Stock Exchange of Thailand, this study tests the empirical validity of Ohlson (1995) model, the LIM-based equity valuation model that expresses price as a function of book value, current residual income and other information. A major issue in testing the model in earlier empirical studies is related to measuring the unspecified other information variable. In this study, I model Ohlson "other information" variable using analysts' forecast-based prediction of residual income as suggested in Ohlson (2001).

The main finding is that the Ohlson (1995) model has substantial empirical validity. In cross-sectional test, the signs of the estimated valuation regression coefficients are consistent with the theoretical prediction of the Ohlson (1995) model. In particular, the estimated coefficients of book value, current residual income and other information are significant positive in valuation model and LIM parameters of residual income and the other information are non-negative and less than one. This finding is consistent with many previous empirical studies in the US. For example, Myers (1999), Begley and Feltham (2002) and Callen and Segal (2005). In addition, I move book value to left hand side and regress on valuation goodwill rather than stock price in order to restrict the coefficient of book value

to one as suggested in the theoretical model. The result reveals that moving book value to left hand side does not affect the inference on residual income and other information.

I also test whether other information variable improve the empirical validity of the Ohlson (1995) model by comparing between model that incorporates other information variable and model that ignores other information variable. The results suggest that incorporating the other information variable improves the empirical validity of the model. In particular, the model that incorporates other information variable reports relatively higher adjusted R-square compared to the model that ignores the other information. In addition, under forecasting approach, the model that incorporates other information produce less valuation error (valuation bias and valuation inaccuracy) compared to the model that ignores other information. This finding is consistent with many previous empirical studies. For instance, Dechow et al. (1999) and Choi et al. (2006). Both are done in the US.

The finding that the model has empirical validity supports the notion that the Ohlson LIM-based valuation model is appealing in that it gives closed-form of valuation expression based on currently observable accounting information, i.e. book value of equity and residual income, and the other information. However, implications of the LIM approach to estimate intrinsic values of the model report significant negative bias, i.e. intrinsic value is lower than market value, indicating that Ohlson (1995) model undervalue equities relative to stock price. The significant negative bias found in this study is consistent with earlier studies, e.g. Dechow et al. (1999), Myers (1999), Callen and Segal (2005) and Choi et al. (2006) and are consistent with the restricted assumption of the Ohlson model that accounting is unbiased, while the present GAAP is biased toward conservatism where market value is higher than book value on average.

The findings that incorporating other information variable into research design improves empirical validity of Ohlson (1995) model and reduces valuation error highlight the importance of the role of other information in equity valuation. While accounting data forms the core of valuation function, an adjustment for information other than accounting data must be considered and the empirical implementation of the other information variable is the key contribution of this study. The findings suggest that during the period of this study, Thai investors paid attention to information other than accounting data when they made investment decision and they obtained the information from analysts' forecast of future earnings. These findings highlight the role of analysts' forecast based other information on explaining stock price. The results of this study will provide guideline for the policymakers, i.e. the Stock Exchange of Thailand and Thai Securities and Exchange Commission, for i) the inclusion of information disclosure related to non-accounting performance information for listed companies and ii) the disclosure for information sources and methodologies utilized in

generating analysts' earnings forecasts, as these forecasts significantly impact investors' investment decision. The limitation of this study is regarding the restricted assumption of Ohlson (1995) model that accounting is unbiased. This leads to suggestions for future research to incorporate accounting choice, i.e. accounting conservatism, as discussed in Feltham and Ohlson (1995) into research design.

REFERENCES

Acaranupong, K. (2017). Comparative Value Relevance of Earnings, Book Values and Cash Flow: Empirical Evidence from Listed Companies on SET100 in Thailand. *Journal of Accounting Profession, 13*(38), 95–114.

Acaranupong, K. (2021). International Financial Reporting Standards Convergence and Value Relevance of Accounting Information: Evidence from ASEAN. *Asian Journal of Business and Accounting, 14*(2), 31–68.

Ahmed, A. S., Morton, R. M. & Schaefer, T. F. (2000). Accounting Conservatism and the Valuation of Accounting Numbers: Evidence of the Feltham-Ohlson (1996) Model. *Journal of Accounting, Auditing and Finance, 15*(3), 271–292.

Arunrungsirilert, T., Sangiumvibool-Howell, P., & Kitticharoenrerk, P. (2022). Value Relevance of Accounting Profit: An Extended Analysis in Thailand. *Thammasat Review, 25*(2), 175–196.

Ashton, D. & Wang, P. (2013). Valuation Weight, Linear Dynamics and Accounting Conservatism: An Empirical Analysis. *Journal of Business Financial and Accounting, 40*(1–2), 1–25.

Ball, R. & Brown, P. (1968). An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research, 6*(2), 159–178.

Barth, M.E., Beaver, W.H., & Landsman, W.R. (2001). The relevance of the value relevance literature for financial accounting standard setting: Another view. *Journal of Accounting and Economics, 31*(1–3), 77–104.

Begley, J. & Feltham, G. A. (2002). The Relation between Market Values, Earnings Forecasts, and Reported Earnings. *Contemporary Accounting Research, 19*(1), 1–48.

Bernard, V. L. (1995). The Feltham-Ohlson Framework: Implications for Empiricists. *Contemporary Accounting Research, 11*(2), 733–747.

Brown, L. D., Griffin, P. A., Hagerman, R. L. & Zmijewski, M. E. (1987a). Security Analyst Superiority Relative to Univariate Time-series Models in Forecasting Quarterly Earnings. *Journal of Accounting and Economics, 9*(1), 61–87.

Brown, L. D., Richardson, G. D. & Schwager, S. L. (1987b). An Information Interpretation of Financial Analyst Superiority in Forecasting Earnings. *Journal of Accounting Research, 25*(1), 49–67.

Bruner, R. F., Conroy, R. M., Estrada, J., Kritzman, M. & Li, W. (2002). Introduction to 'Valuation in Emerging Markets'. *Emerging Markets Review, 3*(4), 310–324.

Callen J. L. & Segal, D. (2005). Empirical Tests of the Feltham-Ohlson (1995) Model. *Review of Accounting Studies, 10*(4), 409–429.

Cheng, Q. (2005). The role of analysts' forecasts in accounting-based valuation: A critical evaluation. *Review of Accounting Studies, 10*(1), 5–31.

Choi, Y. S., O'Hanlon, J. F. & Pope, P. F. (2006). Conservative Accounting and Linear Information Valuation Models. *Contemporary Accounting Research, 23*(1), 73–101.

Clubb, C. D. B. (1996). Valuation and Clean Surplus Accounting: Some Implications of the Feltham and Ohlson Model for the Relative Information Content of Earnings and Cash Flows. *Contemporary Accounting Research, 13*(2), 329–337.

Clubb, C. D. B. (2012). Information Dynamics, Dividend Displacement, Conservatism, and Earnings Measurement: a Development of the Ohlson (1995) Valuation Framework. *Review of Accounting Studies, 18*(2), 360–385.

Dechow, P. M., Hutton, A. P. & Sloan, R. G. (1999). An Empirical Assessment of the Residual Income Valuation Model. *Journal of Accounting and Economics, 26*(1–3), 1–34.

Easton, P. & Harris, T. (1991). Earnings as an Explanatory Variable for Returns. *Journal of Accounting Research, 29*(1), 19–36.

Easton, P. & Pae., J. (2004). Accounting Conservatism and the Relation Between Returns and Accounting Data. *Review of Accounting Studies, 9*(4), 495–521.

Edwards, E. O. & Bell, P. W. (1961). *The Theory of and Measurement of Business Income*, California, CA: University of California Press.

Eng, L.L., Sun, L., & Vichitsarawong, T. (2013). The valuation properties of earnings and book values reported under IAS, domestic GAAP and U.S. GAAP: Evidence from China, Hong Kong, Japan, Korea and Singapore. *Advances in Accounting, incorporating Advances in International Accounting, 29*(2), 278–285.

Fama, E. F. & MacBeth, J. D. (1973). Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy, 81*(3), 607–636.

Feltham, G. A. & Ohlson, J. A. (1995). Valuation and Clean Surplus Accounting for Operating and Financial Activities. *Contemporary Accounting Research, 11*(2), 689–731.

Feltham, G. A. & Ohlson, J. A. (1996). Uncertainty Resolution and The Theory of Depreciation Measurement. *Journal of Accounting Research, 34*(3), 209–234.

Frankel, R. & Lee., C. (1998). Accounting Valuation, Market Expectation and Cross-sectional Stock Returns. *Journal of Accounting and Economics, 25*(3), 283–319.

Francis, J., & Schipper, K. (1999). Have financial statements lost their relevance? *Journal of Accounting Research, 37*(2), 319–352.

Graham, R. C. & King, R. D. (2000). Accounting Practices and the Market Valuation of Accounting Numbers: Evidence from Indonesia, Korea, Malaysia, the Philippines, Taiwan, and Thailand. *The International Journal of Accounting, 35*(4), 445–470.

Graham, R., King, R., & Bailes, I. (2000). The value relevance of accounting information during a financial crisis: Thailand and the 1997 decline in the value of the Baht. *Journal of International Financial Management and Accounting, 11*(2), 84–107.

Hand, J. R. M. (2001). Discussion of Earnings, Book Values, and Dividends in Equity Valuation: An Empirical Perspective. *Contemporary Accounting Research, 18*(1), 121–130.

Hand, J. R. M. & Landsman, W. R. (2005). The Pricing of Dividends in Equity Valuation. *Journal of Business Finance & Accounting, 32*(3–4), 435–469.

James, M. & Koller, T. M.(2000). Valuation in emerging markets. *The McKinsey Quarterly, 2000*(4), 78–85.

King, R. D. & Langli, J. C. (1998). Accounting diversity and firm valuation. *The International Journal of Accounting, 33*(5), 529–567.

Kothari, S. P. (2001). Capital markets research in accounting. *Journal of Accounting & Economics, 31*(1–3), 105–231.

Liu, J. & Ohlson, J. A. (2000). The Feltham–Ohlson (1995) Model: Empirical Implications. *Journal of Accounting, Auditing and Finance, 15*(3), 321–331.

Lo, K., & Lys., T. (2000). The Ohlson model: Contribution to valuation theory, limitations, and empirical applications. *Journal of Accounting, Auditing and Finance, 15*(3), 337–367.

Lundholm, R. J. (1995). A Tutorial on the Ohlson and Feltham/Ohlson models: answers to some frequently asked questions. *Contemporary Accounting Research, 11*(2), 661–687.

Miller, M. H. & Modigliani, F. (1961). Dividend Policy, Growth and the Valuation of Shares. *The Journal of Business, 34*(4), 411–433.

Myers, J. N. (1999). Implementing Residual Income Valuation with Linear Information Dynamics. *The Accounting Review, 74*(1), 1–28.

Myers, J. N. (2000). The Feltham–Ohlson (1995) Model: Empirical Implications. *Journal of Accounting, Auditing and Finance, 15*(3), 321–331.

Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica, 55*(3), 703–708.

Ohlson, J. A. (1989). *Accounting Earnings, Book Value, and Dividends: The Theory of the Clean Surplus Equation (Part I)*. Working paper. Columbia University.

Ohlson, J. A. (1995). Earnings, Book Values, and Dividends in Equity Valuation. *Contemporary Accounting Research, 11*(2), 661–687.

Ohlson, J. A. (2001). Earnings, Book Values, and Dividends in Security Valuation: An Empirical Perspective. *Contemporary Accounting Research, 18*(1), 107–121.

Peasnell, K. V. (1981). On capital budgeting and income measurement. *Abacus, 17*(1), 52–67.

Peasnell, K. (1982). Some Formal Connections between Economic Values and Yields in Accounting Numbers. *Journal of Business Finance and Accounting, 9*(3), 361–381.

Penman, S. H. (1992). Return to Fundamental. *Journal of Accounting, Auditing, and Finance, 7*(4), 465–483.

Penman, S. H. (2009), *Financial Statement Analysis and Security Valuation*. New York: McGraw-Hill.

Penman, S., & Sougiannis, T. (1996). *A Comparison of Dividend, Cash Flow, and Earnings Approaches to Equity Valuation*. Working Paper. University of California at Berkeley and University of Illinois at Urbana-Champaign.

Phakdee, A. and Srijunpetch, S. (2020). The value relevance of accounting information in financial industry: 15-year perspective. *Journal of Business Administrator, 9*(1), 196–214.

Roger, T. (2024). Do financial analysts care about ESG?. *Finance Research Letters, 63*(105289).

Shan, Y., Taylor, S. & Walter, T (2014). The role of "other information" in analysts' forecasts in understanding stock return volatility. *Review of Accounting Studies, 19*(4), 1346–1392.

Srijunpetch, S. (2006). The implementation of international accounting standards in Thailand. *Journal of Accounting Profession, 2*(5), 64–84.

Tan, Z. (2014). The construction of calculative expertise: The integration of corporate governance into investment analyses by sell-side financial analysts. *Accounting, Organizations and Society, 39*(5), 362–384.

Tungsriwong, S. (2022). Value relevance of IFRS-based accounting information adoption in Thailand Listed Company. *Journal of Business, Economics and Communications, 17*(1), 181–193.

Vichitsarawong, T. (2011). The value relevance of earnings and cash flows: Evidence from Thailand. *Journal of Accounting Profession, 7*(19), 39–53.

Walker, M. (1997). Clean Surplus Accounting Models and Market-based Accounting Research: A Review', *Accounting and Business Research, 27*(4), 341–355.

White, H. L., Jr. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica 48*(4), 817–838.