風險管理學報 第十二卷 第一期 2010 年 5 月
Journal of Risk Management Vol.12 No.1 May 2010
pp.33-51

An Application of the Residual Income Valuation Model to Track the Variation of Stock Prices of Insurance Companies

剩餘盈餘評價模型於追蹤保險公司股價變化的應用

詹芳書（Fang-Shu Linus Chan）* 郭維裕（Wei-Yu Kuo）**

蔡政憲（Chenghsien Tsai）***

Abstract

In this paper, a simple regression model was constructed to track the variation of insurance company stock prices. Ohlson’s residual income valuation model (1995) was used to create a new financial ratio P/V (price to intrinsic value) to be compared with P/B (price to book value) and P/E (price to earning) ratios. Ohlson’s model helped to incorporate the clean surplus relationship to estimate the intrinsic value of insurance firms. It was found that the Ohlson’s estimation has a minor improvement of book value under abnormal earning forecasting for finite future periods and does not have an obvious difference under the various discount factors. The regression model with high R-square results from the stable increment of book value and estimation of intrinsic value V.

Keywords: Residual Income, Intrinsic Value, Abnormal Earnings

---

* 聯絡作者，國立政治大學風險管理與保險學系博士候選人，Email: 93358503@nccu.edu.tw, Tel: +886-2-29393091-81201。Ph.D. Candidate, Department of Risk Management and Insurance, National Chengchi University, Taiwan. 作者感謝本刊匿名評審委員所給予的寶貴意見，在此表達由衷的謝意。此外，感謝國科會所提供的研究計畫財務補助（計畫編號：NSC-96-2416-H-004-026-MY3）。

** 國立政治大學國際經營與貿易學系專任副教授，Email: wkuo@nccu.edu.tw。Associate Professor, Department of International Business, National Chengchi University, Taiwan.

*** 國立政治大學風險管理與保險學系專任副教授，Email: ctsai@nccu.edu.tw。Associate Professor, Department of Risk Management and Insurance, National Chengchi University, Taiwan.

摘　要

我們利用財務比率來建構一個簡單的迴歸模型以追蹤保險公司股價的變化。除了股價/淨值比與本益比之外，我們加入一個新的解釋變數，股價/真實價值比來解釋保險公司股價的變化。真實價值的估計是依據 Ohlson (1995) 提出的剩餘盈餘評價模型，藉由引入異常淨盈餘的觀念來估計公司的真實價值。研究結果發現反映未來異常盈餘的公司真實價值，略高於公司的淨值，且此結果不因不同的折現因子而有差異；另一方面，股價/真實價值比在解釋保險公司股價變化上並未提供更多的解釋能力，此結果可歸因於保險公司常透過準備金科目來調整異常盈餘所致。

關鍵字：剩餘盈餘、真實價值、異常盈餘

1. Introduction

Investors often use financial ratios such as price to book value ratio (P/B ratio), price to earning ratio (P/E ratio), and price to dividend ratio (P/D ratio) to track the variation of stock prices. In recent research, Lee et al. (1999) has shown that the price to intrinsic value ratio (P/V ratio) is marginally better than P/B, P/E, and P/D ratios in tracking stock prices and predicting the market return. The new ratio is calculated by applying the intrinsic value estimation provided by Ohlson's idea (1995) to be the denominator. The purpose of this study is to construct a simple regression model of three predictors, P/B, P/E, and P/V ratios to explain the variation of stock prices. Before comparing the P/V with P/B and P/E, Ohlson's idea was applied to estimate the real value of the firm.

First, how to know the real value of an insurance company for the purpose of investment is of interest. Accounting methods are insufficient because of the static valuation process. Few academic articles discuss the practical problems of measuring the intrinsic value even if intrinsic stock value is important to investors and managers. The intrinsic value is difficult to measure. Most researchers recognize the present value of expected future dividends to common shareholders based on currently available information as a proxy of the intrinsic value. Another estimator used by most investors is book value. However, Ohlson has provided a reasonable alternative for the proxy of intrinsic firm value.

Ohlson introduced the residual income valuation method to estimate intrinsic value by incorporating the clean surplus concept and the relationship between book value, future earnings and dividends. The model provides a connection between the value of a firm and the contemporaneous accounting/information variables. Ohlson's model was applied to insurance industry confidently since many empirical studies have enthusiastically supported Ohlson's model, which is now proposed as an alternative to the discount cash flow model in evaluating a firm and even the stock index.

Ohlson's model specifies that a firm's value equals book value plus a linear function of current abnormal earnings and the scalar variable representing other information. This model is presented as an improvement of the present value of expected dividends model (PVED) by using information dynamics.

Existing articles basically focus on two aspects. First, the model predicts and explains stock prices better than the model based on discount short term forecasts of PVED (Penman and Sougiannis, 1996). Second, the model provides a more complete valuation approach than popular alternatives (Frankel and Lee, 1998). When applying Ohlson's model to cross sectional research, Dechow's results support information dynamics of the residual income valuation model (Dechow, Hutton, and Solan, 1999). However, the results also indicate that Ohlson's model provides only minor improvement when implementing the PVED by capitalizing on short term earnings forecasts.

Empirical studies indicate earnings forecasting plays an important role to estimate the intrinsic value through Ohlson's model. By using a time series model to forecast the abnormal earnings, earnings minus the cost of capital, incorporates information dynamics in the residual income valuation model and provide clear depiction of earnings variation.

No references were found that discussed the intrinsic value of the insurance industry even if insurance company operation is more stable than other industries and historical information provides reasonable explanations of earnings forecasts. There are no studies that discuss the variation of insurance firms stock prices. Thus, the insurance industry was chosen for analysis with Ohlson's model and time series (ARIMA model) to apply the clean surplus concept and information dynamics. It was found that the accounting and stock trading data of insurance firms collected by COMPUSTAT are defective. In order to maintain the completeness of data, samples come from all firms that were members of NYSE Multi-lines insurer between July 1994 and July 2002. Data collected from 2002 Center of Research in Securities Prices (CRSP) monthly tape was used to make up for the deficiency of the data from COMPUSTAT. In establishing the industry index, firms traded as ADR forms with missing data were eliminated.

Intrinsic value estimated by the residual income model with six months of abnormal earnings forecasts is slightly higher than book value, and the stock price is significantly higher than the former. The same results were obtained despite changing the risk free rate form spot rate, three month rate, ten year rate and thirty year rate. Analytical results also showed that financial ratios P/V, P/B and P/E ratios explain most stock price variation (95%). When excluding the co-linearity of P/B and P/V ratios, we suggest the models composed of P/V, P/E ratios and P/B, P/E ratios respectively as reasonable two factor models. Our findings verify that insurance firms attempt to maintain a stationary book value through reserve operations and dividend payouts. For this reason, Ohlson's model provides a minor improvement of static book value in estimating insurer intrinsic value.

The remainder of the paper is organized as follows. Section two discusses the meaning of financial ratio and Section three introduces the residual income valuation model. Section four depicts the data and industry index portfolio. Section five analyzes the regression model and explains our results and finding. Section six is the conclusions and suggestions of this paper.

2. The meaning of financial ratios

Financial ratios differ from the assumption of past financial literature that stock price equals the intrinsic value. The stock price P_t is considered one of estimators of theoretical intrinsic value V_t^*. However it is necessary to admit that stock prices converge continuously with intrinsic value. Thus, price P_t could be assumed to be an unbiased estimator of V_t^*. Other estimators are denoted as K_t, there is logarithmic relationship between V_t^*, P_t, and K_t:

$$\log(P_t) = \log(V_t^*) + \varepsilon_t \tag{1.1}$$

and

$$\log(K_t) = \log(V_t^*) + \omega_t \,, \tag{1.2}$$

where variable ε_t is a random error expression with a mean of zero and accuracy of other estimators reflects the random error expression ω_t. The lower first and second moments of ω_t indicate that K_t is a better estimator (Lee and et al., 1999). Equation (1.2) is subtracted from (1.1):

$$\log(P_t / K_t) = \varepsilon_t - \omega_t \,. \tag{2}$$

The random error expression ε_t is determined by the market and predictably converges with zero as an unbiased estimator of V_t^*. The relative accuracy of any estimator of stock prices is considered, since error ω_t cannot be directly observed.

Thus, Price is used to estimate ratio (P/K ratio) for a regression model to examine each ratio's track ability on unbiased estimator P_t[1].

3. Residual income valuation model

3.1 Basic assumptions

To formulate the valuation model, three analytical assumptions need to be considered. First, risk free rate is chosen as the discount rate to match the risk neutrality requirement. Second, regular owner equity accounting applies: accounting data and dividends satisfy the clean surplus relationship, and dividends reduce book value without affecting current earnings. Third, a linear model frames the time-series behavior of abnormal earnings. The three assumptions lead to a linear closed form valuation solution. The intrinsic value equals book value plus a linear function of present value of future abnormal earnings. The value is also regarded as a weighted average of book value and current earnings minus current dividends.

3.2 Intrinsic value under Ohlson's model

The clean surplus relationship is described as equation:

$$y_t = y_{t-1} + x_t - d_t \tag{3}$$

, where x_t is the earnings in period [*t-1*, *t*], y_t is the book value at time *t*, and d_t is the dividend payout at time *t*. Equation (3) satisfies:

$$\begin{aligned} \partial y_t / \partial d_t &= -1 \\ \partial x_t / \partial d_t &= 0 \end{aligned} . \tag{4}$$

The property is consistent with the concept that dividends reduce book value without affecting current earnings. Abnormal earnings is defined as earnings minus the

---

1 Better intrinsic value estimates yield P/V ratios that have a lower standard deviation and a faster rate of mean reversion. Also, better intrinsic value estimates yield P/V ratios that have greater predictive power for future returns.

cost of capital, denoted by x_t^a. Let

$$x_t^a = x_t - (R_f - 1)y_{t-1} \tag{5}$$

where R_f is the risk free rate plus one. If x_t^a is positive, then it is profitable at time *t*; otherwise, it is negative. By applying equation (5) to equation (3):

$$d_t = x_t^a - y_t + R_f y_{t-1}. \tag{6}$$

For simplicity, it is assumed the interest rate is flat and non-stochastic. Intrinsic value V_t^* at time *t* is defined as：

$$V_t^* = y_t + \sum_{\tau=1}^{\infty} R_f^{-\tau} E_t[\tilde{x}_{t+\tau}^a] \tag{7}$$

and

$$E_t[\tilde{x}_{t+x}^a] / R_f^{\tau} \to 0,\ as\ \tau \to \infty. \tag{8}$$

Equation (7) incorporates accounting data, but abnormal earnings forecasts need not adhere to accounting rules. Next, time-series behavior is used to describe the abnormal earnings.

3.3 Abnormal earnings forecasting

A third assumption is applied; a linear model frames the time-series behavior of abnormal earnings, to the discount model. The time-series relationship is depicted as:

$$\tilde{x}_{t+1}^a = \omega x_t^a + v_t + \tilde{\varepsilon}_{1t+1} \tag{9.1}$$

and

$$\tilde{v}_{t+1} = \gamma v_t + \tilde{\varepsilon}_{2t+1} \tag{9.2}$$

where v_t represents information other than abnormal earnings, ε_{1t} and ε_{2t} are random errors with a mean of zero. Variable v_t can be viewed as the influence on financial statements which results from outside information. Thus, v_t and x_t^a are independent. Parameters ω and γ can be estimated from data and be restricted from zero to one. Without loss of generality, γ is assumed to equals one. Equation (9.2) satisfies that $v_0 = \varepsilon_{2t} = 0$ for $t \geq 1$, then $v_1 = v_2 = \cdots = 0$ and v_t for $t \geq 1$ are independent from each other. Under the assumption above, the sequence $\{ x_t^a \}$, $t = 0, 1, \cdots$ is derived following the standard AR (1) process. If sequence $\{ x_t^a \}$ and $\{ d_t \}$ for $t = 0, 1, \cdots$ are given, then the book value y_t is derived for initial condition $y_0 = -d_0$ by equation (10):

$$y_t = x_t^a + R_f y_{t-1} - d_t . \tag{10}$$

Combined with equation (9.1) and (10), such that

$$E_t[\tilde{x}_{t+1}] = (R_f - 1) y_t + \omega x_t^a + v_t \tag{11}$$

where $E_t[.]$ is the expected operator based on information at time *t*. When time series behavior is applied to abnormal earnings forecasting, implementation is based on the general ARIMA model.

4. Data description and industry index calculation

4.1 Data selection

Most life insurers and property-liability insurers belong to privately traded firms which have a lower trading volume. The samples collected by the major finance analysis database, COMPUSTS and CRSP, are missing many values or are unavailable. Our sample consists of all firms that have been members of NYSE Multi-line insurers between July 1994 and July 2002 on COMPUSTAT for completeness of data.

Foreign firms with ADR forms and firms with missing values which could not be repaired using other data were omitted. The items selected include book value quarterly, earnings per share monthly, P/E ratio monthly, P/B ratio monthly, market value monthly, price monthly, and dividend payout per year. All items were adjusted according to monthly data based on accounting rules and a clean surplus relationship. The dividend information was only applied to the clean surplus relationship to reflect the variation of book value each January. The P/D ratio for negative and zero dividend payout was extracted. Stock price is consistent with the data from 2002 Center of Research in Securities Prices (CRSP) for the deficiency of COMPUSTAT.

Earnings forecasting is the average of I/B/E/S one year growth rate (FY1) and predicted value by ARIMA model [2].

4.2 Industry index formulation

The number of firms in our sample varies from 14 to 16. An insurance industry index was constructed using a price under market value weighted calculation. The industry index was recalculated every six months to track the variation of price over time. The market value weighted method index was constructed for July 1994, Jan 1995, and so on. The industry index included industry book value and industry earnings. The clean surplus relationship is reflected each Jan 1 in the analysis period for yearly dividend payouts. Figure 1 depicts the time series plot of the industry index. Corresponding to the Standard & Poor 500 index, the tendency of both indices are nearly consistent. Though the number of firms may be unreasonable, the industry index constructed can be accepted according to expectations. The time series model fitted for abnormal earnings is ARIMA (3, 1, 0) where:

$$\tilde{x}_t^a = 0.07601 + 1.4719 x_{t-1}^a - 0.3245 x_{t-2}^a + 0.4959 x_{t-3}^a - 0.3485 x_{t-4}^a + \tilde{\varepsilon}_t . \quad (12)$$

The weights for each firm in the analysis period are presented in Appendix Table 1.

Table 1 Correlation coefficients matrix

Variable	P/B	P/E	PVL1	PVL2	PVS1
P/B	1				
P/E	0.1691	1			
PVL1	0.883	0.0198	1		
PVL2	-0.847	-0.0452	-0.9893	1	
PVS1	-0.581	-0.6212	-0.5441	0.5344	1
PVS2	-0.5461	0.527	-0.5729	0.4914	-0.207

2 I/B/E/S forecasts only provide FY1 growth rate for larger firms. Simple ARIMA models are selected by abnormal earnings data with ACF and PACF.

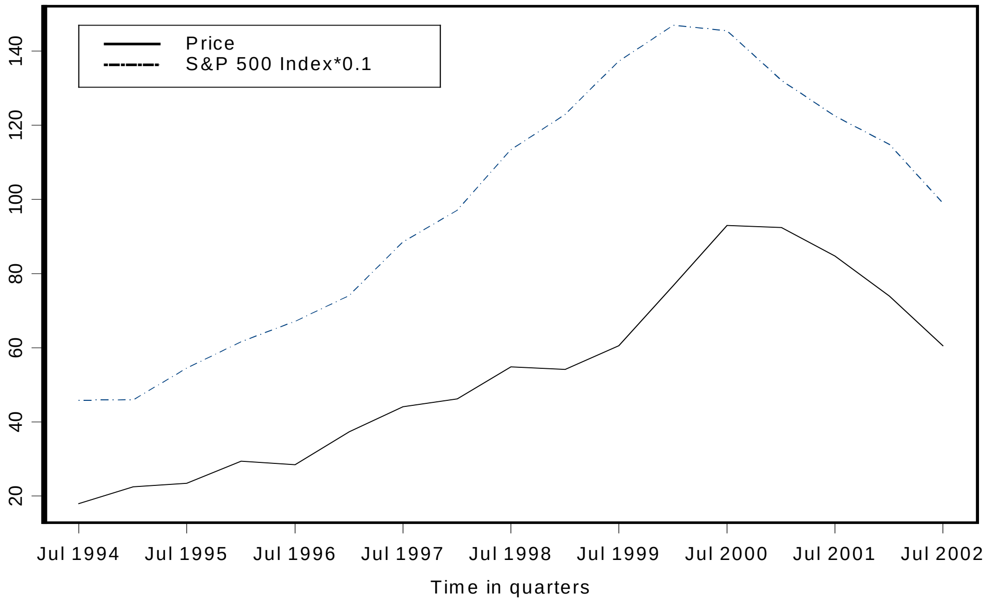

Figure 1 Price of insurance industry portfolio and S&P 500 index

4.3 Discount factor

In order to satisfy the risk neutrality assumption, a spot rate was selected with three months interest rate for the short term rates, and ten year and thirty year treasury bond yields for the long term rates. The discount model was adjusted to incorporate the interest rate risk by modifying the flat discount factor. There was no assumption the interest rate process follows any stochastic model such as CIR and HJM model for over complexity in value estimation. For simplicity, the empirical interest rate data was used to obtain variation into the model. Equation (5) is revised to

$$V_t = y_t + \sum_{\tau=1}^{\infty} R_{ft}^{-\tau} E_t[\tilde{x}_{t+\tau}^a] \tag{13}$$

,where R_{ft} is time-varying discount factor.

4.4 Residual income valuation model implementation

The success of equation (11) depends on abnormal earnings forecasting for infinite periods. In practice, predictable future earnings were restricted to six months in order to be consistent with the index adjustment per half year. The estimation formula then

$$\hat{V}_t = y_t + \sum_{\tau=1}^{6} R_{ft}^{-\tau} E_t[\tilde{x}_{t+\tau}^{a}]. \tag{14}$$

Notations VS1, VS2, VL1 and VL2 denote the estimation by equation (14) under spot rate, three month interest rate, ten year and thirty year Treasury bond yields respectively. Figure 2 depicts the time series plot of intrinsic estimations VS1, VS2, VL1 and VL2 versus the book value.

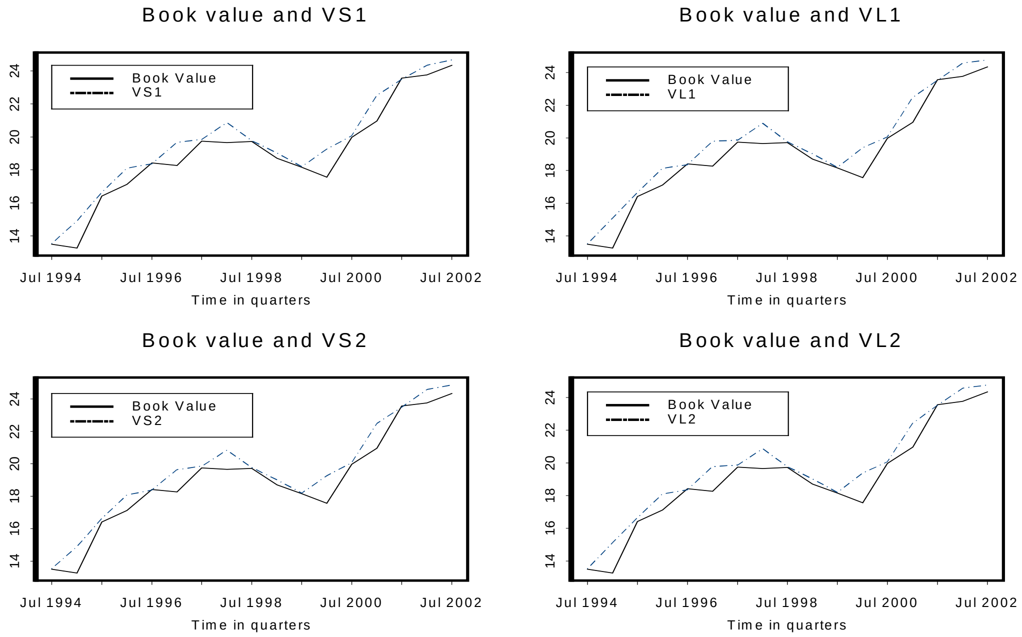

Figure 2 Book value and intrinsic values using different discount rates

5. Regression model

5.1 Model formulation

Ohlson's estimation for intrinsic value was calculated to see how it compared with book value. To test if the P/V ratio has better tracking than the P/B and P/E ratios, each ratio is stationary before constructing the regression model to examine the explanation ability of each financial ratio. The β in the unit root test is estimatedas: -0.1453, -0.1330, -0.1327, -0.1332, -0.1336, -0.1060 for P/B, P/VL1, P/VL2, P/VS1, P/VS2 and P/E ratios respectively. The financial ratios are regarded as a stationary process following the research of Dickey-Fuller[3]. Figure 3 depicts time series plots of P/B, P/E, P/VL1, P/VL2, P/VS1 and P/VS2 ratios.

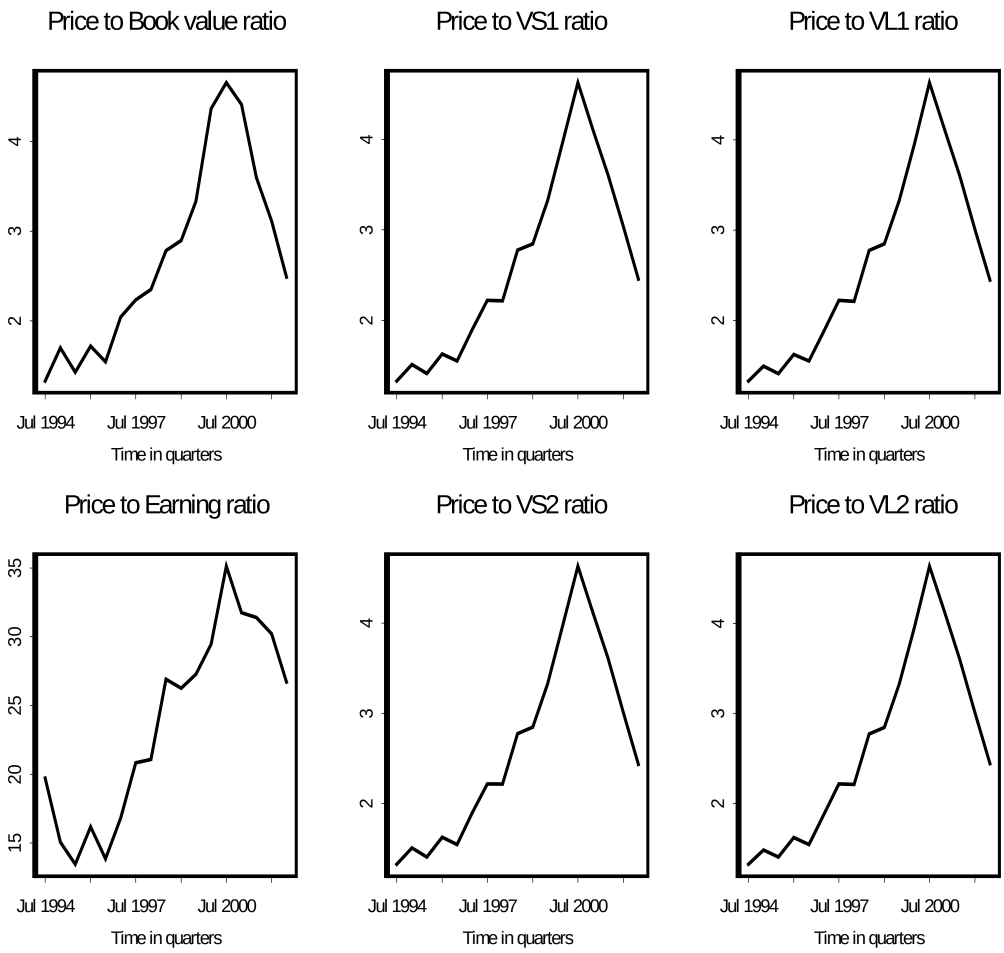

Figure 3 Financial ratios

3 Dickey- Fuller concept: By subtracting Y_{t-1} from both sides of the equation $Y_t = b_1 Y_{t-1} + \varepsilon_t$, $Y_t - Y_{t-1} = (b_1 - 1)Y_{t-1} + \varepsilon_t$ or $\Delta Y_t = \beta Y_{t-1} + \varepsilon_t$ are obtained. Test: $H_0: \beta = 0 \rightarrow$ Unit root; $H_1: \beta < 0 \rightarrow$ Stationary.

The time series plots show a high correlation between P/B ratio and each P/V ratio; the correlation coefficients matrix in Table 1 confirms this result.

The regression model is constructed with three factors. After eliminating multi-co-linearity, our model was modified to be a two factor model. A univariate model to represent the P/V ratio's tracking ability was added.

The variation of the industry index as the response variable with predictors P/B, P/E and P/V ratios is used. The three factor model is

$$\Delta P_t = \alpha + \beta_1 PB_{t-1} + \beta_2 PE_{t-1} + \beta_3 PV_{t-1} + \varepsilon_t \,. \tag{15}$$

PV_t was substituted for $PVS1_t$, $PVS2_t$, $PVL1_t$, and $PVL2_t$ as the regression model respectively. Table 2 to 5 show analysis results. There is little difference between the two factor model and the univariate model. The three factor model was broken down for multi-co-linearity. The various discount rates did not make obvious differences in the model.

Table 2 Regression results of $\Delta P_t = \alpha + \beta_1 PB_{t-1} + \beta_2 PE_{t-1} + \beta_3 PVS1_{t-1} + \varepsilon_t$

Value in parentheses represents the p-value and double star ** denotes the significance at 5%.

Response Variable/ Predictors coefficient	Variation of Portfolio Stock Price (market value weighted)				
Intercept	-18.3396	-18.1503	-17.0025	-5.4116	-6.1176
P/B ratio (market value weighted)	9.8158 (0.4666)	8.7774 ** (0.0201)	-	21.6970** (8.546e-009)	-
P/E ratio (market value weighted)	2.0767** (0.0083)	2.0421** (0.0011)	1.8662** (0.0072)	-	-
P/V ratio under short term rate (spot rate)	-1.3095 (0.9356)	-	10.2048** (0.0279)	-	22.6889** (1.672e-009)
Adj. R-square	0.9628	0.9628	0.961	0.9125	0.9306

Table 3 Regression results of $\Delta P_t = \alpha + \beta_1 PB_{t-1} + \beta_2 PE_{t-1} + \beta_3 PVS2_{t-1} + \varepsilon_t$

Value in parentheses represents the p-value and double star ** denotes the significance at 5%.

Response Variable/ Predictors coefficient	Variation of Portfolio Stock Price (market value weighted)				
Intercept	-18.3396	-18.1503	-17.1973	-5.4116	-5.9888
P/B ratio (market value weighted)	10.4178 (0.4327)	8.7774 ** (0.0201)	-	21.6970** (8.546e-009)	-
P/E ratio (market value weighted)	2.0911** (0.0059)	2.0421** (0.0011)	1.9054** (0.0057)	-	-
P/V ratio under short term rate (3 months)	-2.0314 (0.8966)	-	9.9384** (0.0293)	-	22.6606** (2.213e-009)
Adj. R-square	0.9628	0.9628	0.9608	0.9125	0.9278

Table 4 Regression results of $\Delta P_t = \alpha + \beta_1 PB_{t-1} + \beta_2 PE_{t-1} + \beta_3 PVL1_{t-1} + \varepsilon_t$

Value in parentheses represents the p-value and double star ** denotes the significance at 5%.

Response Variable/ Predictors coefficient	Variation of Portfolio Stock Price (market value weighted)				
Intercept	-18.3396	-18.1503	-16.9948	-5.4116	-5.9224
P/B ratio (market value weighted)	9.2282 (0.4644)	8.7774 ** (0.0201)	-	21.6970** (8.546e-009)	-
P/E ratio (market value weighted)	2.0570** (0.0073)	2.0421** (0.0011)	1.8781** (0.0066)	-	-
P/V ratio under short term rate (10 years)	-0.5674 (0.9699)	-	10.1212** (0.0281)	-	22.6716** (1.823e-009)
Adj. R-square	0.9628	0.9628	0.961	0.9125	0.9298

Table 5 Regression results of $\Delta P_t = \alpha + \beta_1 PB_{t-1} + \beta_2 PE_{t-1} + \beta_3 PVL2_{t-1} + \varepsilon_t$

Value in parentheses represents the p-value and double star ** denotes the significance at 5%.

Response Variable/ Predictors coefficient	Variation of Portfolio Stock Price (market value weighted)				
Intercept	-18.3396	-18.1503	-16.9718	-5.4116	-5.9070
P/B ratio (market value weighted)	8.7782 (0.4905)	8.7774 ** (0.0201)	-	21.6970** (8.546e-009)	-
P/E ratio (market value weighted)	2.0421** (0.0075)	2.0421** (0.0011)	1.8735** (0.0065)	-	-
P/V ratio under Long term rate (30 years)	-0.001 (0.99999)	-	10.1487** (0.0271)	-	22.6553** (1.78e-009)
Adj. R-square	0.9628	0.9628	0.9612	0.9125	0.93

5.2 Results and implications

In the superior model P/B is added to P/E for the highest R-square. This is only marginally worse than the former model. The univariate model with almost 93% R-square is not obviously inferior to the two factor model since our intrinsic value estimation $\hat{V}$ has incorporated information of book value and earnings.

Before P/V can be accepted for good tracking ability, the extremely high explanation ability R^2 (>90%) is of interest. The two factor model and the univariate model possess an extremely high explanation ability R^2. The results show the rise of similar tendencies of price and financial ratios. Financial ratios in our model may not depend on price, but on the market. The financial ratios P/E and P/B are collected from the market and the P/V ratios are calculated according to Ohlson's research. This does not correspond with our findings. Our belief is that reasonable financial ratios are decided by the market to reflect investor expectations in economic environments.

We suspect that the variation of price predicts itself. This could be one of the reasons for the extremely high explanation ability R^2. Next, we tried to decompose the financial ratios to analyze the causes which result in the high R-square regression model.

By following the clean surplus relationship the intrinsic value reflected by abnormal earnings was estimated. Our results show intrinsic value estimations from residual income valuation method by time-varying rate have a minor improvement over book value. The summary of book value and intrinsic value estimations are shown in Table 6.

Table 6 Summary of estimators

Minimum, first quarter, median, mean, third quarter, maximum, and stand error are displayed in columns 2 to 8 respectively.

Characteristic/ Variable	Min.	1st Q.	Median	Mean	3rd Q.	Max.	Std. Error
Price	17.96	29.42	54.15	52.95	73.92	92.96	24.7967
Book Value	13.26	17.56	18.7	19.01	19.97	24.34	3.1190
VS1	13.52	18.19	19.66	19.60	20.87	24.65	3.0382
VS2	13.52	18.19	19.64	19.62	20.85	24.85	3.0828
VL1	13.52	18.19	19.76	19.65	20.90	24.76	3.0542
VL2	13.52	18.19	19.76	19.64	20.87	24.76	3.0485

Financial ratios were calculated by dividing the price by estimators. It was found that the variation of financial ratios depend mostly on the variation of price, because the standard error of price is much greater than each estimator. On the other hand, estimators except for price, displayed a stationary increment during the analytical period. This phenomenon confirms the results above. We discuss the properties of book value in the insurance industry to explain the minor improvement of Ohlson’s estimations and our model’s characteristics.

Insurance firms tend to maintain a stationary book value to satisfy the requirements of regulators. If the book value decreases, insurance firms could be asked to raise their capital and the insurable capacity would be restricted to a fixed amount. Managers often smooth the variation of book value by increasing or decreasing liability reserves to satisfy regulations and shareholder expectations. This result is consistent with Mary Weiss (1985). Abnormal earnings are not significant for conservative earnings forecasting. Expected rate of return is often assumed to be associated with the risk free rate. Thus, there is only minor improvement by applying the book value and abnormal earnings to Ohlson’s model. For this reason, the intrinsic value estimators are similar to the tendencies of book value. Our results indicate financial ratios are acceptable predictors to track the variation of price although the high explanation ability is caused by predictor characteristics in our regression model.

6. Conclusions and suggestions

When using the Ohlson model to estimate the real value of a firm to create a new P/V ratio for the regression model, the model reflected the characteristics of the insurance industry. Accounting data was combined with time-series earnings forecasting to evaluate the real value of insurance firms. Abnormal earnings forecasting plays an important role in the success of Ohlson’s model. However, the effect of abnormal earnings is not significant to a real value estimate for the minor improvement of book value in the insurance industry. The reasons are: (i) insufficient data; (ii) insurance firm characteristics mitigate the effect of information dynamics on the discount model for hidden earnings.

The hidden earnings of insurance firms could be reflected in the market by higher stock prices. Thus, larger variations of stock prices dependent on investor expectations explain the same variation of financial ratios. This phenomenon provides a reasonable explanation for our regression model.

This article constructs a simple regression model to discuss the variation between insurance firm prices and each financial ratio. We also apply Ohlson’s concept to estimate the real value of the insurance industry. There are no previous studies which have applied a residual income valuation model to a single industry. We suggest that future research can focus on three areas: (1) a model for hetero-skedasticity; the first-order difference of logarithmic return as a responsible variable in our model; (2) tracking the variation of stock prices, incorporate market variables into our model; (3) firm size effect on the stability of book value in the insurance industry; if hidden earnings can be reflected by abnormal earnings forecasting, the model can be extended to individual firms.

References

1. Dechow, P.M., A.P. Hutton, and R.G. Sloan, 1999, An Empirical Assessment of the Residual Income Valuation Model, *Journal of Accounting and Economics*, 26, 1, 1-34.
2. Feltham, G.A. and J.A. Ohlson, 1995, Valuation and Clean Surplus Accounting for Operation and Financial Activities, *Contemporary Accounting Research*, 11, 2, 689-731.
3. Frankel, R. and C.M.C. Lee, 1998, Accounting Valuation, Market Expectation, and Cross-Sectional Stock Returns, *Journal of Accounting and Economics*, 25, 3,283-319.
4. Lee, C.M.C., J. Myers, and B. Swaminathan, 1999, What is the Intrinsic Value of the Dow, *Journal of Finance*, 54, 5, 1693-1741.
5. Olson, J.A., 1995, Earnings, Book Values, and Dividends in Equity Valuation, *Contemporary Accounting Research*, 11, 2, 661-87.
6. Penman, S.H. and T. Sougiannis, 1996, A Comparison of Dividend, Cash Flow, and Earning Approaches to Equity Valuation, Working paper, University of California at Berkeley and University at Urbana-Champaign.
7. Weiss, M., 1985, A Multivariate Analysis of Loss Reserving Estimates In Property-Liability Insurers, *Journal of Risk and Insurance*, 52, 2,199-221.

Appendix

Appendix Table 1 Portfolio weights

Companies' name is in row 1. Portfolio's renew dates are in column 1. The number in each blanket represents the weight on each renewed date.

Date	3CFIN	3MLRMF	AAME	AFC	AFG	AIG	ALFA	ANAT	HCC
1994/7/1	0.000128	0.007450	0.000881	-	0.027922	0.714123	0.010498	0.032333	0.003994
1995/1/1	0.000120	0.007463	0.000822	-	0.025957	0.734120	0.009104	0.027633	0.005120
1995/7/1	0.000159	0.009224	0.000754	-	0.027677	0.717834	0.009055	0.030865	0.006147
1996/1/1	0.000133	0.007872	0.000653	0.018652	0.027330	0.642326	0.007699	0.025547	0.007769
1996/7/1	0.000103	0.007326	0.000874	0.021338	0.025845	0.635370	0.006230	0.024459	0.013272
1997/1/1	0.000109	0.007547	0.000686	0.020722	0.024915	0.642129	0.005758	0.022577	0.011286
1997/7/1	0.000038	0.008181	0.000502	0.019824	0.025055	0.665153	0.005313	0.023288	0.012813
1998/1/1	0.000016	0.009883	0.000786	0.027634	0.020136	0.675342	0.006381	0.020857	0.007524
1998/7/1	0.000007	0.010358	0.000658	0.028046	0.016991	0.734000	0.005713	0.017223	0.006741
1999/1/1	-	0.008968	0.000499	0.019876	0.013516	0.776566	0.005488	0.013298	0.005713
1999/7/1	-	0.007240	0.000435	0.018063	0.011022	0.806776	0.004068	0.010599	0.006161
2000/1/1	-	0.003828	0.000288	0.013566	0.006677	0.864280	0.003167	0.008178	0.003474
2000/7/1	-	0.002821	0.000185	0.013545	0.006249	0.865530	0.003053	0.006987	0.004307
2001/1/1	-	0.002319	0.000180	0.013209	0.007588	0.844512	0.003069	0.008441	0.004768
2001/7/1	-	0.001944	0.000145	0.012074	0.008532	0.827834	0.004025	0.009068	0.005754
2002/1/1	-	-	0.000214	0.009536	0.006898	0.829281	0.003988	0.009442	0.006878
2002/7/1	-	-	0.000234	0.007248	0.007623	0.836601	0.004926	0.011340	0.007026

Appendix Table 1 (continued)

Date	HIG	HMN	LTR	NSEC	TCHC	UFCS	UNAM	UTR
1994/7/1	-	0.018460	0.126746	0.000980	-	0.004609	0.000677	0.051197
1995/1/1	-	0.014060	0.121589	0.000865	-	0.004512	0.000582	0.048053
1995/7/1	-	0.011637	0.143145	0.000791	-	0.004226	0.000691	0.037795
1996/1/1	0.082091	0.010833	0.136137	0.000415	-	0.004543	0.000552	0.027448
1996/7/1	0.089151	0.010518	0.134448	0.000409	-	0.005249	0.000623	0.024784
1997/1/1	0.097409	0.011406	0.128408	0.000335	-	0.003801	0.000723	0.022191
1997/7/1	0.093012	0.010871	0.110745	0.000310	-	0.003750	0.000610	0.020535
1998/1/1	0.092926	0.012445	0.100521	0.000372	-	0.004013	0.000646	0.020518
1998/7/1	0.085356	0.009567	0.064499	0.000258	-	0.002886	0.000622	0.017076
1999/1/1	0.072292	0.006232	0.058440	0.000172	0.000146	0.001972	0.000446	0.016377
1999/7/1	0.068723	0.005813	0.042962	0.000147	0.000124	0.001429	0.000356	0.016082
2000/1/1	0.045190	0.004101	0.031763	0.000121	0.000108	0.001078	0.000253	0.013929
2000/7/1	0.058945	0.002433	0.026418	0.000128	0.000072	0.000821	0.000180	0.008323
2001/1/1	0.059490	0.002890	0.041118	0.000116	0.000041	0.000969	0.000151	0.011139
2001/7/1	0.066945	0.003568	0.047759	0.000134	0.000031	0.001255	0.000149	0.010783
2002/1/1	0.067463	0.003489	0.049556	0.000163	0.000049	0.001321	0.000140	0.011582
2002/7/1	0.062713	0.003489	0.044920	0.000182	0.000084	0.001769	0.000133	0.011711