V. The regression model

A. Specification checks

Before constructing the regression model to examine the explanation ability of financial ratios, we need to make sure that all ratios are stationary. The b in the unit root test is estimated as follows: -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 ratio respectively. These ratios are regarded as stationary process by the Dickey-Fuller's test. Figure 3 depicts time series plots of P/B, P/E, P/VL1, P/VL2, P/VS1, and P/VS2 ratios.

[Insert Figure 3 Here]

The P/V ratios under various discount rates present similar tendencies to P/B and P/E, especially the P/B ratio. Comparing Figure 1 with and Figure 3, we find that the P/B and P/V ratios have the same pattern as the stock price. This result owes to that the variations in the book value and our real value estimations are smaller than those in the stock price.

The time series plots indicate a high correlation between the P/B ratio and the P/V ratios. We thus further present the correlation coefficients matrix in Table 1. Table 1 shows that the absolute values of correlation coefficients between P/B and PV under various rates are bigger than 0.5. The absolute values of correlation

coefficients between PVL1 and other estimations of intrinsic values are also bigger than 0.5. The collinearity problem will be taken into account in constructing models.

[Insert Table 1 Here]

B. Establishing the regression model

The industry index is the response variable while the predictors are P/B, P/E, and/or P/V ratios. The three-factor model is

$$P_t = a + b_1 PB_t + b_2 PE_t + b_3 PV_t + e_t \,. \tag{15}$$

We substitute PV_t for $PVS1_t$, $PVS2_t$, $PVL1_t$, and $PVL2_t$ respectively in the regression model. The collinearity problem between the P/B ratio and the P/V ratios lead us to construct two-factor model that might be more robust. We also construct uni-variate models to examine the individual P/V ratios' tracking abilities. The uni-variate model constructed by P/B ratio is then compared with each P/V ratio model.

Tables 2 to 5 contain the results. In Table 2, we find that the predictors, P/B and P/V, in the three-factor model are insignificant for the p-value 0.4666 and 0.9356. On the other hand, the predictors in the two-factor model are both significant. The explanation ability indicated by R-square of the model (P/B +P/E) is a little higher

than the model (P/E + P/V). Similar results exhibit in other tables.

[Insert Tables 2~5 Here]

The major findings from these tables are that the intrinsic value estimations using the residual income valuation method with time-varying rates generate only minor improvements over book values. The differences between two-factor models and uni-variate models are minor. The four discount rates do not make significant differences either. The three-factors model is susceptible to the collinearity problem, on the other hand.

C. Results and implications

The uni-variate P/V model is a little superior to P/B model with R-square 93% and 91.25% respectively. New financial ratio P/V represents higher explanation ability than the conventional P/B ratio in uni-variate regression. However, the best model is the P/B + P/E model since it has the highest R-square, with the model P/V + P/E follow closely. Although these high R-squares could be explained as good tracking abilities of our models, we concern about other reasons that might give rise to the similar tendency between price and financial ratios. For instance, our regression model might boil down to the one using the dependent variable to predict itself if the demonstrators of the financial ratios do not change much. We therefore

decompose the financial ratios and the results are in Table 6. The summary of book value and intrinsic value estimations shows in Table 6.

[Insert Table 6 Here]

The results in Table 6 show that the variations in the financial ratios are largely determined by the variations in the stock price. The standard error of the stock price 24.7967 is much bigger than those of financial ratios. The book value and other estimators vary in a narrow interval with small standard error (about 3). There is minor difference between our real value estimations, VS1, VS2, VL1, and VL2. The choices for the discount rate hence do not affect our results. Furthermore, the estimators except price display a stationary increment during the sampling period, which confirms the results from Table 6. These results imply that the high explanatory power of our model is not from the financial ratios but from the dependent variable itself.

A possible explanation for the above results could be that insurance companies tend to maintain stable book values to meet the stringent regulation. Volatile book values could attract regulators' attentions or even trigger the intervening mechanism embedded in capital requirements such as the NAIC's risk-based capital system. Managers of insurance companies hence tend to smooth the book values through

reserving, as documented in Weiss (1991). Another reason is that managers tend to maintain a stable operation performance and avoid the tax burden. In addition, insurers' abnormal earnings might not be significant. Applying the information dynamics of abnormal earnings brings in little changes from the book value. The intrinsic value estimators hence exhibit similar tendency to the book value and Ohlson's model produce minor improvements only.