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Empirical estimation of the Residual Income Valuation Model: Profit-Making vs. Loss-Making firms

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Abstract

This paper tests the empirical performance of different specifications of the residual income valuation model based upon the inflation-adjusted model of Gregory, Saleh, and Tucker (2005) that is consistent with the Walker's (1997, p 354) suggestion that historical cost accounting versions of the model be abandoned in favor of one based on deprival values. Overall, the paper concludes that the Ohlson (1995) specification appears to be the best model that explains stock prices relative to other specifications used in this paper.

Keywords: Residual-income mode, Ohlson model, equity valuation, inflation-adjusted model.

1. Introduction

Extensive research has tried to find a strong link between accounting numbers and firm value. The argument is that if accounting numbers are informative about fundamental values and changes in values, then they should be correlated with stock price changes. The aim of this paper is to enhance our understanding of the link between accounting numbers and firm value. In particular, the paper seeks to investigate the empirical performance of different specifications of the residual income model. The different specifications of the residual income valuation model build upon the inflation-adjusted model of Gregory, Saleh, and Tucker (2005); hereafter GST, which is in line with the suggestion proposed by Walker (1997, p. 354) that historical cost accounting versions of the model be abandoned in favor of one based on deprival values .Broadly speaking, this paper concludes that the persistence parameter of abnormal earnings and the persistence parameter of the "other information" variable behave in a manner which is consistence with the Ohlson's (1995) prediction. Furthermore, the Ohlson (1995) specification appears to be the best model that explains stock prices relative to other specifications that used on this paper. Furthermore, the paper examines the scale-effect with book value of equity rather than market value of equity. The evidence suggests that the scale-effect does not have an impact on the results of profit-making firms; however, it has a strong impact on the results of loss-making firms. The remainder of the paper is as follows: in Section 2 the paper reviews the origins of the residual income valuation model. Section 3 describes the research methodology, model specifications, and research hypotheses. Section 4 presents the empirical results and finally Section 5 concludes.

2. The Model

The residual income valuation model (RIM) has received considerable academic attention during the past two decades. The model expresses the market value of equity as current equity book value plus discounted expected residual income to equity holders. The dividend-discount model (DDM) relies on one hypothesis: asset prices represent the present value of all expected dividends-PVED (Lo and Lys, 2000), that is[2]:

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[2] Note that, the model assumes an economy with risk neutrality and homogenous beliefs and that the interest rate to satisfy a non-stochastic and flat term structure.

$$P_t = \sum_{J=1}^{\infty} R^{-J}.E(d_{t+i}) \quad (1)$$

Where *Pt* is market price of equity at date *t*, *dt* symbolizes dividends (or net cash payments to equity holders) received at the end of period *t*, *R* is unity plus the discounted rate *r*, and *Et* is the expectation operator based on the information set at date *t*.

To derive the RIM from the PVED, two additional assumptions are made (Edwards and Bell, 1961; Peasnell, 1982; and Ohlson, 1995). First, the book value of equity follows a "clean surplus" relation (CSR)[3] that only earnings (*Xt*) and net dividends modify book equity, that is, the change in book value from period to period is equal to earnings minus net dividends. That is,

$$BV_t = BV_{t-1} + X_t - d_t \quad (2)$$[4]

Where *BVt* represents book value of equity at date *t*, *Xt* represents earnings for period *t* and *dt* refers to net dividends distributed to shareholders at time *t*.

Second, the book value of equity grows at a rate less than *R* (Lo and Lys, 2000), that is:

$$R^{-J}.E(BV_{t+J}) \xrightarrow{J \to \infty} 0$$

Combining the two assumptions gives the RIM valuation expression[5]:

$$P_t = BV_t + \sum_{J=1}^{\infty} (R)^{-J}.E(X^a_{t+j}) \quad (3)$$

Where $X^a_t = Xt - r.BV_{t-1}$ is the residual income or abnormal earnings.

Equation (3) states that the value of the firm will be equal to the book value of the firm plus the sum of the discounted abnormal earnings that the firm is expected to generate over its lifetime. This model is equivalent to the discounted free cash-flow model. Both of them are derived from the underlying assumption that asset prices represent the present value of all future dividends.

The valuation function in the RIM is consistent with the idea that a company is expected to live forever. For valuation purposes, a finite horizon point in time is often introduced in this function[6]. One limitation of the RIM is that it does not relate reported financial statement numbers to firm value (Lee, 1999). To address this issue, Ohlson (1995) introduced the idea of "linear information dynamics" (LID), which defines the stochastic processes for abnormal earnings and other value relevant information external to the accounting system (called non-accounting information). Barker (2001) illustrates that the Ohlson (1995) model assumes that, in a competitive economy, abnormal earnings, X^a_t, are likely to be temporary. For instance, if a company's rate of return exceeds its cost of capital, this is likely to attract competition. Thus, returns fall towards the cost of capital. But, if the company can continue to achieve a positive rate of return spread (abnormal earnings) for a prolonged period, then these earnings are considered to be relatively persistent. The persistence parameter, ω, in the Ohlson (1995) model measures the sustainability of abnormal earnings. This parameter is defined as the relationship between two consecutive abnormal earnings, that is, $X^a_{t+1} = \omega X^a_t$. For example, if current abnormal earnings are £100 and ω equals 0.60, then the expected abnormal earnings are equal to (100 $\times$0.60) £60. This means that abnormal earnings grow at a negative rate of 40 percent, equal to $\omega - 1$.

3 Clean surplus accounting implies that all value-relevant information is eventually reflected in the profit and loss account (McCare and Nilsson, 2001).

4 Consistent with CSR, the Ohlson (1995) model assumes that dividends reduce current book value, but not current earnings.

5 Lo and Lys (2000) argue that the PVED and the RIM are mathematically equivalent. Thus, rejecting the RIM is logically equivalent to rejecting the hypothesis that investors price securities as the present value of all expected future cash flows.

6 For example, see Penman and Sougiannis (1998) for finite-horizon analysis.

The Linear information dynamics model (LID) is as follows:

(a) $X^a_{t+1} = \omega X^a_t + V_t + e_{1,t+1}$ (4)[7]

(b) $V_{t+1} = \gamma V_t + e_{2,t+1}$ (5)

Where X^a_t is the residual income (abnormal earnings) in period t, which equals X_t-$r.BV_{t-1}$, BV_{t-1} is the lagged book value of equity, r is the risk-free interest rate or cost of equity capital, ω and γ are the persistence parameters, ω reflects the extent to which the current level of abnormal earnings is likely to persist into the future (Rees, 1995). V_t is value-relevant information other than abnormal earnings. The model assumes that Vt is unrelated to current earnings and dividends (Walker, 1997). The "other information" in the Ohlson (1995) model formalizes the idea that prices reflect a richer information set than transaction-based, historical-cost earnings (Beaver, 2002). e_1 and e_2 are distributed normally with a mean of zero.

Equations (4) and (5) stated that "abnormal earnings are expected to converge towards zero from its current level and has an unconditional mean of zero" (Rees, 1995). The persistence parameters, ω and γ are assumed to be known, non-negative and less than unity. Moreover, they are assumed to be constant over time. Thus, this assumption, the constant persistence parameter over time, allows the use of current abnormal earnings to predict future abnormal earnings, and hence current stock price (Barker, 2001). As mentioned above, the Ohlson model assumes that both ω and y are less that unity. Thus, abnormal earnings will turn to zero. This in turn implies that book values and market values will converge. However, Barker (2001) asserts that abnormal earnings will not revert to zero unless book value is economically meaningful. Ohlson's linear information dynamics also resolves the finite valuation problem inherent in most traditional valuation models (McCare and Nilsson, 2001). Further, it does not require explicit forecasts of future dividends (Dechow, Hutton and Sloan, 1999). Combining the linear information dynamics with the RIM yields a linear expression relating current equity market value to currently observable book equity, residual income, and "other information", Vt. That is, $P_t = BV_t + \alpha_1 X^a_t + \alpha_2 V_t$ (6)[8]

Where $\alpha_1 = \dfrac{\omega}{(1+r-\omega)}$ $\alpha_2 = \dfrac{(1+r)}{(1+r-\omega)(1+r-\gamma)}$

Equation (6) says that:

"The market value equals the book value adjusted for (a) The current profitability as measures by abnormal earnings and (b) other information that modifies the prediction of future profitability".

The Ohlson (1995) model assumes that accounting numbers (e.g. book value) are unbiased. In practice, this assumption is unlikely to be held. Given this fact, a number of improvements have been suggested to modify the Ohlson (1995) model. For example, the Feltham and Ohlson (1995) model expands the Ohlson (1995) model by separating a firm's net assets into financial and operating assets. The Feltham and Ohlson (1995) dynamics consist of the following equations:

$OX^a_{t+1} = \omega_{11} OX^a_t + \omega_{12} Oa_t + \nu_{1,t} + e_{1,t+1}$ (7)

$Oa^a_{t+1} = \omega_{22} Oa_t + \nu_{2,t} + e_{2,t+1}$ (8)

$\nu_{1,t+1} = \gamma_1 \nu_{1,t} + e_{3,t+1}$ (9)

$\nu_{2,t+1} = \gamma_2 \nu_{2,t} + e_{4,t+1}$ (10)

Where OX^a_t are the abnormal operating earnings, defined as: $OX^a_t = OX_t - (R_f - 1)Oa_{t-1}$. OX_t are operating earnings for period t, Rf is one plus risk-free rate of return, Oa^a_t are abnormal operating assets, Oa are the

[7] Walker (1997) illustrates that the random walk model of earnings is a special case of this model in which ω equals one, all earnings are distributed, and where y and the variance of e_2 both equal zero. Also note that under the random walk model dividend signalling is impossible because dividends are restricted to equal earnings. Furthermore, the random walk model implicitly rules out conservative accounting since the model implies that future earnings changes are unpredictable.

[8] Rees (1995) suggests that "a practical operationalisation of equation (6) would probably require that the X^a term be replaced by a series of terms each representing an earnings source". For example, operating profits are expected to have a ω close to unity, while profits and losses on termination of an operation are expected to have a ω close to zero.

operating assets, *v1* and *v2* are other information. Thus, the Feltham-Ohlson approach assumes that the prediction of future abnormal operating earnings depends on current abnormal operating earnings, current operating assets, and other information. Under the Feltham and Ohlson (1995) dynamics, the valuation function is:

$$P_t = BV_t + \alpha_1 OX_t^a + \alpha_2 Oa_t + \beta_1 v_{1,t} + \beta_2 v_{2,t} \qquad (11)$$

Where $$\alpha_1 = \frac{\omega_{11}}{R_f - \omega_{11}} \qquad \alpha_2 = \frac{\omega_{12}.R_f}{(R_f - \omega_{22})(R_f - \omega_{11})}$$

$$\beta_1 = \frac{R_f}{(R_f - \omega_{11})(R_f - \gamma_1)} \qquad \beta_2 = \frac{\alpha_2}{(R_f - \gamma_2)}$$

Lo and Lys (2000) argue that the Feltham and Ohlson (1995) model is distinct from the Ohlson (1995) model not because of the separation of operating and financial activities, but rather, because of the analysis of conservatism and growth. The Feltham-Ohlson approach assumes that accounting is unbiased if, on average, abnormal operating earnings equal the present value of future cash flow, or if, on average, the present value of expected abnormal operating earnings equal to zero. That is, in a special case where book value is unbiased, the parameter α_2 equals zero and the model reduces to the Ohlson (1995) model. Barker (2001) illustrates that the parameter α_1 depends on the persistence of abnormal earnings, while the parameter α_2 depends jointly on the persistence of abnormal earnings, the degree of conservatism in the accounts, and the rate of growth of operating assets. To conclude, accounting conservatism reduces the book value of operating assets but increases future expected abnormal operating earnings.
Implementing the Ohlson (1995) model for UK data is problematic for at least two reasons. First, there is a period of high inflation in the 1970s (peaking at 25% p.a.), whilst there is a low inflation period in the last ten years (about 2% p.a.). Board and Walker (1990) illustrate that historical cost accounting is likely to be less informative in economies where the rate of inflation is high and uncertain. They find the market placing less reliance on historical cost earnings during periods of high inflation. Furthermore, in the US, Morris and McDonald (1982) aim to determine which set of disclosures (actual constant dollar and current cost disclosure) best represents the information impounded in stock prices[9]. They find that the inflation-adjusted data is impounded in security returns and that the current cost measure of income is the best measure in terms of information impounded in stock returns. Further, they find that the more sensitive the firm's reported results are to inflation, the higher the level of systematic risk. Second, the clean surplus assumption, which is assumed by the Ohlson (1995) model, is violated in many cases and circumstances under UK GAAP. For instance, O'Hanlon and Pope (1997) illustrate that UK GAAP allows direct writing off to reserves of purchased goodwill and discretionary revaluation of fixed assets. Other types of "dirty surplus" in shareholders' funds in the UK include the reporting of "below-the-line" extraordinary items, prior year adjustments and foreign currency translation gain\loss on consolidation. Moreover, Barker (2001) identifies one drawback of the Ohlson (1995) model, that is, abnormal earnings will not revert to zero unless book value is economically meaningful. Gregory (2002) argues that this could be due to accounting conservatism, inflation, and technology changes. The first problem suggests a modification to the Ohlson (1995) model (e.g. Feltham and Ohlson, 1995). The last two problems suggest a need to restate asset values.

Furthermore, Walker (1997) suggests that the book value should be adjusted for the cumulative effect of any previous deviation from clean surplus accounting practices. Thus, this paper follows GST (2005) by applying an inflation-adjusted version of the residual income model for UK data[10].

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[9] Note that, in the US, the Statement of Financial Accounting Standards (SFAS) No. 33 issued in September 1979 requires firms to incorporate the impact of inflation in the reporting process. Under this statement, supplementary disclosure of four basic financial statement items are required: (1) the income from continuing operation to be reported on both a constant dollar and a current cost basis; (2) disclosure of the purchasing power gain or loss on net monetary items; (3) disclosure of the current cost and constant dollar basis of net assets; and (4) disclosure the increase or decrease in the current cost amount of inventory and property, plant and equipment.

[10] This version of the Ohlson model deals with a particular form of "dirty surplus" accounting prevalent in the UK over the past three decades, the revaluation of property assets and the crediting of that revaluation direct to a reserve account".

3. Data and Research Design

The sample consists of all non-financial firms with available data for the period 1976-2011. Annual data are collected from the DataStram financial database. Inclusion of firms in the sample required that data on book value of equity, earnings, market value of equity, number of common share outstanding, depreciation, and fixed assets must be available. Firm-years with negative equity values are omitted. Furthermore, the empirical analysis requires a measure of the discount rate and the inflation rate. Following GST (2005) the paper uses a constant 5 percent for the former, whilst the latter has been collected from the International Finance Statistics book.

3.1 Model Specifications

Following DHS (1999) and Myers (1999), the paper investigates the empirical performance of the residual income valuation model by estimating different specifications based upon the Ohlson (1995) and Feltham and Ohlson (1995) models.

The first specification (hereafter, RIM1) omits the "other information" variable and the mean reversion in residual income, that is[11]:

$$FV_t = BV_t \qquad (12)$$

The second specification (hereafter, RIM2) assumes that all value-relevant information is reflected in current and historical financial statements, that is, expectations of future abnormal earnings are based on current abnormal earnings, and that abnormal earnings mean revert at their unconditional historical rate. Thus, it includes the mean reversion in residual income, that is:

$$FV_t = BV_t + \alpha_1 X_t^a \qquad (13)$$ [12]

Where $\alpha_1 = \dfrac{\omega}{(1+r-\omega)}$

The third specification (hereafter, RIM3) represents the residual income valuation model proposed by Ohlson (1995). Thus, it includes value-relevant information from non-accounting sources, *Vt*. The model implies that book value, current abnormal earnings and the other information embedded in the forecast of next period's abnormal earnings all contain incremental information about price (DHS, 1999).

$$FV_t = BV_t + \alpha_1 X_t^a + \alpha_2 V_t \qquad (14)$$

where $\alpha_1 = \dfrac{\omega}{(1+r-\omega)}$ $\qquad \alpha_2 = \dfrac{(1+r)}{(1+r-\omega)(1+r-\gamma)}$

The fourth specification (hereafter, RIM4) represents the Feltham and Ohlson (1995) model, ignoring the "other information" variable. As in Myers (1999), this specification can be modeled as:

$$FV_t = \alpha_0 + \alpha_1 X_t^a + (1+\alpha_2)BV_t \qquad (15)$$ [13]

where

$$X_{t+1}^a = \omega_{10} + \omega_{11} X_t^a + \omega_{12} BV_t + e_{1,t+1}$$

$$BV_{t+1} = \qquad \omega_{22} BV_t + e_{2,t+1}$$

$$\alpha_0 = \frac{\omega_{10}}{(1+r-\omega_{11})r} \qquad \alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$$

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[11] This specification assumes that all value-relevant information is reflected in the current book value of equity, that is, expectations of future abnormal earnings are based on information in current abnormal earnings and that abnormal earnings are purely transitory. Thus, equity market value is represented by the current book value of equity.

[12] Because the "other information" variable is unobservable, it is common in empirical literature to ignore this variable (Myers, 1999; and DSH, 1999). However, Myers (1999) illustrates that when the persistence parameter of the other information variable is nonzero, omitting this variable from the model has consequences for empirical estimation. Thus, the paper tests another specification called RIM22 which includes an intercept in the valuation model. Both of them have revealed the same results.

[13] Following Myers (1999), the paper includes all net assets and all earnings instead of using financial assets and operating income. Note that residual income and operating residual income are equal since financial assets only earn normal earnings (Myers, 1999).

$$\alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})}$$

Myers (1999) illustrates that accounting conservatism may influence the long-run residual income series. Thus, this specification includes a conservatism parameter which is captured by ω_{12}, the book value effect of residual income[14]. Furthermore, ω_{22} represents growth in book value of equity which must be equal to or greater than one for a going concern, but less than one plus the discount rate. Following Myers (1999), the fifth specification (hereafter, RIM5) represents the Feltham-Ohlson (1995) model that incorporates the “other information” variable.

Thus, $FV_t = \alpha_0 + \alpha_1 X_t^a + (1+\alpha_2)BV_t + \alpha_3 v_t$ (16)

where

$$X_{t+1}^a = \omega_{10} + \omega_{11}X_t^a + \omega_{12}BV_t + \omega_{13}v_t + e_{1,t+1}$$

$$BV_{t+1} = \omega_{22}BV_t + e_{2,t+1}$$

$$v_{t+1} = \omega_{33}v_t + e_{3,t+1}$$

$$\alpha_0 = \frac{\omega_{10}}{(1+r-\omega_{11})r} \qquad \alpha_1 = \frac{\omega_{11}}{(1+r-\omega_{11})}$$

$$\alpha_2 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{11})(1+r-\omega_{22})} \qquad \alpha_3 = \frac{(1+r)[(1+r)\omega_{13} - \omega_{13}\omega_{22}]}{(1+r-\omega_{11})(1+r-\omega_{22})(1+r-\omega_{33})}$$

3.2 Hypotheses Testing

The first set of tests aims to investigate how well the evolution of abnormal earnings is described by the different specifications of linear information dynamics. Thus, the following hypotheses are tested: First, the paper investigates whether the persistence parameter of abnormal earnings falls between zero and one as hypothesized by Ohlson, that is: $H_1: 0 < \omega_{11} < 1$. Second, Myers (1999) illustrates that the Feltham-Ohlson approach model the effects of conservatism on the information dynamics. The model predicts that abnormal earnings are positively correlated with lagged abnormal earnings and the lagged book value of equity, thus, ω_{12} falls between zero and one, that is, $H_2: 0 < \omega_{12} < 1$. Third, the paper examines whether the autoregressive coefficient of the “other information” variable[15] differs from the extreme values of zero and one, that is, $H_3: 0 < \omega_{33} < 1$. The second set of tests seeks to examine the ability of the different specifications of the residual income valuation models to explain contemporaneous stock prices. Following Myers (1999) and DSH (1999), the paper examines the following two hypotheses.

First, the paper investigates whether the fundamental (intrinsic) value implied by each valuation model is equal to price (*P*) on average, that is: $H_4: V/P = 1$.

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[14] Note that ω_{12} will be greater than zero if accounting is conservative because a portion of residual income stems from the conservative valuation of book value rather from monopoly power (Myers, 1999).

[15] Following DHS (1999) and as suggested by Ohlson (2001), the paper estimates the “other information” variable as the difference between the market expectation of residual income for period t+1 based on all available information and the expectation of abnormal earnings based only on current period residual income. Also, note that the paper follows the methodology suggested by GST (2005) to estimate this variable for UK data.

Second, the paper investigates the ability of the information variables used in the valuation models to explain stock prices without imposing the restrictions implied by the valuation models, that is: $H_5 : \alpha_i = \alpha_j$ where α_i refers to the coefficients on the information variables in the price level regressions, whilst α_j refers to the valuation coefficients implied by the estimated coefficients in the linear information dynamics.

4. Empirical Results

4.1 Autoregressive properties of abnormal earnings

Panel A of Table 1 reports the value of the autoregressive coefficient of abnormal earnings, ω_{11} estimated on a yearly basis. The autoregressive coefficient for profit (loss) making firms is 0.62 (0.40) with a *t-statistic* of 18.31 (10.49). For the whole sample, the autoregressive coefficient is 0.57 with a *t-statistic* of 17.89. Thus, the hypothesis that the persistence parameter of abnormal earnings falls between zero and one cannot be rejected[16]. By comparison to US firms, it appears that the mean reversion process for abnormal earnings of UK firms is somewhat similar to that of US firms[17]. The value of the persistence parameter of abnormal earnings implies that the market should value one pound of current abnormal earnings at 1.44 (0.62) pound for profit (loss) making firms, but at 1.19 pound for the whole sample, assuming 5 percent discount rate in real terms.

Table 1: Autoregressive Properties of Abnormal Earnings

The autoregressive properties of abnormal earnings defined as: $X^a_{t+1} = \omega_0 + \omega_1 X^a_t + e_{i,t}$ Yearly analysis with one lag		
Panel A: Profit-Making Firms		
ω_{10}	ω_{11}	Adj-R^2
0.01 (3.38)	0.62 (18.31)	0.52
Panel B: Loss-Making Firms		
ω_{10}	ω_{11}	Adj-R^2
-0.12 (-7.58)	0.40 (10.49)	0.21
Panel C: All Firms		
ω_{10}	ω_{11}	Adj-R^2
0.00 (0.00)	0.57 (17.89)	0.45

Note that sample covered the period 1976-2011. To reduce the influence of heteroscedasticity, all variables are scaled by the market value of equity at the end of the period. The paper drops any observation for which the residuals are larger than three standard errors from the mean, to reduce the effect of outliers. All t-statistics are in parentheses with standard errors calculated using White (1980) corrections.

4.2 Autoregressive Parameter of the Other Information variable

Table 2 shows that the value of the autoregressive coefficient of the “other information” variable is 0.73 (0.42) with a *t-statistic* of 27.62 (6.06) for profit (loss) making firms. For the whole sample it is 0.58 with a *t-statistic* of 13.08. This suggests that the “real” other information variable mean reverts at approximately the same rate as “real” abnormal earnings (GST, 2005).

Thus, this result supports the hypothesis that the persistence parameter of the “other information” variable falls between zero and one as hypothesized by Ohlson (1995). The value of the persistence parameter of the “other information” variable implies that the market should value the increase of one pound in forecasted abnormal earnings

[16] Note that DHS (1999) result is 0.62 with a t-statistic of 138.31. However, Myers (1999) finds that the median autoregressive parameter is 0.234.

[17] For the real version of the Ohlson model, GST (2005) find that the second lag abnormal earnings is not significant. The coefficient of a two-period lag is 0.03 with a *t-statistic* of 1.71.

over current abnormal earnings at 7.63 (2.56) pound for profit (loss) making firms, but at 4.65 pound for the whole sample, assuming real discount rate of 5 percent.

Table 2: Autoregressive Properties of the Other Information Variable

The autoregressive properties of other information defined as: $v_{t+1} = \omega_{1o} + \omega_{33} v_t + e_{i,t}$ Yearly analysis with one lag		
Panel A: Profit-Making Firms		
ω_{10}	ω_{33}	Adj-R^2
-0.01 (-2.36)	0.73 (27.62)	0.67
Panel B: Loss-Making Firms		
0.08 (7.02)	0.42 (6.06)	0.23
Panel C: All Firms		
ω_{10}	ω_{33}	Adj-R^2
0.00 (0.00)	0.58 (13.08)	0.43

4.3 Autoregressive Properties of Feltham-Ohlson model, ignoring the other information variable

Panel A of Table 3 presents the results of regressions of abnormal earnings on lagged abnormal earnings and lagged book value of equity. DHS (1999) state that "If the first-order autoregressive process is appropriate, then the additional book value term should not load in the regression"[18]. The results from Panel A of Table 3 show that the book value of equity loads insignificantly with a negative coefficient for profit making firms, the value of ω_{12} coefficient is 0.21 with a *t-statistic* of 1.01. However, for loss-making firms, the value of ω_{12} coefficient is –0.04 with a *t-statistic* of –4.43. For the whole sample it loads insignificantly with a negative coefficient. Feltham and Ohlson (1995) interpret the negative loading on book value as "aggressive accounting". The inclusion of book value leads to a marginal decline in the coefficient of abnormal earnings (from 0.62 to 0.59, 0.40 to 0.33, and from 0.57 to 0.56 for profit-making, loss-making, and the whole sample, respectively) and to a marginal increase in the adjusted R^2 (from 0.21 to 0.27 and from 0.45 to 0.46 for the loss-making firms and the whole sample, respectively)[19].

Furthermore, in this section the book value series are tested for unit roots to investigate whether or not book values are non-stationary. If non-stationary (i.e. unit roots) exists, then OLS approach does not provide valid test statistics, that is, the OLS time-series estimates are inconsistent (Hamilton, 1994).

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[18] However, note that Myers (1999) argues that if the accounting is conservative, then the model does not describe the effect of conservatism on the information dynamics.

[19] In DHS (1999), the inclusion of book value leads to a decline in the coefficient of abnormal earnings.

Table 3: : Autoregressive Properties of the Feltham-Ohlson model, Ignoring the other Information variable

Panel A: Model: $X^a_{t+1} = \omega_{10} + \omega_{11} X^a_t + \omega_{12} BV_t + e_{1,t+1}$ $BV_{t+1} = \omega_{22} BV_t + e_{2,t+1}$						
Panel A1: Profit-making Firms						
ω_{10}	ω_{11}	ω_{12}	Adj-R^2			
0.01 (5.00)	0.59 (13.98)	0.21 (1.01)	0.52			
Panel A2: Loss-making Firms						
-0.07 (-5.47)	0.33 (7.90)	-0.04 (-4.43)	0.27			
Panel A3: All Firms						
ω_{10}	ω_{11}	ω_{12}	Adj-R^2			
-0.00 (-0.24)	0.56 (16.07)	-0.003 (-1.02)	0.46			
Panel B: Testing for Unit Root Model : $\Delta BV_t = \phi_0 + (\phi_1 - 1) BV_{t-1} + e_{1,t+1}$						
Augmented Dickey-Fuller Test						
Lags	t-statistics					
0	3.80					
1	3.15					
4	3.40					
First Differences						
0	-18.58					
1	-12.64					
4	-4.76					
Critical Values						
1%	-3.46					
5%	-2.87					
10%	-2.57					
Note that the critical values are based on Mackinnon (1991). The tests are one side; a value below the critical value implies that the null hypothesis of unit root is rejected.						
Panel C: The Distribution of ω_{22}						
Panel C1: Profit-Making Firms						
	10%	**25%**	**Median**	**75%**	**90%**	**Mean**
ω_{22}	0.96	1.04	1.12	1.25	1.56	6.11
Panel C2: Loss-Making Firms						
	10%	**25%**	**Median**	**75%**	**90%**	**Mean**
ω_{22}	0.62	0.83	0.97	1.19	1.65	1.30
Panel C3: All Firms						
	10%	**25%**	**Median**	**75%**	**90%**	**Mean**
ω_{22}	0.87	1.01	1.10	1.23	1.56	1.28

Since book value of equity tends to grow for most firms, then one could expect that book value series contain a unit root. Thus, we test the unit root hypothesis as the null hypothesis. From Panel B of Table 3 there is evidence of a unit root in the un-differenced book value series. The *t-statistics* are greater than the critical values, thus, the null hypothesis of a unit root cannot be rejected.

However, a unit root is rejected for the first differences of the book value series[20]. Therefore, the paper estimates the growth rate of equity for each firm as the median ratio of year *t+1* book value of equity to year *t* book value of equity. Panel C of Table 3 shows that the median of the growth rate of equity is 1.12, 0.97, and 1.10 for profit-making, loss-making, and the whole sample, respectively.

4.4 Autoregressive Properties of Feltham-Ohlson model, incorporating the other information variable

Table 4 reports the coefficient values of the Feltham-Ohlson model that incorporates the "other information" variable.

For the whole sample, the results indicate that the forecasted abnormal earnings translate into an increase in abnormal earnings in the following year. Note that the "other information" variable loads with a significantly positive coefficient and that the inclusion of the "other information" variable leads to an increase in the coefficient on abnormal earnings (from 0.56 to 0.72).

This suggests that the "other information" variable should be used in the linear information dynamics as suggested by RIM5 to estimate the future abnormal earnings after controlling for current book value of equity and residual income[21]. However, for profit and loss-making firms, the results show that the forecasted abnormal earnings load insignificantly with a negative coefficient.

Table 4: Autoregressive Properties of the Feltham-Ohlson model, incorporating the other Information variable

Model:

$$X^a_{t+1} = \omega_{10} + \omega_{11} X^a_t + \omega_{12} BV_t + \omega_{13} v_t + e_{1,t+1}$$
$$BV_{t+1} = \omega_{22} BV_t + e_{2,t+1}$$
$$v_{t+1} = \omega_{33} v_t + e_{3,t+1}$$

ω_{10}	ω_{11}	ω_{12}	ω_{13}	Adj-R^2
Panel A: Profit-Making Firms				
0.01 (5.52)	0.61 (18.03)	0.003 (1.40)	-0.003 (-0.19)	0.53
Panel B: Loss-Making Firms				
-0.07 (-5.50)	0.17 (1.03)	-0.04 (-4.88)	-0.09 (-0.60)	0.27
Panel C: All Firms				
-0.009 (-2.36)	0.72 (11.73)	0.004 (1.25)	0.19 (5.44)	0.44

4.5 Explanation of Contemporaneous Stock Prices

In Table 5 the paper investigates whether the fundamental values estimated by the different specifications are correct on average. The expected *V/P* ratio should be equal to one if the model accurately values firms[22]. For the whole sample, the results indicate that the median *V/P* ratio is 0.94 in the first specification, RIM1, which is close to

[20] Myers (1999) argues that "when the time series of the first differences is linear, the time series of the levels in nonlinear".

[21] Note that the RIM5 suggests that the "other information" variable enter the linear information dynamics with a coefficient equal to ω_{13}. However, The Feltham and Ohlson model suggest that the variable should be entered into the model with a coefficient equal to one, which means that the inclusion of the "other information" variable does not affect the persistence parameter of abnormal earnings.

[22] An implied assumption here is that market prices are correct on average.

the hypothesized value of one. That is, the RIM1 underestimates stock prices by approximately 6 percent for the median firms. For RIM2 and RIM3, the median *V/P* ratio is 0.97 for both models. The *V/P* ratios are 0.83 and –0.38 for the RIM4 and RIM5, respectively, the Feltham-Ohlson models, implying that these specifications have a misspecification problem. Thus, the real version of the Ohlson model appears to be the best model which explains stock prices.

Table 5: The Distribution of V/P Ratios

Panel A: Profit-Making Firms						
Model	**10%**	**25%**	**Median**	**75%**	**90%**	**Mean**
RIM1	0.32	0.53	0.85	1.31	1.95	1.22
RIM2	0.42	0.63	0.96	1.42	2.05	1.29
RIM22	1.17	1.39	1.72	2.18	2.81	2.04
RIM3	-0.18	0.35	0.82	1.30	1.86	0.87
RIM33	0.69	1.13	1.44	1.96	2.49	1.61
RIM4	0.58	0.87	1.20	1.67	2.27	1.31
RIM5	0.45	0.79	1.14	1.60	2.25	1.23
Panel B: Loss-Making Firms						
Model	**10%**	**25%**	**Median**	**75%**	**90%**	**Mean**
RIM1	0.48	0.83	1.36	2.12	3.23	2.32
RIM2	0.41	0.77	1.29	2.03	2.97	1.63
RIM22	-4.75	-4.39	-3.87	-3.17	-2.20	-3.53
RIM3	0.75	1.20	1.82	2.82	4.23	2.32
RIM33	-4.41	-4.00	-3.49	-3.09	-1.02	-3.17
RIM4	-3.01	-2.15	-1.40	-0.34	0.99	-1.11
RIM5	-4.76	-3.93	-3.04	-2.01	-0.62	-2.83
Panel C: All Firms						
Model	**10%**	**25%**	**Median**	**75%**	**90%**	**Mean**
RIM1	0.34	0.57	0.94	1.50	2.35	1.48
RIM2	0.36	0.61	0.97	1.48	2.24	1.45
RIM22	0.26	0.50	0.85	1.34	2.09	1.30
RIM3	0.39	0.62	0.97	1.46	2.21	1.48
RIM33	0.36	0.60	0.94	1.44	2.19	1.42
RIM4	-1.61	0.14	0.83	1.87	4.48	1.10
RIM5	-5.64	-1.64	-0.38	1.15	6.09	0.04

Note that the values in Table 5 represent the distribution of the fundamental value estimates (V) divided by market value six months after fiscal year end. Also, note that the statistics reports are the means based on the estimates from 34 years.

For profit (loss) making firms, the results show that the median V/P ratio is 0.85 (1.36) in the first specification, RIM1. The values for RIM2, RIM3, RIM4, and RIM5 are 0.96 (1.29), 0.82 (1.82), 1.20 (-1.40), 1.14 (-3.04), respectively. Furthermore, Table 6 presents the results of annual cross-sectional regressions of stock price on the fundamental values estimated by the different valuation models and the information variables used in the valuation models. For the whole sample, the results indicate that the book value loads positive and significant in the regression (Panel A3, the RIM1)[23]. The coefficient on the book value is 0.47, which is less than one. The adjusted R^2 is 0.41 which means that book value is highly correlated with stock price. For the RIM2, the value of the fundamental value coefficient is 0.45 with a *t-statistic* of 10.30. The adjusted R^2 is 0.39 which means that there is a misspecification in including abnormal earnings in the model. One suggestion here is that the misspecification problem in RIM2 arises from ignoring the "other information" variable from the Ohlson model. For the RIM3 which represents the "real" version of the Ohlson model, the coefficient on the fundamental value is 0.50 with a *t-statistic* of 10.24. The adjusted R^2 is 0.41, thus, including the "other information" variable in the model has little improvements over current book value and abnormal earnings. The coefficients on the fundamental values for the RIM4 and RIM5 are 0.15 and 0.11 with *t-statistics* of 3.10 and 2.78, respectively. Thus, including the conservatism parameter in the linear information dynamics has an adverse effect on the precision of the model to predict stock prices.

[23] Note that the RIM1 suggests that stock price equals current book value.

The adjusted R^2 for both models are 0.16 and 0.15, respectively. To sum up, it appears that the real version of the Ohlson model is the best model that explains stock prices, relative to other specifications used in this paper. Panel A1 (A2) reports the results for profit (loss) making firms.

The results for profit-making firms show that the values of the fundamental value coefficient are 0.49, 0.49, 0.69, 0.26, and 0.24 with t-statistics of 9.78, 11.66, 9.02, 5.75, 4.68 for the RIM1, RIM2, RIM3, RIM4, and RIM5, respectively. For loss-making firms, the values of the fundamental value coefficient are 0.45, 0.43, 0.42, -0.10, and –0.10 for the RIM1, RIM2, RIM3, RIM4, and RIM5, respectively.

The above results confirm that the Ohlson model (RIM3) is the best model that explains stock prices relative to other specifications used in this paper. Note that the adjusted R^2 for the RIM3 is 0.57 (0.69) for profit (loss) making firms. Panel B of Table 6 reports the linear regressions of price on abnormal earnings and the "other information" variable[24]. For the whole sample, the results indicate that the coefficients on abnormal earnings and book value are 5.19 and 0.27 with *t-statistics* of 4.29 and 2.37, respectively. The adjusted R^2 is 0.44 which is greater than that of the RIM2. Thus, stock prices appear to place too high weight on abnormal earnings and too low weight on book value. The value of ω_{11} that justify the empirical regression coefficients is approximately 0.88. DHS (1999) have discussed two explanations. First, the results are driven by a misspecification of the valuation models. Second, investors appear to overestimate the persistence of abnormal earnings, thus, stock prices do not reflect rational expectations[25]. Moreover, the results from Panel B3 show that the coefficients on abnormal earnings, book value and the "other information" variable are 13.93, 0.76 and 12.73, respectively. Thus, when inventors take the other information variable into account, the empirical regression coefficient is 0.98, that is, the persistence of abnormal earnings will persist for a long-time period. Again, this suggests that investors overestimate the persistence of abnormal earnings or there is a misspecification in the model.

Table 6: regressions of Stock Price on the Fundamental Values and the Information Variables used in the valuation Models

Panel A1: Regressions of Price on Fundamental Values (FV)- Profit Making Firms			
Model	**Intercepts**	**FV**	**Adjusted-R^2**
RIM1	1.02 (8.79)	0.49 (9.78)	0.40
RIM2	0.94 (8.02)	0.49 (11.66)	0.48
RIM22	0.46 (4.28)	0.47 (9.68)	0.70
RIM3	0.80 (6.36)	0.69 (9.02)	0.57
RIM33	0.40 (3.93)	0.56 (10.03)	0.74
RIM4	1.08 (7.72)	0.26 (5.75)	0.36
RIM5	1.15 (7.18)	0.24 (4.68)	0.29
Panel A2: Regressions of Price on Fundamental Values (FV)- Loss Making Firms			
Model	**Intercepts**	**FV**	**Adjusted-R^2**
RIM1	0.52 (7.28)	0.45 (5.54)	0.46
RIM2	0.49 (7.15)	0.43 (8.20)	0.64

24 Note that specification number one (the RIM1) represents the book value of equity.

25 That is, investors behave like that the persistence of abnormal earnings will decay after eight years, whilst the model states that it will decay after two years.

RIM22	0.41 (4.04)	-0.34 (-5.45)	0.84
RIM3	0.39 (6.60)	0.42 (7.33)	0.69
RIM33	0.51 (4.73)	-0.27 (-5.01)	0.76
RIM4	0.81 (7.59)	-0.10 (-2.16)	0.33
RIM5	0.68 (7.30)	-0.10 (-2.08)	0.38
Panel A3: Regressions of Price on Fundamental Values (FV)- All Firms			
Model	**Intercepts**	**FV**	**Adjusted-R^2**
RIM1	0.97 (9.88)	0.47 (10.41)	0.41
RIM2	0.98 (10.46)	0.45 (10.39)	0.39
RIM22	0.89 (6.21)	0.28 (3.79)	0.50
RIM3	0.91 (9.95)	0.50 (10.24)	0.41
RIM33	0.89 (10.15)	0.47 (9.15)	0.37
RIM4	1.32 (10.64)	0.15 (3.10)	0.16
RIM5	1.40 (10.53)	0.11 (2.78)	0.15

Panel B1: Regressions of Price on Information Variables- Profit Making Firms					
	Intercepts	X_t^a	BV_t	v_t	**Adjusted-R^2**
	1.10 (10.56)	13.06 (6.77)	------	------	0.39
	0.78 (8.49)	12.12 (6.24)	0.27 (3.06)	------	0.60
	0.31 (5.65)	16.16 (6.99)	0.82 (14.99)	11.72 (9.51)	0.79
Panel B2: Regressions of Price on Information Variables- Loss Making Firms					
	Intercepts	X_t^a	BV_t	v_t	**Adjusted-R^2**
	0.62 (8.43)	-3.46 (-5.14)	-----	------	0.47
	0.36 (6.48)	-2.01 (-3.81)	0.18 (1.41)	------	0.70
	0.30 (7.82)	-0.02 (-0.02)	0.26 (1.74)	2.23 (2.81)	0.75
Panel B3: Regressions of Price on Information Variables- All Firms					
	Intercepts	X_t^a	BV_t	v_t	**Adjusted-R^2**
	1.50 (12.52)	4.72 (3.60)	-----	-----	0.13
	0.94 (12.46)	5.19 (4.29)	0.27 (2.37)	-----	0.44
	0.37 (7.75)	13.93 (8.14)	0.76 (17.89)	12.73 (16.05)	0.75

Note that the values in Table 6 represent the price coefficients obtained by regressing price on fundamental values, abnormal earnings, book value, and the other information variable (Panels A and B. The statistics are based on the estimates from 24 annual cross-sectional regressions from 1978 to 2011. To reduce the influence of heteroscedasticity, all variables are scaled by the number of outstanding shares at the beginning of the period.

The paper drops any observation for which the residuals are larger than three standard errors from the mean, to reduce the effect of outliers. All t-statistics are in parentheses with standard errors calculated using White (1980) corrections.

Furthermore, comparing the adjusted R^2 from the regressions of price on fundamental values with that from the regressions of price on the information variables used in the valuation models yields that the valuation models' parameters are so noisy because they reduce the precision of the value estimates. This result is consistent with Myers (1999). The results for profit-making and loss-making firms confirm that the Ohlson model is the best model that explains stock prices relative to other specifications used in this paper.

The results show that the coefficients on abnormal earnings and book value for profit (loss) making-firms are 12.12 (-2.01) and 0.27 (0.18) with t-statistics of 6.24 (-3.81) and 3.06 (1.41), respectively. The adjusted R^2 is 0.60 (0.70) which is very close to that of the RIM2. This may suggest that splitting the sample into profit-making and loss-making firms enhances the model power. For profit-making firms, the value of ω_{11} that justify the empirical regression coefficients is approximately 0.97.

4.5.1 Including an Intercept in the RIM2 & RIM3

One could argue that the valuation models in RIM2 and RIM3 are misspecified since they do not include an intercept in the valuation function. Therefore, the paper re-estimates them by including an intercept and the paper referred to them as RIM22 and RIM33. That is,

$$FV_t = \alpha_0 + BV_t + \alpha_1 X_t^a \qquad (17)$$

Where[26] $\alpha_0 = \dfrac{(1+r).\omega_0}{r(1-\omega_1)}$ $\qquad \alpha_1 = \dfrac{\omega_1}{(1+r-\omega_1)}$

$$FV_t = \alpha_0 + BV_t + \alpha_1 X_t^a + \alpha_2 V_t \qquad (18)$$

where $\alpha_0 = \dfrac{(1+r).\omega_0}{r(1-\omega_1)}$ $\qquad \alpha_1 = \dfrac{\omega_1}{(1+r-\omega_1)}$ $\qquad \alpha_2 = \dfrac{(1+r)}{(1+r-\omega_1)(1+r-\gamma)}$

The results in Table 5 show that the median V/P ratio for the whole sample is 0.85 and 0.94 for the RIM22 and RIM33, respectively. The corresponding figures before including an intercept in the valuation function are 0.97 for both models. Thus, including the intercept has more impact on the RIM2 than RIM3. This result seems logical since the RIM2 ignores the effect of the "other information" variable. The results for profit (loss) making firms yield to the same conclusion. The results from Table 6 confirm that including an intercept in the valuation function increases the model's power. For example, the adjusted R^2 for the RIM22 increases from 0.48 to 0.70, 0.64 to 0.84, and from 0.39 to 0.50 for profit, loss, and the whole sample, respectively, when the paper includes an intercept in the model. For the RIM33, the adjusted R^2 changes from 0.57 to 0.74, 0.69 to 0.76, and from 0.41 to 0.37 for profit, loss, and the whole sample, respectively.

4.6 Choi et al's Approach and Scale effect

Choi, O'Hanlon, and Pope (2003) proposed a valuation model which is similar to the RIM3, but includes intercept terms from the generating processes for scaled residual income and the "other information" variable. They argue that this approach will avoid the implicit assumption that scaled residual income and the "other information" variable have means of zero. Further, they use book value of equity instead of market value as a deflator. Their LIM approach is as follows:

$$\frac{X_{t+1}^a}{BV_t} = \omega_{10} + \omega_{11}\frac{X_t^a}{BV_t} + \frac{v_t}{BV_t} + e_{1,t+1} \qquad (19)$$

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[26] See Myers (1999) for the derivation of α_0.

$$\frac{v_{t+1}}{BV_t} = \gamma_0 + \gamma_1 \frac{v_t}{BV_t} + e_{2,t+1} \quad (20)$$

$$\frac{BV_{t+1}}{BV_t} = G + e_{3,t+1} \quad (21)$$[27]

They, then derive the following valuation function:

$$FV_t = \alpha_1 X_t^a + \alpha_2 v_t + (1 + \alpha_3 + \alpha_4) BV_t \quad (22)$$

where, $\alpha_1, and\ \alpha_2$ as previously defined in RIM3, whilst

$$\alpha_3 = \frac{(1+r)\omega_0}{(1+r-\omega_1)(1+r-G)} \qquad \alpha_4 = \frac{(1+r)\gamma_0}{(1+r-\omega_1)(1+r-\gamma_1)(1+r-G)}$$

Moreover, the paper repeats RIM3, but using book value of equity as a deflator instead of market of equity. Thus, a comparison with the original RIM3 will give us glue about any scale effect in the results.

Table 7 reports the values of the autoregressive coefficient of abnormal earnings scaled by book value of equity. These values are 0.63, 0.60, and 0.62 for the whole sample, profit-making, and loss-making firms with *t-statistics* of 24.08, 19.81, and 17.12, respectively. The adjusted R^2 is 0.52, 0.57, and 0.36, respectively. A comparison with Table 1 yields that scaling with book value of equity rather than market value of equity has a strong effect on loss-making firms and on the whole sample, but not on profit-making firms. For example, the values of the autoregressive coefficient increase from 0.40 and 0.57 to 0.62 and 0.63 for loss-making firms and the whole sample, respectively. However, for profit-making firms there is a marginal decrease from 0.62 to 0.60. The adjusted-R^2 increases from 0.52, 0.21, and 0.45 to 0.57, 0.36, and 0.52 for profit, loss-making firms, and the whole sample, respectively.

Table 7: Autoregressive Properties of Abnormal Earnings- Scaled Book Value

The autoregressive properties of abnormal earnings defined as: $X_{t+1}^a = \omega_0 + \omega_1 X_t^a + e_{i,t}$ Yearly analysis with one lag		
Panel A: Profit-Making Firms		
ω_{10}	ω_{11}	Adj-R^2
0.02 (6.57)	0.60 (19.81)	0.57
Panel B: Loss-Making Firms		
ω_{10}	ω_{11}	Adj-R^2
-0.05 (-12.87)	0.62 (17.12)	0.36
Panel C: All Firms		
ω_{10}	ω_{11}	Adj-R^2
0.01 (1.86)	0.63 (24.08)	0.52

Table 8 reports the values of the autoregressive coefficient of the "other information" variable scaled by book value of equity and intercept exclusive- the RIM3 approach scaled by book value of equity. The values are 0.61, 0.54, and 0.70 with *t-statistics* of 29.91, 28.33, and 16.37 for the whole sample, profit-making, and loss-making firms, respectively. A comparison with the results from Table 2 yields that the value of the coefficient for profit-making firms decreases from 0.73 to 0.54 and the adjusted R^2 decreases form 0.67 to 0.40.

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[27] Note that G here is equivalent to ω_{22} in our LIM4, therefore, it defines as the median ratio of year t+1 book value of equity to year t book value of equity.

However, the values of the coefficient for loss-making firms and the whole sample are increases from 0.42 and 0.58 to 0.70 and 0.61, and that the adjusted R^2 increases from 0.23 and 0.43 to 0.43 and 0.46, respectively. Thus, scaling by book value of equity rather than market value of equity has an effect on the results.

Table 8: Autoregressive Properties of the Other Information Variable-Scaled Book Value

The autoregressive properties of other information defined as: $v_{t+1} = \omega_{1o} + \omega_{33} v_t + e_{i,t}$ Yearly analysis with one lag		
Panel A: Profit-Making Firms		
ω_{10}	ω_{33}	Adj-R^2
-0.021 (-9.64)	0.54 (28.33)	0.40
Panel B: Loss-Making Firms		
0.058 (4.61)	0.70 (16.37)	0.43
Panel C: All Firms		
ω_{10}	ω_{33}	Adj-R^2
-0.004 (-1.65)	0.61 (29.91)	0.46

Table 9 presents the values of the autoregressive coefficient of the “other information” variable scaled by book value of equity and intercept inclusive- the Choi et al’s approach. These values are 0.58, 0.55, and 0.73 with *t-statistics* of 20.51, 22.61, and 16.39 for the whole sample, profit-making, and loss-making firms, respectively. A comparison with Table 2 yields that the autoregressive coefficient of the “other information” variable decreases from 0.73 to 0.55 for profit-making firms and that the adjusted-R^2 decreases from 0.67 to 0.42. For loss-making firms the value of the coefficient increases from 0.42 to 0.73 and the adjusted R^2 increases from 0.23 to 0.44. However, there is no effect when the paper considers the whole sample. Furthermore, a comparison with Table 8 yields that including the intercept terms from the generating processes for scaled residual income and the “other information” variable has a marginal effect on the results. For example, the value of the coefficient changes from 0.61, 0.54, and 0.70 to 0.58, 0.55, and 0.73 for the whole sample, profit-making, and loss-making firms and that the adjusted R^2 changes from 0.46, 0.40, and 0.43 to 0.43, 0.42, and 0.44, respectively. Table 10 reports the results of annual cross-sectional regressions of stock price on the fundamental values estimated by the RIM3 scaled by book value of equity and by the Choi et al’s approach. The values of the fundamental value coefficient are 0.76, 0.34, and 0.61 for the Choi et al’s approach with *t-statistics* of 10.68, 5.16, and 8.96 for profit-making, loss-making firms, and the whole sample, respectively. The corresponding figures for the RIM3 scaled by book value of equity are 0.56, 0.26, and 0.38 with *t-statistics* of 11.60, 5.15, and 7.82 for profit-making, loss-making firms, and the whole sample, respectively. Thus, including the intercept terms yields to a higher fundamental value coefficients. Furthermore, a comparison between the RIM3 scaled by book value of equity with that scaled by market value of equity yields that scaling by book value of equity results in a lower value coefficient and a lower adjusted R^2.

Table 9: Autoregressive Properties of the Other Information Variable-Scaled Book Value Intercept Inclusive- Choi et al Approach

The autoregressive properties of other information defined as: $v_{t+1} = \omega_{1o} + \omega_{33} v_t + e_{i,t}$ Yearly analysis with one lag		
Panel A: Profit-Making Firms		
ω_{10}	ω_{33}	Adj-R^2
-0.016 (-7.09)	0.55 (22.61)	0.42
Panel B: Loss-Making Firms		
0.07 (6.27)	0.73 (16.39)	0.44
Panel C: All Firms		
ω_{10}	ω_{33}	Adj-R^2
0.0004 (0.10)	0.58 (20.51)	0.43

Table 10: Regressions of Stock Price on the Fundamental Values and the Information Variables used in the valuation Models

Panel A: Regressions of Price on Fundamental Values (FV)- Profit Making Firms			
Model	Intercepts	FV	Adjusted-R^2
Choi et al Approach	0.76 (7.47)	0.76 (10.68)	0.54
RIM3, but scaled BV	1.05 (9.38)	0.56 (11.60)	0.38
Panel B: Regressions of Price on Fundamental Values (FV)- Loss Making Firms			
Model	Intercepts	FV	Adjusted-R^2
Choi et al Approach	0.58 (7.59)	0.34 (5.16)	0.45
RIM3, but scaled BV	0.47 (9.19)	0.26 (5.15)	0.47
Panel C: Regressions of Price on Fundamental Values (FV)- All Firms			
Model	Intercepts	FV	Adjusted-R^2
Choi et al Approach	0.81 (8.56)	0.61 (8.96)	0.47
RIM3, but scaled BV	1.07 (9.05)	0.38 (7.82)	0.35

5. Summary and Conclusion

The aim of this paper was to investigate the empirical performance of different specifications of the residual income model. The paper provides evidence to suggest that the Ohlson (1995) specification appears to be the best model that explains stock prices relative to other specifications used in this paper. In addition, this paper provides an empirical assessment of the persistence parameter of abnormal earnings and the persistence parameter of the "other information" variable for profit-making firms and loss-making firms. Overall, the paper finds that the autoregressive properties of the persistence parameter of abnormal earnings and the persistence parameter of the "other information" variable fall between the extreme values of zero and one as hypothesized by the Ohlson (1995) model. Furthermore, the paper examines the scale-effect with book value of equity rather than market value of equity. The evidence suggests that the scale-effect does not have an impact on the results of profit-making firms, however, it has a strong impact on the results of loss-making firms.

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