The Relation between Residual Income and Stock Price in Tehran Stock Exchange

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Abstract:
This study examines the relation between residual earnings and stock prices in Tehran Stock Exchange (TSE). The analysis is based on a residual income model that expresses the value of the firm in terms of book value of equity and residual income. The model holds for any clean surplus accounting system. The study address the question that whether book value per share (BV) and abnormal (residual) earnings per share (RE) have incremental and relative explanatory power or not. We find that RE have less explanatory power than BV. Also, we find that accounting book value of equity and residual earnings are positively and significantly related to current stock prices in Tehran Stock Exchange (TSE).

Keywords: Residual Earnings Model, Valuation, Stock Price, Book Value of Equity, Tehran Stock Exchange (TSE).

1. INTRODUCTION

In order to decide analysts, dealers and investors about purchasing, selling or keeping their stock in capital market, they require the stock

price to be determined. In determining the stock they need reliable and timely information. For this purpose, accountants provide information on company's operations, which are usually presented in financial statements and the notes accompanying them. So, analysts, dealers and investors based on such information, should be able to decide about purchasing, selling or keeping their stock.

For determining the stock price, they can use different models such as Economical Value Added (EVA), Free Cash Flows (FCF) or Dividend Discounted model. In dividend discounted model merely the dividends are regarded and there is no role for book value of equity. In recent years, however, some researchers have presented a new model for valuation by proposing some illusions (Jiang and Lee, 2005). They believed that in models such as Dividend discount model, dividends alone, do not account for all of the changes for securities with wide fluctuation, but only part of that. So, considering assumptions such as clean surplus, a new model called residual income was proposed.

To relate firm value and accounting earnings, there must be a link between earnings and dividends. Until recently, researchers have assumed either a proportional payout of earnings or a monotonic relation between earnings and dividends. Ohlson (1995) shows that a firm's intrinsic value is equal to the book value of equity plus the present value of expected future residual income. Residual Income (RI) is the difference between accounting earnings and a change for the normal return on equity (the discount rate * book value of stock). Intrinsic value equals the present value of expected future dividends regardless of the dividend payout policy or the quality of the accounting numbers, providing that clean surplus is observed.

The clean surplus assumption is a restriction on the relation between accounting earnings(x), accounting book value of equity (bv) and net dividend (d) through time (t):

$$bv_t = bv_{t-1} + x_t - d_t$$

The clean surplus assumption can be solved for dividends, and hold regardless of accounting method choice, so that:

$$d_t = bv_{t-1} + x_t + bv_t$$

Using the clean surplus and the dividend discount formula:

$$V_t = \sum_{\tau=1}^{\infty} E\left[\frac{d_{t+\tau}}{(1+r)^t}\right]$$

Where V is intrinsic value and r is the discount rate. Firm value can be written in terms of present value expected future accounting earnings and book value of equity:

$$V_t = bv_t + \sum_{\tau=1}^{\infty}\left[\frac{x_{t+\tau} - r * bv_{t+\tau-1}}{(1+r)^{\tau}}\right]$$

The only assumption required to move from the dividend discount formula to equation is clean surplus.

Our analysis follows a model developed by Edwards and Bell (1961), Peasnell (1982) and formalized by Ohlson (1991, 1995) and Feltham and Ohlson (1995) that sometimes termed the Residual Income Model. The model formally states that firm value is a function of book value of equity and present value of future residual earnings.

In this paper we investigates that whether book value per share (BV) and residual earnings per share (RE) have incremental and relative explanatory power or not. The results indicate that RE have incrementally explanatory power than BV for stock valuation. In addition, the results indicate that book value of equity and residual earnings are positively and significantly related to current stock prices in Tehran Stock Exchange.

The next section of the article briefly reviews literature of research which is followed by the research design and the description of the sample. This is followed by results. The results section presenting the analysis of our data and reporting the result of our tests follows. Final section summarizes and concludes the study.

2. LITERATURE REVIEW

Research concerned with the relation of accounting numbers and stock prices covers decades. In this brief review we summarize recent research with study designs and research methods similar to ours or relevance to residual income model. The researches are as follow:
Graham and King (2000) investigate the relation between accounting practices and the market valuation of accounting numbers in

Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand in the years 1991 to 1995. The results indicated that RE explanatory power is less than BV explanatory power in all the six mentioned countries. Also, they found that BV and RE have appositive and significant relation with stock prices in all the six mentioned countries.

Bernard (1995) examine the relation between stock prices, accounting earnings, and book values .The analysis follows the residual earnings model formalized by Ohlson (1991, 1995) and Feltham and Olson (1995). The results indicate that accounting book values and residual earnings are positively and significantly related to current stock prices.

Dechow et al. (1999) examine the residual income valuation model in the years 1976 to 1995. Empirical results generally support Ohlson's information dynamics. However, they found that their empirical implementation of Ohlson's model provides only minor improvements over existing attempts to implement the dividend-discounting model by capitalizing short-term earnings' forecasts in perpetuity.

King and Langli (1998) examine the explanatory power of BV and earnings per share (EPS) across a 15-year period (1982-1996) for Germany, Norway, and the UK. They find significant differences in the valuation power of accounting book value and earnings across the three countries, and they interpret some of the differences as consistent with diversity in accounting practices. They finding indicate that for Germany the incremental explanatory power of book value increases significantly while that for EPS decreases. There is no significant change in their common information. For Norway, there is no significant change in the incremental explanatory power of book value or EPS over time. While for the UK, the incremental explanatory power of book value increases and the incremental explanatory power of EPS is unchanged over the time period.

Frankel and Lee (1999) look at the relation between accounting values, earnings forecasts and market prices across 20 countries (including Korea and Thailand) for 8 years (1987-1994). Sample sizes for Korea and Thailand are small with 3 to 8 observations per year (33 total firm-years) for Korea and 1 to 40 observations per year (162 total firm-years) for Thailand. They find that estimates of value based on the residual earnings model have incremental explanatory power

beyond book value of equity and earnings in explaining market value in all countries.

Joos and Lang (1994) relate book value and earnings to stock prices for France, Germany, and the UK. Their sample covers 1982 to 1990, and they focus on the effects of implementing the accounting related directives of the European Union. They find the explanatory power of book value of equity and earnings together ranges from 20 to 38 percent for Germany, from 48 to 78 percent for France, and from 14 to 42 percent for the UK. They do not examine incremental explanatory power.

Collins et al. (1997) examine the incremental explanatory power of book value and earnings across a 41-year time period (1953-1993) for US firms. They find a decline in the ability of earnings to explain market prices over this period. But the explanatory power of book value of equity increases such that total explanatory power is actually higher in more recent periods. Average adjusted R^2 for a model regressing BV and EPS on stock price for the first 10 years (1953-1962) was .50 increasing to .69 for their most recent 10-year period (1984-1993).

Bao and Chow (1999) examined the relative value relevance in equity valuation of two sets of financial reports, one based on International Accounting Standards (IAS) and the other based on China's accounting Standards. The sample consists of firms that issued the so-called B shares to foreign investors covering the period 1992-1996. The result of the study showed that earnings and book value of equity prepared under IASs explain 23.6 percent of the variation of stock prices, while earnings and book values prepared under China's accounting Standards explain only 21.1 percent of the variation of the stock prices.

EL-Shamy and Kayed (2005) examines the value relevance of earnings and Book values derived under the Kuwaiti accounting system using a valuation model provided by Ohlson (1995). The study uses statistical association between stock prices and both earnings and book values to measure value-relevance of the accounting system. The study also compares the incremental explanatory power of earnings and book values and examines some conditions under which earnings or book values would explain a relatively higher proportion of the variation of stock prices. The results show that earnings and book values jointly and individually are positively and significantly related

to stock prices. The incremental information content of earnings is greater than that of book values.

3. RESEARCH DESIGN

Our analysis is based on contemporaneous cross-sectional regressions of accounting book values of equity and residual earnings on stock prices (dependent variable). We analyze both the relative and the incremental explanatory power of book value of equity and residual earnings using an approach applied previously in accounting by Graham and King (2000). Empirical specification of the residual earnings model requires estimates of book value of equity, residual earnings, and the horizon for residual earnings. For residual earnings estimated to terminate at time T, Graham and King (2000) use the following model:

$$PRICE_{it}=a_0+a_1BV_{it}+a_2RE_{it+1}+a_3RE_{it+2}+a_4RE_{it+3}.....+a_kRE_{it+K}+e_{it} \quad (1)$$

Where $PRICE_{it}$ is the price per share of firm i at the end of period t, BV_{it} is the book value of equity per share of firm i at the end of period t, and RE_{it} is the residual earnings per share of firm i for year $t + k$.

The coefficient a_1 would have an expected value of 1.0 while the coefficients a_2 to a_4 would have expected values of $(1 + r)^{-t}$. Finally, the expected value of coefficient a_k would be $(1/r)*(1 + r)^{-T}$. Residual earnings horizons will differ cross-sectionally; therefore, parsimonious cross sectional representations of Equation (1) will have only a few terms. For example Frankel and Lee (1999) use T = 2 because analysts' forecasts used to predict future residual earnings were only available for 2 years. Also, Graham and King (2000) use T=1 to test residual income model. We use T = 1 to test residual income model, because firms' forecasts used to predict future residual earnings were only available for 1 year.

Our first tests are concerned with the incremental explanatory power of book value of equity and residual earnings. As in Graham and King (2000) we compare the results of three regression equations to address the question of relative and incremental explanatory power. Equation (2) below provides the most parsimonious empirical specification of the residual earnings model on a per share basis (the horizon is only one period). Current period residual earnings are the

proxy for future expected residual earnings. Residual earnings are estimated by subtracting an estimate of normal (expected) earnings from reported earnings. Expected earnings are the product of the estimated cost of capital (r) and book value. In this paper for compute average cost of capital we take the following steps: In first, cost of equity capital is calculated by Market Model. Then rate of borrowing is computed out of notes accompanying financial statement, which was that adjusted for tax to reach cost of debt. Finally in order to come to average cost of capital, the rates calculated in the two above steps were respectively multiplied by equity to the sum of debt and equity ratio and debt to sum of debt and equity ratio. Noteworthy to say that market value is used to compute equity.

In the residual earnings model, book value and firm value are taken at time t while future abnormal earnings are for periods after time t. In our empirical analysis residual earnings (RE_t) are for the period ending at time t. Hence, as in Bernard (1994), and Graham and King (2000) current earnings are a proxy for expected future earnings.

$$PRICE_{it} = b_0 + b_1 BV_{it} + b_2 RE_{it} + e_{it} \qquad (2)$$

where $PRICE_{it}$ is the stock price per share of firm i at the end of year t, BV_{it} is the book value of equity of firm i at the end of year t, RE_{it} is the residual earnings per share, which is equal to $EPS_{it}-(r*(BV_{t-1}))$ (proxy for expected RE in period $t+1$), EPS_{it} is the earnings per share of firm i for year t, and r is the average cost of capital.

Equation (2) expresses price as a function of book value of equity and residual earnings. Examining the relative and incremental explanatory power of book value of equity and of residual earnings requires two additional equations expressing price as a function of book value alone, Equation (3), and residual earnings alone, Equation (4).

$$PRICE_{it} = c_0 + c_1 BV_{it} + e_{it} \qquad (3)$$

$$PRICE_{it} = c_0 + d_1 RE_{it} + e_{it} \qquad (4)$$

Such as Graham and King (2000) we define the incremental explanatory power of the book value of equity and residual earnings variables in terms of differences in the coefficient of determination

(R^2). These differences are sometimes called the semi-partial coefficient of determination (Cohen and Cohen, 1975). They are a measure of the incremental explanatory power of one variable given the remaining independent variables. Define the R^2 statistics from Equations (2), (3), and (4) as $R^2_{b,r}$, R^2_b and, R^2_r respectively.

Then the incremental explanatory power is defined as:

$$R^2_{b|r} = R^2_{b,r} - R^2_r$$
$$R^2_{r|b} = R^2_{b,r} - R^2_b$$
$$R^2_{com} = R^2_{b,r} - R^2_{b|r} - R^2_{r|b}$$

The incremental explanatory power of book value of equity is the total explanatory power of book value of equity and residual earnings less the explanatory power of residual earnings alone. The incremental explanatory power of residual earnings is the total explanatory power of book value of equity and residual earnings less the explanatory power of book value of equity alone. The explanatory power common to book value of equity and residual earnings is the total explanatory power of book value of equity and residual earnings less the incremental explanatory power of book value of equity and the incremental explanatory power of residual earnings. We can also assess the relative explanatory power of book value of equity and residual earnings by comparing the conditional (incremental) power as shown above (Biddle et al., 1995).

4. SAMPLE SELECTION

Our sample covers publicly traded firms in Tehran Stock Exchange (TSE) across the period from 2000 to 2004. The sample selection criteria are:

1.   The end of fiscal year is march 20 (29 Asfand), and
2.   Company's stock is traded 7 month out of 12 month.

For calculate stock rate of return in each moon's and then calculate expected rate of return based on market model we take second criteria. Considering the first criterion 155 companies of the 180 (member) population were qualified. Considering the second criterion 49 companies were left, which were used to do the research.

5. RESULTS

Table 1 reports the pair-wise correlation between stock price and accounting variables. For Tehran Stock Exchange (TSE) the rank (Spearman) correlations are greater than the product-moment (Pearson) correlations. However, the patterns and significance of the parametric (Spearman) and non-parametric (Pearson) correlations are similar. Stock price have a relatively strange correlation with BV and RE. So, we expect that BV and RE explain stock price.

Table1. Correlation statistic on variables

			Correlations Pearson		
		N	RE	BV	MV
Correlations Spearman	RE	245		0.346*	0.478*
	BV	245	0.271*		0.339*
	MV	245	0.535*	0.408*	
RE is residual income, BV is book value, and MV is market value					
* = significant at the 0.05 level					

Table 2. regression of book value of equity and residual earnings on stock price by year to year

$$PRICE_{it}=b_0+b_1 BV_{it}+b_2 RE_{it}+e_{it}$$

Where $PRICE_{it}$ is the price per share pf firm i at time t, BV_{it} is the book value per share of firm i at the end of period t, and RE_{it} is the residual earnings per share of firm i for year t.

year	N	b_1BV	t-statistic	b_2RE	t-statistic	R^2_{br}
pooled	245	2.42	3.36**	1.88	6.97**	0.36
2000	49	2.71	3.74**	0.98	1.05	0.59
2001	49	5.21	12.20**	1.26	1.72	0.84
2002	49	3.69	3.98**	1.75	1.27	0.42
2003	49	5.07	2.49*	1.55	1.66	0.21
2004	49	-0.01	-0.05	4.23	7.14**	0.55
nt at or below the 0.05 level.						
ant at or below the 0.01 level.						

We examine the incremental explanatory power of BV beyond that for RE, $R^2_{b/r}$, and the incremental explanatory power of RE beyond that of BV, $R^2_{r/b}$. relative explanatory power can be addressed by comparing $R^2_{b/r}$ and $R^2_{r/b}$ to each other (Biddle et al., 1995 and Graham

and King, 2000). In table 2 results of equation (2) estimates are showed. The results indicate that BV and RE can explain stock prices. Also, our findings indicate that BV and RE are related with stock prices positively and significantly for overall and most years. This result is consistent with Bernard (1995) and Graham and King (2000) findings.

In the table 3 results of equation (3) and (4) estimates are showed. The results indicate that BV alone and RE alone are able to explain stock prices in Tehran stock exchange. According to table 3, RE alone and BV alone are positively and significantly related to stock prices. Of course, our findings indicate that RE is important than BV in Tehran Stock Exchange. Our findings are consistent with western researches such as Graham and King (2000).

Table 3. regression of book value of equity alone and residual earnings alone on price of stock by year to year

$PRICE_{it} = c_0 + c_1 BV_{it} + e_{it}$

$PRICE_{it} = c_0 + d_1 RE_{it} + e_{it}$

Where $PRICE_{it}$ is the price per share pf firm i at time t, BV_{it} is the book value per share of firm i at the end of period t, and RE_{it} is the residual earnings per share of firm i for year t.

year	$c_1 BV$	t-statistic	R^2_b	$d_1 RE$	t-statistic	R^2_r
pooled	2.93	5.63**	0.3	3.09	8.50**	0.18
2000	3	4.76**	0.57	2.81	3.55**	0.22
2001	5.59	14.80**	0.83	5.78	2.36*	0.3
2002	4.32	2.51*	0.4	4.64	3.44**	0.21
2003	5.83	2.89	0.16	2.06	2.16*	0.09
2004	0.38	0.56	0.02	4.22	7.36**	0.55

Significant at or below the 0.05 level.
**Significant at or below the 0.01 level.*

In the table 4 incremental explanatory powers of residual earnings, book value of equity, and incremental power common to book value of equity and residual earnings is showed, which indicates that RE incremental explanatory power is less than that of BV incremental explanatory. Moreover comparing incremental explanatory powers of BV during research period (2000-2004) indicates that incremental

explanatory powers of BV continuously decreased, but incremental explanatory powers of RE during the mentioned period increased. Also, the finding indicated that the incremental power common to book value and residual is continuously decreased during the period 2000-2004. Our finding indicates that in recent years market focus on residual earnings instead of book value of equity. In the other words, investors in latest years give more weight to residual earnings than book value of equity in stock valuation.

Table 4. Incremental and relative information content of book values and residual earnings

$$R^2_{b|r} = R^2_{b,r} - R^2_r$$

$$R^2_{r|b} = R^2_{b,r} - R^2_b$$

$$R^2_{com} = R^2_{b,r} - R^2_{b|r} - R^2_{r|b}$$

where $R^2_{b|r}$ is the incremental power of book value, $R^2_{b,r}$ is the total explanatory power of book value and residual earnings less, R^2_r the explanatory power of residual earnings, $R^2_{r|b}$ The incremental power of residual earnings, R^2_b is the total explanatory power of book value, R^2_{com} is the incremental power common to book value and residual earnings.

year	$R^2 b/r$	$R^2 r/b$	$R^2 com$
pooled	0.18	0.06	0.12
2000	0.37	0.02	0.20
2001	0.54	0.01	0.29
2002	0.21	0.02	0.19
2003	0.11	0.05	0.04
2004	0.00	0.53	0.02

6. SUMMARY AND CONCLUSION

A primary goal of financial reporting is aiding investors, analysts and other users in economic decisions making. A primary economic decision making for investors is assessing the value of firms in which they are invested or consider investing. So, investors should know that

what existing the relation between accounting numbers and value of firm.

This study examined the relation between stock prices with accounting earnings and book values by using a sample of Tehran stock exchange firms during 2000 - 2004. We investigate that whether book value per share (BV) and residual earnings per share (RE) have incremental and relative explanatory power or not. The analysis is based on a residual earnings model that expresses the value of the firm in terms of book value and residual income. The residual earnings model is based on the clean surplus assumption which is a restriction on the relation between accounting earnings, book value of equity and net dividend.

Our results indicate that first, accounting book value and residual income are positively and significantly related to current stock prices in Tehran Stock Exchange. Our findings is consistent with king and Langli (1998) findings in European countries, Bernard (1994) result in US firms and Graham and King (2000) result in Asia firms. Second, relative and incremental explanatory power of BV is more than that of RE. This result is consistent with prior studies. Overall, the result indicated that book value and residual earnings have important role for valuation in Tehran Stock Exchange (TSE). Thus, investors and other market players must be attention to book value and residual earnings in determining stock valuation of firms in Tehran Stock Exchange (TSE).

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