Full Length Research Paper

An empirical evaluation of using the residual income model for prediction of stock price

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The use of fundamental analysis can be regarded as one of the effective tools to predict changes in stock prices. The residual income model is considered among the effective models for fundamental analysis. The purpose of this study is to predict stock prices by such a model. Therefore a sample of 87 companies listed on the Tehran Stock Exchange was selected, and the results of this study indicate the potential of this model. They showed a significant relationship between the current stock price and calculated price by use of a residual income model and the book value of stock. Furthermore, it can be concluded that in predicting stock prices, the ratio of the price calculated by the residual income model to the current stock price is more appropriate, in comparison to the ratio of the book value to the current price of stock.

Key words: Residual income model, intrinsic value, book value, fundamental analysis.

INTRODUCTION

Regarding the evaluation of stock prices for investment and the prediction of future prices, different models and methods have come into vogue. Although there will still be errors in prediction, this method will be more useful than selecting the stock without any knowledge. By taking all these problems into account, investors and analyzers have implemented technical and fundamental analysis to evaluate stock values and investments. Technical analyses are based on the study of stock price trends or, in other terms, prediction of stock price behaviors based on past behaviors. On the other hand, in fundamental analyses investors and analyzers are interested in calculating the intrinsic values of stocks. Therefore the difference between the intrinsic values of stock and the current prices of stock can play a very significant role in improving investor motivations to undertake investments. Further, fundamental analyses examine the basic financial information of a company to predict profit, demand, supply, management capabilities, and other

intrinsic issues that can affect market value and its growth potential. In fundamental analysis, investors contend that the fundamentals, including the financial statements of a company, the interim financial reports, the historical financial trends, and any other kinds of forecast concerning such things as future growth, sale, and profit, should be able to regularize the process of selecting stock and its timing of sales (Thomsett, 1999).

Stockholders and creditors evaluate the value of a company according to the profits that it acquires. In an efficient market, the present value is acquired by the expected future cash flow that has been discounted to the expected rate of return with regard to its risk. The current performance of a company is summarized in its financial statements. However, we are unable to predict its cash flow and the market value by making use of these pieces of information. Although according to the conceptual framework of financial accounting, financial statements should help investors and creditors in assessing the prices, the timing, and the uncertainty of future cash flow (SFAC NO. 1; 1987). As a result, a close relationship exists between the current financial perfor-mance of a company, future cash flow, and between financial performance and stock price and the changes in

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stock price. The main purpose of researching capital markets is to provide evidence for confirming the existence of these relationships (Kothari, 2001).

According to Neveu (1985), fundamental analyses are considered as one of the data analysis methods for predicting stock prices. Kothari (2001) expresses two principal roles as far as fundamental analyses are concerned. "First, the main reason behind doing research on fundamental analyses and its application is determining the mispricing of securities for investment. Second, they are used to determine the intrinsic value of stocks". Capital markets research on fundamental analysis has become extremely popular in recent years in part because of mounting evidence in the financial economics literature against the efficient markets hypothesis. Regarding the relationship between the intrinsic value and stock price, a lot of research has been done by different scholars (Dechow et al., 1999; Penman, 2001; Higgins, 2011).The best answer to the question of whether the researches done with respect to fundamental analyses can result in discussing some parts of the accounting researches is that the available information in financial statements and the capital market should first be compared. Doing market research on fundamental analyses has recently been generalized because there is some strong evidence about finance literature while it cannot be regarded as true for efficient market hypothesis (Kothari, 2001). Among methods used for fundamental analyses that we can refer to is the residual income model, which predicts a stock price based on residual income. The purpose of this study is to assess the ability level of this model in predicting stock prices.

Residual income model

In fundamental analysis, financial statements are regarded as the criteria for evaluation. In other words, the evaluation of financial statements is the starting point. Investors start the process of valuation based on the values that have been defined in the balance sheet, and they will then follow a process to recognize additional value on book value.

Price = book value + additional price

To measure the additional amount, we can make use of residual income. The residual income is defined based on difference of the profit of the related period and the minimum of expected return. The model that can be used to measure the additional value of predicting the residual income is called the residual income model, and the basis for it is Clean Surplus Relationship (Ohlson, 1995; Feltham and Ohlson, 1995). According to Absolute Surplus Relation, a change in book value of the owners' equity equals profits of the period minus the dividend.   In

other words, the following calculation will be done:

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

Therefore, we can define Residual Income Model as follows:

$$V_t^E = B_t + \frac{RI_1}{(1+k_e)} + \frac{RI_2}{(1+k_e)^2} + \frac{RI_3}{(1+k_e)^3} + ...$$

In the above formulae, RI is the residual income of owners' equity.

$$RI_1 = Earn - k_e * B_{t-1}$$

In this formula, B_{t-1} is the book value of the available stock in t-1 and k_e is the expected return.

The companies are usually exchanged by price, which is quite different from book value. The main reason for this problem is that some parts of assets and liabilities are recorded according to the market price, some based on the cost value in the balance sheet, and lastly, some are not recorded in the balance sheet. Accordingly, the analysts pay no attention to the balance sheet in their analysis. They observe the book value of a stock, and then they want to find out the amount of value that must be added to the book value until the real value is discovered (Penman, 2004). As a result, the owners' equity will be obtained by adding the expected residual future income and the book value of the expected residual income. This amount equals the missing value on the balance sheet. According to Peasnell (1982), this amount is considered as the company's goodwill. Peasnell (1982), also contends that the goodwill equals the current value of the expected residual income in Clean Surplus Relationship conditions.

If we express the first formula according to financial ratio $(V_t^E \big/ BV_t)$, we will have the following calculations:

$$V_t^E \big/ BV_t = 1 + \frac{\sum_{t-1}^{\tau} RI_t}{BV_t}$$

$$V_t^E = BV_t + \frac{\sum_{t-1}^{\tau} (ROE_{t+1} - k_e)}{(1+k_e)^t} * BV_t$$

Then, $ROE = \dfrac{Earn_t}{BV_{t-1}}$

It means that if we expect that the earnings of stock-holders are more than the book value amount of the owners' equity (the positive residual income), the equity should include more value than book value, should be changed to a higher amount, and if the ROE is less than the expected return, it means that the stock should be sold for a price less than its book value.

LITERATURE REVIEW

Dechow et al. (1999) provide an empirical assessment of the residual income valuation model proposed in Ohlson (1995). They point out that existing empirical research relying on Ohlson's model is similar to past research relying explicitly on the dividend-discounting model. They establish that the key original empirical implications of Ohlson's model stem from the information dynamics that link current information to future residual income. Their empirical results generally support Ohlson's information dynamics.

Higgins (2011) demonstrated a method to forecast stock prices that uses analyst earnings forecasts as essential signals of company valuation. It is based on the residual income model, with adjustment for autocor-relation. Overall, this paper provided a method to forecast stock prices that blends fundamental data with mechanical analyses of past time series.

Penman (2001) demonstrated, with examples, that the claim that cash flow and accrual accounting methods for valuing equities must always yield equivalent valuations is misguided. He concluded that practice inevitably involves forecasting over finite truncated horizons, and the accounting specified in a model — cash versus accrual accounting in particular — is pertinent to valuation with finite-horizon forecasting. He found that the issue of choosing a valuation model is an issue of specifying pro forma accounting, and so for finite-horizon forecasts, we cannot be indifferent to the accounting.

Plenborg (2002) compares the discounted cash-flow approach and the residual income model. The two valuation approaches are compared on the basis of analytical attractiveness. This study demonstrates that if practitioners introduce simplifying assumptions in their valuation of a company, they also introduce biases in their value estimates. Sometimes the residual income approach yields more accurate company value estimates, though in others the discounted cash-flow approach yields more accurate estimates. Further, the impact of simplifying assumptions on a company's value estimates can be significant.

Xiaoquan (2002) tested the empirical validity of the accounting-based residual income model and compared the performance of this model with the conventional dividend discount model. He tested two implications of the two: volatility of prices relative to fundamentals based on the West inequality tests and their dynamic implications by cross-equation restrictions based on the Campbell-Shiller VAR test.

The residual income model is found not to be rejected by either test using either the S and P; S&amp P index or the DJIA index. Neither is it rejected by either test at most individual companies listed on the Dow Jones Industrial Average.

RESEARCH HYPOTHESES

The main hypothesis

The stock price can be predicted by the residual income model.

The secondary hypothesis

1. If the proportion of the calculated price by the residual income model divided by the current stock price is more than 1, the stock price will increase in the future.
2. There is a significant relationship between the calculated price by the residual income model and the current stock price.
3. There is a significant relationship between the book stock value and the current stock price.
4. To predict the stock price, the proportion of the calculated price by the residual income model divided by the current stock price is more appropriate, in comparison to the proportion of the book stock value divided by the current stock price.

Variables

The following variables have been used for the purpose of this study:

1. The current stock price (P).
2. The book value of stock (B), which is obtained by the sum of the owners' equity divided by the number of stocks.
3. The calculated intrinsic value in the residual income model: To calculate this variable, the three years' related data have been used according to Frankel and Lee (1998):

$$V_t = B_t + \frac{(ROE_t - K_e)}{(1+K_e)^1} * B_t + \frac{(ROE_{t+1} - K_e)}{(1+K_e)^2} * B_{t+1} + \frac{(ROE_{t+2} - K_e)}{(1+K_e)^1} * B_{t+2}$$

According to this model, we can utilize the predicted or real data. However, the real data have been used in this research.

Table 1. The results of hypothesis 1 testing.

Success proportion	Z	P-value
69.60%	3.53	0

Table 2. The results of hypothesis 2 testing.

Mean		Standard deviation		T	Df	P-value
P	V	P	V			
7510	10122	52177	13130	-1.01	488	0.312

Table 3. The results of hypothesis 3 testing.

Mean		Standard deviation		T	Df	P-value
P	B	P	B			
10122	2840	13130	6259	-0.44	621	0.174

Sample

Our sample comprises data from 87 nonfinancial companies listed on the Tehran Stock Exchange for the years 1999 through 2005.The companies must meet specific criteria to be included in the sample:

1. They must close their fiscal year in mid-March (end of Persian calendar).
2. The balance of owners' equity in these companies should be positive.
3. They must have full financial data for the whole period of investigation.

Source of data

The required data for examination were extracted from the information of market and financial statements. For this purpose, a large section of the information was extracted from Tadbir Pardaz and RahAvard Novin software (two Iranian software products), and the rest of the information was extracted through the information database of the Islamic Studies and Research Management Center of the Tehran Stock Exchange.

HYPOTHESIS ANALYSIS

In this research, there is one main hypothesis followed by four secondary hypotheses.

The first secondary hypothesis testing:

Hypothesis 1

If the proportion of the price calculated by the residual income model divided by the current stock price is more than 1, the stock price will increase in the future.

A proportion test is used to study this hypothesis. To do this, we divide the companies into two groups. In group one, we select those in which the proportion of the calculated price by the residual income model divided by the current stock price is more than one. In group two, we choose those companies in which the proportion of the calculated price by the residual income model divided by the current stock price is less than one. In the case that the proportion of the price calculated by the residual income model divided by the current stock price is more than 1, we consider p as the proportion of those companies having an increase in stock price in the following year. However, if this proportion is more than half (50%), the first hypothesis is accepted.

When the results in Table 1 are considered, the first hypothesis (when the proportion of V/P is more than one, there will be an increase in the stock price) was accepted at 0.05 level of significance.

The second secondary hypothesis testing

To test the second hypothesis (there is a significant relationship between the calculated price by residual income model and the current stock price), the t-test was implemented. Table 2 shows the results obtained from this hypothesis. Regarding the above results, we can conclude that there was significant relationship between the calculated price by residual income model and the current stock price. Therefore the second hypothesis is accepted.

The third secondary hypothesis testing

Taking the third hypothesis into account (there is a significant relationship between book stock value and current stock value); we found a significant relationship between book stock value and current stock value because it is clear from Table 3. Therefore the book stock value explains the current stock value.

The fourth secondary hypothesis testing

To predict the stock price, we find that the proportion of the calculated price by the residual income model divided by the current stock price is more appropriate in comparison to the proportion of the book stock value divided by the current stock price. Therefore, concerning the fourth hypothesis we found that the results of data analysis in Table 4 indicated that this hypothesis is also accepted because the obtained P value was found to be insignificant at .05 levels.

Table 4. The results of hypothesis 4 testing.

Mean		Standard deviation		T	Df	P-value
V-P	B-P	V-P	B-P			
-2612	-7281	53836	14299	1.75	494	0.041

Conclusion

The main purpose of this research was to study the amount of usefulness of the residual income model in predicting prices. To keep this purpose in mind, four secondary hypotheses were suggested. The results obtained from secondary hypothesis 1 indicated that if the proportion of the calculated price by the residual income model divided by the current stock price is more than 1, the stock price will increase in the future. According to the available financial literature, the predicted price is more than its real price when this pro-portion is more than one. Consequently, stock customers are fascinated to buy this stock, leading to an increase in demand for it, which ultimately results in an increase in its price.

The obtained results of the secondary hypothesis 2 proved that there is a significant relationship between the calculated price by the residual income model and the current stock price. Taking the results of the third secondary hypothesis into account, we learned that there is a significant relationship between the book stock value and the current stock value. Lastly, as the results of secondary hypothesis 4 indicate, the proportion of the calculated price by the residual income model divided by the current stock price is more appropriate than the proportion of the book stock value divided by the current stock price. Considering the results of all these secondary hypotheses, we find that we are able to predict the stock price by making use of the residual income model. Altogether, the main research hypothesis is accepted.

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