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A Study on the Determinants of Earnings Response Coefficient in an Emerging Market

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Abstract**—**The determinants of Earnings Response Coefficient (ERC), including firm size, earnings growth, and earnings persistence are studied in this research. These determinants are supposed to be moderator variables that affect ERC and Return Response Coefficient. The research sample contains 82 Iranian listed companies in Tehran Stock Exchange (TSE) from 2001 to 2012. Gathered data have been processed by EVIEWS Software. Results show a significant positive relation between firm size and ERC, and also between earnings growth and ERC; however, there is no significant relation between earnings persistence and ERC. Also, the results show that ERC will be increased by firm size and earnings growth, but there is no relation between earnings persistence and ERC.

Keywords**—**Earnings response coefficient, return response coefficient, firm size, earnings growth, earnings persistence.

I. Introduction

BASED on EMH, market shows a fast reaction to new information. Shareholders have some beliefs about the firm's performance and predict the future performance based on the expected risk and return related to that firm. Although the firm performance is depicted in financial statements, shareholders demand more information beyond these reports. Actually, they want to be sure about the growth and persistence of the firm performance.

According to [1], [2], events like earnings announcement that give some information about the firm, cause some changes in stock price and trading volume in stock market. When earnings are not growing but it is persistent that the management is probably trying for making improvement in the firm's performance. This affects shareholders' reaction in capital market. The quantity of financial disclosure in different firms varies according to their size and related industry; and different reactions to this information are quite normal. Since large companies are expected to report more information, not reporting expected information may imply a weak performance in shareholders' mind, and this probably cause negative reactions in stock market.

The main consequence of shareholders' reactions to disclosed information -especially earnings- is the stock price changes. The shareholders' reaction to unexpected earnings announcements is called ERC. In other words, ERC is the relationship between a firm's stock returns and any unexpected earnings announcements.

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In this research, we study about some factors which affect ERC, including earnings growth, earnings persistence, and firm size. Then, we investigate about the types of those effects, if any.

The rest of this paper is structured as follows. Section II reviews related research and literature. The research methodology is discussed in Section III. Section IV presents our empirical tests and results and Section V concludes.

II. Literature Review

A. Conceptual Framework

The EMH is an investment theory that states it is impossible to beat the market, because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information. Shareholders evaluate their expectations via good and bad news concluded from announced earnings. These evaluations help to predict the future earnings. Difference between real and expected earnings is called unexpected earning [1].

According to pricing theory, there is a hypothetical relationship between the existing information in capital market about the public companies and their stock price. Based on this theory, at the time of information announcement, the shareholder's decisions affect stock price. So, price changes should be related to information disclosed in the capital market. Price change shapes the stock (or equity) return[1]. ERC is the relationship between a firm's stock returns and any unexpected earnings announcements. A firm's stock price is related to information available to investors. Thus, news of unexpected earnings can lead to buying panic while low earnings can lead to selling panic. ERC is measured by fallowing model:

$$UR = a + bUX + e$$

where UR is the unexpected return, b is ERC, and UX is unexpected earnings (appropriately scaled [2]).

There are lots of factors that affect ERC. One of these factors is beta or the systematic risk in capital market. As the systematic risk increases, the firm value and ERC decrease [3]. Another factor is the capital structure. High leverage causes less ERC. Also, earnings quality has an effect on ERC, as earnings quality is measured by earnings growth and earnings persistence. High earnings quality causes high ERC

[1] A return is the gain or loss of a stock in a particular period. The return consists of the income and the capital gains relative on an investment, and it is usually quoted as a percentage. The general rule is that the more risk you take, the greater the potential for higher returns and losses.

[4]-[6]. Another factor that affects ERC comes from the differences between different stockholder's expectations. In other words, the more similar expectation of different shareholder, the more similar reactions happen to the announced earning, and consequently higher ERC. Stock price is another factor. Stock price reflects all information in market, while accounting system recognizes this information with a time lag. So the higher informative stock price, the less informative announced earnings and the less ERC. The firm size is another proxy for informativeness of stock price because there is lots of information about large companies in the capital market. [2], [5], [7]

B. Previous Studies

According to accounting literature, the relation between accounting earnings and stock return and the effective factors on this relation have been studied many times. Earnings growth, earnings persistence, firm's size, interest rate, financial leverage, capital market risk, and financial disclosure are some common examples for these studies.

According to [8], accounting earnings affect investment decisions, and earnings growth is a signal for a good firm performance. This research conducted in TSE and the research sample contains 208 registered companies from 2000 to 2007. The results showed the companies with both earnings and revenue growth in comparison to those with just earnings growth have higher earnings quality and higher ERC as well. Also, companies with earnings and revenue growth had higher earnings persistency. According to the Ohlson Model [9], these companies had higher ERC and less book value response coefficient.

The releasing financial statement and earnings announcement signal some information to capital market and cause some changes in stock price and trade volume [10]. As unexpected returns vary among different companies, this question arises that "*why the capital market shows different reactions for different companies*?"

The firm size is the other factor which affects ERC. One research conducted in TSE about the relationship between firm size and ERC [10]. Results of this research showed a significant relation between earnings announcement and unexpected return around earnings announcement time in medium and small size companies; but this relationship was not found among large companies. However according to [11], the firm size effects on ERC, i.e. there is a positive significant relation between firm size and ERC. It seems ERC increases by more disclosure about large companies. Result of their research showed there was a positively significant relation between size and ERC in long term. During the research about measure of size and announced information through media, [11] found not only ERC decrease by information announcement through media, but also increase. This result implies that the more disclosure, the less uncertainty about accounting system which produce earnings and financial numbers; therefore, shareholders are able to predict about future earnings more properly.

Based on results of another study [12], companies with more persistency in their earnings and revenues have higher earnings quality and higher ERC as well. Also, these companies encounter less earnings management and less book value response coefficient.

The effects of risk, interest rate, earnings growth, earnings persistence, and firm size on ERC were studied in [2]. The results of this study showed that ERC had a reverse relationship with the interest rate and the company's risk. Also, the results showed a positive relationship between ERC and earnings growth and earnings persistence as well. Moreover, this study implies that the large companies probably have more opportunities for growth; therefore, they have higher earnings and also higher ERC.

III. Research Methodology

In this research, we try to find out about the relation between ERC and some firms' characteristics. The data for the research have been collected from TSE database for registered firms during 2001 to 2012. We applied some limitation for choosing our sample. The applied criteria for limiting our sample are as follows: (1) Fiscal year of companies should be 19th March (or 29th Esfand based on Iranian calendar); (2) The companies' data should be available; (3) Companies should not change their fiscal year during research period; and (4) Companies should not be from the banking, financial, investment, and insurance industry because of their different financial structure. According to the data restrictions, 984 firm-year observations (84 firms in 12 years) have been selected for whole time period. EVIEWS software has been used for performing required statistical tests.

A. Research Hypotheses

Our hypotheses in this research are as follows.

H1. There is significant relationship between ERC and firm size.

H2. There is a positive significant relationship between ERC and earnings growth.

H3. There is a positive significant relationship between ERC and earnings persistence.

B. Research Variables and Models

"Unexpected earnings" is the dependent variable in this research. For measuring unexpected earnings, changes in earnings per share (hereafter, EPS) were scaled by the stock price in the beginning period. For studying the relationship between the firm size and ERC, first of all we estimated Return Response Coefficient (hereafter, RRC) for all companies in our sample. PRC is the relation between stock return and unexpected earnings. Then, we estimated RRC among small, medium and large companies separately. Next we classified companies by quintiles, as the first quintile includes the small companies; the second and the third quintile include medium-sized companies; and the fourth quintile contains the large companies. After that, we considered the growth proxy and the firm size. Finally, we entered the growth and earnings persistence in our model simultaneously.

According to the research hypotheses, we employed the following models:

Model 1: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it-1} + \gamma_{2t}R_{it} + \varepsilon_{it}$
Model 2: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it} + \gamma_{2t}\ P/E_{it} + \gamma_{3t}\ P/E_{it}\ R_{it} + \gamma_{4t}Size\ R_{it} + \varepsilon_{it}$
Model 3: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it} + \gamma_{2t}\ P/E_i\ R_{it} + \gamma_{3t}\theta + \gamma_{4t}\theta R_{it} + \varepsilon_{it}$

where P is stock price, R is stock return, and E is earnings. $\Delta X/P_{t-1}$ is changes in EPS scaled by stock price in the beginning period, which is considered as a proxy for unexpected earnings. P/E is the price to EPS and a proxy of growth. This variable is a moderator variable and it is expected to effects on the relationship between stock return and earnings. θ is earnings persistence that is estimated by ARIMA estimation. θ is a moderator variable and it is expected to effects on the relationship between stock return and earnings. Earnings persistence for each firm is estimated for the 5 past year's earnings. For example, θ in 2006 is an estimation of earnings persistence for 2001-2006.

Size is the firm size and a dummy variable which is zero for the small companies and one for the large and medium-sized companies.

For testing our hypotheses, we obtained the earnings data for 2001-2012 to measure the earnings persistence for 2006-2012. Return and price data are gathered for 2005-2012, and other data, including revenue and P/E are gathered from 2006-2012.

C. Statistical Tests

We used Chaw and Hausman test for realizing whether these data are panel or pooled. Result of these test showed data are not pool and have just cross sectional random effects. Another test we did in this research is chaw test. Purpose of this test is whether differences between estimated regression among several groups are significant or not.

We also did correlation significance test. Besides, we did the regression and correlation analyzes to investigate the regression reliability and the degree of linear association between our variables.

IV. Research Results

Table I shows the result of applying the first model among all companies as a whole, while Table II shows the results for the small, medium and large companies, separately; and Table III is about the chaw statistical test we did for these companies. Tables IV and V show result of applying the second and the third models for the growth and earnings persistence.

According to the results, none of return coefficients are significant and also coefficient of determination shows that independent variable explains only 1.4% of dependent variable changes. Also F and t statistics all are more than 5%, so coefficients are not significant and regressed model is not verified. Therefore, according to our results there is no relationship between size and ERC regardless the size of firms in out sample.

TABLE I
Model 1 –Relation between Firm Size and ERC (All Companies)

Model: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it-1} + \gamma_{2t}R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	0.77	4.08	0.0001
R_{it}	-.0035	-1.41	0.151
R_{it-1}	0.0036	1.046	0.296
R^2	Adjusted R^2	F statistics	Probability
0.014	0.0048	1.034	0.41

$\Delta X/P_{t-1}$ is unexpected earnings; R_{it} is stock return.

TABLE II
Model 1- Relation between Firm Size and ERC (Among Small, Medium and Large Companies)

small companies: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it-1} + \gamma_{2t}R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	4.88	9.25	0.000
R_{it}	-0.0077	-0.98	0.33
R_{it-1}	-0.0027	-0.45	0.65
R^2	Adjusted R^2	F statistics	Probability
0.055	0.00045	1.008	0.43
Medium-sized companies: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it-1} + \gamma_{2t}R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	-0.89	-0.27	0.000
R_{it}	0.0013	2.8	0.005
R_{it-1}	0.00032	0.63	0.53
R^2	Adjusted R^2	F statistics	Probability
0.05	0.026	1.92	0.057
large companies: $\Delta X/P_{t-1}= \gamma_{0t} + \gamma_{1t}R_{it-1} + \gamma_{2t}R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	0.0021	0.012	0.91
R_{it}	0.00088	3.33	0.001
R_{it-1}	-.00036	-1.25	0.21
R^2	Adjusted R^2	F statistics	Probability
0.11	0.063	2.23	0.029

$\Delta X/P_{t-1}$ is unexpected earnings; R_{it} is stock return.

According to Table II, there is not any significant relation between firm size and ERC in small companies. Although the current year coefficient among medium-sized companies is significant, according to F statistic this relation cannot be verified. However, in large companies the current year coefficient is significant; and according to F statistic this relation is verified.

TABLE III
Chaw Statistics

Computing formula: $(k+1)] -jk-j)/[(j-1) \sum \boldsymbol{nj}\ ]*(\ )/\ \sum \boldsymbol{RSSj}$ $F= [(RSS_{combined} - \sum \boldsymbol{RSSj}$ ((979905.0-(733526.8+9856.69+6.12))/743389.6)×((82-3-3)/(3-1)*(1+1)=6.52		
Test result	Critical value	Computed statistics
Significant difference between different-sized companies	4.54	6.52

According to Table III, the coefficients and other statistics are significant only among large companies. Therefore, the results imply that the firm size effects on ERC only in large companies.

Results about testing the second model are shown Table IV. According Table IV, there is a negative significant

relationship between growth and ERC. Therefore, the second hypothesis is not rejected.

TABLE IV
MODEL 2- INVESTIGATING RELATION BETWEEN EARNINGS GROWTH AND ERC

Model 2: $\Delta X/P_{t-1} = \gamma_{0t} + \gamma_{1t}R_{it} + \gamma_{2t}\, P/E_{it} + \gamma_{3t}\, P/E_{it}\, R_{it} + \gamma_{4t}\text{Size}\, R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	0.91	17.35	0.000
R_{it}	-0.0006	-0.8	0.42
P/E_{it}	-0.013	-3.34	0.0009
$P/E_{it}\, R_{it}$	-0.0002	-3.41	0.0007
Size R_{it}	0.0008	0.93	0.34
R^2	Adjusted R^2	F statistics	Probability
0.37	0.26	3.40	0.000

$\Delta X/P_{t-1}$ is unexpected earnings; R_{it} is stock return; P/E is price to earnings.

TABLE V
MODEL 3- INVESTIGATING RELATION BETWEEN EARNINGS PERSISTENCE AND WRC

Model 3: $\Delta X/P_{t-1} = \gamma_{0t} + \gamma_{1t}R_{it} + \gamma_{2t}\, P/E_i\, R_{it} + \gamma_{3t}\theta + \gamma_{4t}\theta R_{it} + \varepsilon_{it}$			
	Γ	T statistics	Probability
γ_{0t}	0.56	7.7	0.000
R_{it}	-0.00049	-0.11	0.91
$P/E_i\, R_{it}$	-0.000056	-1.7	0.08
θ	0.000001	9.3	0.23
$\theta * R_{it}$	0.000000037	0.93	0.35
R^2	Adjusted R^2	F statistics	Probability
0.016	-0.0011	0.94	0.496

$\Delta X/P_{t-1}$ is unexpected earnings; R_{it} is stock return; P/E is price to earnings; θ is earnings persistence.

The results about testing the third model are shown Table V. According to these results, none of the coefficients are significant; therefore, the regressed model is not significant as well. So, we can say there is no relationship between earnings persistence and ERC in our sample; and the third hypothesis would be rejected.

V. CONCLUSION AND SUGGESTION

In this research, we studied the effects of firm size, earnings growth, and earnings persistence on ERC. The results show a positive relation between firm size and ERC. Also, based on our results there is positive significant relationship between earnings growth and ERC. However, we did not find out a significant relation between earnings persistence and ERC.

According to our results, the larger companies disclose more information to the capital market and shareholders reacts to these information and stock prices will probably change consequently. Also, this affects stock returns. Therefore, the larger firm, the more ERC is expected. There is a same relation about the earnings growth. As the firms communicate about their good performance via disclosing higher earning, the capital market reacts more positively; and this means more ERC.

Although it is expected the more signals about the firms' earning persistence cause the more ERC, in this research sample there is no evidence about a significant relationship between earnings persistence and ERC.

For the future studies, we suggest to test the effects of variables other than firm size, earnings growth, and earnings persistence on ERC, including inflation rate, interest rate, leverage degree, and revenue growth.

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