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Studying the Relationship between P/E Ratio and Stock Return in the Manufacturing Firms Accepted in Tehran Stock Exchange Market

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ABSTRACT

Background: Regarding the fact that each investor takes into consideration two important factors, that is, return size and stock risk, and one of the indexes to compare various firms stock risk is P/E ratio, **Objective:** the current research is focusing on two factors of return and P/E ratio and attempts to examine the relationship between these two variables. To find the relationship between these two variables, this ratio information, the latest daily transactional price of the firms which have been used in estimating stock return have been analyzed for 46 firms of the statistic sample from 2001 to 2011. **Results:** Through econometric tests, validity of Regression equations in above-mentioned firms has been proved. **Conclusion:** Regression results revealed a positive and significant relationship between stock return and P/E ratio. It means that this ratio is a suitable and significant variable to explain stock return.

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INTRODUCTION

Any country economic growth depends on proper planning and investment. Appropriate direction of monetary flows and unplanned funds toward manufacturing issues will bring about economic growth, increasing annual revenue and finally public convenience. Investment requires financial supplement. Two main groups that are responsible for financial supplying of investment are investors and credits. From the first group viewpoint, the power and financial condition of credit-taker firms play an important role in paying back the debts on time. Some of the market participants complain about P/E ratio fluctuations and attempt to find the reasonable ratio. Speculators start to purchase stock, when P/E ratio is falling, because they believe that this fall is temporary, and this falling trend will change in the future. Of course, this view toward P/E ratio is not frequent, and depends on the firms current situations. Whenever investors have some expectations from a firm, they start to purchase the stocks of that firm. Then, the price of that firm's stocks will increase due to high amount of demand, and consequently P/E ratio will increase too. When P/E ratio is high, investors expect increasing income in the future, implementing growth plans or the firm development. Therefore, after announcing positive reports, falling P/E ratio can be expected.

In fact, one of the important figures which can be analyzed for investors and help them to make decision is the firms' P/E ratio. As P/E ratio is obtained by dividing market price on the firm's annual income, therefore, investor can calculate that income obtained from stocks can remove his investment. Fluctuations of P/E ratio can be analyzed by the investor and based on the obtained conclusions; investor can invest in the best time to get the best return. Therefore, determining P/E ratio and stock return relationship can open the way for investors for future planning of the firms. Thus, the current research attempts to examine the relationship between P/E ratio and stock return in Tehran stock exchange market to cast light on the information necessary for decision making.

P/E coefficient is not only a scale for evaluating firms but also an instrument for comparing the countries' capital markets performance. However, in using this index in different countries and analyzing it, the basic differences in specific structures, inflation rate, interest rate, the firms' profitability, and other macro and micro factors should be taken into account. In Tehran stock exchange market, P/E ratio, as a criterion, along with other ratios is used to evaluate securities. P/E ratio in Tehran stock exchange market is obtained by dividing total value of the market on total income after subtracting estimated tax of the firms accepted in Tehran stock exchange market. The main goal of this research is examining this question that "can P/E ratio explain stock return? And how much is its explanation ability? In fact, examining the relationship between P/E ratio and stock

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return can help the investors a lot for the future planning of the firm and help the investors to gain more and more capital.

Review of the literature:

The paper presented by James D. Mc Williams (1996) is considered as one of the first studies in the field of P/E ratio. In this paper, Williams evaluates advantage of P/E ratio as an analysis instrument. According to the sample of this study which consists of 390 firms in New York stock exchange market from 1953 to 1964, it has been revealed that investment return in portfolio with low P/E ratio is higher than that with high P/E ratio. Selecting 100 shares with the highest return which have been ordered based on the P/E ratio, Williams also concluded that normal share with the highest return in each row was accompanied with low P/E ratio. Then he selected 10 shares with the lowest return ordered according to P/E ratio, and concluded that the loss probability of investment in portfolio with low P/E ratio is higher than that with high P/E ratio (Ebadzade, 1998).

Francis Nicholson presented the results of his study in 1968. Nicholson believed that securities analysis may sufficiently contain the factors income, income outlook, the rate of income growth, but the importance of P/E ratio and its relationship with stock return requires more relationship with real figures such as assets and sales. In other words, Nicholson showed that importance of securities highly depends on the factors such as income, income outlook, and the rate of income growth. However, real items such as assets and sales play important role in shaping price and stock return. The following are the results of the mentioned research:

1. Portfolio with low P/E ratio has a higher percentage of increasing price.
2. Portfolio with low P/ amortization ratio has a higher percentage of increasing price.
3. Portfolio with the lowest price/book value has a higher percentage of increasing price.

(Rahimi, 1995)

Basu (1977) is among the people who studied the relationship between common stock investment return and P/E ratio. He made two portfolios with two different P/E ratios for each studied period, and investigated the relationships of risk and return of these two portfolios, and then evaluated their performance based on the determined indexes (Basu, 1977, 673). In this study, comparing the return of portfolio with the lowest P/E ratio with that with the highest P/E ratio which has been mediated against risk, he came into conclusion that portfolio with low P/E ratio normally acquired higher return than the portfolio with high P/E ratio. Basu work rejected the semi-strong version of effective market (Hormozi, 2001).

Another research done in this field is William Beaver and Dale Mors (1978). Classifying common stocks and shaping different portfolios, they studied the behavior of P/E ratio and the power of explanation of income growth and risk. Income growth has been evaluated as one-year income changes, and risk has been measured as stock return sensitivity to market return ratio (William Beaver and Dale Mors, 1978, 70). Regarding three-variable Regression (P/E as dependent variable, risk and income growth as independent variables), they observed that 50% of P/E ratio changes is justified by risk and income growth (Hesadi, 1998).

Westerfeld (1989) supported results obtained by William Beaver and Dale Mors (1978). He also showed that the effect of P/E ratio is not just observed in January. Andro Alford (1992) studied the effect of classifying firms according to industry, risk and income growth on firm's evaluation accuracy by P/E ratio. The results showed that most of temporal changes of P/E ratio is explained by risk, industry and income growth. He concluded that industry is a good alternative for risk components and income growth dealing with P/E ratio (Aga, 2006, 7). Harry Ramchern (2002) examined the factors influencing P/E ratio in new-born markets, and identified two factors of economic growth and credit risk as factors which determine P/E ratio. He implemented annual data of capital markets of new-born countries from 1992 to 1999 and Regression procedure. His 21 selected countries are among Latin America, Asia, Africa, Europe which have used important financial reforms up to the beginning of the 90s. He found out that growth is the factor which determines changes in P/E ratio in new-born markets (Ebadzade, 1998).

Rahimi (1995) studied the relationship between common stock return and P/E ratio and concluded that the relationship between these two variables cannot be rejected. In this research, only one hypothesis has been studied. This hypothesis is stock with low P/E ratio in 1990 to 1995 has a higher return than stock with high P/E. the result is that the relationship between P/E ratio and stock return cannot be rejected.

Kalantari (1999) examined the indexes of P/E ratio, stock risk fluctuation and interest rate without risk and market risk toward determining return rate expected by firm stock holders by the procedure of P/E ratio, and improved stock return in the firms.

Hesadi (1998) focusing on the two factors of P/E ratio and return, attempted to investigate the role of P/E ratio in common stock return in the firms accepted in Tehran stock exchange. This research proved a significant relationship between P/E ratio and stock return.

Lewellen (2004) released a paper entitled "predicting return by using financial ratios". Predictability of three financial ratios (dividend yield) DY have been tested. Experimental tests showed that D/Y predicts market

return from 1946 to 2000 and also in a set of different time periods. These test showed that B/M and P/E had lower predictability, while D/Y had a higher predictability.

Another research dealing with the relationship between P/E per share and the obtained return has been conducted. This research investigated the relationship between P/E per share and the obtained return in the firms of industrial group of non-metal industries in Tehran stock exchange market. Finally, the results showed that stock return is affected by P/E ratio per share. Correlation test has also showed that P/E variable could not predict the variable of stock return fully (Janani & Hadizade).

Methodology:

Method:

This is a applied research in terms of goal, from collecting data vantage point, this is a descriptive research. To test the hypothesis, Regression analysis has been used. The method of the research is pseudo-experimental. Information of P/E ratio and stock return has been provided from daily, weekly, monthly and annual reports of stock exchange journals, in addition to the information of the software Tadbirpardaz, and data banks of Sahra, Dena Sahn and Pars Portfolio.

Statistical population of the research:

To limit experimental analyses of accessible observations, some criteria have been selected. From among all firms accepted in Tehran stock exchange, some of them have been selected which had methodological conditions as follows:

1. The end of their financial year should be the end of April 21st.
2. The firms should be constantly active during the period of 2001 to 2011.
3. The firms should be manufacturing.
4. Necessary information for the third hypothesis contains the latest transacted price and daily P/E of the firms should be accessible.

After searching, 46 firms had the above-mentioned qualities.

Research hypotheses:

To study the relationship between P/E ratio and stock return, a hypothesis has been shaped as follows: P/E ratio is a significant explanatory variable for stock return.

P/E ratio:

Among the most important financial ratios is P/E ratio. Investors often use this ratio as an indicator of the firm value. In Tehran stock exchange, P/E ratio along with other indexes is used to evaluate securities. P/E ratio is obtained by dividing the total value of market on total income after subtracting the estimated tax of accepted firms.

In this research, this ratio has been adopted from the stock exchange software such as Rahavardnovin and Tadbirpardaz and financial reports. To have this variable, logarithm difference has been implemented:

$$dper_{i,t} = \ln\left(\frac{per_{i,t}}{per_{i,t-1}}\right) \quad (1)$$

In which $per_{i,t}$ and $per_{i,t-1}$ are P/E ratio of the day t and the days after that.

P/E ratio can be obtained from the following equation (Mo'tameni, 2006, 27):

$$R_i = \ln\left(\frac{P_i + D_i}{P_{i-1}}\right) \quad (2)$$

R_i is logarithm of stock return. P_i and P_{i-1} show the stock price at the beginning and end of the period. D_i shows the share of paid cash income for each share for each period.

According to Lakonishik and Smidh (1998) and Schatzberg and Datta (1992) and Fisher, Gosnell and Lasser (1993), not considering the share of paid cash income has no significant effect on return (Schatzberg and Datta, 1992, 203). Therefore, the above-mentioned equation can be written as follows:

$$R_i = \ln\left(\frac{P_i}{P_{i-1}}\right) \times 100 \quad (3)$$

Therefore, stock return in a period can be extracted only by stock value at the beginning and ending of the period. In this research, daily stock return of the firms, using the relation (11-3), is obtained as follows:

$$R_{di} = \ln\left(\frac{P_{i,d}}{P_{i,d-1}}\right) \times 100 \quad (4)$$

In which $P_{i,d}$ and $P_{i,d-1}$ are the latest transacted price of the firm i on the day d and the day before that.

The statistic methods of testing hypotheses:

The required statistic tests and the type of used statistic to analyze information at the significance level of 95% are inserted in the following table:

Table 1: The required statistic tests and the type of used statistic.

The type of used statistic	The type of used test
F statistic	The significance test of Regression
T statistic	Significance test of coefficients
Watson-Dourbin test	Regression inner-correlation error test
F statistic and statistic of obs*R-squared	Inner-correlation L-M
t statistic	, (ADF) Augmented Dicky-Fuller Unit Root Test and Phillips Perron (Regression variables stationary)

Findings:

Data analysis:

To test the above-mentioned hypothesis, we have the null hypothesis and its opposite hypothesis as follows:

H_0 : P/E ratio isn't a significant explanation for stock return

H_1 : P/E ratio isn't a significant explanation for stock return

This hypothesis has first been analyzed for each firm separately and then by mixed regression for all firms. To test the above-mentioned hypothesis, linear regression has been used. And the following model presented by Aga (2006) has been studied:

$$R_{it} = c + \sum_{j=0}^k DPER_{i(t-j)} + \varepsilon_t \quad (5)$$

In which R_{it} is the stock return of the firm i in time t , c is the fixed sentence, and $DPER_{it}$ is logarithm difference of P/E difference stock i in time t . k is the number of breaks, ε_t is remaining sentence. To determine the model for each firm, considered breaks for each firm are selected by statistic t . In so doing, first the regression model with the optimum break which is 25 according to the model Showartz Beizin in this research, is estimated. Then the breaks which are statistically above 5% significant is inserted in each firm's regression model. In other words, to determine the estimated breaks of each firm, step-by-step-forward method has been used. It means that the independent variable $DPER$ with optimum break is inserted in the model and the effect of independent variable with different breaks on stock return is evaluated by statistic t . Finally the variables which are important statistically are inserted into the model and their effect on stock return is evaluated.

Before testing the research hypothesis, because the research essence is time series, stationary and non-stationary tests which are R_{it} and $dper_{it}$ should be done for the test. To do so, (ADF) Augmented Dicky-Fuller Unit Root Test and Phillips Perron have been used. After estimating regression, White test is used to see whether similarity in variance and Dourbin Watson statistic and Serial Correlation LM Test are used to find inner-correlation in remaining sentences.

The results of Augmented Dickey Fuller Test:

Unit Root test which is in the form of Augmented Dickey Fuller Test can be used to test stationary of a time series. In this method statistic of ADF or calculated t of the desired variable is compared with critical values of Makinon. If the obtained t is lower than critical values, it can be concluded that the desired variable is stationary. H_0 and H_1 are as follows:

H_0 : the given variable has unit root

H_1 : the given variable has no unit root (stationary of the variable)

This test for all firms of the statistic population has been separately done. For example the results of this test have been inserted for the firm of Sarma Afarin:

Table 2: Dickey Fuller Test on the level of R_{it} of Sarma Afarin firm.

Null Hypothesis: R has a unit root				
Prob.*	t-Statistic			
0.0000	-8.018417	Augmented Dickey-Fuller test statistic		
	-3.464643		1% level	Test critical values:
	-2.876515		5% level	
	-2.574831		10% level	

Table 3: Dickey Fuller Test on the level of $DPER_{it}$ of Sarma Afarin firm.

Null Hypothesis: DCPI has a unit root				
Prob.*	t-Statistic			
0.0000	-8.341313	Augmented Dickey-Fuller test statistic		
	-3.464643		1% level	Test critical values:
	-2.876515		5% level	
	-2.574831		10% level	

The results of Augmented Dickey Fuller in other firms also indicate stationary of other variables of the research. It means that in all values statistic t of Dickey Fuller is lower than %1, %5 and %10 of critical values and this rejects non-stationary of the variable and accepts stationary of the variable and accepts H_1 . But there is the probability of series correlation in these time series, Philips Perron Test is used.

Philips Perron unit root:

This test is also used for testing stationary of a time series, when there is a probability of time series. This test has also been done for all firms of statistic population separately. For example, the results of this test for Iran Tire firm are as follows:

Table 4: Philips Perron Test on the level of R_{it} of Iran Tire firm.

Null Hypothesis: R has a unit root				
Prob.*	Adj. t-Stat			
0.0000	-8.174579	Phillips-Perron test statistic		
	-3.464643		1% level	Test critical values:
	-2.876515		5% level	
	-2.574831		10% level	

Table 5: Philips Perron Test on the level of $DPER_{it}$ of Iran Tire firm.

Null Hypothesis: DCPI has a unit root				
Prob.*	Adj. t-Stat			
0.0000	-8.428538	Phillips-Perron test statistic		
	-3.464643		1% level	Test critical values:
	-2.876515		5% level	
	-2.574831		10% level	

The results of this test in other firms indicate stationary of the research variables in levels of 0.01, 0.05 and 0.10 percent.

Table 6: Combinational Regression results.

Dependent Variable: R				
Method: Pooled Least Squares				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0028	2.991476	7.18E-05	0.000215	C
0.0000	270.9548	0.002941	0.796894	DPER
0.0000	8.791240	0.002954	0.025971	DPER(-2)
0.0006	-3.436042	0.002398	-0.008241	DPER(-4)
0.0000	-5.495454	0.002300	-0.012640	DPER(-8)
0.0000	-7.696594	0.002365	-0.018204	DPER(-12)
7.86E-05	Mean dependent var		0.636101	R-squared
0.025260	S.D. dependent var		0.635939	Adjusted R-squared
-5.529173	Akaike info criterion		0.015241	S.E. of regression
-5.525116	Schwarz criterion		10.47613	Sum squared resid
3941.684	F-statistic		124759.2	Log likelihood
0.000000	Prob(F-statistic)		1.916619	Durbin-Watson stat

The results of estimated combined regression (all firms):

Regarding the fact that the research observations have been done for 46 firms from 2001 to 2011, therefore, they contain t time series and 46 cross-sectional data. These data are grouped into combinational data which contains time series data and cross-sectional data. To estimate regression model, combinational regression is used for combinational data. After classifying required data in the software reviews by the use of combinational

regression procedure and observing the classic conditions of regression and removing inner-correlation of variables, the estimated model is as follows:

As seen, determination coefficient is 33% which shows high explanation ability of variables. Estimated data meets theoretical considerations, and all coefficients are significant at the level of 95%. These results show that P/E ratio can be used for explaining stock return, and this variable describes stock return changes.

Conclusion and discussion:

The regression results show that for each of the stocks of the studied firms, the P/E ratio is a significant variable for the variable stock return. Determination coefficient is high for most of the firms, for all firms, except 3 firms, P/E ratio coefficients are significant. These results show that at the time of stock return modeling P/E ratio is an explanatory variable, and this variable has the power of stock explanation. Therefore, the research hypothesis is accepted. These results are in line with Karan (1996), Rahimi (1995), and Westerfield (1984) which show a positive and significant relationship between stock return and P/E ratio. However the results of the current study do not support Hormozi (2001) which showed that there is no relationship between stock return and P/E ratio.

Nowadays, majority of financial analysts view P/E ratio as a determiner of value. In fact, they compare stock price with P/E ratio by this method, and predict the next period price. P/E ratio is also used as a constant way of evaluation stock. As long as the firm is active, its true value is a function of income. P/E ratio takes into consideration income after tax and stock exchange market and relates each share price to the activity of that share in the market.

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