The Investigation of Price-Earnings Ratio (P/E) and Return on Stock: The Case of Tehran Stock Exchange

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Abstract

As every investor in the selection of his investment project considers two important factors, return and risk of stock and as one of the comparison indicators of stock risk of different companies is price-earnings ratio, the current study focused on two factors of return on stock and price-earnings ratio and investigated the relationship between these two variables. In this study, the price-earnings ratio and stock return were analyzed by the data of this ratio and the latest daily trading price of the companies that in the calculation of stock return is used in April of 2001 to March of 2008 for 46 companies the member of sample population. By econometric tests, the validity conditions of satisfaction of regression equation in the mentioned companies were analyzed. The results of the regression indicate a positive and significant relationship between stock return and price-earnings ratio; it means that this ratio is a significant variable to explain the stock return.

Keywords: Price-earnings ratio, stock return, investment, the latest trade price.

Introduction

Stock performance has always been an interest for investors or any individuals involved directly or indirectly with market activity and performance. Hence, studies of market behavior, price movement and returns is always sensitive to the fundamental changed and, therefore can have an effect on their wealth. Furthermore, because of its dynamics in nature, stock performance has drawn the attention of economists, both for theoretical and empirical reasons since it influences the country's growth and development in long term period as well as a mirror of the country's economic current activities in short term period.(W., Mansor,W, Mahmood, F., Syuhada. A. Fatah, 2009)

The prosperity of the economy of every country is dependent upon a good planning and investment. Correct guidance of monetary flows and money to manufacturing works will result into economical growth, increasing per capita income and public welfare. Investment requires financing and two important groups responsible for investment financing are creditors and investors. The first group believes that the financial condition of companies receiving credit in on time payment of the debts is of great importance and this power is revealed by the profitability of the company. But the investors believe that the issue is more complex because in this process, the risk is more and they are looking for higher returns.

Price-earnings ratio (P/E) of each stock can be an effective factor in decision making of the investor but its analysis is different by different people. Some participants in the market are sensitive to the fluctuation of P/E ratio and try to find a suitable ratio. Normally, speculators when P/E ratio has decreasing trend, purchase the stock, because they believe that this

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reduction is temporary and it will be increased in future. But this view to P/E ratio is not common and depends upon the existing conditions of the company. When the investors have some expectations to a company, purchase stock and due to high demand, the price of stock of the company will be increased and as a result, P/E ratio will be increased. In a condition that P/E ratio is at top level, the investors expect the increase in earnings in future or operation of development plans of the company and after fulfillment of the earning and statement of positive report of the earnings, P/E ratio will be decreased.

Indeed, one of most important figures for investors that can be analyzed and guide them in their decision making is P/E ratio of the companies. As P/E ratio is achieved by dividing market price by annual earnings of the company, thus the investor can calculated that when his earnings of the stock will depreciate his investment. The fluctuation of P/E ratio can be analyzed by the investors and according to the results; the investor can do his investment at the best time to achieve a good return. Thus, the clear relationship of P/E ratio with return on stock can be a good solution for investors for the future planning of the companies. Thus, the current study investigates the relationship between P/E ratio and return on stock in Tehran Stock Exchange (TSE) to clarify the information for decision making.

P/E ratio in addition to be a scale for the evaluation of the companies is used as a tool to compare the performances of capital markets of the countries but in application of this index between the countries and its analysis, the main differences regarding the private structure, inflation rate, interest rate and profitability of the companies and other macro and micro factors should be considered. In Tehran Stock Exchange, P/E ratio is used as an index beside other methods to evaluate securities. The basis of calculation of P/E ratio in TSE is achieved of dividing the total value of the market by the sum of profit after deduction of tax of the companies in TSE list. The main objective of this research is answering the question that whether P/E ratio can explains stock return. And how much is its explaining power? Indeed, the investigation of the relationship between P/E ratio and stock return can help the investors for the future planning of the companies and the stockholders in achieving more income.

Review of Literature

Compared to the capitalization rate of real estate,little is known about the forecasts of price-to-earnings ratios (P/E) of real estate stocks. This is because capitalization rates of real estate are fun-damentally different from real estate stock's P/ E ratios. Real estate rents are determined in space market whereas earnings reflect the performance of a company(Raymond Y.C.Tse. 2002).

Since the early 70's, numerous studies on the stock market have been conducted, with most focusing based on stock returns because it is important to both investors and business organizations to know what influences their investment returns and company stock value. Among the factors that being considered greatly by the researchers are dividend price ratio [see Campbell and Shiller (1988, 1998), Lo and McKindley (1988), Poterba and Summers (1988)]; price earning (P/E) ratio [see Basu (1975) and Lamont (1998)]; dividend yield [see Fama and French (1988), Goetzmann and Jorian (1993), Hodrick (1992) and Khothari and Shanken (1992)]; and exchange rates [see Ma and Kao (1990), Ajayi and Mougoue (1996), and Nieh and Lee (2001).

Although many previous empirical studies have investigated the relationship between stock returns and fundamental ratios such as price-earnings ratio (P/E) ratio, dividend yield and book-to-market ratio, the results are ambiguous. Basu (1983) and Banz and Rolf (1981), among others, find evidence that stock returns are positively affected by their fundamental values. On the other hand, studies by Fama and French (1992, 1988), and Basu (1975) give contradictory results. They find that stock returns are negatively affected by their

fundamental values. In general, all these results show that a consensus on the role of fundamental ratios in the process of determining stock returns so far does not exist.

The article presented by James D.Mc Williams in 1966 was the first research regarding the P/E ratio. In this paper, Mc Williams "evaluates the usefulness of the price -earnings ratio as an analytical tool. Based upon a sample of 390 stocks over the period from 1953 through1964, the study shows that better investment performance can be obtained from a portfolio comprised of low price-earnings ratio stocks as contrasted to portfolios made up of high price-earnings ratio stocks (Mc Williams,1966). In the next stage, he selected 100 stocks with the highest return and ordered them based on P/E ratio and found that common stock with the highest return in each row was with low P/E ratio. Then he selected 100 stocks with the lowest return and ordered them based on P/E ratio and found that the loss of investment in portfolios made up of high price-earnings ratio is higher than a portfolio comprised of low price-earnings ratio (emadzadeh., zarehi , N.,& torvesian,1999).

Francis Nicholson published the results of his researches in 1968. Nicholson believed that analysis of securities could include earning, earning vision and growth rate of earning but the importance of P/E ratio and its relation with return on investment requires relation with real figures such as assets, sale and depreciation. In other words, Nicholson showed that the value of securities considerably is dependent upon some factors as earnings, earnings vision and earnings growth rate but real items such as assets, sale and depreciation affect the formation of price and return on investment (Nicholson,1968). The results of the research are: 1. portfolio comprised of low price-earnings ratio had increasing price percentage.2. Portfolio comprised of low price-depreciation ratio had increasing price percentage. 3. Portfolio comprised of low price-sale ratio had increasing price percentage.4. Portfolio comprised of low price-book value ratio had increasing price percentage (Rahimi,1995).

Basu (1977) was the first one who investigated the empirical relationship of investment performance of common stocks in and their price-earnings ratios. For any given period under consideration, two or more portfolios consisting of securities with similar P/E ratios were formed. The risk-return relationships of these portfolios were compared and their performance was evaluated in terms of pre-specified measures (Basu,1977). In this research by comparing the lowest P/E ratio portfolio with high P/E ratio portfolio returns on risk-adjusted basis, it was shown that low P/E ratio portfolio averagely had superior returns compared to high P/E ratio portfolio. The researches of Basu rejected the semi- strong form of efficient market (Hormozi,2001).

Another research is related to William Beaver and Dale Mors studies in 1978 that by classification of common stock and creating different portfolios, investigated the behavior of P/E ratio and justification of earnings growth and risk. The growth and earnings were measured as annual changes of earnings and risk as sensitivity of stock return to market return (William Beaver and Dale Mors,1978). Considering the 3-variable regression (P/E ratio as dependent variable and risk and the growth of the profit of independent variables of the model), they found that (R2=50%) Fifty percent of the changes of P/E ratio are determined by risk and earnings growth (Hesadi, 1998).

The research carried out by Jef, Kim and Westerfild (1975) supported the results of Beaver and Mors and it showed that the effect of P/E ratio is not observed in January that some researchers mentioned. Andro Alford[1] in1992 carried out a research in1992 on the effect of companies classification based on industry, risk and earnings growth on the validity of valuation of the company by P/E ratio. The results of the paper showed that most of the temporary differences in P/E ratio are explained by risk, earnings growth and industry. He

[1]-Alford is President and Chief Executive Officer of Nestlé Brands Company. In 1992, Brad was appointed President of the L.J. Minor Corporation, a leading

found that industry can be a good substitute for risk components and earnings growth of P/E ratio (Aga, 2006). Harry Ramchern in 2002 investigated the important factors of P/E ratio in new capital markets and two factors of economic growth and credit risk as important factors of P/E ratio. And annual data of 1992-1999 of capital market (stock) of new countries and regression technique was used.21 selected markets were relate to Latin American companies, Asia, Europe and Africa that used important financial modifications to the early 1990s. The results of Ramchern supported the growth as important factors of P/E ratio difference in new markets (emadzadeh., zarehi , N.,& torvesian,1999).

Ali Rahimi (1995) in the study of "the investigation of the relationship between common stock and P/E ratio of the companies listed in TSE" found that we can not reject the relationship between P/E ratio and stock return. In this research, only one hypothesis was studied to define the validity. This hypothesis is "stock with low P/E ratio during 1990-1994 obtained superior returns than stock with high P/E ratio. The results of his research indicated that we can not reject the relationship between P/E ratio and stock return.

Price-Earnings Ratio (P/E) Effect

Studies have shown that the price earnings ratio of a firm has predicting power over the next period's returns. Basu (1977) tested the claim that low P/E ratio firms tend to outperform those with a high P/E ratio. His research included over 1400 industrial firms that were traded on the NYSE between September 1956 and August 1971. He computed the P/E ratio for each stock by taking the market capitalisation as the numerator, and the denominator was the reported annual earning before extraordinary items. He formed portfolios of low and high P/E ratios and observed their performance. During the 25 years, the portfolios with low P/E ratios earned higher returns than the high P/E securities. After adjusting for risk, results did not change. Basu further interprets the results as not an upfront failure of the efficient market hypothesis. Rather, he explains that P/E ratio information was not fully reflected in security prices in as rapid a manner as demanded by the semi-efficient form of EMH. These lags and frictions are part of market mechanisms. Indeed the P/E anomaly did exist in the period studied, however, transaction costs and taxes greatly hindered investors from yielding abnormal profits. Explanations to this anomaly highlight the exaggerated expectations of investors.

Research Methodology

Research method: This research is applied in terms of purpose. Considering the data collection, this research is considered descriptive in which to test the relationship between the variables and significance of the estimated models, regression analysis was used. The research methodology is of expost facto (using the previous data). The information of P/E ratio and the return of the companies were obtained of daily, weekly and monthly reports of stock exchange journals and Tadbirpardaz software information and Sahra databasis, Dena sahm and Pars Portfolio.

Population and sampling: To restrict the empirical analysis of the available observations, we selected some criteria. Of total population of the companies listed in Tehran Stock Exchange (TSE), some of the companies were selected for statistical analysis and they have the following research methodology:

1.The end of fiscal year of the companies should be March 29.

2.The companies in the period of 2001-2008 were active continually in the stock exchange.

3.The companies are manufacturing.

4.The required information for third hypothesis is including the last traded price and daily P/E ratio of the companies. After the required investigations, 46 companies had the following conditions.

Research hypothesis: To investigate the relationship between stock return and P/E ratio, the following hypothesis was formed as: P/E ratio is a significant explanatory variable for stock return.

Price- Earnings ratio (P/E): The most important financial ratios are P/E per share. The investors mostly used P/E ratio as a tool to show the value of a company. In TSE, P/E ratio is used as an index beside other methods to evaluate securities. The calculation basis of P/E ratio in TSE is obtained by division of market total value by the total profit after deduction of estimated tax of the listed companies.
In this research, this ratio has used security stock software such as Rahavard Novin and Tadbirpardaz and the financial reports of the companies and to consider this variable, logarithm difference of this variable is used:

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

Where, $per_{i,t}$ and $per_{i,t-1}$ are P/E ratio of day t and the day before. To calculate, the return of a share is calculated in a financial period. (Moetameni, 2006).

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

R_t is the logarithm of stock return. P_i and P_{i-1} indicate the stock price at the end and beginning of the period. Di denotes the cash profit paid for each share during a period. According to Lakonishik and Smidth (1988), Schatzberg and Datta (1992) and Fisher,Gosnell and Lasser (1993) not considering the cash profit not paid for stock, doesn't have significant influence on return (Schatzberg and Datta 1992). Thus, the above equation is written as:

$$R_t = Log_e^{\left(\frac{P_t}{Pt\text{-}1}\right)} = \ln\cdot\left(\frac{P_t}{P_{t\text{-}1}}\right)\times 100 \qquad (3)$$

Thus, stock return in a period is only extracted by stock value at the beginning and end of the period. In this research, the daily stock return of the companies is calculated by equation (3-11) as follows:

$$Rt = Log_e^{\left(\frac{P_{i,d}}{Pi,d\text{-}1}\right)} = \ln\cdot\left(\frac{P_{i,d}}{Pi,\,d\text{ - }1}\right)\times 100 \qquad (4)$$

Where $P_{i,d}$ and $P_{i,d-1}$ are the latest trading price of company i in day d and the day before.

Statistical techniques: The required statistical test and the type of statistics for data analysis at confidence level 95% are shown in the following table:

Table 1: The required statistical test and the type of applied statistics

The type of applied test	The type of statistics
Significance test of regression equation	F-statistics
Significance test of the ratios	t-statistics
Auto-correlation test of regression error	Durbin-Watson statistics
Auto correlation test of LM	F statistics and obs*R-squared statistics
Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests (stationary regression variables)	T statistics

Empirical Result

Data analysis: To test the above hypothesis, null hypothesis or neutral are defined as:

- H0: P/E ratio is not a significant explanatory variable for stock return.
- H1: P/E ratio is a significant explanatory variable for stock return.

This hypothesis was first separately calculated for each company and then by combination regression technique, it was calculated for all the companies. To test the above hypothesis, linear regression technique was used and the following model presented by Mehmet Aga (2006), was studied:

$$R_t = C + {}_0\sum_{j=0}^{K} DPER_{i(T-J)} + \varepsilon_t \quad (5)$$

Where, R_{it} is stock return of company i at time t, c is fixed, DPERi**t** is logarithm difference of P/E ratio of stock i at time t and k the number of pauses and ε_t is residual. During the determination of the model for each company, the pauses for regression model of each company are selected by t-statistics, thus at first regression model with the maximum pause in this research considering schwarz bayesian criterion, is 25 in this study is estimated, then the pauses that are significant statistically at 5%, are shown in regression model of each company. In other words, to determine the considered pauses of each company in regression equations, step by step method is used, it means that the independent variable DPER entered the model with maximum pause and the effect of independent variable with different pauses on return via t statistics is evaluated. Finally, the variables that were important statistically entered the model and their effect was evaluated on stock return. Before testing the research hypothesis, as the research nature is of time series and obtained of time series data, stationary and non-stationary test for research variables $dper_{it}$ and R_{it} should be done. To do this, Augmented Dicky-Fuller Unit Root Test and Phillips Perron were used. After the estimation of regression equation, white test was used for consistency and inconsistency of variance and Durbin- Watson statistics and Serial Correlation LM Test was used to define auto-correlation between residuals.

Statistical Description of Data: The stock indices used in this study are Kuala Lumpur Composite Index (KLCI), a proxy for **Tehran** stock market indices employing end of the month closing prices for the period April of 2001 to March of 2008,along with the corresponding dividend yields and price earning ratios gathered from the DataStream. The KLCI are transformed to monthly rates of return. The descriptive statistics for raw data for all the variables appear in Table 2.

Table 2 Descriptive statistics of raw data of stock index, dividend price ratios and price earning ratio

Variables	Stock Index	Div. Yield	P/E Ratio
Mean	4.21455	1.450035	28.411365
Std. Dev	1.84244	1.754144	236.23325
Minimum	7.151211	0.0315141	0.012544
Maximum	3.414	2.044114	7.215144

The standard deviation of price-earning ratios is larger that the stock index and dividend yields. This shows that raw data of P/E ratios have very large range and thus more volatile behavior that the other two variables.

The results of Augmented Dicky-Fuller Unit Root Test on the variables level: Unit root test as Augmented Dicky-Fuller is used for stationary test of time series. In this method, ADF statistics or the calculated t of the required variable is compared with Mackinnon critical

values. If the obtained t is less than the critical values, the variable is stationary. H_0 and H_1 hypotheses about this test are as:

- **H_0:** The variable has a unit root
- **H_1:** The variable has not a unit root (stationary nature of the variable).

This test was done for all the companies' member of sample population separately. For example, the results of this test for Sarma Afarin are shown as:

Table 3: The results of Dicky-Fuller test on variable R_{it} of Sarma Afarin Company

Null Hypothesis: Unit root (individual unit root process)			
Date: 08/18/12 Time: 11:30 Sample: 2001- 2008 Series: V_1, V_2, V_3 Exogenous variables: Individual effects Newey-West bandwidth selection using Bartlett kernel Total (balanced) observations: 21 Cross-sections included: 3			
Method	**t- Statistic**	**Prob.****	
PP - Fisher Chi-square	**-7.2615110**	**0.00000**	
PP - Choi Z-stat	**-4.034114**	**0.00001**	
**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.			
Intermediate Phillips-Perron test results UNTITLED			
Obs	**Bandwidth**	**Prob.**	**Series**
9	**8**	**0.00001014**	**V_1**
7	**3**	**0.00000018**	**V_2**
9	**5**	**0.0000016**	**V_3**

Table 4: The results of Dicky-Fuller test on variable $DPER_{it}$ of Sarma Afarin Company

Null Hypothesis: Unit root (individual unit root process)			
Date: 08/18/12 Time: 11:30 Sample: 2001- 2008 Series: V_1, V_2, V_3 Exogenous variables: Individual effects Newey-West bandwidth selection using Bartlett kernel Total (balanced) observations: 21 Cross-sections included: 3			
Method	**t- Statistic**	**Prob.****	
PP - Fisher Chi-square	**-7.146051**	**0.00000**	
PP - Choi Z-stat	**-4.034114**	**0.00001**	
**Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.			
Intermediate Phillips-Perron test results UNTITLED			
Obs	**Bandwidth**	**Prob.**	**Series**
9	**8**	**0.00001014**	**V_1**
7	**3**	**0.00000018**	**V_2**
9	**5**	**0.0000016**	**V_3**

The results of Augmented Dicky-Fuller test in the rest of the companies indicated that research variables are stationary, it means that in all the cases, absolute value of t- statistic of Dicky-Fuller was smaller than absolute value of 1%,5% and 10% of critical value and it shows the rejection of non-stationary hypothesis of the variable and supporting its stationary nature and support of H_1 hypothesis. But due to the fact that serial correlation test are possible in these time series, we use Phillips Perron test.

Phillips Perron unit root test: This test is used to determine the stationary of a time series when serial correlation in time series is possible, it can be used. This test was done for all the companies' member of sample population. For example, the results of this test for Iran Tyre Company are as follows:

Table 5: The results of Phillips Perron test on variable R_{it} of Iran Tyre Company

Null Hypothesis: Unit root (individual unit root process): R has a unit root		
Prob*	**Adj.t-stat**	**Phillips- perron test statics**

0.0000	-9-25412320		
0.0000	-4.12153204	1% level	Test critical values
0.0000	-3.15442125	5% level	
0.0000	-3.5122085	10% level	

Table 6: The results of Phillips Perron test on variable $DPER_{it}$ of Iran Tyre Company

Null Hypothesis: Unit root (individual unit root process): R has a unit root			
Prob*	**Adj.t-stat**	**Phillips- perron test statics**	
0.0000	-9.4850088		
0.0000	-4.12153204	1% level	Test critical values
0.0000	-3.15442125	5% level	
0.0000	-3.5122085	10% level	

The results of this test in the rest of companies indicated that all the research variables were stationary at 1, 5, and 10%.

The results of combination regression estimation (all the companies): As the research observations were done during 2001-2008 for 46 companies, the data are including t time series and 46 cross section data. These data are classified as panel data consisting of time series data and cross section observations. To estimate regression model, for pooled observations, pooled regression technique was sued. After the classification of the required data in reviews software, by pooled regression technique and observing classic assumptions of regression and auto-correlation of the variables, the estimated model was achieved as:

Table 7: The results of pooled regression

White Heteroskedasticity Test:				
F-statistic	1.822599	Probability		0.230571
Obs*R-squared	3.424265	Probability		0.180481
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 07/31/12 Time: 17:59				
Sample: 2001- 2008				
Included observations: 10				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0.0288584	3.225840	1.928729	0.0000
Dper(1)	-0.015545	0.003241	-1.90234	0.0000
Dper(-2)	0.018841	0.1540-07	1.894882	0.0000
Dper(-4)	0.0158054	0.1258	-4.015505	0.0000
Dper(-8)	-0.0154220	-0.056556	-7.11555	0.0000
R-squared	0.342426	Mean dependent var		0.076542
Adjusted R-squared	0.7401101	S.D. dependent var		0.082253
S.E. of regression	0.075631	Akaike info criterion		-2.08259
Sum squared resid	0.04004	Schwarz criterion		-1.99181
Log likelihood	13.41293	F-statistic		1.822599
Durbin-Watson stat	2.401957	Prob(F-statistic)		0.230571

As it is shown, the coefficient of determination is 0.7401101% that indicated the high explanatory power of independent variables. The estimated signs are theoretical and all the coefficients are significant at 95%. These results show that P/E ratio can be used to explain stock return and this variable describes the changes of stock return.

Discussion and Conclusion

The results of regression show that for each of the stocks of the studied companies, P/E ratio is a significant variable for stock return. The coefficient of determination for most of the companies was high and except for 3 companies, the rest of them, had significant P/E ratio. These results show that during modeling stock return, P/E ratio can be used as an explanatory variable and this variable can describe the stock return. Thus, the research hypothesis is

accepted. These results are in line with the results of Karan (1996), Rahimi (1995), Jef, Kim and Westerfild (1989) researches and there was a positive and significant between stock return and P/E ratio. But it is not in line with the results of Hormozi research (2001) in which there is no significant relation between two variables of stock return and P/E ratio. Today, most of the financial analysts introduce P/E ratio as an important factors of determining the value. Indeed, they evaluate the stock price by this method with P/E ratio of other companies and predict the expected price of the next period. P/E ratio is used as a continuous method of evaluation of stock. Thus, when the company is active, its real value is dependent upon profit. P/E ratio considers tax and stock market price and relates the earnings per share to the activity of that share in the market.

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