THE CORRELATION BETWEEN FIRM SIZE AND STOCK RETURN OF THE COMPANIES IN THE INDEX OF 50 MOST ACTIVE FIRMS LISTED ON TEHRAN STOCK EXCHANGE

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ABSTRACT

This research aims to study the correlation between risk variables on stock return of the companies in the index of the most active firms listed on Tehran Stock Exchange. For this purpose, the correlation between firm size and stock return of the companies in the index of the most active firms listed on Tehran Stock Exchange for the period from 2001 to 2011 has been studied. To take a sample, the index of 50 most active companies has been used. Thereafter, the regression model has been applied to estimate the correlation of the firm size with the stock return of the companies in the said index.

The results show that there is a positive and significant (weak) relation between firm size and stock return when fluctuations in the index are not considered. When the return on the index is inserted in the model, this relation remains positive and significant. Moreover, this research shows that the return on the index of 50 most active companies has not effect on the firm size and fluctuations in stock returns (β).

***Keywords**:* Risk, Stock Return (β), Different Economic Conditions, Index of 50 Most Active Companies, Firm Size

***JEL Classification*:** G1, G11, G14, G32.

RESEARCH PROBLEM

The most important concept in making decisions on investment is the issues of risk and return. Any share or portfolio of shares purchased, maintained, and sold within a specified period brings the owner a specific amount of returns including change in price and profits arising out of ownership (Rai and Saidi, 2004). On the other hand, return of stock varies in different periods, and has not fixed and monotonic trend. Therefore, fluctuations and

changeability are integral parts of stock return during time. Changeability and fluctuation of the returns of the future times of stocks causes investment to face risk. Thus, investors try to reduce risk and increase to ensure return (Rai, 1998).

In the recent years, the progress in scientific researches changed the concept of risk. In the early 1900s, analysts focused on balance sheets to evaluate the risks of securities. That means the amount of loans and debts of a firm were decisive in estimating the risk in corporate stocks. In 1950, Harry Markowitz developed the essential portfolio model, which paved the way for the introduction of modern portfolio theory (Tehrani and Nourbakhsh, 2003). In this model, Markowitz used variance (or standard deviation) as a risk criterion. That means investment may face more risk if the return on investment changes more (Mortazavinia, 2006).

In 1961, William Sharpe introduced the one-factor model by determining beta (β) sensitivity coefficient as a risk indicator. This model states that, all securities are affected by the general market fluctuations, since similar economic forces affect the future of most companies. These factors include business cycles, inflation, war, recession, technology, and changes of money supply.

All these factors affect most of the companies. That means stock return is correlated with market changes, and the best scale for expressing such correlation is achieved by estimating the relation between stock return and market index of stock return.

Capital asset pricing model (CAPM) is the most well known one-factor model developed based on β coefficient and used as an index for the assessment of risk. This model was developed almost simultaneously but independently by Sharpe (1964), Lintner (1965), and Mossin (1966) (Mortazavinia, 2006). Although the primary empirical tests of CAPM confirmed its axial forecast stating that, there is a linear positive relation between systematic risk (β) and stock return (e.g. Jensen *et al* 1972; Fama & Macbeth, 1973), the results of the later studies showed that there are other factors in addition to systematic risk that affect the mean stock return (Bagherzadeh, 2005).

In 1992, Fama and French showed that other variables including firm size and the ratio of book value to market value are better than systematic risk index (β) in explaining stock returns variation (Fama & French, 1992).

At the same time, other issues on the relation between β and stock return were introduced. Francis and Fabozzi (1977) developed dual-β model, in which different betas were introduced for bull and bear markets. The results showed that dual-β model could explain stock returns variation better than fixed β model did. However, the results of the research conducted by Pettengill, Sundaram, and Mathur showed that the use of one β for both bull and bear markets was a better method to study the relation between return and β (Pettengill, Sundaram, & Mathur, 1995).

On the other hand, it seems that economic conditions affect capital market and expectations of stockholders and investors from the economic perspective of their country, and they form a part of the investors' behavior in the market. In other words, some risks threatening corporations and stockholders depend on their economic environment affecting the transaction of ordinary shares.

The present research aims to study the relation between fluctuations in returns and firm size under different conditions of market (bull and bear markets) using the data of Tehran Stock Exchange.

REVIEW OF LITERATURE

Boyd *et al* (2001) found that macroeconomic news have separately time-varying effects on the returns of companies. The results of their study showed that the declaration of severe unemployment increases stock price during economic upturn, and in contrast, such news declines stock value during recession (Namazi & Mohammadtabar, 2007).

Pettengill, Sundaram, and Mathur (2002) compared the relation of dual betas with return and that of fixed β and return in market segmentation approach. In general, the results of their research showed that market segmentation approach was a sufficient condition to find a significant relation between return and risk (Perez-Quiros & Timmermann, 2000). Ho *et al* (2005) tested a modified version of Pettengill *et al'* model (2002) and found that when market is segmented into up and down markets, the most important systematic (negative) positive relation exists between realized return and β in up (down) markets (Cenesizoglu, 2006).

Cenesizoglu (2006) studied the asymmetries in the reaction of portfolio return with different specifications (in CRSP) to similar macroeconomic news. The results showed that the return on the portfolio of large companies in the process of growth reacted to economic news more strongly than smaller companies did (Wittink, Dick. R., 2005).

Perez-Quiros and Timmermann (2000) studied the relation between firm size and the fluctuations in stock returns under different economic conditions. The results showed that the fluctuations in stock returns were intensified during economic recessions. They also showed that there was a close relation between firm size and fluctuations in returns. Moreover, the fluctuations in the returns of small companies are affected by recessions more significantly (Fama & French, 1992).

Zeng *et al* (2008) used the model introduced by Perez-Quiros & Timmermann (2002) and found that additional returns expected from the stocks of exchange companies during recession, are affected significantly; however, the expected additional returns of the companies in the process of growth are not affected.

In Iran, several studies have been conducted on the systematic risk index (β), firm size, and the relation between these two variables under different market conditions. In the following, some of these studies have been introduced.

Bagherzadeh (2003) studied in his PhD thesis the factors affecting the return expected from the stocks of the companies listed on Tehran Stock Exchange. The results of this thesis show that there is a positive relation between the firm size and stock returns of the companies listed on Tehran Stock Exchange (Bagherzadeh, 2005).

Mosaddegh (2006) studied the relation of risk and size with return under different market conditions of the companies listed on Tehran Stock Exchange. The results showed that the variable *size* could be used under up market conditions to explain the changes in return. That means large companies have higher returns; but in down markets, the variable *risk index* (β),

which is in inverse relation with the return, can merely be used to explain the changes in return.

Namazi and Mohammad Tabar Kasgari (2007) studied the effects of some economic variables (including monetary growth, gold coin price, exchange rate of dollar, and Tehran Stock Exchange price index) on the stock returns of the companies listed on Tehran Stock Exchange. The results of this study showed that no studied variable could explain the changes in stock returns.

Although the variable *size* is considered as a control variable like other variables such as book-to-market factor or leverage) in some models, this does not cause to the decline of the importance of this effective variable in research fields. In this study like the previous studies conducted by Perez-Quiros & Timmermann (2000) and Bagherzadeh, 2003, the relation between firm size as an independent variable and the fluctuations in stock returns (β) has been studied. However, the period studied in the previous researches was of very old times. To tackle this problem, we selected a vast and different period of ten years up to Mar. 19, 2012. Moreover, the variables of this research are not identical to those of the previous researches.

RESEARCH QUESTIONS

The following questions have been developed as regards the subject matter of this research:

1. Is there a significant relation between the size and stock returns of a company?
2. Do the special conditions of the index of 50 most active companies listed on Tehran Stock Exchange have significant effects on this relation?

In other words, the main purpose of this research is to find an answer to the question that, if the size of companies affects the return on their stocks; and if the conditions of market have effects on the intensity of this relation.

RESEARCH HYPOTHESES

To answer the questions of this research, the following hypotheses have been developed based on the theoretical framework.

1. There is a significant relation between the size and stock returns of the companies in the index of 50 most active firms listed on Tehran Stock Exchange.

There is no significant difference between the relations of firm size and stock returns of the companies in the index of 50 most active firms listed on Tehran Stock Exchange in bull and bear markets.

Operational Definitions of the Variables

Stock Return Volatility

Stock return volatility means the achievement of real return different from the expectations. This volatility is also known as investment risk (Rai, and Talangi, 2004). To assess such a risk, there are different criteria including standard deviation, β coefficient, financial leverage, etc. In these researches, stock return volatility has been assessed by systematic risk index (β).

Firm Size

To calculate the variable size, the criteria such as logarithm of total assets or sales are applied. However, due to the inflation conditions and irrelevance of assets value during the course of time, the market value of shares at the end of fiscal period has been used as a basis to determine the value of the company, and finally its logarithm is used to delete measurement scale as the variable firm size (Namazi & Khajavi, 2004).

Index of 50 Most Active Companies listed on Tehran Stock Exchange

Tehran Stock Exchange has been subject to many changes during its activity years, in such a way that different periods can be observed in the course of its activities. The volume of the transactions of the companies listed on Tehran Stock Exchange, current value of shares, and above all stock market index reflecting conditions of the stock exchange are the proofs of the different stages of the stock exchange activities (Poushai, 1997).

Once three months, 50 active companies listed on the stock exchange are introduced as the index of 50 most active firms. This index is calculated based on Dow Jones Index. In this calculation, the number of the shares issued by the company is not applied, and only the sum of the stock price of 50 companies is divided by the number of the shares to find out the value of the index. This number has been equal to 50 at the first time of calculation, i.e. Mar. 20, 2000, and it was adjusted gradually.

This index must be adjusted in the following cases:

- In case of increase in capital for whatsoever reason (whether in form of contribution or reserve).
- Adding or removing the companies from the list of 50 most active companies at the end of each three months.

RESEARCH METHOD

This research, which is of applied type, uses correlation method. Correlation researches include all studies, in which the relation between different variables is determined using correlation coefficient (Bagherzadeh, 2005). To test the hypotheses of this research, regression model has been applied, and the results are analyzed using Eviews software and panel data.

To test the hypotheses, it is required the dependent variables to be normal, and the variance and autocorrelation be identical, otherwise the results are not reliable and this lead to false conclusions.

The statistical population of this research includes the companies of the index of 50 most active firms listed on Tehran Stock Exchange for the period from 2001 to 2011. After ensuring regression assumptions, the hypotheses of the research were tested. Before estimation of coefficients, significance test of the models were carried out.

To test the first hypothesis, simple linear regression model set forth in the following has been used:

$$Y = C + \beta_i X_i \quad (1)$$

Where, Y as the dependent variable is the coefficient of β, and X_I as the independent variable is the firm size.

To test the significance of regression mode, the following statistical hypotheses are provided:

H_0 = the model is not significant

H_1 = the model is significant

Considering the value of F for the model, and t-statistic calculated for both coefficients acceptable in terms of H_1, it is concluded that the model and its coefficients are of significance at the confidence level of 95%.

Table 1. The Results of the Significance Test of Regression Model for the 1st Hypothesis

Variable	Coefficients	Statistical Error	T-Statistic	Probability
C	- 0.822	0.345	- 2.383	0.018
X	0.073	0.018	4.113	0.000
Coefficient of Determination	0.029	Adjusted coefficient of determination		0.027
F-Statistic	16.918	Durbin – Watson Statistic		0.639
(F- Probability) statistic		0.0000		

Source: Findings of the Researcher

The calculated coefficient of determination (r_2) of this hypothesis equal to 2.9 % is not of significance. That means 2.9 percent of the changes in the dependent variable (β) is explained by firm size, and 97.1 percent of the changes depend on other factors, which are not studied in this research.

As shown in the table 1, Durbin – Watson static equal to 0.639 shows a positive autocorrelation in the data of the first hypothesis. To remove such an autocorrelation, auto-regressive models are used. Where, the value of Y at the time t depends on its value at the previous periods. Therefore, the relation between the variables can be formulated as follows:

$$(2)\ Y_t = C + \beta 1\ X_i + \alpha Y_{t-1}$$

Where, Y_t is the value of β at the time t; and Y_t -1 is the beat of the previous periods (t -1).

Table 2. The Results of the Significance Test of the Auto-regressive Model of the 1st Hypothesis

Variable	Coefficients	Statistical Error	T-Statistic	Probability
C	1-011	0.589	- 1.716	0.087
X	0.076	0.030	2.588	0.011
AR(1)	0.676	0.031	21.486	0.000
Coefficient of Determination	0.479	Adjusted coefficient of determination		0.477
F-Statistic	242.865	Durbin – Watson Statistic		2.179
(F- Probability) statistic		0.0000		

Source: Findings of the Researcher

Considering the confidence level of 95 percent and F statistic equal to 242,865 acceptable by H_1, it can be concluded that the model is of significance (table 2).

Moreover, the values of the t-statistic calculated for the coefficients of the variable X and AR (1), which are greater than $\pm$ 1.96, shows that these coefficients are significant at the confidence level of 95%. However, the fixed coefficient *C* is not significant at the confidence level of 95%, therefore it is not inserted in the model.

The coefficient of determination in this model is equal to 0.479. However, this does not mean that 47.9 percent of the changes in β is explained by firm size, since Y_{t-1} (the β of the previous periods) are added to the equation.

Therefore, the model of the first hypothesis can be formulated in form of the equation 3 using auto-regressive model:

$$Y_t = -0/011 + 0/076\ X_i + [AR(1) = 0/676] \quad (3)$$

The above model shows a positive relation between the changes in β and firm size, and that means if firm size increases by 1 unit, β is changed by at least 0.076.

In conclusion, the results of the first hypothesis show that there is a positive and significant relation between firm size and fluctuations in stock returns assessed by β. That means any increase in firm size increases β too.

Before testing the second hypothesis, at first we determine the conditions of bull and bear market in the studied years using the collected data. Considering the data extracted from Tehran Stock Exchange, the changes in the total index of price and volume of transactions (in Rials, and number) have been positive, and therefore, it can be concluded that we had bull market during the studied years. Only in the year 2005, these changes had been negative, and we faced recession in the same year. As the changes in the determined criteria have not been the same in 2001 and 2006, bull and bear markets have been chosen alternately.

Effects of Firm Size on Beta in both Bull and Bear Markets

To study the effects of size in bull and bear market conditions, dummy variable is used. The general model developed by this variable is as follows:

$$Beta = \beta_0 + \beta_1 Size_{it} + \beta_2 D_1 + \beta_3 D_1 \times size + \varepsilon_{it} \quad (4)$$

If the product of multiplication of dummy variable by firm size is significant, the relation between firm size and β is different in two conditions of bull and bear markets, as the model for the case of recession D1=0 and upturn D1=1 are formulated in form of the following equations:

$$Beta_{it} = \beta_0 + \beta_1 Size_{it} + \varepsilon_{it} \quad D_1=0 \quad (5)$$

$$Size_{it} = (\beta_0 + \beta_2)(\beta_1 + \beta_3) Size_{it} + \varepsilon_{it} \quad D_1=1 \quad (6)$$

Null hypothesis and alternative hypothesis for the significance of the model are as follows:

$$H_0: \beta_1 = \beta_2 = \beta_3 = 0$$
$$H_1 = \beta_i \neq 0 i = 1,2,3$$

H_0 = there is no significant model

H_1 = there a significant model

Table 3. The Results of the 2nd Hypothesis using Auto-regressive Models

Variable	Coefficient	Statistical Error	T-Statistic	Probability
Constant	-1.788	0.730	- 2.448	0.015
Firm Size	0.121	0.037	3.237	0.001
D1	0.752	0.486	1.547	0.123
XD1	0.045	0.025	-1.755	0.077
AR (1)	0.675	0.031	21.473	0.000
Coefficient of Determination	0.491	Durbin – Watson Statistic		2.175
Adjusted Coefficient of Determination	0.487			
F-Statistic	127.000			
(F- Probability) Statistic	0.000			

Source: findings of the researcher

The value of (F-Probability) statistic is equal to 0.000. Therefore, null hypothesis is rejected at the confidence level of 95 percent. This means that the model is of significance. The coefficient of determination (R^2) is equal to 0.49, and this means that 49 percent of the changes in the dependent variable are explained by the independent variable *firm size*, D, and the product of the multiplication of firm size and a part of dependent variable with time delay. This value of the coefficient of determination is high. The value of Durbin – Watson statistic is equal to 2.18 indicating the absence of autocorrelation.

The t-value for the slope of firm size is equal to 3.24, for D equal to 1.55, and the most important part D*Size equal to – 1.77, and finally AR(1) is equal to 21.47. Firm size and AR (1) are significant at the confidence level of 95%. D*Size is significant at the confidence level of 90 percent (the probability value is less than 0.10 and not less than 0.05). D is not significant, and is equal to -2.45 for the constant or interception elevation, which is significant at the confidence level of 95 percent. This model is estimated by deleting D statistic, which is not significant.

Table 4. The Results of the Retests of the 2nd Hypothesis after the Deletion of D part using Auto-Regressive Models

Variable	Coefficient	Statistical Error	T-Statistic	Probability
Constant	- 1.106	0.584		
Firm Size	0.086	0.030		
XD1	- 0.006	0.002		
AR(1)	0.674	0.031		
Coefficient of Determination	0.489	Durbin – Watson Statistic		2.384
Adjusted Coefficient of Determination	0.486	(F- Probability) Statistic		0.000
F-Statistic	168.091			

Source: Findings of the Researcher

$$Beta_{it=}0/106 + 0/086Size_{it} - 0/006D_1 \times Size + [AR(1) = 0/674] \quad (7)$$

The relation between firm size and β is positive and significant, and any increase by one unit (when other variables are controlled), the value of β increases by 0.086 units (table 4). D*Size indicates that when there is an upturn in market, the relation between firm size and β is less significant than the time there is a recession in market. During the upturn in market, the slope is 0.006 units less than the slope in the time of recession.

Therefore, is can be concluded that the second hypothesis is confirmed at the confidence level of 95 percent. That means the correlation of firm size with the stock return of the companies in the index of 50 most active firms listed on Tehran Stock Exchange during the upturn has no significant difference from the correlation of the time of recession. The results of the tests of the hypotheses have been summarized in the table 5.

Table 5. The Results of the Tests of Hypotheses

The Results of the Test of Hypotheses	The Results of Significance Test of the Model (F)	R^2 (percent)	Market Conditions	Hypotheses
Confirmed	Significant (0.0000)	47.9 %	Not considered	1st Hypothesis
Confirmed	Significant (0.0000)	47.9%	First condition	2nd Hypothesis
		47.9%	Second condition	

CONCLUSION AND RECOMMENDATIONS

This research aims to study the relation between firm size and fluctuations in stock returns under the different conditions of market. The results of this research show that there is a positive and significant relation between firm size and fluctuations in stock returns (β) when the conditions of market are not considered. The results of the test of this hypothesis are different from those of the similar studies conducted by Banz (1981) and Fama and French

(1992). Their study show that there is inverse relation between firm size and return, and this is because of the difference in the political and economic conditions of markets especially the conditions of stock exchange of the countries. Moreover, the results of this research are consistent with the results of the studies conducted by Iranian researchers (Vosough, 1996, and Mousavi, 1999). This relation is perhaps due to the high risk of domestic large companies. In other words, as large companies are more subject to the decisions made in macro-economic and political level of the society, and most of these decisions are beyond the terms of reference of the companies and directors, therefore these companies are more subject to risks and therefore, they may face many changes because of the changes that may happen in conditions.

However, when the condition of market is inserted in the model, the relation between firm size and fluctuations in stock returns is positive and significant in both times of upturn and recession. That means that the relation between firm size and fluctuations in stock returns is not of significance under different market conditions. The results of this research are not consistent with the findings of Pettengill *et al* (2002). Their study showed that there was a significant inverse relation between firm size and stock return in up and down markets, and the intensity of such a relation in down markets is more considerable). Moreover, the results of this research are inconsistent with those obtained by Perez-Quiros *et al* (2000) stating that the fluctuations in the stock return of smaller companies (more risky companies) are more significant during the period of recession. However, the results of this research are consistent with those of the study of Namazi and Mohammad Tabar Kasgari (2007) stating that there is no relation between the changes in stock returns and some economic variables including stock price index. In fact, it seems that because of nonprofessional nature of the stock exchange, asymmetry of information, high number of publishing news and opinions on the adverse effects of the policies made by the government as regards national economy and stock exchange on the news published to confirm such policies, investors are considerably affected by the governing atmosphere of the market and therefore, transact shares collectively. Therefore, the lack of relation between the fluctuations of stock returns and stock market indices can be accepted as one of the economic indices.

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