ABSTRACT

This research studied the relationship between portfolio return volatility and stock return volatility using wavelet analysis was performed on the Tehran Stock Exchange (TSE). all sample companies in (TSE) for the period 2008-2013 constituted. The research sample consists of 60 firms in the three industries of pharmaceutical and Food were selected by non-probability sampling method. Data needed to calculate the volatility of the portfolio return and volatility of stock returns were collected and using Eviews six econometric software tool was evaluated in a wavelet transform. The results showed that short-term than long-term relationship between stock returns and the level of portfolio return is greater, so that the stock market in the short term and in the long term is more efficient.

KEYWORD
Volatility of Market Portfolio Return, Volatility of Stock Returns, Wavelet Analysis

JEL CLASSIFICATION:M40- M41 - M49

INTRODUCTION

One of the basic criteria for deciding on a stock, stock returns are, stock returns alone has more content and potential investors in financial analysis and forecast of its uses. any investor to invest due to several factors, most notably the return on investment and the expected return on the investment is among the various items of investment (at constant risk of them) usually choose the investor will have to be more efficient. One of the objectives of accounting information to assist users in predicting the entity's future cash flows of inputs and consequently the return on investment is anticipated. Some of the variables that affect stock returns in the stock market due to the financial information which is produced by the accounting system, the effectiveness of this information is very complex and partially unknown. One of the factors that affect asset returns, the risk of the shareholders and investors need to assess the sensitivity of equity to risk assets ratio and the people are always looking to identify, measure and control are factors affecting asset returns. (Shahvysi, 2010)

Where investors seek to invest its funds in the most efficient and have the lowest risk, if we can provide conditions that both investors and corporate executives need to be informed about capital market and those familiar with the factors affecting the investment, and an important factor in helping them decide on the capital market boom is created. (Raei and Talangy, 2004)

Wavelet analysis is one of the relatively new and exciting achievements in pure mathematics is based on decades of research in harmonic analysis, today is a very important applications in many fields of science and engineering as well as new possibilities for understanding the mathematical aspects of it increasing applications is provided.

Each set of wavelet coefficients of a time series covers a different time scale.

Using the wavelet basis functions, a series of time-frequency space and transferred to the time series at different time scales shows. Wavelet analysis, analysis of data at different scales when enabled.

Wavelets are mathematical functions that fulfill certain requirements and explain the relationship between data and functions are used.

Wavelet analysis, fast access to the information is possible through the use of other means of frequency analysis - time remain hidden from view, provides.
Since the return to investors and financial analysts as one of the basic criteria to assess stock companies, using these people tend to measure future returns, the decision to invest in stock or stock sale will be held. On the other hand, to take decisions at each stage investors buy or hold the stock to the information they need to express the company's future stock returns is.

In fact, the projected efficiency, great importance was and the variables that influence the judgments and decisions of users and is considered an important factor in the efficiency of capital markets. Investors that their funds by investing in securities that are not endangered faced with many risks, ways to assess the value of shares and securities offered in the market are required.

Knowledge of these practices can be effective in today's investment environment and can contribute to what investors want to gain.

Because of their desire to earn wealth is to increase efficiency, therefore must operate in ways that create the most efficient for them.

Many studies to provide strategies for investing in securities has been and research conducted in this area in the last fifty years, leading to the formation of new theories investment selection strategies securities mainly depends on the combination of risk and return papers they review.

Known as templates for creating efficiency, capital asset pricing model is that the future cash flows to determine the price of securities can be used.

Accordingly, the present study sought is the relationship between the volatility of portfolio return and volatility of stock returns in the short term and long term using wavelet tools to evaluate.

For this purpose, hypothesis testing, beta corporate short term and long term capital asset pricing model will calculate adjusted. Using wavelet tools beta companies under investigation will be evaluated and optimized based on the time period is introduced.

**BACKGROUND RESEARCH**

Fernandez, V.(2008), he studied CAPM and value at risk at different time horizons concluded that the CAPM model to predict the short-term horizon is more relevant.

Cifter, A. &A.ozun.(2008), to explain stock returns from a multivariate regression model was used. He concluded that, contrary to expectations, the relationship between stock returns and market value is positive. Also found that the ratio of book value to market value is high power to explain average returns. The relationship between the ratio of book value to market value and return on equity was negative.

Najet.rhaiem, saloua. BenAmmou and Anour.BenMabrouk(2009), in a study entitled systematic risk and time scales, with the shares of listed companies in France, a new approach for the estimation of systematic risk (beta assets) based on the capital asset pricing model proposed. Scalable Wavelet method proposed approach is based on a specific time scale, the scale breaks is based. At each scale, Wavelet variance of market returns and Wavelet covariance between market returns portfolios in order to obtain an estimate of the beta of the portfolio is calculated. Results indicate that the relationship between portfolio return and beta as standard Wavelet grows, becomes stronger. Thus the predictions of the CAPM in the periods of time when compared with short-term horizons are more favorable.

Shafizadeh, A.(1996) the research "The relationship between systematic risk (β) and return on equity in Tehran Stock Exchange" can be investigated.

For this, 40 companies among the listed companies in (TSE) as samples and rates of return and beta or systematic risk index them for a period of 48 months from the beginning of 1991 until the end of 1993 can be calculated. Results of regression and correlation analysis showed that the systematic risk and stock returns statistically significant correlation exists. The results also indicate that the relationship is nonlinear is better than linear correlation between systemic risk and be able to explain stock returns. This means that, assuming a linear relationship between systematic risk and stock returns is rejected at the (TSE).

Zanjirdar, M. and RahnamayRoodposhti, F (2009) in his Ph.D. dissertation entitled "an analysis of the adequacy of the beta coefficients leveraged and non-leveraged, beta-traditional beta-reduction to explain the expected rate of return on listed companies at (TSE)" to examine the adequacy of the coefficients leveraged and non-leveraged beta, beta-traditional (CAPM) and beta-reduction (DCAPM) to determine the expected rate of return paid to shareholders in the (TSE).

The findings of incompetence in (TSE) for each of the three models in terms of explaining the relationship between risk and expected returns suggests and the proposed research model to measure expected returns, conditional capital asset pricing model and decreasing (CD-CAPM), which has been proposed to explain the relationship between risk and return on investment will be for the market (risk premium ) should be given in all cases, the model represents the relationship between risk and return and the market risk premium.

**RESEARCH HYPOTHESES**

H$_{1.1}$:There is a negative relationship between the volatility of market portfolio return and volatility of stock returns in the short term.

H$_{1.2}$:There is a negative relationship between the volatility of market portfolio return and volatility of stock returns over the long term.

**SOCIETY SAMPLE**

In this study, companies operating in the pharmaceutical and food listed in (TSE) for the financial reporting period of 6 years from 2008 to 2013, they were available, were studied. Other restrictions are as follows:

1 - The beginning of 2004 have been a member of the (TSE).
2 - Financial year at the end of solar year is over e.g 29/12/xx.
3 - During the research period, interrupted their stock trades have been more than 6 months.
4 - Except intermediat financial, banking, credit, investment and holding institutions.

Based on a total of 60 cases were studied.

The third requirement is imposed because, if the trading symbol for a long time, depending on the company and its shares are not traded, first, it shares features with parameters that are continuously traded shares were not and secondly, parameter estimation, such as measures of systemic risk was not statistically very significant.

Thus, the systemic risk index based on the regression between stock returns and market returns of companies is obtained, trading lag longer than usual, causing the company’s expected return can be measured with reasonable accuracy. On the other hand, less than 6 months may lead to the removal of larger statistical sample of companies.

**METHODS OF DATA ANALYSIS**

Volatility of market portfolio is independent variable and volatility of the expected return on a portfolio of individual stocks is dependent variable. Beta as unchangeable risk of an asset relative to the stock market, CAPM return on investment in the form of equation (1) defined by equation (1):

\[ E(R_i) = \beta_i E(R_m) - r_f \]

\[ \beta_i \text{Volatility of the expected return on a portfolio of individual} \]

\[ r_f \text{risk-free rate of return} \]

\[ E(R_m) \text{trading portfolio return} \]

\[ \text{CAPM two parts can be risk-free rate of return (rf), and the risk premium } \beta_i E(R_m - r_f) \text{ is divided. The equity risk premium investors demand returns in excess of risk-free interest rate to offset the risk that the investment is unchangeable beta in equation (2) is calculated as:} \]

\[ \beta_i = \frac{COV(R_i; R_m)}{Var(R_m)} \]

Market risk premium, the efficiency \( E(R_m - r_f) \) are considered. Greater than the risk-free rate of return for investors, to keep the stock market. Because the risk premium on individual assets, multiplied by the market risk premium in beta. Equation (1) can form a relationship (3) can be rewritten as:

\[ E(R_i) - r_f = \beta_i E(R_m - r_f) \]

However, the expected rate of return \( k_j \) using D-CAPM is:

\[ K_j = r_f + \beta(R_m - r_f) \]

And beta-reduction (mitigation beta) is calculated by the following equation:

\[ \beta = \frac{S_{cov(R_i; R_m)}}{S_{var(R_m)}} \]

**k_j**: Expected Returns

\( R_f \) risk-free interest rate

\( r_f \) is calculated from the following equation:

\[ (6). \frac{R_m}{1} = \frac{(1+\alpha)^2 + DPS + P_0}{P_0} \]

\( \alpha \) percentage of increase in capital

\( P_0 \): first-period price

\( P_t \): price end of the period

DPS : benefit split between shareholders

for calculation \( R_f \) using data from the website of the Central Bank of Iran on account of interest rates on term deposits are considered investments. The following equations are used to calculate market returns:

\[ (7). R_m = \frac{l_2 - l_1}{l_1} + 100 \]

\( l_2 \): end price market index

\( l_1 \): first month market index prices

\( R_M \): market rate

In this study wavelet coefficient beta of the second period short-term and long-term use, If movements in the short and in the long run as long as 2-8 days on top of scale associated with the motion 32-128.

Because long-term period has been considered as the highest scale is, after a period of 128-256 days is associated with a nearly 1 year is calculated, the main goal is to study abroad.

Based on the data, there are two main wave wavelet. The first wave of continuous wavelet transform (CWT) is to work with time series defined on the whole real axis design.

Second wavelets, discrete wavelet transform (DWT) that separate different frequency components in the data set, it is possible to separate data set to test the depth of the study. (Konlon, gerun, Roskin, 2008)

There are two kinds of wavelets. Father wavelet (\( \Phi \)) and mother wavelet (\( \omega \)):

\[ (8). \int_R \omega(t)dt = 1 = \int_R \phi(t)dt \]

The smooth low frequency signal using wavelet father is shown, and the mother wavelet, to show greater detail and high-frequency parts are used. The official definition of parent wavelets, respectively, is shown in the following equation:

\[ (9). \phi_{j,k}(t) = 2^{-j/2} \phi(2^{-j}t - k) \]

\[ (10). \omega_{j,k}(t) = 2^{-j/2} \omega(2^{-j}t - k) \]

Fernandez (2007) notes that the most common uses wavelets, wavelets are orthogonal. orthogonal wavelet series approximation to a signal \( f(t) \) is given by the following equation:

\[ (11). \sum_k \sum_{j,k} d_{j,k} \omega_{j,k}(t) + \sum_k \sum_{j,k} \phi_{j,k}(t) \]

\( j \): number of multi-scale analysis

\( K \): the scope of a number of coefficients in the corresponding components

Also, the detail coefficients (\( d_{j,k} \) .... \( d_{(J, k)} \)), higher frequency oscillations. Small-scale deviations below shows the relationship:
Equation (12):
\[ d_{ik} = \int \omega_{ik} f(t) dt \]
\[ s_{ik} = \int \varphi_{ik} f(t) dt \]

Where \( s_\_ (j, k) \) represents the filter coefficients or coefficient estimates and \( d_\_ (j, k) \) are the wavelet coefficients or detail.

Wavelet series approximation of an original signal \( f(t) \), the following relation of signal detail and smooth part of the signal is composed of:

Equation (13):
\[ s_j(t) = \sum_{k} s_{jk} \varphi_{jk}(t) \]
Equation (14):
\[ s_j(t) = \sum_{k} d_{jk} \psi_{jk}(t) \]
Equation (15):
\[ D_j(t) = \sum_{k} d_{jk} \omega_{jk}(t) \]

**STATISTICAL RESULTS**

**DESCRIPTIVE STATISTICS**

The results in (Table.1) the average portfolio return in the short term and long term respectively 0.02 and -0.01 and short-term and long-term average expected rate of return is 0.37 and 0.29. Standard deviation of the portfolio return in the short term and long term, respectively, 0.05 and 0.00 standard deviations in the short-term and long-term expected rate of return of 1.00 and 0.72 respectively is. At least in the short term and long term return on the market portfolio, respectively, with -0.08 and -0.53 and short-term and long-term expected rate of return at least equal to -1.95 and -1.91. The maximum efficiency of the market portfolio in the short and long term respectively 0.16 and 1.46 and the maximum short-term and long-term expected rate of return is equal to 2.82 and 2.67.

Results descriptive statistics (Table.1) show that the portfolio return over the long term with a low standard deviation (0.00) is that it can cause large fluctuations in the long-term portfolio return is that they affect the.

<table>
<thead>
<tr>
<th>Variable</th>
<th>AVG</th>
<th>Std. Error</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERm The short-term (2-8 days)</td>
<td>0.02</td>
<td>0.05</td>
<td>-0.08</td>
<td>0.16</td>
</tr>
<tr>
<td>ERm The long-term (32-128 days)</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.53</td>
<td>1.46</td>
</tr>
<tr>
<td>ERi The short-term (2-8days)</td>
<td>0.37</td>
<td>1.00</td>
<td>-1.95</td>
<td>2.82</td>
</tr>
<tr>
<td>ERi The long-term (32-128 days)</td>
<td>0.29</td>
<td>0.72</td>
<td>-1.91</td>
<td>2.67</td>
</tr>
</tbody>
</table>

**TESTING HYPOTHESES AND ANALYZING RESULTS**

**THE FIRST HYPOTHESIS TEST (SHORT-TERM 2-8 DAYS)**

The results in (Table.2) The F-statistic equals 37.895, which is significant at a confidence level of 95%. In addition, the coefficient of determination and the adjusted coefficient of determination equal to 0.40 and 0.389 model, which indicates that 40% of the variability can be shown to the independent variable. The results in (Table.2) the value of the independent variable and the dependent variable is portfolio return in the short-term expected rate of return equal to 0.082-th is significant at 95% confidence.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Error</th>
<th>t-statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.045</td>
<td>0.023</td>
<td>6.319</td>
<td>0.00</td>
</tr>
<tr>
<td>ERm</td>
<td>-0.082*</td>
<td>0.00</td>
<td>-6.135</td>
<td>0.00</td>
</tr>
<tr>
<td>R- squared</td>
<td>0.40</td>
<td>Mean dependent var</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.389</td>
<td>S.D dependent var</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.041</td>
<td>Akaike info criterion</td>
<td>-3.6325</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>0.111</td>
<td>Schwarz criterion</td>
<td>-3.5615</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>107.352</td>
<td>Hannan-Quinn criter.</td>
<td>-3.6045</td>
<td></td>
</tr>
<tr>
<td>Dorbin-Watson stat</td>
<td>1.802</td>
<td>F-statistic</td>
<td>37.895</td>
<td></td>
</tr>
<tr>
<td>Prob (F-statistic)</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regarding the relationship between the first hypothesis at 95% confidence, Thus it can be said that: there is a negative relationship between the volatility of market portfolio return and volatility of stock returns in the short term. Dorbin-Watson stat in the optimal range equal to 1.802, suggesting the absence of first order autocorrelation in the regression model. The proximity of the Akaike statistics, Hanan Quinn and Schwarz criterion each regression model indicates that the best model is selected.

**THE SECOND HYPOTHESIS TEST (LONG-TERM 32-128 DAYS)**

The results in (Table.3) The F-statistic equals 14.451, which is significant at a confidence level of 95. In addition, the coefficient of determination and the adjusted coefficient of determination model is equal to 0.20 and 0.188. The parameter values of the independent variables and the dependent variable is portfolio return over the long-term expected rate of return equal to -0.024 which is significant at 95% confidence.
The first hypothesis can be concluded that the short-term there is a relationship between portfolio return and the expected rate of return on equity, as well as short-term impacts of the portfolio return is higher. Studies show that short-term market returns on the relationship between stock returns were higher due to the lack of consensus of analysts had been returns on shares and the reasons for behavioral as skewness. (Bali et al, 2005)

But the relationship between portfolio return and stock return some positive studies Ciffer, A. &A.ozun.(2008)and in others a positive linear relationship was rejected. ShafiZadeh, A. (1996).

The resulting research saved as a result of Najjet.rhaiem, saloua. BenAmmou and Anouar.BenMabrouk(2009) showed that long periods of time compared to short term time horizon, the more desirable they are not associated.

The second hypothesis can be concluded that the long-term there is a relationship between portfolio return and the expected rate of return. Also in the long term than the short-term impacts of the portfolio return is lower. The overall result of this study is the result of his research in Fernandez, V.(2008). andNajjet.rhaiem, saloua. BenAmmou and Anouar.BenMabrouk(2009) was adapted and shows the relationship between stock returns and portfolio return in the short term is more intense than that. So that the stock market is efficient in the short term.Looking for more studies examining the relationship between market risk and return among stocks without regard to different time periods, respectively.

**CONCLUSION**

According to the results of the first hypothesis was confirmed. It is suggested that in the short term, economists and investors, their analysis is based on wavelet analysis to analysis, thus, short-term fluctuations in the relationship between market returns and volatility of stock returns is stronger. As well as standard definition today new methods and financial indicators are rising and analysts to determine the more appropriate and easier to change parameters and predict financial markets. So Iranian investors should use the methods defined market assessment, portfolio construction and fit portfolios because such necessities activity predict changes in financial markets.

**SUGGESTED BASED ON RESEARCH RESULTS**

1 - According to the results of the first hypothesis was confirmed. It is suggested that the utility of wavelet analysis and clear objective, the situation changes, the analyst puts so using wavelet tools can be useful in the diagnosis of assessing changes in the defined portfolio investors said. It also suggested that capital market participants in the relationship between market risk and stock returns in the short-term and long-term periods to suit.

2 - Analyses the effects of interest rate changes on stock prices using wavelet tools according to the following hypothesis:

**RECOMMENDATIONS FOR FUTURE RESEARCH**

According to researchers in this field, there are still several issues for future research can be important. Therefore, in order to further the research results and help clarify the factors affecting the volatility of portfolio return volatility of stock returns and pay more attention to the following issues:

1. The relationship between individual stock returns and the volatility of the portfolio return volatility of different capital structure (equity portfolios with low portfolio with the high capital) using wavelet tools in different time series, according to the following hypothesis:
   a. There is a negative relationship between the volatility of individual stock returns and the volatility of the portfolio return with different capital structure in the short term.
   b. There is a negative relationship between the volatility of individual stock returns and the volatility of the portfolio return with different capital structure in the long term.

2. Analyses the effects of interest rate changes on stock prices using wavelet tools according to the following hypothesis:
   a. There is a positive relationship between the effects of changes in interest rates and stock prices in the short term.
There is a positive relationship between the effects of changes in interest rates and stock prices in the long term.

**REFERENCES**


