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COMPARE ABILITY OF MARKOWITZ AND VAR MODELS IN SELECTING OPTIMUM PORTFOLIO OF STOCKS IN ACCEPTED COMPANIES OF TEHRAN STOCK EXCHANGE

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ABSTRACT

This study compares ability of Markowitz and value-at-risk (VAR) models in selecting optimum portfolio of stocks in accepted companies of Tehran Stock Exchange. This study uses referential statistics with applied goals. Statistical population includes all accepted companies in Tehran Stock Exchange. Regarding study restriction, 80 companies from 2008-2012 were selected. To reach portfolio of stocks using Markowitz and VAR models, MATLAB software was used. Identifying portfolios and their return and risks, hypotheses were tested using SPSS software. According to the findings, both models can form optimal portfolios but ability of VAR model is higher than Markowitz model with lower risk.

Keywords: *Risk, Return, Optimal Portfolio, Markowitz Model, Value at Risk Model.*

INTRODUCTION

Investment is a hot issue in financial management. Basically, investment in stock market necessitates risk. Risk and return are two distinct factors in investment decision. These two factors are theoretically proven to having a tight linear or positive relationship (Zakaria, 2013). Proper selection of assets helps investors to get maximum return in an acceptable risk level. But, for investment, security is required; so, risk should be minimized or controlled. One way of controlling investment risk is forming portfolio and diversifying assets. Efficient portfolio refers to a desirable combination of securities in a way that risk of that portfolio is minimized for gaining a good return. A wisdom investment works so that the highest probable and expected return is reached by accepting a given level of risk. The assumed or given return is one of the investment methods which might lower the risk and implement the diversification strategy of the portfolio (Mir Mohammadi Sadrabadi,2013). Reasonable investors look for an efficient portfolio. Because, such portfolios maximize expected returns for a definite level of risk or minimum risk for a definite expected return(Radpour, 2009). Today the stock market performance of developed countries as a measure to evaluate the policies and decisions of economic, financial and trade of these countries used to be. Continue to operate as a stock exchange in any country's economic growth and development is a continuous process this is only for investors who are attracted to different tastes and preferences (Fakher Aein, 2013). Mean-variance model of Markowitz and VAR and Waterston models are known models in this regard. In 1950, Markowitz offered a basic portfolio model, introducing diversification officially. Labor portfolios are the ones which have the highest expected return at expense of a definite risk level or the lowest risk at expense of a definite expected return (Eghbalnia, 2006). Regarding considerable costs and requirements of Markowitz model, Waterston followed Markowitz works and offered VAR. VAR index offers maximum probable portfolio loss in a time span with quantitative statements. These models use different methods for selecting efficient portfolios and offer different portfolios with unequal values which are preferable one to another (Raei et al., 2004). This techniques is rarely used in Iran Stock Exchange, hence it is expected that applying this modeles causes a new horizon to be captured for the selection of optimum portfolio in Iran's capital market and consequently enhancing the investment culture. Utilization of this methods contributes managing the investment risk and selecting an optimal portfolio (Mir Mohammadi Sadrabadi,2013). This paper examines portfolio formation in Tehran Stock Exchange using VAR model compared with Markowitz model to see which one has higher ability in optimum portfolio formation. Due to the complexities and variety of effective factors in identifying portfolios of the firms, decision-making in relation with the stocks of a company or a portfolio of the

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firms is a complex issue. Researcher of this study examines predictability of Markowitz and VAR models in determining an optimal portfolio to assist investors, researchers, academics, and brokers of Tehran Stock Exchange and other stakeholders to prevent from inefficient portfolios. This leads to the best optimal portfolio selection. (Zakipour, 2009).

MATERIALS AND METHODS

1. Theoretical Concepts Review

1.1. Markowitz model

In 1950, Markowitz offered a portfolio formation basis, known as the foundation of modern theory of portfolio. Investors were familiar with investment, risk and return concepts before Markowitz; but, they couldn't measure it. They knew that diversity is good and they shouldn't put all their eggs in one basket. But Markowitz (2006) was the one who introduced portfolio and diversification formally. Attention to investment, not only based on standard deviation but also according to the risk of investment, was the most significant feature of Markowitz model (Raei and Talangi, 2008). Labor portfolios are the ones which have the highest expected return at expense of a definite risk level or the lowest risk at expense of a definite expected return. While, optimum portfolios are the most reliable efficient portfolios from investors' views based on the following assumptions: 1. Investors consider each investment alternative as being presented by a probability distribution of expected returns over some holding period. 2. Investors minimize one-period expected utility, and their utility curves demonstrate diminishing marginal utility of wealth. 3. Investors estimate the risk of the portfolio on the basis of the variability of expected returns. 4. Investors base decisions solely on expected return and risk, so their utility curves are a function of expected return and the expected variance (or standard deviation) of returns only. 5. For a given risk level, investors prefer higher returns to lower returns. Similarly, for a given level of expected returns, investors prefer less risk to more risk (Talangi, 2008).

1.2. VAR model

VAR is a quantitative method for measuring investment risk. In this method, for a definite confidence level, maximum loss is estimated for a holding period. For measuring it, confidence level should be determined based on normality of data distribution. VAR is maximum loss in a way that decrease of portfolio value for a definite holding in future with a definite confidence coefficient doesn't exceed that. In other words, VAR measures the worst expected loss under common market conditions and a definite holding period at a definite confidence level. Application of this model in risk management is a measure for risk and needed capital of an organization for operations (Talebna and Nezamabadi, 2010). VAR doesn't have many restrictions of traditional risk management methods like normality of return distribution, the lack of considering time span, or cashability of financial assets. This measure is responsive to the complexities of financial tools, summarizing different risks in a number. Thus, senior managers don't face a sum of risk calculations. By VAR, risk can be purposeful and planned (Hanifi, 2003). VAR summarizes risk of portfolio in a number. It is a framework for measuring and analyzing risk that can be equally used about different assets. Thus, using VAR, a portfolio made of securities with formed portfolio from comparable stocks can be compared.

3. Community sample

Statistical population of this study includes all accepted companies in Tehran Stock Exchange from 2004-2012. The companies with the following conditions were accepted as the sample:

1. Their stocks' transaction doesn't have any long stop (i.e. over 4 months).
2. Investment, financial services, and mediation companies are excluded from sample companies
3. Needed information for calculating research variables of under-study firms are available.
4. They are accepted in Tehran Stock Exchange before 2001 and have not exit it till the end of fiscal year of 2013.
5. Their fiscal year ends in last month of winter.

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4. Hypothesis

1. VAR has the ability of forming optimum portfolio in Tehran Stock Exchange.
2. Results of VAR are conformed to Markowitz model.

5. Measurements

5.1. Input variables of Markowitz Model:

1. Expected return of securities,
2. Expected portfolio return,
3. Without-risk return rate,
4. Return rate of market investment complex,
5. β coefficient,
6. Portfolio risk,
7. Covariance of securities' interreturn

5.2. Input variables of VAR

The most common calculation method for VAR is parametric method, calculated by assuming normality of asset return distribution as follows (Hanifi, 2004):

Equation 1.

$$VAR_i = P_i \times Z \times S_{di}$$

Where,

VAR_i: VAR of asset i

P_i: price of asset i (market value of asset i)

Z : standard normal statistics related to confidence level

S_{di}: price volatility of asset i

RESULTS AND DISCUSSION

1. Hypothesis test

After collecting data, information of sample firms was classified in Excel sheets and MATLAB software to their return, risk, and variations based on mentioned methods and differentiation of each year.

This study used variation coefficient of Kroskal-Valis and Mann-Whitney tests for analyzing and ranking portfolios and Friedman test for examining ranks of 3 models. Kroskal- Valis test is used when assumptions of one-way variance analysis don't work. It happens when there are two or some independent groups and we want to compare their indices. Mann-Whitney test is a non-parametric test, used for measuring difference of the samples. In this test, there is ranking and calculations of ranks. In Friedman test, the amount of effectiveness of each dimension is measured and factors' prioritization is done.

Table 1. Results of Markowitz model-minimum risk and VAR model

model	Rank mean	Rank sum	sig
Markowitz model- minimum risk	0.821	7.392	0.137
VAR model	0.819	7.376	

Table 2. Results of Markowitz model-maximum risk and VAR model

model	Rank mean	Rank sum	sig
Markowitz model- maximum risk	0.830	7.475	0.168
VAR model	0.819	7.376	

As seen in Table 1, since significant value is 0.137 (and above 5%), H1 is confirmed and conformation of two models in 9 years is accepted. Examining table of portfolio results (return, risk, and variation coefficient), conformation of Markowitz model- minimum risk and VAR is confirmed. Because, variation coefficient of VAR is close to Markowitz model- minimum risk in 9 years, revealing low risk of each return unit.

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Regarding Table 2, since significant value is above 5%, H1 is confirmed and conformation of two models in 9 years is accepted. Examining table of portfolio results (return, risk, and variation coefficient) conformation of Markowitz model-minimum risk and VAR is confirmed. Because, variation coefficient of VAR is close to Markowitz model- minimum risk in 9 years, revealing low risk of each return unit. To make sure about reliability of results, Kroskal-Valis test was used and 3 models were selected regarding selected portfolio.

Table3.Results of Kroskal-Valis test

model	Rank mean
Markowitz model- minimum risk	2.33
Markowitz model- maximum risk	2.11
VAR model	1.55

Based on the ranking based on Kroskal-Valis test, it is observed that in 9 years, results of VAR gained the best rank; then, Markowitz model- maximum return obtained the second rank, and final rank belonged to Markowitz model-minimum risk. Thus, VAR conforms to both Markowitz models in selecting optimum portfolio.

Table4.results of Friedman test

likelihood valu	0.001
Chi-square statistic	476.805

Since likelihood value is below 5% significance level. Therefore, there is a significant difference between dimensions' effects.

DISCUSSION

Results of H1 showed that VAR has higher ability in forming optimal portfolio among firms of Tehran Stock Exchange.Results of H2 showed that during these years portfolio from VAR has higher return than portfolio from Markowitz model (maximum return, minimum risk). Generally, VAR results are more conformed to Markowitz results and using and understanding it is easier than other complicated models. This study agrees with the study of Akgiray and Faf (1998) revealing superiority of VAR model compared with CAPM.

Also, Tseyung and U (2001) who conducted a study in Japan, Singapore, and South Korea concluded that VAR model is an exact estimation of portfolio risk. Alexander and Papista (2001), Chang (2005), Pocharlef and Plask (2000), Hendrix(1996), Angelbert (2003) found similar results in their studies. Badr (1996) compared VAR model using Monte Carlo simulation and Fama and French model, concluding high return of VAR.

In the studies inside Iran, Moosavizadeh (2008), Karimi (2008), and Khalili (2009) showed positive effect of VAR application in ranking stocks and decision-making about optimum portfolio selection. Talebnia and Fathi (2010) concluded that selecting optimum stock portfolio in capital market of Iran via VAR and Markowitz models yield the same results. Talebnia and Nezamabadi (2010) found that 3-factor model of Fama and French has prediction power of optimum portfolio but VAR doesn't have such power.

Conclusion

Regarding results of this study for suggesting a proper model for investment companies' managers, analysts, and capital market of Iran, it is concluded that since managers search for hedging against maximum loss and gaining minimum profit from investments, VAR can be the best suggested model. Financial analysts, stock brokers, and intermediaries are recommended to form different portfolios using mentioned models and analyze continuance of those portfolios in relation with the ability of gaining

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return. Universities and higher education institutes can form portfolios with different models, examining conformation of them in return and risk precisely for training knowledgeable students.

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