

Journal of Accounting Advances (J.A.A)
Vol. 3, No. 1, Spring & Summer 2011, Ser. 60/3

Extended Abstract

A Comparison of Portfolio Selection Models Based On the Random and the Fuzzy Random Security Returns in Tehran Stock Exchange

Dr. M. Yahyazadehfar Dr. A. Safaie Ghadikolaie M. Khakpour
University of Mazandaran

Introduction

One of the basic problems of applied finance is the optimal selection of stocks by conflicting objective of maximizing future return and minimizing investment risk. The first systematic treatment of this dilemma is the mean variance approach proposed by Markowitz. Markowitz combined the optimization and probability theory to solve the dilemma. In Markowitz's mean variance model, the security returns are assumed to be random variables, and the investors are postulated to establish equilibrium between the conflicted objectives, which the investment risk and return are respectively quantified by mean and variance of portfolio of security.

A basic assumption behind Markowitz's mean variance model is that the situation of the stock market in future can be correctly reflected by security data in the past, that is, mean and covariance of a portfolio of securities in the future are similar to the past ones. However, there are so many uncertain factors that this assumption cannot be guaranteed for the real ever changing stock markets. This uncertainty can be fuzzy variables, and consequently, a portfolio of securities can be selected on the assumption that security returns are considered to be fuzzy variables. A fuzzy variable is a measurable function from credibility space to a set of real numbers. Sometimes, fuzziness and randomness simultaneously appear in a system. A hybrid variable describes the quantities with

fuzziness and randomness. A hybrid variable is a measurable function from a chance space to set of real numbers. A hybrid variable can be fuzzy random variable and random fuzzy variable. A fuzzy random variable is a measurable function from a probability space to a collection of fuzzy sets, and a random fuzzy variable is a function from a possibility space to a collection of random variables.

Another Markowitz's assumption is homogenous expectations that all the investors share the same expected returns and predicted variance and covariance about the future is unrealistic in real world.

In this paper, λ mean variance portfolio selection model which assumes security returns are fuzzy random variables and considers the investors' subjective opinions for estimating the rate of return of each security that is compared with Markowitz's mean variance portfolio selection model assuming security returns are random variable, thus considering homogenous expectation for the investors.

Research hypothesis

In this paper, we try to answer the question of "what differences are there between the efficient frontier of the λ mean variance portfolio selection model and Markowitz's model?". In order to compare efficient frontier of the λ mean variance portfolio selection model and Markowitz's model, two hypotheses are considered as follows:

Hypothesis 1: In a given level of portfolio risk, optimistic portfolio return is completely greater than Markowitz's portfolio return and Markowitz portfolio return is completely greater than pessimistic portfolio return.

$$H_0 : \mu_{R1} \geq \mu_{R2} \geq \mu_{R3}$$

$$H_1 : \mu_{R1} < \mu_{R2} < \mu_{R3}$$

Hypothesis 2: In a given level of portfolio return, optimistic portfolio risk is completely less than Markowitz's portfolio risk and Markowitz portfolio risk is completely less than pessimistic portfolio return.

$$H_0 : \mu_{\delta_3} \geq \mu_{\delta_2} \geq \mu_{\delta_1}$$

$$H_1 : \mu_{\delta_3} < \mu_{\delta_2} < \mu_{\delta_1}$$

Methods

Two types of data are collected in this research. First, the historical security returns are collected monthly from Tehran Stock Exchange with respect to the limitation that the company trading symbols remain open for 45 consecutive days from March 2005 to March 2010. Based on the limitation, the numbers of companies are obtained 63. Because of collecting questionnaires and receiving better answers from the quality aspect, 30 companies are selected considering simultaneously more mean of days which company symbols remain open and the more mean of monthly historical returns during the years.

The second is the maximum and minimum expected returns which are collected by questionnaires. In this paper they are considered by experts who are the managers and staffs of the brokerage firms and investment companies. The brokerage firms and investment companies are 121 totally. Because some companies may not answer to the questionnaires, the estimation sample is applied to determine how many questionnaires must be collected.

Finally, these data are used in the λ mean variance and Markowitz's model to calculate risk and return portfolios.

Results

SPSS software program is applied to test the hypotheses according to analysis of variance (ANOVA). Because SPSS software is used for two tailed test, first, hypotheses 1 and 2 are examined as two tailed test, then, Tukey's test is performed. Testing hypotheses shows H_1 is accepted and H_0 rejected. Considering the results of the hypothesis testing, the research question can be answered as Markowitz's efficient frontier is under the optimistic efficient frontier and above the pessimistic efficient frontier.

Conclusion and discussion

One of the fundamental assumptions behind the Markowitz's model is that the future situation of the stock market can be correctly reflected by security data in the past, which future security return is calculated on the assumption that security return is random variable. The other basic assumption of the Markowitz's model is homogenous expectation, that is, all investors share the same expected return. These problematic assumptions have been dealt with λ mean variance model on the following assumptions. First, security return is fuzzy random variable. Second, investors have heterogeneous expectation. In fact, investors use experts' judgment according to left and right spread of security returns and select their subjective degree of optimism-pessimism. The result of the research indicating two new assumptions lead to Markowitz's efficient frontier placed between the optimistic and pessimistic efficient frontier. Investigating how this research results in selecting appropriate portfolio requires more researches.

Keywords: Fuzzy Set Theory, Fuzzy Random Variable, Subjective Degree of Investor's Optimism-Pessimism.