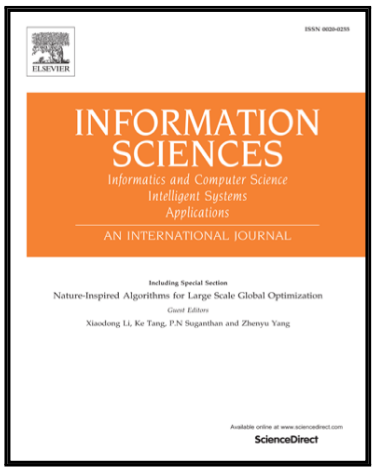

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Portfolio Selection under Different Attitudes in Fuzzy Environment

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Abstract: This paper studies stock portfolio selection problem based on varying conservative-neutral-aggressive attitudes. The return rates of stocks are characterized by fuzzy variables. The Pareto-optimal solutions are obtained by maximizing the return and minimizing the risk subject to constraints of transaction cost and value at risk. Since investors with different attitudes may have different understanding of the likelihoods of occurrence, measure Me with the ability of reflecting varying conservative-neutral-aggressive attitudes is adopted. Based on Me, the expected value of fuzzy return and the lower absolute deviation are used to quantify the return and risk levels of a portfolio respectively. Then the ε-constraint method is employed to obtain the efficient frontier. Finally, an empirical study is carried out using the data for 10 stocks in Chinese stock market. Sensitivity comparisons are also given to demonstrate the effectiveness of the proposed model. The results show that different frontiers can be obtained under different attitudes, confidence levels and values at risk.

Keywords: portfolio selection, conservative-neutral-aggressive attitude, fuzzy variable, value at risk, ε-constraint method

1. Introduction

Portfolio selection involves allocation of capital among a large number of securities such that the investment yields the most profitable return, while minimizing risk. Investors in stock market always make decisions of portfolio selection for future, so the realized value for any stock is difficult to predict precisely due to the uncertainty of future markets. So investors usually have no choice but rely on the historical data. Most of literatures considered the return rate for a stock was a random variable and the distribution parameters could be estimated from the historical data. Under this assumption, a great deal of portfolio selection models have been built based on the probability theory.

In 1952, Markowitz [7,8] published his pioneering work, which served the basis for the development of the modern portfolio theory over the past several decades. Markowitz's model used variance to describe the risk by the biased degree between effective rate of return and the expected rate of return. However, variance calculated by the total deviation from the expected return describes both the downside risk and the upside risk. Investors don't like the downside risk, but they are actually willing to accept the upside risk. It thus may limit the potential profits as well. In 1952, Roy [13] proposed the safety-first portfolio model, which only minimized the probability of the downside risk. Another standard benchmark for measuring firm-wide risk is Value at Risk (VaR). For a given time horizon and the confidence level β, the VaR of a portfolio is the loss in the portfolio's market value over the time horizon that is exceeded with probability 1−β. For example, a 99% VaR for a 10-day holding period, implies that