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Optimization of multi-period portfolio model after fitting best distribution

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ABSTRACT

In this paper, we use a multi-periodic portfolio selection algorithm to maximum the investor wealth using probabilistic risk measure. We use ASX100 stock data from 2015 to 2017 with 36 periods, 100 stocks and 725 days. Then we examine and use T-student, stable and kernel distributions to improve and optimize the multi-period portfolio optimization model. Kolmogorov-Smirnov test indicates that these distributions fit the experimental data better in comparison with normal distribution. Furthermore, kernel density estimator is the best density function to fit returns.

1. Introduction

The portfolio theory and the selection of the optimal stock of portfolios after the first attempts by Markowitz (1952) have always been one of the attractive areas. The stock portfolio selection or portfolio optimization involves designing an appropriate optimization model and choosing suitable criteria for stock selection. The first criteria used by Markowitz in the traditional portfolio model, was expected returns and portfolio return variance. However, the reviews of variance turned into semi-variance by Markowitz (1959). The term risk has undergone many changes in recent decades, and it has been introduced for different criteria in different situations. Righi and Borenstein (2018) compare risk measures regarding performance of optimal portfolio strategies. Chen (2005) presented a multi-period optimization model using value-at-risk as a risk measure. Wei and Ye (2007) introduced a multi-period variance model under the control of bankruptcy risk. Liu et al. (2013) developed a multi-period portfolio optimization model in terms of variance as a risk measure in a fuzzy environment. Liu and Zhang (2015) use fuzzy semi-variance as a risk measure and for each goal, consider the degree of investor satisfaction and consider the multi-objective model which be transformed into a single-objective model using solving a genetic algorithm. Sun et al. (2015) presented a flexible portfolio selection method as a bi-criteria optimization problem. Their model maximizes the expected portfolio return and minimizes the maximum individual risk of the assets in the portfolio. Moreover, Sun et al. (2016) develop the previous model using multiperiodic variables and probabilistic risk measure.

The probability density function using in Sun et al. (2015, 2016) was Gaussian. In this paper, we examine and use T-student, stable and kernel distribution functions to improve and optimize the multi-period portfolio optimization model. In financial matters, especially when an investor is supposed to invest a large sum, the accuracy of optimizing the portfolio and making the answers closer to reality are important for any financial analyst. Empirical evidences have shown that in a portfolio selection, in particular when a large sum of investments is involved, assuming the distribution of the output to be normal in normal terms could result a significant error in expected return (Sun et al., 2016). By observing the kernel distribution density diagram and because of the dispersion of data

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