Risk Analysis of Portfolio Based on Kernel Density Estimation-Maximum Likelihood Method and Monte Carlo Simulation

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Abstract.

Nowadays one of the most studied issues in economic or finance field is to get the best possible return with the minimum risk. Therefore, the objective of the paper is to select the optimal investment portfolio from SP500 stock market and CBOE Interest Rate 10-Year Bond to obtain the minimum risk in the financial market.

For this purpose, the paper consists of: 1) the marginal density distribution of the two financial assets is described with kernel density estimation to get the "high-picky and fat-tail" shape; 2) the relation structure of assets is studied with copula function to describe the correlation of financial assets in a nonlinear condition; 3) value at Risk (VaR) is computed through the combination of Copula method and Monte Carlo simulation to measure the possible maximum loss better.

Therefore, through the above three steps methodology, the risk of the portifolio is described more accuratly than the conventional method, which always underestimates the risk in the finicial market.

So it is necessary to pay attention to the happening of extreme cases like "Black Friday 2008" and appropriate investment allocation is a wise strategy to make diversification and spread risks in financial market.

uzzy regression model, fuzzy random variable, expected value, variance, confidence interval.