

PORTFOLIO OPTIMIZATION WITH MULTIVARIATE COPULA: A MONTE CARLO STUDY

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Abstract

According to Markowitz (1952) portfolio theory assumed that the investor has a concave utility function that expresses an attitude of risk aversion and managed to put portfolio selection based on two criteria, mean and variance. Other studies have improved this approach and following Basel II recommendations by using Value-at-Risk (VaR) as a standard risk measure in finance, Alexander & Baptista (1999) and others have proposed Mean-VaR approach. Artzner et al. (1999) showed that this risk measure suffers from some practical problems that the Conditional-VaR (CVaR) may be the alternative measure. Indeed, the portfolio choice using the Mean-CVaR approach has become a research interest given economic and financial circumstances. The world of statistics has provided the copula which has helped many modelers and practitioners. The aim of this research is to use multivariate copula to measure dependence structure between risks in a portfolio and to optimize its risk measured by CVaR. Monte Carlo simulation approach is used for Goodness-of-fit tests in selecting the right copula and the right dependence structure of portfolio in a multivariate framework. Mean-copula-CVaR approach gave results more rigorous in terms of an efficient frontier closer and a more diversified portfolio. We conclude that portfolio selected according to our approach using copula outperform standard Markowitz selection and Mean-VaR optimization. Investor using this approach, can enhance appreciation of risk of his investment and respect more Basle II recommendations.

Keywords: Portfolio optimization, Mean-CVaR approach, multivariate copula, Monte Carlo simulation, Goodness-of-fit tests, efficient frontier, diversification.

Main references

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