Estimating hedged portfolio value-at-risk using the conditional copula: An illustration of model risk

陳怡璇,林化宇
Finance
Management
cathy1107@chu.edu.tw

Abstract

The conventional portfolio value-at-risk model with the assumption of normal joint distribution, which is commonly practiced, exhibits considerable biases due to model specification errors. This paper utilizes the estimation of hedged portfolio value-at-risk (HPVaR) to illustrate the potential model risk due to inappropriate use of the correlation coefficient and normal joint distribution between index spot and futures returns. The results show that HPVaR estimation can be improved by using the conditional copulas and their mixture models to form joint distributions to calculate the optimal hedge ratio. Backtesting diagnostics indicate that the copula-based HPVaR outperforms the conventional HPVaR estimator at both the 99% and the 95% coverage rates. The conventional models obviously underestimate the HPVaR, especially under a 99% coverage rate. We then employ a bootstrap resampling technique to quantify and compare the magnitude of model risk by constructing confidence intervals around HPVaR point estimates. The results suggest that the risk management models should apply a smaller nominal coverage rate (95% instead of 99%) to avoid the model risk mentioned above.

Keyword：Copula; Value-at-risk; Hedge ratios; Backtests; Subprime market crash