Portfolio Optimization via Dynamic Networks and Vine Copulas

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ABSTRACT

This study explores the application of vine copulas combined with network-based methods for portfolio optimization. A DeGARCH technique is employed to preprocess each series to address inherent characteristics such as autocorrelation, conditional heteroscedasticity, and volatility clustering in financial time series. A similarity matrix is then computed from the multivariate DeGARCH data and used to construct a global minimum spanning tree (MST), which facilitates the identification of suitable stocks for portfolio construction. Subsequently, a local MST (LMST) is built from the selected stocks, and a vine copula is applied based on the LMST structure to model the joint distribution. This copula-network-based distribution is then used to determine portfolio weights. The empirical analysis, conducted on component stocks of the S&P 100 index over the 2019–2023 period using a rolling-window framework, shows that the proposed method achieves competitive cumulative returns compared to benchmark approaches.