Bayesian Analysis of Dynamic Cross-sectional Copula Factor Models

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Abstract: Correlation analysis has been an important component of financial risk analysis. However, the nonlinear dependence among financial returns and time-varying features haven't been fully captured by existing models. By incorporating market factors under the CAPM model, we propose a new cross-sectional vine copula factor model and its Bayesian inference to better capture the dependence among financial returns. Vine decomposition is applied to estimate conditional dependence by expressing a high-dimensional distribution by linking the financial returns to the market factors and linking the market factors by copula functions. With the modeling of the marginal distribution of returns using a GARCH-t structure, the proposed model can capture non-linear and non-monotonic dependence while accounting for heteroscedasticity in financial returns. The computation burden due to high-dimensionality and Bayesian iterations now concerns only the number of market factors, regardless of the dimension of financial returns. Simulation study is performed to illustrate that our methodology works in high-dimensional situations. An empirical study with multiple financial time series is also conducted to illustrate this new model.