Cutting Feedback in Misspecified Copula Models

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Abstract:

In copula models the marginal distributions and copula function are specified separately. We treat these as two modules in a modular Bayesian inference framework, and propose conducting modified Bayesian inference by ``cutting feedback''. Cutting feedback limits the influence of potentially misspecified modules in posterior inference. We consider two types of cuts. The first limits the influence of a misspecified copula on inference for the marginals, which is a Bayesian analogue of the popular Inference for Margins (IFM) estimator. The second limits the influence of misspecified marginals on inference for the copula parameters by using a rank likelihood to define the cut model. We establish that if only one of the modules is misspecified, then the appropriate cut posterior gives accurate uncertainty quantification asymptotically for the parameters in the other module. Computation of the cut posteriors is difficult, and new variational inference methods to do so are proposed. The efficacy of the new methodology is demonstrated using both simulated data and a substantive multivariate time series application from macroeconomic forecasting. In the latter, cutting feedback from misspecified marginals to a 1096 dimension copula improves posterior inference and predictive accuracy greatly, compared to conventional Bayesian inference.