

# Regular vines with nonparametric copulas

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Regular vine is a flexible model that combines different bivariate and conditional bivariate copulas into a multivariate one (for overview of the theory and applications see [1]).

Every absolutely continuous density can be represented as a regular vine density. The representation is not unique and the number of possible constructions grows rapidly with dimension. Moreover in general, the conditional copulas will depend on conditioning variables directly, not only through their arguments. For practical reasons, however, it is always assumed that conditional copulas do not depend directly on the conditioning variables. The simplified vine model (with constant conditional copulas) can approximate a density. We do not know, in general, how good the approximation is but we observed that some structures can approximate the density better than the others.

To find a regular vine copula from data one must choose a vine structure, then copula families have to be fixed and then the maximum likelihood estimates of the parameters can be found. Each step of this procedure can lead to model misspecification.

We investigate a different steps of vine copula model construction for few data sets with very unusual bivariate copulas. To approximate these copulas we use Bernstein polynomials (so called Bernstein copulas) and shape preserving cubic splines.

## References

- [1] Edts D.Kurowicka and H. Joe, *Dependence Modeling: Vine Copula Handbook*, World Scientific, (2011).

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