Chapter Outline: Multivariate Copula

1. Introduction to Multivariate copula: - Lit Review

Nelson (Introduction to copulas, pages 151 -154) generalizes all the major copula families from bivariate to multivariate and provides the conditions under which the generalization holds. Not much is mentioned about multivariate dependence in his book, except to generalize quadrant dependence (See reference, GIJBELS et al, Canadian Journal of Statistics, 2010) into orthant dependence.

Multivariate copulas have been mostly used in fields of finance (Fisher et al, Quantitative Finance, 2009) or in fields of hydrology but not much in survival modeling. See (Othus and Li, Statistics in Biosciences. 2010 December; 2(2): 154–179) applied to multi center clinical trial data. They used a semi parametric frailty model, which allow for unrestricted marginal and unrestricted pairwise dependence to model clustered data with time dependent covariate. Also provides the information that there have been two previous works on the area but not accommodating clustered data.

Durante in 2009 proposed a transformation of multivariate copulas into hierarchical copula model with shocks both local and global to the underlying random variables. The paper also talks about effect of such transformation on the Kendall's tau or the Spearman's rho.

Wu et al, in 2014 (Methodology and Computing in Applied Probability) proposed a non-parametric Bayesian methodology, which removes the symmetric constraint for Gaussian copulas.

Chen et al, JASA 2006 proposed a sieve MLE procedure of estimation for a parametric copula distribution with non-parametric marginal.

2. Estimation of dependence parameter and correlation matrix: Lit review
3. Gaussian copula only allows pairwise dependence between the multivariate responses. So finding adequate applicability will be a challenge.
4. Our method revised for multivariate model – estimation of phi
5. Simulation studies
6. Real Data Analysis