

Using Archimedean copulas to model dichotomous data

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This presentation shows that multivariate Archimedean copulas provide several models to accommodate an extra binomial variation in Bernoulli experiments. These model feature parameters for the marginal probability of success and a copula dependency parameter. Maximum likelihood estimator for these parameters are derived and a particular copula model can be selected using the Akaike information criterion (AIC).

Two applications are presented. First, we consider a simple case, without covariates, and construct profile likelihood confidence intervals for the intra-cluster correlation. The second application is concerned with an heterogeneity in capture probabilities in a mark-recapture study for estimating the size of a closed population. Unit level covariates are recorded on the units that are captured and copulas are used to model a residual heterogeneity that is not accounted for by covariates. The parameters are estimated using a conditional likelihood constructed with the data obtained on the units caught at least once. The population size is estimated using a Horvitz—Thompson estimator constructed using the estimated probability that a unit is caught at least once. This generalizes the model of Huggins (1991) that did not account for a residual heterogeneity.

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