SETSCI Conference Indexing System,
Volume 2 (2018), 136-136

ISAS 2018
I[st] International Symposium on Innovative Approaches in Scientific Studies
April 11-13, 2018, Kemer-Antalya, Turkey

A Simulation Study on Dependency Structure of Order Statistics

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Presentation/Paper Type: Oral / Abstract

Abstract- In this study, dependency structure of order statistics which are widely used in statistical hypothesis, prediction problems, statistical process controls, reliability, risk management and many applied areas have been investigated with copulas. Dependency relations of the extreme order statistics $X_{(1)}, X_{(n)}$ have been examined for different n values and the suitability of Clayton, Gumbel, Gaussian and min-max-copula families to the data set has been explored by Chi-square goodness of fit test from depending on the change of these relations. Let's assume that random samples are drawn from $X \sim N(0,1)$ distribution and $X_{(1)}, X_{(2)}, ..., X_{(n)}$ are order statistics of these samples. For different n values (n =2, 0, 20,100) the results classified with 4×4 quartile points for $X_{(1)}, X_{(n)}$ extreme order statistics are obtained. Chi-square (χ^2) values for each copula family is calculated by using the obtained values and repeated $r = 500$ times. According to the analysis results, min-max copula has been found the best-fit copula for small n values. However, none of the copulas have been found suitable for large *n* values. Consequently, although the-best fit copula for dependency structure of order statistics is min-max copula, it is shown with simulation that min-max copula is more convenient for small *n* values.

Key words- dependent structure, order statistics, copula

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