2019년 제 8회 통계세미나

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Copula methods for insurance

<Abstract>

This presentation consists of two parts. In the first part of presentation, we review the recent development in multidimensional copula methods focusing on actuarial and insurance context. Copula is defined as the joint distribution function having standard uniform marginals. In modelling the complicated joint distributions, copula methods allow the modelling the marginal distributions separately from the dependence structure which is completely characterized by copula function only. Hence, assuming the given marginal distributions which are relatively easier to model, modelling of the joint distribution function boils down to modelling of copula functions. We first survey various techniques to construct multidimensional copulas including nested Archimedean copulas, factor copulas, and Vine copulas. Then, we briefly compare the copula models with the dependence modelling methods, including the random effect method, in classic statistical literature. Detailed examples on how to implement the model in insurance sector for each copula model introduced are given. The second part concerns the transformation of copula. Then density function of a continuous distribution can be represented as the product of marginal density functions and the copula function, which leads to intuitive interpretation of conditional distribution and the convenient estimation procedure. However, this is not the case of the copula model having a discrete marginal distribution, where the corresponding density function cannot be nicely separable as did in the copula model with continuous marginals only. In this paper, we provide the copula transformation method which enables the density function of mixed discrete and continuous marginal distributions to be represented as the product of marginal density functions and the copula function. With the proposed method, we show that conditional distribution can be analytically described, and computational complexity in the estimation procedure can be reduced.

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