Melkumova L. E. (Samara, Russia). **Simplified PCC and conditional quantile reproduciblity.**

Pair copula construction is a hierarchical method of constructing multivariate probability distributions using pair copulas, which became widely used since the end of 1990s. The definition of the PCC and its simplified form – «simplified PCC» – can be found in [1]. The PCC is based on the following decomposition of a 3-dimensional conditional distribution using bi-variate distributions and a pair copula:

$$F_{12|3}(x_1, x_2|x_3) = C_{12|3}(F_{1|3}(x_1|x_3), F_{2|3}(x_2|x_3); x_3).$$

The distribution of the triple of random variables (X_1, X_2, X_3) is assumed to be absolutely continuous with strictly monotone marginal distribution functions. In case when $C_{12|3}$ does not depend on x_3 the construction is called the simplified PCC. The assumption of $C_{12|3}$ being independent of x_3 is usually referred to as the «simplifying assumption». This talk puts forward that the simplifying assumption in PCC is equivalent to the conditional quantile reproducibility property for the 3-dimensional conditional distribution function $F_{1|23}(x_1|x_2, x_3)$.

$$q_{1|23}^{(x_1^0, x_2^0, x_3^0)}(q_{2|3}^{(x_2^0, x_3^0)}(x_3), x_3) = q_{1|3}^{(x_1^0, x_3^0)}(x_3),$$

where $q_{i|j}^{(\mathbf{x^0})}(\mathbf{x_j})$ are conditional quantiles going through the point $\mathbf{x^0}$. The conditional quantile reproducibility property and its version, «full» conditional quantile reproducibility, are considered in detail in [2]. [2] also provides some examples of probability distributions with reproducible conditional quantiles and gives a necessary condition of the full reproducibility property in terms of a Pfaffian differential equation of a certain form. In this talk, we also discuss the connection between pair copulas corresponding to different pairs of random variables from the (X_1, X_2, X_3) triple.

REFERENCES

1. *Stober J., Joe H., Czado C.* Simplified pair copula constructions – Limitations and extensions. Journal of Multivariate Analysis, 119 (2013), pp. 101–118
2. *Shatskikh S.Ya., Melkumova L.E.* Reducing the sample size when estimating conditional quantiles. CEUR Workshop Proceedings, 1638 (2016), pp. 769–781