

國立中央大學

統計研究所

學術演講

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講 題：General classes of estimators for bivariate data using copulas

時 間：108年12月31日（星期二）上午11：00 ~ 12：00

地 點：中央大學鴻經館M429室

ABSTRACT

In the first part of this talk, we propose a general copula-based approach for estimating a bivariate common mean vector. We first define the bivariate copula model and then give sufficient conditions for the copula parameter to be uniquely determined by the correlation coefficient. Under the bivariate copula model, we estimate the common mean vector by the maximum likelihood estimator (MLE). In addition, we derive a general form for the Fisher information matrix. Based on the theory of independent but not identically distributed samples, we study the asymptotic properties of the proposed MLE. Simulation studies are conducted to examine the performance of the proposed method, and a real data is analyzed for illustration. The computational programs are made available in R *CommonMean.Copula* package.

In the second part of this talk, we study the copula correlation ratio. We first derive a new expression of the copula correlation ratio. By utilizing the \otimes -product operator, we show that the copula correlation ratio is equal to Spearman's rho of the \otimes -product of two copulas. In addition, our new expression also suggests a natural generalization of the copula correlation ratio by allowing Spearman's rho to be replaced by any other measure of association. Theoretical properties of the copula correlation ratios are investigated, including difference and discontinuity. For multivariate copulas, we also define the copula correlation ratio matrix with showing its invariance property.

Beside the theoretical results, we propose a nonparametric estimation method for the copula correlation ratio. Our fundamental tool is the so-called empirical beta copula that is a special case of the empirical Bernstein copula. We will show that the copula correlation ratio of the empirical beta copula has a closed-form expression. Based on our newly obtained expression, we propose new estimators for the copula correlation ratio and difference measure. Resampling technique of the empirical beta copula is employed to construct confidence interval for our new estimators. Simulation studies are conducted to examine the performance of the proposed method. A real data is analyzed for illustration.

Keywords: Asymptotic theory, Correlation coefficient, Directional association, Fisher information, Invertible copula, Kendall's tau, Markov product, Maximum likelihood estimation, Regression association, Spearman's rho, Stein's identity

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