



Statistical Properties of Bernstein Copulae with Applications in Multiple Testing

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Abstract

A general way to estimate continuous functions consists of approximations by means of Bernstein polynomials. Sancetta and Satchell (2004) proposed to apply this technique to the problem of approximating copula functions. The resulting so-called Bernstein copulae are nonparametric copula estimates with some desirable mathematical features like smoothness. In the present paper, we extend previous statistical results regarding bivariate Bernstein copulae to the multivariate case and study their impact on multiple tests. In particular, we utilize them to derive asymptotic confidence regions for the family-wise error rate (FWER) of simultaneous test procedures which are empirically calibrated by making use of Bernstein copulae approximations of the dependency structure among the test statistics. This extends a similar approach by Stange et al. (2015) in the parametric case. A simulation study quantifies the gain in FWER level exhaustion and, consequently, power which can be achieved by exploiting the dependencies, in comparison with common threshold calibrations like the Bonferroni or the Šidák correction. Finally, we demonstrate an application of the proposed methodology to real-life data from insurance.

Keywords: Asymptotic oscillation behavior, Bonferroni correction, family-wise error rate, p -value, risk management, Šidák correction, simultaneous test procedure

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