Maximum likelihood estimation of a common mean vector in the bivariate FGM copula model for meta-analysis

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Abstract

Bivariate meta-analysis is a method to obtain summary estimate where two outcomes are collected across different studies. However, most existing methods for bivariate meta-analysis are based on the bivariate normal model (Berkey et al. 1998; Riley 2009; Mavridis and Salanti 2011). Then it is natural to consider an alternative model which provides a different dependence pattern from the bivariate normal distribution model.

We introduce a general copula-based approach including model construction, maximum likelihood estimation, and the Fisher information matrix. In this context, we focus on the so-called Farlie-Gumbel-Morgenstern (FGM) copula which has a simple and mathematically attractive form. This form allows some special mathematical identities and tractable Fisher information matrix. These properties make the bivariate FGM copula model suitable for fixed-effects meta-analysis. More details about this talk are seen from the conference paper available from the web and the original article under review (Shih et al. 2018-).

Keywords Asymptotic theory · Copula · Fisher information matrix · Maximum likelihood estimation · Multivariate analysis

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