On exact testing problems in linear models with two variance-covariance components

Julia Volaufova

Abstract

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Linear models with variance-covariance components are used in a wide variety of applications. A special case of models with two variance-covariance components has been studied extensively for decades. Most often the objective of inference is testing linear hypotheses about the mean of the response. Even assuming multivariate normality, it is not clear what test to recommend except in a few special settings, such as balanced or orthogonal designs. Here we shall investigate a simultaneous hypothesis on the mean and on the between-subject variance component (see also Crainiceanu & Ruppert (2004)) and in that setting the likelihood ratio test (LRT) will be studied. Some special cases will be mentioned as well. We shall illustrate some statistical properties of test procedures, such as accuracy of p-values and power obtained by simulation.