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Estimation strategy of multilevel model for ordinal longitudinal data

This paper considers the shrinkage estimation of multilevel models that are appropriate for ordinal longitudinal data. These models can accommodate multiple random effects and, additionally, allow for a general form of model covariates that are related to the overall level of the responses and changes to the response over time. The likelihood inference for multilevel models is computationally burdensome due to intractable integrals. A maximum marginal likelihood (MML) method with Fisher's scoring procedure is therefore followed to estimate the random and fixed effects parameters. In real life data, researchers may have collected many covariates for the response. Some of these covariates may satisfy certain constraints which can be used to produce a restricted estimate from the unrestricted likelihood function. The unrestricted and restricted MMLs can then be combined optimally to form the pretest and shrinkage estimators. Asymptotic properties of these estimators including biases and risks will be discussed. A simulation study is conducted to assess the performance of the estimators with respect to the unrestricted MML estimator. Finally the relevance of the proposed estimators will be illustrated with a real data set.