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Inference on the Common Variance of Correlated Normal Random Variables.

The repeated measures ANOVA design is a model in which correlated normal random variables are analyzed under the assumption that the variables have a common variance. Scale equivariant estimators of the common variance for these random variables have mean squared errors, which depend upon the unknown correlations. For this reason, a scale equivariant estimator of the variance, which uniformly minimizes the mean squared error, does not exist. By considering the special case of equal correlations, the authors have developed three equivariant estimators of the variance; one Bayesian and two non - Bayesian. For one of the two non-Bayesian estimators, we prove that this estimator uniformly beats the MLE in terms of mean squared error. Using computer simulations, we demonstrate that the second non-Bayesian estimator is a further improvement. We then extend these three estimators to the general case of multiple unknown correlations. For the general model, computer simulations demonstrate that the Bayesian estimator outperforms the other estimators in terms of mean squared error. We go on to develop a system of confidence intervals based upon these three estimators, which produce the desired coverage probability while being efficient in terms of expected length. (Received September 20, 2007)