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Estimation of error variance in ANOVA model and order restricted scale parameters

Abstract We consider the estimation of error variance in the analysis of experiments using two level orthogonal arrays. We address the estimator which is the minimum of all the estimators which we obtain by pooling some sums of squares for factorial effects. Under squared error loss, we discuss whether or not this estimator uniformly improves upon the best positive multiple of error sum of squares. We show that when we have two factorial effects, we obtain uniform improvement. However, we show that when we have more than two factorial effects, we cannot necessarily obtain uniform improvement. Further, the above results are applied to the problem of estimating the smallest scale parameter of chi-square distributions.

Keywords Two-level orthogonal arrays · Stein's estimator · Squared error loss · Uniform improvement · Simple tree order restriction · Isotonic regression estimator · Random effects model