A Revision of Tukey Multiple Comparisons Procedure to Control the Probability of Committing at Most One Type I Error

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Abstract

Halperin et al. (1988) suggested an approach which allows for k Type I errors while using Scheffe's method of multiple comparisons for linear combinations of p means. In this paper we apply the same type of error control to Tukey's method of multiple pairwise comparisons. In fact, the variant of the Tukey (1953) approach discussed here defines the error control objective as assuring with a specified probability that at most one out of the p(p-l)/2 comparisons between all pairs of the treatment means is significant in two-sided tests when an overall null hypothesis (all p means are equal) is true or, from a confidence interval point of view, that at most one of a set of simultaneous confidence intervals for all of the pairwise differences of the treatment means is incorrect. The formulae which yield the critical values needed to carry out this new procedure are derived and the critical values are tabulated. A Monte Carlo study was conducted and several tables are presented to demonstrate the experimentwise Type I error rates and the gains in power furnished by the proposed procedure