

Simultaneous Inference in General Parametric Models *

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Abstract

Simultaneous inference is a common problem in many areas of application. If multiple null hypotheses are tested simultaneously, the probability of rejecting erroneously at least one of them increases beyond the pre-specified significance level. Simultaneous inference procedures have to be used which adjust for multiplicity and thus control the overall type I error rate. In this paper we describe simultaneous inference procedures in general parametric models, where the experimental questions are specified through a linear combination of elemental model parameters. The framework described here is quite general and extends the canonical theory of multiple comparison procedures in ANOVA models to linear regression problems, generalized linear models, linear mixed effects models, the Cox model, robust linear models, etc. Several examples using a variety of different statistical models illustrate the breadth

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of the results. For the analyses we use the R add-on package **multcomp**, which provides a convenient interface to the general approach adopted here.

Key words: multiple tests, multiple comparisons, simultaneous confidence intervals, adjusted p -values, multivariate normal distribution, robust statistics.

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