

# A resolution for unbalanced ANOVA

Lynn Roy LaMotte

*LSU Health New Orleans, USA*

## Abstract

Multiple regression models include ANOVA effects with dummy variables, which causes containment issues. Contrast coding has long been used to avoid those problems. Effects can be tested with extra SSE due to deleting corresponding sets of regressors, but it is not always clear exactly what is tested. In models with empty cells, determining what part of an effect is estimable requires extra steps. It is established here that those problems are avoided with contrast coding. Then the model formed by deleting an effect's regressors is the correct restricted model for the target ANOVA effect; the non-centrality parameter is zero if and only if all estimable linear functions of the effect are zero; and no other numerator sum of squares that tests the effect has a greater non-centrality parameter or lesser degrees of freedom.

## Keywords

Restricted model - full model SS; Main effects SS; Contrast coding