Analysis of Medians under Two-Way Model With and Without Interaction for Birnbaum-Saunders Distributed Response

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Abstract

We develop a test for analysis of medians for a Birnbaum-Saunders distributed response to assess the impact of two interacting or non-interacting factors on the median, the scenario where no test is presently available. The proposed test is a likelihood-based test employing the idea of eliminating the nuisance shape parameters through integrated likelihood. The second-order-accurate asymptotic chi-square distribution of the test is derived. Simulation study strongly supports the excellent performance of the test even under small group sizes. Similar test developed under the one-way model is found uniformly superior over its existing peer. The proposed test is straightway extendable under more general multi-way set-up and has the potential to be extended to other non-normal response variables. The importance and genuine need of such small sample ANOVA like procedures in industry, where factorial experiments with non-normal responses are commonly encountered, is highlighted through an in-depth analysis of two real data sets from industry.