

Comparison of Designs for the Three-Fold Nested Random Model

Byoung Cheol Jung* , André I. Khuri** , and Juneyoung Lee***

* Department of Statistics, University of Seoul, Seoul, Korea

** Department of Statistics, University of Florida, Gainesville, FL, USA

*** Department of Biostatistics, Korea University, Seoul, Korea

The quality of estimation of variance components depends on the design used as well as on the unknown values of the variance components. In this article, three designs are compared, namely, the balanced, staggered, and inverted nested designs for the three-fold nested random model. The comparison is based on the so-called quantile dispersion graphs, introduced in Khuri (1997), using analysis of variance (ANOVA) and maximum likelihood (ML) estimates of the variance components. It is demonstrated that the staggered nested design gives more stable estimates of the variance component for the highest nesting factor than the balanced design. The reverse, however, is true in case of lower nested factors. A comparison between ANOVA and ML estimation of the variance components is also made using each of the aforementioned designs.

KEY WORDS : ANOVA, Balanced nested design, Four-stage nested experiment, Inverted nested design, Maximum likelihood, Quantile dispersion graphs, Staggered nested design, Variance components.