

Robustness of variance balanced designs against the unavailability of some observations

Dedicated to Professor Michihiko Kikkawa on the occasion of his 60th birthday

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ABSTRACT. Robustness of variance-balanced designs is investigated, when any number of observations in a block or any two blocks are lost in a design, in terms of efficiency of the residual design. The investigation shows that variance-balanced designs are fairly robust against the unavailability of observations in the set-up mentioned above.

1. Introduction

When some observations become unavailable in a designed experiment for some reason, it is of interest to examine the unavailability of information, defined suitably, that is incurred due to missing data. Designs for which this loss is “small” may be termed *robust*. The robustness of several kinds of block designs against the unavailability of data has been investigated in abundance, for example, see Hedayat and John (1974), Dey and Dhall (1988), Srivastava, Gupta and Dey (1990), Mukerjee and Kageyama (1990), Bhaumik and Whittinghill (1991), Ghosh, Kageyama and Mukerjee (1992), Das and Kageyama (1992) and Dey (1993). For variance-balanced (VB) block designs, Gupta and Srivastava (1992) investigated the robustness of the design against the unavailability of some disjoint blocks. As a special case, they also showed that resolvable balanced incomplete block (BIB) designs are fairly robust against the unavailability of one resolution set consisting of disjoint blocks. On the other hand, Bhaumik and Whittinghill (1991) discussed the optimality of VB designs by showing that the optimal design is derived by removing blocks which have disjoint sets of treatments, and the worst design appears when identical blocks are removed.

We here pay our attention to the following two situations: (i) any number

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