

EXPERIMENTAL DESIGNS IN COMPUTER SIMULATION

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Experimental designs are often used in computer simulation studies. Classical statistical analysis of experimental designs requires variances to be equal. However, in simulation studies this assumption is often violated. The classical way of dealing with unequal variances is application of variance stabilizing transformations. An applied treatment of these transformations may be found in Neter and Wasserman [1].

Application of transformations will make the results of the analysis in terms of the transformed data. Therefore, they are recommended when either the results can be transformed back to the original domain, or the interpretation of results from the transformed data is as sensible as from the original data. Several authors, including Fishman [2], argue that transformations result in finding "the natural scale of data analysis", because the "right" transformation will often reduce the complexity of the model.

However, there are situations in which one is only interested in the parameters of the original data, and inferences based on the transformed data are either not suitable or can not be transformed back to the original domain. In this talk, we outline an approximation method based on the original data for dealing with unequal variances in application of experimental designs. We refer to this method as "OLS with Sample Variances." The basic idea behind the method is to incorporate the ordinary least square estimator with the sample variances. Our goal in this talk is to emphasize the practical application of the method.

Nozari [3] considers incorporating a number of different estimators of the unequal variances with both the ordinary least squares and generalized least squares. Also, a Monte Carlo study is presented in that paper to examine the behavior of these incorporations. It is concluded that "OLS with Sample Variances" performs quite satisfactorily and is better than others.

References

- [1] Neter, J., and Wasserman, W. Applied Linear Statistical Models, Irwin, Homewood, Ill., 1974.
- [2] Fishman, G. S. Principles of Discrete-Event Simulation, John Wiley and Sons, New York, 1978.
- [3] Nozari, A. "Generalized and Ordinary Least Squares With Estimated and Unequal Variances," Communication in Statistics, Simulation and Computation, Vol. 13, 1984, 521-537.

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