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Summary: This work studies the properties of the maximum likelihood estimator (MLE) of a multidimensional parameter in a nonlinear model with additive Gaussian errors. The observations are collected in a two-stage experimental design and are dependent because the second stage design is determined by the observations at the first stage. The MLE maximizes the total likelihood. Unlike most theory in the literature, the approximation made to the distribution of the MLE only involves taking the second stage sample size to infinity, as the resulting approximate model retains the dependency between stages, and therefore, more closely reflects the actual two-stage experiment. It is proved that the MLE is consistent and that its asymptotic distribution is a specific Gaussian mixture, via stable convergence. Finally, the efficiency of the adaptive procedure relative to the fixed procedure is illustrated by a simulation study under three parameter dose-response Emax and Exponential models.

MSC:
62J02 General nonlinear regression
62K05 Optimal statistical designs
62F12 Asymptotic properties of parametric estimators

Keywords:
nonlinear regression; two-stage adaptive optimal design; Gaussian scale mixtures; stable convergence; Emax model; exponential model

Software:
DoseFinding; SAS

Full Text: DOI

References:

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[22] Lane, A.; Wang, H.; Flournoy, N., Conditional inference in two-stage adaptive experiments via the bootstrap, MODa 11-Advances in Model-Oriented Design and Analysis (2016), Springer, 173-181


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