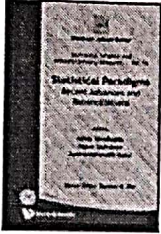


This Chapter



308pp Nov 2014

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H. V. Kulkarni and S. C. Patil (2014) On Confidence Intervals for Expected Response In 2ⁿ Factorial Experiments with Exponentially Distributed Response Variables. Statistical Paradigms: pp. 71-84.

https://doi.org/10.1142/9789814343961_0005

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Chapter 5: On Confidence Intervals for Expected Response in 2ⁿ Factorial Experiments with Exponentially Distributed Response Variables

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The exponential distribution is an important distribution in the analysis of lifetime data. Its one interesting characterization is that interoccurrence times between the successive events of a Poisson process are independent exponentially distributed. In industrial designed-experiments setting, exponentially distributed response variable can be encountered, for example, when the response is inter-occurrence time between successive defective products when the defectives are produced according to a Poisson process. Traditionally in such a situation, the logtransformed response variable is analyzed using ordinary least squares (OLS). However, this approach has its own limitations and the generalized linear models (GLM) appear to be a good alternative. In the present work, a comparative study is attempted for analyzing 2ⁿ factorial experiments for exponentially distributed response variable among GLM, methods based on Edgeworth expansion and a method based on exact distribution of a pivotal quantity. The comparison is based on theoretical considerations and an extensive simulation study related to the coverages and expected length of confidence intervals (LOCI) for the expected response. The method based on exact distribution of a pivotal quantity turns out to be the best among all the approaches. Results of the analysis of a real dataset agree with the theoretical findings.

Keywords: Confidence intervals, Edgeworth expansion, Exact method, Factorial experiments, Generalized linear models