Abstract

The objective of this study is to compare four interval estimation methods for the Poisson, geometric and exponential population means; the methods are Wald method, Score method, Adjusted Wald method and Bayes' method. Bootstrap Score method and Bootstrap Bayes' method are also considered for exponential random variable. The comparison criteria are based on the coverage probability and the average length of the confidence intervals. The study is performed using sample sizes (n) equal to 5, 10, 25, 50 and 100 whereas Poisson population means (λ) are 0.2, 0.4, 0.6, 0.8 and 1, geometric population means $\left(\frac{1}{p}\right)$ are $\frac{1}{0.1}, \frac{1}{0.3}, \frac{1}{0.5}, \frac{1}{0.7}$ and $\frac{1}{0.9}$, and exponential population means (β) are 1, 5, 10, 20 and 30, confidence levels of 90%, 95% and 99% are used. The data are generated through Monte Carlo simulation technique and each case the simulation is repeated 1,000 times. Results of the research are as follows:

Among the methods that have coverage probabilities not lower than the given confidence coefficient, the methods with the smallest average length confidence interval are as follows:

For Poisson population means, Bayes' method using gamma(1,1) as prior distribution is the method that has coverage probability not lower than the given confidence coefficient with the smallest average length confidence interval for all sample sizes and population means.

For geometric population means, when sample size is small $(n < 50)$, the methods are Bayes' method using beta(1,1) as prior distribution when the population means are $\frac{1}{0.1}$ and $\frac{1}{0.3}$ and Bayes' method using beta(1,2) as prior distribution when the population means are $\frac{1}{0.5}$, $\frac{1}{0.7}$, and $\frac{1}{0.9}$. For large sample size $(n \geq 50)$, the method is Bayes' method using beta(1,2) as prior distribution.

For Exponential population means, when sample size is small $(n < 50)$, the methods are Bayes' method and Bootstrap Bayes' method using gamma(0.5,3) and gamma(1,2) as prior distributions. For large sample size $(n \geq 50)$, the method are Wald method, Bayes' method and Bootstrap Bayes' method using gamm(1,2) as prior distributions.