ABSTRACT

The purpose of the project is to select the best method of finding simultaneous confidence intervals of several quantiles that gives the smallest average confidence interval width and highest confidence level for a target population with sample size n. The project also includes the explanation of obtaining simultaneous confidence intervals of quantiles using recursive algorithm explained by Hayter (2014), parametric method for normal population by Liu et al. (2013) & Kolmogorov's method as well as their limitations.

The methods I used in the simulation to obtain average confidence interval width and confidence level are: (i) non-parametric method: recursive method; (ii) parametric method for normal distribution and (iii) Kolmogorov's method. The distributions I used for obtaining a population sample for the simulation are (i) normal; (ii) gamma; (iii) uniform and (iv) beta. In the simulation, I calculate average confidence interval widths for these 4 distributions. I also use Monte Carlo method to find confidence level of simultaneous confidence intervals for specific quantiles in each of the three methods.

The results of the simulation show that if the sample size is small, parametric method (normal) is more suitable for normally distributed population and non-parametric method (recursive) is more suitable for population with gamma, uniform and beta distributions. If the sample size is large, Kolmogorov's method is the best method as it gives the highest confidence level among all 3 methods for all 4 distributions. In the end, Kolmogorov's method is the best method for finding simultaneous confidence intervals of several quantiles for population with unknown population as a large sample is a good representation of the population.