abc.mse R Package

Concept Behind Package

The purpose of this R package is to illustrate Approximate Bayesian Computation (ABC), a simulation-based inference method used to obtain the posterior distribution of parameters given the data. In this R package, we approximate a joint likelihood of the data by simulating the prior probability for the parameter(s) of interest, generate a data set under the parameter(s), and then compare a summary statistic of this data set to the summary statistic of the observed data. We accept the value of the simulated parameter as if it were from the posterior if the difference between the simulated and observed summary statistic are within some error (say epsilon). We iterate through this process a number of times, then we take the mean of the accepted values to be a point estimate of the parameter(s).

For each simulation of the data generating functions, we generate one point estimate of the parameter(s), and so the number of point estimates of the parameter(s) that we obtain is the same as the number of simulations we ran. Taking the mean of these posterior point estimates gives us an ABC estimator, and we calculate the variance of the ABC estimator as well. Then we can calculate the mean-square error to assess the approximation of the estimator. In this program, we find the ABC estimators of exponential distributions, Cauchy distributions (heavier-tailed distribution), and Gumbel distributions (lighter-tailed distribution).

Functions

cauchy_abc() - data generating function for the Cauchy distribution. Generates the posterior point estimates of the location and scale parameters.

exp_abc() - data generating function for the Exponential distribution. Generates the posterior point estimates of the rate parameter.

gumbel_abc() - data generating function for the Gumbel distribution. Generates the posterior point estimates of the location and scale parameters.

mse_abc() - main function that calculates the mean-squared error for the ABC estimators and plots the posterior distribution of the parameter(s)

Access this Package

To access and use this R package, visit:
`https://github.com/Zmhiga/abc.mse.git`