Statistical Method
Homework 3

Due data: 23:59, October 16, 2023

Given the following distributions, use the method of moments (MME) to estimate the model parameters for the two datasets in Homework 2.

- Normal distribution with μ and σ^2.
- Exponential distribution with rate parameter λ.
- Laplace distribution with location parameter μ and scale parameter b.
- Gamma distribution with shape parameter α and rate parameter λ.

Please answer the following questions:

(a) Use the method of moments (MME) to estimate the model parameters.

Distributions	Dataset 1	Dataset 2
Normal	$(\hat{\mu}, \hat{\sigma^2}) =?$	$(\hat{\mu}, \hat{\sigma^2}) =?$
Exponential	$\hat{\lambda} =?$	$\hat{\lambda} =?$
Laplace	$(\hat{\mu}, \hat{b}) =?$	$(\hat{\mu}, \hat{b}) =?$
Gamma	$(\hat{\alpha}, \hat{\lambda}) =?$	$(\hat{\alpha}, \hat{\lambda}) =?$

Table 1: MMEs

(b) For each dataset, add the "fitted probability density functions" of the given distributions to the histograms of the two datasets. Tying to select more suitable distributions to the data based on your opinion.

(c) Plot the "fitted cumulative distribution functions (cdf)" with the empirical cdf of the two datasets.

(d) Provide the necessary evidence for selecting suitable models for the two datasets via suitable hypothesis testings. (could be choose one or more.)

Hints in R:

1. Normal: dnorm(...), pnorm(...), rnorm(...)
2. Exponential: dexp(...), pexp(...), rexp(...)

3. Laplace:
   install.packages("extraDistr")
   library(extraDistr)
   dlaplace(...), plaplace(...), rlaplace(...)

4. Gamma: dgamma(...), pgamma(...), rgamma(...)