Working Problems for BSE 5034 Stochastic Hydrology (2019)

WP-3 Fundamentals of Hydrological Frequency Analysis (HFA-1)

(1) Conduct a Chi-square GOF test to determine whether the data in Problem 2 of WP-2 can be characterized by (i) a Gumbel distribution and (ii) a normal distribution. [Note: the number of categories = 10.]
Note: By default, the chi square test in R is conducted using equiprobable intervals. However, it can be changed by specifying probabilities of individual intervals.
chisq.test(x, p = rep(1/length(x), length(x)))

(2) Conduct a KS GOF test to determine whether the data in Problem 2 of WP-2 can be characterized by (i) a Gumbel distribution and (ii) a normal distribution.

(3) The values of $D_{n,\alpha}$ of the KS GOF test is shown in the following table. Based on the asymptotic distribution of $\sqrt{n}[F_n(X) - F_X(X)]$ derived in Problem 3 of WP-2, design and conduct a stochastic (Monte Carlo) simulation to verify the following table.

$$D_{n,\alpha} = \frac{x_{1-\alpha}}{\sqrt{n}}$$

n	$D_{n,0.05}$	$D_{n,0.01}$
15	0.338	0.404
16	0.328	0.392
17	0.318	0.381
18	0.309	0.371
19	0.301	0.363
20	0.294	0.356
25	0.27	0.32
30	0.24	0.29
35	0.23	0.27
>35	$1.36/\sqrt{n}$	$1.63/\sqrt{n}$