

# Simulation Lab(MC503)

## Assignment-9

*Try to solve all the problems*

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1. Consider the Burr Type XII distribution with

$$\text{PDF } f(x; c, k) = ck \frac{x^{c-1}}{(1+x^c)^{k+1}}; x > 0; c, k > 0$$

$$\text{CDF } F(x; c, k) = 1 - (1+x^c)^{-k}; x > 0; c, k > 0$$

Simulate a random sample of size 50 from this distribution when the values of  $c$  and  $k$  are 1 and 0.5, respectively. Find maximum likelihood estimates (MLEs) of unknown parameters  $c$  and  $k$ . Also, find their mean squared error(MSE), Bias and 95% asymptotic confidence intervals based on 1000 iterations of samples.

2. Consider a real dataset with observations listed as

.70	.84	.58	.50	.55	.82	.59	.71	.72	.61	.62	.49	.54	.36	.36	.71	.35
.64	.85	.55	.59	.29	.75	.46	.46	.60	.60	.36	.52	.68	.80	.55	.84	.34
.34	.70	.49	.56	.71	.61	.57	.73	.75	.44	.44	.81	.80	.87	.29	.50	

Compute MLEs as well as CIs (confidence interval) of  $c$  &  $k$  from both Burr X and Burr XII distributions. Apply the Chi-square and K-S tests to check the goodness fit of the data. The CDF of Burr XII distribution is given by

$$F(x; c, k) = (1 - e^{-(cx)^2})^k; x > 0, c > 0, k > 0$$

3. Consider a real dataset with observations listed as

0.080	0.084	0.102	0.124	0.326	0.358	0.412	0.444	0.456	0.504	0.498	0.564	0.648
0.666	0.682	0.732	0.770	0.814	0.840	0.862	0.882	0.922	0.924	0.964	1.034	1.034
1.048	1.128	1.134	1.172	1.238	1.240	1.242	1.244	1.294	1.302	1.372	1.522	1.526

Check the goodness fit of the data based on the Chi-square and K-S tests for Gompertz distribution. The PDF and CDF of Gompertz distribution is given by

$$f(x) = \beta \eta e^{\beta x} e^{-\eta(e^{\beta x - 1})}; x > 0, \beta, \eta > 0$$

$$F(x) = 1 - e^{-\eta(e^{\beta x - 1})}; x > 0, \beta, \eta > 0$$

..... end .....