Homework 7

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2017/11/21

1

(i)

$$\text{the interval is: } z_{\alpha/2}\frac{\sigma}{\sqrt{n}} * 2\text{so if we want to halve it: } m(n) = 4n$$

(ii)

$$z_{\alpha/2}\frac{\sigma}{\sqrt{n}} = \frac{l}{2}\textbf{so } n = \frac{4z_{\alpha/2}^2\sigma^2}{l^2}$$

(iii)

$$n = \frac{4 * 1.645^2}{0.1^2} \approx 1083$$

2

(i)

the CDF of X: $F(x) = 1-e^{-(x-\theta)}(x > \theta)$so the p.d.f of Y1 is $f_Y(x) = n(1-F(x))^{(n-1)}f(x) = ne^{-n(x-\theta)}(x > \theta)$

(ii)

T is the linear transformation of Y1, the p.d.f of T is:$f_T(y) = \frac{1}{2}e^{-\frac{1}{2}y}I_{y\geq 0}$according to the definition of chi square distr

(iii)

T has the function related to θ but the distribution is irreleventso T is the pivot variable$P(\chi_2^2(1-\alpha/2) \leq T \leq \chi_2^2(\alpha/2)$

3

$T = (n-1)S^2/\sigma^2$ is the pivot variable which is $\sim \chi^2_{(n-1)}$so the confidence interval of σ is: $[\sqrt{\frac{(n-1)S^2}{\chi^2_{(n-1)}(\alpha/2)}}, \sqrt{\frac{(n-1)S^2}{\chi^2_{(n-1)}(1-\alpha/2}}$

4

(i) [0.57202651,0.16659375,0.11972054,-0.33681715,0.04054679,-0.05460625,0.37101069,-0.00665182]
(ii) shown in the folder
(iii) shown in the folder
(iv) shown in the folder

code: written in python, also in the folder. can be opened by jupyter notebook