Hypothesis test using large sample and confidence interval

Friday, April 23, 2021 4:54 PM

q. 2. Hypothesis test for the mean using a large sample :-

Ex-3

$\Sigma t = 2624$, $\Sigma t^2 = 96283$, $n = 80$

$\bar{t} = \frac{2624}{80} = 32.8$

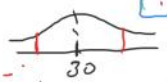
i) $s^2 = \frac{n}{n-1}\left\{\frac{\Sigma t^2}{n} - (\bar{t})^2\right\} = \frac{80}{79}\left(\frac{96283}{80} - (32.8)^2\right)$

$s^2 = 129.31 \Rightarrow s = \sqrt{129.31}$

$z = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{32.8 - 30}{\frac{\sqrt{129.31}}{\sqrt{80}}} = 2.20 > 1.96$

ii) $H_0 : \mu = 30$, $H_1 : \mu \neq 30$ (2-tail test)

5% LOS , $-z = 1.96$ (*)



Method I

$\bar{t} \in \left(30 - 1.96 \times \frac{\sqrt{129.31}}{\sqrt{80}}, 30 + 1.96 \times \frac{\sqrt{129.31}}{\sqrt{80}}\right) = (27.5, 32.5)$

$32.8 \notin (27.5, 32.5)$

Reject H_0

Ex-4

$p = \frac{1}{5} = 0.2$, $q = 0.8$

(i) X - the no. of question Novak answers correctly

$X \sim B(50, 0.2)$

$H_0 : p = 0.2$, $H_1 : p > 0.2$

(ii) (1%) LOS , $z_s = 2.326$

$\frac{18}{50} = 0.36$ ← from sample

$= 0.2 + 2.326 \cdot \sqrt{\frac{0.2 \times 0.8}{50}}$

$= 0.332 < 0.36$

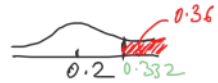
$0.36 > 0.332$ — reject H_0

5% → 0.025 , $z = 1.96$

-1.96

5% → 0.05

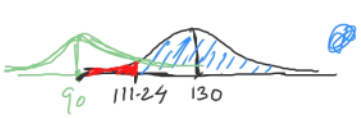
1.645



Ex 5

i) $H_0: \lambda = 130$, $H_1: \lambda < 130$

ii) 5% LOS $\quad Po(130)$



$= 130 - 1.645 \times \sqrt{130}$

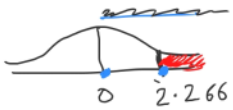
$= 111.24$

Reject H_0 if $x < 111.24$

(iii) $P(\text{Type II error}) \quad N(90, 90)$, $Po(90)$

$= P\left(z > \frac{111.5 - 90}{\sqrt{90}} = 2.266\right)$

$= P(Z > 2.266) = 0.01172$

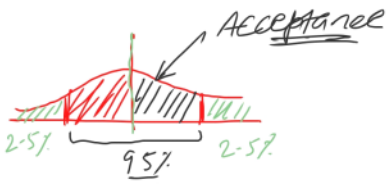


$0.5 - 0.4882$

$= 0.01172$

9.3 Using a Confidence Interval to carry out a hypothesis test:

Ex 6



CI = 95%

$n = 40$, $\bar{x} = 250.3$

$s^2 = 15.8$

(i) $\bar{x} \pm 1.96\frac{s}{\sqrt{n}} = 250.3 \pm 1.96\frac{\sqrt{15.8}}{\sqrt{40}}$

$= (249.1, 251.5)$

(ii) $\bar{x} = 252$

mean is not 252