22/4/20

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CSE 4

① An airline claims that only 6% of all lost luggage is never found. If in a random sample 17 of 200 lost luggages are found. Test the null hypothesis $P = 0.06$ against alternative hypothesis $P > 0.06$ at 5% LOS

Given: $n = 200$

$x = 17$

$\therefore p = \frac{x}{n} = \frac{17}{200} = 0.085$

Given $P = 6\% = \frac{6}{100} = 0.06$

$\therefore Q = 1 - P = 0.94$

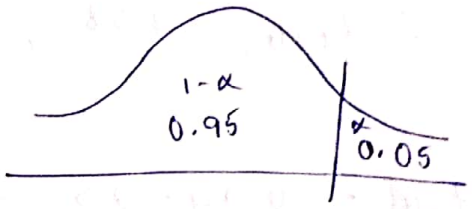
Null hypothesis = H_0 : $P = 0.06$

Alternative hypothesis = H_1 : $P > 0.06$ [Right tail test]

Given $\alpha = 5\% = 0.05$

$Z_\alpha = 1.64$

$Z_{tab} = 1.64$



$$Z_{cal} = \frac{p - P}{\sqrt{\frac{PQ}{n}}} = \frac{0.085 - 0.06}{\sqrt{\frac{0.06 \times 0.94}{200}}} = \frac{0.026}{\sqrt{\frac{0.0564}{200}}}$$

$$= \frac{0.026}{\sqrt{0.000282}} = \frac{0.026}{0.0168} = 1.538$$

$\therefore |Z_{cal}| < |Z_{tab}|$ so H_0 is accepted.

$\therefore$ Airline claims that 6% of loss luggage never found is true.

2) In a sample of 1000 people in Karnataka 540 are rice eaters & the rest are wheat eaters, can we assume that both rice & wheat eaters are equally popular in this state at 1% LOS.

Sol:

Given $n = 1000$

$x = 540$ (rice eaters)

$$p = \frac{x}{n} = \frac{540}{1000} = 0.54$$

Rice eaters & wheat eaters are equi distributed.

$\therefore P = 1/2$ $\quad \therefore Q = 1 - P = 1 - 1/2 = 1/2$

Now, null hypothesis $H_0 :$ $P = 1/2$

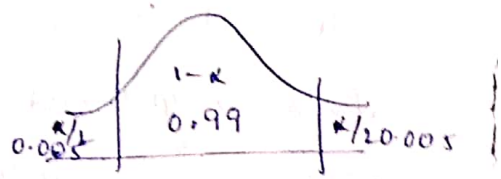
Alternative hypothesis $H_1 :-$ $P \neq 1/2$ [2 tail test]

Given $\alpha = 1\% = 0.01$

$\alpha/2 = 0.005$

$z_{\alpha/2} = 2.58$

$\therefore z_{tab} = 2.58$



Now, $z_{cal} = \dfrac{p - P}{\sqrt{\dfrac{PQ}{n}}}$

$$z_{cal} = \frac{0.54 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{1000}}} = \frac{0.04}{\sqrt{0.00025}} = \frac{0.04}{0.0158}$$

$z_{cal} = 2.5316$

$\therefore |z_{cal}| < |z_{tab}|$ so H_0 is accepted.

$\therefore$ Rice and wheat eaters are equally popular in state.

③ In a study designed to investigate whether certain detonators used with explosives in coal mines meet the requirement that atleast 90% will ignite the explosive when charged, it is found that 174 of 200 function properly. Test the null hypothesis $P = 0.90$ against alternative hypothesis $P < 0.90$ at 5% LOS.

Sol:- given $n = 200$

$x = 174$ $\quad p = \frac{x}{n} = \frac{174}{200} = 0.87$

$P = 90\% = \frac{90}{100} = 0.90$

$Q = 1 - P = 1 - 0.90 = 0.10$

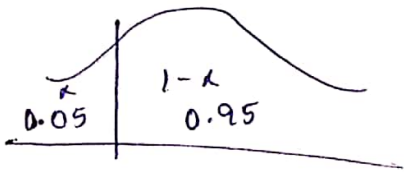
Now, Null hypothesis H_0 : $P = 0.90$

Alternative hypothesis H_1 : $P < 0.90$

(left tail test)

given $\alpha = 5\%$.

$\alpha = 0.05$



$z_\alpha = -1.64 \longrightarrow |z_\alpha| = |z_{1-\alpha}| = 1.64$

$\therefore |z_{tab}| = 1.64$ $\quad$ Now $z_{cal} = \frac{p - P}{\sqrt{\frac{PQ}{n}}}$

$$z_{cal} = \frac{0.87 - 0.90}{\sqrt{\frac{0.90 \times 0.10}{200}}}$$

$$= \frac{-0.03}{\sqrt{0.00045}} = \frac{-0.03}{0.0212} = -1.415$$

$|z_{cal}| = 1.415$ $\quad |z_{tab}| = 1.64$

$|z_{tab}| > |z_{cal}|$ so H_0 is accepted.

$\therefore$ Claim that atleast 90% will ignite the explosive when charged is true.