June 25

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2020

STATISTICAL INFERENCE

14774

Q1

$n = 25, s = 237.52$

$s^2 = (237.52)^2 = 56415.7504$

For 95% C.I $= 1 - 0.95 = 0.05$

$\alpha = 0.05$

$\alpha/2 = 0.025$

$1 - 0.025 = 0.975$

$n - 1$

$25 - 1 = 24$

Critical values $\Rightarrow \alpha/2 = 0.025 = 39.364$

$1 - \alpha/2 = 0.975 = 12.401$

Now we use

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \leq \sigma^2 \leq \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$$

$\alpha/2$

$$\frac{24 \times 56415.7504}{39.364} \le \sigma^2 \le \frac{24 \times 56415.7504}{12.401}$$

$$\frac{1353978.01}{39.364} \le \sigma^2 \le \frac{1353978.01}{12.401}$$

$$34396.35225 \le \sigma^2 \le 109182.9699$$

For 50% C.I

$\alpha = 0.5$

$\alpha/2 = 0.25$

$1-\alpha/2 = 0.75$

Critical values $\Rightarrow$ $0.25 = 28.241$

$0.75 = 19.037$

324

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \le \sigma^2 \le \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$$

$$\frac{1353978.01}{28.241} \le \sigma^2 \le \frac{1353978.01}{19.037}$$

$$47943.69925 \le \sigma^2 \le 71123.49687$$

Q2.) $n_1 = 5$, $S_1 = 3.4$
$n_2 = 5$, $S_2 = 2.6$

$S_1^2 \Rightarrow (3.4)^2 = 11.56$ $v_1 = n_1 - 1 = 5 - 1 = 4$
$S_2^2 =$ 6.76 $v_2 = n_2 - 1 = 6 - 1 = 5$

For 99% C.I
$\alpha = 0.01$
$\alpha/2 = 0.005$
$v_1, v_2 = 15.56$
$v_2, v_1 = 22.46$

Now
$$\frac{S_1^2}{S_2^2} \times \frac{1}{F_{\alpha/2}(v_1,v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{S_1^2}{S_2^2} \times F_{\alpha/2}(v_2,v_1)$$

$$\frac{11.56}{6.76} \times \frac{1}{15.56} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{11.56 \times 22.46}{6.76}$$

$$0.1099 < \frac{\sigma_1^2}{\sigma_2^2} < 38.4079$$

For 90% C.I
$\alpha = 0.10$ $v_1, v_2 = 7.39$
$\alpha = 0.05$ $v_2, v_1 = 9.36$

$\frac{11.56}{6.76} \times \frac{1}{7.39} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{11.56}{6.76} \times 9.36$

$0.231 < \frac{\sigma_1^2}{\sigma_2^2} < 16.0061$

Q3) $\mu = 60, \sigma = 12$

$n = 225$

$\bar{x} = 65$

$\alpha = 2\% = 0.02$

① $H_0 : \mu = 60$

$H_1 : \mu \neq 60$

② $\Rightarrow \alpha = 0.02$

$\alpha/2 = 0.01$

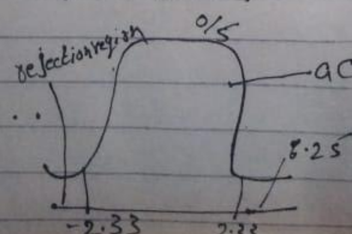
$1 - 0.01 = 0.99$ Finding Z From table

$Z = 2.33$

Z - test

$Z = \frac{x - u}{\sigma/5}$

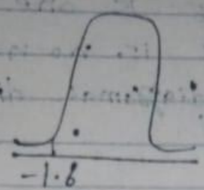
④



$Z > 2.33$

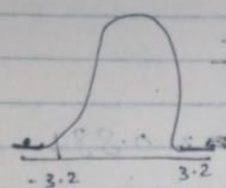
$Z < 2.33$

Q4.



Z = 1.5

We will accept Ho because value is in Acceptance region



Z = 2.9

As value is in acceptance region so we accept the Ho

Q5)

$\mu = 1, n = 20, s = 0.02$

Now $H_0: \mu = 1$

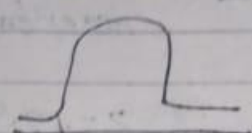
$H_1: \mu < 1$

t-test will be used because "σ" is unknown and sample standard diviation in known

(5) $$Z = \frac{0.93 - 0.88}{\sqrt{\frac{0.88(1-0.88)}{100}}}$$

$$Z = \frac{0.05}{\sqrt{\frac{0.88 \times 0.12}{100}}} = \frac{0.05}{\sqrt{0.001056}} = 1.5386$$

Nature of test is one tail.
because H1 value is no negative
side of the diagrama distribution
It is Lefor tail



for z value

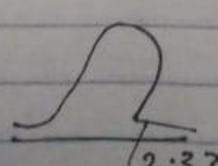
Q6) $\pi \Rightarrow 88\% = 0.88$
$n = 100$
$P = \dfrac{93}{100} = 0.93$

$\alpha = 0.01$ ① $H_0 : \pi = 0.88$
$H_1 : \pi > 0.88$

② $\alpha = 0.01$ $1 - 0.01 = 0.99$
$Z = 2.33$

③ Z-test $Z = \dfrac{P - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}}$

④



$Z > 2.33$

Bonus question asnwers:-

Answer 1:-

PAIR T- TEST:-

A paired t-test is used to compare two population means where you have two samples in which in one sample can be paired with observations in the other sample.

EXAMPLES:-

- Before-and-after observations on the same subjects (e.g. students' diagnostic test results before and after a particular module or course).
- A comparison of two different methods of measurement or two different treatments where the measurements/treatments are applied to the same subjects (e.g. blood
- pressure measurements using a stethoscope and a dynamap).

WHEN IT USE:-

A paired t-test is used when we are interested in the difference between two variables for the same subject. A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample. Before and after observations on the same subjects e.g. students' diagnostic test results before and after a particular module or course

ANSWER 2:-

DIFFERENCE BETWEEN NORMAL T TEST AND PAIR T TEST:-

The normal t test have 1 or 2 population but both the population are different from one another e.g male and female. In a pair t test we also have two populations but are related to one another. e.g population has 5 students. And we take their GPA in two different semester. In this case we have different result in different semester so we consider these 2 different results as 2 population but related to one another. And in such cases we make pairing. A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample.