Hypothesis Testing And Statistical Analysis

① Z Test
② t Test
} ⇒ Average ⇒ Z table → Z score And p value
t table

③ CHI SQUARE ⇒ Categorical Data

④ ANNOVA ⇒ Variance

Z test

i) Population std ii) $n \geq 30$

1) The average heights of all residents in a city is 168cm. A doctor believes the mean to be diffuent. He measured the height of 36 individuals and found the average height to be 169.5 cm. with a $\sigma = 3.9$

(a) State null and Alternate Hypothesis

(b) At a 95% confidence level, is there enough evidence to reject the null hypothesis.

Ans) $\mu = 168cm$ $\sigma = 3.9$ $n = 36$ $\bar{x} = 169.5$

$C.I = 0.95$ $\alpha = 1 - C.I = 1 - 0.95 = 0.05$ // → significance value

① Null Hypothesis $H_0 = \mu = 168cms$

② Alternate Hypothesis $H_1 = \mu \neq 168cm$

③ Based on C.I We will draw Decision Boundary

$1 - 0.025 = 0.9750 \Rightarrow$ Z-score

$\Downarrow$

Area $\Rightarrow \pm 1.96$

find using z-table--->mcrosoftworls-stu-z table

if Z is less than -1.96 or greater than +1.96, Reject the Null Hypothesis.

Z-score $= \dfrac{\bar{x} - \mu}{\sigma}$

$\Downarrow$

$\dfrac{\sigma}{\sqrt{n}}$

Z-test

$$Z_d = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{169.5 - 168}{3.9/\sqrt{36}}$$

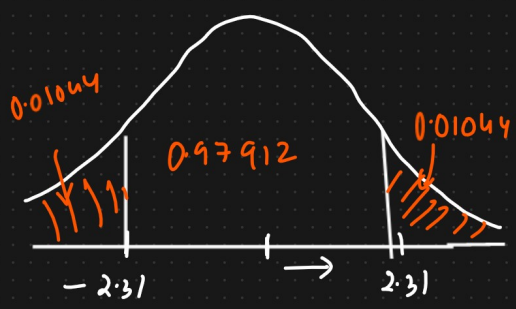
$$Z_d = \frac{1.5}{0.65} = \boxed{2.31}$$

Conclusion

Z-score

$2.31 > 1.96$ Reject the Null Hypothesis

$p < 0.05$



0.98956

$1 - 0.98956 = 0$

$\Downarrow$

Final Conclusion the Average $\neq$ 168cm

The average height seems to increasing based on sample heights.

p value $= 0.01044 + 0.01044$

$= 0.02088$

$p < 0.05$

$0.02088 < 0.05 \Rightarrow$ Reject the Null Hypothesis

(2) A factory manufactures bulbs with a average warranty of 5 years with standard deviation of 0.50. A worker believes that the bulb will malfunction in less than 5 years. He tests a sample of 40 bulbs and find the average time to be 4.8 years.

(a) State null and alternate hypothesis

(b) At a 2% significance level, is there enough evidence to support the idea that the warranty should be revised?

Ans) $\mu = 5 \quad \sigma = 0.50 \quad n = 40 \quad \bar{x} = 4.8$

a) Null Hypothesis $H_0 : \mu = 5$

Alternate Hypothesis $H_1 : \mu < 5$ {1 Tail Test}

b) Decision Boundary

c) Z-test

$$Z_d = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{4.8 - 5}{0.50/\sqrt{40}}$$

$$= -2.53$$

Area under curve with Z score $-2.53 = 0.0570$.

P-value $= 0.0570$ $\quad \alpha = 0.02$

Compare P-value with α

$0.0570 < 0.02 \Rightarrow$ False

We accept the Null Hypothesis ==.

We Fail to Reject the Null Hypothesis.