

Large Sample Test

① Let population mean (μ) amount spent per customer in a restaurant is 250.

A sample of 100 customer selected. A sample mean is calculated as 275 and s_p 30.

Test hypothesis that population mean 250 or not at 5% level of significance.

② A random sample test 1000 students it is found that 750 use pen test.

The hypothesis that population proportion is 0.08 at 1% level of significance.

$$\mu_0 = 250$$

$$\bar{x}_{\text{sample}} = 275$$

$$s_d = 30$$

$$n = 100$$

$$z_{\text{cal}} = (\bar{x}_{\text{sample}} - \mu_0) / (s_d / \sqrt{n})$$

$$z_{\text{cal}} = (" \text{value of } z \text{ is } = ", z_{\text{cal}})$$

$$8.333333$$

$$p\text{value} = 2 \times (1 - \text{pnorm}(\text{abs}(z_{\text{cal}})))$$

$$p\text{value}$$

$$0$$

value is less than 0.05 we will reject

The value of $H_0 = \mu = 250$.

Q1

① $p=0.8$

$$q = 1-p$$

$$P = 750 / 1000$$

$$n = 1000$$

$$z_{\text{cal}} = (p - \hat{p}) / \text{Coart}(p + q/n)$$

coart C value of z_{cal} : " , z_{cal}

value of z_{cal} -3.952847

$$\text{pvalue} = 2 * \text{C1-pnorm}(\text{abs}(z_{\text{cal}}))$$

pvalue

$$7.72268 e^{-05}$$



- ② Random sample of size 1000 and 2000 are drawn from 2 population with some SD. The 5 sample means are 67.5 and 68.

Test hypothesis $H_0: \mu = \mu_0$ at 5% level of significance.

- ④ A study result in 2 Hospital is given below. Test claim 2 hospital have same level of noise at 1% level of significance.

Hos A

84

61.2

7.9

Hos B

34

59.4

7.5

$$\textcircled{3} \quad n_1 = 1000$$

$$n_2 = 2000$$

$$m_{\text{oc1}} = 67.5$$

$$sd_1 = 2.5$$

$$sd_2 = 2.5$$

$$z_{\text{cal}} = (m_{\text{oc1}} - m_{\text{oc2}}) / \sqrt{(sd_1^2/n_1) + (sd_2^2/n_2)}$$

$$z_{\text{cal}}$$

$$-5.163975$$

$$\text{pvalue} = 2 * \text{C1-pnorm}(\text{abs}(z_{\text{cal}}))$$

pvalue

$$2.41754 \times 10^{-7} \quad (\text{Rejected})$$

$$\textcircled{4} \quad n_1 = 84$$

$$n_2 = 84$$

$$m_{\text{oc1}} = 61.2$$

$$m_{\text{oc2}} = 59.4$$

$$sd_1 = 7.9$$

$$sd_2 = 7.5$$

$$z_{\text{cal}} = (m_{\text{oc1}} - m_{\text{oc2}}) / \sqrt{(sd_1^2/n_1) + (sd_2^2/n_2)}$$

$$z_{\text{cal}}$$

$$1.62528$$

$$\text{pvalue} = 2 * \text{C1-pnorm}(\text{abs}(z_{\text{cal}}))$$

pvalue

$$0.25021$$

Ex

$H_0: p_1 = p_2$ against $H_1: p_1 \neq p_2$

$$n_1 = 600$$

$$n_2 = 900$$

$$p_1 = 400/600$$

$$p_2 = 450/900$$

$$p = \frac{(n_1 * p_1 + n_2 * p_2)}{n_1 + n_2}$$

$$p$$

$$0.566067$$

$$q = 1 - p$$

$$q$$

$$0.4333333$$

$$z_{\text{cal}} = \frac{(p_1 - p_2)}{\sqrt{q * (q * (1/n_1 + 1/n_2))}}$$

$$6.381534$$

$$\text{pvalue} = 2 * (1 - \text{norm.pdf}(z_{\text{cal}}))$$

$$1.73322e-10$$

\therefore value is less than 0.01, the value is rejected.

Small Sample Test

- ① The marks are 10 stud are given by 63, 67, 66, 68, 69, 70, 70, 71, 72. Test hypothesis that sample comes from population with avg marks 66.

$$H_0: \mu = 66$$

$$n = 10 \quad (63, 66, 67, 68, 69, 70, 70, 71, 72)$$

t-test (α)

One Sample Test

data : α

$$t = 68.319, df = 9, pvalue = 1.588e^{-13}$$

alternative hypothesis mean is not equal to 10.95%

confidence interval 65.65171 - 70.14829

sample estimated

mean of α

Sample test

$$67.9$$

Since pvalue is smaller we reject the significance of at 5% level of significance

$$\alpha = 0.05$$

If pvalue > 0.05 I cat ("accept H_0 ") if else {"reject H_0 "}

③ 2 groups of stud scored following marks.

Test hypothesis no. of significance btw 2 group.

$$Gp1 = (18, 27, 21, 17, 20, 17, 23, 20, 22, 21)$$

$$Gp2 = (16, 20, 14, 21, 20, 18, 13, 15, 17, 21)$$

t-test (c)

Two sample

data : x y

$$t = 2.2573 \quad df = 16.376 \quad pvalue = 0.03748$$

alternative hypothesis true diff in means is not equal
to 0

95% confidence interval

$$0.1628205 \quad 5.0371795$$

sample estimates :

mean of x mean of y

$$20.1$$

$$17.5$$

rejected

- ③ The scale data of 6 shops before and after a special campaign given below

before : 53, 28, 31, 48, 50, 42

after : 58, 29, 30, 55, 56, 45

Test hypothesis that campaign is effective.

- H_0 : There is no sig diff of sales before and after campaign

$$x = c [53, 28, 31, 48, 50, 42]$$

$$y = c [58, 29, 30, 55, 56, 45]$$

t-test (x, y , paired = T, alternative = "greater")

~~paired t-test~~

data = x and y

$$t = -2.7815, df = 5, p\text{value} = 0.9806$$

alternative hypo: true diff in means is greater than 0.95 percent confidence interval

-6.035547 INR

Sample estimates :

mean of diff -3.5

Accepted.

medical shops . 2 groups of patient

10, 12, 13, 11, 14

8, 9, 12, 14, 15, 10, 19.

If there is sig diff btw 2 medicines

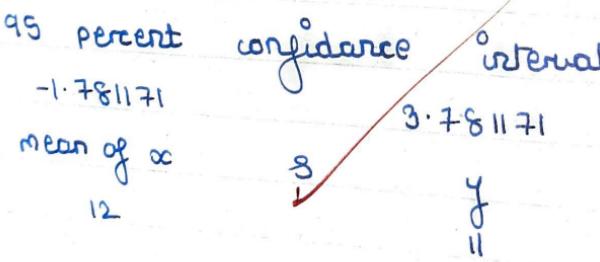
: there is no sig diff

$x = c(10, 12, 13, 11, 14)$

$y = c(8, 9, 12, 14, 15, 10)$

Sample t-test

$t = 0.80384$ $df = 9.7994$ $pvalue = 0.440$



Accept S.I. level of significance

Practical 8

16

$$\textcircled{1} \quad H_0 : \mu = 55 \quad H_1 : \mu \neq 55$$

$$n = 100$$

$$r_{20c} = 92$$

$$r_{20} = 55$$

$$sd = 7$$

$$z_{\text{cal}} = (r_{20c} - r_{20}) / (sd / \sqrt{n})$$

$$z_{\text{cal}}$$

$$[1] = -4.285714$$

$$\text{pvalue} = 2 * (1 - \text{pnorm}(|z_{\text{abs}}|, z_{\text{cal}}))$$

pvalue

$$[1] 1.82153 \times 10^{-5}$$

we reject

$$\textcircled{2} \quad p = 350/700 \quad H_0 : p = 1/2$$

$$n = 700$$

$$p = 0.5$$

$$q = 1-p$$

$$z = (p - \bar{p}) / (\sqrt{pq/n})$$

z

$$[1] 0$$

$$\text{pv} = 2 * (1 - \text{pnorm}(|z|))$$

$$[1] = 1$$

Accept pvalue at $H_0: p = 1/2$

Q1

$$\textcircled{3} \quad n_1 = 1000$$

$$n_2 = 1500$$

$$p_1 = 0.02$$

$$p_2 = 0.01$$

$$p = (n_1 * p_1 + n_2 * p_2) / (n_1 + n_2)$$

$$p$$

$$[1] 0.04$$

$$q = 1-p$$

$$z = (p_1 - p_2) / \sqrt{p_1 q_1 / n_1 + p_2 q_2 / n_2}$$

$$z$$

$$[1] 0.003474737$$

$$p_u = 2 * [1 - \text{pnorm}(\text{abs}(z))]$$

$$p_u$$

$$[1] 0.03708364$$

we reject.

$$\textcircled{4} \quad H_0: \mu = 100$$

$$m_{\infty} = 99 \quad sd = 8$$

$$m_0 = 100 \quad n = 44$$

$$z = (m_{\infty} - m_0) / (sd / \sqrt{n})$$

$$z$$

$$[1] -2.5$$

$$p_u = 2 * [1 - \text{pnorm}(\text{abs}(z))]$$

$$[1] 0.01241933$$

⑤ $H_0:$

$$x = c(63, 63, 68, 69, 71, 71, 72)$$

$t \cdot t(t+eat)$

one sample T. Test

$$t = 47.94$$

$$df = 6$$

$$pvalue 5.522e^{-09}$$

alternative

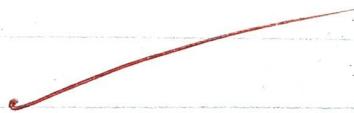
$$69.66479$$

$$71.62092$$

mean of x

$$68.14286$$

we reject H_0 .



⑥ H_0

$$n = 100$$

$$m_0 = 1200$$

$$m_x = 1150$$

$$z = (m_x - m_0) / (sd / \sqrt{n})$$

2

$$[1] 4$$

$$pu = 2 * (1 - pnorm (abs(z)))$$

$$[1] 6.334248e-05$$

we reject.

71

④ $n_1 = 200$

$n_2 = 300$

p_1

p_2

$$p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

$$q = 1 - p$$

$$[r_1] = 0.9128709$$

$$p_{\text{v}} = C_2 \text{ & } C_1 \text{-norm } \| \text{abs}(C_2) \|_1$$

$$p_{\text{v}} [r_1] 0.3613104$$

we accept.

(8)

