Module – III

Non-parametric test.

1: one sample test.

→ Adv of non-parametric test =

* Generally they are easier to do & to understand.
* Sometimes exn formal ordering / ranking is not required.

→ Limitations =

* They ignore a certain amount of info
* They are often not as efficient as parametric test.

The non-paramtric test are, χ^2 test, Sign test, wilcoxon matched pair signed rank test, median test, test of randomness, mean-whitney U test, kruskal-walli test, etc.

⇒ one sample Sign test =

It is applicable whn sample is taken frm a contin symmtrical (ϕ). In this case the prob that the sample value is < mean & the prob that a sample value is > mean are both ½. Suppose we are testing null hypo $H_0: \mu = \mu_0$ against the suitable alternating hypo by using a sample of size n. each sample value > μ_0 is replaced by + sign & each sample value < H_0 is replaced by −ve sign. Then we test null hypo that these + & − sign are the values of r.v having a binomial distrin with $p = 1/2$. In case any sample value is found to be = to H_0. we simply omitt it.

For a small the test is performed by the binomial distrin. for a large sample the normal distrin is used as an approximation to the binomial distrin.

1) It is desire to tst the hypo that the mean value μ of a contin distrin is 15 against the alternative hypo $\mu > 15$. 20 obsr are taken & follo- rslt –

17	18	16	16	17	19	14	13	19	21
22	11	9	12	14	17	23	18	17	16

You may use $\alpha = 0.05$ as a level of S.

A) Replacing each value > 15 with + & each value < 15 with −,

+ + + + + + − − + + + − − − − + + + + + .

now the q is whether 14 + sign

observed in 20 trials. Suppose null hypo $p = 1/2$ and $p > 1/2$.

we can find for $n=20$, & $p = 1/2$ the prob of 14 or more success is 0.05.

$f(x) = {}^nC_x p^x q^{n-x}$.

$P(x \geq 14)$

$P(x=14) + P(x=15) + P(x=16) + \ldots + P(x=20)$

${}^{20}C_{14} (1/2)^{14} (1/2)^6 + \ldots$

Q) Data given below is on a large Industrial plants –

17	15	20	29	19	18	22	25	27	9
24	20	17	6	24	14	15	23	24	26
19	23	28	19	16	22	24	17	20	13
19	10	23	18	31	13	20	17	24	14

use 1 sample sign test to null hypo that plants true avg daily emission of 50 is $\mu = 23.5$ tons against the alternative hypo $\mu < 23.5$ tons at 0.05 LOS?

A) – – – + – – – + + – + – – – + – – –

+ + – – + – – – + – – – – – – – + – – – + –.

These are 11 + sign & 29 – ve.s

$H_0 : p = 1/2 \quad H_1 : p < 1/2$.

$x = 11$, $n = 40$, $p = 1/2$

$$z = \frac{x - np_0}{\sqrt{np_0(1-p_0)}}$$

$$= \frac{11 - 40 \times 1/2}{\sqrt{40 \times 1/2 (1-1/2)}}$$

$$= -2.85$$

Absolute value of computed z,

$|z| = 2.85$

Table value of z is 1.645 at $\alpha = 0.05$.

cal value is > table value

∴ H_0 is reject.