

Confidence Level / Interval



Level of confidence = 95%
Level of significance = 5%

95% case are sure about our analysis that it is true
 α is also called type 1-error

→ Confidence interval for the median base on the sign test.

We need two limits upper and lower.
Our values lies between upper and lower
If k_n corresponding the prob lie k_n in
to sum prob that is our lower limit.

We may obtain a symmetric two sided confidence interval for the popⁿ median by using a procedure that is closely related to the sign test. Thomson and Sator described this procedure and devised the mathematical derivation of the interval

$100(1-\alpha)\%$ confidence interval for them consist of those values of M_0 for which we would not reject the two sided null hypothesis
 $H_0: M = M_0$ at the α level of significance

designate the lower limit of our confidence interval by M_1 and the upper limit of our confidence interval by M_2 as follows

We use table A.1 to determine the largest number of positive or negative sign that value of a such that
 $P(k \leq k_p, n, 0.5) \leq \frac{\alpha}{2}$

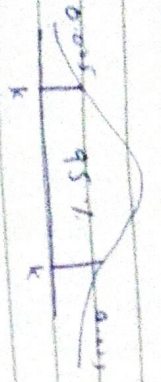
In other words use select k just as we did in 2 sided sign test. When we have average the observations as M_1 . The lower limit of the $(k+1)^{th}$ confidence interval. To find M_2 upper limit of the $(n-k)^{th}$ observation from the upper end is M_2 . Counting from the lower end of the ordered array that is beginning with the smallest sample value we find that M_2 is the $(n-k)^{th}$ value.

Example:-
In a study of side effects of drugs reported data shown below. Let us construct a 95% confidence interval for the median of pops from which these sample data has been drawn
4, 3, 7, 5.4, 3.8, 7.3, 10, 7.5, 2.6 and 1.8.

Arrange data
1.8, 2.6, 3.3, 3.8, 4, 5.4, 7, 7.3, 7.5, 10

S. # 3.

$n=10$
 $n > 10$ (Large sample)



When we refer to the question, we want to construct a 95% confidence interval so we need to find the value of k as observation value.

$$P(k \leq 1 | 10, 0.50)$$

value of k will be referred by cumulative of probability in table as below.

Table A.1 is for Sign test.

k	prob from A1	Cumulative prob
0	0.0010	0.0010
1	0.0098	0.0108
2	0.0439	0.0547
3	0.1172	0.1719
4	0.2051	0.3770
5	0.2961	0.6231
6	0.2051	0.8282
7	0.1172	0.9454
8	0.0439	0.9547
9	0.0098	0.9649
10	0.0010	0.9659

$$P(k \leq 1 | 10, 0.50) = 0.0108$$

$$P(k \leq 2 | 10, 0.50) = 0.0547$$

The wider interval and the higher confidence interval $k=1$ cumulative prob is 0.0108

upper confidence interval = $100(1 - 0.0547) = 94.53\%$ of C.I

lower confidence interval = $100(1 - 0.0108) = 98.92\%$ of C.I

Therefore for the first and 2nd case we will find the upper and lower limits as well.

$1 = k' - 1$
 $= k'' + 1 = 2$ The observation is 2nd observation from each end of the ordered array

Rank	values
1	1.8
2	2.6 → 2nd observation
3	3
4	3.8
5	4
6	5.4
7	7
8	7.3
9	7.5 → 2nd observation
10	10

Rank of upper limit
 Rank of lower limit

#5.

we can say that we are 97.89%
confident that the popⁿ median is b/w 2.6
and 7.5.

Lower Confidence

$$k = 2$$

$$k+1 = 3$$

The observation is
3rd observation from each end of the
ordered array

3 = 3 → lower limit

8 = 7.3 → upper

We can say that we are 89%
confident that the popⁿ median is between
3 and 7.3.