

Topic 8a Confidence Intervals

1. Theory

α = probability of error (Type I)

$1 - \alpha$ = confidence level = probability that a random interval will capture the true value of the population μ

2. Two-sided Interval

Central Limit Theorem

- As the sample size n increases, or as the number of trials n approaches infinite, the shape of a sampling distribution becomes increasingly like a normal distribution
- The mean of a sampling distribution = the mean of population = μ
- The standard deviation of a sampling distribution = $\sigma(x) = \frac{\sigma_x}{\sqrt{(n)}}$

$$Z_{\alpha/2} = \frac{X - \mu}{\sigma / \sqrt{(n)}}$$

Explanation : 100(1- α)% of the possible sample means surround μ in the middle

Margin of error

margin of error = (upper_bound - lower_bound)/2

Sample size n

$$n = \left(\frac{Z_{\alpha/2}(\sigma)}{w} \right)^2$$

3. SAS commands

Proc means

Option	Description
CLM	Lower and upper two-sided 95% confidence interval (CI) for the mean
LCLM	Lower one-sided 95% CI for the mean.
UCLM	Upper one-sided 95% CI for the mean.

Notes: If both LCLM and UCLM are requested, a two-sided CI is computed; otherwise, this option gives you a one-sided interval.

Topic 8b
