STAT 4352 - Mathematical Statistics Notes

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February 28, 2021

1 Chapter 11 - Interval Estimation

Point Estimators
θ is a unknown parameter (feature of a population)

- Ex: population mean μ

- **Fixed.**

$\hat{\theta}$ is a point estimator of θ (it is a numerical value)

- Ex: sample mean $\bar{x}$

- **Varies from sample to sample.**

- No guarantee of <u>accuracy</u>

- Must be *supplemented by* $\text{Var}(\theta)$
    Standard Error $\text{SE}(\hat{\theta})$ measures how much $\hat{\theta}$ varies from sample to sample.
    small SE $\implies$ low variance thus a more reliable estimate of θ

Interval Estimators

Interval Estimate
Provides a range of values that best describe the population.
Let L = L(x) be the Lower Limit
    U = U(x) be the Upper Limit
Both L,U are Random Variables because they are functions of sample data.

Confidence Level / Confidence Coefficient
Is the probability that the **interval estimate** will include population parameter θ.

- Sample means will follow the <u>normal probability distribution</u> for large sample sizes
  $(n \geq 30)$

- For small sample forces us to use the <u>t-distribution</u> probability distribution$(n < 30)$

- <u>A confidence level of 95%</u> implies that **95% of all samples would give an interval that includes θ, and only 5%of all samples would yield an erroneous interval.**

- The most frequently used confidence levels are 90%, 95%, and 99% with corresponding Z-scores 1.645, 1.96, 2.576.

- The higher the confidence level, the more strongly we believe that the value of the parameter lies within the interval.

Confidence Interval

Gives plausible values for the parameter θ being estimated where degree of plausibility specified by a confidence level.

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