Section 8: Inferences about the population Mean

Tuesday, April 4, 2017 2:12 PM

given information about a sample (sample size n, mean $\bar{x}$, std dev s),

we want to estimate μ for the population

example: you test the gas mileage for a number of vehicles of a certain model

$\Rightarrow$ you estimate from that the gas mileage for vehicles of that model

One way of reporting this estimate is a confidence interval:

"with 95% confidence, we estimate that the gas mileage for model X is between 38 and 42 mpg."

rule of thumb for confidence levels:

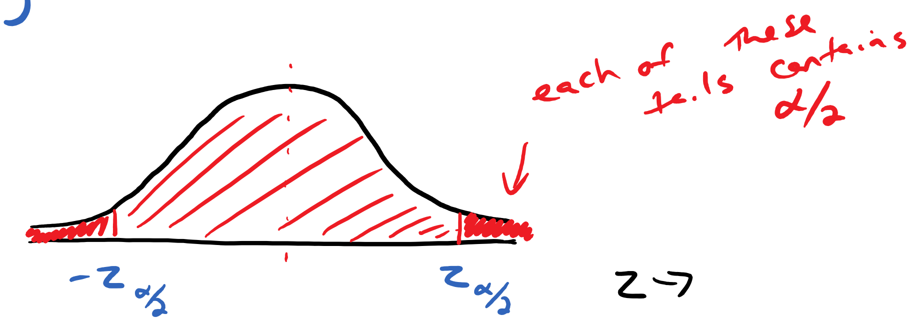
90% used for social science
95% engineering

but if the result may be catastrophic failure, you instead say that you want failure to be "out at six sigma"

how to construct a confidence interval:

you start with the confidence level

let's say 95%



95%

$1-\alpha$

so what's α? 0.05

then the 95% confidence interval is, for <u>large samples</u>,

$$\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

and, again, for large samples, we replace σ by s:

$$\bar{x} - z_{\alpha/2}\frac{s}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\frac{s}{\sqrt{n}}$$

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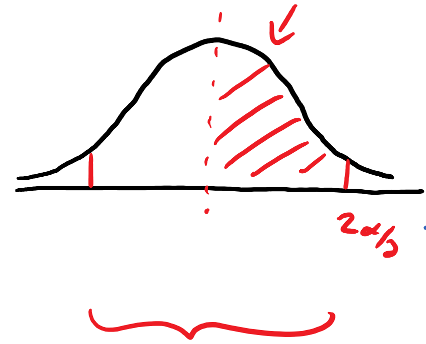
1. volumes of cans of Coke have std dev of

① volumes of cans of Coke have std dev of 2.5 mL ← σ

a random sample of n → 60 cans has an average volume of 355.3 mL. Find a 95% confidence interval for the average volume among all cans of Coke.

$1-\alpha$

$\bar{x}$



so if $1-\alpha = 0.95$

$\alpha = 0.05$

CI: $\bar{x} - z_{\alpha/2}\dfrac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\dfrac{\sigma}{\sqrt{n}}$

$$355.3 - 1.96\left(\frac{2.5}{\sqrt{60}}\right) < \mu < 355.3 + 1.96\left(\frac{2.5}{\sqrt{60}}\right)$$

$$354.7 < \mu < 355.9$$

Conclusion: with 95% confidence, the average volume for a can of Coke is between 354.7 mL and 355.9 mL.