8.6 Confidence Intervals for the Population Mean

Using the Normal Distribution

Translation of the top paragraph on p. 147:
If you follow the correct procedures for constructing the lower and upper bounds of 95% confidence intervals on 100 different samples from 100 different populations, then the true population mean will be between the corresponding lower and upper bounds about 95 times.
If in the rest of your MBA courses you read 100 correctly constructed confidence intervals each at the 95% confidence level, about 95 of the hundred will actually contain the true population mean.

8.7 Determining the Requisite Sample Size for Estimating the Mean

MOE for "margin of error" is often used instead of E in honor of the chief Stooge.

8.8 The t Distribution and Confidence Intervals for the Mean

Translation of first paragraph of Section 8.8:
When you use the sample standard deviation s to estimate the population standard deviation sigma, you are more uncertain than if you already "know" sigma. Gosset, using the pseudonym Student, worked out a way to reflect this precisely IF the POPULATION is normally distributed. Using percentiles of his "t" distribution instead of percentiles of the standard normal distribution "z" gives a wider MOE to reflect the greater uncertainty. t is not appropriate if the population is not approximately normal, regardless of n.

Translation of second paragraph of Section 8.8:
The number of degrees of freedom is n-1 for all confidence intervals resembling those in Chapters 8 through 11.

Example 10: 95% Int = $\bar{X} \pm t_{df} s_{\bar{X}}$

Translation: We can be 95% confident that $\mu$, the mean lifetime of all past, present, and future light bulbs in the population, is at least $\bar{X} - t_{df} s_{\bar{X}}$ hours but no more than $\bar{X} + t_{df} s_{\bar{X}}$ hours.)

Excel: We can be 95% confident that $\mu$ is at least $4000 - \text{TINV}(1-.95,10-1) \times 200 / \sqrt{10}$ hours but no more than $4000 + \text{TINV}(1-.95,10-1) \times 200 / \sqrt{10}$ hours.

We can be 95% confident that $\mu$ is at least $4000 - 2.2622 \times 63.2456$ hours but no more than $4000 + 2.2622 \times 63.2456$ hours.

We can be 95% confident that $\mu$ is at least $3856.9285$ hours but no more than $4143.07$ hours.

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\begin{array}{|c|c|}
\hline
(1 - a) = 95\% = \text{two sided confidence level} & \alpha = .05 = \text{two sided significance level} \\
\hline
t_{df} = \text{TINV}(a, df) = \text{TINV}(1-.95,10-1) = 2.2622 = \text{reliability factor} & s_{\bar{X}} = \frac{s_x}{\sqrt{n}} = 63.2456 = \text{standard error} \\
\hline
t_{df} s_{\bar{X}} = \text{TINV}(a, df) \times \frac{s_x}{\sqrt{n}} = 143.0715 = \text{Margin of Error (MOE), also known as E in Section 8.6} \\
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\end{array}
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