

Section 8.4: Choosing the Sample Size

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2:38 PM

- the precision of your estimate (confidence interval) is measured by the margin of error (or, equivalently, the width of the confidence interval)

∴ when designing your sampling plan, choose sample size to ensure that you get the accuracy you want/need

example: suppose you wish to estimate the mean time between failures for a certain brand of disk drive. From previous experience, you know that σ is in the neighborhood of 200 hours. If you want your estimate of the mean to be accurate, with 99% confidence, to within ± 50 hours of the true value, how many disk drives will you need to test?

$$\text{MOE} \leq B \quad \leftarrow \text{bound} = \text{maximum margin of error}$$

$$z_{\alpha/2} \frac{\sigma}{\sqrt{n}} \leq B$$

$$z_{\alpha/2} \frac{\sigma}{B} \leq \sqrt{n}$$

$$\sqrt{n} \geq \frac{z_{\alpha/2} \sigma}{B}$$

$$n \geq \left(\frac{z_{\alpha/2} \sigma}{B} \right)^2$$

$$\begin{aligned}
 n &\geq \left(\frac{z_{\alpha/2} \sigma}{B} \right)^2 \\
 &\geq \left(\frac{2.58 (200)}{50} \right)^2 \\
 &\geq 106.502 \\
 &\geq 107 \\
 &\quad (\text{round up!})
 \end{aligned}$$

2.58 - either from chart of confidence levels or normal table

You'll need to test at least 110 disk drives to get that margin of error.