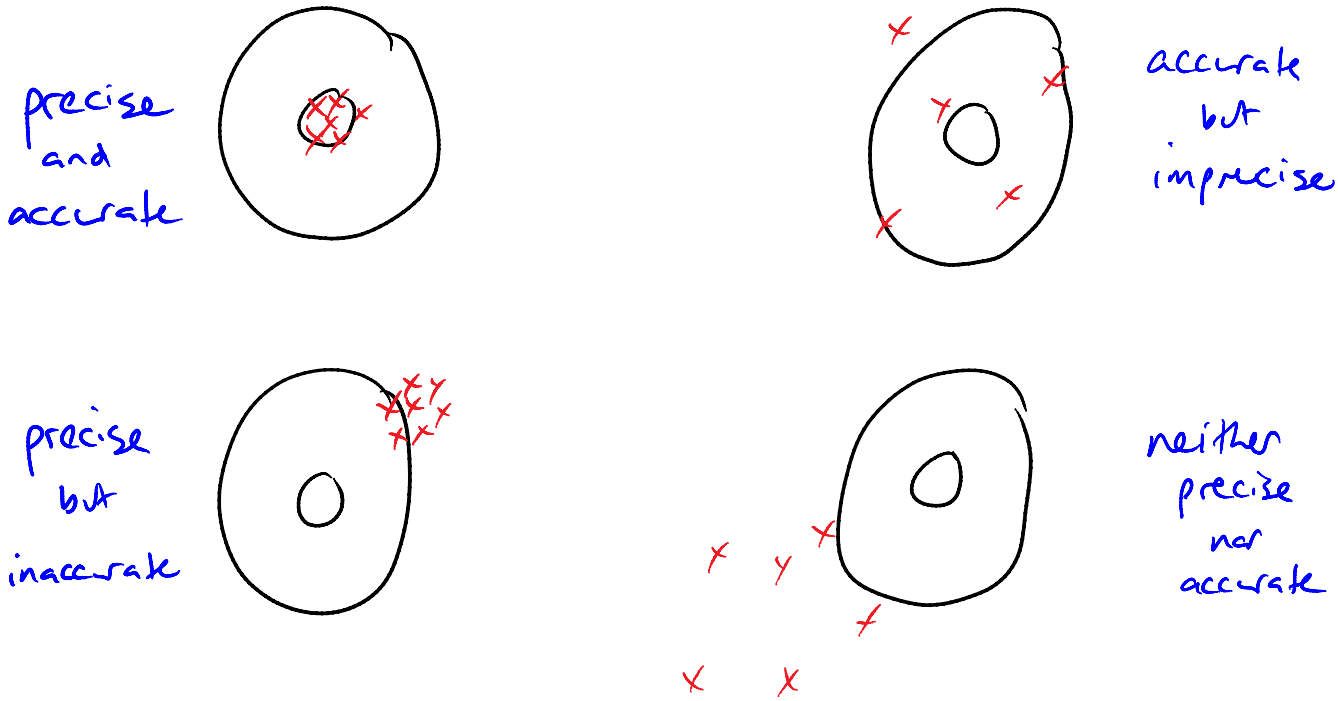
Section 8.1: Cont'd

Tuesday, June 04, 2013
11:31 AM

precision vs. accuracy:



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when estimating the parameter (mean, for example) of a population, you want your estimator to be unbiased

ie. accurate

and you also want the spread (variance / std dev) to be as small as possible

precision

error of estimation - distance between your estimate and the actual parameter

empirical rule: ~95% of all point estimates will fall within the mean plus or minus two times standard error

$$\mu \pm 2\,SE$$

(SE ~ standard error)

from the standard normal table, exactly 95% fall within

$$\mu \pm 1.96\,SE$$

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so, how do we estimate μ from $\bar{x}$ and s?

estimate that $\mu = \bar{x} \pm MOE$

(MOE ~ margin of error)

and to calculate MOE:

for 95% confidence level,

$$MOE = 1.96\,SE$$

1.96 ← normal table

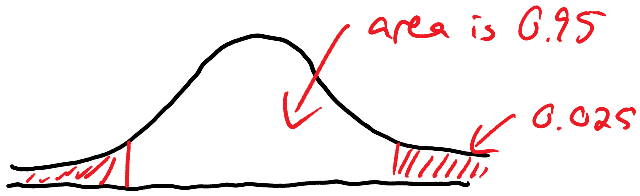
$$SE = \frac{\sigma}{\sqrt{n}}$$

in general, for any confidence level, the MOE is

$$MOE = z_{\alpha/2}\ SE$$

normal table

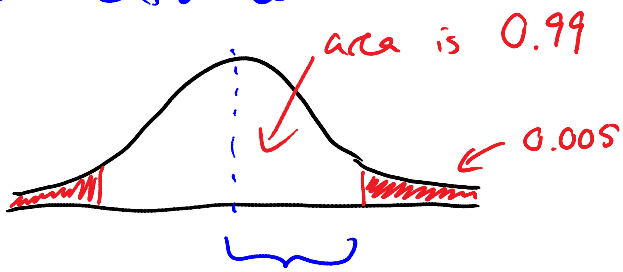
95% confidence



say that $1 - \alpha = 0.95$

α is called the significance level

99% confidence



$$\text{area} = \frac{0.99}{2} = 0.495$$

with $z_{\alpha/2} = 2.575$

or $MOE = z_{\alpha/2}\ SE$

$$= 2.575 \cdot \frac{\sigma}{\sqrt{n}}$$

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example: A sample of 75 plots randomly chosen

in North America's temperate forests produced mean diameters for Douglas fir trees of 85 cm with a standard deviation of 12 cm. Estimate, then, the average diameter of Douglas fir trees for temperate forests in North America, including a margin of error.

- if not otherwise specified, assume a confidence level of 95%

- do we have a large sample? yes, $n \geq 30$

$$\mu = \bar{x} \pm \text{MOE}$$

$$= \bar{x} \pm z_{\alpha/2}\, SE$$

$$= \bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

since $n \geq 30$, ok to approximate σ by s

$$= 85 \pm \frac{1.96\,(12)}{\sqrt{75}}$$

$$= 85 \pm 2.71586$$

note: ridiculous number of sigfigs

$$= 85 \pm 3 \text{ cm}$$

The average diameter of Douglas fir trees in North America's temperate forests is 85 ± 3 cm.

ndk: If we said 99% confidence instead, the margin of error would increase as $z_{\alpha/2}$ increases

if we wanted to know the diameter with 95% confidence still but have a smaller margin of error, what could we do?

→ larger sample size!