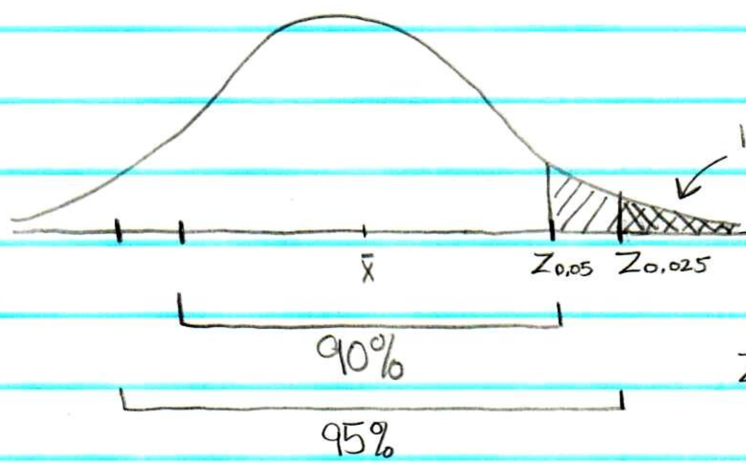
Sample Size

1. Increase the sample size from 25 to 30
   - standard error <u>decreases</u>
   - interval becomes <u>narrower</u>

$$z \cdot \sqrt{\frac{p(1-p)}{n}} \qquad t \cdot \frac{s}{\sqrt{n}}$$

Increasing n decreases se, which decreases M_E.

2. Construct a 95% CI instead of a 90%
   - critical value increases, <u>wider</u> interval
   - probabitity of making an error is <u>smaller</u>



larger Z, smaller probability of making an error, wider interval

$Z_{0.025} > Z_{0.05}$

Confidence Intervals for Sample Means

1. $t_{\frac{\alpha}{2}, df}$ $\quad$ $t_{0.025, 14} = 2.145$
   $CI = 95\%$
   $n = 15$

2. $t_{\frac{\alpha}{2}, df}$ $\quad$ $t_{0.005, 24} = 2.797$
   $CI = 99\%$
   $n = 25$

3. $\bar{X} = 27,\ S = 3.5,\ n = 36,\ 95\%$ $\quad$ $t_{0.025, 35} = 2.03$

$$27 \pm 2.03 \cdot \frac{3.5}{\sqrt{36}} \qquad 27 \pm 1.18$$

$$[25.82, 28.18]$$

4. $\bar{X} = 12.5,\ S^2 = 2.4,\ n = 25,\ 99\%$ $\quad$ $t_{0.005, 24} = 2.797$

$S = 1.55$ $\quad$ drawn from a normal population

$$12.5 \pm 2.797 \cdot \frac{1.55}{\sqrt{25}} \qquad 12.5 \pm 0.87$$

$$[11.63, 13.37]$$

5. $\bar{x} = 2.8$, $s^2 = 0.25$, $n = 20$, 90% $t_{0.05,19} = 1.729$

$s = 0.5$ normally distributed population

$2.8 \pm 1.729 \cdot \frac{0.5}{\sqrt{20}}$ 2.8 ± 0.19

$[2.61, 2.99]$

6. $\bar{x} = \$53$, $s = \$20$, $n = 16$, 90% $t_{0.05,15} = 1.753$

normally distributed population

$53 \pm 1.753 \cdot \frac{20}{\sqrt{16}}$ 53 ± 8.765

$[\$44.24, \$61.77]$

7. $\bar{x} = \$135$ thousand, $s = \$16$ thousand, $n = 25$, 95% $t_{0.025,24} = 2.064$

normally distributed population

$135 \pm 2.064 \cdot \frac{16}{\sqrt{25}}$ 135 ± 6.6

$[\$128{,}800, \$141{,}200]$ $[\$128.8, \$141.2]$ thousand

8. 90% CI for above $t_{0.05,24} = 1.711$

$135 \pm 1.711 \cdot \frac{16}{\sqrt{25}}$ 135 ± 5.48

compare to #7   Narrower Interval, less confidence $[\$129.5, \$140.48]$ thousand

9. Larger sample size with 95% for above $n = 35$

$t_{0.025,34} = 2.032$

$135 \pm 2.032 \cdot \frac{16}{\sqrt{35}}$ $\quad 135 \pm 5.5$

Compare to #7

[\$129.5, \$140.5] thousand

Narrower interval, same confidence

Confidence Intervals for sample proportions

1. $\bar{p} = 10/50 = 0.2$, $n = 50$, 95% CI

$$me = Z_{\frac{\alpha}{2}} \cdot \sqrt{\frac{p(1-p)}{n}} = 1.96 \cdot 0.057 = 0.112$$

2. $\bar{p} = 0.53$, $n = 300$, 95% CI $\qquad Z_{0.025} = 1.96$

$$0.53 \pm 1.96 \cdot \sqrt{\frac{(0.53)(0.47)}{300}} \qquad 0.53 \pm 0.057$$

$[0.473, 0.587]$

3. $\bar{p} = 160/300$, $n = 300$, 90% CI $\qquad Z_{0.05} = 1.645$
$= 0.53$

$$0.53 \pm 1.645 \cdot \sqrt{\frac{(0.53)(0.47)}{300}} \qquad 0.53 \pm 0.048$$

compare to #2 $\qquad [0.482, 0.578]$

narrower, less confidence

4. $\bar{p} = 0.53$, $n = 400$ 95% CI $\qquad Z_{0.025} = 1.96$

$$0.53 \pm 1.96 \cdot \sqrt{\frac{(0.53)(0.47)}{400}} \qquad 0.53 \pm 0.049$$

compare to #2 $\qquad [0.481, 0.579]$

narrower interval, same confidence

5. 0.17 unfriendly $n = 2007$ 95% CI

0.06 an enemy $Z_{0.025} = 1.96$

$\bar{p} = 0.23$ unfriendly or enemy

$$0.23 \pm 1.96 \cdot \sqrt{\frac{(0.23)(0.77)}{2007}} \qquad 0.23 \pm 0.018$$

$[0.212, 0.248]$

6. Candidate B 102 Candidate A $300 - 156 = 144$

Candidate C $\underline{54}$ $\bar{p} = \frac{144}{300} = 0.48$ $n = 300$

156 98% CI

$$0.48 \pm 2.33 \cdot \sqrt{\frac{(0.48)(0.52)}{300}} \qquad Z_{0.01} = 2.33$$

0.48 ± 0.067 $[0.413, 0.547]$

7. $\bar{p} = 0.41$ $n = 1400$ 99% CI $Z_{0.005} = 2.58$

$$0.41 \pm 2.58 \cdot \sqrt{\frac{(0.41)(0.59)}{1400}} \qquad 0.41 \pm 0.0339$$

$[0.3761, 0.4439]$