Panel 1

Wrapping Up

1. Review page 4 of exam 3 ✓
2. Were the 3 exams significantly different from one another? ✓
3. One-tail vs two-tail tests
4. Proportions

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Panel 2

Ex: Weight of flour is labeled as 500g. You suspect it is less.

Pick a sample of 100 bags, weigh them: $\bar{x} = 499.2$ $s = 10$

$H_0: \mu = 500$

$H_a: \mu \neq 500$ — $\mu > 500$ or $\mu < 500$ (2-tail alt.)

actually $\mu < 500$ (1-tail alt.)

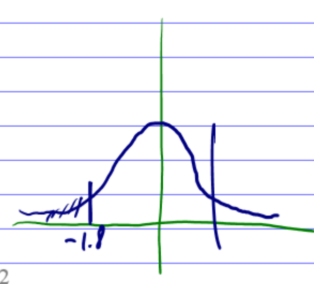
Conclusion of
1-tail test: Reject
2-tail test: inconclusive

$z = \frac{\bar{x} - \mu}{s/\sqrt{100}} = -1.8$ $(+1.8$

$2 \cdot 0.036 = 0.072$

$p = 2 \cdot P(z > 1.8) = 0.0359$

$1.8 \rightarrow .0359$



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Panel 3

Proportions

Our stats tests and confidence intervals apply to numeric variables. (except for Chi-Square test)

Many variables are, however, categorical (nominal or ordinal).

=> Possible Solution: use proportions

Ex: Do you have health insurance?

use proportion of people with health insurance

As a Canadian, do you favor independence for Quebec?

use proportion of Candians for independence

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Panel 4

Consider an experiment with 2 outcomes, labeled

success = 1 failure = 0

Ex: person with health insurance = success, 1

person for independence = success, 1

heads in a coin toss = success 1

Let π be the probability of success: $\pi = P(x=1)$

To estimate π, we would use $\bar{x}$ in a large sample, i.e. average of 1's and 0's

Fact: The standard deviation $S = \sqrt{\pi(1-\pi)}$

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Panel 5

Confidence Interval for a Proportion $\quad n \geq 30$

Recall: $\bar{x} \pm k \, s/\sqrt{n}$ ← std. error $\quad k = 1.645$ or 1.96 or 2.58

Thus: $\bar{x} - k\sqrt{\pi(1-\pi)/n}$ to $\bar{x} + k\sqrt{\pi(1-\pi)/n}$

where $k = 1.645, \; 1.96, \; \text{or } 2.58$
$\qquad\quad 90\% \quad 95\% \quad 99\%$

Ex: A 2006 Florida Poll asked: 'Do you think it is appropriate for state governments to create laws restricting access to abortion'

Of 1200 respondents, 396 said 'yes' (1)

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Panel 6

$\bar{x} = 396/1200 = \underline{0.33}$

$s = \sqrt{\pi(1-\pi)} = \sqrt{0.33(1-0.33)} = \sqrt{0.33 \cdot 0.67} = \underline{0.47}$

(Note: $\bar{x}$ for proportions is always between 0 and 1 and sometimes denoted by $\hat{\pi}$ $(=\bar{x})$)

95% confidence interval goes from

from $\bar{x} - k(s/\sqrt{n}) = \bar{x} - 1.96\sqrt{0.33 \cdot 0.67/1200} = 0.33 - 1.96 \cdot 0.0136 = 0.33 - 0.027 = \underline{0.303}$

to $\bar{x} + k\sqrt{\pi(1-\pi)/n} = 0.33 + 0.027 = \underline{0.357}$

Thus: Less than 36% are for restricting rights

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Panel 7

Similar to regular confidence intervals, you should use a t-distr. if n is small, z-dis. if n is large

Statistical Test about π (for large n)

$H_0: \pi = \pi_0$

$H_a: \pi \neq \pi_0$ (2-tail)

$$t_0 = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{\bar{x} - \pi_0}{\sqrt{\pi_0(1-\pi_0)/n}}$$

I use π_0 to compute σ, indep. of the the s of my sample

$p = 2 \cdot P(z > |t_0|)$

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Panel 8

Ex: To cover increasing cost of services in local government, you can do (a) increase taxes or (b) decrease services

Let π = pop. of voters in favor of raising taxes

$H_0: \pi = 0.5$

$H_a: \pi \neq 0.5$

Ask 1200 voters, 52% - raise taxes (1), 48% - decr. services (0)

$$t_0 = \frac{\bar{x} - \pi_0}{\sqrt{\pi_0(1-\pi_0)/n}} = \frac{0.52 - 0.5}{\sqrt{0.5 \cdot 0.5/1200}} = \frac{0.02}{\#} = 1.39$$

$p = 2 \cdot P(z > |t_0|) = 2 \cdot P(z > 1.39) = 0.16$ inconclusive

This was no help in deciding

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