STT 200 11-2-09

Note Title 11/2/2009

ABOUT EXAM 3: 20 QUESTIONS

SOME Z, T CI USE T TABLE FOR Z OR T CI

IDENTIFY MOE, ESD OF μ, ESD OF σ, ESD OF SD OF $\bar{x}$, OR OF $\hat{p}$

MATCH SETTING TO METHOD

CALCULATE "SPECIAL" ESTIMATORS

(a) $w_1\bar{x}_1 + w_2\bar{x}_2$ W/ w_i: KNOWN POP'N WEIGHTS

(b) $\bar{y} + (\mu_x - \bar{x})R$ $R = b_1$ IN $\hat{y} = b_0 + b_1 x$

REMIND

(1) CALC s_x (SAMPLE SD) FROM LIST $= \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$

(OR CALCULATOR) $\sigma_x = \sqrt{\frac{n}{n-1}}\sqrt{\overline{x^2} - \bar{x}^2}$

(2) T TABLE eg 3 FOR 99% CI

DF	3 for 99% CI
$3 \to \infty$	2.576
CONF LEVEL	90% ---- 99%

(3) T WHEN SAMPLE POPULATION ≈ NORMAL

⇒ FOR SAMPLE (W/R) (NO FPC) 2.353

95% CI FOR μ : $\bar{x} \pm$ ~~1.96~~ $\sigma_x/\sqrt{n}$

eg $n = 4$, DF = 3, 3 | 2.353 (95)

* USE T FOR DF $n-1$ AND 95%

(3) WHENEVER YOU HAVE 95% CI

- e.g. $\bar{x} \pm 1.96\, s_x/\sqrt{n}$ — EST'D MOE FOR $\bar{x}$

  OR $\hat{p} \pm 1.96\, \sqrt{\hat{p}(1-\hat{p})}/\sqrt{n}$ EST'D MOE FOR $\hat{p}$

s_x EST OF σ_x (pop'n)

$\sigma_{\bar{x}} = \sigma_x/\sqrt{n}$

WHY $s_x \sim \sigma_x$?

$s_x = \sqrt{\frac{n}{n-1}}\sqrt{\overline{x^2} - \bar{x}^2} \sim 1 \cdot \sqrt{\mu_{x^2} - \mu_x^2}$

$= \sigma_x$

$1 \leftarrow$

NOTE: $n=1$ $\sigma_{\bar{x}} = \sigma_x$ $n=2$ $\sigma_{\bar{x}} = \sigma_x/\sqrt{2}$

SO NATURAL TO ESTIMATE $\sigma_{\bar{x}}$ BY $s_x/\sqrt{n}$.

SO TOO $\sigma_{\bar{x}} = \left(\frac{\sigma_x}{\sqrt{n}}\right)\sqrt{\frac{N-n}{N-1}}$

SD OF (ISD OF ALL POSS $\bar{x}$'s) — SAMPLE WITHOUT REPL

ANATOMY OF $\bar{x} \pm 1.96 \frac{s_x}{\sqrt{n}}$ — (ESD) MOE

POINT EST OF $\bar{x}$

ALWAYS a 95% CI

$\bar{x}$ (ESD) $\pm$ (MOE) — WHATEVER IT TAKES FOR 95%.

EST OF $p_x - p_y$

$\hat{p}_x \ominus \hat{p}_y \pm 1.96 \sqrt{\frac{\hat{p}_x(1-\hat{p}_x)}{n_x} \oplus \frac{\hat{p}_y(1-\hat{p}_y)}{n_y}}$ MOE

$\hat{p}_x$ = SAMPLE FRACTION OF SMOKERS BUYING LIQUOR.

$\hat{p}_y$ for NON SMOKERS

SETUP: Sm → n_x, NSm → n_y

(4) SOME BETTER (PREFERRED) ESTIMATORS.

(a)

KNOW → $W_1 = .62$, $W_2 = .38$ — Pop x SCORE

$n = 200$??

⇒ JUST SAMPLE EQ PROB AS A WHOLE

(FIND) 92 WOMEN, 108 MEN

#3 11-3-09

$\bar{x}_{WOMEN} = 2.61$

$\bar{x}_x = 3.11$

$\bar{x}_{MEN} = 4.49$

$\bar{x}_y = 4.88$

PREFERRED ESTIMATE OF μ_x IS

NOT $\bar{x}$ (INCL M & W)

RATHER $.62(2.61) + .38(4.49)$

W_1 WT FOR WOMEN IN POP (KNOWN)

AVG x FOR SAMPLE MEN

(NOT $\bar{x}$ $= \frac{92}{200}(2.61) + \frac{108}{200}(4.49)$

~~$\bar{x} \neq \mu$~~

$\bar{x}^* \pm 1.96 \sqrt{W_1^2 \frac{s_{x\,\text{WOMEN}}^2}{n_{x\,\text{WOMEN}}} + W_2^2 \frac{s_{x\,\text{MEN}}^2}{n_{x\,\text{MEN}}}}$

USING POP WTS:

$(\bar{x}^*) \pm 1.96 \sqrt{.62^2 \frac{3.11^2}{92} + .38^2 \frac{4.88^2}{108}}$ 95% CI for μ_x

I MOE FOR $\bar{x}^*$

(5) SETUP VS FORMULA –

y: EST μ_y y = INCOME 5 YRS OUT FOR MSU GRADS (PRESENT MONEY) (OR INFLATION ADJUSTED – ?)
ALSO LOOK UP THEIR GPA x

PLAN TO USE REGR BASED EST OF μ_y GIVEN BY ✡

$$P\left(\mu_y \text{ "IN" } \bar{y} + (\mu_x - \bar{x}) R \frac{s_y}{s_x}\right) \pm 1.96 \frac{s_y}{\sqrt{n}} \sqrt{1-R^2} \sqrt{\frac{N-n}{N-1}}$$

$\rightarrow .95$ AS $n \rightarrow$

SO TOO: WEEKLY ADMISSIONS: (#1 ON 1/3-09)

TALK TELLS US FRACTION → $\hat{p}$ p.

CI for p: $\hat{p} \pm 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

SO TOO DO^5 − MD^5. X = # HAPPY PILLS −

μ_X = AVG # PRESCRIBED.

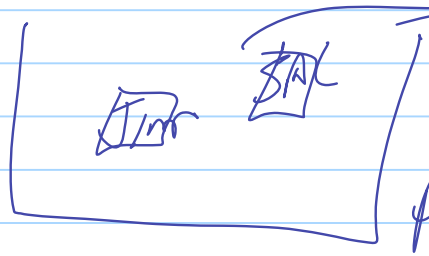
? DIFFERS DO TO MD ? KNOW RATE OF DO^5 IN POP^n OF DOCS −

$$\left(w_{DO}\,\bar{x}_{DO} + w_{MD}\,\bar{x}_{MD}\right) \pm 1.96 \sqrt{w_1^2 \sim \oplus w_2^2 \sim}$$

#2. ILLUSTRATE EQ PR WITHOUT-REPL SAMPLES.

a.  HENRY SAL JIM

SAMPLE OF CONVENIENCE
NOT RANDOM AT ALL

b. 

→ RANDOM SELECTIONS

POP OF PARENTS.

IF SO + IF NO REPEATS
IT IS RANDOM SAMPLE.

c. DIE SIX NAMED FACES.
ROLL IT + GET JIM WILL A JIM

NOT WITHOUT REPL

JIM ALBERT

IF I TAKE
ITS WITH REPL
HENRY

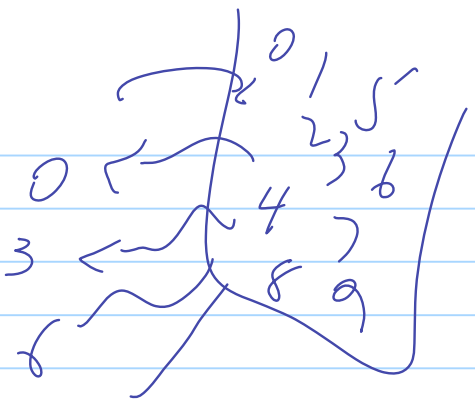
d. USEFUL

(23)

01407

AS IT IS DIGITS WITH REPL.

JIM-0 SOL-1 --- WILLA-J



JIM ALBERT JIM REPEATS JIM SO IT IS WITH REPL.

#4 $n = 400$ HOSPITALS IN SAMPLE (VERY LARGE N CODE FOR WITH-REPL)

SCORE y = FEO # BILLED 2008.

EST μ_y. + MAKE NOTE OF $\bar{x} = 22.2$

$\sqrt{\frac{N-n}{N-1}} \sim 1$ FOR N LARGE

FREE INFO

YOU'VE GOT LEVERAGE TO EXTENT y, x ARE CORRELATED!

GIVEN $\mu_x = 22.2$ (MISSING FROM 1ST POST)

SO PREFERRED EST IS NOT (JUST) $\bar{y}$ BUT

$$\left(\bar{y} + (\mu_x - \bar{x}) R \frac{s_y}{s_x}\right) \pm 1.96 \frac{s_y}{\sqrt{n}} \sqrt{1-R^2}$$

(μ_x: LOOKUP + CALC.; R: EST FROM (x,y))

$$\left(\left(1641.8 + (22.2 - 21.5) \cdot .46 \frac{421.2}{18.2}\right) \pm 1.96 \frac{421.2}{\sqrt{400}} \sqrt{1-.46^2}\right.$$

$\bar{y}$ — GIVEN μ_x — $\bar{x}$ — R

μ_x INCREASES FROM $\bar{y}$