STT 200   5:30 pm   2-15-10a

Note Title   2/15/2010

RECALL ASSIGNMENT IN-CLASS LAST WED.

YOU HAD EACH A BLOCK OF n "Y" or "N".

n	TRUE p
100	.5
100	.4
100	.6
60	.5
60	.4
60	.6
30	.5
30	.4
30	.6

CORRECT WHAT I TOLD YOU LAST PERIOD & REFIGURE WHETHER YOUR CI INCLUDES YOUR TRUE p.

RECALL $\approx 68\%$ CI:

$$\underbrace{\hat{p}}_{\text{POINT ESTIMATE OF } p} \pm 1 \underbrace{\sqrt{\hat{p}\hat{q}/n}}_{\text{STANDARD ERROR OF } \hat{p}}$$

$= \text{EST OF } \sigma_{\hat{p}}$

$= \widehat{\sigma_{\hat{p}}}$

YOUR BASIC $\overset{(\approx)}{\to}$ 68% as $n \to \infty$ PER CLAIM $P(p \text{ IN } \underbrace{\boxed{\hat{p} \pm 1\sqrt{\hat{p}\hat{q}/n}}}_{X/n \text{ RANDOM}}) \to .68$ as $n \to$

[HOW TO ACCOUNT FOR SAMPLING WITHOUT REPLACEMENT?]

CLAIM: $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} \sqrt{\frac{N-n}{N-1}}$

(N = POPULATION SIZE)

DID PROVE

$\text{Var}\,\hat{p} = pq/n$

SO $\sigma_{\hat{p}} = \sqrt{pq/n}$

SO THE APPROPRIATE $\approx 68\%$ CI FOR p: WITH-REPL (INDEP)

$P(p \underset{\text{IN}}{\in} \boxed{\hat{p} \pm 1\sqrt{\hat{p}\hat{q}/n}\,\underbrace{\sqrt{\frac{N-n}{N-1}}}_{\text{FPC}}}) \sim .68$

(WITHOUT)

eg $N=1000$ & $n=80$ WITHOUT REPL.

$\text{FPC} = \sqrt{(1000-80)/(1000-1)} \approx .96$

SECONDLY, TO DEAL WITH DRAWBACK THAT

$n p$ TOO SMALL TENDS TO VOID THE

NORMAL APPROX

BY OFFERING A "TEACHABLE MODIFICATION."

$$\tilde{p}^{\text{ TILDE}} = \frac{X+2}{n+4}$$

offer 68% CI

$$\tilde{p} \pm 1 \sqrt{\tilde{p}\tilde{q}/(n+4)}$$

CLAIM: $P\left(p \text{ IN } \boxed{\tilde{p} \pm 1 \sqrt{\tilde{p}\tilde{q}/(n+4)}}\right) \sim .68$

& THE $\approx$ IS BETTER THAN USING $\hat{p}$ HAT INTERVAL

OVER A BROAD RANGE OF p, n. (IN AN OVERALL SENSE).

ALL HINGES ON $\dfrac{\hat{p}-p}{\sqrt{\hat{p}\hat{q}/n}} \sim Z$ as $n \to \infty$, p fixed

SO TOO $\dfrac{\tilde{p}-p}{\sqrt{\tilde{p}\tilde{q}/(n+4)}} \sim Z$ " BUT FASTER

C	NOT
9	4
14	4
8	8

$\frac{31}{47} = .66$ fairly close to $.68$

PER RECITATION ASSIGNMENT 2-16-10:

#1. GIVEN INDEPENDENT SAMPLES. (CODE FOR WITH-REPL). Y, N, Y, N - - -

"Y" = DEFECTIVE
"N" = NOT "

- a. $n = 60$ b. X = # DEFECTIVE IN SAMPLE = 22

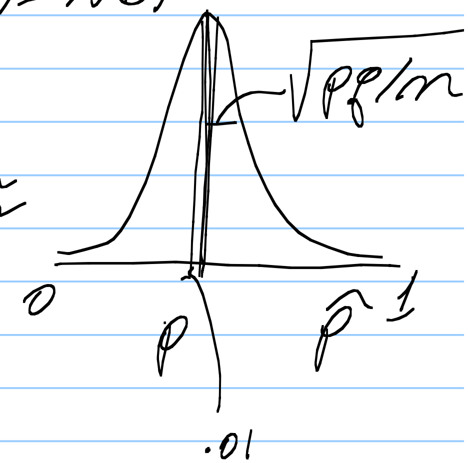
c. LIKELY SIZE OF $P(\hat{p} = p) \sim 0$

eg $P(\hat{p} = .35 \text{ when } p = .35)$ ($\underline{n = 100}$)

$= P(X = 35 \text{ when } p = .35)$

$\overset{\text{BOOK}}{=} \left(\dfrac{100!}{35!\,65!}\right) .35^{35} \, .65^{65} =$

$\approx$



$\underline{\text{SMALL}}$

$\frac{50}{100}$

$P(50 \text{ HEADS FROM A COIN}) = \underbrace{\frac{100!}{50!\,50!}}_{\text{BIG}} \cdot \underbrace{.5^{100}}_{\text{TINY}} \sim \underline{\text{SMALL}}$

CANNOT BE SMALLER THAN 1/101 OBVIOUSLY!

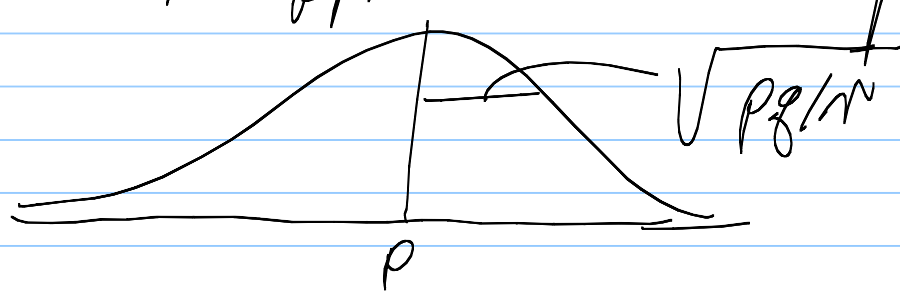
0 1 2 ... 100 ARE POSSIBLE VALUES OF X

1d. $E\hat{p} = E\frac{X}{n} = \frac{np}{n} = p.$

1e. $\sigma_{\hat{p}} = \sqrt{Var \frac{X}{n}} = \frac{1}{n}\sqrt{Var X} = \frac{1}{n}\sqrt{npq} = \sqrt{\frac{pq}{n}}$

1f. SKETCH APPROX DIST^N OF $\hat{p}$.

$\approx$



$np \geq 10$
$nq \geq 10$

1g. WHAT IS $\hat{\sigma}_{\hat{p}} = \sqrt{\hat{p}\hat{q}/n}$ $\sigma_{\hat{p}} = \sqrt{pq/n}$

EST OF $\sigma_{\hat{p}}$ OBTAINED FROM DATA

CALLED STANDARD ERROR.

1h. CI $\frac{22}{60} \pm 1 \sqrt{\frac{22}{60}\frac{38}{60}/60}$

1i. P(p IN 68% CI) ~ .68

1j. p IS ACTUALLY 0.35, DID THE CI 1h COVER p?