Note Title 2/22/2010

STT 200 5:30 2-22-10

(1) Some of the assigned exercises Chapter 20.

(2) Supplement to Chapter 21 (posted) and its example.

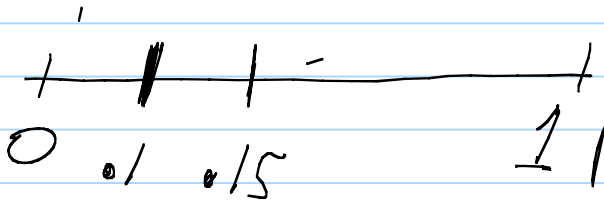
Correction (pg 2 of Supplement) Fourth paragraph

type 2 error rate is 0.04 (not 0.08)

Begin with item (2) Design a test

Sample size n X = # def in sample Reject shipment if $X \geq C$

WE'LL SOLVE FOR THAT n & C FOR WHICH



p = POPULATION FRACTION DEFECTIVES.

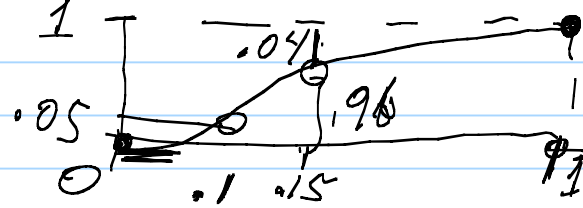
CHOOSE n, C (POLICY REJECT SHIPMENT IF X = #DEF IN SAMPLE $\geq C$)

WHERE [TYPE 1 ERROR PROBABILITY IS .05
MEANS P(REJ SHIPMENT IF $p = .1$) $\sim .05$]

[TYPE 2 ERROR PROBABILITY IS 0.04 (NOT TYPO 0.08)
MEANS P(FAIL TO REJ SHIPMENT IF $p = 0.15$) ~ 0.04]

SO ERROR OF TYPE 1 (FIRST KIND) (REJ H_0 WHEN IT TRUE)
I.E. " " " $2(2^{nd}$ ") (FAIL TO REJ H_0 WHEN $p = 0.15$)

QUES. $P(\text{FAIL TO REJ } H_0 \text{ WHEN } p=.1) = 1 - P(\text{REJ } H_0 \text{ WHEN } p=.1)$



$P(\text{REJ } H_0 \text{ when } p) = 1 - .05 = .95$

POWER FUCTION

ASIDE

HOW TO DO THIS?

SPECS ARE (.1) .05 (.15) .04 ⇒ ?

n, c

$\frac{.04}{\sigma/\sqrt{n}} - z_0 = 1.645$

z

1.64 ← .95

$\frac{.04}{.01} = 2.01$

use 1.645

INTERPOLATION

$z_1 = -1.75 \quad \frac{.04}{\sigma/\sqrt{n}}$

.0401

-1.7 ←

$$n \cong \left(\frac{\sqrt{p_0 q_0}\,|z_0| + \sqrt{p_1 q_1}\,|z_1|}{p_0 - p_1} \right)^2 = \left(\frac{\sqrt{.1 \cdot .9}\,1.645 + \sqrt{.15 \cdot .85}\,1.25}{.1 - .15} \right)^2$$

~ 500.3 ROUND UP 501 $\therefore n = 501$

$$C = z_0\sqrt{n p_0 q_0} + 0.5 + n p_0 = 1.645\sqrt{500.3 \cdot .1 \cdot .9} + 0.5 + 500.3(.1)$$

(use 500.3)

$= 61.398$

ROUND UP TO 62.

SO WE BEGAN WITH SPECS.

n REJ H_0 IF X (#DEF IN SAMPLE) $\geq C$.

WISH: [IF $p = .1$ (10% DEF IN SHIPMENT) WANT P(REJ SHIPMENT) $\cong .05$

IF $p = .15$ (15% DEF ") " $P(\text{FAIL TO REJ SHIPMENT}) \approx .04$

$\Rightarrow$ BY NORMAL APPROX $n = 501$ $C = 62$

NOW LET'S DO $\hat{p}$! PG 3 OF SUPPLEMENT.

" " " " " " - - - - "DEF"

ACTUAL $p = .13$

POP^N N LARGE

(BERNOULLI TRIALS)

- - — - - TOTAL OF 501

COUNT $X = \#$ DEF FINDING $67 = X$ DEFECTIVES

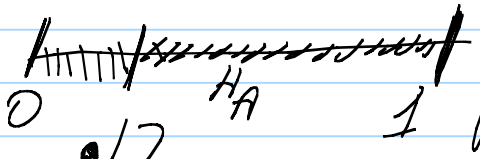
SINCE $C = 62$ & POLICY IS REJ SHIPMENT IF $X \geq C = 62$

In Oman. WE SPEC'D A TEST.

$\Rightarrow n = 501, C = 62$ REJ IF $X \geq C$

$67 \geq 62 \Rightarrow$ REJECT SHIPMENT

YOUR EXERCISE pg 404.



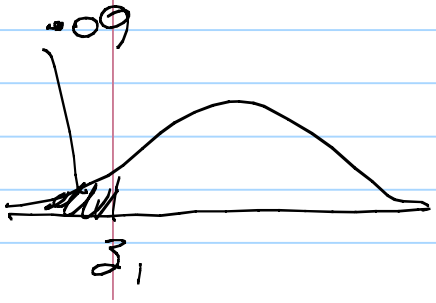
.17

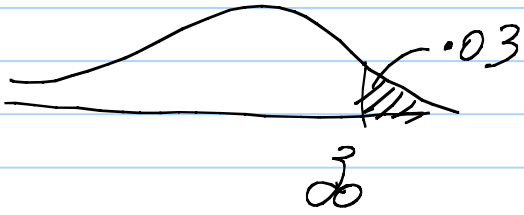
$H_0: p = .17$

p = FRAC OF POPN REQUIRING IMMUNIZATION

SPEC: FOR $p = .17$ WISH $P(\text{REJ } H_0) \tilde{=} .03$

FOR $p = .21$ WISH $P(\text{FAIL TO REJ } H_0) \tilde{=} 0.06$





THEN $n \doteq \left(\dfrac{\sqrt{.17 \cdot .83}\,|z_{.01}| + \sqrt{.21 \cdot .79}\,|z_{.11}|}{|.17 - .21|} \right)^2$

ROUND UP

C AS IN SHEET.

CHAPTER 20. ASSIGNED EXERCISES.

7. POLL TV SPOTS POLL $\hat{p}_{BEFORE}$ $\hat{p}_{AFTER}$ p = FRACTION OF POPULATION RECOGNIZING CANDIDATES NAME.

ARE ADS EFFECTIVE? GIVEN P-VALUE = 0.033.

WAY 1

P(IN ABSENCE OF INCREASE IN RECOGNITION OF CANDIDATE WE'D HAVE GOTTEN DATA WITH MORE DISCREPANCY $P_{AFTER} - P_{BEFORE} \geq$ WHAT WE SAW) ~ 0.033.

WAY 2

AROUND 33/1000 (JUST BY LUCK OF DRAW, NO BENEFIT FROM TV) WE'D SEE THIS MUCH (OR MORE) APPARENT BENEFIT FROM TV.

WAY 3.

IF YOU WERE TO REJ HYP TV HAS NO BENEFIT IF P-VALUE < 0.01 (SAY) THEN YOU'D WRONGLY REJ HYP IN 1/100 CASES WHERE HYP IS TRUE.

#11. $H_0: p = .96$ (p_0)

$H_A: p > .96$

Ck $200(.96) \geq 10$ ok

[$200(.04) >$ NOT QUITE] ← ?

$H_0: \hat{p} = .96$

$H_0: \hat{p} \neq .96$

$200(.96) \geq 10$

p = FRAC OF POPULATION WHO SUCCEED.

$\hat{p}$ = SAMPLE FRACTION $\frac{188}{200} = .94$

$SD(\hat{p}) = \sqrt{pq/n} = \sqrt{\frac{.96 \cdot .04}{200}}$

$SD(\hat{p}) = \sqrt{\hat{p}\hat{q}/n} = \sqrt{\frac{.94 \cdot .06}{200}} = .017$

$z = \frac{\hat{p} - p_0}{\sqrt{p_0 q_0 / n}} = \frac{.94 - .96}{\sqrt{.96 \cdot .04/200}}$

$z = \frac{.96 - .94}{.017} = 1.18$

REALLY WRONG NEG OF CORRECT.

$P(z > "-1.18") \geq 0.881$

P-VALUE $= P(z > 1.18) = 0.12$ SMALL

OBVIOUSLY SAMPLE $\hat{p} = .94 < p_0 = .96$ IN MY SETUP DOES NOT ARGUE IN FAVOR OF H_A.

RESET THE PROBLEM #1. $H_0: p = .96$

$H_A: p < .96$

$$P\text{-VALUE} = P\left(Z < \frac{\hat{p} - p_0}{\sqrt{p_0 q_0 / n}}\right)$$

(MORE EVIDENCE AGAINST H_0 TOWARDS H_A IS LEFT IN THIS SETUP)

$$= P\left(Z < \frac{.94 - .96}{\sqrt{.96 \cdot .04 / 200}}\right) = P(Z < -1.44) = .075$$

FOR THIS SETUP P-VALUE = 0.075.
THIS CAN BE TAKEN AS EVIDENCE THAT p MAY BE LESS THAN 0.96. IT IS NOT REALLY CONVINCING SINCE AROUND 7.5% CHANCE WE'D SEE THIS MUCH (OR MORE) EVIDENCE FOR A DROP IN p EVEN IF $p = 0.96$.

CAN WE ARGUE THAT IN #11 WE SHOULD USE THE SETUP $H_0: p = 0.96$ $H_A: p < 0.96$?
I AM NOT CONVINCED. AFTER ALL, THE

TEST CAN ONLY HAVE A USEFUL RESULT IF THE NEW INSTRUCTIONS ARE ACTUALLY BAD AND REDUCE THE SUCCESS RATE!

AS I SET IT UP FIRST THE TEST HAS A USEFUL RESULT IF THE NEW INSTRUCTIONS PROVE TO IMPROVE SUCCESS, (WHAT THEY'RE SUPPOSED TO DO!)