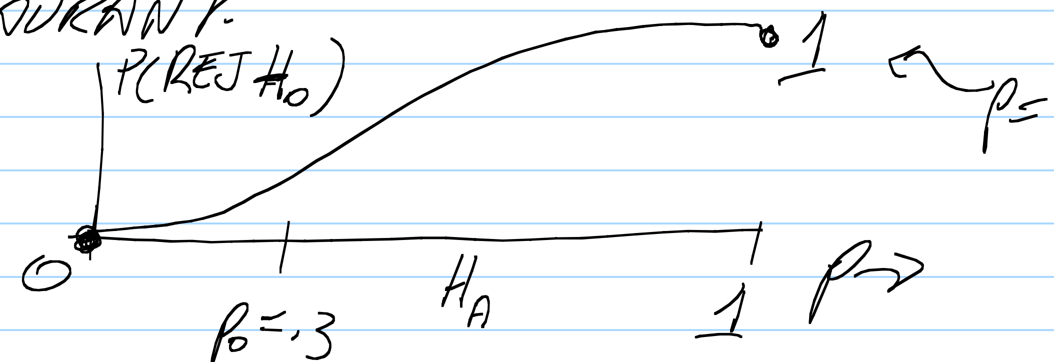
STT200 12-7-09

Note Title 12/7/2009

1. p = (NOT KNOWN) IS FRACTION OF BEVERAGE ORDERS FOR COKE IN A RESTAURANT.

($p_0 = .3$ GIVEN)

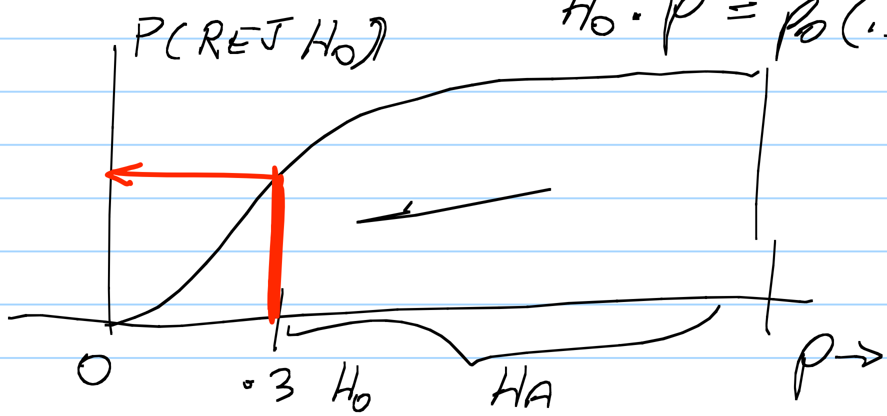
eg .3 (HISTORY)



GIVEN $p_0 = .3$
NOT GIVEN H_A
ARE GIVEN

$H_0: p = p_0$ (.3)

$H_A: p > .3$



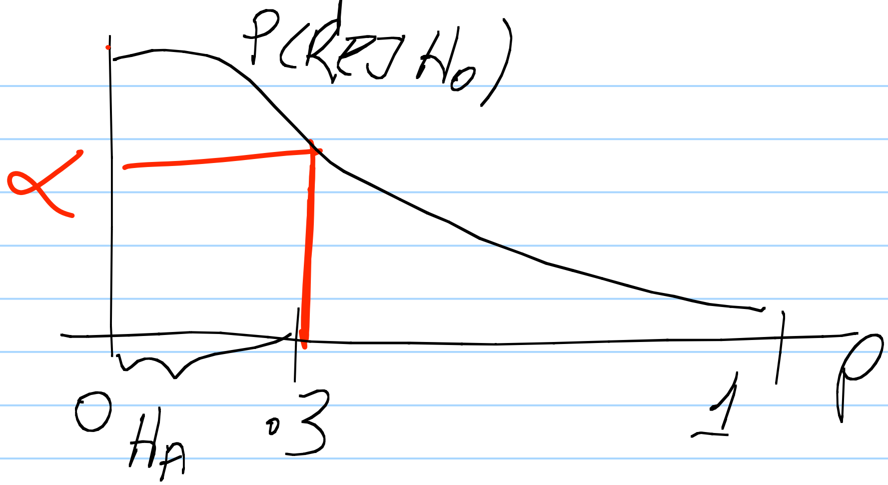
α

ALPHA

WANT P(REJ H_0) WHEN H_0 IS TRUE TO BE SMALL.

IF INSTEAD GIVEN $p_0 = .3$

AND

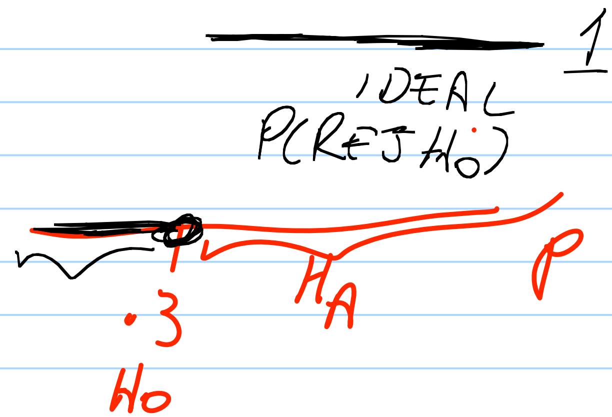


P(TYPE I ERROR) $= \alpha$

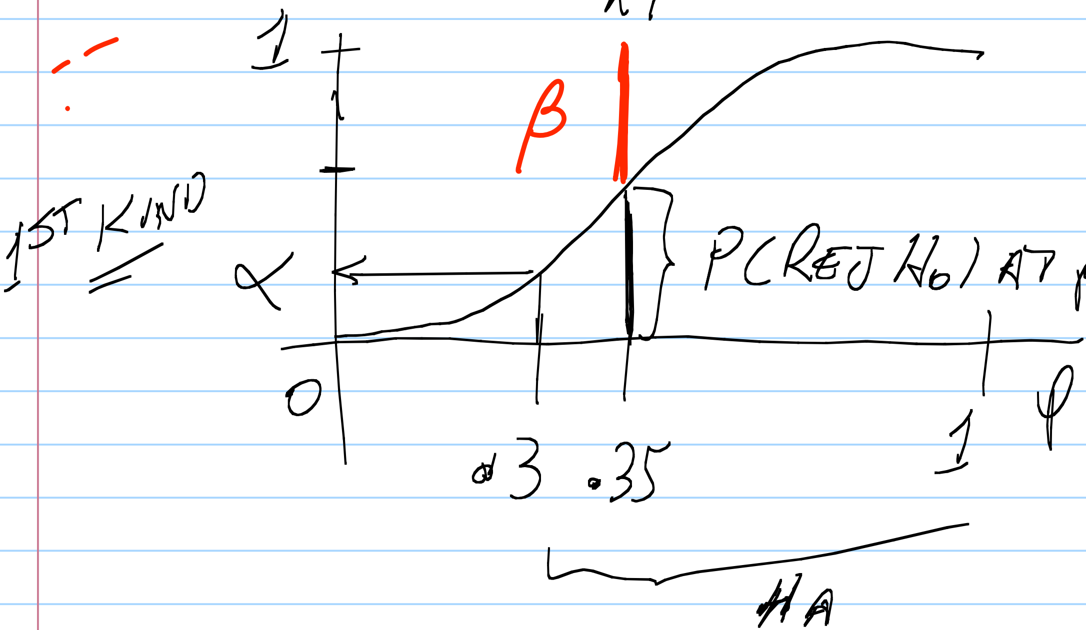
READ OFF THE CURVE

= P(ERROR OF THE FIRST KIND)

FIRST ONE ABOVE



(c) DETERMINE $\hat{\beta}$ = P(FAIL TO REJECT H_0) AT $p = .35$



$\beta = 1 - P(\text{REJ } H_0)$ AT $p = .35$

β CALLED TYPE 2 ERROR PROBABILITY

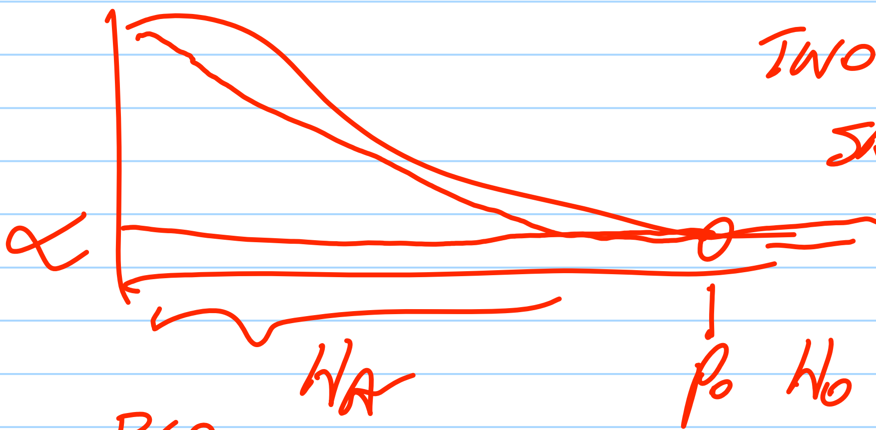
CRIMINAL JUSTICE? H_0: INNOCENT

H_A: NOT

? P(CONVICT INNOCENT) $= \alpha$ P(FAIL TO CONVICT INNOCENT) $= \beta$

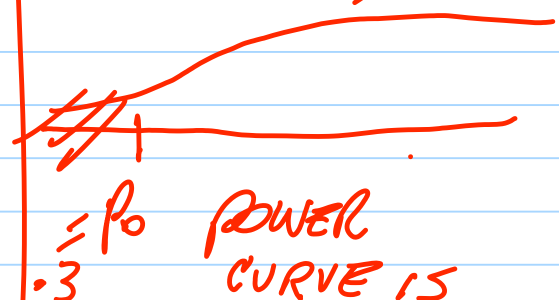
DO WE KNOW THESE?

2.



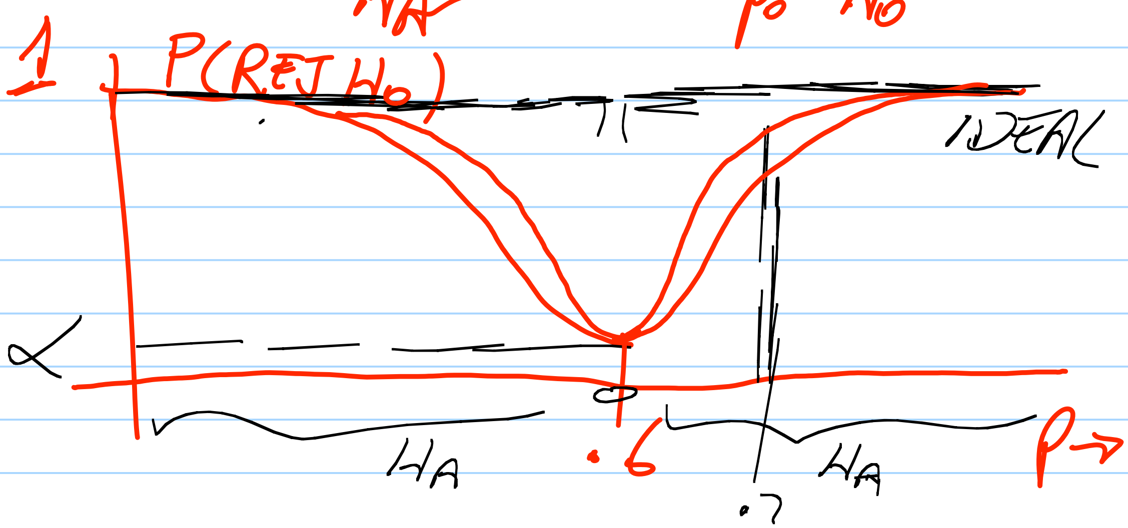
TWO TESTS - EACH OF SAME H_0. SAME α

(ADMISSION)



POWER CURVE IS ONLY ON H_A TECHNICALLY

3.



$H_0: p = .6$ $H_A: p \neq .6$

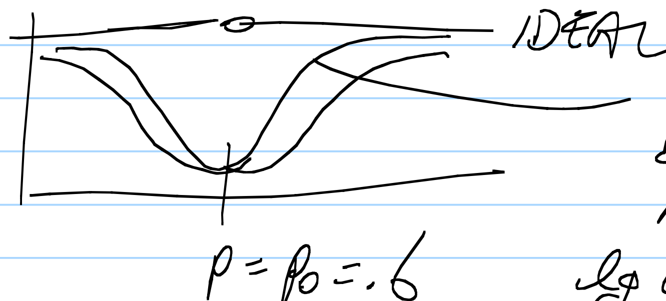
TWO - SIDED TEST (WHY?)

ONE SIDED IF H_A IS ALL TO ONE SIDE OF H_0

- TWO SIDED — H_A BOTH SIDES OF H_0.

3c. IDEAL (DONE ABOVE)

3d. WHICH IS BETTER TEST — CLOSER TO IDEAL.



BETTER - USUALLY BASED ON MORE INFO

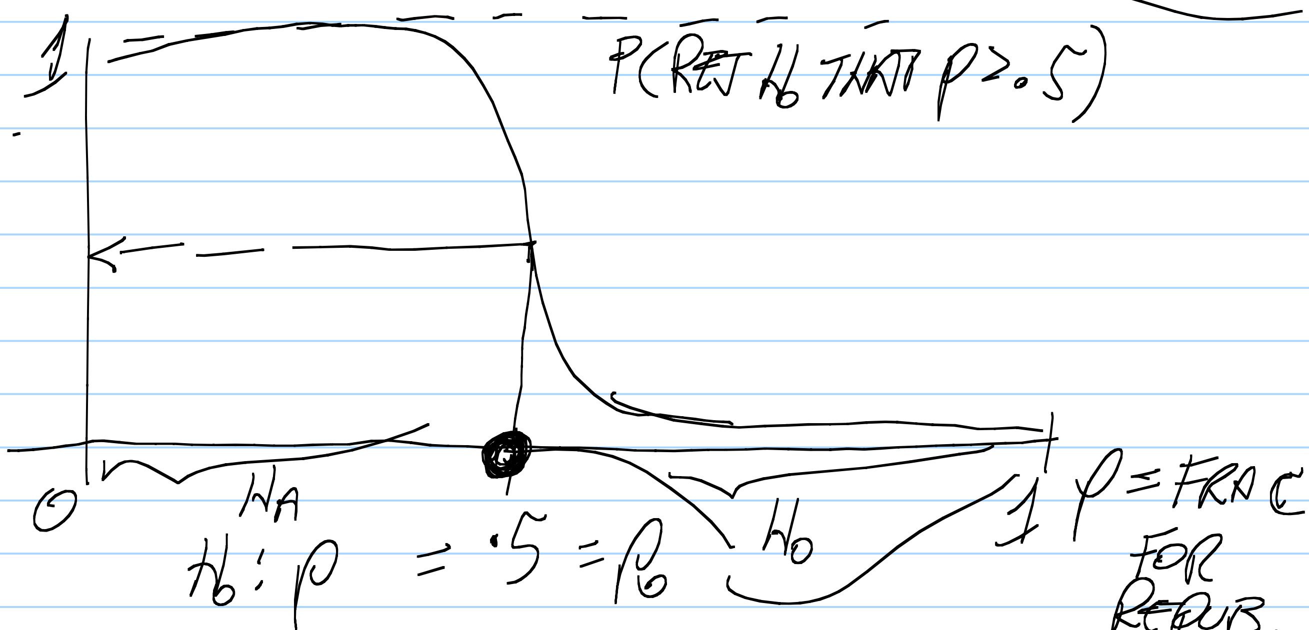
eg LARGER SAMPLE

(DNA EVIDENCE?)

3e.

4. TEST ADOPTED

I THINK
P(REJ H_0) WHEN
$p = .5$ IS ~.3

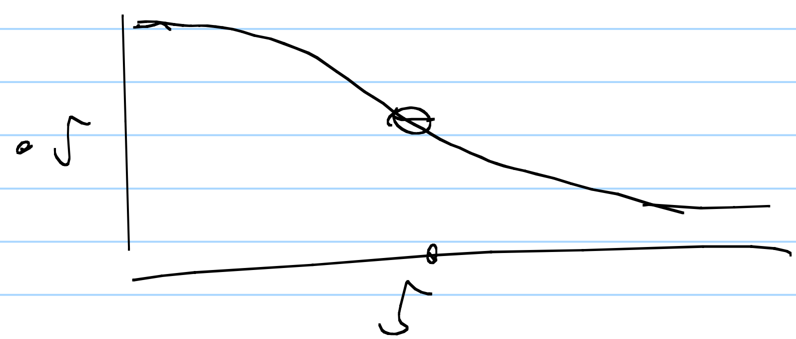


REJECTING H_0 (REP AHEAD) IS LIKE CALLING VOTE FOR DEMOCRATS.

BUT $P(\underbrace{\text{CALL FOR DEM}}_{\text{(REJ } H_0 \text{ REPUB AHEAD)}})$ IS ONLY .3 AT $p = .5$

I.e. FAIR TO BOTH PARTIES ← USE SYMMETRIC TEST.

POWER CURVE



SIMPLE REJ $H_0 : p = .5$ (VS $H_A : p < .5$) IF $\hat{p} < .5$.

SAME AS REJ $H_0: p = .5$ IF

$$\boxed{\frac{\hat{p} - .5}{SD(\hat{p})}} < 0 \quad \text{i.e.} \quad \boxed{\frac{\hat{p} - .5}{\sqrt{\frac{.5 \cdot .5}{n}}}} < 0$$

$SD(p_0)$

$\sim Z$ DIST IF $p = .5$

SO IF $p = .5$ CHANCE IS $P(Z < 0) \approx .5$

\# 5. TEST $H_0: p = .3$ $n = 400$ ORDERS.

FIND THAT 150 (OF 400) ARE FOR WINE. $H_A: p > .3$

$$\hat{p} = \frac{150}{400} = .375$$

SUPPOSE WE DECIDE $\alpha = .2$

SAYS 20% CHANCE THE RESULTING TEST WILL REJ $H_0: p = .3$ WHEN IN FACT $p = .3$

TEST STATISTIC

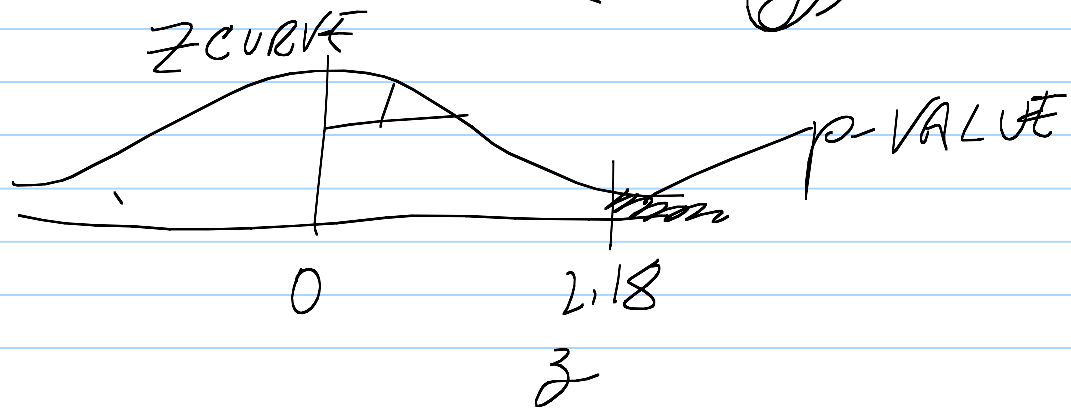
$$\rightarrow \frac{\hat{p} - .3}{\sqrt{\frac{.3 \cdot .7}{400}}} = z \text{ (SAY)} \qquad .3 \leftarrow p_0$$

$$\frac{.375 - .3}{\sqrt{\frac{.3 \cdot .7}{400}}} = z$$

SUPPOSE THIS z WORKS OUT TO 2.18

THEN P(MORE EVIDENCE THAN THIS AGAINST H_0) CALCULATED UNDER $p_0 = .3$

i.e. $P(Z > z)$



5.f. THE TEST REJECTS H_0
IF P-VALUE IF

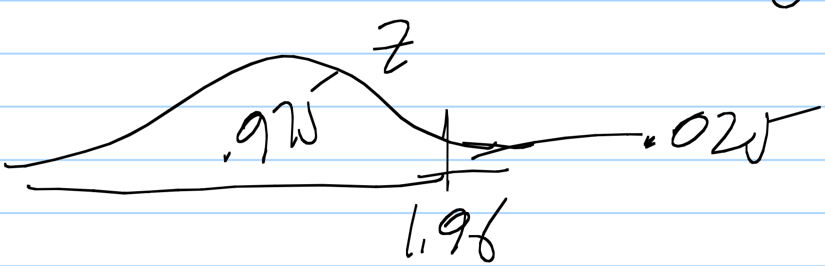
P-VALUE $< \alpha = .2$

SO IF P-VALUE WORKS OUT TO .039 (SAY) $\Rightarrow$ REJECT H_0

z	.08
2.1	$\boxed{}$

P-VALUE

SIMPLE EXAMPLE   SUPPOSE $z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}} = 1.96$ $H_0 < H_A$



z	.06
1.9	$\boxed{.975}$

$\Rightarrow$ P-VALUE IS .025

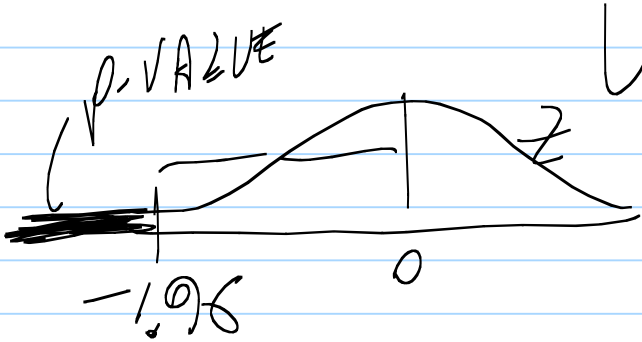
ANOTHER - SUPPOSE $z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = 1.96$ $\quad H_A < H_0$

NO POINT IN TESTING

EVIDENCE IN $\hat{p}$ IS FOR

$p > p_0$ & $H_A < p_0$.

ANOTHER SPSE $\frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = -1.96$ $\quad \underline{H_A < H_0}$



So p-VALUE .025

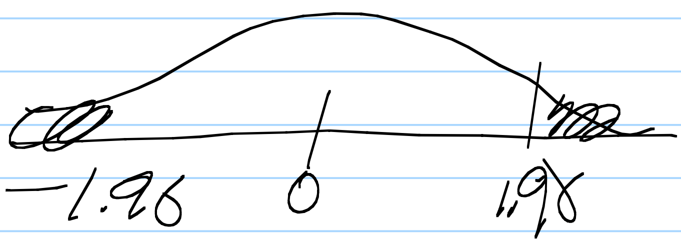
ANOTHER

$H_0: p = p_0$

$H_A: p \neq p_0$

SUPPOSE TEST STAT $= \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}} = -1.96$

P-VALUE NOW IS $P(Z < -|1.96|) + P(Z > |1.96|)$



SO P-VALUE

$= 2P(Z > 1.96)$

$= .05$