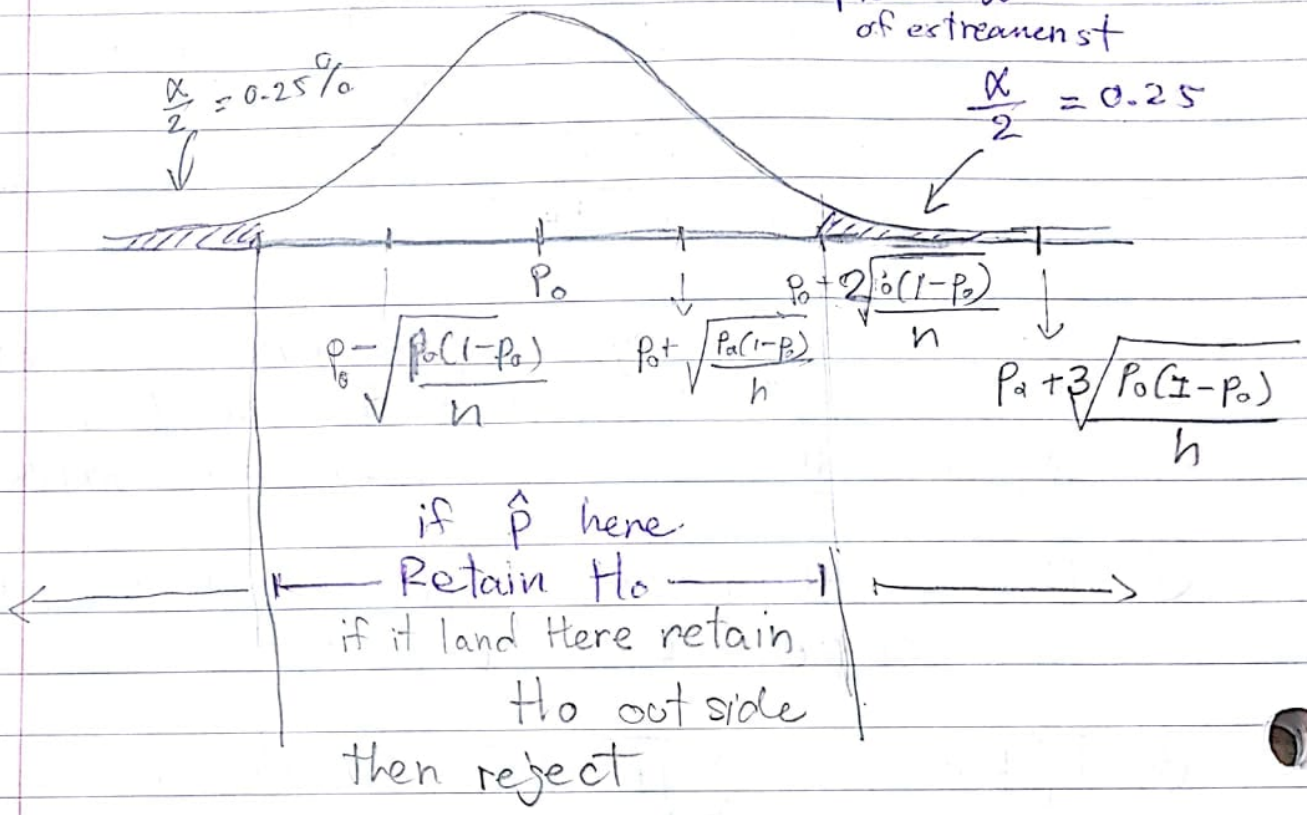
$\hat{P} \mid H_0$ (Assume H_0 is true)



Retainer Region $:= \left[P_0 \pm \frac{2\alpha}{2} \sqrt{\frac{P_0(1-P_0)}{n}} \right]$

Rejection Region is the complement

To test, check

$\hat{p} \in$ Retainer Region $\Rightarrow$ Retain H_0

$\hat{p} \notin$ Retain Region $\Rightarrow$ Reject H_0

$n = 345$ # model 169 $\hat{p} = \frac{169}{345} = .48$

Ret Region $\alpha = 5\%$

$$\left[.5 \pm 2\sqrt{\frac{.5(1-.5)}{345}} \right] = [.446, .554]$$

Flip coins 100 times Ask is it fair?

Situation #1
51 heads? ~~Yes~~, close to 50%
95 heads? No.
61 heads?

$H_0 = 0.5$
$H_a \neq 0.5$
$\hat{p} = \frac{61}{100} = .61$

Ret Region at $\alpha = 5\%$ $= \left[0.5 \pm 2\sqrt{\frac{0.5(1-0.5)}{n=100}} \right] = [0.40, 0.60]$

$\hat{p} \notin$ Ret Region $\Rightarrow$ Reject H_0

Say the porp. of bbe m&m is 20% let say is lying. $\alpha = 5\%$
$n = 204$

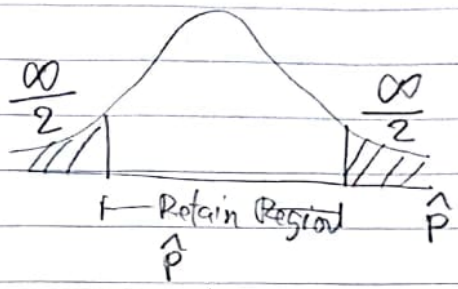
$H_0 : p = 0.2$ Ret Region $\left[0.2 \pm 2\sqrt{\frac{0.2(1-0.2)}{206}} \right]$
$H_a : p \neq 0.2$

$\hat{p} = \frac{33}{206} = .160 = [.144, .256]$

then $\hat{p}$ is inside $\Rightarrow$ then they not line.

Decision

	Retain H_0	Reject H_0
H_0 true	✓	Type I erro X Prob = α
H_a false	X Type II prob = β	✓



H_0 $p = p_0$
H_a $p \neq p_0$

when α get smaller Region get bigger so

$\alpha \downarrow \Rightarrow \beta \uparrow$ so $\alpha \uparrow \Rightarrow \beta \downarrow$

Clinical Trial for a drug

H_0 : drug doesn't work

H_a : drug works

Type I : Selling a drug that doesn't work lost:
Type II : Not selling a drug that doesn't work lost:

Fire Alam System

H_0 : No fire
H_a : fire
Type I : No fire but hit alam | lost: anoyng
Type II : when Fire, doen't go up | lost: people may died.
α should be big to minimize Type II

America Court System

H_0 : innocent
H_a : guilty

Type I : innocent but go to jail lost: ruine someone life
Type II : guilty but not go to jail lost: more victim

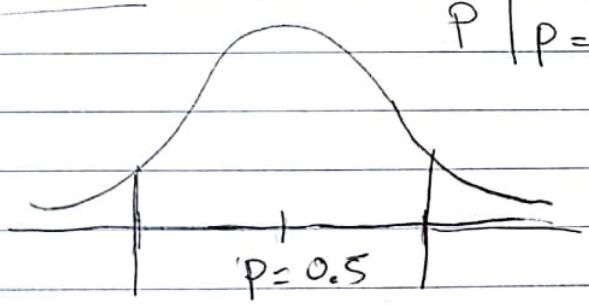
Sciof Thm

H_0 : old thm
H_a : new thm
] $\alpha = 1\%$ or 5%

Human Sex ratio $p = P(\text{male})$

$H_0 : p = 0.5$
$H_a : p \neq 0.5$

$\alpha = 5\%$



dd experiment

$n = 345 \Rightarrow$ Res Region $= [.446, .554]$

2008 all American birth

$n = 4,247,000$

$$\text{Res Region} = \left[0.5 \pm Z\sqrt{\frac{0.5(1-0.5)}{n=4,247,000}}\right] = [.495, .505]$$

# of male : 2,173,000

$$\hat{p} = \frac{2,173,000}{n = 4,247,000} = .512 \notin \text{Res Region} \Rightarrow \text{Reject } H_0$$

sex ratio Not exist

$\alpha \downarrow \Rightarrow \beta \uparrow$ * $n \uparrow \Rightarrow$ no change α

$\alpha \uparrow \Rightarrow \beta \downarrow$

$n \uparrow \Rightarrow \beta \downarrow$

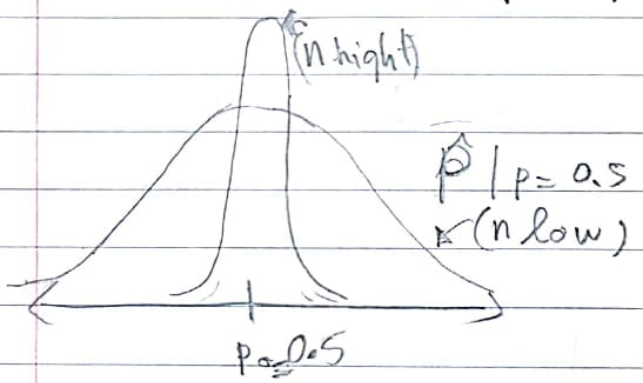
$n \downarrow \Rightarrow \beta \uparrow$

$$CI_{p,\ 1-\alpha} := \left[\hat{p} \pm z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right]$$

* Goal provide window value of p

$$\text{Rest Region} := \left[p_0 \pm z_{\frac{\alpha}{2}} \sqrt{\frac{p_0(1-p_0)}{n}} \right]$$

* Goal to test the th



H_0 : aliens doesn't exist

H_a : aliens do exist

α low

↑ can't convince

α high