lec 23

12/8

ex: $p = P(\text{Male})$

retain $H_0: p = 0.5$

reject $H_a: p \neq 0.5$

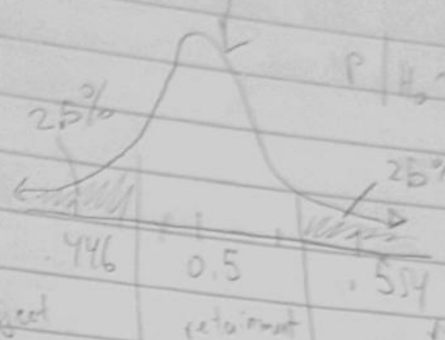
$\alpha = 5\%$

$n = 345$

CLT get the norm

$\hat{p} \mid H_0 \sim N\left(p, \left(\sqrt{\frac{p(1-p)}{n}}\right)^2\right)$

= .0269



$= [.446, .554]$

two sided Test of one proportion

169 births male

$\hat{p} = \frac{169}{345} = 0.48 \in$ Retainer region => Retain H_0

	retain H_0	reject H_a
H_0	✓	Type I error
H_a	Type II error	✓

$\alpha \uparrow \Rightarrow P(\text{Type II error}) \downarrow$

$\alpha \downarrow \Rightarrow P(\text{Type II error}) \uparrow$

$P(\text{Type I error}) = \alpha$

Do expereene again with more data

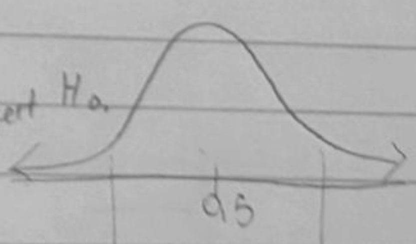
$n = 4,247,000$

every born in America in 2088.

α Same (5%)

Run experiment: 2,173,000 male

$\hat{p} = \frac{2173,000}{4,247,000} = .51165 \notin$ ret Region => reject H_0



Retain Region =

$\left[p \pm 2\sqrt{\frac{p(1-p)}{n}}\right]$

$= [.495, .505]$

I'm still not clear

$n \uparrow \Rightarrow \alpha$ doesn't change P(Type I error)

$n \uparrow \Rightarrow$ P(Type II error) $\downarrow$

Not on exam or HW

$H_0: p = 0.5$	$H_0: p = 0.50001$
$H_a: p \neq 0.5$	$H_a: p \neq 0.50001$
$\alpha = 5\%$	$\alpha = 5\%$
$n = 345$	$n = 3467$
$\hat{p} = .48$	$\hat{p} = .48$
$\Rightarrow$ Retain	$\Rightarrow$ Retain

H_0: UFO's and alien ~~exist~~ don't exist

H_a: " do ~~not~~ "

α low

H_0: UFO's and alien exist

H_a: " do not "

α high

Business case setting

uber ~~fo~~ firing driving if more than 5% of passenger complain.

$p = P(\text{complains})$

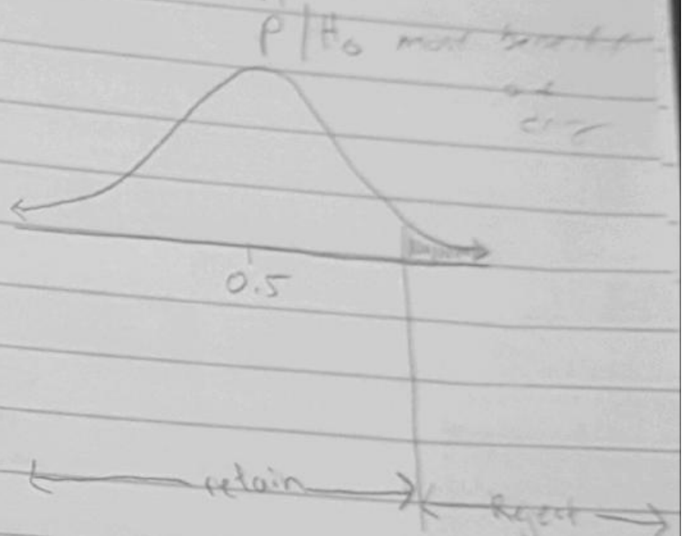
make decision from 1,000 rides

H_0: good driver

H_a: bad driver

H_0: good driver $p \le .05$

H_a: bad driver $p > .05$



(Right-tailed) one-sided test of one proportion

$\alpha = P(\text{Reject})$

$1-\alpha = P(\text{Retain})$

$= P(Z - Z\alpha)$

$= P\left(\sqrt{\frac{p(1-p)}{n}}\, Z > Z\alpha \sqrt{\frac{p(1-p)}{n}}\right)$

$= P\left(\sqrt{\frac{p(1-p)}{n}}\, Z > p + Z\alpha \sqrt{\frac{p(1-p)}{n}}\right)$

$P\left(\hat{p} < p + Z\alpha \sqrt{\frac{p(1-p)}{n}}\right)$

$\Rightarrow$ Retain Region $= \left(-\infty,\ p + Z\alpha \sqrt{\frac{p(1-p)}{n}}\right)$

$P(Z > 2) = 1 - 2.5\%$

$Z = 2.5\%$

two sided	Z
5%	2
1%	2.84
one sided	
2.5%	2
0.5%	2.84

Experiment

71 complains

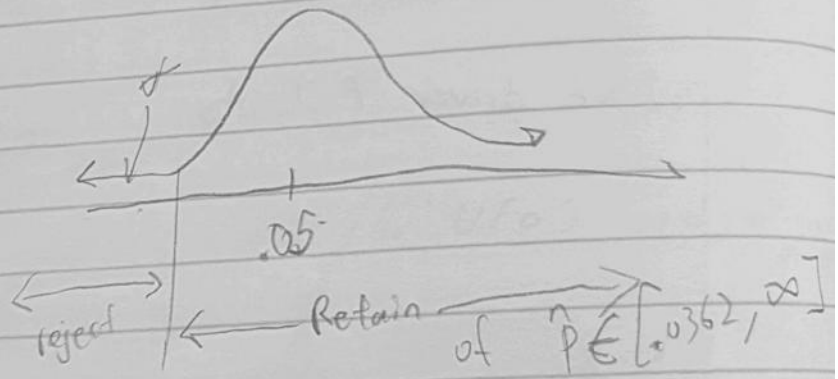
$\hat{p} = \frac{71}{1000} = .071 \notin$ Ret. Region $\Rightarrow$ Retain H_0, Five drink.

Retain Region $= (-\infty, 0.05 + 2\sqrt{\frac{.05(1-.05)}{1000}}] = (-\infty, 0.0638]$

$.05 \neq .0638$

H_0: Bad $p \geq .05$

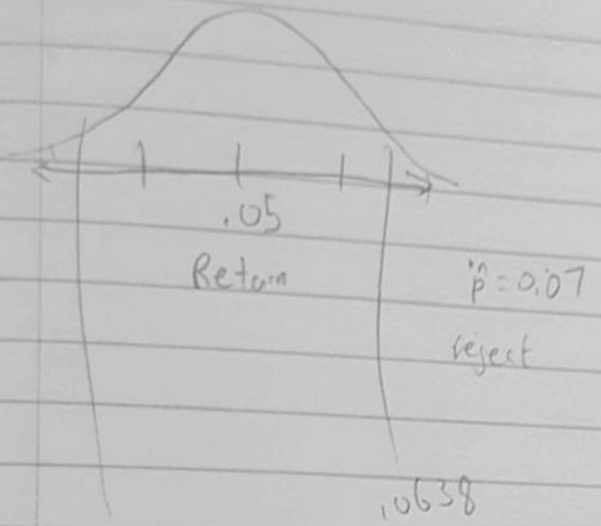
H_a: Good $p < .05$



By $\hat{p}$ give

birth to

small $\hat{p}$



P val = P($\hat{p}$ or more | H_0 true)

$= P(\hat{p} > .07)$

$= P\left(\frac{\hat{p} - 0.5}{.0284} > \frac{.07 - .05}{.0269}\right)$

$= P(Z > 3.04) = .11\% < 2.5\%$

A.W 9

p value exam