Dec 08
Lec 22

H_0: Aliens don't exist.
H_a: Aliens do exist.

α low $\Rightarrow$ Skeptic Position

α high $\Rightarrow$

We have seen
many flying unknowns stuff
So we believe

H_0: Aliens exist

H_a: Aliens don't exist.

α low

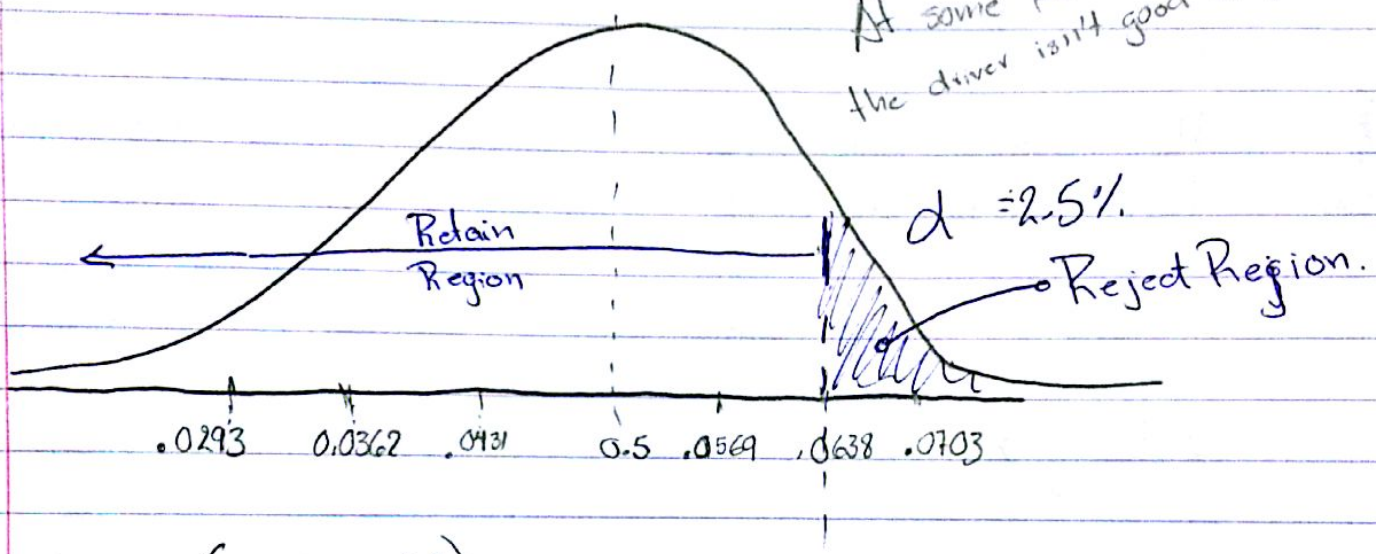
α high

Uber fires bad drivers. (% complains > 5 %) after 1,000 rides
H_0: $p \leq 0.005$ By default the driver is good.

H_a: $p > 0.005$ " " " " " bad.

I assume think driver is good unless i get evidence that Contradicts my assumption.

One-side, One-Proportion Test (Right -tailed)



$$\hat{P} \sim N\left(p, \left(\sqrt{\frac{p(1-p)}{n}}\right)^2\right) = N(0.05, 0.00692)$$

$$\alpha = 2.5\% \Rightarrow Z_\alpha = Z_{0.5\%} = 2$$

$H_0: p = 0.05$
$H_a: p = 0.05$

$$\text{Retainment Region} = \left(-\infty,\ p + Z_\alpha\sqrt{\frac{p(1-p)}{n}}\right)$$

$$= (-\infty, 0.0638)$$

John has 61 complains.

$$\hat{p} = \frac{61}{1000} = 0.061 \in (\text{Ret. Region}) \Rightarrow \text{Keep John as Driver}$$

No compelling evidence to reject him as a good driver!

Decision

Truth	Keep	Fire
(Good) = H_0 = truth	✓	Type I Error → Fire a good driver
(Bad) = H_0 = False	Type II Error → Keep bad driver ⇒ Cost loses (Bad reputation)	✓

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

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

How to Control Wack'em all scenario?

Bad = H_0 true

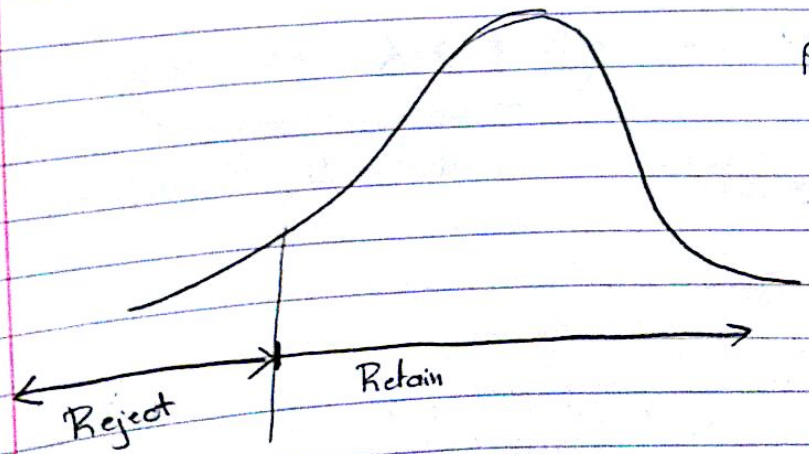
Good = H_0 false

$P \geq 0.05$ (Bad) $\quad \alpha = 2.5\% \Rightarrow Z_\alpha = Z_{2.5\%}$

$P < 0.05$ (Good)

Invert these

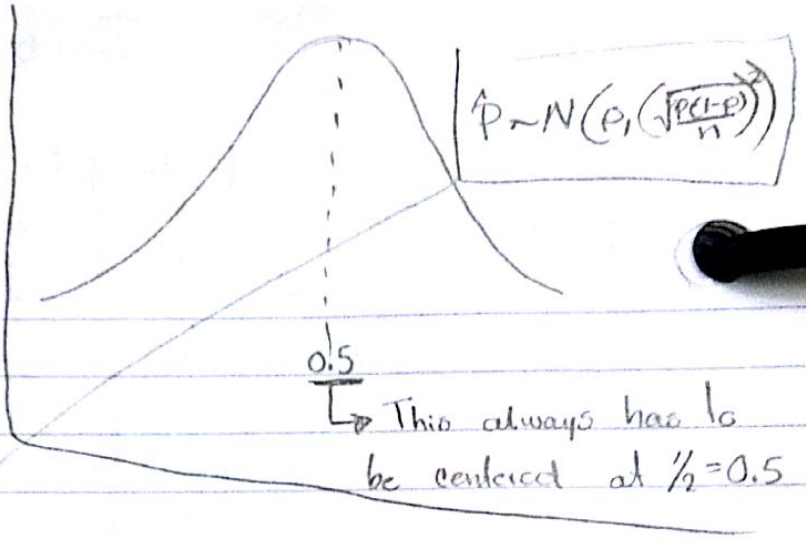
→ We neend the driver to prove he is good!



$\hat{p} = \frac{61}{1000} = 0.061 \in$ Red Region $\Rightarrow$ Fire John

No evidence to suggest he is a good driver

ctrl + tilda → "Best Marriage of Excel feature"
Ctrl + ~



H_0: $p \geq 0.05$ (Good)

H_a: $p < 0.05$ (Bad)

$\hat{p} = \frac{1}{1000} = 0.00$

Accept/Reject Machine that doesn't tell us the degree of accept/reject.

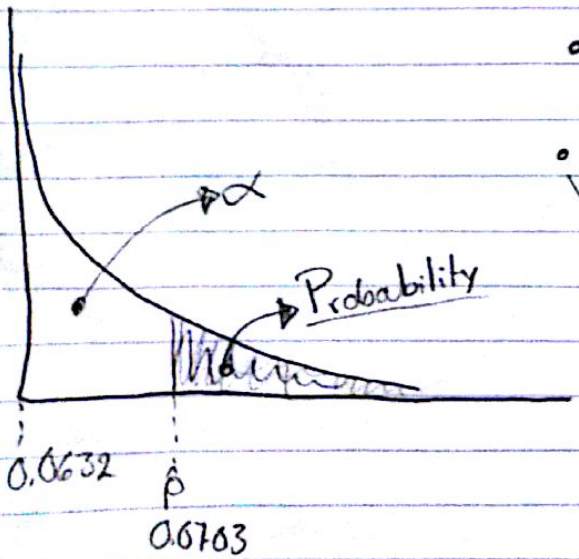
$$p = P(\hat{p} > \hat{p} \mid H_0 \text{ true})$$

$$= P(\hat{p} > 0.071 \mid p = 0.05)$$

$$= P\left(\frac{\hat{p} - 0.05}{0.0063} > \frac{0.071 - 0.05}{0.0063}\right) = P(Z > 3.09) = 0.00118 \approx 0.1\%$$

?

Probability of seeing your data or more extreme under the null.



- If $p < \alpha$ then Reject
- If $p > \alpha$ then Retain

Statistically Significant Result/differen