① Hypothesis testing revision

Maggi ⟵ Nesle

Lead ≃ 2.5 ppm

2.6 ppm → 100 maggi

Criminal

Ho : innocent

HA : guilty

Ex: 2021

travel time = 40 min

2022 : ↑

Ho : Aug commute time = 40 min

H_A : $\neq$ 40 min

Criminal

H_0 : innocent

H_A : guilty

If Guilty

Reject Null Hypo

Not Guilty

Failed to reject Null Hypothesis

Ex: Air conditioner : 2021

Avg demand of AC units / store / month

= 350 AC per

2022 : Heat increased

H_0 : $\mu = 350$

H_A : $\mu \neq 350$

Rule:

H_0 :	=	$\leq$	$\geq$
H_A	$\neq$	$>$	$<$

"at least"

"at most"

"less than"
"greater than"

Amazon: Claimed that total revenue in Dec 2021 was at least $14 billion

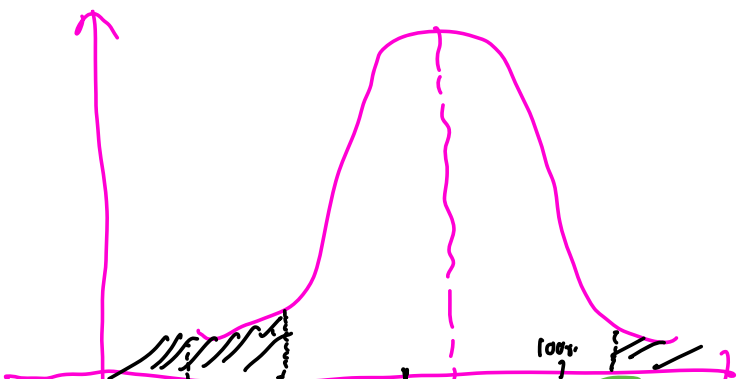
H_0: $\geq$ 14 $ Billion
H_A: $<$ 14 $B

Amazon: Claimed that total evaluation in Dec 2021 was greater than $14_B

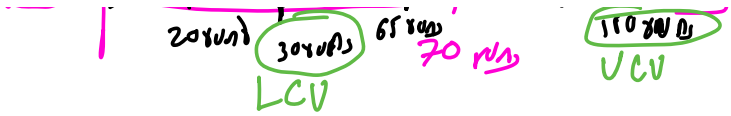
H_A: $>$ $14_B
H_0: $\leq$ $14_B

$\Rightarrow$ Avg score = 70 runs over 5 games:

If Avg score $\Rightarrow$ 20 runs $\rightarrow$ less likely
$\Rightarrow$ 65 runs $\rightarrow$ more likely



H_0 = 70 runs
$H_A \neq$ 70 runs



$H_A \Rightarrow \neq 70$ mm

Two tailed test

$\neq$

Medicine (Paracitamol)

$\Downarrow$

optimal quantity = 500 mg

if less: no cure

if higher: side effect

If H_A "<" → lower tailed test

H_A ">" → right tailed te

Critical value Method

store $\Rightarrow$ 350 Ac unit /store

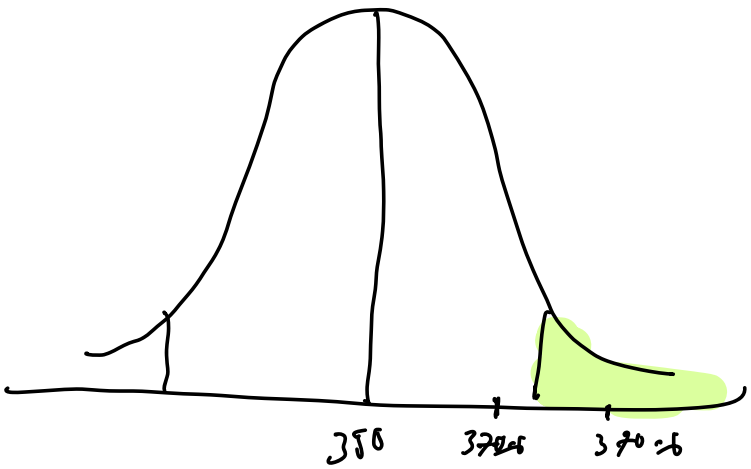
sample from 36 stores

$\bar{x} = 370.6$

$H_0: \mu = 350$

$H_A: \mu \neq 350$

H_0



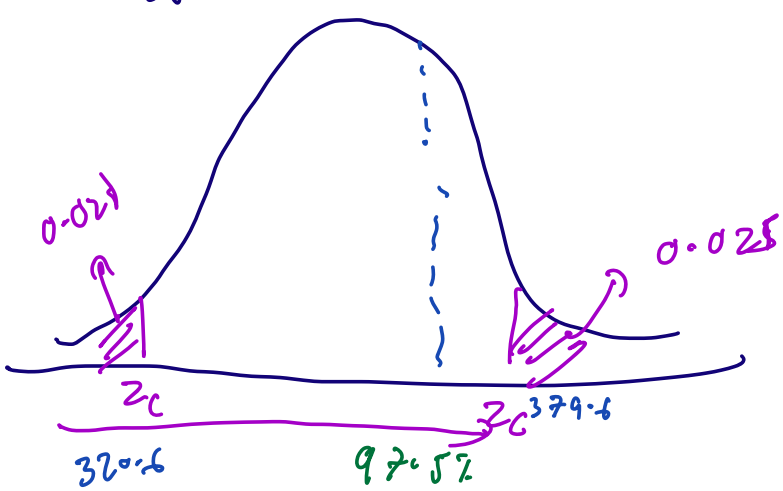
Population sd (σ) = 90

36 stores $\mu_{\bar{x}}$ = 370.6

Std error = $\frac{sd}{\sqrt{\text{no. of sample}}}$

= $\frac{90}{\sqrt{36}}$ = 15

α = 0.05



0.9750 → 1.96

$$UCV = \mu + (Z_c * \sigma_{\bar{x}})$$
$$= 350 + (1.96 * 15)$$
$$= 379.4$$

$$LCV = \mu - (Z_c * \sigma_{\bar{x}})$$
$$= 350 - 1.96 * 15$$
$$= 320.6$$

320.6 – 379.4

Break: 10:41 pm

a) H_0: $\mu \leq 350$

H_A: $\mu > 350$

z-score = 1.645

b) Max = 2.6 ppm

Sample = 100

$\bar{x}$ = 2.6 ppm

$\alpha = 0.03$

Sales Example

$$\mu_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \Rightarrow \frac{90}{\sqrt{36}} = 15$$

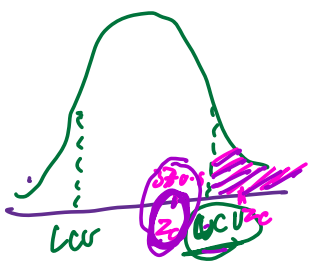
$\mu = 350$

$\bar{x} = 370.6$

$$Z\ score = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$$

$$= \frac{370.6 - 350}{15} = 1.37$$

check in Z table $\Rightarrow$ 0.9099



p-value $\Rightarrow$ $1 - 0.9099$

$= 0.0901$

2-tailed $\Rightarrow$ $2 * 0.0901$

$\Rightarrow 0.1802$

$\alpha \Rightarrow 0.05$

Fail to reject

t-test

other distributions

qq & cdf

AB test

when