

## 8- Hypothesis Testing

Tuesday, March 23, 2021 4:54 PM

Hypothesis: Testing whether or not a claim is valid.

Ex \* Most people get their job through computer.

✓  $p > 0.50$

\* the average payload of trucks on highway is 18000 lbs.

✓  $\mu = 18000$  lbs.

### parts of Hypothesis:

1) Null hypothesis: ( $H_0$ )

→ states that the population parameter (mean & proportion) is equal to some value.

eg:  $H_0: \mu = 5$  ,  $H_0: p = 0.5$

Note: How to test Hypothesis-

→ Start by assuming the null hypothesis  $H_0$  is true. Then, use evidence to reach a conclusion.

• Reject  $H_0$ . : 'I have enough evidence to prove  $H_0$  is wrong.

Cannot accept

• Fail to Reject  $H_0$ . : "I don't have enough evidence to prove  $H_0$  is wrong"

### Alternative Hypothesis:

states that the parameter ( $\mu, p$ ) has a value different than  $H_0$ .

( $<, >, \neq$ )

eg.  $H_1: p < .53$  ,  $H_1: p > .50$  ,  $H_1: p \neq .50$

$H_1: \mu < 12$  ,  $H_1: \mu > 12$

$H_1: \mu \neq 12$

# If you want to support a claim  
you must state it as  $H_1$  (Not  $H_0$ )

1) The mean of fluid is atleast 12oz in  
a CAN.

claim:  $\mu \geq 12$  :  $H_0: \mu = 12$

opp:  $\mu < 12$  :  $H_a: \mu < 12$

2) The proportion of male CEOs is greater than  
0.5. (most CEOs are male).

claim:  $p > 0.5$

opp:  $p \leq 0.5$

$H_a: p > 0.5$

$H_0: p = 0.5$

Wrong

3) The mean weight of babies is atleast 8.9 lbs

claim:  $\mu \leq 8.9$  ←  $H_0: \mu = 8.9$

opp:  $\mu > 8.9$   $H_a: \mu > 8.9$

1. The proportion of primary school teachers who have passed A Level Maths is 23%. The government launches a campaign to encourage people with A Level Maths to consider teaching in primary schools. A random sample of 40 applications for training is taken to see if the proportion of people with A Level Maths has increased. Give the null and alternative hypotheses you would use in the test.

soln

$p = 23\%$

$H_0: p = 0.23$  vs  $H_a: p > 0.23$

- ✓ 2. 13 out of the 40 applications in the test in question 1 were from people with A Level Maths, and the null hypothesis was not rejected at the 5% level of significance.  
State the conclusion in context.

Q The mean IQ score is 100.

Claim:  $\mu = 100$ .

$H_0: \mu = 100$ .

opp:  $\mu \neq 100$

$H_1: \mu \neq 100$ .

Test statistic:

✓ proportion:  $p$ :  $\left\{ Z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} \right\}$  ✓

✓ mean:  $\mu$ :  $\left\{ Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} \right\}$

proportion of the sample.

Q Survey A sample of 706 companies.

found that 61% of CEOs were male.

claim: most CEOs are male.

Soln

claim:  $p > 0.50$

opposite:  $p \leq 0.5$

$\left\{ \begin{array}{l} \leftarrow H_1: p > 0.5 \\ \leftarrow H_0: p = 0.5 \end{array} \right.$

Test statistic  $\hat{p} = 0.61$

$p = 0.5, q = 0.5$

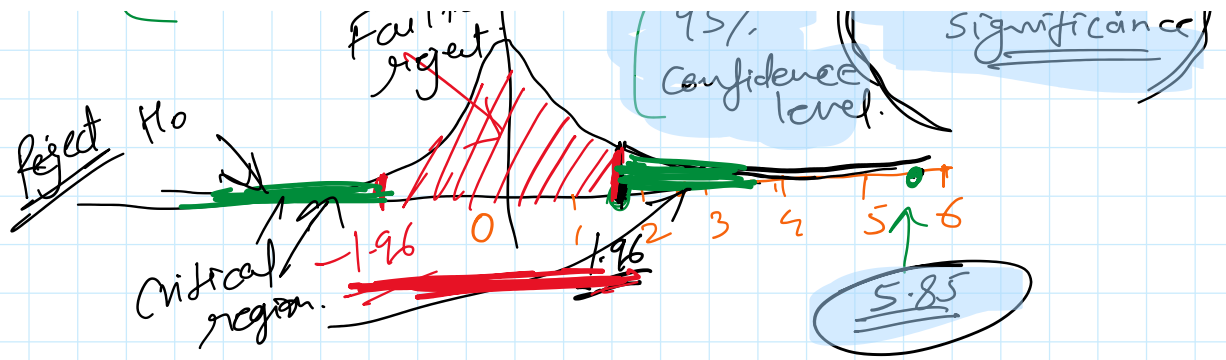
✓  $Z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{(0.61 - 0.5)}{\sqrt{\frac{0.5 \times 0.5}{706}}}$

$Z = 5.85$

Fail to reject  $H_0$

95% Confidence level

(5% level of significance)



$1.96 < 5.85$