DATE / /

Hypothesis Testing

Null hypothesis ⇒ Treat everything same or equal.

Null Hypothesis → It is default or well accepted already.

A hypothesis which has already ~~done~~ ~~by~~ done by someone or Not done by someone, just assume between independent of one variable to dependent of other variable has no relation.

It means, we just assume no relationship between them, so someone just proof it and confidence level more than that so we accept the hypothesis, or we are just ~~rejected~~ Reject it ~~basically~~ basis of Not proven at certain level.

"The Null hypothesis states, there is no relationship between two population parameters."

"Researches reject or disprove the Null hypothesis to set the stage for further experimentation.

Null hypothesis is coin is fair coin

DATE / /

Null Hypothesis represented by H_0

e.g. $H_0 \rightarrow T_1$ & T_2 (variable)

both are same ($\mu_1 = \mu_2$)
(Mean) other variable (mean of other variable)

(II) ALTERNATE Hypothesis →

It is inverse of Null hypothesis and saying it is not true both of two variable. Alternate hypothesis is Rejected the Null hypothesis.

$H_a \rightarrow T_1$ & T_2 (not same)

$\mu_1 \neq \mu_2$

Example ⇒ Null hypothesis (H_0) - The world is flat

Alternate hypothesis (H_a) - The world is round

Question	Null Hypothesis
Does taking aspirin every day reduce the chance of having a heart attack?	Taking aspirin daily does not affect heart attack risk.

DATE / /

P-value = Probability value

P-Value → or Two Tailed Test

Short name of P-value is probability value.

Definition → It is defined as a probability of getting result that is either the same or more extreme than the actual observation.

The P-value is also known as level of marginal significance within the hypothesis-Testing that represents the probability of occurances of given event.

The P-value is used as a alternative to the rejection point to provide the least significance of at which the NULL HYPOTHESIS is Rejected,

if The P-Value is small, Then There is stronger evidence in favor of the Alternative hypothesis.

OR

P-Value → It is the probability for the "Null hypothesis" to be true

P-Value Table

DATE / /

P-value	Decision
P-value > 0.05	The result is not statistically, and hence don't reject the null hypothesis
P-value < 0.05	This result is significant. Reject the null hypothesis in favor of the Alternative hypothesis.
P-value < 0.01	The result is highly statistically significant, and thus rejects the null hypothesis in favor of the alternative hypothesis

- P-value and the range between 0 and 1
- level of significance is denote by α

P-value formula →

$$\boxed{Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}}$$

$\hat{p}$ = Sample proportion

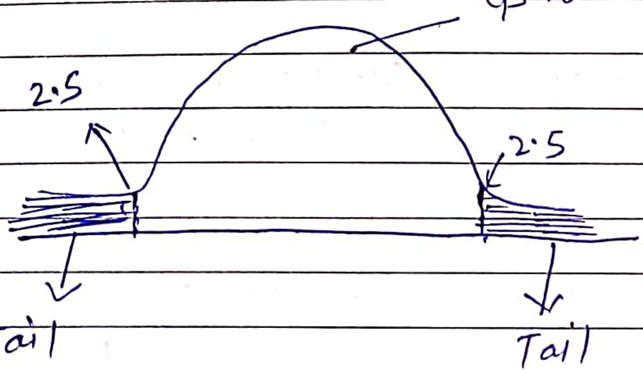
p_0 = Assumed population proportion in The null hypothesis

n = Sample Size

DATE __/__/__

2 Tailed Test

95% → If Mean Null hypothesis come under this.



example → A statistician wants to test the hypothesis $H_0: \mu = 120$ using the Alternative hypothesis $H_a: \mu > 120$ and assuming that $\alpha = 0.05$ for that, he took the sample values as

$n = 40$, $\sigma = 32.17$ and $\bar{x} = 105.37$

determine the conclusion for this hypothesis?

Solution →

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{32.17}{\sqrt{40}} = 5.0865$$

Now, using the Test static formula, we get

$$t = (105.37 - 120) / 5.0865$$

$$t = -2.8762$$

DATE __/__/__

Using the ~~table~~ Z-score table We can find the value of $P(t > -2.8762)$

From the table, we get

$$P(t < -2.8762) = P(t > 2.8762) = 0.003$$

Therefore,

$$\text{if } P(t > -2.8762) = 1 - 0.003$$
$$\text{P-value} = 0.997$$

$$\text{P-value} = 0.997 > 0.05$$

So, Null hypothesis is accepted

or

failed to Reject H_0 (Null hypothesis)

DATE / /

Type I error →

Rejecting Null hypothesis when it is true

Type II error →

Not Rejecting the Null hypothesis when is is false

$P(\text{Type I error} / H_0 \text{ is true}) = \alpha$

$P(\text{Type II error} / H_0 \text{ is false}) = \beta$

$P(\text{Rejecting a false } H_0) = 1 - \beta$

	H_0	
	True	False
Reject H_0	Type I error	✓
Fail to Reject H_0	✓	Type II error

DATE / /

Z-Score or Z-Test →

Z-score says How many standard deviation you are away from the mean, if z-score is equal to 0, then it is on Mean

$$Z = \frac{x - \mu}{\sigma}$$

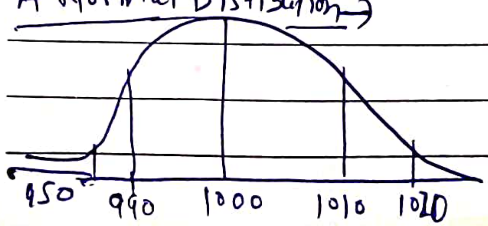
where Z = standard score
x = observed value
μ = mean of the sample
σ = standard deviation of the sample

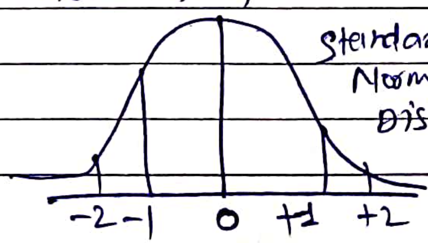
if z-score is higher than mean avearage
e.g.– if z-score is equal to +1, it is 1 standard deviation above the mean

z-score is negative the mean average is below
e.g.– z-score is equal to −2 standard deviation below the mean

z-scores is by creating standard normal distribution

A Normal Distribution →





Standard Normal Distribution

DATE / /

Z- Score → A Z-score Measures exactly how many Standard deviation above or below the mean a data point is.

- A positive Z-Score Says the data Point is above average

- A Negative Z-Score says the data point is below average

- A Z-Score close to 0 says the data point is Close to querage

- A data point can be Considered Unusual if its Z-Score is above 3 or below -3