



PROPORTION TEST

HYPOTHESIS TESTING

prepared by:

Gyro A. Madrona
Electronics Engineer

TOPIC OUTLINE

1 Proportion Test

2 Proportion Test

ANOM



1 PROPORTION TEST



1 PROPORTION TEST

A 1 Proportion Test tests whether the proportion of successes in a single sample differs from a hypothesized population proportion.

Null Hypothesis

$$H_o: P_1 = P_o$$

Alternative Hypothesis

$$H_a: P_1 \neq P_o \text{ (p-value} \leq \alpha \text{)}$$

Binomial Test

`binomtest(`

`k = number of success,`

`n = number of trials,`

`p = population proportion,`

`)`



1 PROPORTION TEST

A 1 Proportion Test tests whether the proportion of successes in a single sample differs from a hypothesized population proportion.

Null Hypothesis

$$H_o: P_1 = P_o$$

Alternative Hypothesis

$$H_a: P_1 \neq P_o \text{ (p-value} \leq \alpha \text{)}$$

Z-Test

```
z_stat, p_value = proportions_ztest(  
    count = number of success,  
    nobs = number of trials,  
    value = population proportion,  
)
```



EXERCISE

In a survey of **1250** people, **600** preferred product A.
Test if this is significantly **different** from the expected
50% preference.

Solution

Let $\alpha = 0.05$

Null Hypothesis

$$H_o: P_1 = 0.5$$

Alternative Hypothesis

$$H_a: P_1 \neq 0.5 \text{ (p-value} \leq 0.05)$$



2 PROPORTION TEST



2 PROPORTION TEST

A 2 Proportion Test compares proportions between two independent groups.

Null Hypothesis

$$H_0: P_1 = P_2$$

Alternative Hypothesis

$$H_a: P_1 \neq P_2 \text{ (p-value} \leq \alpha \text{)}$$

Z-Test

```
z_stat, p_value = proportions_ztest(  
    count = [success_1, success_2],  
    nobs = [trial_1, trial_2],  
)
```



EXERCISE

A company produces two types of circuit boards, Board A and Board B. In a quality test:

- 35 out of 150 Board A samples were defective
- 25 out of 120 Board B samples were defective

Is there a significant difference in the defect rates between Board A and Board B at a 5% significance level?

Solution

Let $\alpha = 0.05$

Null Hypothesis

H_0 : Board A = Board B

Alternative Hypothesis

H_a : Board A \neq Board B (p-value ≤ 0.05)



ANOM



ANOM

Analysis of Means (ANOM) is multiple comparison method to determine which group proportions (or means) differ from the overall average.

Null Hypothesis

$$H_0: P_1 = P_2 = P_3$$

Alternative Hypothesis

$$H_a: \text{at least 1} \neq (\text{p-value} \leq \alpha)$$

Chi-square Test for Proportions

```
chi_stat, p_value, table =  
proportions_chisquare(  
    counts = [success array],  
    nobs = [trials array],  
)
```



EXERCISE

A company produces two types of circuit boards, Board A and Board B. In a quality test:

- 35 out of 150 Board A samples were defective
- 25 out of 120 Board B samples were defective
- 30 out 85 Board C samples were defective

Is there a significant difference in the defect rates between the boards at a 5% significance level?

Solution

Let $\alpha = 0.05$

Null Hypothesis

H_0 : Board A = Board B = Board C

Alternative Hypothesis

H_a : at least 1 board is different (p-value ≤ 0.05)



LABORATORY

