

IT2120 - Probability and Statistics

Lab Sheet 10

IT24103526 - Senaratne P.A.R.T.

Exercise

1. A vending machine owner claims that customers choose the four snack types (A, B, C, D) with equal probability. To test this claim, a researcher records the number of purchases for each snack type during one week and results are given below.

Snack_Type	Count
A	120
B	95
C	85
D	100

- i. State the null and alternative hypotheses for the test.
- ii. Perform a suitable chi-squared test to test the null hypothesis.
- iii. Give your conclusions based on the results.

```
1 setwd("C:\\Users\\HP\\Desktop\\IT24103526")
2
3 #Observed frequencies
4 snack_counts <- c(A = 120, B = 95, C = 85, D = 100)
5 snack_counts
6
7 # Expected probabilities (equal probability = 0.25 each)
8 expected_prob <- rep(1/4, 4)
9
10 # Perform Chi-Square Goodness-of-Fit Test
11 chi_result <- chisq.test(snack_counts, p = expected_prob)
12
13 # Display test results
14 print(chi_result)
15
16 # Display expected frequencies (to check assumptions)
17 chi_result$expected
18
19 # Conclusion based on p-value
20 if (chi_result$p.value < 0.05) {
21   cat("\nConclusion: Since p-value < 0.05, reject H0.\n")
22   cat("There is a significant difference in the proportion of snack choices.\n")
23 } else {
24   cat("\nConclusion: Since p-value >= 0.05, fail to reject H0.\n")
25   cat("There is no significant difference - snack choices are equally likely.\n")
26 }
27
```

Environment

baking_times	num [1:25] 43.9 44.5 48.1 45.1 45.3 ...
expected_prob	num [1:4] 0.25 0.25 0.25 0.25
i	25L
iq_95th	124.672804404272
mu	45
n	chr [1:25] "s 1" "s 2" "s 3" "s 4" "s 5" "s 6" "s 7" "s 8" "s 9"...
p_above_130	0.0227501319481792
p_at_most_2	0.486582880967408
p_between_10_25	0.375
popmn	2.468
popstd	0.256106948813907
s	num [1:6] 2.89 2.23 2.13 2.7 2.42 1.71
s.means	Named num [1:25] 2.54 2.54 2.55 2.36 2.5 ...
s.stds	Named num [1:25] 0.179 0.27 0.199 0.347 0.32 ...
sample_size	25
samplemean	2.44713333333333
samplestd	0.0995342394094355
sigma	2
snack_counts	Named num [1:4] 120 95 85 100
truesd	0.0426844914689845

Console

```
> setwd("C:\\Users\\HP\\Desktop\\IT24103526")
> #Observed frequencies
> snack_counts <- c(A = 120, B = 95, C = 85, D = 100)
> snack_counts
  A    B    C    D 
120  95  85 100 
> # Expected probabilities (equal probability = 0.25 each)
> expected_prob <- rep(1/4, 4)
> # Perform Chi-Square Goodness-of-Fit Test
> chi_result <- chisq.test(snack_counts, p = expected_prob)
> # Display test results
> print(chi_result)

Chi-squared test for given probabilities

data:  snack_counts
X-squared = 6.5, df = 3, p-value = 0.08966
```

```
IT24103252 - Lab08.R x IT24103526_PS_Lab9.R x IT24103526_PS_Lab10.R* x IT24103526_PS_Lab8.R x
Source on Save Run Source
4 snack_counts <- c(A = 120, B = 95, C = 85, D = 100)
5 snack_counts
6
7 # Expected probabilities (equal probability = 0.25 each)
8 expected_prob <- rep(1/4, 4)
9
10 # Perform Chi-Square Goodness-of-Fit Test
11 chi_result <- chisq.test(snack_counts, p = expected_prob)
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13 # Display test results
14 print(chi_result)
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17 chi_result$expected
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20 if (chi_result$p.value < 0.05) {
21   cat("\nConclusion: Since p-value < 0.05, reject H0.\n")
22   cat("There is a significant difference in the proportion of snack choices.\n")
23 } else {
24   cat("\nConclusion: Since p-value >= 0.05, fail to reject H0.\n")
25   cat("There is no significant difference - snack choices are equally likely.\n")
26 }
27
28
27:1 (Top Level) R Script

Console Terminal Background Jobs
R 4.5.1 - C:/Users/HP/Desktop/IT24103526/

> # Display expected frequencies (to check assumptions)
> chi_result$expected
  A  B  C  D
100 100 100 100
> if (chi_result$p.value < 0.05) {
+   cat("\nConclusion: Since p-value < 0.05, reject H0.\n")
+   cat("There is a significant difference in the proportion of snack choices.\n")
+ } else {
+   cat("\nConclusion: Since p-value >= 0.05, fail to reject H0.\n")
+   cat("There is no significant difference - snack choices are equally likely.\n")
+ }

Conclusion: Since p-value >= 0.05, fail to reject H0.
There is no significant difference - snack choices are equally likely.
>
>
```