

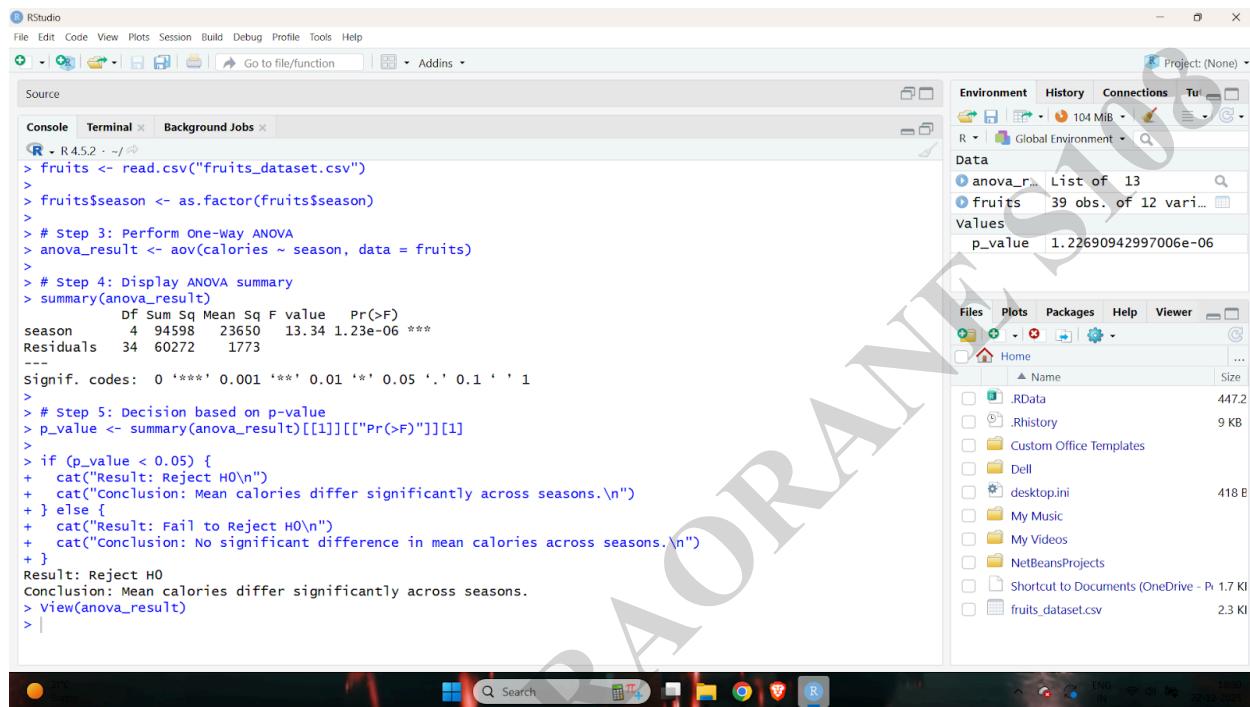
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SUBJECT : R-PROGRAMMING

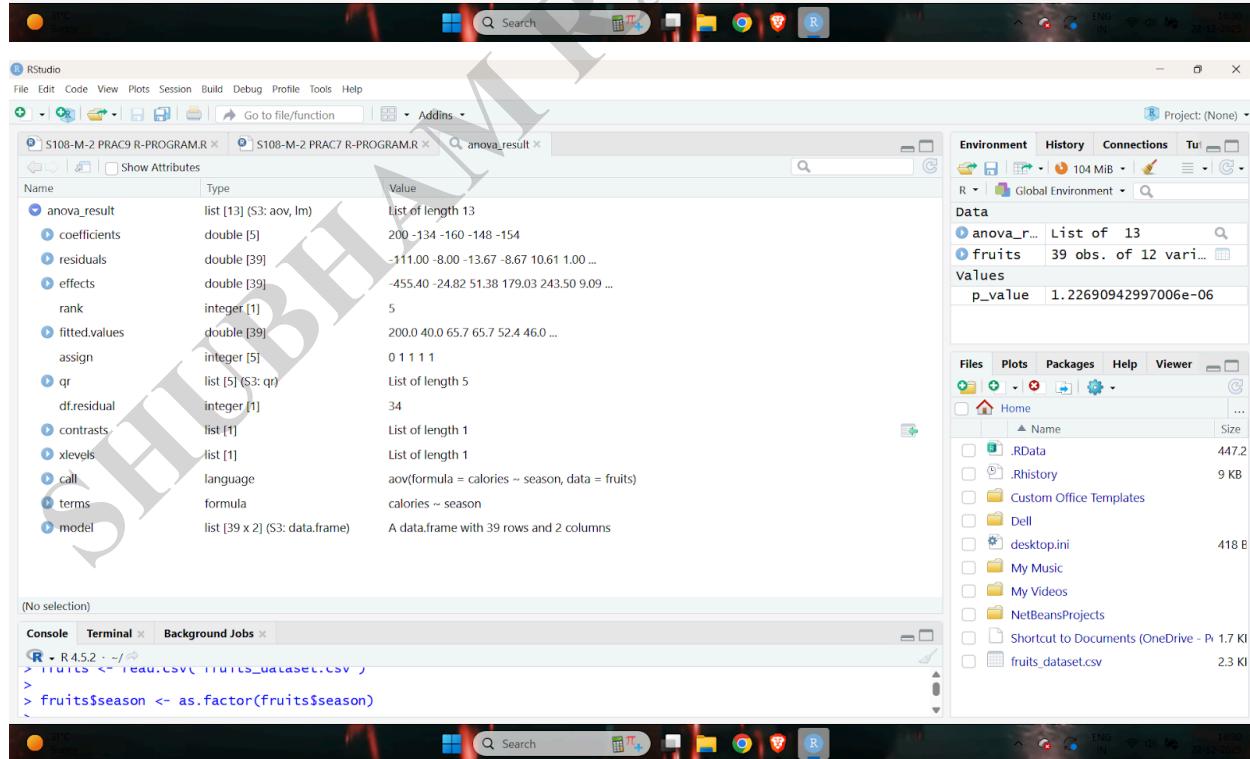
AIM : Performing one-way ANOVA using aov() (R).

OUTPUT

PRACTICAL7 M-2



```
R> fruits <- read.csv("fruits_dataset.csv")
R> fruits$season <- as.factor(fruits$season)
R>
R> # Step 3: Perform One-way ANOVA
R> anova_result <- aov(calories ~ season, data = fruits)
R>
R> # Step 4: Display ANOVA summary
R> summary(anova_result)
   Df Sum Sq Mean Sq F value    Pr(>F)
season      4  94598   23650   13.34 1.23e-06 ***
Residuals  34  60272    1773
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
R>
R> # Step 5: Decision based on p-value
R> p_value <- summary(anova_result)[[1]][["Pr(>F)"]][1]
R>
R> if (p_value < 0.05) {
+   cat("Result: Reject H0\n")
+   cat("Conclusion: Mean calories differ significantly across seasons.\n")
+ } else {
+   cat("Result: Fail to Reject H0\n")
+   cat("Conclusion: No significant difference in mean calories across seasons.\n")
+ }
Result: Reject H0
Conclusion: Mean calories differ significantly across seasons.
R> view(anova_result)
R> |
```

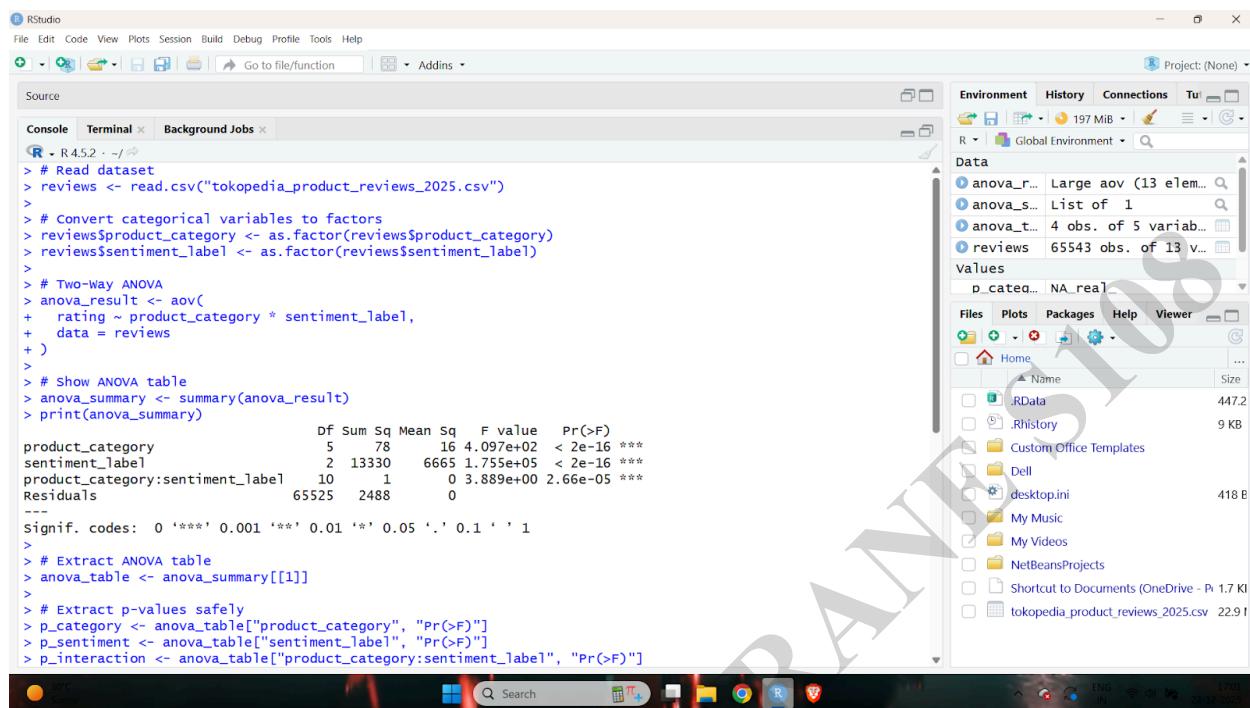


```
S108-M-2 PRAC7 R-PROGRAM.R x S108-M-2 PRAC7 R-PROGRAM.R x anova_result x
R> fruits <- read.csv("fruits_dataset.csv")
R> fruits$season <- as.factor(fruits$season)
```

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PRACTICAL8 M-2



RStudio

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Console Terminal Background Jobs

```

> # Read dataset
> reviews <- read.csv("tokopedia_product_reviews_2025.csv")
>
> # Convert categorical variables to factors
> reviews$product_category <- as.factor(reviews$product_category)
> reviews$sentiment_label <- as.factor(reviews$sentiment_label)
>
> # Two-Way ANOVA
> anova_result <- aov(
+   rating ~ product_category * sentiment_label,
+   data = reviews
+ )
>
> # Show ANOVA table
> anova_summary <- summary(anova_result)
> print(anova_summary)

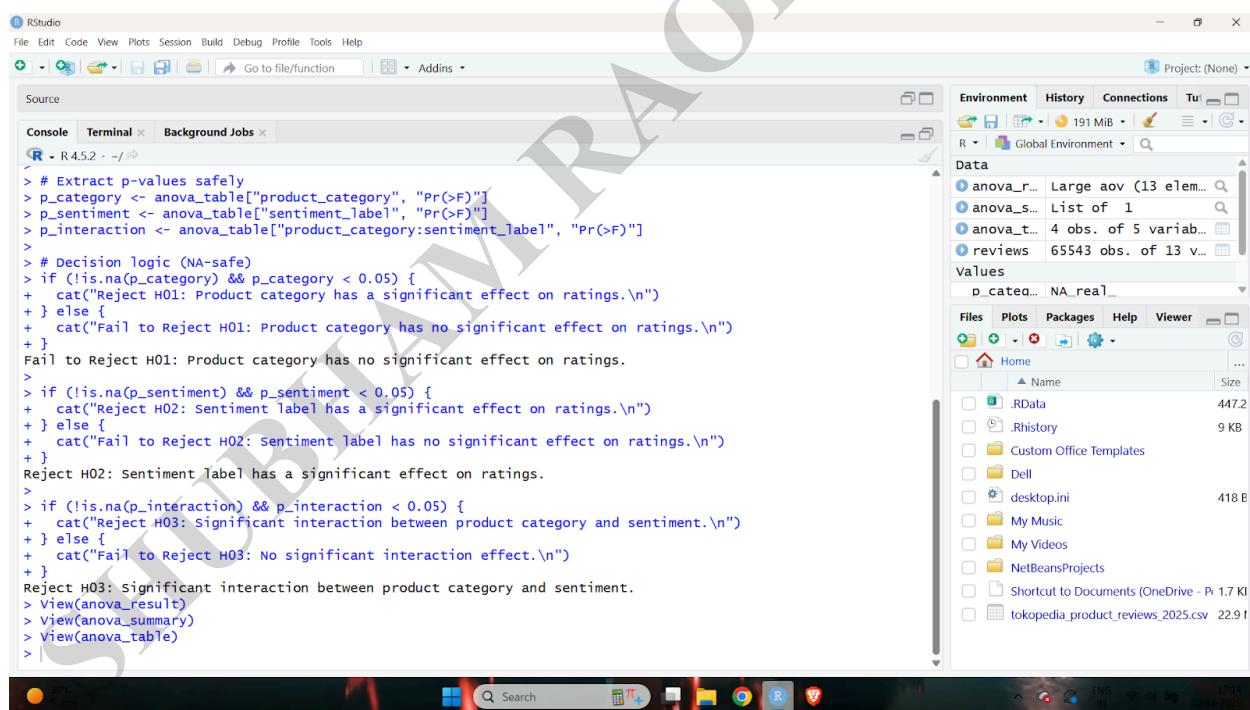
```

	DF	Sum Sq	Mean Sq	F value	Pr(>F)
product_category	5	78	16	4.097e+02	< 2e-16 ***
sentiment_label	2	13330	6665	1.755e+05	< 2e-16 ***
product_category:sentiment_label	10	1	0	3.889e+00	2.66e-05 ***
Residuals	65525	2488	0		

```

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
> # Extract ANOVA table
> anova_table <- anova_summary[[1]]
>
> # Extract p-values safely
> p_category <- anova_table["product_category", "Pr(>F)"]
> p_sentiment <- anova_table["sentiment_label", "Pr(>F)"]
> p_interaction <- anova_table["product_category:sentiment_label", "Pr(>F)"]

```



RStudio

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```

> # Extract p-values safely
> p_category <- anova_table["product_category", "Pr(>F)"]
> p_sentiment <- anova_table["sentiment_label", "Pr(>F)"]
> p_interaction <- anova_table["product_category:sentiment_label", "Pr(>F)"]
>
> # Decision logic (NA-safe)
> if (!is.na(p_category) && p_category < 0.05) {
+   cat("Reject H01: Product category has a significant effect on ratings.\n")
+ } else {
+   cat("Fail to Reject H01: Product category has no significant effect on ratings.\n")
+ }
Fail to Reject H01: Product category has no significant effect on ratings.
>
> if (!is.na(p_sentiment) && p_sentiment < 0.05) {
+   cat("Reject H02: Sentiment label has a significant effect on ratings.\n")
+ } else {
+   cat("Fail to Reject H02: Sentiment label has no significant effect on ratings.\n")
+ }
Reject H02: Sentiment label has a significant effect on ratings.
>
> if (!is.na(p_interaction) && p_interaction < 0.05) {
+   cat("Reject H03: Significant interaction between product category and sentiment.\n")
+ } else {
+   cat("Fail to Reject H03: No significant interaction effect.\n")
+ }
Reject H03: Significant interaction between product category and sentiment.
> View(anova_result)
> View(anova_summary)
> View(anova_table)
>

```

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The screenshot shows the RStudio interface with two sessions displayed. The top session is titled 'S108-M-2 PRAC8 R-PROGRAM.R' and the bottom session is titled 'S108-M-2 PRAC8 R-PROGRAM.R'. Both sessions show the following R code in the console:

```
R > # Show ANOVA table
R > anova_summary <- summary(anova_result)
```

The environment pane shows the following objects:

Name	Type	Value
anova_result	list [13] (S3: aov, lm)	List of length 13
coefficients	double [18]	1.3333 -0.12366 -0.05128 0.00887 -0.00842 -0.04010 ...
residuals	double [65543]	0.0362 0.0362 0.0362 0.0362 0.0362 0.0362 ...
effects	double [65543]	-1252.871 3.582 5.268 0.168 -5.066 -3.394 ...
rank	integer [1]	18
fitted.values	double [65543]	4.96 4.96 4.96 4.96 4.96 4.96 ...
assign	integer [18]	0 1 1 1 1 1 ...
qr	list [5] (S3: qr)	List of length 5
df.residual	integer [1]	65525
contrasts	list [2]	List of length 2
xlevels	list [2]	List of length 2
call	language	aov(formula = rating ~ product_category * sentiment_label, data = reviews)
terms	formula	rating ~ product_category * sentiment_label
model	list [65543 x 3] (S3: data.frame)	A data.frame with 65543 rows and 3 columns

The bottom session shows a single object in the environment:

Name	Type	Value
anova_summary	list [1] (S3: summary.aov, listof)	List of length 1
[[1]]	list [4 x 5] (S3: anova, data.frame)	A data.frame with 4 rows and 5 columns

The RStudio interface includes a top bar with File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help, and Addins menus. The bottom bar shows system status including battery level, signal strength, and network connection.

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The screenshot shows the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The top toolbar has icons for file operations like Open, Save, and Print, along with a search bar and a Go to file/function button. The main workspace shows a table titled 'anova_table' with columns Df, Sum Sq, Mean Sq, F value, and Pr(>F). The table includes rows for 'product_category', 'sentiment_label', 'product_category:sentiment_label', and 'Residuals'. The right sidebar shows the 'Environment' tab with objects like 'anova_r...', 'anova_s...', 'anova_t...', and 'reviews'. The 'Files' tab shows a file tree with 'RData', 'Rhistory', 'Custom Office Templates', 'Dell', 'desktop.ini', 'My Music', 'My Videos', 'NetBeansProjects', and 'tokopedia_product_reviews_2025.csv'. The bottom console shows R code for generating the ANOVA table:

```

> # Show ANOVA table
> anova_summary <- summary(anova_result)

```

PRACTICAL9 M-2

The screenshot shows the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The top toolbar has icons for file operations like Open, Save, and Print, along with a search bar and a Go to file/function button. The main workspace shows the 'Source' tab with R code for reading a CSV file and viewing its first few records. The code includes:

```

> data <- read.csv("dataset.csv")
> # Step 2: View first few records
> head(data)

```

The code then prints the first few rows of the dataset to the console. The right sidebar shows the 'Environment' tab with objects like 'chi_res...', 'data', and 'conting...'. The 'Files' tab shows a file tree with 'RData', 'Rhistory', 'Custom Office Templates', 'dataset.csv', 'Dell', 'desktop.ini', 'My Music', 'My Videos', 'NetBeansProjects', and 'Shortcut to Documents (OneDrive - P... 1.7 Ki'. The bottom console shows the output of the R code:

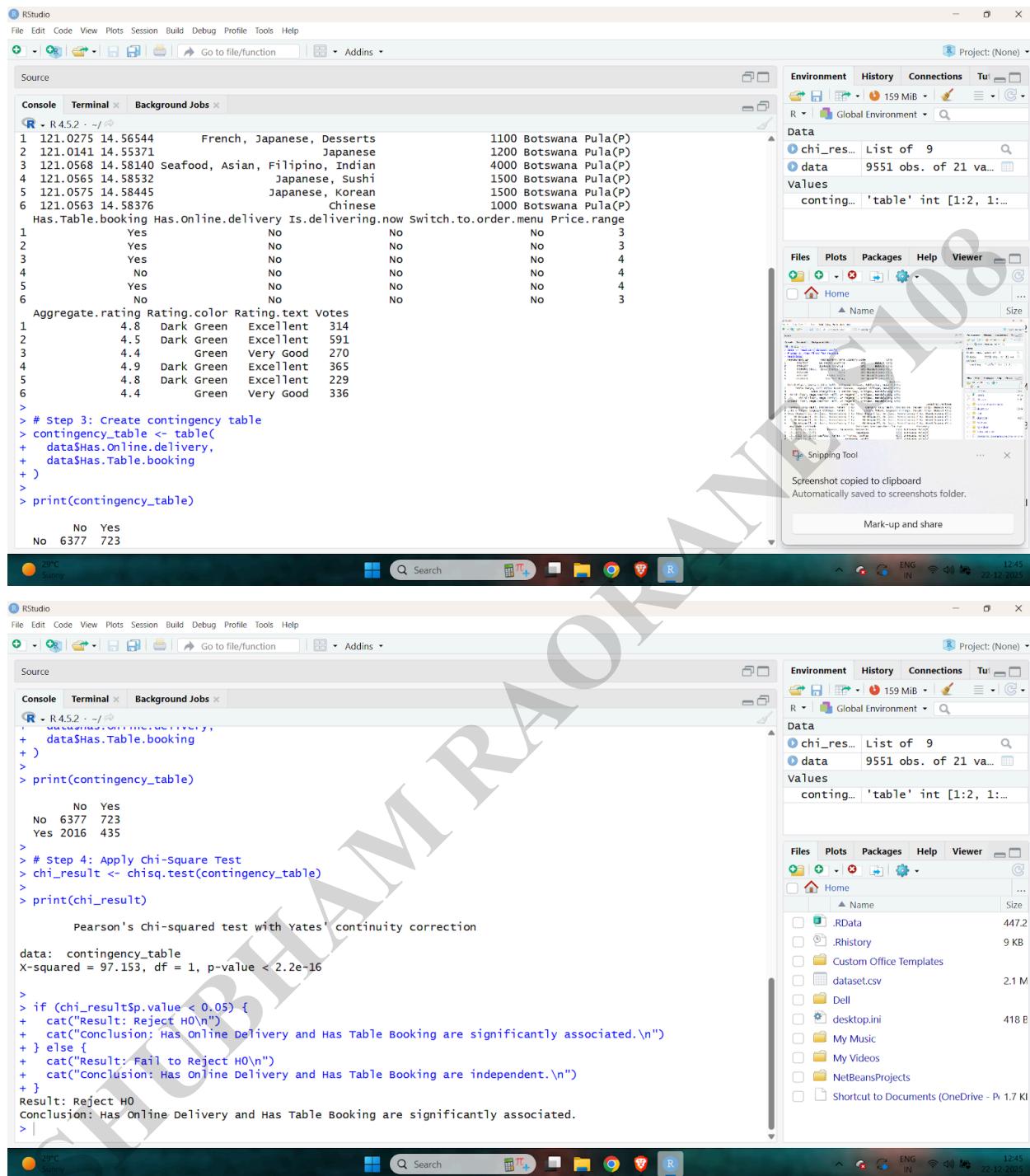
```

1 Restaurant.ID Restaurant.Name Country.Code City
1 6317637 Le Petit Souffle 162 Makati City
2 6304287 Izakaya Kikufuji 162 Makati City
3 6300002 Heat - Edsa Shangri-La 162 Mandaluyong City
4 6318506 Ooma 162 Mandaluyong City
5 6314302 Sambo Kojin 162 Mandaluyong City
6 18189371 Din Tai Fung 162 Mandaluyong City

```

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Two screenshots of the RStudio interface are shown, illustrating the R-Programming process for a contingency table analysis.

Top Screenshot (R 4.5.2):

```

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
+ Go to file/function Addins

Source
Console Terminal Background Jobs

R - R 4.5.2 - ~/r
1 121.0275 14.56544 French, Japanese, Desserts 1100 Botswana Pula(P)
2 121.0143 14.55371 Japanese 1200 Botswana Pula(P)
3 121.0568 14.58140 Seafood, Asian, Filipino, Indian 4000 Botswana Pula(P)
4 121.0565 14.58532 Japanese, Sushi 1500 Botswana Pula(P)
5 121.0575 14.58445 Japanese, Korean 1500 Botswana Pula(P)
6 121.0563 14.58376 Chinese 1000 Botswana Pula(P)
Has.Table.booking Has.Online.delivery Is.delivering.now switch.to.order.menu Price.range
1 Yes No No No 3
2 Yes No No No 3
3 Yes No No No 4
4 No No No No 4
5 Yes No No No 4
6 No No No No 3
Aggregate.rating Rating.color Rating.text Votes
1 4.8 Dark Green Excellent 314
2 4.5 Dark Green Excellent 591
3 4.4 Green Very Good 270
4 4.9 Dark Green Excellent 365
5 4.8 Dark Green Excellent 229
6 4.4 Green Very Good 336
>
> # Step 3: Create contingency table
> contingency_table <- table(
+   data$Has.Online.delivery,
+   data$Has.Table.booking
+ )
>
> print(contingency_table)
      No Yes
No 6377 723
  
```

Bottom Screenshot (R 4.5.2):

```

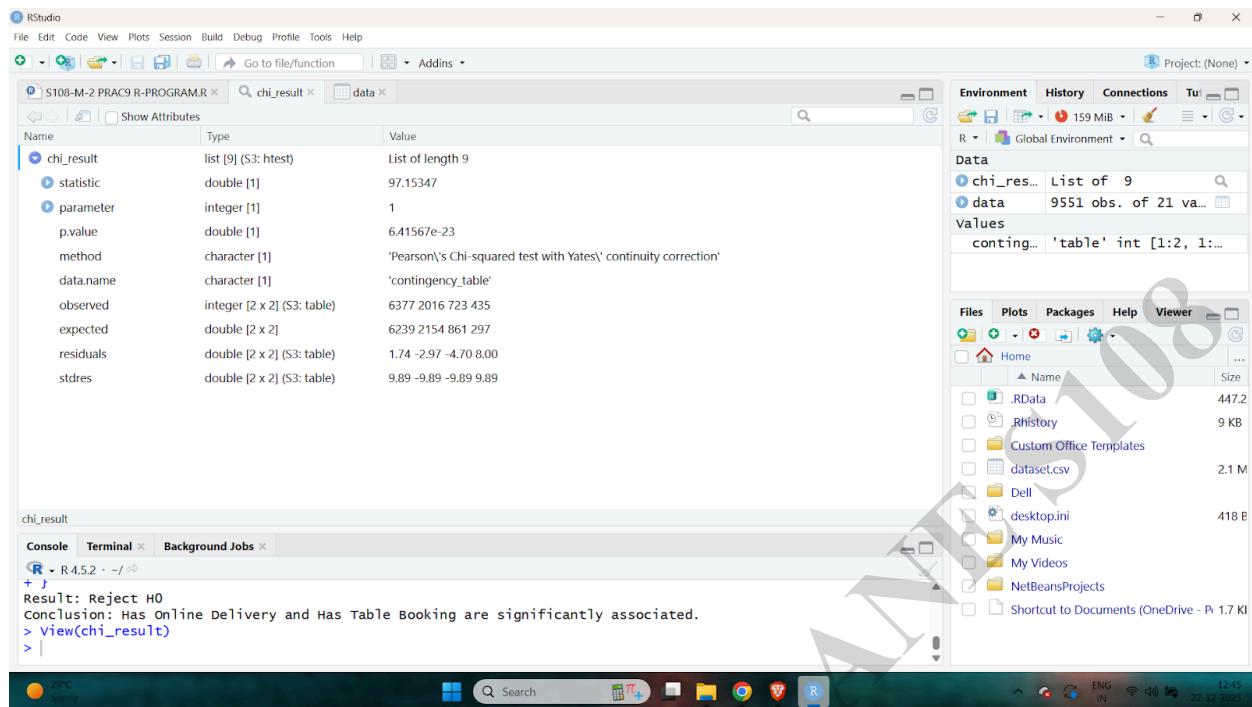
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
+ Go to file/function Addins

Source
Console Terminal Background Jobs

R - R 4.5.2 - ~/r
+ data$Has.Online.delivery,
+ data$Has.Table.booking
+ )
>
> print(contingency_table)
      No Yes
No 6377 723
Yes 2016 435
>
> # Step 4: Apply chi-square Test
> chi_result <- chisq.test(contingency_table)
>
> print(chi_result)
Pearson's chi-squared test with Yates' continuity correction
data: contingency_table
X-squared = 97.153, df = 1, p-value < 2.2e-16
>
> if (chi_result$p.value < 0.05) {
+   cat("Result: Reject H0\n")
+   cat("Conclusion: Has Online Delivery and Has Table Booking are significantly associated.\n")
+ } else {
+   cat("Result: Fail to Reject H0\n")
+   cat("Conclusion: Has Online Delivery and Has Table Booking are independent.\n")
+ }
Result: Reject H0
Conclusion: Has Online Delivery and Has Table Booking are significantly associated.
> |  
```

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The screenshot shows the RStudio interface with the following details:

- Environment View:** Shows the `chi_result` object as a list of length 9, with various components like statistic, parameter, p.value, method, data.name, observed, expected, residuals, and stdres.
- Console View:** Displays the R command `> view(chi_result)` and its output, which includes the test statistic (97.15347), degrees of freedom (1), and p-value (6.41567e-23). The output also states: "Result: Reject H0" and "Conclusion: Has Online Delivery and Has Table Booking are significantly associated."
- File Explorer:** Shows the directory structure of the user's desktop, including .RData, .Rhistory, Custom Office Templates, dataset.csv, Dell, desktop.ini, My Music, My Videos, NetBeansProjects, and a Shortcut to Documents (OneDrive - Pi 1.7 Ki).
- System Tray:** Shows the date (22-12-2023), time (12:45), battery level (29%), and weather (sunny).

