

PRAVALIKA BA ASSIGNMENT 2

2022-10-20

```
#import dataset
```

```
retail <-read.csv("C:/Users/girne/OneDrive/Documents/Hello/Assignment/Online_Retail.csv")
```

#1. Show the breakdown of the number of transactions by countries i.e., how many transactions are in the dataset for each country (consider all records including cancelled transactions). Show this in total number and also in percentage. Show only countries accounting for more than 1% of the total transactions.

```
summary(retail)
```

```
## InvoiceNo      StockCode      Description      Quantity
## Length:541909 Length:541909 Length:541909 Min. :-80995.00
## Class :character Class :character Class :character 1st Qu.: 1.00
## Mode :character Mode :character Mode :character Median : 3.00
## Mean : 9.55
## 3rd Qu.: 10.00
## Max. : 80995.00
##
## InvoiceDate      UnitPrice      CustomerID      Country
## Length:541909 Min. :-11062.06 Min. :12346 Length:541909
## Class :character 1st Qu.: 1.25 1st Qu.:13953 Class :character
## Mode :character Median : 2.08 Median :15152 Mode :character
## Mean : 4.61 Mean :15288
## 3rd Qu.: 4.13 3rd Qu.:16791
## Max. : 38970.00 Max. :18287
## NA's :135080
```

```
summary(retail$Country)
```

```
## Length Class Mode
## 541909 character character
```

```
country_totalnumber<-table(retail$Country)
transaction_percent<-round(100*prop.table(country_totalnumber),digits = 2)
percentage<-cbind(country_totalnumber,transaction_percent)
total<-subset(percentage,transaction_percent>1)
total
```

```
## country_totalnumber transaction_percent
## EIRE 8196 1.51
## France 8557 1.58
## Germany 9495 1.75
## United Kingdom 495478 91.43
```

##(2) Create a new variable 'TransactionValue' that is the product of the existing 'Quantity' and 'UnitPrice' variables. Add this variable to the dataframe.

```
library(dplyr)
```

```
##
```

```
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
## filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
## intersect, setdiff, setequal, union
```

```
retail <- retail %>% mutate(TransactionValue= Quantity * UnitPrice)
summary(retail$TransactionValue)
```

```
##      Min.      1st Qu.      Median      Mean      3rd Qu.      Max.
## -168469.60      3.40       9.75      17.99      17.40    168469.60
```

##(3).Using the newly created variable, TransactionValue, show the breakdown of transaction values by countries i.e. how much money in total has been spent each country. Show this in total sum of transaction values. Show only countries with total transaction exceeding 130,000 British Pound

```
data <- summarise(group_by(retail,Country),sum_1= sum(TransactionValue))
Transaction <- filter(data,sum_1 >130000)
Transaction
```

```
## # A tibble: 6 x 2
```

```
##   Country      sum_1
```

```
##   <chr>      <dbl>
```

```
## 1 Australia  137077.
```

```
## 2 EIRE       263277.
```

```
## 3 France     197404.
```

```
## 4 Germany    221698.
```

```
## 5 Netherlands 284662.
```

```
## 6 United Kingdom 8187806.
```

##4.the variable is read as a categorical when you read data from the file. Now we need to explicitly instruct R to interpret this as a Date variable."POSIXlt" and "POSIXct" are two powerful object classes in R to deal with date and time. first let's convert 'InvoiceDate' into a POSIXlt object:

```
Temp=strptime(retail$InvoiceDate,format='%m/%d/%Y %H:%M',tz='GMT')
head(Temp)
```

```
## [1] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"
```

```
## [3] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"
```

```
## [5] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"
```

#Now, let's separate date, day of the week and hour components dataframe with names as New_Invoice_Date, Invoice_Day_Week and New_Invoice_Hour:

```
retail$New_Invoice_Date <- as.Date(Temp)
```

#The Date objects have a lot of flexible functions. For example knowing two date values, the object allows you to know the difference between the two dates in terms of the number days.

```
retail$New_Invoice_Date[20000]- retail$New_Invoice_Date[10]
```

```
## Time difference of 8 days
```

#Also we can convert dates to days of the week. Let's define a new variable for that

```
retail$Invoice_Day_Week= weekdays(retail$New_Invoice_Date)
```

let's just take the hour (ignore the minute) and convert into a normal numerical value:

```
retail$New_Invoice_Hour = as.numeric(format(Temp, "%H"))
```

#define the month as a separate numeric variable too:

```
retail$New_Invoice_Month = as.numeric(format(Temp, "%m"))
```

4.a) The percentage of transactions (by numbers) by days of the week.

```
a<-summarise(group_by(retail,Invoice_Day_Week),Transaction_Value=n_distinct(InvoiceNo))
a1<-mutate(a, transaction_percent=(Transaction_Value/sum(Transaction_Value))*100)
a1
```

```
## # A tibble: 6 x 3
##   Invoice_Day_Week Transaction_Value transaction_percent
##   <chr>             <int>             <dbl>
## 1 Friday           4184             16.2
## 2 Monday           4138             16.0
## 3 Sunday           2381              9.19
## 4 Thursday         5660             21.9
## 5 Tuesday          4722             18.2
## 6 Wednesday        4815             18.6
```

4. b) The percentage of transactions (by transaction volume) by days of the week

```
b1<-summarise(group_by(retail,Invoice_Day_Week),Transaction_Volume=sum(TransactionValue))
b2<-mutate(b1,percentage=(Transaction_Volume/sum(Transaction_Volume))*100)
b2
```

```
## # A tibble: 6 x 3
##   Invoice_Day_Week Transaction_Volume percentage
##   <chr>                <dbl>         <dbl>
## 1 Friday                1540611.         15.8
## 2 Monday                1588609.         16.3
## 3 Sunday                 805679.          8.27
## 4 Thursday              2112519         21.7
## 5 Tuesday               1966183.         20.2
## 6 Wednesday             1734147.         17.8
```

4. c) The percentage of transactions (by transaction volume) by month of the year

```
c1<-summarise(group_by(retail,New_Invoice_Month),Transaction_Volume=sum(TransactionValue))
c1<-mutate(c1,percentage=(Transaction_Volume/sum(Transaction_Volume))*100)
c1
```

```
## # A tibble: 12 x 3
##   New_Invoice_Month Transaction_Volume percentage
##   <dbl>                <dbl>         <dbl>
## 1                1         560000.          5.74
## 2                2         498063.          5.11
## 3                3         683267.          7.01
## 4                4         493207.          5.06
## 5                5         723334.          7.42
## 6                6         691123.          7.09
## 7                7         681300.          6.99
## 8                8         682681.          7.00
## 9                9        1019688.         10.5
## 10              10        1070705.         11.0
## 11              11        1461756.         15.0
## 12              12        1182625.         12.1
```

##4. d) What was the date with the highest number of transactions from Australia?

```
retail <- retail %>% mutate(TransactionValue= Quantity * UnitPrice)
retail %>% filter(Country == 'Australia') %>% group_by(New_Invoice_Date) %>% summarise(max=max(TransactionValue))
```

```
## # A tibble: 49 x 2
##   New_Invoice_Date      max
##   <date>              <dbl>
## 1 2010-12-01           51
## 2 2010-12-08          71.4
## 3 2010-12-14         -6.25
## 4 2010-12-17         148.
```

```
## 5 2011-01-06      1020
## 6 2011-01-10       81.6
## 7 2011-01-11       35.4
## 8 2011-01-14      142.
## 9 2011-01-17       47.4
## 10 2011-01-19      38.2
## # ... with 39 more rows
```

4. e) The company needs to shut down the website for two consecutive hours for maintenance. What would be the hour of the day to start this so that the distribution is at minimum for the customers? The responsible IT team is available from 7:00 to 20:00 every day.

```
library(zoo)
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric
```

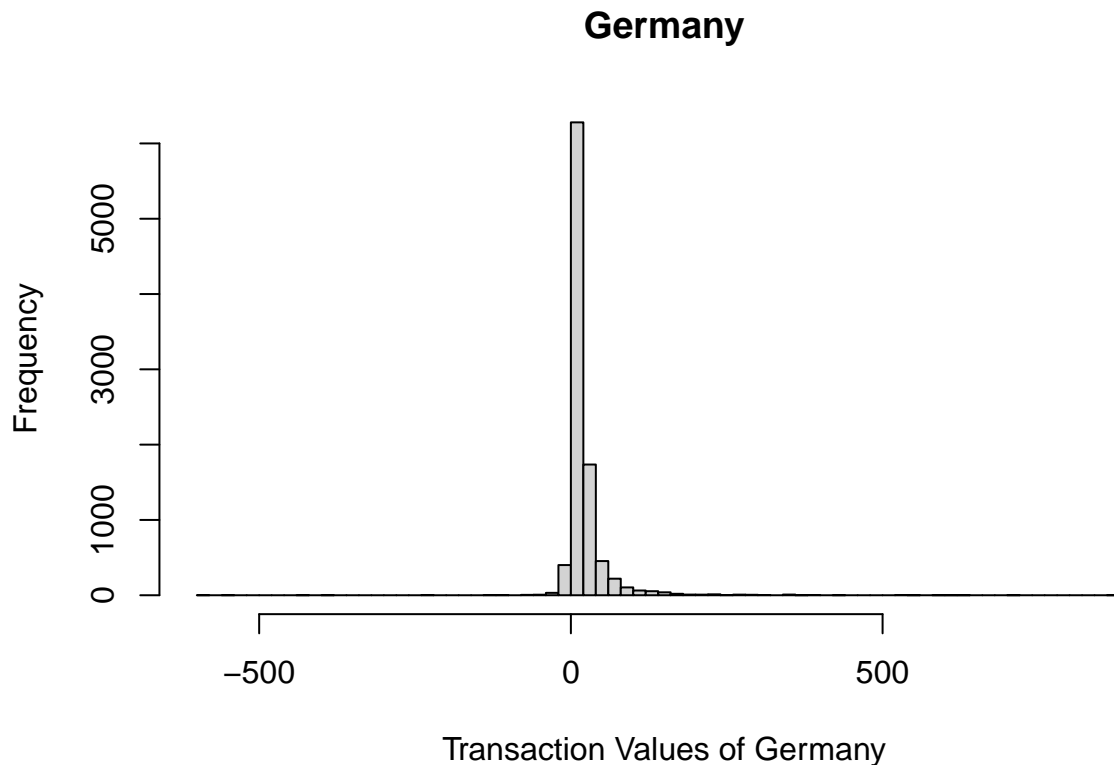
```
e1<-summarise(group_by(retail,New_Invoice_Hour),Transaction_min=n_distinct(InvoiceNo))
e1<-filter(e1,New_Invoice_Hour>=7&New_Invoice_Hour<=20)
e12<-rollapply(e1$Transaction_min,3,sum)
e123<-which.min(e12)
e123
```

```
## [1] 12
```

starting the work at 12noon is correct for maintenance.

#5. Plot the histogram of transaction values from Germany. Use the hist() function to plot.

```
Germany_data <- subset(retail$TransactionValue, retail$Country == "Germany")
hist(Germany_data, xlim = c (-600, 900), breaks = 100 , xlab = "Transaction Values of Germany", main =
```



##6. Which customer had the highest number of transactions? Which customer is most valuable (i.e. highest total sum of transactions)?

```
retail1 <- na.omit(retail)
result1 <- summarise(group_by(retail1, CustomerID), sum2= sum(TransactionValue))
result1[which.max(result1$sum2),]
```

```
## # A tibble: 1 x 2
##   CustomerID    sum2
##       <int>   <dbl>
## 1      14646 279489.
```

```
data2 <- table(retail$CustomerID)
data2 <- as.data.frame(data2)
result2 <- data2[which.max(data2$Freq),]
result2
```

```
##      Var1 Freq
## 4043 17841 7983
```

##7. Calculate the percentage of missing values for each variable in the dataset

```
missing_values <- colMeans(is.na(retail)*100)
missing_values
```

```
##      InvoiceNo      StockCode      Description      Quantity
##      0.00000      0.00000      0.00000      0.00000
##      InvoiceDate      UnitPrice      CustomerID      Country
##      0.00000      0.00000      24.92669      0.00000
## TransactionValue New_Invoice_Date Invoice_Day_Week New_Invoice_Hour
##      0.00000      0.00000      0.00000      0.00000
## New_Invoice_Month
##      0.00000
```

##8. What are the number of transactions with missing CustomerID records by countries?

```
retail_2 <- retail %>% filter(is.na(CustomerID)) %>% group_by(Country)
summary(retail_2$Country)
```

```
##      Length      Class      Mode
##      135080 character character
```

##10. the retail sector, it is very important to understand the return rate of the goods purchased by customers. In this example, we can define this quantity, simply, as the ratio of the number of transactions cancelled (regardless of the transaction value) over the total number of transaction with this definition, what is the return rate for the French customers?

```
retail_table <- filter(retail, Country=="France")
totalrow <- nrow(retail_table)
cancel <- nrow(subset(retail_table, TransactionValue<0))
cancel
```

```
## [1] 149
```

```
notcancel <- totalrow-cancel
notcancel
```

```
## [1] 8408
```

```
TEST2=(cancel/8556)
TEST2
```

```
## [1] 0.01741468
```

##11. What is the product that has generated the highest revenue for the retailer? (i.e. item with the highest total sum of TransactionValue').

```
Transaction_Value <- tapply(retail$TransactionValue, retail$StockCode , sum)
Transaction_Value[which.max(Transaction_Value)]
```

```
##      DOT
## 206245.5
```

##12. How many unique customers are represented in the dataset? You can use unique() and length() functions.

```
unique_customers <- unique(retail$CustomerID)  
length(unique_customers)
```

```
## [1] 4373
```