BA_Assignment–2

2022-10-25

#import dataset

```
retail<-read.csv("C:/Users/MEGHANA/Downloads/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 exising '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.he 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. irst 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) Show 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)Show 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)Show 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
```

7. 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(Transacti
## # 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
```

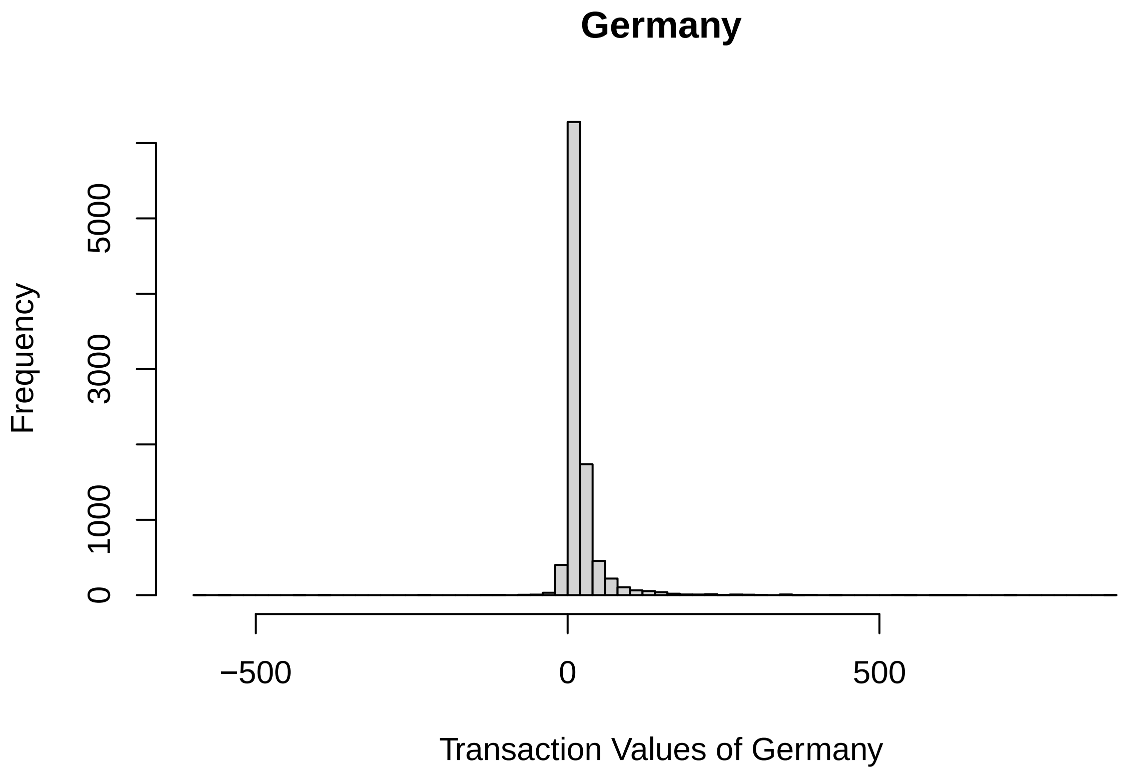
```
e1<-summarise(group_by(retail,New_Invoice_Hour),Transaction_min=n_distinct(InvoiceNo))
e1<-filter(e1,New_Invoice_Hour>=7&New_Invoice_Hour<=20)
e12<-rollapply(e1$Transaction_min,3,sum)
e123<-which.min(e12)
e123
```

```
## [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
```