

PCA Analysis

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2023-02-09

PCA Analysis on Travel Discrimination

Dataset explanation: | Variable | Description | |-----|-----|
-----| | Q1 | Frequency of traveling | | Q2 | Discrimination | | Q3 | Have the respondent ever made complaint | | Q4 | Travel award or voucher | | Q5 | Visibly represent religion | | Q6_15 | Checkin experience rate | | Q6_16 | Bag drop off experience rate | | Q6_17 | Security line experience rate | | Q6_18 | Boarding airplane experience rate | | Q6_19 | Baggage claim experience rate | | Q8 | Have respondent ever been denied by entry due to racial profile | | Q9 | Have respondent ever avoided air travel due to racial profile | | Q10 | Have respondent ever been asked to deplane by entry due to racial profile | | Q11 | Have respondent ever been detained at the airport | | Q12 | Have respondent ever been developed strategy to avoid being racially profiled | | Q13 | Do respondent have ethnic sounding name | | Q14 | Age | | Q15 | Gender | | Q16 | US citizenship | | Q17 | Best description of respondent | | Q18 | Religious affiliation | | Q19 | Chronic illness | | prefer_ | airlines that respondent prefer | | avoid_ | airlines that avoided | | not_flown | airlines that haven't been flew with |

Library

```
library(readr)
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.2 --
## v ggplot2 3.4.0      v dplyr 1.0.10
## v tibble 3.1.8      v stringr 1.5.0
## v tidyr 1.2.1      v forcats 0.5.2
## v purrr 0.3.5
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag() masks stats::lag()

library(XML)
library(corrplot)

## corrplot 0.92 loaded

library(factoextra)

## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
library(MASS)

##
## Attaching package: 'MASS'
##
## The following object is masked from 'package:dplyr':
```

```
##
##      select
library(mvtnorm)
library(MVN)
library(psych)

##
## Attaching package: 'psych'
##
## The following objects are masked from 'package:ggplot2':
##
##      %+%, alpha
library(ggfortify)
library(ggpubr)
```

Read the dataset

```
travel_df <- read_csv("Travel Study 2.7.23.csv")

## Rows: 207 Columns: 82
## -- Column specification -----
## Delimiter: ","
## chr (82): StartDate, EndDate, Progress, Duration (in seconds), Finished, Ext...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
head(travel_df)

## # A tibble: 6 x 82
##   StartDate      EndDate Progr~1 Durat~2 Finis~3 Exter~4 Locat~5 Locat~6 Distr~7
##   <chr>          <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <chr>
## 1 "Start Date"    "End D~ "Progr~ "Durat~ "Finis~ "Exter~ "Locat~ "Locat~ "Distr~
## 2 "{\"ImportId\"~ "{\"Im~ "{\"Im~ "{\"Im~ "{\"Im~ "{\"Im~ "{\"Im~ "{\"Im~ "{\"Im~
## 3 "7/4/2022 7:2~ "7/4/2~ "100"   "177"   "TRUE"   <NA>    "28.99~ "-82.4~ "anony~
## 4 "7/4/2022 7:4~ "7/4/2~ "100"   "174"   "TRUE"   <NA>    "38.65~ "-77.2~ "anony~
## 5 "7/4/2022 7:5~ "7/4/2~ "100"   "570"   "TRUE"   <NA>    "28.55~ "-81.3~ "anony~
## 6 "7/4/2022 8:1~ "7/4/2~ "100"   "256"   "TRUE"   <NA>    "28.54~ "-81.2~ "anony~
## # ... with 73 more variables: UserLanguage <chr>, `Text / Graphic` <chr>,
## #   Q1 <chr>, Q2 <chr>, Q3 <chr>, Q4 <chr>, Q5 <chr>, Q6_15 <chr>, Q6_16 <chr>,
## #   Q6_17 <chr>, Q6_18 <chr>, Q6_19 <chr>, Q7_0_GROUP <chr>, Q7_1_GROUP <chr>,
## #   Q7_2_GROUP <chr>, Q7_0_1_RANK <chr>, Q7_0_2_RANK <chr>, Q7_0_3_RANK <chr>,
## #   Q7_0_4_RANK <chr>, Q7_0_5_RANK <chr>, Q7_0_6_RANK <chr>, Q7_0_7_RANK <chr>,
## #   Q7_0_8_RANK <chr>, Q7_0_9_RANK <chr>, Q7_0_10_RANK <chr>,
## #   Q7_0_11_RANK <chr>, Q7_0_12_RANK <chr>, Q7_0_13_RANK <chr>, ...
```

```
str(travel_df)
```

```
## spc_tbl_ [207 x 82] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
## $ StartDate      : chr [1:207] "Start Date" "{\"ImportId\":\"startDate\", \"timeZone\":\"America/Denver\"}"
## $ EndDate        : chr [1:207] "End Date"  "{\"ImportId\":\"endDate\", \"timeZone\":\"America/Denver\"}"
## $ Progress       : chr [1:207] "Progress" "{\"ImportId\":\"progress\"}" "100" "100" ...
## $ Duration (in seconds): chr [1:207] "Duration (in seconds)" "{\"ImportId\":\"duration\"}" "177" "177" ...
## $ Finished       : chr [1:207] "Finished" "{\"ImportId\":\"finished\"}" "TRUE" "TRUE" ...
```

```

## $ ExternalReference : chr [1:207] "External Data Reference" "{\"ImportId\":\"externalDataReferen
## $ LocationLatitude : chr [1:207] "Location Latitude" "{\"ImportId\":\"locationLatitude\"}" "28.
## $ LocationLongitude : chr [1:207] "Location Longitude" "{\"ImportId\":\"locationLongitude\"}" "-
## $ DistributionChannel : chr [1:207] "Distribution Channel" "{\"ImportId\":\"distributionChannel\"}
## $ UserLanguage : chr [1:207] "User Language" "{\"ImportId\":\"userLanguage\"}" "EN" "EN" ..
## $ Text / Graphic : chr [1:207] "Text / Graphic introduction" "{\"ImportId\":\"QID1\"}" "Yes"
## $ Q1 : chr [1:207] "How frequently do you travel by airplane?" "{\"ImportId\":\"Q
## $ Q2 : chr [1:207] "Have you ever experienced discrimination in air travel? (Sele
## $ Q3 : chr [1:207] "Have you ever filed a complaint as result of discrimination y
## $ Q4 : chr [1:207] "Have you ever received any monetary award, travel voucher, or
## $ Q5 : chr [1:207] "Do you visibly represent your religious identity in any of the
## $ Q6_15 : chr [1:207] "How would you rate your air travel experience compared to oth
## $ Q6_16 : chr [1:207] "How would you rate your air travel experience compared to oth
## $ Q6_17 : chr [1:207] "How would you rate your air travel experience compared to oth
## $ Q6_18 : chr [1:207] "How would you rate your air travel experience compared to oth
## $ Q6_19 : chr [1:207] "How would you rate your air travel experience compared to oth
## $ Q7_0_GROUP : chr [1:207] "Please select your preference to airlines. Drag the name of th
## $ Q7_1_GROUP : chr [1:207] "Please select your preference to airlines. Drag the name of th
## $ Q7_2_GROUP : chr [1:207] "Please select your preference to airlines. Drag the name of th
## $ Q7_0_1_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th
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## $ Q7_0_6_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th
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## $ Q7_1_8_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th
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## $ Q7_1_10_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th
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## $ Q7_2_6_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th
## $ Q7_2_7_RANK : chr [1:207] "Please select your preference to airlines. Drag the name of th

```

```

## $ Q7_2_8_RANK      : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_9_RANK      : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_10_RANK     : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_11_RANK     : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_12_RANK     : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_13_RANK     : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q7_2_14_RANK     : chr [1:207] "Please select your preference to airlines. Drag the name of tl
## $ Q8               : chr [1:207] "Have you ever been denied entry to an airplane based on racia
## $ Q9               : chr [1:207] "Have you ever avoided air travel to avoid racial profiling?"
## $ Q10              : chr [1:207] "Have you ever been asked to deplane from an airplane based on
## $ Q11              : chr [1:207] "Have you ever been detained at the airport?" "{"ImportId\":"
## $ Q12              : chr [1:207] "Have you developed or adopted a strategy to avoid being racia
## $ Q12_1_TEXT       : chr [1:207] "Have you developed or adopted a strategy to avoid being racia
## $ Q13              : chr [1:207] "Do you have an ethnic- or foreign-sounding name?" "{"ImportI
## $ Q14              : chr [1:207] "How old are you?" "{"ImportId\":"QID16\"}" "18-24 years old
## $ Q15              : chr [1:207] "To which gender identity do you most identify? - Selected Cho
## $ Q15_6_TEXT       : chr [1:207] "To which gender identity do you most identify? - Not Listed -
## $ Q16              : chr [1:207] "Why did you choose to take the question tour?" "{"ImportId\"
## $ Q17              : chr [1:207] "Did you find this explanation useful?" "{"ImportId\":"QID4\
## $ Q18              : chr [1:207] "The question tour has helped me learn how to configure my own
## $ Q18_24_TEXT      : chr [1:207] "The question tour has helped me learn how to configure my own
## $ Q19              : chr [1:207] "Do you suffer from any chronic illness(es)?" "{"ImportId\":"
## $ Q20              : chr [1:207] "(Optional) Please share any travel experiences you have endur
## - attr(*, "spec")=
## .. cols(
## ..   StartDate = col_character(),
## ..   EndDate = col_character(),
## ..   Progress = col_character(),
## ..   `Duration (in seconds)` = col_character(),
## ..   Finished = col_character(),
## ..   ExternalReference = col_character(),
## ..   LocationLatitude = col_character(),
## ..   LocationLongitude = col_character(),
## ..   DistributionChannel = col_character(),
## ..   UserLanguage = col_character(),
## ..   `Text / Graphic` = col_character(),
## ..   Q1 = col_character(),
## ..   Q2 = col_character(),
## ..   Q3 = col_character(),
## ..   Q4 = col_character(),
## ..   Q5 = col_character(),
## ..   Q6_15 = col_character(),
## ..   Q6_16 = col_character(),
## ..   Q6_17 = col_character(),
## ..   Q6_18 = col_character(),
## ..   Q6_19 = col_character(),
## ..   Q7_0_GROUP = col_character(),
## ..   Q7_1_GROUP = col_character(),
## ..   Q7_2_GROUP = col_character(),
## ..   Q7_0_1_RANK = col_character(),
## ..   Q7_0_2_RANK = col_character(),
## ..   Q7_0_3_RANK = col_character(),
## ..   Q7_0_4_RANK = col_character(),
## ..   Q7_0_5_RANK = col_character(),

```

```

## .. Q7_0_6_RANK = col_character(),
## .. Q7_0_7_RANK = col_character(),
## .. Q7_0_8_RANK = col_character(),
## .. Q7_0_9_RANK = col_character(),
## .. Q7_0_10_RANK = col_character(),
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## .. Q7_1_5_RANK = col_character(),
## .. Q7_1_6_RANK = col_character(),
## .. Q7_1_7_RANK = col_character(),
## .. Q7_1_8_RANK = col_character(),
## .. Q7_1_9_RANK = col_character(),
## .. Q7_1_10_RANK = col_character(),
## .. Q7_1_11_RANK = col_character(),
## .. Q7_1_12_RANK = col_character(),
## .. Q7_1_13_RANK = col_character(),
## .. Q7_1_14_RANK = col_character(),
## .. Q7_2_1_RANK = col_character(),
## .. Q7_2_2_RANK = col_character(),
## .. Q7_2_3_RANK = col_character(),
## .. Q7_2_4_RANK = col_character(),
## .. Q7_2_5_RANK = col_character(),
## .. Q7_2_6_RANK = col_character(),
## .. Q7_2_7_RANK = col_character(),
## .. Q7_2_8_RANK = col_character(),
## .. Q7_2_9_RANK = col_character(),
## .. Q7_2_10_RANK = col_character(),
## .. Q7_2_11_RANK = col_character(),
## .. Q7_2_12_RANK = col_character(),
## .. Q7_2_13_RANK = col_character(),
## .. Q7_2_14_RANK = col_character(),
## .. Q8 = col_character(),
## .. Q9 = col_character(),
## .. Q10 = col_character(),
## .. Q11 = col_character(),
## .. Q12 = col_character(),
## .. Q12_1_TEXT = col_character(),
## .. Q13 = col_character(),
## .. Q14 = col_character(),
## .. Q15 = col_character(),
## .. Q15_6_TEXT = col_character(),
## .. Q16 = col_character(),
## .. Q17 = col_character(),
## .. Q18 = col_character(),
## .. Q18_24_TEXT = col_character(),
## .. Q19 = col_character(),
## .. Q20 = col_character()
## .. )

```

```
## - attr(*, "problems")=<externalptr>
```

Dataset contains 207 rows and 82 columns which is still messy. Thus, we'll conduct some data preprocessing steps.

```
## DATA PREPROCESSING
```

```
# First, drop two first rows. Next, filter only data that has 100 in progress
```

```
travel_df <- travel_df %>%
  slice(-c(1,2)) %>%
  filter(Progress == '100')
```

```
# Drop the first 11 columns since it contains the questionnaire status
```

```
travel_df_clean <- travel_df[-c(1:11)]
```

```
# Drop all column that contains _RANK in the end of the name
```

```
travel_df_clean <- travel_df_clean[!grepl("_RANK$", names(travel_df_clean))]
```

```
# Drop optional column named Q20 and column contains _TEXT in the end of name
```

```
travel_df_clean <- travel_df_clean[!grepl("_TEXT$", names(travel_df_clean))]
```

```
travel_df_clean <- subset(travel_df_clean, select = -c(Q20))
```

```
# CHECK MISSING VALUE----
```

```
# Count the missing values by column wise
```

```
print("Count of missing values by column wise")
```

```
## [1] "Count of missing values by column wise"
```

```
sapply(travel_df_clean, function(x) sum(is.na(x)))
```

```
##      Q1      Q2      Q3      Q4      Q5      Q6_15      Q6_16
##      0       1       3       3       1       4         8
##      Q6_17    Q6_18    Q6_19 Q7_0_GROUP Q7_1_GROUP Q7_2_GROUP      Q8
##      6       6       8      19      46      32         2
##      Q9      Q10     Q11     Q12     Q13     Q14      Q15
##      2       2       2       2       2       1         1
##      Q16     Q17     Q18     Q19
##      1       1       6       9
```

```
# Missing value imputation
```

```
# Since our data contains 46 missing value, let's impute with mode
```

```
# Function to see mode
```

```
calc_mode <- function(x){
```

```
  # List the distinct / unique values
```

```
  distinct_values <- unique(na.omit(x))
```

```
  # Count the occurrence of each distinct value
```

```
  distinct_tabulate <- tabulate(match(x, distinct_values))
```

```
  # Return the value with the highest occurrence
```

```
  distinct_values[which.max(distinct_tabulate)]
```

```
}
```

```
calc_mode(travel_df_clean$Q8)
```

```
## [1] "No"
```

```

calc_mode(travel_df_clean$Q7_0_GROUP)

## [1] "Delta Air Lines"

calc_mode(travel_df_clean$Q7_1_GROUP)

## [1] "Spirit Airlines"

calc_mode(travel_df_clean$Q7_2_GROUP)

## [1] "Sun Country Airlines"

# Impute missing value----
travel_df_clean <- travel_df_clean %>%
  mutate(across(everything(), ~replace_na(.x, calc_mode(.x))))

# CONVERT DATA TYPE-----
# First, convert column Q6_15 - Q6_19 to numeric data type
travel_df_clean[6:10] <- lapply(travel_df_clean[6:10], as.numeric)

# Second convert to character exclude Q7_0_GROUP , Q7_1_GROUP, Q7_2_GROUP to numeric
exclude <- travel_df_clean[,6:13]

travel_df_clean[,-6:-13] <- lapply(travel_df_clean[,-6:-13], factor)
travel_df_clean[,-6:-13] <- sapply(travel_df_clean[,-6:-13], as.numeric)

# CONVERT Q7_0_GROUP , Q7_1_GROUP, Q7_2_GROUP to dummy----
travel_df_clean = travel_df_clean%>%
  separate_rows(Q7_0_GROUP, sep = ",") %>%
  mutate(Q7_0_GROUP = as.factor(Q7_0_GROUP)) %>% mutate(seen =1) %>%
  pivot_wider(names_from = Q7_0_GROUP, values_from = seen,
              names_prefix = 'prefer_', values_fn = list(seen = length), values_fill = 0)

travel_df_clean = travel_df_clean%>%
  separate_rows(Q7_1_GROUP, sep = ",") %>%
  mutate(Q7_1_GROUP = as.factor(Q7_1_GROUP)) %>% mutate(seen =1) %>%
  pivot_wider(names_from = Q7_1_GROUP, values_from = seen,
              names_prefix = 'avoid_', values_fn = list(seen = length), values_fill = 0)

travel_df_clean = travel_df_clean%>%
  separate_rows(Q7_2_GROUP, sep = ",") %>%
  mutate(Q7_2_GROUP = as.factor(Q7_2_GROUP)) %>% mutate(seen =1) %>%
  pivot_wider(names_from = Q7_2_GROUP, values_from = seen,
              names_prefix = 'not_flown_', values_fn = list(seen = length), values_fill = 0)

head(travel_df_clean)

## # A tibble: 6 x 61
##       Q1     Q2     Q3     Q4     Q5  Q6_15  Q6_16  Q6_17  Q6_18  Q6_19    Q8     Q9    Q10
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1     1    12     1     3     2     54     50     71     50     51     2     2     2
## 2     1     2     2     2     5     52     52     51     53     52     2     2     2
## 3     2    17     2     2     2     50     50     50     50     50     2     2     2
## 4     1    17     2     2     6     51     53     54     52     57     2     2     2

```

```
## 5      1      12      2      2      5      48      100      100      100      100      3      3      3
## 6      1      18      1      2      2      50      50      50      50      50      2      2      2
## # ... with 48 more variables: Q11 <dbl>, Q12 <dbl>, Q13 <dbl>, Q14 <dbl>,
## #   Q15 <dbl>, Q16 <dbl>, Q17 <dbl>, Q18 <dbl>, Q19 <dbl>,
## #   prefer_JetBlue <int>, `prefer_Allegiant Air` <int>,
## #   `prefer_Delta Air Lines` <int>, `prefer_Southwest Airlines` <int>,
## #   `prefer_American Airlines` <int>, `prefer_Frontier Airlines` <int>,
## #   `prefer_Spirit Airlines` <int>, `prefer_Alaska Airlines` <int>,
## #   `prefer_United Airlines` <int>, `prefer_Hawaiian Airlines` <int>, ...
```

EXPLORATORY DATA ANALYSIS

1. Summary Statistics

```
mvn(travel_df_clean, mvnTest = "royston", univariatePlot = "qq")
```

```
## $multivariateNormality
##      Test      H p value MVN
## 1 Royston 4696.468      0 NO
##
## $univariateNormality
##      Test      Variable Statistic      p value
## 1 Anderson-Darling      Q1      14.4161 <0.001
## 2 Anderson-Darling      Q2      17.8401 <0.001
## 3 Anderson-Darling      Q3      31.8252 <0.001
## 4 Anderson-Darling      Q4      48.7622 <0.001
## 5 Anderson-Darling      Q5      12.3710 <0.001
## 6 Anderson-Darling     Q6_15      8.1987 <0.001
## 7 Anderson-Darling     Q6_16     11.4048 <0.001
## 8 Anderson-Darling     Q6_17      1.7367 2e-04
## 9 Anderson-Darling     Q6_18      9.7366 <0.001
## 10 Anderson-Darling     Q6_19     12.4107 <0.001
## 11 Anderson-Darling      Q8      46.4123 <0.001
## 12 Anderson-Darling      Q9      40.0428 <0.001
## 13 Anderson-Darling     Q10      48.7622 <0.001
## 14 Anderson-Darling     Q11      35.7464 <0.001
## 15 Anderson-Darling     Q12      29.2234 <0.001
## 16 Anderson-Darling     Q13      26.4450 <0.001
## 17 Anderson-Darling     Q14       5.5692 <0.001
## 18 Anderson-Darling     Q15      23.3882 <0.001
## 19 Anderson-Darling     Q16      31.8536 <0.001
## 20 Anderson-Darling     Q17      19.5704 <0.001
## 21 Anderson-Darling     Q18       9.4365 <0.001
## 22 Anderson-Darling     Q19      20.4406 <0.001
## 23 Anderson-Darling   prefer_JetBlue     26.3155 <0.001
## 24 Anderson-Darling   prefer_Allegiant Air     48.9547 <0.001
## 25 Anderson-Darling   prefer_Delta Air Lines     27.3967 <0.001
## 26 Anderson-Darling   prefer_Southwest Airlines     28.0235 <0.001
## 27 Anderson-Darling   prefer_American Airlines     24.9742 <0.001
## 28 Anderson-Darling   prefer_Frontier Airlines     45.7747 <0.001
## 29 Anderson-Darling   prefer_Spirit Airlines     40.4975 <0.001
## 30 Anderson-Darling   prefer_Alaska Airlines     38.5997 <0.001
## 31 Anderson-Darling   prefer_United Airlines     26.0810 <0.001
## 32 Anderson-Darling   prefer_Hawaiian Airlines     42.4590 <0.001
```


## 33	Anderson-Darling	prefer_Avelo Airlines	46.4297	<0.001
## 34	Anderson-Darling	prefer_Breeze Airways	52.1632	<0.001
## 35	Anderson-Darling	avoid_Delta Air Lines	39.8565	<0.001
## 36	Anderson-Darling	avoid_Spirit Airlines	28.3584	<0.001
## 37	Anderson-Darling	avoid_Frontier Airlines	39.2236	<0.001
## 38	Anderson-Darling	avoid_American Airlines	37.9855	<0.001
## 39	Anderson-Darling	avoid_United Airlines	34.0066	<0.001
## 40	Anderson-Darling	avoid_Southwest Airlines	35.6387	<0.001
## 41	Anderson-Darling	avoid_Allegiant Air	50.6851	<0.001
## 42	Anderson-Darling	avoid_Sun Country Airlines	51.2147	<0.001
## 43	Anderson-Darling	avoid_Alaska Airlines	51.7113	<0.001
## 44	Anderson-Darling	avoid_JetBlue	44.4511	<0.001
## 45	Anderson-Darling	avoid_Eastern Airlines	51.2147	<0.001
## 46	Anderson-Darling	avoid_Avelo Airlines	51.2147	<0.001
## 47	Anderson-Darling	avoid_Breeze Airways	51.7113	<0.001
## 48	Anderson-Darling	not_flown_Eastern Airlines	26.0810	<0.001
## 49	Anderson-Darling	not_flown_Hawaiian Airlines	24.4431	<0.001
## 50	Anderson-Darling	not_flown_Southwest Airlines	39.8565	<0.001
## 51	Anderson-Darling	not_flown_Sun Country Airlines	46.4297	<0.001
## 52	Anderson-Darling	not_flown_United Airlines	46.4297	<0.001
## 53	Anderson-Darling	not_flown_Breeze Airways	27.7029	<0.001
## 54	Anderson-Darling	not_flown_American Airlines	45.1146	<0.001
## 55	Anderson-Darling	not_flown_Avelo Airlines	24.9742	<0.001
## 56	Anderson-Darling	not_flown_Alaska Airlines	24.7192	<0.001
## 57	Anderson-Darling	not_flown_Allegiant Air	25.4634	<0.001
## 58	Anderson-Darling	not_flown_Frontier Airlines	25.6550	<0.001
## 59	Anderson-Darling	not_flown_JetBlue	35.0819	<0.001
## 60	Anderson-Darling	not_flown_Spirit Airlines	32.0164	<0.001
## 61	Anderson-Darling	not_flown_Delta Air Lines	47.7154	<0.001
##	Normality			
## 1	NO			
## 2	NO			
## 3	NO			
## 4	NO			
## 5	NO			
## 6	NO			
## 7	NO			
## 8	NO			
## 9	NO			
## 10	NO			
## 11	NO			
## 12	NO			
## 13	NO			
## 14	NO			
## 15	NO			
## 16	NO			
## 17	NO			
## 18	NO			
## 19	NO			
## 20	NO			
## 21	NO			
## 22	NO			
## 23	NO			
## 24	NO			

```

## 25    NO
## 26    NO
## 27    NO
## 28    NO
## 29    NO
## 30    NO
## 31    NO
## 32    NO
## 33    NO
## 34    NO
## 35    NO
## 36    NO
## 37    NO
## 38    NO
## 39    NO
## 40    NO
## 41    NO
## 42    NO
## 43    NO
## 44    NO
## 45    NO
## 46    NO
## 47    NO
## 48    NO
## 49    NO
## 50    NO
## 51    NO
## 52    NO
## 53    NO
## 54    NO
## 55    NO
## 56    NO
## 57    NO
## 58    NO
## 59    NO
## 60    NO
## 61    NO

```

```
##
```

```
## $Descriptives
```

##	n	Mean	Std.Dev	Median	Min	Max	25th
## Q1	136	1.705882353	0.63383193	2	1	3	1
## Q2	136	5.955882353	5.76819844	2	1	18	2
## Q3	136	2.198529412	0.78711713	2	1	7	2
## Q4	136	2.014705882	0.17149859	2	1	3	2
## Q5	136	5.191176471	3.92996976	2	1	15	2
## Q6_15	136	54.448529412	19.72583185	50	0	100	50
## Q6_16	136	56.272058824	16.87095550	50	0	100	50
## Q6_17	136	50.345588235	26.24313065	50	0	100	30
## Q6_18	136	55.691176471	18.22270245	50	0	100	50
## Q6_19	136	56.250000000	17.19119068	50	5	100	50
## Q8	136	2.014705882	0.21030116	2	1	3	2
## Q9	136	2.117647059	0.34552855	2	1	3	2
## Q10	136	2.014705882	0.17149859	2	1	3	2
## Q11	136	2.169117647	0.39543969	2	1	3	2

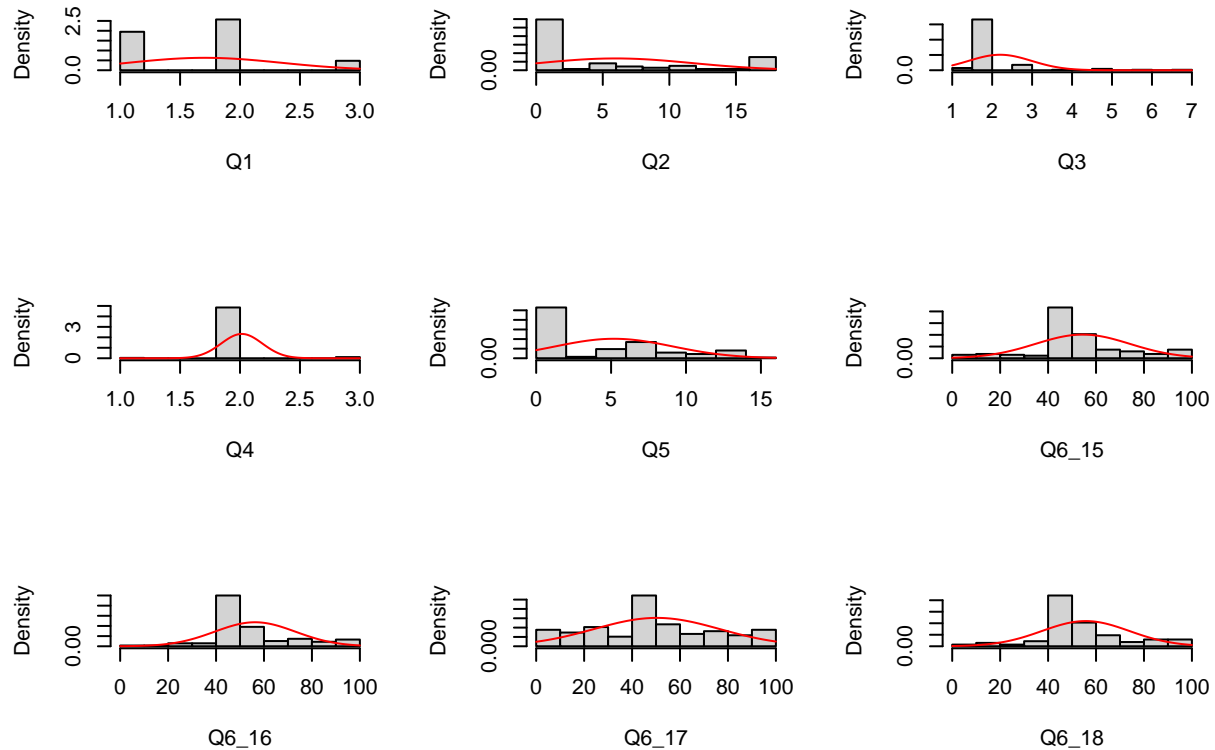
## Q12	136	2.139705882	0.44176069	2	1	3	2
## Q13	136	2.683823529	0.51210829	3	1	3	2
## Q14	136	2.852941176	1.67123557	3	1	6	1
## Q15	136	2.029411765	0.99585196	3	1	3	1
## Q16	136	2.764705882	0.49043132	3	1	3	3
## Q17	136	3.904411765	2.57589589	2	1	8	2
## Q18	136	6.308823529	2.27226337	7	1	12	5
## Q19	136	7.095588235	1.59572891	7	1	11	7
## prefer_JetBlue	136	0.375000000	0.48591266	0	0	1	0
## prefer_Allegiant Air	136	0.051470588	0.22177242	0	0	1	0
## prefer_Delta Air Lines	136	0.654411765	0.47731776	1	0	1	0
## prefer_Southwest Airlines	136	0.330882353	0.47227028	0	0	1	0
## prefer_American Airlines	136	0.426470588	0.49639221	0	0	1	0
## prefer_Frontier Airlines	136	0.088235294	0.28468536	0	0	1	0
## prefer_Spirit Airlines	136	0.147058824	0.35547385	0	0	1	0
## prefer_Alaska Airlines	136	0.169117647	0.37624159	0	0	1	0
## prefer_United Airlines	136	0.382352941	0.48775865	0	0	1	0
## prefer_Hawaiian Airlines	136	0.125000000	0.33194154	0	0	1	0
## prefer_Avelo Airlines	136	0.080882353	0.27366232	0	0	1	0
## prefer_Breeze Airways	136	0.007352941	0.08574929	0	0	1	0
## avoid_Delta Air Lines	136	0.154411765	0.36267885	0	0	1	0
## avoid_Spirit Airlines	136	0.676470588	0.46955224	1	0	1	0
## avoid_Frontier Airlines	136	0.161764706	0.36959614	0	0	1	0
## avoid_American Airlines	136	0.176470588	0.38262936	0	0	1	0
## avoid_United Airlines	136	0.227941176	0.42105532	0	0	1	0
## avoid_Southwest Airlines	136	0.205882353	0.40583972	0	0	1	0
## avoid_Allegiant Air	136	0.029411765	0.16958234	0	0	1	0
## avoid_Sun Country Airlines	136	0.022058824	0.14741786	0	0	1	0
## avoid_Alaska Airlines	136	0.014705882	0.12081784	0	0	1	0
## avoid_JetBlue	136	0.102941176	0.30500545	0	0	1	0
## avoid_Eastern Airlines	136	0.022058824	0.14741786	0	0	1	0
## avoid_Avelo Airlines	136	0.022058824	0.14741786	0	0	1	0
## avoid_Breeze Airways	136	0.014705882	0.12081784	0	0	1	0
## not_flown_Eastern Airlines	136	0.617647059	0.48775865	1	0	1	0
## not_flown_Hawaiian Airlines	136	0.536764706	0.50048996	1	0	1	0
## not_flown_Southwest Airlines	136	0.154411765	0.36267885	0	0	1	0
## not_flown_Sun Country Airlines	136	0.919117647	0.27366232	1	0	1	1
## not_flown_United Airlines	136	0.080882353	0.27366232	0	0	1	0
## not_flown_Breeze Airways	136	0.661764706	0.47485808	1	0	1	0
## not_flown_American Airlines	136	0.095588235	0.29511270	0	0	1	0
## not_flown_Avelo Airlines	136	0.573529412	0.49639221	1	0	1	0
## not_flown_Alaska Airlines	136	0.441176471	0.49836333	0	0	1	0
## not_flown_Allegiant Air	136	0.595588235	0.49259218	1	0	1	0
## not_flown_Frontier Airlines	136	0.397058824	0.49109721	0	0	1	0
## not_flown_JetBlue	136	0.213235294	0.41110669	0	0	1	0
## not_flown_Spirit Airlines	136	0.257352941	0.43879167	0	0	1	0
## not_flown_Delta Air Lines	136	0.066176471	0.24950932	0	0	1	0
##	75th	Skew	Kurtosis				
## Q1	2.00	0.326729731	-0.71553486				
## Q2	9.25	1.062501689	-0.50049073				
## Q3	2.00	3.530070410	15.21902416				
## Q4	2.00	2.659489089	30.04395545				
## Q5	8.00	0.811797303	-0.65741311				
## Q6_15	60.00	0.053050339	1.09528336				

## Q6_16	60.00	0.739915663	1.42204132
## Q6_17	70.00	-0.008747504	-0.64264997
## Q6_18	60.25	0.372732355	1.42791782
## Q6_19	60.00	0.658496427	1.72471662
## Q8	2.00	1.372541869	19.14208329
## Q9	2.00	1.798452447	3.13205867
## Q10	2.00	2.659489089	30.04395545
## Q11	2.00	1.383144974	1.02870403
## Q12	2.00	0.647120238	1.17473645
## Q13	3.00	-1.265755341	0.54574600
## Q14	4.00	0.382441118	-1.12823659
## Q15	3.00	-0.058196267	-1.99650757
## Q16	3.00	-1.951557083	3.01577728
## Q17	7.00	0.773505729	-1.23044901
## Q18	7.00	-0.080086208	0.45871915
## Q19	7.00	-1.056259576	3.27041715
## prefer_JetBlue	1.00	0.510712698	-1.75189230
## prefer_Allegiant Air	0.00	4.015209828	14.22667970
## prefer_Delta Air Lines	1.00	-0.642240440	-1.59912368
## prefer_Southwest Airlines	1.00	0.710923989	-1.50549510
## prefer_American Airlines	1.00	0.294076952	-1.92752996
## prefer_Frontier Airlines	0.00	2.871500176	6.29193932
## prefer_Spirit Airlines	0.00	1.971149348	1.89955890
## prefer_Alaska Airlines	0.00	1.745949427	1.05626788
## prefer_United Airlines	1.00	0.478851612	-1.78365444
## prefer_Hawaiian Airlines	0.00	2.242820518	3.05285313
## prefer_Avelo Airlines	0.00	3.040505494	7.29850090
## prefer_Breeze Airways	0.00	11.405916931	129.04395545
## avoid_Delta Air Lines	0.00	1.891740563	1.59053930
## avoid_Spirit Airlines	1.00	-0.746127893	-1.45382123
## avoid_Frontier Airlines	0.00	1.816838614	1.31070186
## avoid_American Airlines	0.00	1.678650678	0.82408938
## avoid_United Airlines	0.00	1.282769170	-0.35696621
## avoid_Southwest Airlines	0.00	1.438770033	0.07074116
## avoid_Allegiant Air	0.00	5.509158896	28.56100090
## avoid_Sun Country Airlines	0.00	6.436491420	39.72064718
## avoid_Alaska Airlines	0.00	7.974414838	62.04768679
## avoid_JetBlue	0.00	2.584473673	4.71433016
## avoid_Eastern Airlines	0.00	6.436491420	39.72064718
## avoid_Avelo Airlines	0.00	6.436491420	39.72064718
## avoid_Breeze Airways	0.00	7.974414838	62.04768679
## not_flown_Eastern Airlines	1.00	-0.478851612	-1.78365444
## not_flown_Hawaiian Airlines	1.00	-0.145834604	-1.99322655
## not_flown_Southwest Airlines	0.00	1.891740563	1.59053930
## not_flown_Sun Country Airlines	1.00	-3.040505494	7.29850090
## not_flown_United Airlines	0.00	3.040505494	7.29850090
## not_flown_Breeze Airways	1.00	-0.676308423	-1.55387064
## not_flown_American Airlines	0.00	2.720575254	5.44170404
## not_flown_Avelo Airlines	1.00	-0.294076952	-1.92752996
## not_flown_Alaska Airlines	1.00	0.234331057	-1.95933402
## not_flown_Allegiant Air	1.00	-0.385249234	-1.86513546
## not_flown_Frontier Airlines	1.00	0.416146758	-1.84019089
## not_flown_JetBlue	0.00	1.384828539	-0.08269618
## not_flown_Spirit Airlines	1.00	1.097846235	-0.80045756

```
## not_flown_Delta Air Lines      0.00  3.451844175   9.98883734
```

2. Histogram We'll look at into data distribution via histograms. However, since our dataset contains large column. We'll separate the plot into some chunks. One chunk contains 9 subplots.

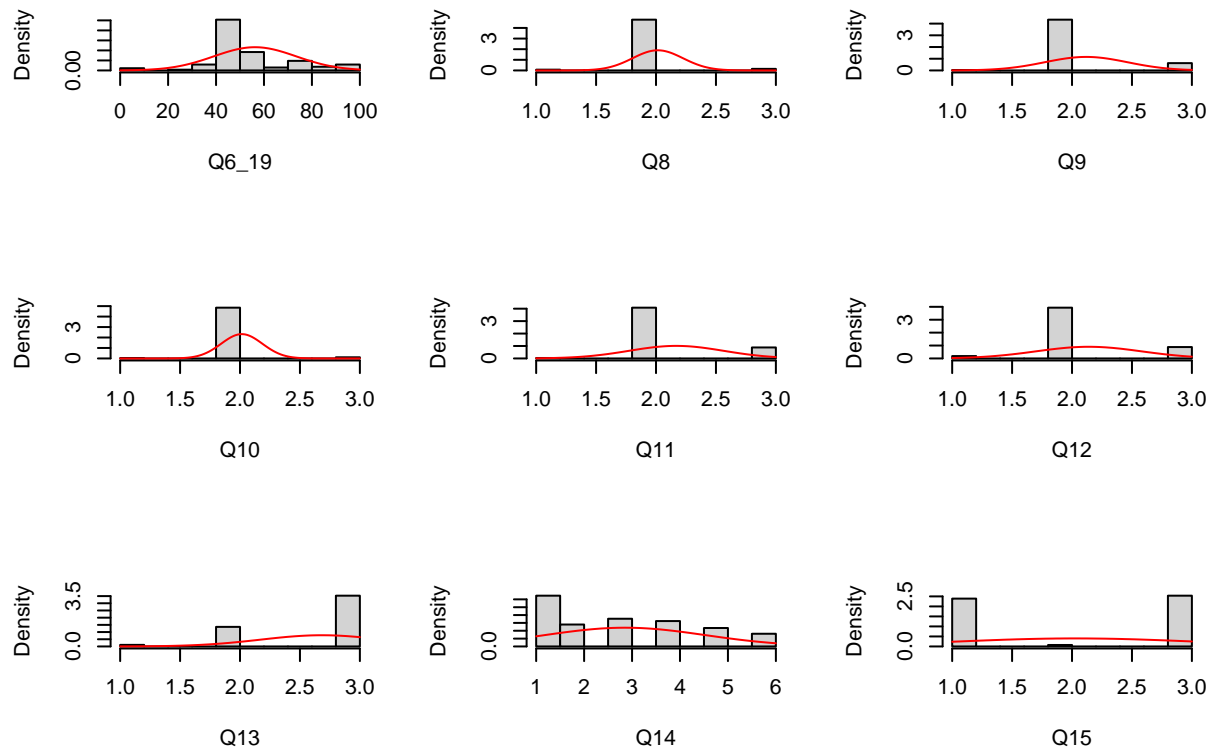
```
mvn(travel_df_clean[,1:9], mvnTest = "energy", univariatePlot = "histogram")
```



```
## $multivariateNormality
##           Test Statistic p value MVN
## 1 E-statistic   8.16936      0 NO
##
## $univariateNormality
##           Test Variable Statistic  p value Normality
## 1 Anderson-Darling   Q1      14.4161 <0.001      NO
## 2 Anderson-Darling   Q2      17.8401 <0.001      NO
## 3 Anderson-Darling   Q3      31.8252 <0.001      NO
## 4 Anderson-Darling   Q4      48.7622 <0.001      NO
## 5 Anderson-Darling   Q5      12.3710 <0.001      NO
## 6 Anderson-Darling  Q6_15       8.1987 <0.001      NO
## 7 Anderson-Darling  Q6_16     11.4048 <0.001      NO
## 8 Anderson-Darling  Q6_17       1.7367 2e-04      NO
## 9 Anderson-Darling  Q6_18       9.7366 <0.001      NO
##
## $Descriptives
##           n      Mean      Std.Dev Median Min Max 25th 75th      Skew
## Q1      136  1.705882  0.6338319      2   1   3    1  2.00  0.326729731
## Q2      136  5.955882  5.7681984      2   1  18    2  9.25  1.062501689
## Q3      136  2.198529  0.7871171      2   1   7    2  2.00  3.530070410
## Q4      136  2.014706  0.1714986      2   1   3    2  2.00  2.659489089
```

```
## Q5      136  5.191176  3.9299698      2  1  15      2  8.00  0.811797303
## Q6_15   136 54.448529 19.7258319     50  0 100     50 60.00  0.053050339
## Q6_16   136 56.272059 16.8709555     50  0 100     50 60.00  0.739915663
## Q6_17   136 50.345588 26.2431307     50  0 100     30 70.00 -0.008747504
## Q6_18   136 55.691176 18.2227024     50  0 100     50 60.25  0.372732355
##          Kurtosis
## Q1      -0.7155349
## Q2      -0.5004907
## Q3       15.2190242
## Q4       30.0439554
## Q5      -0.6574131
## Q6_15    1.0952834
## Q6_16    1.4220413
## Q6_17   -0.6426500
## Q6_18    1.4279178
```

```
mvn(travel_df_clean[,10:18], mvnTest = "energy", univariatePlot = "histogram")
```



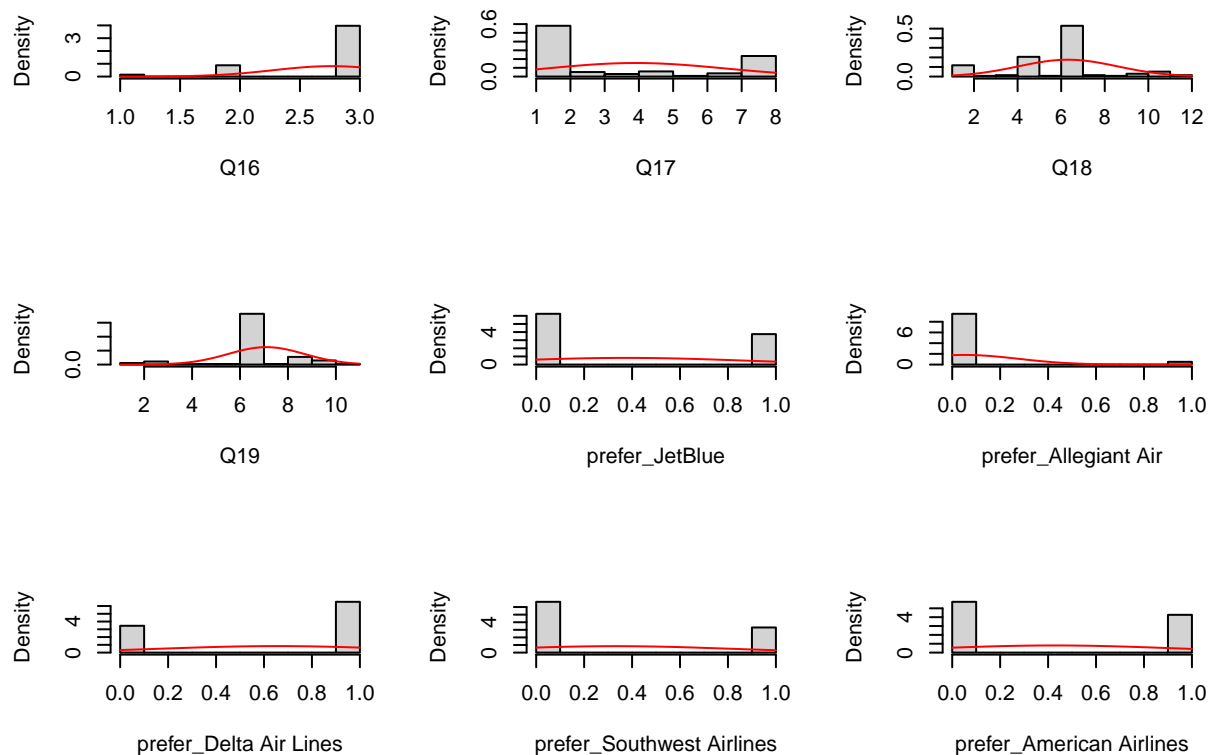
```
## $multivariateNormality
##          Test Statistic p value MVN
## 1 E-statistic 9.255564      0 NO
##
## $univariateNormality
##          Test Variable Statistic  p value Normality
## 1 Anderson-Darling Q6_19      12.4107 <0.001      NO
## 2 Anderson-Darling Q8         46.4123 <0.001      NO
## 3 Anderson-Darling Q9         40.0428 <0.001      NO
## 4 Anderson-Darling Q10        48.7622 <0.001      NO
## 5 Anderson-Darling Q11        35.7464 <0.001      NO
## 6 Anderson-Darling Q12        29.2234 <0.001      NO
## 7 Anderson-Darling Q13        26.4450 <0.001      NO
```

```
## 8 Anderson-Darling    Q14      5.5692 <0.001    NO
## 9 Anderson-Darling    Q15     23.3882 <0.001    NO
##
```

```
## $Descriptives
```

	n	Mean	Std.Dev	Median	Min	Max	25th	75th	Skew	Kurtosis
## Q6_19	136	56.250000	17.1911907	50	5	100	50	60	0.65849643	1.724717
## Q8	136	2.014706	0.2103012	2	1	3	2	2	1.37254187	19.142083
## Q9	136	2.117647	0.3455285	2	1	3	2	2	1.79845245	3.132059
## Q10	136	2.014706	0.1714986	2	1	3	2	2	2.65948909	30.043955
## Q11	136	2.169118	0.3954397	2	1	3	2	2	1.38314497	1.028704
## Q12	136	2.139706	0.4417607	2	1	3	2	2	0.64712024	1.174736
## Q13	136	2.683824	0.5121083	3	1	3	2	3	-1.26575534	0.545746
## Q14	136	2.852941	1.6712356	3	1	6	1	4	0.38244112	-1.128237
## Q15	136	2.029412	0.9958520	3	1	3	1	3	-0.05819627	-1.996508

```
mvn(travel_df_clean[,19:27], mvnTest = "energy", univariatePlot = "histogram")
```



```
## $multivariateNormality
```

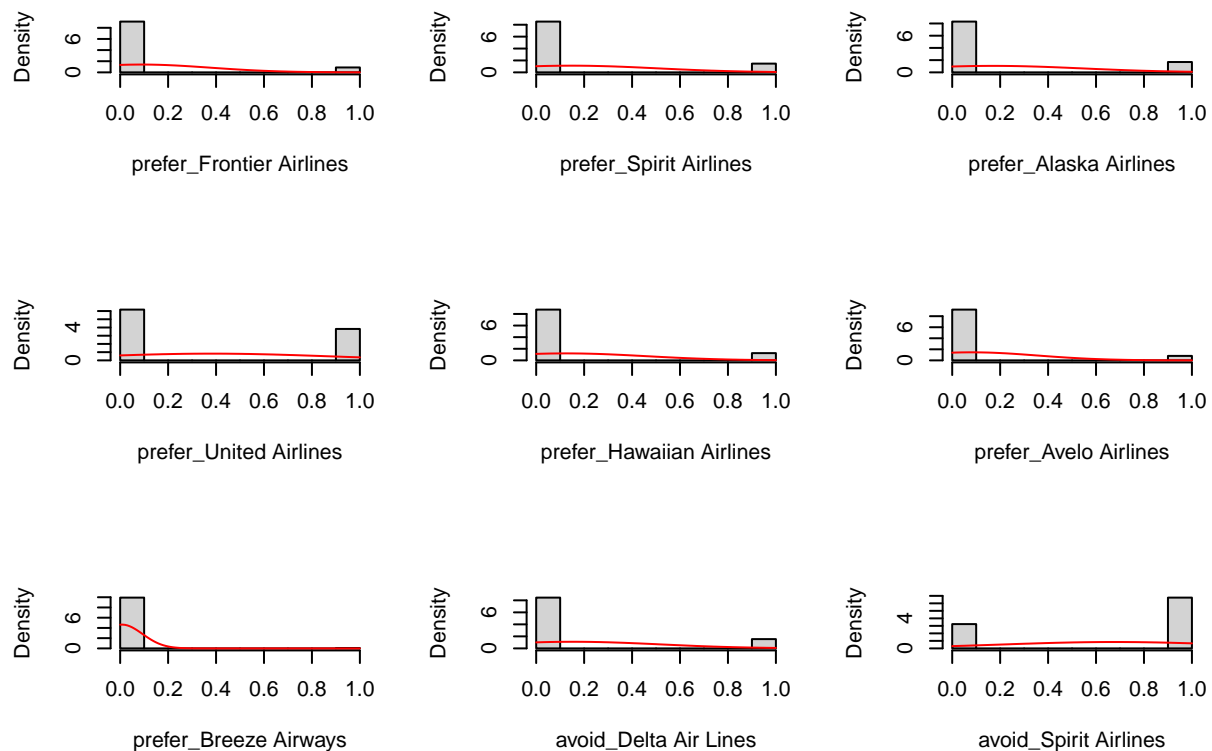
```
##           Test Statistic p value MVN
## 1 E-statistic 4.773747      0 NO
##
```

```
## $univariateNormality
```

	Test	Variable	Statistic	p value	Normality
## 1	Anderson-Darling	Q16	31.8536	<0.001	NO
## 2	Anderson-Darling	Q17	19.5704	<0.001	NO
## 3	Anderson-Darling	Q18	9.4365	<0.001	NO
## 4	Anderson-Darling	Q19	20.4406	<0.001	NO
## 5	Anderson-Darling	prefer_JetBlue	26.3155	<0.001	NO
## 6	Anderson-Darling	prefer_Allegiant Air	48.9547	<0.001	NO
## 7	Anderson-Darling	prefer_Delta Air Lines	27.3967	<0.001	NO

```
## 8 Anderson-Darling prefer_Southwest Airlines 28.0235 <0.001 NO
## 9 Anderson-Darling prefer_American Airlines 24.9742 <0.001 NO
##
## $Descriptives
##               n      Mean   Std.Dev Median Min Max 25th 75th
## Q16           136 2.76470588 0.4904313      3  1  3    3    3
## Q17           136 3.90441176 2.5758959      2  1  8    2    7
## Q18           136 6.30882353 2.2722634      7  1 12    5    7
## Q19           136 7.09558824 1.5957289      7  1 11    7    7
## prefer_JetBlue 136 0.37500000 0.4859127      0  0  1    0    1
## prefer_Allegiant Air 136 0.05147059 0.2217724      0  0  1    0    0
## prefer_Delta Air Lines 136 0.65441176 0.4773178      1  0  1    0    1
## prefer_Southwest Airlines 136 0.33088235 0.4722703      0  0  1    0    1
## prefer_American Airlines 136 0.42647059 0.4963922      0  0  1    0    1
##               Skew   Kurtosis
## Q16          -1.95155708  3.0157773
## Q17           0.77350573 -1.2304490
## Q18          -0.08008621  0.4587191
## Q19          -1.05625958  3.2704171
## prefer_JetBlue  0.51071270 -1.7518923
## prefer_Allegiant Air  4.01520983 14.2266797
## prefer_Delta Air Lines -0.64224044 -1.5991237
## prefer_Southwest Airlines 0.71092399 -1.5054951
## prefer_American Airlines 0.29407695 -1.9275300
```

```
mvn(travel_df_clean[,28:36], mvnTest = "energy", univariatePlot = "histogram")
```

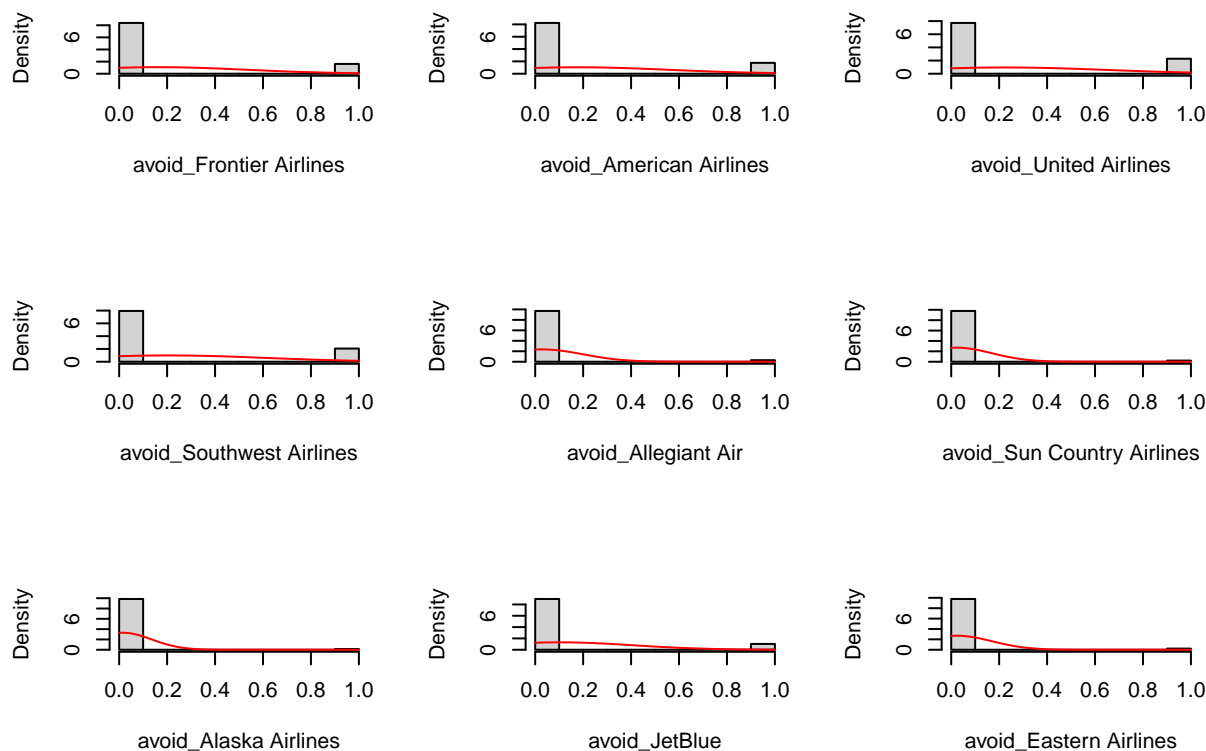


```
## $multivariateNormality
##           Test Statistic p value MVN
## 1 E-statistic 27.9792      0 NO
##
```



```
## $univariateNormality
##           Test           Variable Statistic   p value Normality
## 1 Anderson-Darling prefer_Frontier Airlines  45.7747 <0.001      NO
## 2 Anderson-Darling prefer_Spirit Airlines   40.4975 <0.001      NO
## 3 Anderson-Darling prefer_Alaska Airlines   38.5997 <0.001      NO
## 4 Anderson-Darling prefer_United Airlines   26.0810 <0.001      NO
## 5 Anderson-Darling prefer_Hawaiian Airlines  42.4590 <0.001      NO
## 6 Anderson-Darling prefer_Avelo Airlines    46.4297 <0.001      NO
## 7 Anderson-Darling prefer_Breeze Airways    52.1632 <0.001      NO
## 8 Anderson-Darling avoid_Delta Air Lines     39.8565 <0.001      NO
## 9 Anderson-Darling avoid_Spirit Airlines     28.3584 <0.001      NO
##
## $Descriptives
##           n           Mean   Std.Dev Median Min Max 25th 75th
## prefer_Frontier Airlines 136 0.088235294 0.28468536      0  0  1  0  0
## prefer_Spirit Airlines   136 0.147058824 0.35547385      0  0  1  0  0
## prefer_Alaska Airlines   136 0.169117647 0.37624159      0  0  1  0  0
## prefer_United Airlines   136 0.382352941 0.48775865      0  0  1  0  1
## prefer_Hawaiian Airlines 136 0.125000000 0.33194154      0  0  1  0  0
## prefer_Avelo Airlines    136 0.080882353 0.27366232      0  0  1  0  0
## prefer_Breeze Airways    136 0.007352941 0.08574929      0  0  1  0  0
## avoid_Delta Air Lines    136 0.154411765 0.36267885      0  0  1  0  0
## avoid_Spirit Airlines    136 0.676470588 0.46955224      1  0  1  0  1
##
##           Skew   Kurtosis
## prefer_Frontier Airlines 2.8715002  6.291939
## prefer_Spirit Airlines   1.9711493  1.899559
## prefer_Alaska Airlines   1.7459494  1.056268
## prefer_United Airlines   0.4788516 -1.783654
## prefer_Hawaiian Airlines 2.2428205  3.052853
## prefer_Avelo Airlines    3.0405055  7.298501
## prefer_Breeze Airways    11.4059169 129.043955
## avoid_Delta Air Lines    1.8917406  1.590539
## avoid_Spirit Airlines    -0.7461279 -1.453821

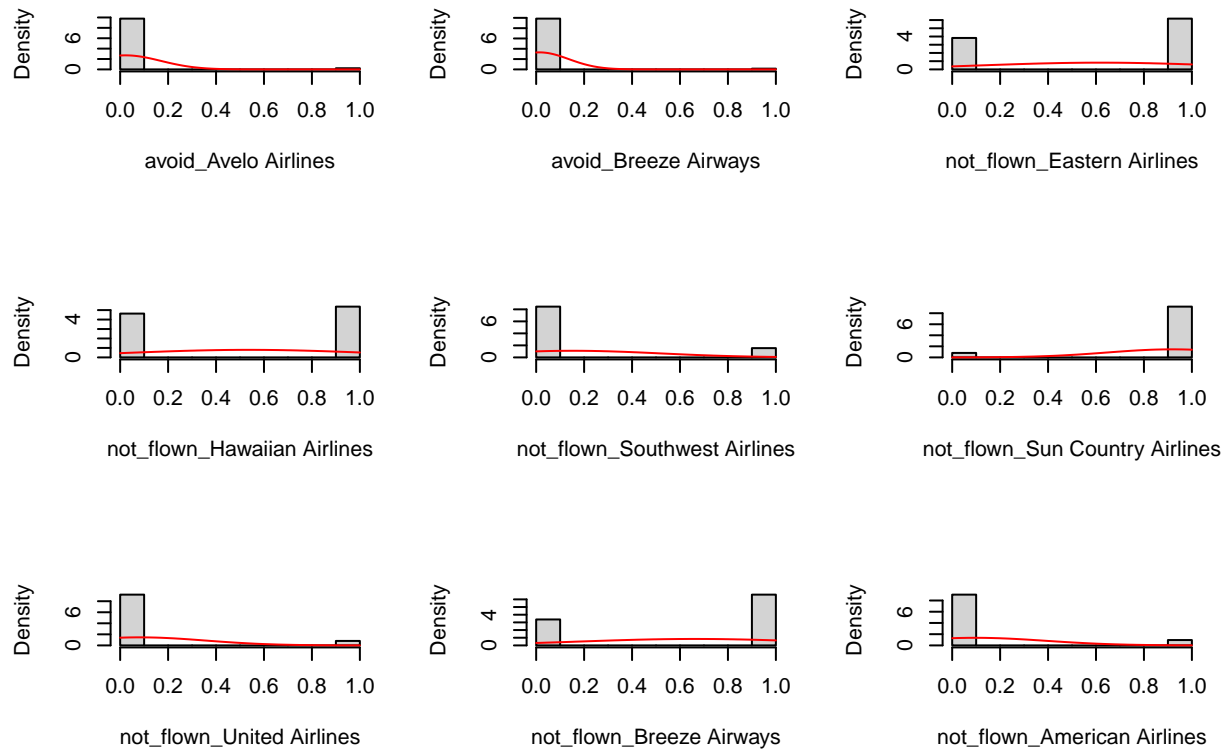
mvn(travel_df_clean[,37:45], mvnTest = "energy", univariatePlot = "histogram")
```



```
## $multivariateNormality
##      Test Statistic p value MVN
## 1 E-statistic 48.98893      0 NO
##
## $univariateNormality
##      Test Variable Statistic p value Normality
## 1 Anderson-Darling avoid_Frontier Airlines 39.2236 <0.001 NO
## 2 Anderson-Darling avoid_American Airlines 37.9855 <0.001 NO
## 3 Anderson-Darling avoid_United Airlines 34.0066 <0.001 NO
## 4 Anderson-Darling avoid_Southwest Airlines 35.6387 <0.001 NO
## 5 Anderson-Darling avoid_Allegiant Air 50.6851 <0.001 NO
## 6 Anderson-Darling avoid_Sun Country Airlines 51.2147 <0.001 NO
## 7 Anderson-Darling avoid_Alaska Airlines 51.7113 <0.001 NO
## 8 Anderson-Darling avoid_JetBlue 44.4511 <0.001 NO
## 9 Anderson-Darling avoid_Eastern Airlines 51.2147 <0.001 NO
##
## $Descriptives
##      n Mean Std.Dev Median Min Max 25th 75th
## avoid_Frontier Airlines 136 0.16176471 0.3695961 0 0 1 0 0
## avoid_American Airlines 136 0.17647059 0.3826294 0 0 1 0 0
## avoid_United Airlines 136 0.22794118 0.4210553 0 0 1 0 0
## avoid_Southwest Airlines 136 0.20588235 0.4058397 0 0 1 0 0
## avoid_Allegiant Air 136 0.02941176 0.1695823 0 0 1 0 0
## avoid_Sun Country Airlines 136 0.02205882 0.1474179 0 0 1 0 0
## avoid_Alaska Airlines 136 0.01470588 0.1208178 0 0 1 0 0
## avoid_JetBlue 136 0.10294118 0.3050054 0 0 1 0 0
## avoid_Eastern Airlines 136 0.02205882 0.1474179 0 0 1 0 0
##
##      Skew Kurtosis
## avoid_Frontier Airlines 1.816839 1.31070186
## avoid_American Airlines 1.678651 0.82408938
```

```
## avoid_United Airlines      1.282769 -0.35696621
## avoid_Southwest Airlines   1.438770  0.07074116
## avoid_Allegiant Air        5.509159 28.56100090
## avoid_Sun Country Airlines 6.436491 39.72064718
## avoid_Alaska Airlines      7.974415 62.04768679
## avoid_JetBlue              2.584474  4.71433016
## avoid_Eastern Airlines     6.436491 39.72064718
```

```
mvn(travel_df_clean[,46:54], mvnTest = "energy", univariatePlot = "histogram")
```



```
## $multivariateNormality
##           Test Statistic p value MVN
## 1 E-statistic 31.64279      0 NO
##
```

```
## $univariateNormality
##           Test Variable Statistic p value Normality
## 1 Anderson-Darling avoid_Avelo Airlines 51.2147 <0.001 NO
## 2 Anderson-Darling avoid_Breeze Airways 51.7113 <0.001 NO
## 3 Anderson-Darling not_flown_Eastern Airlines 26.0810 <0.001 NO
## 4 Anderson-Darling not_flown_Hawaiian Airlines 24.4431 <0.001 NO
## 5 Anderson-Darling not_flown_Southwest Airlines 39.8565 <0.001 NO
## 6 Anderson-Darling not_flown_Sun Country Airlines 46.4297 <0.001 NO
## 7 Anderson-Darling not_flown_United Airlines 46.4297 <0.001 NO
## 8 Anderson-Darling not_flown_Breeze Airways 27.7029 <0.001 NO
## 9 Anderson-Darling not_flown_American Airlines 45.1146 <0.001 NO
##
```

```
## $Descriptives
##           n Mean Std.Dev Median Min Max 25th
## avoid_Avelo Airlines 136 0.02205882 0.1474179 0 0 1 0
## avoid_Breeze Airways 136 0.01470588 0.1208178 0 0 1 0
## not_flown_Eastern Airlines 136 0.61764706 0.4877586 1 0 1 0
```

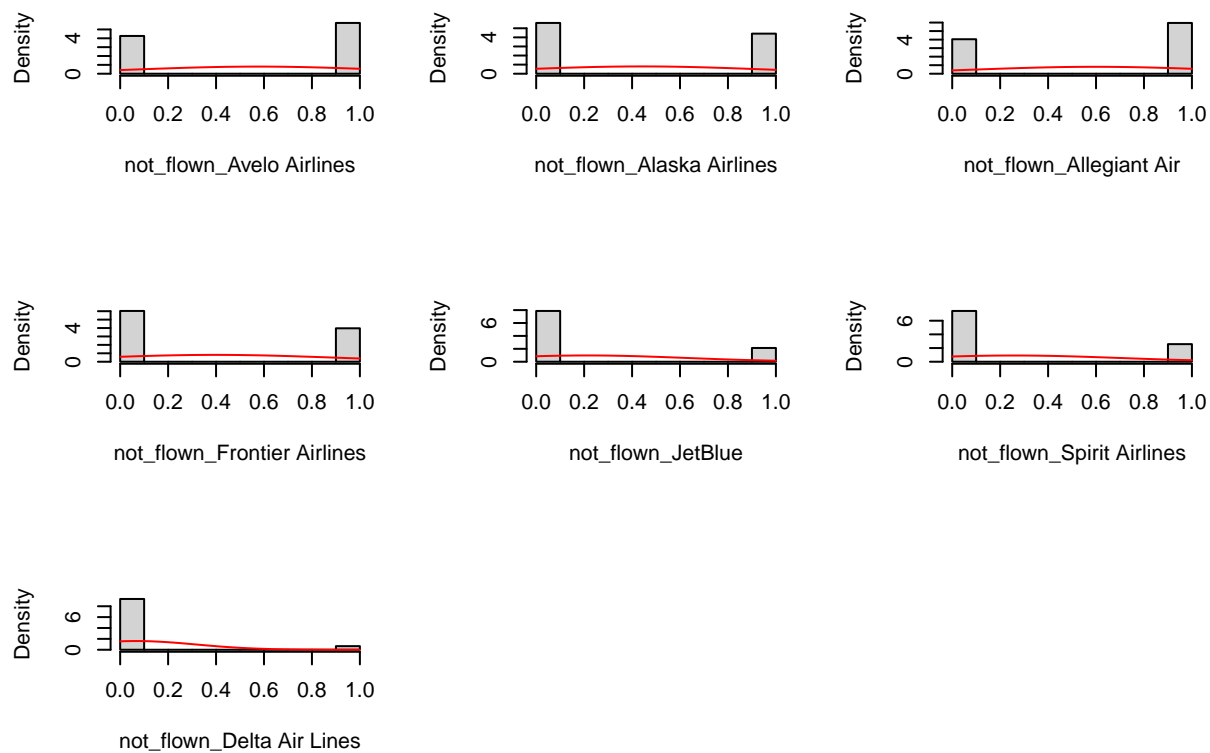
```
## not_flown_Hawaiian Airlines 136 0.53676471 0.5004900 1 0 1 0
## not_flown_Southwest Airlines 136 0.15441176 0.3626788 0 0 1 0
## not_flown_Sun Country Airlines 136 0.91911765 0.2736623 1 0 1 1
## not_flown_United Airlines 136 0.08088235 0.2736623 0 0 1 0
## not_flown_Breeze Airways 136 0.66176471 0.4748581 1 0 1 0
## not_flown_American Airlines 136 0.09558824 0.2951127 0 0 1 0
## 75th Skew Kurtosis
## avoid_Avelo Airlines 0 6.4364914 39.720647
## avoid_Breeze Airways 0 7.9744148 62.047687
## not_flown_Eastern Airlines 1 -0.4788516 -1.783654
## not_flown_Hawaiian Airlines 1 -0.1458346 -1.993227
## not_flown_Southwest Airlines 0 1.8917406 1.590539
## not_flown_Sun Country Airlines 1 -3.0405055 7.298501
## not_flown_United Airlines 0 3.0405055 7.298501
## not_flown_Breeze Airways 1 -0.6763084 -1.553871
## not_flown_American Airlines 0 2.7205753 5.441704
```

```
mvn(travel_df_clean[,55:61], mvnTest = "energy", univariatePlot = "histogram")
```

```
## $multivariateNormality
## Test Statistic p value MVN
## 1 E-statistic 17.37024 0 NO
##
```

```
## $univariateNormality
## Test Variable Statistic p value Normality
## 1 Anderson-Darling not_flown_Avelo Airlines 24.9742 <0.001 NO
## 2 Anderson-Darling not_flown_Alaska Airlines 24.7192 <0.001 NO
## 3 Anderson-Darling not_flown_Allegiant Air 25.4634 <0.001 NO
## 4 Anderson-Darling not_flown_Frontier Airlines 25.6550 <0.001 NO
## 5 Anderson-Darling not_flown_JetBlue 35.0819 <0.001 NO
## 6 Anderson-Darling not_flown_Spirit Airlines 32.0164 <0.001 NO
## 7 Anderson-Darling not_flown_Delta Air Lines 47.7154 <0.001 NO
##
```

```
## $Descriptives
## n Mean Std.Dev Median Min Max 25th 75th
## not_flown_Avelo Airlines 136 0.57352941 0.4963922 1 0 1 0 1
## not_flown_Alaska Airlines 136 0.44117647 0.4983633 0 0 1 0 1
## not_flown_Allegiant Air 136 0.59558824 0.4925922 1 0 1 0 1
## not_flown_Frontier Airlines 136 0.39705882 0.4910972 0 0 1 0 1
## not_flown_JetBlue 136 0.21323529 0.4111067 0 0 1 0 0
## not_flown_Spirit Airlines 136 0.25735294 0.4387917 0 0 1 0 1
## not_flown_Delta Air Lines 136 0.06617647 0.2495093 0 0 1 0 0
## Skew Kurtosis
## not_flown_Avelo Airlines -0.2940770 -1.92752996
## not_flown_Alaska Airlines 0.2343311 -1.95933402
## not_flown_Allegiant Air -0.3852492 -1.86513546
## not_flown_Frontier Airlines 0.4161468 -1.84019089
## not_flown_JetBlue 1.3848285 -0.08269618
## not_flown_Spirit Airlines 1.0978462 -0.80045756
## not_flown_Delta Air Lines 3.4518442 9.98883734
```

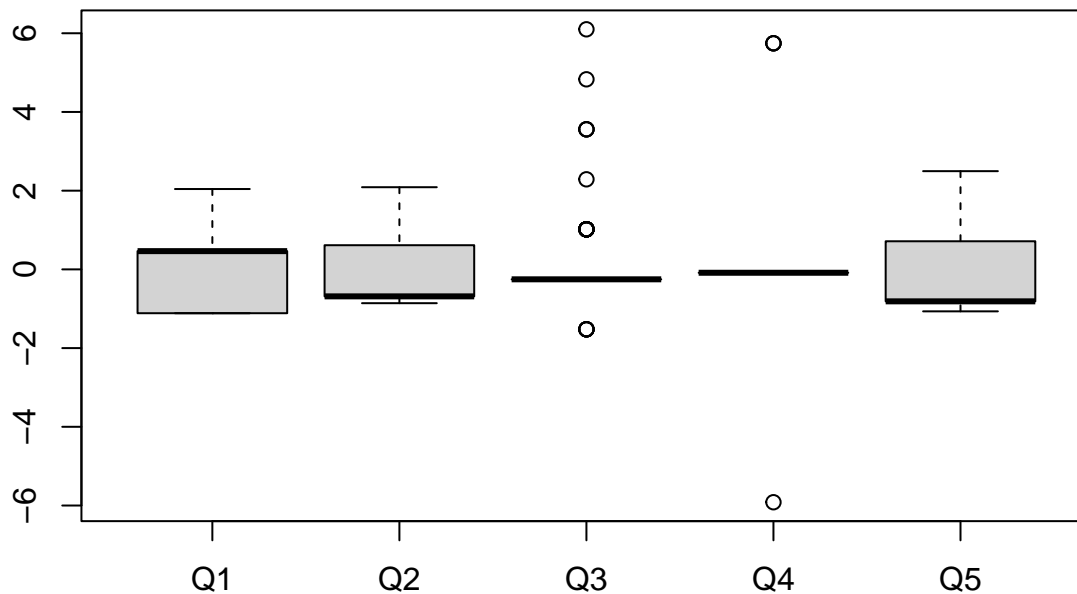


3. Boxplot

Since our data contains many dummy variables (started with `prefer_`, `avoid_`, and `not_flown_`), we'll only generate one plot for this type of data. Again, we'll divide plot into some chunks.

```
mvn(travel_df_clean[,1:5], mvnTest = "royston", univariatePlot = "box")
```

```
## Warning in uniPlot(data, type = univariatePlot): Box-Plots are based on
## standardized values (centered and scaled).
```

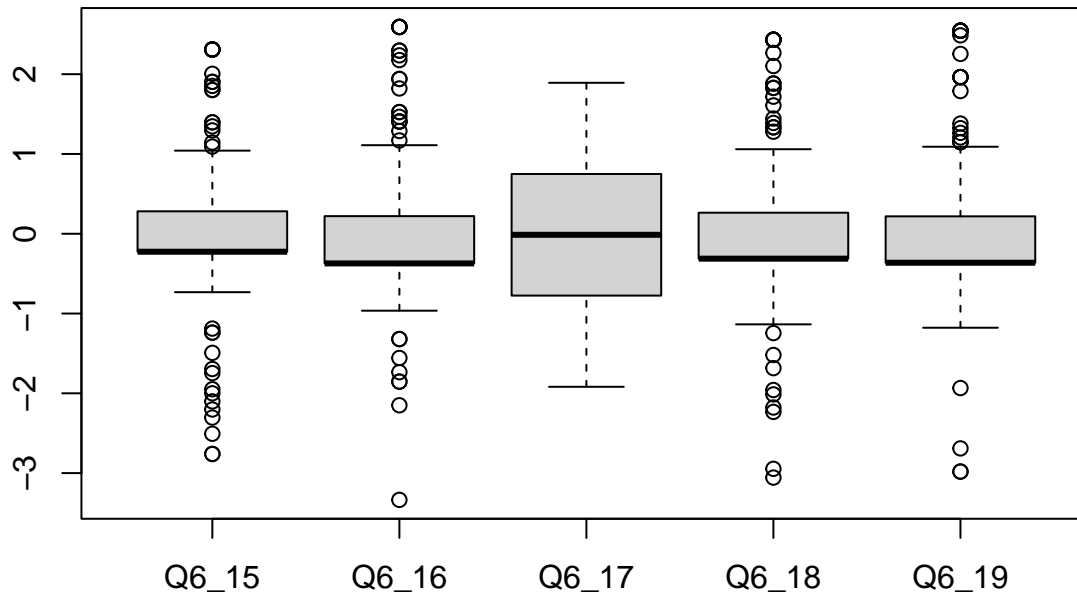


```
## $multivariateNormality
```

```
##      Test      H      p value MVN
## 1 Royston 356.9461 5.613193e-75 NO
##
## $univariateNormality
##      Test Variable Statistic  p value Normality
## 1 Anderson-Darling Q1      14.4161 <0.001 NO
## 2 Anderson-Darling Q2      17.8401 <0.001 NO
## 3 Anderson-Darling Q3      31.8252 <0.001 NO
## 4 Anderson-Darling Q4      48.7622 <0.001 NO
## 5 Anderson-Darling Q5      12.3710 <0.001 NO
##
## $Descriptives
##      n      Mean      Std.Dev Median Min Max 25th 75th      Skew      Kurtosis
## Q1 136 1.705882 0.6338319      2 1 3 1 2.00 0.3267297 -0.7155349
## Q2 136 5.955882 5.7681984      2 1 18 2 9.25 1.0625017 -0.5004907
## Q3 136 2.198529 0.7871171      2 1 7 2 2.00 3.5300704 15.2190242
## Q4 136 2.014706 0.1714986      2 1 3 2 2.00 2.6594891 30.0439554
## Q5 136 5.191176 3.9299698      2 1 15 2 8.00 0.8117973 -0.6574131
```

```
mvn(travel_df_clean[,6:10], mvnTest = "royston", univariatePlot = "box")
```

```
## Warning in uniPlot(data, type = univariatePlot): Box-Plots are based on
## standardized values (centered and scaled).
```

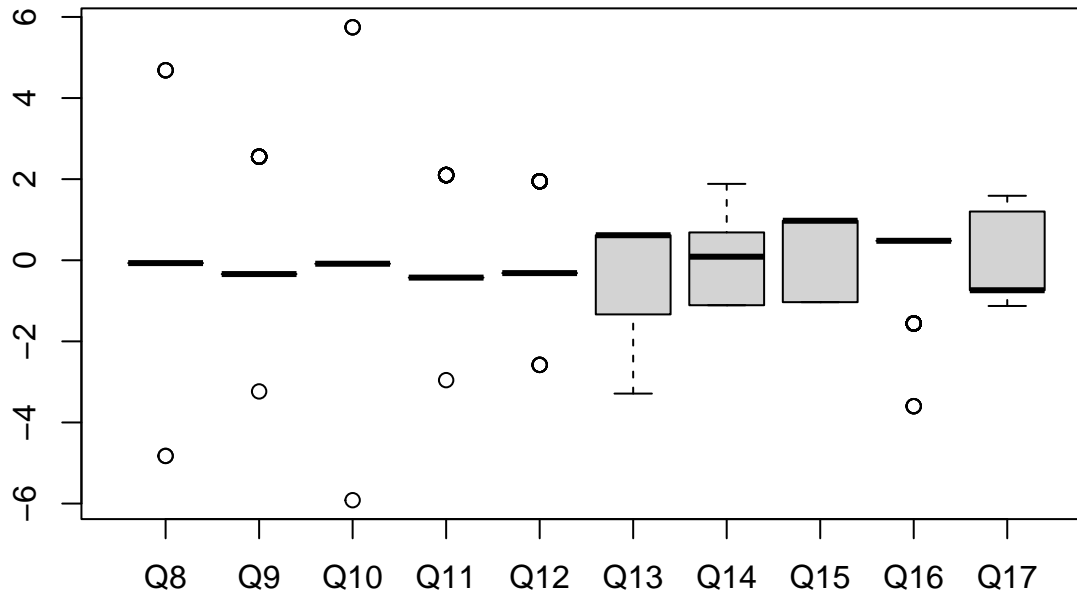


```
## $multivariateNormality
##      Test      H      p value MVN
## 1 Royston 177.0711 2.107496e-36 NO
##
## $univariateNormality
##      Test Variable Statistic  p value Normality
## 1 Anderson-Darling Q6_15      8.1987 <0.001 NO
## 2 Anderson-Darling Q6_16     11.4048 <0.001 NO
## 3 Anderson-Darling Q6_17      1.7367 2e-04 NO
## 4 Anderson-Darling Q6_18      9.7366 <0.001 NO
## 5 Anderson-Darling Q6_19     12.4107 <0.001 NO
##
```

```
## $Descriptives
##      n      Mean  Std.Dev Median Min Max 25th 75th      Skew  Kurtosis
## Q6_15 136 54.44853 19.72583    50  0 100  50 60.00  0.053050339  1.095283
## Q6_16 136 56.27206 16.87096    50  0 100  50 60.00  0.739915663  1.422041
## Q6_17 136 50.34559 26.24313    50  0 100  30 70.00 -0.008747504 -0.642650
## Q6_18 136 55.69118 18.22270    50  0 100  50 60.25  0.372732355  1.427918
## Q6_19 136 56.25000 17.19119    50  5 100  50 60.00  0.658496427  1.724717
```

```
mvn(travel_df_clean[,11:20], mvnTest = "royston", univariatePlot = "box")
```

```
## Warning in uniPlot(data, type = univariatePlot): Box-Plots are based on
## standardized values (centered and scaled).
```

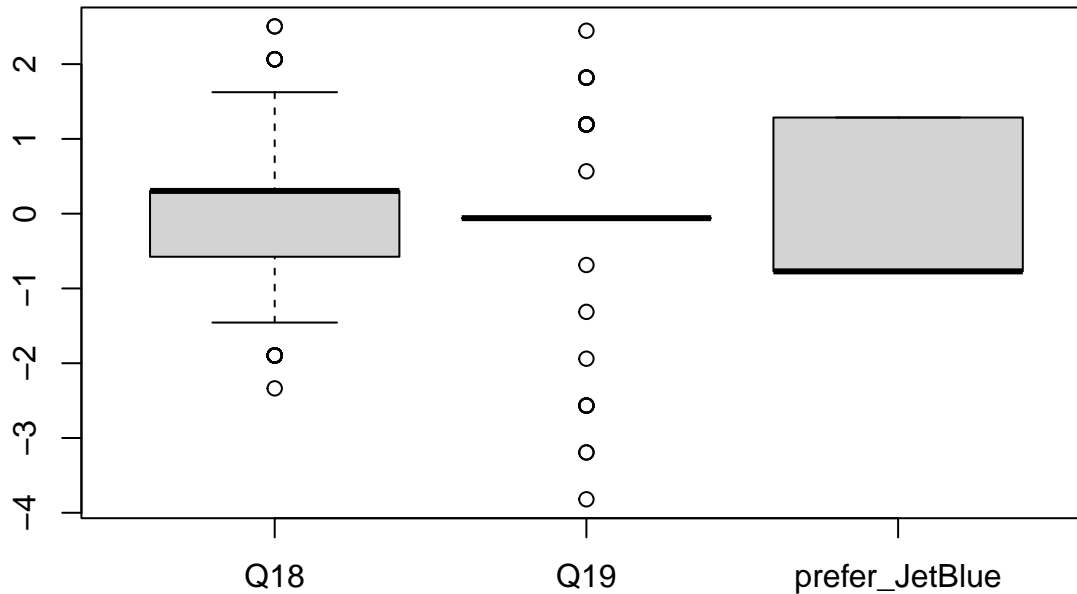


```
## $multivariateNormality
##      Test      H      p value MVN
## 1 Royston 767.9068 1.674594e-158 NO
##
## $univariateNormality
##      Test Variable Statistic p value Normality
## 1 Anderson-Darling Q8 46.4123 <0.001 NO
## 2 Anderson-Darling Q9 40.0428 <0.001 NO
## 3 Anderson-Darling Q10 48.7622 <0.001 NO
## 4 Anderson-Darling Q11 35.7464 <0.001 NO
## 5 Anderson-Darling Q12 29.2234 <0.001 NO
## 6 Anderson-Darling Q13 26.4450 <0.001 NO
## 7 Anderson-Darling Q14 5.5692 <0.001 NO
## 8 Anderson-Darling Q15 23.3882 <0.001 NO
## 9 Anderson-Darling Q16 31.8536 <0.001 NO
## 10 Anderson-Darling Q17 19.5704 <0.001 NO
##
## $Descriptives
##      n      Mean  Std.Dev Median Min Max 25th 75th      Skew  Kurtosis
## Q8 136 2.014706 0.2103012    2  1  3  2  2  1.37254187 19.142083
## Q9 136 2.117647 0.3455285    2  1  3  2  2  1.79845245  3.132059
## Q10 136 2.014706 0.1714986    2  1  3  2  2  2.65948909 30.043955
## Q11 136 2.169118 0.3954397    2  1  3  2  2  1.38314497  1.028704
```

```
## Q12 136 2.139706 0.4417607      2  1  3  2  2  0.64712024  1.174736
## Q13 136 2.683824 0.5121083      3  1  3  2  3 -1.26575534  0.545746
## Q14 136 2.852941 1.6712356      3  1  6  1  4  0.38244112 -1.128237
## Q15 136 2.029412 0.9958520      3  1  3  1  3 -0.05819627 -1.996508
## Q16 136 2.764706 0.4904313      3  1  3  3  3 -1.95155708  3.015777
## Q17 136 3.904412 2.5758959      2  1  8  2  7  0.77350573 -1.230449
```

```
mvn(travel_df_clean[,21:23], mvnTest = "royston", univariatePlot = "box")
```

```
## Warning in uniPlot(data, type = univariatePlot): Box-Plots are based on
## standardized values (centered and scaled).
```



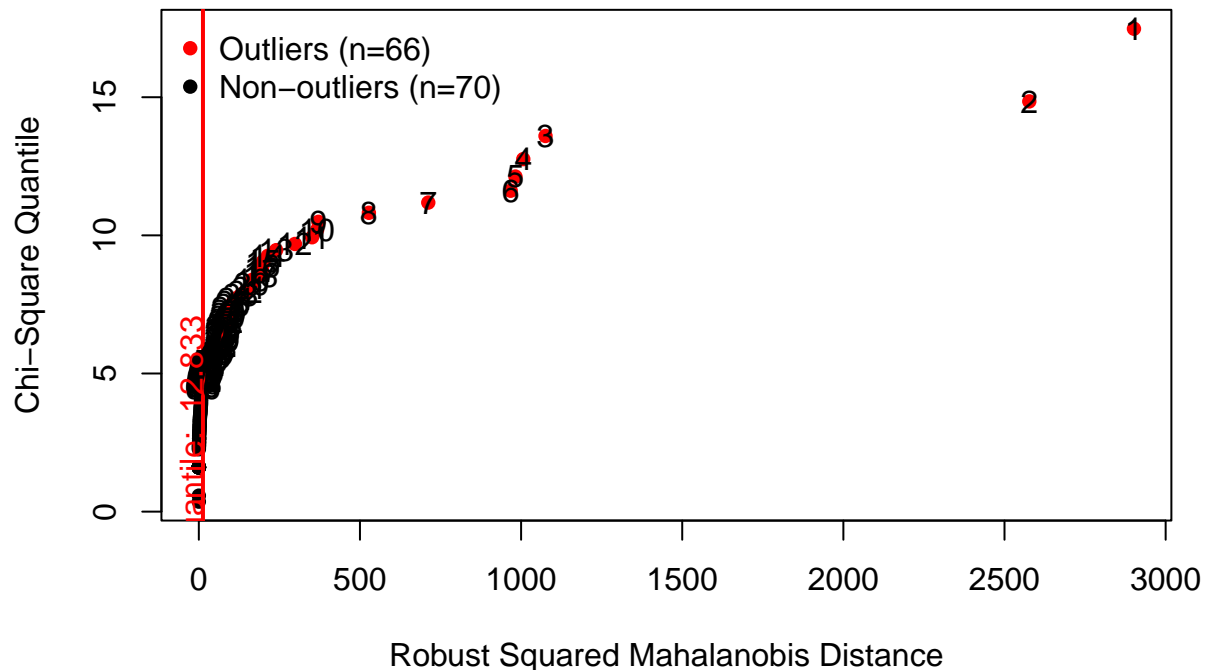
```
## $multivariateNormality
##      Test      H      p value MVN
## 1 Royston 174.1648 1.605007e-37 NO
##
## $univariateNormality
##      Test      Variable Statistic      p value Normality
## 1 Anderson-Darling      Q18      9.4365 <0.001      NO
## 2 Anderson-Darling      Q19     20.4406 <0.001      NO
## 3 Anderson-Darling prefer_JetBlue 26.3155 <0.001      NO
##
## $Descriptives
##      n      Mean      Std.Dev      Median      Min      Max      25th      75th      Skew
## Q18      136 6.308824 2.2722634      7      1      12      5      7 -0.08008621
## Q19      136 7.095588 1.5957289      7      1      11      7      7 -1.05625958
## prefer_JetBlue 136 0.375000 0.4859127      0      0      1      0      1 0.51071270
##
##      Kurtosis
## Q18      0.4587191
## Q19      3.2704171
## prefer_JetBlue -1.7518923
```

4. QQ-Plot

Since we got error in integer variable, `system` is exactly singular: $U[2,2] = 0$, thus we'll do chi-square quantile plot in numeric (var 6 -10) only.


```
mvn(travel_df_clean[,6:10], mvnTest = "royston", multivariatePlot = "scatter",
    multivariateOutlierMethod="quan")
```

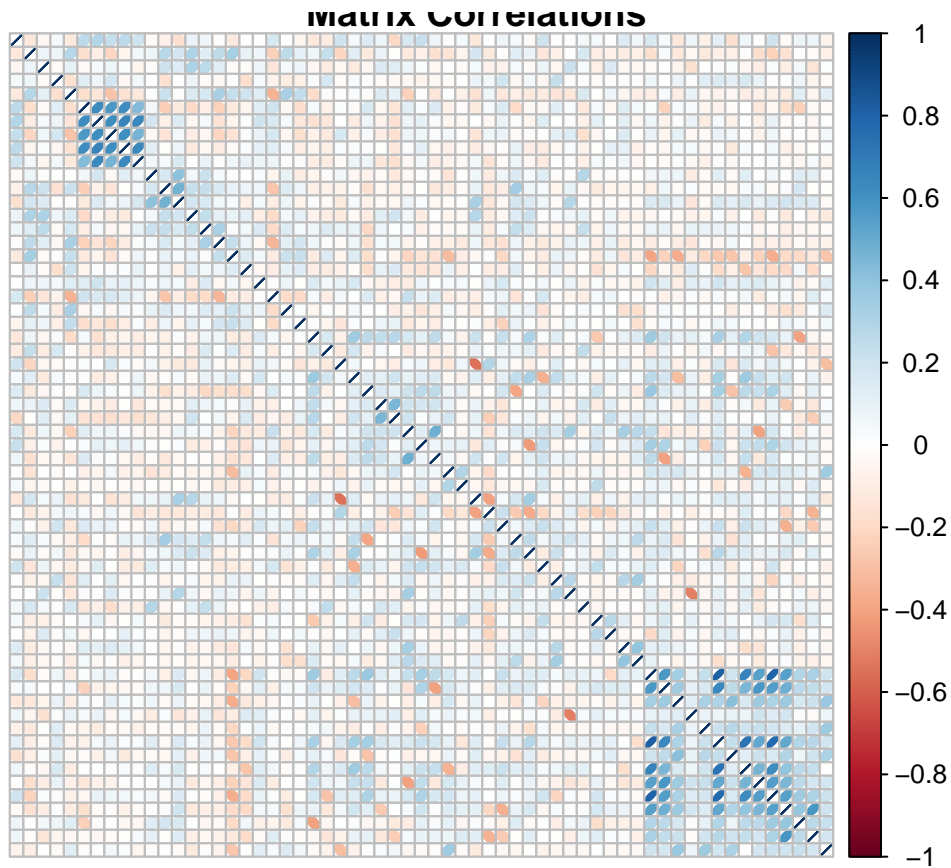
Chi-Square Q-Q Plot



```
## $multivariateNormality
##      Test      H      p value MVN
## 1 Royston 177.0711 2.107496e-36 NO
##
## $univariateNormality
##      Test Variable Statistic p value Normality
## 1 Anderson-Darling Q6_15      8.1987 <0.001      NO
## 2 Anderson-Darling Q6_16     11.4048 <0.001      NO
## 3 Anderson-Darling Q6_17      1.7367 2e-04      NO
## 4 Anderson-Darling Q6_18      9.7366 <0.001      NO
## 5 Anderson-Darling Q6_19     12.4107 <0.001      NO
##
## $Descriptives
##      n      Mean Std.Dev Median Min Max 25th 75th      Skew Kurtosis
## Q6_15 136 54.44853 19.72583    50   0 100   50 60.00  0.053050339  1.095283
## Q6_16 136 56.27206 16.87096    50   0 100   50 60.00  0.739915663  1.422041
## Q6_17 136 50.34559 26.24313    50   0 100   30 70.00 -0.008747504 -0.642650
## Q6_18 136 55.69118 18.22270    50   0 100   50 60.25  0.372732355  1.427918
## Q6_19 136 56.25000 17.19119    50   5 100   50 60.00  0.658496427  1.724717
```

CORRELATION MATRIX

```
corrplot(cor(travel_df_clean),
         method="ellipse",
         tl.pos="n",
         title="Matrix Correlations")
```



```
correlation = cor(travel_df_clean)
```

```
correlation[1:20,1:20]
```

##		Q1	Q2	Q3	Q4	Q5
## Q1	1.000000000	-0.12513889	-0.04541582	0.040085071	-0.114051652	
## Q2	-0.125138891	1.000000000	0.07046634	0.060564659	0.289235943	
## Q3	-0.045415821	0.07046634	1.000000000	-0.021788191	0.107370795	
## Q4	0.040085071	0.06056466	-0.02178819	1.000000000	-0.169059373	
## Q5	-0.114051652	0.28923594	0.10737080	-0.169059373	1.000000000	
## Q6_15	0.269533056	-0.17813769	-0.02629204	0.122844578	-0.176453003	
## Q6_16	0.292242783	-0.09959010	0.03327590	0.070291274	-0.134409360	
## Q6_17	0.239951255	-0.21016778	0.06407088	0.184843390	-0.286140352	
## Q6_18	0.262076276	-0.05573256	0.01876627	-0.048311133	-0.159285655	
## Q6_19	0.202582731	0.05441888	-0.05022581	0.054017962	-0.114300237	
## Q8	-0.022882294	0.07992184	-0.01776806	-0.006040670	0.005535741	
## Q9	-0.077593236	0.27021637	0.21308145	-0.154415939	0.217878281	
## Q10	-0.164348790	0.18786056	0.14283370	-0.007407407	-0.015192716	
## Q11	0.081707288	0.30855786	0.31970266	0.072281812	0.150634437	
## Q12	0.068471337	0.13615685	0.26049125	-0.027318907	0.172235787	
## Q13	-0.014766381	0.25854449	0.13850008	-0.031008087	0.324702150	
## Q14	-0.118055825	0.33357678	-0.02832086	-0.018243172	0.235515115	
## Q15	-0.009664434	0.09049462	-0.01695442	-0.176039885	0.208642561	
## Q16	-0.009812124	0.06438359	0.06433904	0.041444658	0.138809209	
## Q17	0.177741613	-0.23758972	-0.13670743	-0.063865782	-0.345751478	
##	Q6_15	Q6_16	Q6_17	Q6_18	Q6_19	
## Q1	0.26953306	0.29224278	0.23995125	2.620763e-01	0.202582731	

## Q2	-0.17813769	-0.09959010	-0.21016778	-5.573256e-02	0.054418885
## Q3	-0.02629204	0.03327590	0.06407088	1.876627e-02	-0.050225814
## Q4	0.12284458	0.07029127	0.18484339	-4.831113e-02	0.054017962
## Q5	-0.17645300	-0.13440936	-0.28614035	-1.592857e-01	-0.114300237
## Q6_15	1.00000000	0.62715776	0.57879155	6.206019e-01	0.438614767
## Q6_16	0.62715776	1.00000000	0.61704396	6.651326e-01	0.640459754
## Q6_17	0.57879155	0.61704396	1.00000000	6.117973e-01	0.465644724
## Q6_18	0.62060187	0.66513259	0.61179733	1.000000e+00	0.641252644
## Q6_19	0.43861477	0.64045975	0.46564472	6.412526e-01	1.000000000
## Q8	0.05910930	0.18676426	-0.03313986	1.229672e-01	0.050197800
## Q9	-0.24580708	-0.07160761	-0.14420613	-6.920231e-05	0.038657880
## Q10	-0.11801452	0.14709588	0.05975885	7.257127e-02	0.169591275
## Q11	-0.19782157	-0.04247772	-0.09489730	-1.181088e-01	-0.009534284
## Q12	-0.09564924	0.04555098	-0.04061530	-3.692844e-02	0.095830944
## Q13	-0.22563958	-0.14343809	-0.21227902	-1.002361e-01	0.012410535
## Q14	-0.11033181	-0.05505475	-0.14087208	-2.047418e-02	0.068838891
## Q15	-0.05761595	0.01230606	0.02284999	2.458724e-02	0.094323951
## Q16	0.13350022	0.20116981	0.09845049	1.095055e-01	0.078193758
## Q17	0.20173703	0.16576936	0.17932314	1.229290e-01	0.074646628
##	Q8	Q9	Q10	Q11	Q12
## Q1	-0.022882294	-7.759324e-02	-0.164348790	0.081707288	0.06847134
## Q2	0.079921837	2.702164e-01	0.187860559	0.308557857	0.13615685
## Q3	-0.017768061	2.130815e-01	0.142833698	0.319702659	0.26049125
## Q4	-0.006040670	-1.544159e-01	-0.007407407	0.072281812	-0.02731891
## Q5	0.005535741	2.178783e-01	-0.015192716	0.150634437	0.17223579
## Q6_15	0.059109299	-2.458071e-01	-0.118014516	-0.197821569	-0.09564924
## Q6_16	0.186764263	-7.160761e-02	0.147095880	-0.042477721	0.04555098
## Q6_17	-0.033139862	-1.442061e-01	0.059758849	-0.094897303	-0.04061530
## Q6_18	0.122967225	-6.920231e-05	0.072571269	-0.118108758	-0.03692844
## Q6_19	0.050197800	3.865788e-02	0.169591275	-0.009534284	0.09583094
## Q8	1.000000000	1.798925e-01	0.404724877	0.058945126	0.21692035
## Q9	0.179892456	1.000000e+00	0.470600957	0.232796248	0.23122316
## Q10	0.404724877	4.706010e-01	1.000000000	0.181507662	0.16822695
## Q11	0.058945126	2.327962e-01	0.181507662	1.000000000	0.24537750
## Q12	0.216920354	2.312232e-01	0.168226951	0.245377497	1.00000000
## Q13	0.043493293	1.699107e-01	0.053333910	0.119686528	0.32766992
## Q14	-0.014877132	9.432042e-02	0.033445815	0.093953778	0.02803407
## Q15	-0.002080563	7.597835e-02	-0.089295594	0.118946244	0.05794171
## Q16	0.033797722	7.713943e-02	0.041444658	-0.098857935	0.15285007
## Q17	-0.052081934	-2.702366e-01	-0.097401482	-0.187629934	-0.18997351
##	Q13	Q14	Q15	Q16	Q17
## Q1	-0.01476638	-0.11805583	-0.009664434	-0.009812124	0.17774161
## Q2	0.25854449	0.33357678	0.090494623	0.064383592	-0.23758972
## Q3	0.13850008	-0.02832086	-0.016954422	0.064339045	-0.13670743
## Q4	-0.03100809	-0.01824317	-0.176039885	0.041444658	-0.06386578
## Q5	0.32470215	0.23551512	0.208642561	0.138809209	-0.34575148
## Q6_15	-0.22563958	-0.11033181	-0.057615954	0.133500222	0.20173703
## Q6_16	-0.14343809	-0.05505475	0.012306061	0.201169807	0.16576936
## Q6_17	-0.21227902	-0.14087208	0.022849985	0.098450489	0.17932314
## Q6_18	-0.10023611	-0.02047418	0.024587235	0.109505538	0.12292901
## Q6_19	0.01241053	0.06883889	0.094323951	0.078193758	0.07464663
## Q8	0.04349329	-0.01487713	-0.002080563	0.033797722	-0.05208193
## Q9	0.16991067	0.09432042	0.075978347	0.077139432	-0.27023659
## Q10	0.05333391	0.03344581	-0.089295594	0.041444658	-0.09740148

```
## Q11    0.11968653  0.09395378  0.118946244 -0.098857935 -0.18762993
## Q12    0.32766992  0.02803407  0.057941712  0.152850070 -0.18997351
## Q13    1.00000000  0.23953968  0.076468708 -0.032963317 -0.33192445
## Q14    0.23953968  1.00000000  0.149493037  0.056883358 -0.10997173
## Q15    0.07646871  0.14949304  1.000000000 -0.046392489 -0.09707568
## Q16   -0.03296332  0.05688336 -0.046392489  1.000000000 -0.01793553
## Q17   -0.33192445 -0.10997173 -0.097075683 -0.017935527  1.00000000
```

We called 20x20 of our correlation matrix. Basically, PCA should be used mainly for variables which are strongly correlated. If the relationship is weak between variables, PCA does not work well to reduce data. Refer to the correlation matrix we obtained. In general, if most of the correlation coefficients are smaller than 0.3, PCA will not help. Since some variables are highly correlated and some aren't, PCA will work for some variable and not for the weak correlation.

PRINCIPLE COMPONENT ANALYSIS

1. PCA Summary

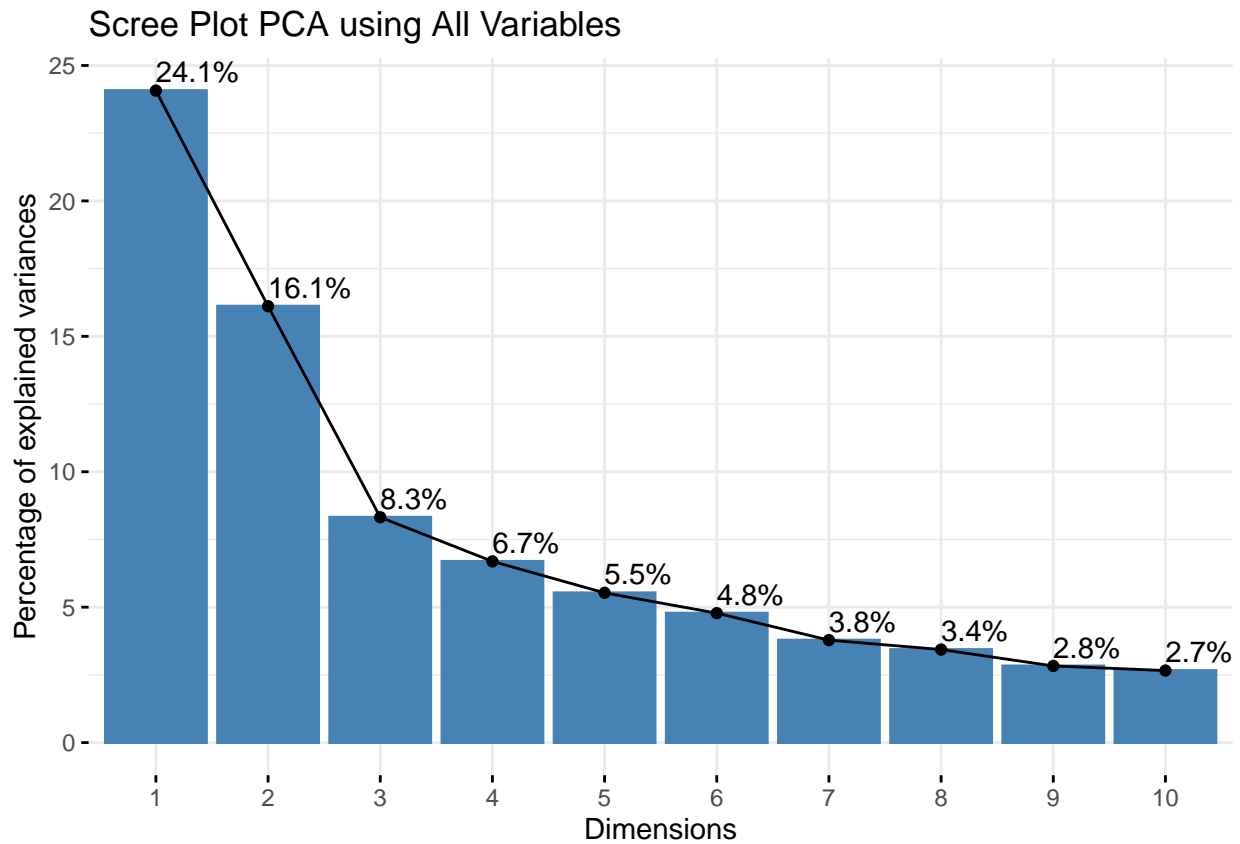
```
pca <- prcomp(correlation)
summary(pca)
```

```
## Importance of components:
##          PC1      PC2      PC3      PC4      PC5      PC6      PC7
## Standard deviation    0.7231 0.5916 0.4251 0.38122 0.34655 0.3222 0.28665
## Proportion of Variance 0.2407 0.1611 0.0832 0.06691 0.05529 0.0478 0.03783
## Cumulative Proportion 0.2407 0.4018 0.4850 0.55195 0.60725 0.6550 0.69287
##          PC8      PC9     PC10     PC11     PC12     PC13     PC14
## Standard deviation    0.27316 0.2479 0.2404 0.21432 0.20782 0.20007 0.18664
## Proportion of Variance 0.03435 0.0283 0.0266 0.02115 0.01988 0.01843 0.01604
## Cumulative Proportion 0.72722 0.7555 0.7821 0.80327 0.82316 0.84159 0.85762
##          PC15     PC16     PC17     PC18     PC19     PC20     PC21
## Standard deviation    0.18184 0.17246 0.1634 0.15409 0.14120 0.1366 0.12888
## Proportion of Variance 0.01522 0.01369 0.0123 0.01093 0.00918 0.0086 0.00765
## Cumulative Proportion 0.87285 0.88654 0.8988 0.90977 0.91895 0.9275 0.93519
##          PC22     PC23     PC24     PC25     PC26     PC27     PC28
## Standard deviation    0.12037 0.11436 0.10988 0.10652 0.10440 0.09445 0.08997
## Proportion of Variance 0.00667 0.00602 0.00556 0.00522 0.00502 0.00411 0.00373
## Cumulative Proportion 0.94186 0.94789 0.95344 0.95867 0.96369 0.96779 0.97152
##          PC29     PC30     PC31     PC32     PC33     PC34     PC35
## Standard deviation    0.08679 0.08019 0.07740 0.07043 0.06849 0.06621 0.06271
## Proportion of Variance 0.00347 0.00296 0.00276 0.00228 0.00216 0.00202 0.00181
## Cumulative Proportion 0.97499 0.97795 0.98071 0.98299 0.98515 0.98717 0.98898
##          PC36     PC37     PC38     PC39     PC40     PC41     PC42
## Standard deviation    0.05984 0.05526 0.05154 0.04864 0.04618 0.04066 0.03943
## Proportion of Variance 0.00165 0.00141 0.00122 0.00109 0.00098 0.00076 0.00072
## Cumulative Proportion 0.99063 0.99203 0.99326 0.99435 0.99533 0.99609 0.99680
##          PC43     PC44     PC45     PC46     PC47     PC48     PC49
## Standard deviation    0.03417 0.03359 0.03233 0.02782 0.02463 0.02204 0.01998
## Proportion of Variance 0.00054 0.00052 0.00048 0.00036 0.00028 0.00022 0.00018
## Cumulative Proportion 0.99734 0.99786 0.99834 0.99870 0.99898 0.99920 0.99939
##          PC50     PC51     PC52     PC53     PC54     PC55
## Standard deviation    0.01770 0.01690 0.01326 0.01262 0.01157 0.009694
## Proportion of Variance 0.00014 0.00013 0.00008 0.00007 0.00006 0.000040
## Cumulative Proportion 0.99953 0.99966 0.99974 0.99982 0.99988 0.999920
```

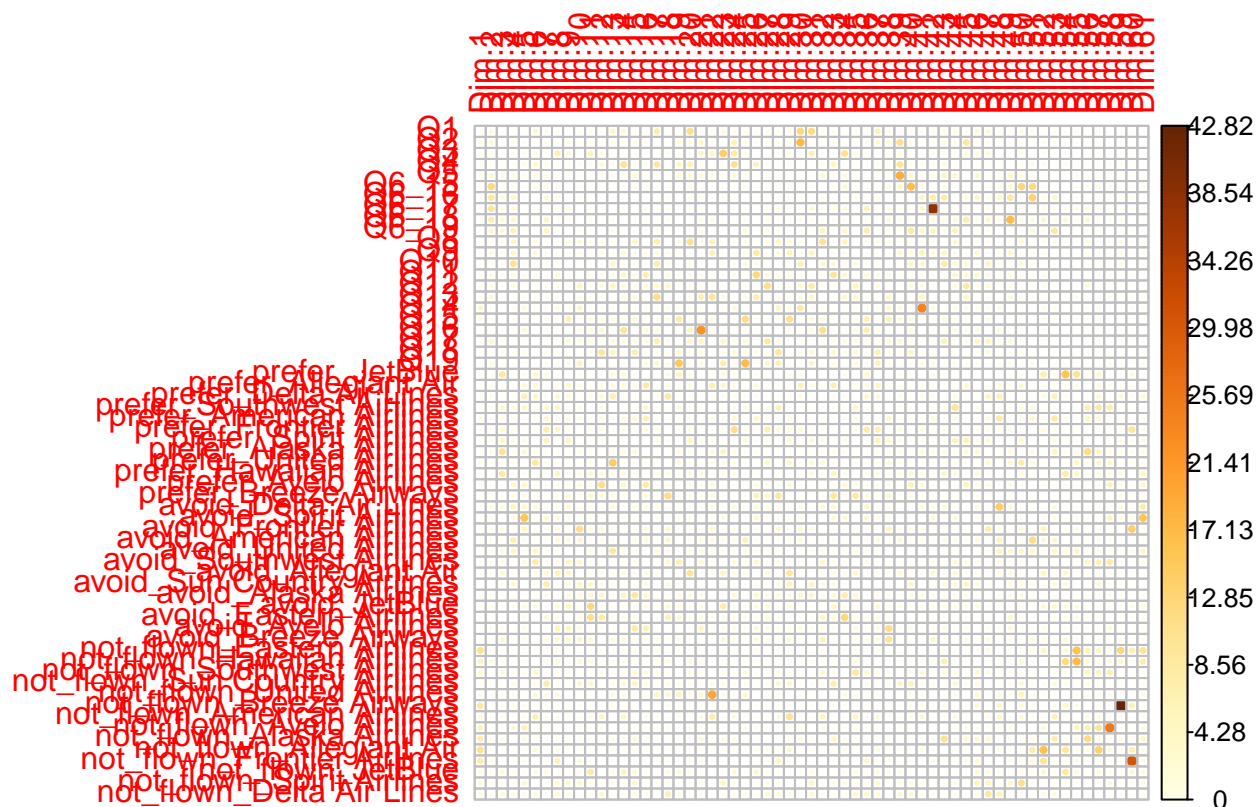
```
##
## Standard deviation      PC56      PC57      PC58      PC59      PC60      PC61
## Proportion of Variance 0.000030 0.000030 0.000010 0.000010 0.000000 0.000e+00
## Cumulative Proportion  0.999950 0.999980 0.999990 1.000000 1.000000 1.000e+00
```

2. Scree Plot

```
fviz_screepLOT(pca, type = "lines", addlabels = TRUE,
               main = "Scree Plot PCA using All Variables")
```



```
var <- get_pca_var(pca)
corrplot(var$contrib, is.corr = FALSE)
```



```
print(pca$rotation,digits = 8, cutoff = 0.01, 10)
```

	PC1	PC2	PC3
## Q1	-0.0342088532	0.186654137	-0.0029487484
## Q2	0.1567150808	-0.185774186	0.0206612031
## Q3	0.0729043679	-0.060237867	0.0031011599
## Q4	-0.0337174113	0.039491099	-0.0218086678
## Q5	0.1164469903	-0.192512728	0.1354446190
## Q6_15	0.0088952140	0.350412774	0.0405145512
## Q6_16	0.0098461645	0.300173830	0.1583089122
## Q6_17	-0.0265980456	0.313854815	0.1293903479
## Q6_18	0.0167104605	0.275012658	0.1793783380
## Q6_19	0.0357256948	0.205215908	0.1870803872
## Q8	0.0052725600	-0.026738676	0.0776145162
## Q9	0.0762348335	-0.171017684	0.1107313117
## Q10	-0.0169935616	-0.097378597	0.0631771682
## Q11	0.1013750791	-0.141468165	-0.0572075813
## Q12	0.0727487452	-0.123824056	0.0237074773
## Q13	0.1159568678	-0.177854452	0.0288874888
## Q14	0.2257992216	-0.078061365	0.0211293209
## Q15	0.1396184755	-0.045267149	0.0683773212
## Q16	-0.0326606852	0.020527010	0.0648624655
## Q17	-0.0738832587	0.208952297	-0.0824529990
## Q18	0.0864080753	-0.076458383	0.1111843300
## Q19	0.0456282699	-0.144516255	0.0598230468
## prefer_JetBlue	-0.1028030046	-0.050030863	-0.3003622844
## prefer_Allegiant Air	0.0506095229	-0.089701380	-0.0606200780
## prefer_Delta Air Lines	-0.0465261018	0.104775852	0.0149822163

## prefer_Southwest Airlines	-0.0544629234	-0.078845808	-0.1967004797
## prefer_American Airlines	-0.1575342182	0.101841629	-0.1382435704
## prefer_Frontier Airlines	0.0201348207	-0.063584300	-0.1910031854
## prefer_Spirit Airlines	0.0014961347	-0.116768424	-0.2190167879
## prefer_Alaska Airlines	-0.0337702487	0.117798151	-0.3262996436
## prefer_United Airlines	-0.1311220904	0.075308481	-0.0274737645
## prefer_Hawaiian Airlines	-0.0645089997	0.085170045	-0.2966353658
## prefer_Avelo Airlines	-0.0907003233	-0.027656425	0.0407833295
## prefer_Breeze Airways	-0.0380453684	0.022070479	0.0359670082
## avoid_Delta Air Lines	-0.0198592279	-0.140541955	-0.1434081409
## avoid_Spirit Airlines	-0.0032342750	0.096046090	0.0421907672
## avoid_Frontier Airlines	-0.0505902979	0.101520517	-0.1617549845
## avoid_American Airlines	0.0405648383	-0.101163884	-0.0683818397
## avoid_United Airlines	-0.0400919850	-0.107333352	-0.1651869661
## avoid_Southwest Airlines	-0.0472069212	0.076852597	-0.1101814333
## avoid_Allegiant Air	0.0301430563	0.064199952	-0.1803906223
## avoid_Sun Country Airlines	0.0296035830	0.022873352	-0.1082612907
## avoid_Alaska Airlines	0.0220257202	-0.117838419	-0.0544725883
## avoid_JetBlue	-0.0705707024	0.055875239	0.0316141781
## avoid_Eastern Airlines	0.0187205102	-0.031620338	-0.0303209880
## avoid_Avelo Airlines	-0.0143549452	0.113356175	-0.1014680465
## avoid_Breeze Airways	0.0082492515	0.056372013	-0.2042285684
## not_flown_Eastern Airlines	-0.3311408499	-0.026149297	-0.0800535072
## not_flown_Hawaiian Airlines	-0.2465150684	-0.147322811	0.0947630234
## not_flown_Southwest Airlines	-0.2021867571	-0.045498731	0.1836747149
## not_flown_Sun Country Airlines	-0.0744460918	-0.011483725	0.0421540503
## not_flown_United Airlines	-0.1249304550	-0.060650704	0.1019423236
## not_flown_Breeze Airways	-0.3059763755	-0.073203853	-0.0570843210
## not_flown_American Airlines	-0.1365061366	-0.093819384	0.1205651134
## not_flown_Avelo Airlines	-0.2464465445	-0.059863015	-0.0890897202
## not_flown_Alaska Airlines	-0.2767151640	-0.101533678	0.1300476328
## not_flown_Allegiant Air	-0.3281226134	-0.027610440	0.0099962230
## not_flown_Frontier Airlines	-0.2819109641	-0.101275773	0.0917471848
## not_flown_JetBlue	-0.1393975056	-0.106622836	0.1739809949
## not_flown_Spirit Airlines	-0.1847860362	-0.053959473	0.1074842724
## not_flown_Delta Air Lines	-0.1241647020	-0.052764624	0.1688486453
##	PC4	PC5	PC6
## Q1	0.03481399770	-0.0027079335	0.2039232858
## Q2	0.13780388173	-0.0873091992	-0.0074301295
## Q3	0.06746288152	0.0829710089	0.1380828123
## Q4	0.05179536417	-0.1101658946	-0.2021884741
## Q5	-0.13394142154	-0.0963779782	0.1482883672
## Q6_15	0.09399967769	-0.0147186237	-0.1420527259
## Q6_16	0.21241811198	0.0604189407	0.0108734215
## Q6_17	0.15100564243	0.0220170278	-0.0917506106
## Q6_18	0.20737256634	0.0136539922	-0.0263457005
## Q6_19	0.25341500182	0.0339256563	-0.0462872685
## Q8	0.21909707241	0.0155208021	0.1174660765
## Q9	0.20951219408	0.0460280469	0.1699061781
## Q10	0.32464608011	0.1030747821	0.0748995129
## Q11	0.13529052962	0.1010269309	0.0917952953
## Q12	0.14652286270	-0.0303799791	0.0461091518
## Q13	0.05394127779	-0.0533620393	0.0892177998
## Q14	0.07473098657	-0.1724896490	0.0377449534

## Q15	-0.05368608887	0.0686536015	-0.0353360767
## Q16	0.05144217106	-0.1804193023	-0.0374658006
## Q17	-0.03474663123	0.0529889468	-0.0386201702
## Q18	0.02829687031	-0.1179711670	0.0043686080
## Q19	-0.04426566247	0.0215681920	0.0256648670
## prefer_JetBlue	0.02505582044	-0.1220931772	-0.2066539691
## prefer_Allegiant Air	0.01251390632	-0.1799649952	-0.1971335953
## prefer_Delta Air Lines	-0.04407304146	-0.2507306604	0.2236871140
## prefer_Southwest Airlines	0.14729922354	-0.2038746242	-0.0858845412
## prefer_American Airlines	-0.11242896756	-0.0618621141	0.1045187396
## prefer_Frontier Airlines	-0.09782902342	0.0396251371	0.0882929201
## prefer_Spirit Airlines	-0.13687221047	0.1307136302	-0.0515603006
## prefer_Alaska Airlines	0.06418333151	0.2003271687	0.1183370235
## prefer_United Airlines	-0.07700666315	-0.0472858522	0.3042182693
## prefer_Hawaiian Airlines	0.00285327961	0.0592639079	0.0027354209
## prefer_Avelo Airlines	-0.19720965839	0.2184148644	-0.0379593643
## prefer_Breeze Airways	-0.11939350295	0.1244966178	0.1042324660
## avoid_Delta Air Lines	0.24019924364	0.2145894093	-0.1709328739
## avoid_Spirit Airlines	-0.13328040541	-0.3971550472	0.0509823655
## avoid_Frontier Airlines	0.03678696726	-0.2277462967	-0.0562381200
## avoid_American Airlines	0.26916795924	0.0743002829	0.0744448341
## avoid_United Airlines	0.22871076617	0.0793925036	-0.2311885610
## avoid_Southwest Airlines	-0.05189656777	0.1654462471	0.2860522968
## avoid_Allegiant Air	0.08047858551	-0.0437938037	-0.1267228742
## avoid_Sun Country Airlines	0.20342272349	-0.0232798979	0.0941984569
## avoid_Alaska Airlines	0.03570463061	0.0093581219	0.0798962711
## avoid_JetBlue	-0.10009138762	0.1579005804	0.1612935409
## avoid_Eastern Airlines	0.00058375261	0.1231957699	0.0144241591
## avoid_Avelo Airlines	-0.01609877537	0.1317918913	0.0048507824
## avoid_Breeze Airways	-0.00461200663	0.1121584473	-0.0159639950
## not_flown_Eastern Airlines	0.07152070343	-0.0668132110	0.0765281804
## not_flown_Hawaiian Airlines	0.02899145659	-0.0720880299	0.0584621329
## not_flown_Southwest Airlines	-0.04057611234	0.0984045126	-0.2157181964
## not_flown_Sun Country Airlines	-0.14654580475	0.0237676113	-0.0802715834
## not_flown_United Airlines	-0.08015440953	0.0058404374	-0.1827006985
## not_flown_Breeze Airways	0.12629462633	-0.1157460476	0.0450569218
## not_flown_American Airlines	-0.02437431596	0.0931160432	-0.2694914326
## not_flown_Avelo Airlines	0.18621307486	-0.2522530010	0.0676424356
## not_flown_Alaska Airlines	-0.00250088590	-0.1570688325	-0.0452323114
## not_flown_Allegiant Air	0.04660855535	0.0146328953	0.1764035290
## not_flown_Frontier Airlines	0.06454786705	0.1302559441	0.0097343937
## not_flown_JetBlue	0.07153202413	0.0465086376	0.1464054742
## not_flown_Spirit Airlines	0.08449435257	0.1800718750	0.0104183968
## not_flown_Delta Air Lines	-0.13412937034	0.1199064153	-0.1712746904
##	PC7	PC8	PC9
## Q1	0.0970039962	-0.0369096251	0.0168132082
## Q2	0.1042600866	0.0236516598	-0.1300798287
## Q3	-0.0273817394	0.2688346156	0.1745925473
## Q4	-0.1097623436	0.0209704092	-0.0886535343
## Q5	0.1539506287	0.0629406838	0.0827391221
## Q6_15	0.1395431777	0.0847340199	0.0056719840
## Q6_16	0.1770144000	0.0888199966	0.0059327864
## Q6_17	0.0252505514	0.0656705845	0.1711748398
## Q6_18	0.2342907824	0.0277893475	0.1028148602

## Q6_19	0.2277832943	-0.0291839000	0.0451751235
## Q8	-0.0664782083	0.0542830591	-0.1600388403
## Q9	-0.0708712635	0.0436925856	0.0761880307
## Q10	-0.1190023734	0.0937556950	-0.0456031502
## Q11	0.0318361448	0.1631773835	0.0471276307
## Q12	0.0832553618	0.0979191089	0.0436769722
## Q13	0.0670345975	0.0448997769	0.0866027718
## Q14	0.0851112873	-0.1601088133	-0.1002855703
## Q15	0.1198185349	-0.0323542602	0.2655565089
## Q16	0.0682013223	0.0457034427	-0.0116086363
## Q17	-0.0253421903	-0.0425243442	-0.1720976596
## Q18	0.1082131588	0.0813027676	-0.0456933738
## Q19	0.1039018569	-0.0299217486	0.1250238993
## prefer_JetBlue	0.1587759614	0.0560232616	0.0520095879
## prefer_Allegiant Air	0.0071142831	-0.0630608900	-0.1963355417
## prefer_Delta Air Lines	-0.0756596215	-0.1872146237	0.1564041080
## prefer_Southwest Airlines	0.2071730763	-0.2256839273	0.0808713689
## prefer_American Airlines	0.1982000591	0.0955443161	-0.1475764303
## prefer_Frontier Airlines	0.2787292631	0.2327214759	0.1332004073
## prefer_Spirit Airlines	0.2451840805	0.0607753432	0.2439719086
## prefer_Alaska Airlines	-0.0734028811	0.0601277227	0.0913809765
## prefer_United Airlines	0.1044605576	-0.0566298177	0.0408014918
## prefer_Hawaiian Airlines	-0.0261511294	0.2400489404	-0.0878177335
## prefer_Avelo Airlines	0.0542983493	0.0617641257	0.1206434334
## prefer_Breeze Airways	-0.0224400721	-0.1280468044	-0.1791895991
## avoid_Delta Air Lines	0.0705568416	0.1133072718	-0.1747596433
## avoid_Spirit Airlines	-0.2017973789	0.1557411499	0.1174069905
## avoid_Frontier Airlines	-0.1024215737	0.1316207661	-0.0975236007
## avoid_American Airlines	-0.0477337598	-0.1994753206	0.1680180611
## avoid_United Airlines	0.0781252556	-0.0921819768	-0.0496051450
## avoid_Southwest Airlines	-0.0763159410	0.1207647483	-0.2356585151
## avoid_Allegiant Air	-0.1741900078	-0.2525362303	0.2032732930
## avoid_Sun Country Airlines	-0.2806913954	0.1070622915	0.1487401639
## avoid_Alaska Airlines	0.0951153829	0.0093898414	-0.1429138542
## avoid_JetBlue	0.0792358694	-0.1727095113	-0.2382678582
## avoid_Eastern Airlines	0.1809590272	-0.1106320166	-0.0431234685
## avoid_Avelo Airlines	-0.0520779429	-0.2461460063	0.2336806277
## avoid_Breeze Airways	-0.1632272596	-0.1970845432	0.1960902534
## not_flown_Eastern Airlines	0.0142208736	0.0775093601	0.0989994582
## not_flown_Hawaiian Airlines	0.0819538201	-0.1540647283	0.0987937308
## not_flown_Southwest Airlines	-0.0786674748	0.1199558476	0.0994432046
## not_flown_Sun Country Airlines	0.2857251221	-0.0933989885	-0.0246484860
## not_flown_United Airlines	-0.1387381732	0.1670902119	-0.0077442119
## not_flown_Breeze Airways	0.0961417359	0.0787893414	0.0585709520
## not_flown_American Airlines	-0.0881064205	0.0709424698	0.0299640055
## not_flown_Avelo Airlines	0.0094168607	0.0402561161	-0.0655854142
## not_flown_Alaska Airlines	0.0746856564	-0.0698291481	-0.0052192641
## not_flown_Allegiant Air	0.0774296075	0.1001968271	0.0730307993
## not_flown_Frontier Airlines	-0.0324638363	-0.2500401272	0.0138041952
## not_flown_JetBlue	-0.1556930907	0.0247440921	0.0923719219
## not_flown_Spirit Airlines	-0.0318986457	-0.1676073323	-0.2029008114
## not_flown_Delta Air Lines	-0.0469170977	0.1783606477	0.1309434802
##	PC10	PC11	PC12
## Q1	-0.06594656364	0.1015052383	-0.0361808763

## Q2	-0.02417654825	0.0763081617	0.0778077614
## Q3	0.00828852493	-0.2491125914	-0.1501139639
## Q4	-0.05562246958	-0.0774319421	-0.1863896840
## Q5	0.03584007567	0.0472228916	0.0910668817
## Q6_15	0.01387332066	0.0078498217	0.0023406815
## Q6_16	-0.06871441536	0.0071208004	-0.0044759134
## Q6_17	0.00756226466	-0.0872143286	-0.0330473543
## Q6_18	0.01090403356	0.0377012215	-0.0240921825
## Q6_19	0.04735167224	0.0087506306	0.0309257600
## Q8	-0.18468355210	0.1317633715	-0.0980650466
## Q9	-0.10539231804	0.0380887463	0.1448292267
## Q10	-0.02413248633	-0.0303278077	0.0548998840
## Q11	-0.01918165454	-0.0955032247	-0.0955000528
## Q12	-0.24004159583	-0.0747942876	-0.1582226372
## Q13	0.09616970220	-0.0446421252	-0.1084565916
## Q14	0.23071427025	0.0050205541	0.0546227533
## Q15	-0.07814436976	0.1579011906	0.1431395530
## Q16	-0.12737470541	-0.1587664552	0.1870910361
## Q17	0.13570426042	0.0857113453	-0.0781162488
## Q18	-0.02902758223	-0.1090544353	0.3168583881
## Q19	0.24690405836	-0.0566770130	0.0571099567
## prefer_JetBlue	-0.07501567315	-0.0170832949	0.0420915567
## prefer_Allegiant Air	-0.15149726204	0.0481352572	-0.1349634020
## prefer_Delta Air Lines	-0.03668077284	-0.1441916358	-0.1838854578
## prefer_Southwest Airlines	0.12837978511	0.0270589659	0.1571045928
## prefer_American Airlines	0.13294532231	-0.0121953233	0.1591382489
## prefer_Frontier Airlines	0.01879434999	0.0812720629	-0.1389712147
## prefer_Spirit Airlines	0.01557953420	-0.0676478629	-0.1318074395
## prefer_Alaska Airlines	0.09955347946	-0.0079281392	0.0065021615
## prefer_United Airlines	-0.06051039402	0.1268931518	-0.0217706045
## prefer_Hawaiian Airlines	0.15643081796	0.1995692774	0.1568830722
## prefer_Avelo Airlines	-0.14868317686	-0.1349273846	0.3370340524
## prefer_Breeze Airways	-0.09894839749	-0.2025502645	0.1807774568
## avoid_Delta Air Lines	-0.03281484822	0.0906382637	0.0037553930
## avoid_Spirit Airlines	0.04514827901	0.0628460195	-0.0537049837
## avoid_Frontier Airlines	-0.33917540850	-0.1558545904	0.1748621629
## avoid_American Airlines	-0.21666898721	0.0375259543	0.0977653015
## avoid_United Airlines	-0.01737598660	-0.1567595816	0.0960102002
## avoid_Southwest Airlines	-0.22254623468	-0.0708617067	0.0164599937
## avoid_Allegiant Air	0.02557952207	-0.0706314432	0.0941912142
## avoid_Sun Country Airlines	0.23076792953	-0.2223787747	0.1370230474
## avoid_Alaska Airlines	-0.15779347357	0.1954971447	-0.2181456691
## avoid_JetBlue	-0.02515797022	-0.3526475589	-0.0142805269
## avoid_Eastern Airlines	0.12340759368	-0.3368611881	-0.2856833037
## avoid_Avelo Airlines	-0.15908581905	0.0314556501	-0.0679869985
## avoid_Breeze Airways	-0.22413696005	0.1927224732	-0.0305436139
## not_flown_Eastern Airlines	-0.04214805005	0.0382096916	0.0792673476
## not_flown_Hawaiian Airlines	-0.17532896690	-0.1559550232	-0.0707739353
## not_flown_Southwest Airlines	-0.01790613056	0.0225456555	-0.1334298405
## not_flown_Sun Country Airlines	-0.22030072076	0.2031015985	-0.0162003624
## not_flown_United Airlines	-0.04410642770	0.0110409908	-0.0556382308
## not_flown_Breeze Airways	0.05516689073	-0.0889768140	-0.0375623502
## not_flown_American Airlines	0.02640857460	-0.1089871480	-0.2258411617
## not_flown_Avelo Airlines	0.11621466518	0.0707480037	-0.1177956334

## not_flown_Alaska Airlines	-0.10122067378	-0.0702485236	0.0865086811
## not_flown_Allegiant Air	0.03224987710	-0.0156410562	0.0077049720
## not_flown_Frontier Airlines	0.18041477730	0.0542494979	-0.0137172277
## not_flown_JetBlue	0.05928235406	0.2968819028	0.0087756565
## not_flown_Spirit Airlines	0.21633432839	0.1381441747	0.0721589545
## not_flown_Delta Air Lines	0.00038084153	0.0271439907	0.1945918276
##	PC13	PC14	PC15
## Q1	0.22577400737	-0.1727308854	0.0330574378
## Q2	-0.14147145118	-0.0871496953	-0.1356865968
## Q3	-0.05366081064	-0.0104058936	0.0387151958
## Q4	-0.07005748104	-0.3222092622	0.0972778772
## Q5	0.09782668363	0.0819826066	-0.1785214788
## Q6_15	-0.00243062532	0.0222904160	-0.1347880275
## Q6_16	-0.02984345058	0.0069476611	0.0032770401
## Q6_17	-0.00042002222	-0.1068954654	0.0251500328
## Q6_18	-0.06902222111	0.0219642937	-0.0375322317
## Q6_19	-0.11895348539	-0.0262476533	-0.0117623829
## Q8	0.07807851032	0.0311114509	-0.2224704378
## Q9	-0.06508542879	0.1824840920	0.1048713904
## Q10	-0.21256893474	0.0969959939	-0.0265232819
## Q11	0.07548587190	-0.2280082110	0.1508066350
## Q12	0.23338041748	0.1618261197	-0.1047652811
## Q13	-0.03870195301	0.1492184088	-0.1657285508
## Q14	-0.08342541989	0.0468016832	0.0594819500
## Q15	0.13995065435	-0.0863809637	0.1735395085
## Q16	-0.02046918662	0.3145558324	0.0608709246
## Q17	0.14759614630	0.1025396697	0.1509864367
## Q18	0.24305413474	0.0347546554	-0.2736996196
## Q19	-0.05095825143	-0.0357421942	0.0173100013
## prefer_JetBlue	-0.16939690771	0.1802907064	-0.0944969431
## prefer_Allegiant Air	-0.14750132413	-0.1507366507	-0.1446119862
## prefer_Delta Air Lines	0.26860169945	0.0174256225	-0.0159873897
## prefer_Southwest Airlines	0.03728985647	0.0246203821	0.0451346305
## prefer_American Airlines	-0.08658188100	-0.1676781853	-0.1869339445
## prefer_Frontier Airlines	-0.04333435828	-0.1128700317	-0.0364114779
## prefer_Spirit Airlines	-0.08305192453	-0.0529930893	0.0354536327
## prefer_Alaska Airlines	0.11024038464	0.1279570233	-0.1802477337
## prefer_United Airlines	-0.38332422428	0.0563236934	-0.0308810686
## prefer_Hawaiian Airlines	0.13369478522	0.1528216889	0.0677778342
## prefer_Avelo Airlines	-0.02667621852	-0.2084292392	0.0074546385
## prefer_Breeze Airways	-0.14204073390	-0.1381475933	0.0066983618
## avoid_Delta Air Lines	-0.16684945511	-0.0101124706	0.1590441860
## avoid_Spirit Airlines	-0.07020758687	0.0559607578	0.0760121441
## avoid_Frontier Airlines	0.08668795413	-0.0351780210	0.0539896879
## avoid_American Airlines	0.05712236364	0.0370626627	0.1526962412
## avoid_United Airlines	0.30740906485	-0.1327533229	0.0510628289
## avoid_Southwest Airlines	-0.01361802040	0.0575060882	0.1302033416
## avoid_Allegiant Air	0.04932541949	-0.1520890642	-0.1134538940
## avoid_Sun Country Airlines	-0.11662199412	-0.0829756742	-0.0898336408
## avoid_Alaska Airlines	0.11668875199	-0.2382798977	-0.3049081263
## avoid_JetBlue	-0.00327796173	0.0864495116	-0.0904501061
## avoid_Eastern Airlines	0.09652431482	0.1293853485	0.1316994640
## avoid_Avelo Airlines	-0.04489965853	0.0419432118	-0.2945432899
## avoid_Breeze Airways	-0.16228458086	0.1786800990	-0.0623074062

## not_flown_Eastern Airlines	0.00209374356	-0.0209301943	-0.1004889959
## not_flown_Hawaiian Airlines	-0.07867584032	-0.0933298216	-0.0724129841
## not_flown_Southwest Airlines	-0.08320129523	-0.0489246710	-0.1864107215
## not_flown_Sun Country Airlines	0.11006228168	0.1912552033	0.2365012788
## not_flown_United Airlines	0.14701783515	0.1374535875	-0.0324285609
## not_flown_Breeze Airways	0.11419485267	-0.0632162594	-0.0078115457
## not_flown_American Airlines	-0.01664105816	0.2196249494	-0.0110751220
## not_flown_Avelo Airlines	0.02947808085	0.0531651705	0.0553817535
## not_flown_Alaska Airlines	-0.14019175583	-0.0545329826	0.1745165233
## not_flown_Allegiant Air	0.02984791289	0.0129772810	0.0787591747
## not_flown_Frontier Airlines	-0.01923808727	0.0618727177	0.0029346227
## not_flown_JetBlue	0.10650056963	-0.2472923027	0.1766639753
## not_flown_Spirit Airlines	0.13297490868	0.0476752533	-0.2029771726
## not_flown_Delta Air Lines	0.09796305024	0.0624276454	-0.1594317146
##	PC16	PC17	PC18
## Q1	-0.0117525877	0.2829009407	-0.02937861434
## Q2	0.0956705831	0.0362928515	0.03360685439
## Q3	-0.0495763659	0.0391774050	-0.08445483723
## Q4	0.1081508624	0.3064298044	-0.02696797488
## Q5	0.1070399538	0.0581459688	0.05436332750
## Q6_15	0.0124329394	0.0608117227	-0.04557739626
## Q6_16	0.0287486133	0.0401173487	0.05990781637
## Q6_17	-0.0944126620	0.0061684825	-0.05682537916
## Q6_18	-0.0807880032	-0.0506864969	0.09040287784
## Q6_19	0.0565688903	0.1092615542	0.01460938032
## Q8	-0.0115568248	-0.2683464840	-0.00373712471
## Q9	0.1064289791	-0.1362731677	-0.11076474884
## Q10	0.0315800878	-0.2839597928	-0.11510409423
## Q11	0.2775828039	0.0585963958	-0.15920526298
## Q12	-0.1474330950	0.2021727353	-0.21584596595
## Q13	-0.0167308064	0.3399148996	-0.06947866707
## Q14	0.0593541508	0.0342667916	0.09610370269
## Q15	0.0988463827	-0.0803873680	0.12516092760
## Q16	-0.1693210610	0.1550604821	-0.01051831902
## Q17	-0.1226633352	-0.2692103895	0.14696390035
## Q18	0.0853913920	-0.1027063892	0.08605851395
## Q19	0.1199999424	0.2027714568	0.11220302723
## prefer_JetBlue	-0.0223414649	-0.0797813002	-0.15163138421
## prefer_Allegiant Air	-0.2906175374	0.0377377198	0.13973758622
## prefer_Delta Air Lines	-0.0429702180	-0.1216244411	-0.29044462040
## prefer_Southwest Airlines	-0.2075301404	0.0464401036	0.00872320652
## prefer_American Airlines	0.2625313568	-0.0831605486	-0.03813908279
## prefer_Frontier Airlines	-0.1665095760	-0.1054455668	0.00659794618
## prefer_Spirit Airlines	-0.0096486806	-0.1609730943	0.07955392035
## prefer_Alaska Airlines	-0.0058205612	0.0208213067	0.03622054297
## prefer_United Airlines	-0.1253950464	0.0426405162	0.04761361809
## prefer_Hawaiian Airlines	-0.0434330319	0.1433511660	-0.12489317921
## prefer_Avelo Airlines	-0.2900410627	0.0280561420	-0.10363496948
## prefer_Breeze Airways	-0.1748650936	0.0937519483	-0.34005770275
## avoid_Delta Air Lines	0.1122657165	0.1139994570	0.00025854119
## avoid_Spirit Airlines	0.0107454056	-0.1025657375	-0.05597870543
## avoid_Frontier Airlines	0.1607526562	0.0050354863	0.20617179892
## avoid_American Airlines	-0.1766122948	0.0623667719	0.22089190116
## avoid_United Airlines	0.0194854829	-0.1714781660	-0.13721724872

## avoid_Southwest Airlines	0.0116766690	0.0699334231	0.19297343215
## avoid_Allegiant Air	0.1233442512	0.0610833358	-0.00149868027
## avoid_Sun Country Airlines	-0.1669253316	0.0250445114	0.15324237244
## avoid_Alaska Airlines	-0.2140843352	0.0101750791	0.08013388812
## avoid_JetBlue	0.1501701841	0.0972740449	0.18148038606
## avoid_Eastern Airlines	-0.0508997662	-0.0948561852	0.25303628574
## avoid_Avelo Airlines	0.2668244409	0.0094815229	0.02153430556
## avoid_Breeze Airways	0.1085516717	0.1363125464	0.07397040666
## not_flown_Eastern Airlines	0.0073199662	0.1036453645	-0.04583345703
## not_flown_Hawaiian Airlines	0.0341216495	-0.1215436963	0.16873244570
## not_flown_Southwest Airlines	0.1788543184	-0.1253466465	-0.09085863828
## not_flown_Sun Country Airlines	0.1457762953	0.0286064400	-0.14375901066
## not_flown_United Airlines	0.1136350302	0.2196060510	0.19931502143
## not_flown_Breeze Airways	0.0296792571	-0.0071966900	0.10420925150
## not_flown_American Airlines	-0.1231568411	0.0691492974	-0.04223333192
## not_flown_Avelo Airlines	0.0783657879	0.0446037266	0.10410069751
## not_flown_Alaska Airlines	0.0448273520	-0.0232021531	-0.02618093052
## not_flown_Allegiant Air	0.0726604032	0.0415128297	-0.00850334491
## not_flown_Frontier Airlines	-0.0296018505	0.0347830670	-0.11294455320
## not_flown_JetBlue	-0.1004055490	0.0295848818	0.14164998958
## not_flown_Spirit Airlines	-0.0518795657	0.0839497393	-0.10921591214
## not_flown_Delta Air Lines	-0.1359803194	0.0151230577	0.26298438585
##	PC19	PC20	PC21
## Q1	0.0231439589	-0.33660694456	0.0580511875
## Q2	0.1743695553	-0.15130869159	0.2024236040
## Q3	0.0889432319	0.05152978797	0.2182990333
## Q4	0.2194299151	0.26105981062	0.0335071795
## Q5	0.1826350734	0.18235185987	0.1654573610
## Q6_15	0.0250397217	0.12393606276	0.0319981553
## Q6_16	0.0048301705	0.11560843865	0.0783235367
## Q6_17	0.0253918071	0.01905750243	0.0489711120
## Q6_18	-0.0120014552	-0.00543991205	-0.1312208770
## Q6_19	-0.0823375268	-0.06033904125	-0.1165671469
## Q8	-0.1609526336	0.32740487566	-0.1299587745
## Q9	0.0952515952	-0.02923577913	0.0051658294
## Q10	0.0529166570	0.11280629079	-0.0248228671
## Q11	0.1265691512	-0.10403069634	0.1222645916
## Q12	-0.0584186746	-0.07982308835	-0.0723371228
## Q13	-0.0735449767	-0.11127779957	-0.2678164813
## Q14	-0.1124785471	0.10159626946	0.0633879532
## Q15	-0.2875043752	0.04948512950	-0.0250180961
## Q16	-0.0368670243	0.23378997462	0.4739180331
## Q17	-0.0562929853	-0.21600911304	0.2279554004
## Q18	0.1988728429	-0.07673787177	-0.1533820234
## Q19	-0.3874921506	-0.07191826388	0.1489709233
## prefer_JetBlue	-0.2391913770	-0.13554506477	0.0379039384
## prefer_Allegiant Air	0.0485263357	-0.14120596289	-0.0132926610
## prefer_Delta Air Lines	-0.0875674247	0.06521740187	-0.0578946102
## prefer_Southwest Airlines	0.1711714906	0.06849082580	-0.0497558228
## prefer_American Airlines	-0.0367423355	0.05059472753	-0.0196816996
## prefer_Frontier Airlines	0.0404606937	0.10783345360	0.0184557640
## prefer_Spirit Airlines	-0.0018382741	0.24003569477	-0.0994455001
## prefer_Alaska Airlines	0.1521952840	-0.11831426979	-0.0282006165
## prefer_United Airlines	0.1740733083	-0.08563051862	0.0198815680

## prefer_Hawaiian Airlines	0.0777802243	0.13053195005	-0.1612209795
## prefer_Avelo Airlines	0.0267783390	-0.02217091114	-0.0664931476
## prefer_Breeze Airways	-0.1042416204	0.11796975117	-0.1046121315
## avoid_Delta Air Lines	-0.0176234892	-0.04941721379	0.0062487174
## avoid_Spirit Airlines	0.1131871486	-0.10115270148	0.0271279475
## avoid_Frontier Airlines	0.0579501616	-0.06118673145	-0.0671280808
## avoid_American Airlines	-0.0051763513	-0.08610627681	-0.1578282275
## avoid_United Airlines	0.0205553133	-0.10806483505	0.1471645394
## avoid_Southwest Airlines	-0.2648336507	0.06906532595	0.1724017368
## avoid_Allegiant Air	-0.0102018156	0.31985262808	0.0594055479
## avoid_Sun Country Airlines	-0.0966155861	-0.00762274757	0.0026453330
## avoid_Alaska Airlines	-0.1394264768	0.13913540901	0.1305178943
## avoid_JetBlue	0.1670096735	0.04950732215	-0.1094423811
## avoid_Eastern Airlines	0.1854420764	0.07310590689	-0.1405255987
## avoid_Avelo Airlines	-0.0079945295	-0.06835193981	0.2434147731
## avoid_Breeze Airways	0.1372354364	0.06478101117	-0.0660894171
## not_flown_Eastern Airlines	-0.0601220708	0.00911030436	0.0571550411
## not_flown_Hawaiian Airlines	-0.0483001334	-0.15026104305	0.0969945846
## not_flown_Southwest Airlines	-0.0053582662	-0.15384358225	-0.0941625653
## not_flown_Sun Country Airlines	0.1455784612	0.10225881525	0.0531321072
## not_flown_United Airlines	-0.2353790103	0.11682937412	-0.1918038483
## not_flown_Breeze Airways	-0.0479799158	0.02288144725	0.0554601373
## not_flown_American Airlines	0.0738268156	-0.03728165887	0.1335034497
## not_flown_Avelo Airlines	-0.0083687823	0.07395379412	-0.0690354544
## not_flown_Alaska Airlines	-0.0399234933	0.02350298970	-0.1777190877
## not_flown_Allegiant Air	-0.0157466320	-0.03696771025	-0.0417672327
## not_flown_Frontier Airlines	0.0209029051	0.08094099619	0.1006409759
## not_flown_JetBlue	0.1827569898	0.12035681152	0.0348061378
## not_flown_Spirit Airlines	0.0202022157	-0.00068716017	0.0739089828
## not_flown_Delta Air Lines	0.1582314037	0.01424137258	0.0879446722
##	PC22	PC23	PC24
## Q1	0.0458549700	-0.14921455307	0.0987737593
## Q2	-0.0893884916	0.02099320624	0.2508130593
## Q3	-0.2211095526	-0.37435504369	-0.2996318663
## Q4	-0.0015853983	0.01771600115	0.3294828561
## Q5	0.1388009087	0.07079084913	-0.1734360301
## Q6_15	0.0284179499	-0.00682955896	-0.0700740948
## Q6_16	0.0586767805	0.10374133028	-0.0305138336
## Q6_17	-0.0167954426	0.00210263819	0.0765358484
## Q6_18	-0.1480523892	-0.02021221551	-0.0283940533
## Q6_19	0.0099527944	0.00763062492	-0.0274105490
## Q8	0.2495689088	0.00014079551	0.0687773256
## Q9	-0.2598650615	-0.01747862769	0.0464417138
## Q10	0.0201836298	0.07914116131	0.0984998680
## Q11	-0.0338538252	-0.08166434530	0.0856869803
## Q12	-0.0681864747	-0.00243285980	-0.0876513080
## Q13	0.3138705931	-0.13867566484	0.0281503687
## Q14	-0.0241610819	-0.05599987218	0.1791410709
## Q15	0.1266853173	0.02487849983	0.0787522494
## Q16	-0.0341354827	0.06547662695	-0.0105266348
## Q17	-0.0174298414	-0.22338034147	0.0855536244
## Q18	-0.0269993962	-0.12565253480	0.1752358754
## Q19	0.0235812342	0.27600543215	-0.0525176706
## prefer_JetBlue	0.0253446584	-0.16772282643	0.1088052403

## prefer_Allegiant Air	-0.2636287101	0.21599661459	-0.1438529728
## prefer_Delta Air Lines	-0.0700835252	0.10268927026	0.0939227945
## prefer_Southwest Airlines	-0.0154701641	-0.04659183088	-0.0942236150
## prefer_American Airlines	-0.1382975231	-0.11010536184	-0.2000321637
## prefer_Frontier Airlines	-0.0408538772	0.07114765285	0.3343349546
## prefer_Spirit Airlines	-0.1327816495	0.01194451694	0.0336361665
## prefer_Alaska Airlines	-0.1603906758	0.24375994516	0.1398825302
## prefer_United Airlines	0.1230201934	-0.11913671103	0.1237953160
## prefer_Hawaiian Airlines	0.0527277756	0.12355084480	-0.1013609993
## prefer_Avelo Airlines	0.1609354177	0.01303988980	0.0656551374
## prefer_Breeze Airways	-0.1542489655	0.03337261695	0.0096846224
## avoid_Delta Air Lines	0.1325796093	0.03458262185	-0.1601017638
## avoid_Spirit Airlines	0.0817558466	0.14674504346	-0.0255111996
## avoid_Frontier Airlines	0.1762845216	-0.02262381254	-0.1269104642
## avoid_American Airlines	-0.1424937511	0.10262714777	0.1079564880
## avoid_United Airlines	0.1066862026	0.08780423863	-0.1187375467
## avoid_Southwest Airlines	0.0558223668	-0.06992073377	0.1645710069
## avoid_Allegiant Air	0.0704700159	-0.23360636329	0.1420067060
## avoid_Sun Country Airlines	-0.0077169975	0.10474030655	-0.0491546913
## avoid_Alaska Airlines	0.0219909094	-0.02232108040	-0.1863519618
## avoid_JetBlue	-0.0095506427	0.28554554119	0.0171453111
## avoid_Eastern Airlines	0.1143220022	-0.14179662391	-0.1143049518
## avoid_Avelo Airlines	-0.0660392906	0.14732160399	-0.1355350061
## avoid_Breeze Airways	0.0821608654	-0.18910171463	-0.1066396502
## not_flown_Eastern Airlines	0.0042616449	0.04595064766	0.0117848046
## not_flown_Hawaiian Airlines	0.0234676423	-0.08288819402	0.0481395318
## not_flown_Southwest Airlines	-0.0025995674	0.09784571947	0.0277878035
## not_flown_Sun Country Airlines	-0.1256060527	0.13008926636	0.0602506094
## not_flown_United Airlines	-0.4442836356	-0.13547238964	0.0920663368
## not_flown_Breeze Airways	0.0619866178	0.09038306206	0.0945197651
## not_flown_American Airlines	0.2830342044	0.09604626950	0.1529588959
## not_flown_Avelo Airlines	-0.0862522856	0.01247824183	0.0334375521
## not_flown_Alaska Airlines	0.0035398606	-0.15568800133	-0.1235413446
## not_flown_Allegiant Air	0.0591462104	0.06981357477	-0.0091039287
## not_flown_Frontier Airlines	-0.0495313596	0.00426764500	-0.0502732022
## not_flown_JetBlue	0.0147246819	0.06317469112	-0.1887075768
## not_flown_Spirit Airlines	-0.0400067853	-0.23497188216	0.1339263915
## not_flown_Delta Air Lines	-0.0373265790	-0.10926870174	0.0741530742
##	PC25	PC26	PC27
## Q1	0.0855509707	0.04944100253	-0.1048520251
## Q2	-0.1578172585	-0.05369736233	-0.1006513680
## Q3	0.0851936663	-0.00524986747	0.0141635654
## Q4	0.0139022047	0.24496541325	0.1271496251
## Q5	-0.0342000067	0.03173890105	-0.1429900929
## Q6_15	0.1335948713	-0.06998559551	-0.1113067026
## Q6_16	-0.0070528723	-0.01406537844	0.0704805341
## Q6_17	-0.0258475086	0.04502915158	-0.0850600925
## Q6_18	0.1015945496	-0.02911748247	-0.1344100139
## Q6_19	-0.1812986984	0.01627642527	0.1529268293
## Q8	0.1045424514	-0.00758865021	0.1213424921
## Q9	0.1338200425	0.29469986370	0.0158016532
## Q10	-0.1690562721	0.13805915323	0.0596340539
## Q11	-0.0449018468	-0.35374603234	0.1697996021
## Q12	-0.0869078333	0.01530934279	0.3353783147

## Q13	-0.1591417203	0.27486239196	-0.0011659850
## Q14	0.0332272300	-0.01873178646	-0.0377246583
## Q15	-0.3440123123	-0.11952484695	-0.0771302608
## Q16	-0.1000658914	-0.05681409608	-0.0402610567
## Q17	-0.1779147355	-0.01053825671	0.2895269545
## Q18	0.1332561858	-0.13669064784	-0.0729256095
## Q19	0.4138566905	0.06262354756	0.2051093549
## prefer_JetBlue	0.1012487403	0.08684062093	-0.0236939887
## prefer_Allegiant Air	-0.0391999121	0.16839522126	-0.0480854567
## prefer_Delta Air Lines	-0.0997143059	0.05981659902	-0.0821558753
## prefer_Southwest Airlines	-0.1707179724	-0.02102049352	0.0903434853
## prefer_American Airlines	-0.0579542675	0.22097498936	0.1306943518
## prefer_Frontier Airlines	0.1226495123	0.02864270476	-0.2714303498
## prefer_Spirit Airlines	-0.1694131388	-0.06453185122	0.1199336071
## prefer_Alaska Airlines	-0.1028118523	0.05164684233	0.0582511326
## prefer_United Airlines	0.0630772234	-0.04307631472	0.2047690745
## prefer_Hawaiian Airlines	0.0631448862	0.01789151353	-0.0047872782
## prefer_Avelo Airlines	-0.0711425596	0.14607391430	0.1128835582
## prefer_Breeze Airways	0.0462628476	-0.25190191549	-0.2269233613
## avoid_Delta Air Lines	-0.1019522101	-0.15691305980	-0.1436271661
## avoid_Spirit Airlines	0.0478116202	-0.20519802651	0.0516909086
## avoid_Frontier Airlines	-0.0556840615	0.04923232039	-0.0128724125
## avoid_American Airlines	0.2576569116	-0.10540204017	0.0678603772
## avoid_United Airlines	0.1647833398	0.11041976793	-0.1041474611
## avoid_Southwest Airlines	0.0805951401	0.20246764737	-0.1010235456
## avoid_Allegiant Air	0.1205781666	-0.00081685278	0.1655852079
## avoid_Sun Country Airlines	-0.0730098409	-0.10750745524	-0.0249262805
## avoid_Alaska Airlines	0.0456162833	-0.21443781592	0.1308487019
## avoid_JetBlue	-0.0930670080	-0.16634597978	0.1790434259
## avoid_Eastern Airlines	0.1289391439	0.10356773301	-0.1827365058
## avoid_Avelo Airlines	-0.1066836088	0.18732973835	-0.1562935119
## avoid_Breeze Airways	0.0821957424	-0.17868087023	-0.1185680483
## not_flown_Eastern Airlines	-0.0595391205	-0.11477457764	-0.0257952201
## not_flown_Hawaiian Airlines	-0.0969135407	-0.04064845109	-0.0961882726
## not_flown_Southwest Airlines	0.1795288196	-0.05207696171	0.0441923336
## not_flown_Sun Country Airlines	0.1033370097	0.03829346721	0.1214288218
## not_flown_United Airlines	-0.2040556661	-0.02311374679	-0.0955248132
## not_flown_Breeze Airways	-0.0369270707	0.06403996268	0.0082136163
## not_flown_American Airlines	-0.0432537035	-0.06460145696	-0.0895327857
## not_flown_Avelo Airlines	0.1254542938	-0.12705672599	-0.0674474004
## not_flown_Alaska Airlines	0.0559888389	0.02583036316	0.0234613525
## not_flown_Allegiant Air	-0.0400908806	-0.08701548080	-0.1119336036
## not_flown_Frontier Airlines	0.0005312568	-0.00231451481	0.1073192782
## not_flown_JetBlue	-0.0822151723	0.21002745881	-0.1048863330
## not_flown_Spirit Airlines	-0.0453590063	-0.04285874007	-0.1507005759
## not_flown_Delta Air Lines	0.1414594695	0.00163979415	0.1963613839
##	PC28	PC29	PC30
## Q1	-0.0929074938	-0.09362792689	0.3540859031
## Q2	-0.0976474464	0.12873412449	-0.4151424748
## Q3	0.0999755766	-0.08222084519	-0.1001031301
## Q4	0.0263854942	0.11417859126	-0.0319958602
## Q5	-0.0621122108	0.02827484631	-0.0060780548
## Q6_15	-0.0620871403	-0.10967961978	-0.0648112011
## Q6_16	0.1195970951	0.07073125957	0.0807894305

## Q6_17	0.1439827193	0.00924087486	-0.0689975689
## Q6_18	-0.0751425830	0.06275911025	-0.1251475928
## Q6_19	-0.1255699154	0.03492013195	-0.0552377089
## Q8	-0.2285237332	0.14262055236	0.1015064952
## Q9	-0.1565856395	-0.24706398539	-0.0851750109
## Q10	-0.0296867446	-0.01341384081	0.2618899932
## Q11	-0.1271175723	0.13216279081	0.1149270076
## Q12	-0.0659762224	-0.04941514670	0.2018689141
## Q13	0.0967892251	0.03915543120	-0.1654948598
## Q14	0.2358354320	0.15045326968	0.2934802254
## Q15	0.0389956964	-0.33229339081	-0.0121919058
## Q16	0.0336414693	0.09608808700	0.0691381838
## Q17	-0.1099489185	0.04465257064	-0.0444930670
## Q18	0.3086160239	-0.04866761127	0.1237387749
## Q19	-0.2547242497	0.03738750808	-0.0160017912
## prefer_JetBlue	0.0226054712	0.08395320950	-0.1279318469
## prefer_Allegiant Air	0.0748691064	-0.07718548532	0.2548526903
## prefer_Delta Air Lines	0.0646735353	0.06910077470	-0.1350242403
## prefer_Southwest Airlines	-0.2562231508	-0.05149718606	0.0741789489
## prefer_American Airlines	-0.0271467214	-0.11783429207	0.0213414024
## prefer_Frontier Airlines	-0.1591646433	-0.14816852576	0.1806385848
## prefer_Spirit Airlines	0.0113630267	0.19929321994	-0.0102664581
## prefer_Alaska Airlines	0.0314887404	-0.02774383187	-0.0327630849
## prefer_United Airlines	-0.0123358788	-0.21164348926	-0.0120862357
## prefer_Hawaiian Airlines	0.0022667368	0.01188633511	-0.0178543259
## prefer_Avelo Airlines	0.0990038204	0.17225656658	-0.0018180162
## prefer_Breeze Airways	-0.3040076577	-0.00597326862	-0.0469849833
## avoid_Delta Air Lines	0.1040622795	-0.06538662779	0.1340149405
## avoid_Spirit Airlines	-0.0722144980	0.08136193221	0.1254054896
## avoid_Frontier Airlines	-0.1924786173	-0.02101064179	-0.1909349340
## avoid_American Airlines	0.0485171341	0.11424675583	-0.1650074160
## avoid_United Airlines	0.0155058234	0.00957020876	0.0013108894
## avoid_Southwest Airlines	0.1508114448	-0.00794945913	-0.0019192705
## avoid_Allegiant Air	-0.0360899564	-0.30865601337	0.0417696130
## avoid_Sun Country Airlines	0.1563786692	-0.24883351133	0.0144440347
## avoid_Alaska Airlines	0.1658337419	-0.11185906648	-0.2016400045
## avoid_JetBlue	-0.0128321451	-0.15852465198	-0.0269962640
## avoid_Eastern Airlines	-0.0759620217	0.04148526813	0.0421092740
## avoid_Avelo Airlines	-0.1112247818	0.10819874966	0.1572185169
## avoid_Breeze Airways	0.0216280737	0.18111379648	0.0736354243
## not_flown_Eastern Airlines	0.0734043658	0.02204362814	0.0293019988
## not_flown_Hawaiian Airlines	-0.0261540400	-0.03194339280	0.0251361884
## not_flown_Southwest Airlines	0.1499945103	-0.05683927922	-0.0192257587
## not_flown_Sun Country Airlines	0.2081679472	-0.22764094047	-0.0795842602
## not_flown_United Airlines	-0.1205773187	0.00478363453	0.0670350251
## not_flown_Breeze Airways	0.0200553350	0.05292173095	-0.0262654682
## not_flown_American Airlines	-0.1611949975	-0.32821283418	-0.0361109881
## not_flown_Avelo Airlines	-0.0054434163	-0.08642885526	-0.1054815252
## not_flown_Alaska Airlines	0.0160625145	-0.06553290562	0.1560804227
## not_flown_Allegiant Air	0.0419425720	0.20223968262	0.0324439656
## not_flown_Frontier Airlines	0.2367181401	0.08199444193	-0.0233398457
## not_flown_JetBlue	-0.0739751624	-0.00351967021	-0.0772343935
## not_flown_Spirit Airlines	-0.1043554217	-0.00077207678	-0.0234608351
## not_flown_Delta Air Lines	-0.1604167156	0.13125155638	0.0894236634

##	PC31	PC32	PC33
## Q1	-0.34470833867	-0.090549974	-0.0799744410
## Q2	0.04186594716	-0.016048903	0.0407926996
## Q3	0.26084032467	-0.045614713	-0.0175071733
## Q4	0.02624521075	-0.113763149	-0.2386531358
## Q5	-0.03198811365	0.194394342	0.0511493551
## Q6_15	-0.08219479206	0.019319722	0.1381920564
## Q6_16	0.02420972856	0.140386720	0.0070686748
## Q6_17	0.18004755992	0.096808107	0.0001114574
## Q6_18	-0.08232869400	-0.105659477	0.0530397238
## Q6_19	0.04397794298	0.237482378	-0.0503457671
## Q8	0.01018529642	-0.327005458	0.0273433401
## Q9	-0.24273606303	0.060362796	0.0518868328
## Q10	-0.00420342421	0.189556162	-0.1866907583
## Q11	-0.07312380727	-0.066500184	0.3138617819
## Q12	0.28537611823	0.084181945	-0.0774337167
## Q13	-0.21893574813	-0.015693649	-0.0105626573
## Q14	0.11452978328	0.105245107	0.0227588999
## Q15	0.17777741828	-0.164590025	0.0211554543
## Q16	-0.14656008800	-0.336576474	0.0832823624
## Q17	0.01027266047	0.107431615	-0.1156462355
## Q18	0.18501465857	0.038784845	-0.2053156921
## Q19	0.21950976947	0.032714123	-0.1372417581
## prefer_JetBlue	-0.00289807674	-0.043285967	-0.0238539200
## prefer_Allegiant Air	0.11041145771	0.067777158	0.2679860955
## prefer_Delta Air Lines	0.01859679473	0.031567077	0.0915640946
## prefer_Southwest Airlines	-0.03512645192	-0.061698672	-0.0542167959
## prefer_American Airlines	-0.01146234451	-0.039556355	-0.0987118160
## prefer_Frontier Airlines	0.07186454537	0.054933922	0.0262358380
## prefer_Spirit Airlines	-0.18697471086	0.131450741	0.0415952597
## prefer_Alaska Airlines	0.04349106261	-0.097805107	-0.1212960020
## prefer_United Airlines	0.18848413120	-0.183835937	0.1126200220
## prefer_Hawaiian Airlines	0.16538915185	-0.005641392	0.2408830188
## prefer_Avelo Airlines	0.06464998480	-0.055959094	0.0500904820
## prefer_Breeze Airways	0.01924829671	0.087716737	-0.3090510035
## avoid_Delta Air Lines	0.02840170639	-0.165820128	-0.1890081946
## avoid_Spirit Airlines	0.02290979387	-0.016396894	-0.1842712556
## avoid_Frontier Airlines	0.14589979918	0.010124362	-0.0525275427
## avoid_American Airlines	0.03725137197	-0.062337830	0.0519808735
## avoid_United Airlines	-0.09531345409	0.134465050	0.0754810039
## avoid_Southwest Airlines	-0.00016682456	0.212087915	0.1109412564
## avoid_Allegiant Air	0.00497871118	0.088910739	0.1175557886
## avoid_Sun Country Airlines	-0.23420572660	-0.133183903	-0.1388004776
## avoid_Alaska Airlines	-0.21996044099	0.077570486	-0.1756472849
## avoid_JetBlue	-0.04648412788	0.034028480	0.2046919988
## avoid_Eastern Airlines	0.09060071852	-0.222855651	-0.1628350635
## avoid_Avelo Airlines	0.06727245433	-0.143694804	-0.0476561807
## avoid_Breeze Airways	0.03132384796	0.254290749	-0.0601601074
## not_flown_Eastern Airlines	0.06540491022	0.118531368	-0.0118148991
## not_flown_Hawaiian Airlines	0.08397195227	0.040676586	-0.0788213743
## not_flown_Southwest Airlines	0.00303008976	-0.209569455	0.1014147262
## not_flown_Sun Country Airlines	-0.05166286276	-0.069016679	-0.2788438343
## not_flown_United Airlines	-0.02159450177	-0.053757674	-0.0093432052
## not_flown_Breeze Airways	0.05771254388	-0.041405808	0.0343398638

## not_flown_American Airlines	0.00740983363	0.238144062	0.0259254133
## not_flown_Avelo Airlines	-0.00593427367	0.142094169	-0.0177518100
## not_flown_Alaska Airlines	-0.09675051953	0.023155633	0.2248197913
## not_flown_Allegiant Air	-0.07725664443	0.067536578	-0.0560288524
## not_flown_Frontier Airlines	-0.01834606892	-0.030005475	-0.0230552075
## not_flown_JetBlue	0.13615048208	0.010573124	-0.0319820708
## not_flown_Spirit Airlines	0.23244656897	-0.092416380	0.1305065013
## not_flown_Delta Air Lines	-0.19237399258	0.085906833	-0.0526832404
##	PC34	PC35	PC36
## Q1	-0.0432262359	0.0977105703	0.01671778444
## Q2	-0.0380583917	-0.0866185202	0.10050127294
## Q3	-0.3291201903	0.1593690426	0.04130317156
## Q4	-0.0790703072	0.0875491444	-0.02758326609
## Q5	0.1615305306	-0.0740859024	0.00316432474
## Q6_15	-0.1869231680	0.0391286849	0.07183950247
## Q6_16	-0.0726387526	-0.1233237862	0.02604050760
## Q6_17	0.1483677063	0.0021150441	0.25151291215
## Q6_18	0.0672221363	0.0418411927	0.10081576550
## Q6_19	0.2105981867	-0.0142225529	-0.27429365691
## Q8	-0.2407540512	0.0230224221	0.11781704838
## Q9	0.1304600171	0.0120285507	-0.01749043848
## Q10	0.1055804389	0.1616981133	0.06601610259
## Q11	0.1946872167	-0.0121510979	0.18019770969
## Q12	0.0611624765	-0.2434379287	-0.00070247399
## Q13	-0.1896517875	-0.2044311972	0.09067196566
## Q14	-0.0247035907	-0.0945454798	0.12383073034
## Q15	-0.0960038567	-0.1129190576	0.25565027929
## Q16	0.0294602830	-0.1598372305	-0.27281536126
## Q17	-0.1540891006	-0.1483846438	-0.14391418387
## Q18	-0.1320802341	0.1909530930	-0.10472046424
## Q19	-0.0409804785	0.1544782032	-0.06486856885
## prefer_JetBlue	0.1078494734	0.0343899984	0.19305001107
## prefer_Allegiant Air	-0.0412164720	-0.1171138976	0.15890045165
## prefer_Delta Air Lines	0.0637348439	0.0288844573	-0.20751828128
## prefer_Southwest Airlines	-0.0598352061	0.2254504512	0.08705813533
## prefer_American Airlines	0.0762551629	-0.1574415600	-0.00566170495
## prefer_Frontier Airlines	-0.0028738057	-0.0751362196	-0.28673441181
## prefer_Spirit Airlines	-0.1371071123	0.0510257763	-0.05008319530
## prefer_Alaska Airlines	-0.1045203709	-0.0847792614	0.04620110310
## prefer_United Airlines	0.0616978605	0.0040321150	0.03900919509
## prefer_Hawaiian Airlines	0.1236434077	0.0188084314	0.09921141967
## prefer_Avelo Airlines	0.1857757197	0.1303278558	-0.01317330084
## prefer_Breeze Airways	-0.1073698393	-0.2978151159	0.16476840197
## avoid_Delta Air Lines	0.0349532601	-0.0265672794	-0.22007546568
## avoid_Spirit Airlines	0.1929614015	-0.0162283016	0.20456669811
## avoid_Frontier Airlines	0.0592849791	0.0536571325	-0.04739857291
## avoid_American Airlines	-0.0085061177	0.0167709036	-0.07219081692
## avoid_United Airlines	-0.0808787876	-0.1377326404	0.06186617670
## avoid_Southwest Airlines	0.0834580263	-0.0068308110	0.14713327029
## avoid_Allegiant Air	0.1268140841	-0.2021436535	-0.03254330409
## avoid_Sun Country Airlines	0.0717059889	-0.0542593063	-0.00165659570
## avoid_Alaska Airlines	0.2762862043	0.2015668684	0.01985057274
## avoid_JetBlue	-0.1131988494	0.0504005547	0.01439590228
## avoid_Eastern Airlines	0.3562364772	-0.1424600515	0.10617928711

## avoid_Avelo Airlines	-0.0356589220	0.1682422025	0.11834236251
## avoid_Breeze Airways	0.0075412868	-0.1095393510	-0.12042842189
## not_flown_Eastern Airlines	-0.0747303422	0.0068219664	-0.07123929528
## not_flown_Hawaiian Airlines	0.0095112595	-0.1122429025	0.01398565621
## not_flown_Southwest Airlines	0.0529807420	-0.3053375559	-0.19776021482
## not_flown_Sun Country Airlines	0.0090601979	-0.0175557014	0.13296300044
## not_flown_United Airlines	0.1566376947	0.1234021598	0.03459084105
## not_flown_Breeze Airways	0.0755181408	-0.0065836357	0.01198511991
## not_flown_American Airlines	-0.0600717455	0.2308704053	0.05768296917
## not_flown_Avelo Airlines	-0.0855810542	-0.1377081152	0.08468402203
## not_flown_Alaska Airlines	-0.1386414644	0.1123662718	-0.04581432977
## not_flown_Allegiant Air	-0.0935782327	0.0218345935	0.09253470458
## not_flown_Frontier Airlines	0.0430323945	0.0154788105	0.20527659402
## not_flown_JetBlue	-0.0976218092	-0.1547017252	-0.06130344142
## not_flown_Spirit Airlines	0.1457510348	0.0874935030	-0.07617901266
## not_flown_Delta Air Lines	-0.0383119637	-0.2142187397	0.20674602378
##	PC37	PC38	PC39
## Q1	0.2596617310	-0.1230024679	-0.05023995760
## Q2	0.1900490417	-0.1907378700	-0.33228029183
## Q3	-0.0463814718	-0.1157967179	-0.14415977695
## Q4	-0.1201566616	-0.0973159051	0.31938763100
## Q5	0.0147918456	0.0270182880	0.43608839191
## Q6_15	-0.0359780747	-0.1504077007	0.21608386905
## Q6_16	0.1001654911	0.0470183208	-0.03481997935
## Q6_17	0.0208577731	0.1294575640	0.07814949091
## Q6_18	-0.0272886770	0.1710446114	-0.07912397686
## Q6_19	0.0096391678	-0.1445541104	-0.07551627275
## Q8	0.1234914061	-0.1147150787	-0.04387076885
## Q9	-0.0223695964	0.0018800399	0.19219828702
## Q10	0.0875147268	-0.0398903959	-0.05981458297
## Q11	0.1190136939	0.1358556604	0.07421350597
## Q12	-0.1567590764	-0.0143528428	0.01359478895
## Q13	-0.0310586494	0.2078302538	-0.02203503604
## Q14	-0.1219994202	0.1908955419	-0.16571750950
## Q15	-0.0196666265	-0.2526698960	0.16794579718
## Q16	0.1239851178	-0.0245937395	0.01977149721
## Q17	0.0781492344	0.1738250789	0.18712221151
## Q18	0.2611439819	0.1230874866	0.10296677403
## Q19	0.2515768322	-0.0293700510	0.00472105411
## prefer_JetBlue	0.0037609083	-0.0884035937	0.08294794804
## prefer_Allegiant Air	0.2253760699	-0.0778569438	0.08569764038
## prefer_Delta Air Lines	0.1781918057	-0.0584880976	-0.12572030524
## prefer_Southwest Airlines	-0.0048512876	0.0421600068	-0.06929099001
## prefer_American Airlines	-0.0057633450	-0.1968800667	0.00580379826
## prefer_Frontier Airlines	-0.2684503256	-0.0256560803	-0.16168923074
## prefer_Spirit Airlines	0.2528726194	0.1973115271	0.14444025614
## prefer_Alaska Airlines	0.0948504451	-0.0927194198	0.10651785761
## prefer_United Airlines	0.0876039692	0.1724962428	0.11686427185
## prefer_Hawaiian Airlines	0.1418295682	0.1032840265	-0.09282663682
## prefer_Avelo Airlines	0.0712733677	-0.1146902436	-0.05467067112
## prefer_Breeze Airways	0.1114951071	0.2109092286	0.08365596509
## avoid_Delta Air Lines	-0.0320987125	0.0879290520	0.00264184027
## avoid_Spirit Airlines	-0.1391963481	-0.1065295225	-0.01331651104
## avoid_Frontier Airlines	0.0178938221	0.2254207624	-0.06192152296

## avoid_American Airlines	-0.1807832377	0.0048124389	0.18000045523
## avoid_United Airlines	-0.0936885613	-0.0475873295	-0.00054442757
## avoid_Southwest Airlines	0.0473543348	0.0265217629	-0.00380129864
## avoid_Allegiant Air	0.0726471479	0.0963863688	-0.19709374454
## avoid_Sun Country Airlines	0.0121928972	0.0166496204	-0.01750408321
## avoid_Alaska Airlines	-0.0573979740	0.0791583338	-0.03096614021
## avoid_JetBlue	-0.1855124801	-0.1129437108	-0.11540924337
## avoid_Eastern Airlines	0.1558075530	-0.1071299828	-0.00388021007
## avoid_Avelo Airlines	-0.1488810300	0.3427201654	-0.06029201379
## avoid_Breeze Airways	0.1636833428	-0.3229883915	-0.02761173258
## not_flown_Eastern Airlines	-0.0544422851	0.0287624142	0.03276449056
## not_flown_Hawaiian Airlines	-0.0050542015	-0.0338257461	0.04083775480
## not_flown_Southwest Airlines	0.1269184496	0.1237011466	0.00320432536
## not_flown_Sun Country Airlines	0.0315645509	0.0939867543	-0.23030407817
## not_flown_United Airlines	0.0932011080	0.0130027487	-0.04120629448
## not_flown_Breeze Airways	-0.0267815692	0.0272031724	-0.04164241456
## not_flown_American Airlines	0.1737468446	0.0404354622	-0.03783343005
## not_flown_Avelo Airlines	0.0537971172	-0.0128844179	0.08503970246
## not_flown_Alaska Airlines	-0.0148405215	0.0390589314	-0.01066706289
## not_flown_Allegiant Air	-0.1517117035	-0.0774747479	-0.03802780587
## not_flown_Frontier Airlines	0.1031056936	-0.1300695273	0.03207943643
## not_flown_JetBlue	0.1537981155	0.1295935872	-0.12738387907
## not_flown_Spirit Airlines	-0.1796886396	0.0117766229	0.13020142570
## not_flown_Delta Air Lines	-0.1720099588	-0.0199611359	-0.18546723077
##	PC40	PC41	PC42
## Q1	-0.0569783675	-0.0645809301	-0.0613654761
## Q2	-0.1249498085	-0.0303553779	-0.0190388590
## Q3	0.0264755313	-0.0390931543	0.1081333195
## Q4	0.1063588624	-0.0767061377	0.0552550265
## Q5	-0.2156887757	0.0688479506	0.1141078658
## Q6_15	-0.4093738733	-0.1626702825	-0.0098347082
## Q6_16	0.0140742222	0.2234217553	0.2804288689
## Q6_17	0.0825185750	0.2139154155	-0.6173916217
## Q6_18	-0.0472242072	-0.0362088515	0.1389294068
## Q6_19	0.2964453763	-0.2045606844	0.2350733389
## Q8	0.0217342543	-0.0397748768	-0.0543831126
## Q9	0.1691395882	-0.2472046549	-0.1568344209
## Q10	-0.2159668821	0.2093499617	-0.0055535836
## Q11	0.0184046917	0.0948222314	0.0607971400
## Q12	-0.1654131550	-0.1434049616	-0.0680538896
## Q13	0.0227927336	0.2293701935	0.0140916571
## Q14	-0.1168756548	-0.4890175068	-0.1470767514
## Q15	0.1737720823	-0.0620798782	0.0050998869
## Q16	0.1565111885	0.0069851464	-0.0807607339
## Q17	-0.0903647888	0.0249425312	0.0344341552
## Q18	0.2275860208	0.0520628776	0.0769092180
## Q19	-0.0791052824	0.1298491066	-0.1144928281
## prefer_JetBlue	0.0348200211	0.0523528432	0.1516317509
## prefer_Allegiant Air	0.0473324790	0.0780665073	0.0722662193
## prefer_Delta Air Lines	0.0193963910	0.1131683348	-0.0779159430
## prefer_Southwest Airlines	-0.0527409558	0.0446080195	-0.1023247308
## prefer_American Airlines	0.0713332991	0.0704132223	-0.1675911063
## prefer_Frontier Airlines	0.0174772889	0.1488539892	0.0338322667
## prefer_Spirit Airlines	-0.0430738877	-0.0936246348	-0.0788654077

## prefer_Alaska Airlines	0.0153997121	-0.1614402402	0.1070741551
## prefer_United Airlines	0.0332700845	0.0068289093	-0.0637784085
## prefer_Hawaiian Airlines	0.1757202558	-0.0873764016	0.0437727687
## prefer_Avelo Airlines	-0.2569291722	-0.1737982839	0.0644290928
## prefer_Breeze Airways	0.1150631628	-0.0625146286	0.0674514061
## avoid_Delta Air Lines	0.0091612743	0.1499092555	-0.1193687796
## avoid_Spirit Airlines	0.0401680639	0.0660247989	0.1981247069
## avoid_Frontier Airlines	-0.1361388052	-0.1150800763	-0.0639529349
## avoid_American Airlines	-0.0346343854	0.1364684879	0.0683050726
## avoid_United Airlines	0.0432434669	0.0365432546	0.0054881990
## avoid_Southwest Airlines	0.0068255530	0.0197089424	0.1086556534
## avoid_Allegiant Air	-0.0589618439	0.0838245638	0.1893719755
## avoid_Sun Country Airlines	-0.2079722060	-0.0282260795	0.0517500074
## avoid_Alaska Airlines	0.1316409862	-0.1286283663	-0.0625157335
## avoid_JetBlue	0.0193927895	0.0897099051	-0.1148594221
## avoid_Eastern Airlines	0.0270877617	-0.0714643040	0.0550706161
## avoid_Avelo Airlines	0.1331268837	-0.0659866123	0.1151250311
## avoid_Breeze Airways	-0.0010937558	-0.0233401183	-0.2135551363
## not_flown_Eastern Airlines	-0.0014980659	-0.0088351599	-0.0108907842
## not_flown_Hawaiian Airlines	-0.0995988377	0.0072013458	0.0257729652
## not_flown_Southwest Airlines	-0.1075892598	-0.1865219319	-0.0582720169
## not_flown_Sun Country Airlines	-0.2494865671	0.0750883034	0.0607125588
## not_flown_United Airlines	-0.1405005502	0.1028590663	0.0255963099
## not_flown_Breeze Airways	0.0699993842	-0.0964058279	-0.0259767112
## not_flown_American Airlines	0.1177536716	-0.1855734939	0.0186256416
## not_flown_Avelo Airlines	-0.0037107121	-0.0274397869	-0.0213568065
## not_flown_Alaska Airlines	0.0512668541	-0.0100395366	0.0877179435
## not_flown_Allegiant Air	-0.0313041643	-0.1520532354	-0.0180858813
## not_flown_Frontier Airlines	0.0706684400	0.0270101532	0.1310064118
## not_flown_JetBlue	-0.0344647706	-0.0397166556	0.0481724926
## not_flown_Spirit Airlines	-0.1335432134	0.0854383968	0.0212888116
## not_flown_Delta Air Lines	0.1947574494	0.0828995533	-0.1148699022
##	PC43	PC44	PC45
## Q1	0.1279853618	0.134833832	0.0796140871
## Q2	0.1643712719	0.115870476	0.3053302060
## Q3	0.0963282147	-0.063179414	-0.1488976624
## Q4	0.1640714181	0.018234896	-0.0110448671
## Q5	0.2321816002	-0.218252172	0.0045321577
## Q6_15	-0.1287539542	0.049736113	0.0559362890
## Q6_16	-0.2847411181	0.008116955	0.1778163530
## Q6_17	0.0653644523	-0.049067765	0.0559401151
## Q6_18	0.1175354465	0.176999666	-0.2818932787
## Q6_19	0.0938500235	-0.248361295	-0.0146025395
## Q8	-0.0248816974	-0.205252810	0.0083328700
## Q9	-0.2249088809	0.133232338	-0.0238349314
## Q10	0.2881000770	0.184267328	-0.1964607054
## Q11	-0.0612855059	-0.203920391	-0.1985674754
## Q12	0.0182291912	0.164706639	0.3022860063
## Q13	-0.0144927181	0.052460403	-0.2275429993
## Q14	0.0149867842	-0.121825155	-0.1249897438
## Q15	0.1641844681	0.111818274	-0.0719327097
## Q16	0.0461706267	0.132531584	-0.1409689751
## Q17	0.2517203468	0.022537189	-0.1301645695
## Q18	-0.0340029067	0.041493913	0.0333178642

## Q19	0.0246475372	0.097871481	-0.0848608985
## prefer_JetBlue	0.0672529783	-0.045416912	0.0153834962
## prefer_Allegiant Air	-0.0088712138	-0.021937462	-0.1879025036
## prefer_Delta Air Lines	0.0363777426	-0.158308963	-0.0143139311
## prefer_Southwest Airlines	-0.1155409511	-0.323736428	0.0290230616
## prefer_American Airlines	-0.0298291049	-0.135942980	0.0081208684
## prefer_Frontier Airlines	0.0556531105	-0.026568355	-0.0190886575
## prefer_Spirit Airlines	-0.0734383195	0.248738499	0.2593086986
## prefer_Alaska Airlines	-0.1265051646	-0.081565490	-0.1843557499
## prefer_United Airlines	0.0073469583	-0.089400192	0.0658155414
## prefer_Hawaiian Airlines	0.2251772078	0.161042897	0.0621558754
## prefer_Avelo Airlines	-0.0756310528	0.045798410	-0.2406247796
## prefer_Breeze Airways	0.0605851532	-0.037447585	-0.0247420542
## avoid_Delta Air Lines	-0.1729829997	0.016205264	0.0377663295
## avoid_Spirit Airlines	-0.0714635224	0.173164761	0.0201424801
## avoid_Frontier Airlines	-0.0268229568	0.042217826	-0.0543401687
## avoid_American Airlines	0.1240728177	-0.122150961	0.0726462987
## avoid_United Airlines	0.0989893186	-0.053936179	-0.0185819204
## avoid_Southwest Airlines	-0.0266048182	-0.183883498	0.1518991058
## avoid_Allegiant Air	-0.0776948524	0.190487943	-0.0625489932
## avoid_Sun Country Airlines	0.1704537977	-0.193499597	0.2368611461
## avoid_Alaska Airlines	0.0809627047	0.106237977	-0.1220388685
## avoid_JetBlue	0.1388569419	0.140568102	-0.1093210622
## avoid_Eastern Airlines	0.0867268615	0.056028097	0.0823118354
## avoid_Avelo Airlines	0.1446855409	0.024792448	0.1053692722
## avoid_Breeze Airways	0.0796436200	-0.042987194	-0.1525207220
## not_flown_Eastern Airlines	0.0820282871	-0.013541623	-0.0298361780
## not_flown_Hawaiian Airlines	-0.2658266861	0.076837903	-0.0727826123
## not_flown_Southwest Airlines	0.1820817702	-0.144166313	-0.0050061398
## not_flown_Sun Country Airlines	0.0610364250	-0.186660640	-0.1030286470
## not_flown_United Airlines	-0.0217681695	-0.130230708	-0.0222270214
## not_flown_Breeze Airways	-0.1059865521	0.022032524	-0.0471155760
## not_flown_American Airlines	-0.0445746946	-0.149063214	0.0126957633
## not_flown_Avelo Airlines	0.0030670077	0.114954530	-0.1534460408
## not_flown_Alaska Airlines	0.3301605477	0.050610401	0.1976007325
## not_flown_Allegiant Air	-0.0006940413	0.021453826	-0.0542081946
## not_flown_Frontier Airlines	-0.0733662354	0.047938650	0.1391284539
## not_flown_JetBlue	-0.0383909352	0.001331151	-0.0070668586
## not_flown_Spirit Airlines	-0.0433938848	0.134365244	0.0163569771
## not_flown_Delta Air Lines	0.0331252404	-0.083029992	0.0385105258
##	PC46	PC47	PC48
## Q1	0.1794008744	-0.1852875719	-0.0896766879
## Q2	0.0942385812	0.1042308357	0.0559694954
## Q3	0.1833751686	-0.1720311946	0.0087894363
## Q4	-0.0102416456	-0.0134176138	0.0367911301
## Q5	0.2153792584	-0.0367252197	0.1091542464
## Q6_15	-0.0863868081	0.0083089872	0.1362593910
## Q6_16	0.2258324369	-0.1192793439	-0.2123192680
## Q6_17	0.0347667373	0.1229562656	-0.0290865371
## Q6_18	-0.0855953664	0.2121704893	0.0862690863
## Q6_19	-0.1058905847	-0.1280582041	0.0583161293
## Q8	0.0705488682	0.1113824631	0.0174071218
## Q9	0.1901287561	0.0876858745	0.1073419999
## Q10	-0.0552146080	-0.2304424511	-0.0821801984

## Q11	-0.2045182847	0.1341590874	-0.0093427001
## Q12	-0.1231035699	0.1663451856	0.0507862546
## Q13	0.0130504472	0.0504126859	-0.0761677483
## Q14	0.1052072736	-0.0871225326	-0.1465812905
## Q15	0.0031651960	-0.1265355259	0.0219011143
## Q16	-0.1353264576	0.0250147633	-0.1673667029
## Q17	0.2176469852	0.2191710279	0.1253336142
## Q18	-0.0837705040	0.1650560966	0.0741823194
## Q19	-0.0756833731	0.0095561960	0.0518231626
## prefer_JetBlue	-0.0172171177	-0.0317570226	-0.0042578660
## prefer_Allegiant Air	-0.0110872208	-0.0670161770	0.1663321608
## prefer_Delta Air Lines	-0.0063497330	-0.2347884062	0.2565086675
## prefer_Southwest Airlines	0.1315572376	0.0169928988	0.0542241490
## prefer_American Airlines	-0.0171793593	0.1436537312	-0.2940499924
## prefer_Frontier Airlines	0.0776079979	0.1169932935	-0.0755743393
## prefer_Spirit Airlines	-0.1010691619	-0.1806926190	-0.0871388285
## prefer_Alaska Airlines	-0.1908555203	-0.0143256429	-0.0567036338
## prefer_United Airlines	-0.0429574748	-0.1907576149	-0.0475176954
## prefer_Hawaiian Airlines	0.1705592988	-0.0574253598	-0.0139547436
## prefer_Avelo Airlines	0.1345469550	0.1414218886	0.0589955910
## prefer_Breeze Airways	0.0955853098	-0.0379606585	0.0089233674
## avoid_Delta Air Lines	0.1606639127	-0.0481199914	0.3788526903
## avoid_Spirit Airlines	0.1023719775	0.0811772483	-0.0897177360
## avoid_Frontier Airlines	-0.0086059101	-0.2753032630	-0.1267840870
## avoid_American Airlines	0.1665737926	-0.0458697639	-0.2442738117
## avoid_United Airlines	-0.0483397006	-0.0552380761	-0.2420218941
## avoid_Southwest Airlines	-0.1226969032	0.0667776594	0.1479373657
## avoid_Allegiant Air	0.1143304869	0.0550553430	0.1345532912
## avoid_Sun Country Airlines	-0.1612774187	0.0810330889	0.0577278449
## avoid_Alaska Airlines	0.0132589008	-0.0228762983	-0.0800213756
## avoid_JetBlue	0.1574355112	0.0555834321	-0.0052518751
## avoid_Eastern Airlines	-0.0258551068	0.0339657005	0.0168285133
## avoid_Avelo Airlines	0.0060024287	0.0862214469	0.0851221154
## avoid_Breeze Airways	-0.0495568461	0.1596992562	-0.0194571518
## not_flown_Eastern Airlines	0.0642259684	0.1577056125	-0.0305061349
## not_flown_Hawaiian Airlines	-0.0038181910	-0.0077004865	-0.0877823658
## not_flown_Southwest Airlines	0.1993974922	-0.1480095442	-0.0619384445
## not_flown_Sun Country Airlines	-0.1621280517	-0.0082503380	0.0476828524
## not_flown_United Airlines	0.1923522607	0.0523400944	-0.1687801687
## not_flown_Breeze Airways	0.1897065610	0.0455648622	0.2298180430
## not_flown_American Airlines	0.0016846939	0.1179617441	-0.2062329460
## not_flown_Avelo Airlines	-0.1038835456	-0.0914909391	0.0841318691
## not_flown_Alaska Airlines	-0.1857041419	0.1819515448	0.0375498390
## not_flown_Allegiant Air	-0.0265850630	-0.0348556939	0.1266099062
## not_flown_Frontier Airlines	0.1919099857	0.0383129260	-0.0354199874
## not_flown_JetBlue	-0.1829214883	0.1507228077	-0.1300041154
## not_flown_Spirit Airlines	-0.2404575422	-0.2338026219	-0.0710795492
## not_flown_Delta Air Lines	-0.1220220739	-0.3063215077	0.2528592035
##	PC49	PC50	PC51
## Q1	-0.1079167759	-0.1453771850	-0.0840175514
## Q2	0.0170425671	0.0328624492	0.0325357246
## Q3	-0.0043844118	-0.0975481930	-0.0233051160
## Q4	0.0021451040	0.0549392526	0.1297263244
## Q5	-0.2255227802	-0.1393170945	0.0723778377

## Q6_15	0.1759295207	0.3593651073	-0.3513221018
## Q6_16	0.3042139325	-0.0479791771	0.3699207991
## Q6_17	-0.0064440861	-0.1043021207	-0.0038358900
## Q6_18	-0.4123105202	-0.1369079612	0.1592011051
## Q6_19	-0.0030710765	-0.0189257606	-0.1850022727
## Q8	-0.0377549396	-0.1823014825	-0.0100906387
## Q9	0.2143029337	-0.0352069439	0.1208934515
## Q10	-0.0093462474	0.1714420593	-0.1299722793
## Q11	0.1602520955	0.0349429106	-0.0847677709
## Q12	-0.1151173244	0.0159781648	0.0591547823
## Q13	0.1628249533	0.0482820400	-0.0975021116
## Q14	0.0029185525	-0.0099682027	-0.0391310888
## Q15	0.0897723266	0.0296161239	0.0510889473
## Q16	0.0047618581	0.0474841909	-0.0503236465
## Q17	0.1592721708	0.0188489604	0.0147652956
## Q18	0.0464334722	0.1040022821	-0.0419737291
## Q19	0.0713663314	0.0385941516	0.1000498666
## prefer_JetBlue	-0.0121357479	-0.0481357357	0.0339498465
## prefer_Allegiant Air	0.1220148583	-0.1787595938	-0.0268365759
## prefer_Delta Air Lines	0.0263944825	0.0965091074	-0.0107774705
## prefer_Southwest Airlines	0.0808000673	0.1592582909	0.1609179652
## prefer_American Airlines	-0.0269216112	-0.1249211835	-0.1945891131
## prefer_Frontier Airlines	0.1278727731	0.0391658925	-0.0041036637
## prefer_Spirit Airlines	-0.0601675852	-0.1988264024	-0.0807314990
## prefer_Alaska Airlines	-0.1705407589	0.0012334484	0.1254081382
## prefer_United Airlines	-0.1861613629	0.2740581458	0.1520677281
## prefer_Hawaiian Airlines	0.0716194775	0.1329452065	-0.0550837568
## prefer_Avelo Airlines	0.1407064478	-0.0173268554	0.0106033508
## prefer_Breeze Airways	0.0380455517	0.0035178465	-0.0370475939
## avoid_Delta Air Lines	-0.1783145194	-0.0038387041	-0.0829881305
## avoid_Spirit Airlines	0.0163003205	-0.0564491296	-0.0877475837
## avoid_Frontier Airlines	0.0473440240	-0.1612654395	0.0051377275
## avoid_American Airlines	0.0219485485	-0.0830217297	-0.3433910804
## avoid_United Airlines	-0.1963520526	0.2169124112	0.2114881074
## avoid_Southwest Airlines	-0.0824189174	0.0776878582	-0.0327446913
## avoid_Allegiant Air	-0.1502643377	-0.0597485118	-0.0120798358
## avoid_Sun Country Airlines	0.1593764125	-0.1602172797	0.1238412832
## avoid_Alaska Airlines	0.1317592720	0.1574152290	0.0834013540
## avoid_JetBlue	-0.0062390291	-0.0132922881	0.0199495693
## avoid_Eastern Airlines	0.1986028112	0.0714312104	-0.0459518983
## avoid_Avelo Airlines	0.2007499833	0.0716547275	-0.1003838567
## avoid_Breeze Airways	0.1176789927	-0.0517289521	0.1754831939
## not_flown_Eastern Airlines	0.0362703718	-0.0610891855	-0.1456130099
## not_flown_Hawaiian Airlines	-0.0750426406	0.1725616966	-0.0630559683
## not_flown_Southwest Airlines	0.0815129641	0.0777289009	0.0833977170
## not_flown_Sun Country Airlines	0.1182335354	-0.1998662445	-0.0522451255
## not_flown_United Airlines	-0.0838276234	0.2411683330	0.1119326812
## not_flown_Breeze Airways	-0.0119383322	-0.1830129880	-0.1090703643
## not_flown_American Airlines	-0.0630564685	-0.1636083490	-0.0966443189
## not_flown_Avelo Airlines	0.1132736782	-0.0030679861	-0.0331939193
## not_flown_Alaska Airlines	0.0917069865	-0.0084058499	0.1286726153
## not_flown_Allegiant Air	0.0515061995	0.0240774949	0.2837456840
## not_flown_Frontier Airlines	-0.1136164291	0.0396002969	-0.1586641553
## not_flown_JetBlue	-0.0342501149	0.1095826598	-0.0978228154

## not_flown_Spirit Airlines	0.2027321201	-0.3331062291	0.0995622246
## not_flown_Delta Air Lines	0.0085356511	0.0521624965	-0.0877160940
##	PC52	PC53	PC54
## Q1	0.0287440140	0.05828158160	0.0612507063
## Q2	-0.1073831321	-0.09675540831	-0.0260061055
## Q3	-0.0486264952	0.07187388728	-0.0364140979
## Q4	0.1077789225	-0.01083504863	-0.1175061543
## Q5	-0.0280636967	-0.02569016321	0.0265290409
## Q6_15	0.0317621873	0.00058135262	0.0088794345
## Q6_16	0.0933364429	-0.21452423050	-0.0195495300
## Q6_17	-0.1308529719	0.10971146510	0.1187129847
## Q6_18	0.2082361751	-0.11818315363	-0.1863182006
## Q6_19	-0.1251742892	0.29898124045	0.0378674509
## Q8	-0.0691876405	0.13913254294	-0.0131304512
## Q9	0.0885215755	0.04438991654	0.0081348000
## Q10	-0.0058305588	-0.07922471616	0.0265994006
## Q11	0.1188100079	-0.04436908767	-0.0011934320
## Q12	0.0540999662	-0.03300581575	-0.0088934352
## Q13	-0.0351447415	0.05109964822	-0.0820750249
## Q14	0.1183104764	-0.11840840350	-0.0029760086
## Q15	0.0824434871	-0.07084825887	-0.0279980498
## Q16	-0.0883657729	0.03043983649	0.0418399785
## Q17	-0.0136019484	0.00140521478	-0.0353318571
## Q18	-0.0035646672	0.09183451065	0.0366991864
## Q19	0.0395034991	-0.01264823574	-0.0300996338
## prefer_JetBlue	0.2804078278	0.09998645932	0.3993591455
## prefer_Allegiant Air	-0.0672083914	0.04342463712	0.0470102024
## prefer_Delta Air Lines	0.1574389430	-0.25357431129	-0.0958628185
## prefer_Southwest Airlines	0.0383401668	0.04018470837	0.0176249952
## prefer_American Airlines	-0.0848406282	-0.28837597230	-0.1279032604
## prefer_Frontier Airlines	0.1417788468	0.07729731125	-0.0065413782
## prefer_Spirit Airlines	-0.0446776376	0.15881606546	-0.0413851482
## prefer_Alaska Airlines	-0.0417047228	-0.24024507970	0.0753349600
## prefer_United Airlines	-0.0879910374	0.06030058914	-0.0466590069
## prefer_Hawaiian Airlines	-0.0130141465	0.06200561872	-0.2883939898
## prefer_Avelo Airlines	-0.1193887352	-0.03967527736	-0.0701193654
## prefer_Breeze Airways	0.0031290781	0.00270499034	-0.0178753836
## avoid_Delta Air Lines	0.0068912694	-0.16618035524	-0.0111730545
## avoid_Spirit Airlines	-0.0941121363	0.13176178078	-0.0695826085
## avoid_Frontier Airlines	0.2426393576	-0.01134406024	0.0501641660
## avoid_American Airlines	-0.1801595564	-0.20613264677	-0.0009095953
## avoid_United Airlines	-0.0895973148	0.21908676090	-0.1672637873
## avoid_Southwest Airlines	-0.0133746368	0.07029967890	-0.0583882313
## avoid_Allegiant Air	-0.2396055575	-0.04094338938	0.2078289902
## avoid_Sun Country Airlines	0.1062621282	0.16793196180	-0.1723676936
## avoid_Alaska Airlines	-0.0033826641	-0.10548483684	0.0273305348
## avoid_JetBlue	0.1865510565	0.20712625104	0.1666367667
## avoid_Eastern Airlines	-0.0201858201	-0.11378896668	0.1331376127
## avoid_Avelo Airlines	-0.1120772911	-0.00303426440	-0.0559736895
## avoid_Breeze Airways	0.1336102055	0.07771097315	-0.1931933658
## not_flown_Eastern Airlines	0.2246023094	-0.08162707640	0.2001072839
## not_flown_Hawaiian Airlines	0.0194742380	0.11544213336	-0.3465896389
## not_flown_Southwest Airlines	0.0163365741	0.06052864432	0.0672580588
## not_flown_Sun Country Airlines	-0.0696170270	0.15636056259	-0.0955420466

## not_flown_United Airlines	-0.0847993998	0.08857555181	-0.0035380435
## not_flown_Breeze Airways	-0.0033624697	0.10250863032	-0.2232214292
## not_flown_American Airlines	-0.0573529376	-0.25228981749	-0.0581669985
## not_flown_Avelo Airlines	-0.1760222988	0.00605367321	-0.0448790369
## not_flown_Alaska Airlines	-0.0253764720	-0.27163404900	-0.0670795876
## not_flown_Allegiant Air	-0.4057659502	-0.03112336779	0.3091060828
## not_flown_Frontier Airlines	0.3201699175	0.07604243873	-0.0233792527
## not_flown_JetBlue	0.1914304253	0.11253056230	0.3009086545
## not_flown_Spirit Airlines	-0.0097891727	0.07476758951	-0.0827513092
## not_flown_Delta Air Lines	0.1354973646	-0.16352408179	-0.0643259021
##	PC55	PC56	PC57
## Q1	0.09279597518	0.0071168241	0.0406137968
## Q2	-0.06114538101	-0.0555269087	0.0363166268
## Q3	0.02019458876	-0.0247057920	0.0405219662
## Q4	0.02328403740	0.0633998585	-0.0704853839
## Q5	0.12720673209	-0.0844550248	0.0197000216
## Q6_15	-0.08666396500	-0.0699832504	-0.1181945761
## Q6_16	0.06387256873	-0.0018663189	-0.0196849724
## Q6_17	0.13668470174	-0.1714499692	0.1014554089
## Q6_18	-0.09271664997	0.2097904892	-0.0297333406
## Q6_19	0.01560029241	-0.1198287967	0.0416328283
## Q8	0.04434457100	-0.1413786382	-0.0125424519
## Q9	-0.05413475199	-0.0816815776	-0.0530403376
## Q10	-0.03983343994	0.0833031165	0.0316704707
## Q11	0.00624055474	0.0318112772	-0.0649039210
## Q12	0.02517648878	0.1645285180	-0.0167771821
## Q13	-0.10527687378	-0.0548004269	0.0078184548
## Q14	0.04429979519	-0.1013940675	-0.0955386972
## Q15	-0.09451138057	0.0941988924	0.0181209673
## Q16	0.01538098150	0.0589183476	0.0237588488
## Q17	-0.00395229193	-0.0327947169	-0.1169028711
## Q18	-0.02864127641	0.1172950342	-0.0955828399
## Q19	-0.04620457189	-0.0593116404	-0.0202446189
## prefer_JetBlue	0.32520600513	0.0283767344	-0.2038985909
## prefer_Allegiant Air	-0.14976318207	-0.0197937943	-0.1316004973
## prefer_Delta Air Lines	0.00546297836	0.0109050301	-0.1944141840
## prefer_Southwest Airlines	0.00078958722	0.2681793252	0.2945235750
## prefer_American Airlines	-0.02886494696	0.2170474076	-0.1756952566
## prefer_Frontier Airlines	-0.01406524532	-0.0171277341	0.0116826542
## prefer_Spirit Airlines	-0.08185701482	0.0335382284	-0.0113792396
## prefer_Alaska Airlines	0.10950148434	-0.3427101565	0.2325633172
## prefer_United Airlines	-0.22062383723	-0.0648346346	-0.1867718241
## prefer_Hawaiian Airlines	0.22809019626	-0.0697515753	-0.1228209219
## prefer_Avelo Airlines	0.08302850006	0.0582980184	0.0818015517
## prefer_Breeze Airways	-0.02180443576	-0.0166285775	-0.0226332304
## avoid_Delta Air Lines	0.05787523937	-0.0705218143	-0.0786087618
## avoid_Spirit Airlines	-0.10754995853	-0.0549191220	0.0579222028
## avoid_Frontier Airlines	-0.13890351374	-0.0355545494	0.0032202645
## avoid_American Airlines	0.02718232750	0.0862085979	-0.1210991812
## avoid_United Airlines	-0.23294937189	-0.0919324414	-0.0714865859
## avoid_Southwest Airlines	-0.08567703156	0.2290924701	0.2550251760
## avoid_Allegiant Air	-0.01060681495	-0.0460327135	-0.0300950148
## avoid_Sun Country Airlines	0.03513485045	0.0095566810	-0.1888187670
## avoid_Alaska Airlines	0.02910501964	-0.0835950555	0.0055074174

## avoid_JetBlue	0.15490310125	0.0435732257	-0.0755072732
## avoid_Eastern Airlines	-0.13683147143	-0.0897123051	0.0511936634
## avoid_Avelo Airlines	0.04650729193	0.1050324220	0.0027597774
## avoid_Breeze Airways	-0.06816528879	0.0656799816	-0.0829462469
## not_flown_Eastern Airlines	-0.40301564102	-0.2506540725	0.2215534635
## not_flown_Hawaiian Airlines	0.41263547519	-0.1825144771	-0.0439096643
## not_flown_Southwest Airlines	-0.00133023578	0.2443740859	0.2430777857
## not_flown_Sun Country Airlines	-0.01649052257	-0.1300846136	-0.0604816040
## not_flown_United Airlines	-0.08518022259	-0.1308711096	-0.1064839108
## not_flown_Breeze Airways	-0.14939157960	-0.0175660751	-0.0911778373
## not_flown_American Airlines	0.01170584454	0.1362447964	-0.1589282388
## not_flown_Avelo Airlines	0.23593256474	0.2667195406	0.3181671559
## not_flown_Alaska Airlines	0.12720640788	-0.3443204370	0.1330894016
## not_flown_Allegiant Air	-0.09507845591	0.1344502297	-0.3722330359
## not_flown_Frontier Airlines	-0.13932685026	0.0351756776	0.0337470862
## not_flown_JetBlue	0.16877322999	0.0607402896	-0.1713759671
## not_flown_Spirit Airlines	-0.05381650783	-0.0037350546	-0.0023202952
## not_flown_Delta Air Lines	0.02061904526	-0.0348461955	-0.0483377361
##	PC58	PC59	PC60
## Q1	0.0178946299	0.0043965868	0.03249250867
## Q2	-0.0075901378	-0.0282857368	0.00173550403
## Q3	-0.0583173787	-0.0262864210	0.03090749022
## Q4	-0.0622522253	-0.1131626564	0.02997387360
## Q5	0.0263539359	0.0163845354	-0.04120009807
## Q6_15	-0.0999030779	0.0698117855	-0.00033831503
## Q6_16	0.0729591416	0.0424077201	0.11784946347
## Q6_17	-0.0390419892	0.0029596318	-0.10234914718
## Q6_18	-0.0687792498	-0.1248118840	0.00437837266
## Q6_19	0.0097105008	-0.0605887546	-0.06467972464
## Q8	0.0609039080	-0.1354707347	-0.04637620591
## Q9	-0.0279413213	-0.1281267774	0.01902943011
## Q10	-0.0555344831	0.1481184019	0.03477685759
## Q11	0.0145433681	0.0171532368	-0.06403718423
## Q12	0.0397079691	0.0282332802	-0.02897189005
## Q13	-0.1038664938	-0.0228785219	-0.04778756364
## Q14	-0.0092367051	-0.0611710841	0.04963971804
## Q15	-0.0353911410	-0.0059315975	0.01016650506
## Q16	-0.0502016617	0.0299087512	-0.05216940372
## Q17	-0.0214760766	-0.0548219799	-0.06238286029
## Q18	-0.0410533156	-0.0042607953	-0.02223890275
## Q19	-0.0847633655	-0.0436452534	-0.04247117342
## prefer_JetBlue	0.0181621402	0.0440163701	0.17545786895
## prefer_Allegiant Air	-0.0666039838	-0.0772758298	-0.08517951511
## prefer_Delta Air Lines	-0.0147459121	-0.1757813560	0.05959129178
## prefer_Southwest Airlines	-0.2771511888	-0.0304779241	0.03337005673
## prefer_American Airlines	-0.0354384344	-0.0726058080	0.01676528408
## prefer_Frontier Airlines	0.0440442307	0.0395817613	-0.31597499543
## prefer_Spirit Airlines	-0.0813218005	-0.1255274600	0.07489174073
## prefer_Alaska Airlines	-0.1397033719	0.1291792403	-0.07182234392
## prefer_United Airlines	0.2175684914	0.0169928949	0.08581885447
## prefer_Hawaiian Airlines	-0.1262074010	-0.1467084253	-0.02254428941
## prefer_Avelo Airlines	0.2517104829	-0.1209442224	0.04719514605
## prefer_Breeze Airways	-0.0413224382	0.1271180934	0.03203869766
## avoid_Delta Air Lines	-0.0117245047	-0.1692680337	0.04965582084

## avoid_Spirit Airlines	-0.2476577347	-0.1555934815	0.12034097093
## avoid_Frontier Airlines	0.0160587613	0.0290287119	-0.37463463601
## avoid_American Airlines	-0.0856391932	0.0014625330	0.02573584594
## avoid_United Airlines	0.1205480835	-0.0889807126	0.12574777509
## avoid_Southwest Airlines	-0.2852590406	-0.0915558916	0.03845633439
## avoid_Allegiant Air	-0.0930797011	-0.0389062018	-0.04690975762
## avoid_Sun Country Airlines	0.0930955756	-0.0742861859	-0.02975131226
## avoid_Alaska Airlines	-0.1089618363	0.0555484697	-0.00295690748
## avoid_JetBlue	-0.0394165621	-0.0626956637	0.14561657681
## avoid_Eastern Airlines	0.0307902876	-0.0714808244	0.06902234351
## avoid_Avelo Airlines	0.1694144339	-0.0358633246	0.00615723306
## avoid_Breeze Airways	-0.0426715943	0.1121028332	0.04241356321
## not_flown_Eastern Airlines	0.0991290417	-0.3575727522	0.27127470876
## not_flown_Hawaiian Airlines	-0.1876382132	-0.2103860116	-0.05360102672
## not_flown_Southwest Airlines	-0.2689758901	0.0021214326	0.01884971432
## not_flown_Sun Country Airlines	-0.0173930405	-0.0349368008	0.01762523497
## not_flown_United Airlines	0.1207756418	0.0119312503	0.03658487436
## not_flown_Breeze Airways	-0.0302722313	0.6543902972	0.25971939452
## not_flown_American Airlines	0.0038695103	-0.0630267338	0.01892127362
## not_flown_Avelo Airlines	0.5053537503	-0.0807556331	-0.00836538250
## not_flown_Alaska Airlines	-0.1117365826	0.1496248802	-0.06425502549
## not_flown_Allegiant Air	-0.1704308152	-0.0886002399	-0.26870606407
## not_flown_Frontier Airlines	0.0848485476	0.0401211878	-0.55358201366
## not_flown_JetBlue	-0.0669059246	0.0342118600	0.18894928677
## not_flown_Spirit Airlines	-0.1650896427	-0.0806899935	0.08753023189
## not_flown_Delta Air Lines	0.0310325919	-0.0720428274	0.03205381461
##	PC61		
## Q1	0.0023831538		
## Q2	0.0365853718		
## Q3	0.0630857925		
## Q4	-0.0454794162		
## Q5	0.0150143129		
## Q6_15	0.0999261330		
## Q6_16	-0.0063233464		
## Q6_17	0.0661639712		
## Q6_18	-0.0100634444		
## Q6_19	0.0694284020		
## Q8	0.0376793365		
## Q9	0.0517910648		
## Q10	-0.0901760044		
## Q11	-0.0179552564		
## Q12	0.0057730308		
## Q13	0.1099279926		
## Q14	0.1373990511		
## Q15	0.0369856108		
## Q16	0.0106578410		
## Q17	0.0723556328		
## Q18	0.0583563942		
## Q19	0.0469812870		
## prefer_JetBlue	0.0676077706		
## prefer_Allegiant Air	-0.0163613657		
## prefer_Delta Air Lines	0.1827540158		
## prefer_Southwest Airlines	-0.0225450319		
## prefer_American Airlines	0.0693586452		

```
## prefer_Frontier Airlines      0.1051964637
## prefer_Spirit Airlines       0.1397199196
## prefer_Alaska Airlines       0.1533428145
## prefer_United Airlines       0.0866653045
## prefer_Hawaiian Airlines     -0.2220701408
## prefer_Avelo Airlines        0.2075024775
## prefer_Breeze Airways        0.0250823619
## avoid_Delta Air Lines        0.2800784207
## avoid_Spirit Airlines        0.3966851155
## avoid_Frontier Airlines      0.0744312496
## avoid_American Airlines      0.0314797419
## avoid_United Airlines        0.2040352059
## avoid_Southwest Airlines     0.1243627893
## avoid_Allegiant Air          -0.0257097192
## avoid_Sun Country Airlines   -0.0344928205
## avoid_Alaska Airlines        0.0834781875
## avoid_JetBlue                0.1626009226
## avoid_Eastern Airlines       -0.0737194329
## avoid_Avelo Airlines         0.0913578721
## avoid_Breeze Airways         0.0710107542
## not_flown_Eastern Airlines   -0.3232993614
## not_flown_Hawaiian Airlines -0.2749124928
## not_flown_Southwest Airlines 0.0282964115
## not_flown_Sun Country Airlines -0.0569265417
## not_flown_United Airlines    0.1364306700
## not_flown_Breeze Airways     -0.0394710862
## not_flown_American Airlines  0.0540610557
## not_flown_Avelo Airlines     0.1454240147
## not_flown_Alaska Airlines    0.2276118249
## not_flown_Allegiant Air      -0.1276562273
## not_flown_Frontier Airlines  0.1248837369
## not_flown_JetBlue            0.1714076086
## not_flown_Spirit Airlines    0.1516478511
## not_flown_Delta Air Lines    0.0321470900
```

Using all of variables we have, our first Principle Component can only explain 24.1% of variance in dataset. Thus, we'll build the second PCA, by dropping all dummy variables.

PRINCIPLE COMPONENT ANALYSIS MODEL 2

1. PCA Summary

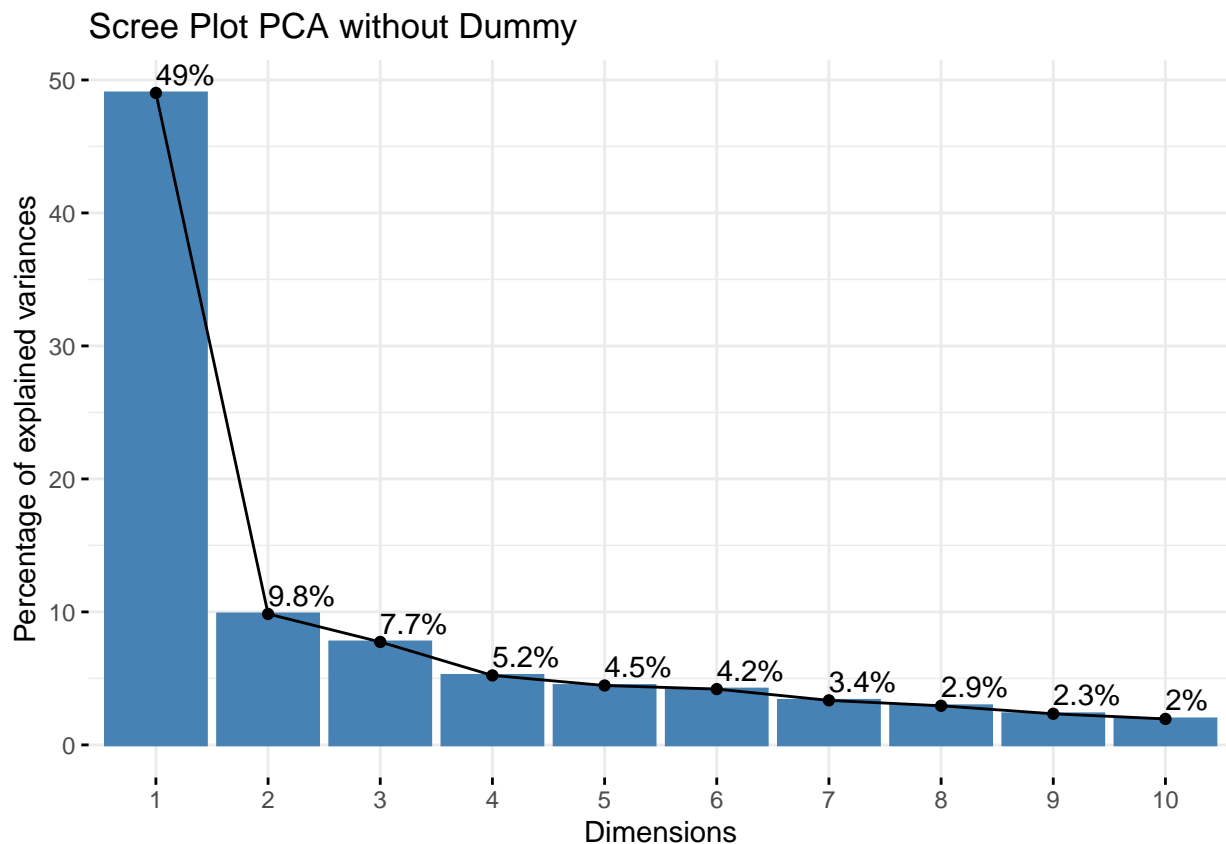
```
correlation2 <- cor(travel_df_clean[,1:22])
pca2 <- princomp(correlation2)
summary(pca2)
```

```
## Importance of components:
##              Comp.1      Comp.2      Comp.3      Comp.4      Comp.5
## Standard deviation  0.8535619 0.38255841 0.33920612 0.27869686 0.25765626
## Proportion of Variance 0.4902404 0.09847695 0.07742237 0.05226407 0.04467047
## Cumulative Proportion 0.4902404 0.58871735 0.66613972 0.71840379 0.76307426
##              Comp.6      Comp.7      Comp.8      Comp.9      Comp.10
## Standard deviation  0.24978094 0.22314238 0.20909626 0.18647382 0.17048507
```

```
## Proportion of Variance 0.04198147 0.03350451 0.02941925 0.02339779 0.01955743
## Cumulative Proportion 0.80505573 0.83856023 0.86797949 0.89137727 0.91093470
##                      Comp.11    Comp.12    Comp.13    Comp.14    Comp.15
## Standard deviation    0.16780372 0.15277457 0.13915962 0.12558491 0.110735381
## Proportion of Variance 0.01894708 0.01570512 0.01303063 0.01061241 0.008251101
## Cumulative Proportion 0.92988178 0.94558690 0.95861753 0.96922994 0.977481043
##                      Comp.16    Comp.17    Comp.18    Comp.19
## Standard deviation    0.099619392 0.083452628 0.081221858 0.066930321
## Proportion of Variance 0.006677699 0.004686182 0.004438998 0.003014289
## Cumulative Proportion 0.984158743 0.988844924 0.993283922 0.996298211
##                      Comp.20    Comp.21    Comp.22
## Standard deviation    0.058779573 0.045236645 2.246638e-09
## Proportion of Variance 0.002324834 0.001376955 3.396295e-18
## Cumulative Proportion 0.998623045 1.000000000 1.000000e+00
```

2. Scree Plot

```
fviz_screplot(pca2, type = "lines", addlabels = TRUE,
              main = "Scree Plot PCA without Dummy")
```



By dropping all dummy variables, our first principle component explanation variability increase to 49%. Next, let investigate the eigen value of each PC.

3. Eigen Value

```
eig_val2 <- get_eigenvalue(pca2)
eig_val2
```

	eigenvalue	variance.percent	cumulative.variance.percent
## Dim.1	7.285679e-01	4.902404e+01	49.02404
## Dim.2	1.463509e-01	9.847695e+00	58.87174
## Dim.3	1.150608e-01	7.742237e+00	66.61397
## Dim.4	7.767194e-02	5.226407e+00	71.84038
## Dim.5	6.638675e-02	4.467047e+00	76.30743
## Dim.6	6.239052e-02	4.198147e+00	80.50557
## Dim.7	4.979252e-02	3.350451e+00	83.85602
## Dim.8	4.372125e-02	2.941925e+00	86.79795
## Dim.9	3.477248e-02	2.339779e+00	89.13773
## Dim.10	2.906516e-02	1.955743e+00	91.09347
## Dim.11	2.815809e-02	1.894708e+00	92.98818
## Dim.12	2.334007e-02	1.570512e+00	94.55869
## Dim.13	1.936540e-02	1.303063e+00	95.86175
## Dim.14	1.577157e-02	1.061241e+00	96.92299
## Dim.15	1.226232e-02	8.251101e-01	97.74810
## Dim.16	9.924023e-03	6.677699e-01	98.41587
## Dim.17	6.964341e-03	4.686182e-01	98.88449
## Dim.18	6.596990e-03	4.438998e-01	99.32839
## Dim.19	4.479668e-03	3.014289e-01	99.62982
## Dim.20	3.455038e-03	2.324834e-01	99.86230
## Dim.21	2.046354e-03	1.376955e-01	100.00000
## Dim.22	5.047384e-18	3.396295e-16	100.00000

However, our PC1 only has 0.728 eigen value. If we use KM1 rule (threshold of 1), we can't say the PCA didn't work for our data since there is no value is greater than 1.

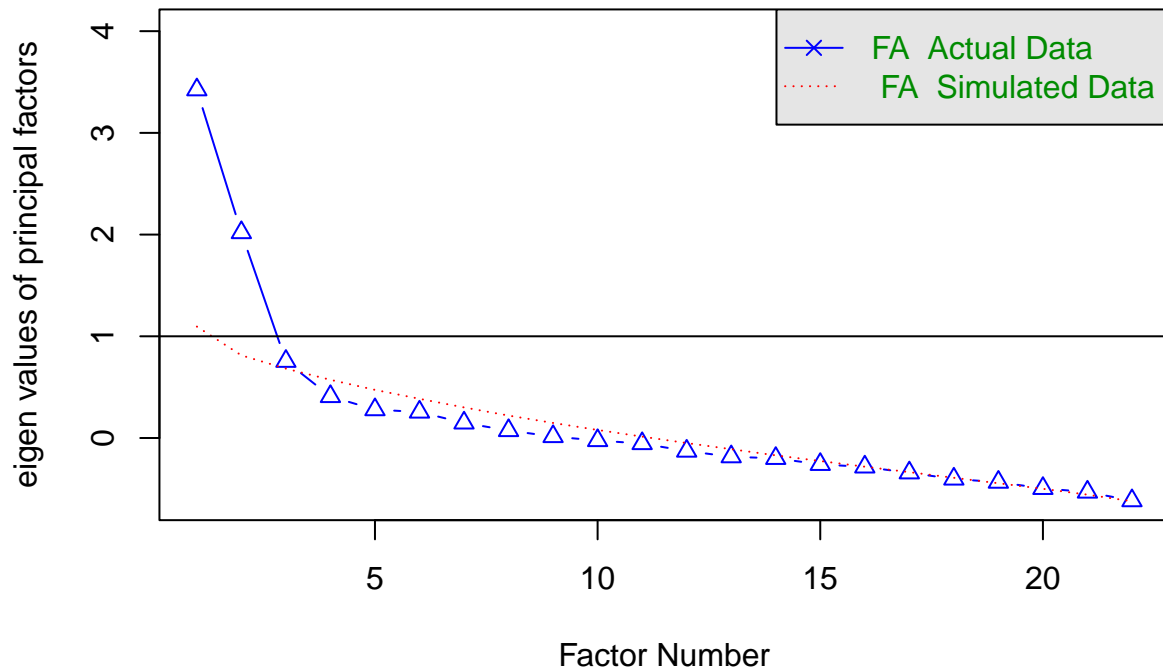
Let's look at for parallel analysis (since it use Monte Carlo concept.)

4. Parallel Analysis

```
fa.parallel(correlation2, fm='pa', fa='fa', main = 'Parallel Analysis Scree Plot', n.iter=500)
```

```
## Warning in fa.parallel(correlation2, fm = "pa", fa = "fa", main = "Parallel
## Analysis Scree Plot", : It seems as if you are using a correlation matrix, but
## have not specified the number of cases. The number of subjects is arbitrarily
## set to be 100
```


Parallel Analysis Scree Plot



Parallel analysis suggests that the number of factors = 3 and the number of components = NA
By using parallel analysis, it suggests us to retain 3 principle component.

```
print(pca2$loadings[, 1:3], digits = 8, cutoff = 0.01)
```

5. Loadings

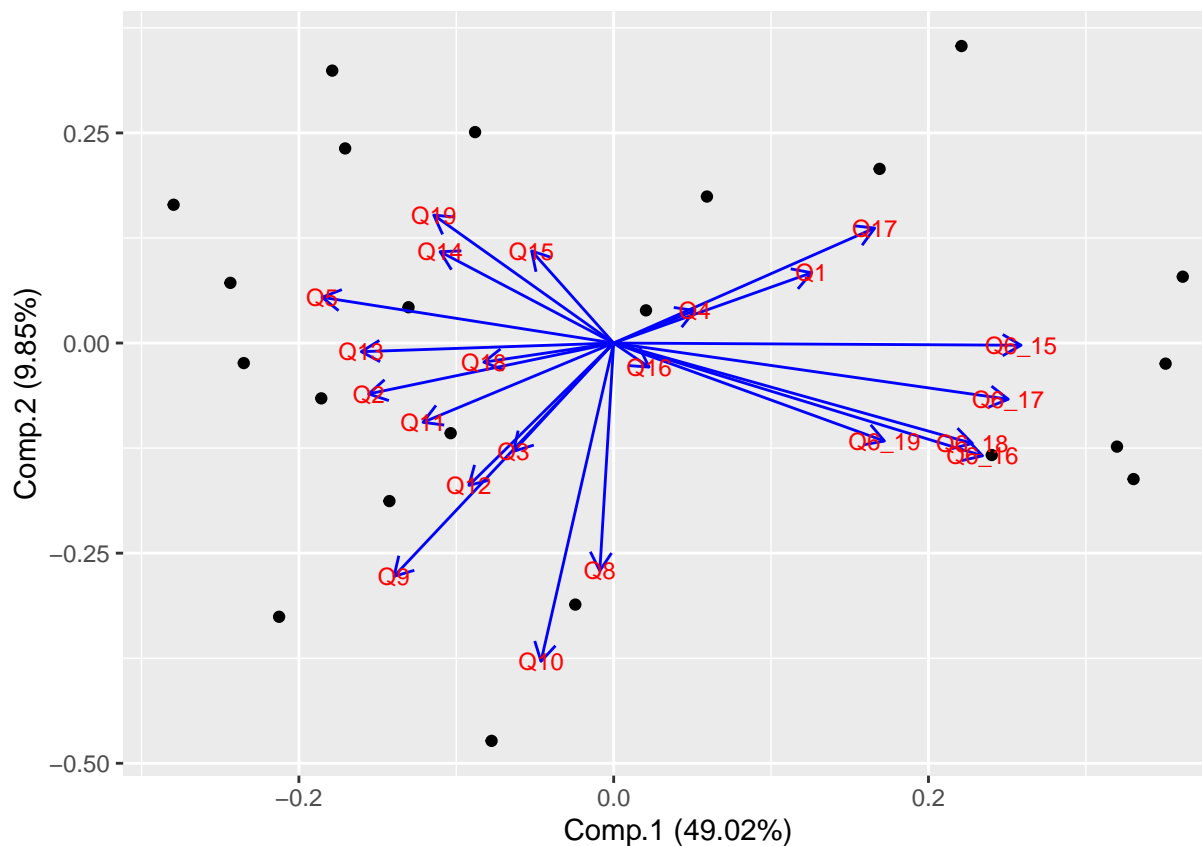
	Comp.1	Comp.2	Comp.3
## Q1	0.181410056	0.1206551548	0.0427009887
## Q2	-0.224515070	-0.0873055551	-0.1493898467
## Q3	-0.091862922	-0.1859250024	0.1340545348
## Q4	0.074329067	0.0558212454	0.3141012476
## Q5	-0.267294208	0.0785540984	-0.3287107049
## Q6_15	0.373340872	-0.0037553316	-0.1654412480
## Q6_16	0.338035220	-0.1935304732	-0.2188252681
## Q6_17	0.361592632	-0.0964671764	-0.0870702046
## Q6_18	0.328690653	-0.1722062515	-0.3228011862
## Q6_19	0.248090641	-0.1681911083	-0.3326654674
## Q8	-0.012688463	-0.3907711013	0.0793257972
## Q9	-0.201371285	-0.4004892296	-0.0504238163
## Q10	-0.066574001	-0.5461675259	0.1082147100
## Q11	-0.174676517	-0.1359915203	0.1532797948
## Q12	-0.132649842	-0.2442563613	0.0028877707
## Q13	-0.231262500	-0.0148373816	-0.1797407598
## Q14	-0.159045812	0.1567624588	-0.2760363883
## Q15	-0.075161012	0.1580058830	-0.2893887839
## Q16	0.032388957	-0.0412722669	-0.0787487333
## Q17	0.239200897	0.1973220061	0.2907633181
## Q18	-0.118991412	-0.0328596326	-0.3034486827

```
## Q19    -0.164872974  0.2195923338 -0.1853425054
```

- By investigating loadings, we see highest positive value by Q6_15 to Q6_19 in PC1. Thus, we can assume PC1 explains about respondent's flight travel rate.
- In PC2, we see high loadings in Q14, Q15, Q17, Q19. Thus we can assume that PC2 represents the racial profile of respondent.
- In PC3, we see high positive loadings in PC3, PC4, PC17. We can assume this component depicts the travel experience.

6. Ellipse Plot

```
autoplot(pca2,
  loadings = TRUE, loadings.colour = 'blue',
  loadings.label = TRUE, loadings.label.size = 3)
```



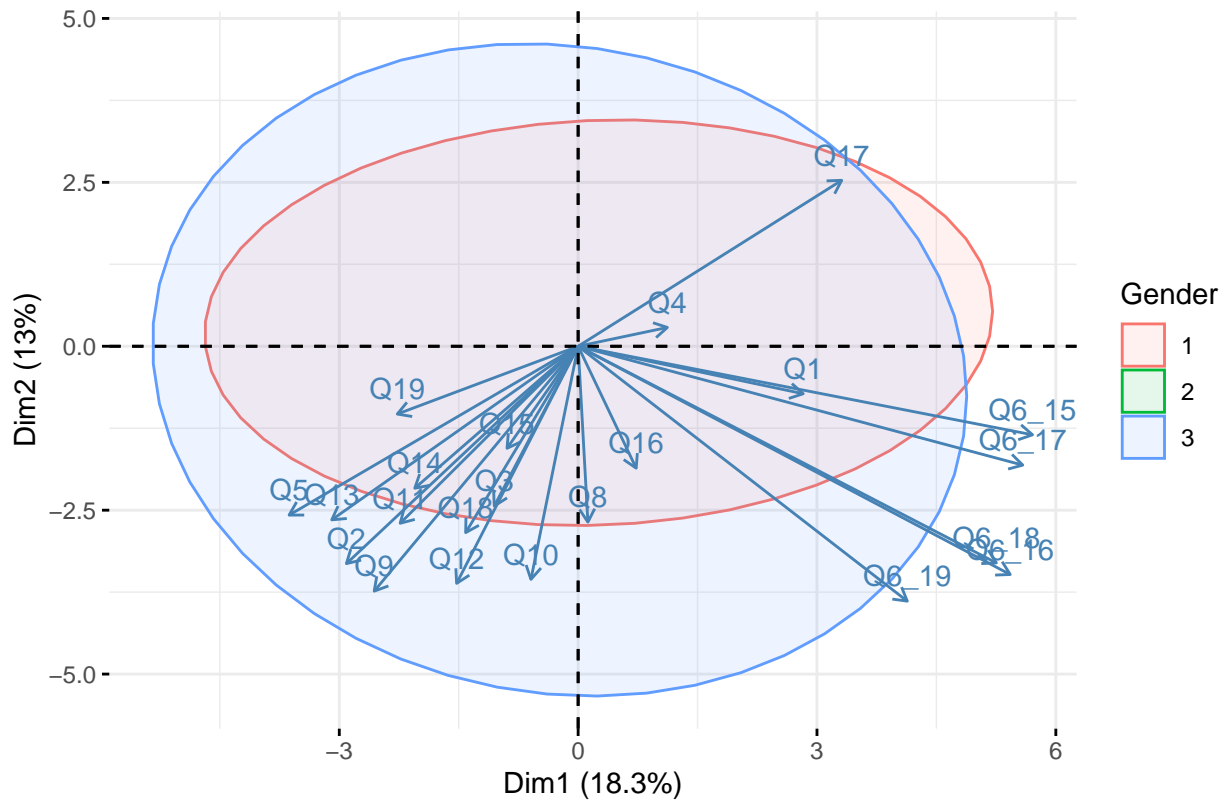
6.1 Via Autoplot

```
pca_2_ <- prcomp(travel_df_clean[,1:22], center = TRUE, scale = TRUE)
fviz_pca_biplot(pca_2_,
  col.ind = travel_df_clean$Q15, # color by groups
  palette = c('#00AFBB', '#E7B800', '#FC4E07'),
  geom.ind = 'points', # show points only (nbut not "text")
  addEllipses = TRUE,
  legend.title = 'Gender'# Concentration ellipses
)
```

6.2 Via Biplot

```
## Too few points to calculate an ellipse
```

PCA – Biplot



In this biplot, we tried to generate ellipse curve by differentiate it by gender. However we only have 136 rows that trigger warning when calculating ellips.