American University Of Armenia
DS233 Marketing Analytics
Homework 1: Bass Model

1. The chosen innovation is AI Dating Assistant.
2. I chose **dating apps** as a past innovation because they share similar technological foundations and target markets with Rizz, the AI dating assistant. Both innovations aim to enhance the user experience in the dating industry, but they do so in different ways. Dating apps like Tinder, Bumble, and OkCupid introduced a platform for online matchmaking, utilizing basic algorithms to suggest potential matches. These apps revolutionized the way people meet, offering location-based, swipe-driven interactions and making dating more accessible and efficient.

   On the other hand, Rizz takes this further by incorporating AI technology, specifically ChatGPT trained by professional dating coaches, to offer real-time, personalized communication advice. Rizz focuses on improving the quality of conversations between users by providing suggested responses based on conversations, effectively acting as a virtual dating coach. This integration of AI represents a significant step forward from basic matchmaking, adding a layer of personalized assistance to help users navigate the complexities of dating conversations. While dating apps serve as a matchmaking platform, Rizz elevates the user experience by addressing the burnout and communication challenges that many users face, marking a shift in how technology can enhance interpersonal relationships in the digital age.

6. For the diffusion analysis of Rizz, the AI dating assistant, I would choose to focus on a

   country-specific scope, specifically the United States for the following reasons:

   Rizz has already established itself as one of the top downloaded dating apps in the U.S. App Store and boasts 1.5 million active monthly users. This suggests that the U.S. market is currently one of the most significant for the app. Given that the app's functionality is designed to cater to the modern digital dating experience, the U.S. provides a robust platform for analyzing the app’s growth and adoption. A focused analysis in the U.S. would allow for more granular insights into how an AI-based dating assistant is being received and used in a market where online dating has become a normalized practice.The U.S. is at the forefront of technological innovation and adoption. With a large population of smartphone users, high internet penetration, and a significant proportion of people engaged in online dating, it provides a suitable environment to track the adoption and impact of a new technology like Rizz. Furthermore, the AI and dating app industries are well-established in the U.S., with platforms like Tinder, Bumble, and Hinge already being widely used. This allows for an interesting comparison in terms of technology, functionality, and user engagement.

Bass Model

2025-02-28

```
library(ggplot2)
library(knitr)
library(readxl)
library(dplyr)
```

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

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

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggpubr)
```

You can also embed plots, for example:

```
data <- read_excel("./data/dating_data.xlsx", sheet=2)
```

```
## New names:
## * `` -> `...2`
## * `` -> `...3`
## * `` -> `...4`
```

```
data
```

```
## # A tibble: 13 x 4
##    Digital Market Outlook: dating service users worldwide 20~1 ...2  ...3  ...4
##    <chr>                                                       <chr> <chr> <chr>
##  1 Number of dating service users worldwide from 2018 to 2028~ <NA>  <NA>  <NA>
##  2 <NA>                                                        Onli~ Casu~ Matc~
##  3 2018                                                        241.~ 86.05 75.66
##  4 2019                                                        278.~ 101.4 84.33
##  5 2020                                                        313.~ 121.~ 100.~
##  6 2021                                                        344.~ 137.~ 107.~
##  7 2022                                                        364.~ 151.~ 109.~
##  8 2023                                                        381.~ 164.~ 115.~
##  9 2024                                                        395.~ 176.~ 119.~
```

```
## 10 2025                                                          408.~ 188.~ 123.~
## 11 2026                                                          423.~ 201.~ 127.~
## 12 2027                                                          437.~ 214.~ 130.~
## 13 2028                                                          452.~ 228.~ 134.5
## # i abbreviated name:
## #   1: 'Digital Market Outlook: dating service users worldwide 2018-2028, by segment'
```

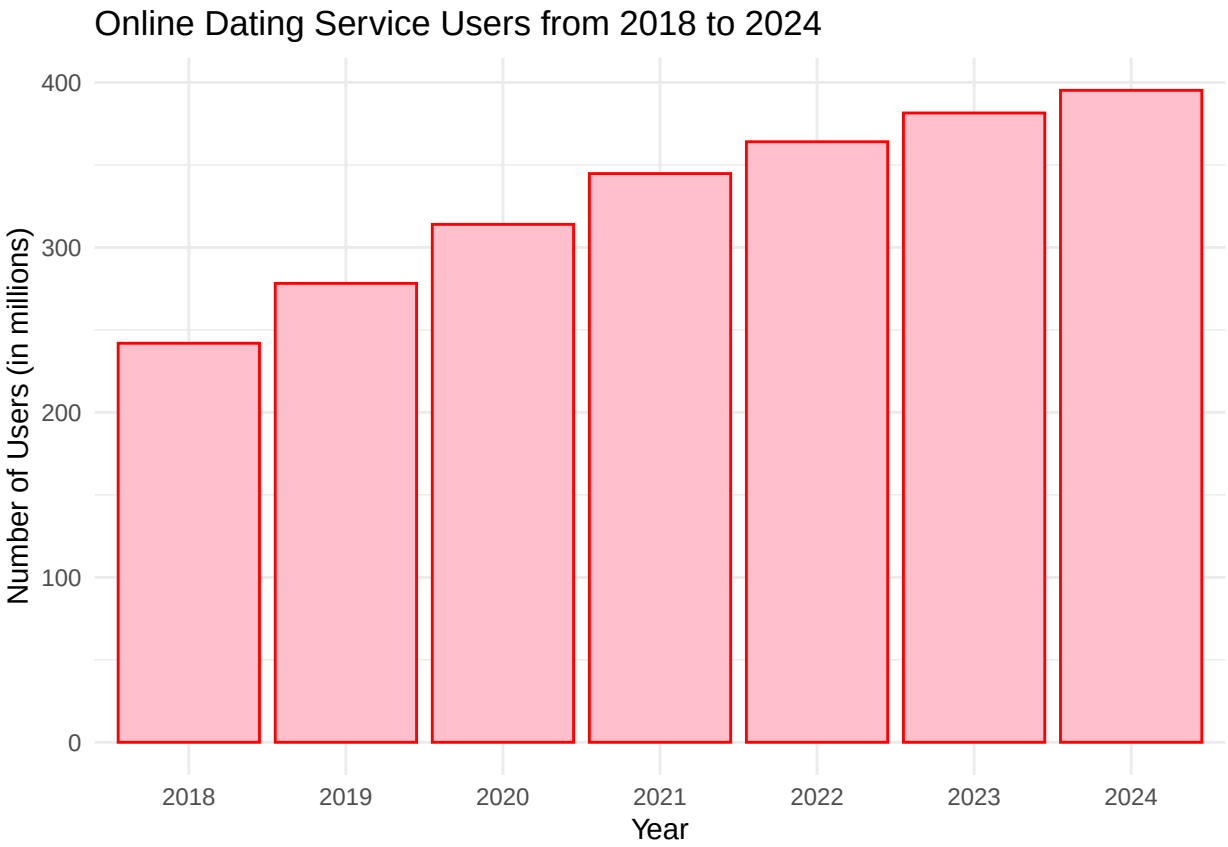
###Data Manipulations ####We remove unnecessary data.

```
# Remove the last 4 rows
data_clean <- data[3:(nrow(data) - 4), ]


colnames(data_clean) <- c("Year", "Online Dating", "Casual Dating", "Matchmaking")

# Convert 'Online Dating' column to numeric
data_clean$`Online Dating` <- as.numeric(data_clean$`Online Dating`)

# Keep only 'Year' and 'Online Dating' columns, and remove the others
data_clean <- data_clean %>%
  select(Year, `Online Dating`)


# View the cleaned data
print(data_clean)
```

```
## # A tibble: 7 x 2
##   Year  'Online Dating'
##   <chr>           <dbl>
## 1 2018             242.
## 2 2019             278.
## 3 2020             314.
## 4 2021             345.
## 5 2022             364.
## 6 2023             381.
## 7 2024             395.
```

###Visualizing Data

```
# Create a bar chart for Online Dating service users over time(2018-2024)
ggplot(data_clean, aes(x = Year, y = `Online Dating`)) +
  geom_bar(stat = "identity", fill = "pink", color = "red") +  # Bar chart with pink bars and red borde
  labs(
    title = "Online Dating Service Users from 2018 to 2024",
    x = "Year",
    y = "Number of Users (in millions)"
  ) +
  theme_minimal()
```



###Bass Model for the Online Dating data

```
years <- c(2018, 2019, 2020, 2021, 2022, 2023, 2024)
values <- c(241.89, 278.19, 313.97, 344.76, 364.05, 381.48, 395.22)

# Define the Bass model function f(t, p, q)
bass.f <- function(t, p, q) {
  ((p + q)^2 / p) * exp(-(p + q) * t) / (1 + (q / p) * exp(-(p + q) * t))^2
}

# Define the cumulative Bass model function F(t, p, q)
bass.F <- function(t, p, q) {
  (1 - exp(-(p + q) * t)) / (1 + (q / p) * exp(-(p + q) * t))
}

# Create the t variable (time)
t <- 1:length(values)

# Fit the model using nonlinear least squares (nls)
# We use the bass.f function and estimate parameters m, p, q
model <- nls(values ~ m * bass.f(t, p, q),
             start = list(m = sum(values), p = 0.02, q = 0.4))

# View the model summary to check the fitted parameters
summary(model)
```

```
##
```

```
## Formula: values ~ m * bass.f(t, p, q)
##
## Parameters:
##    Estimate Std. Error t value Pr(>|t|)
## m 5.828e+03  2.882e+02   20.23 3.53e-05 ***
## p 3.609e-02  1.359e-03   26.57 1.19e-05 ***
## q 1.910e-01  8.823e-03   21.65 2.69e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.194 on 4 degrees of freedom
##
## Number of iterations to convergence: 6
## Achieved convergence tolerance: 3.246e-07
```

```
# Extract the fitted parameters (m, p, q)
fitted_params <- coef(model)
fitted_params
```

```
##            m            p            q
## 5.828249e+03 3.609337e-02 1.909848e-01
```

From our model summary we can conclude than our parameters are the following:

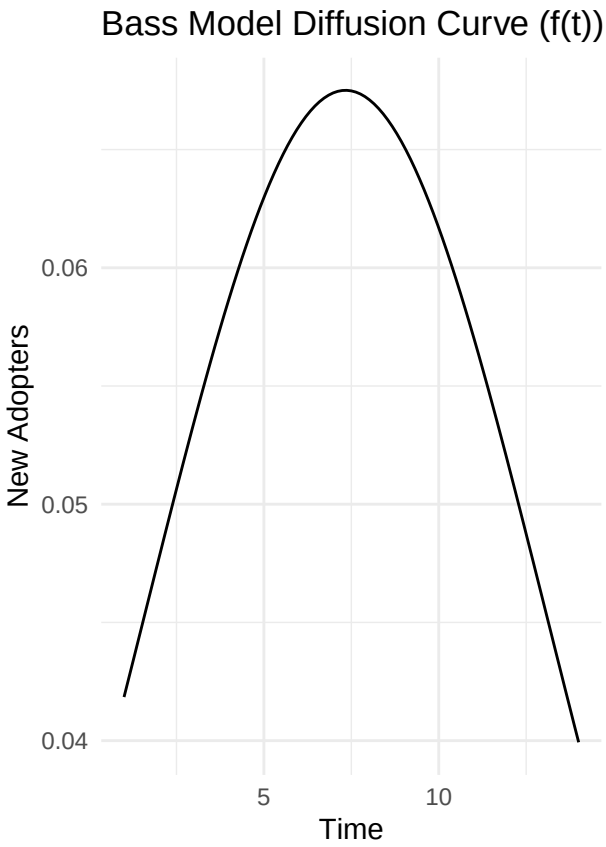
m (market potential): 5828.00

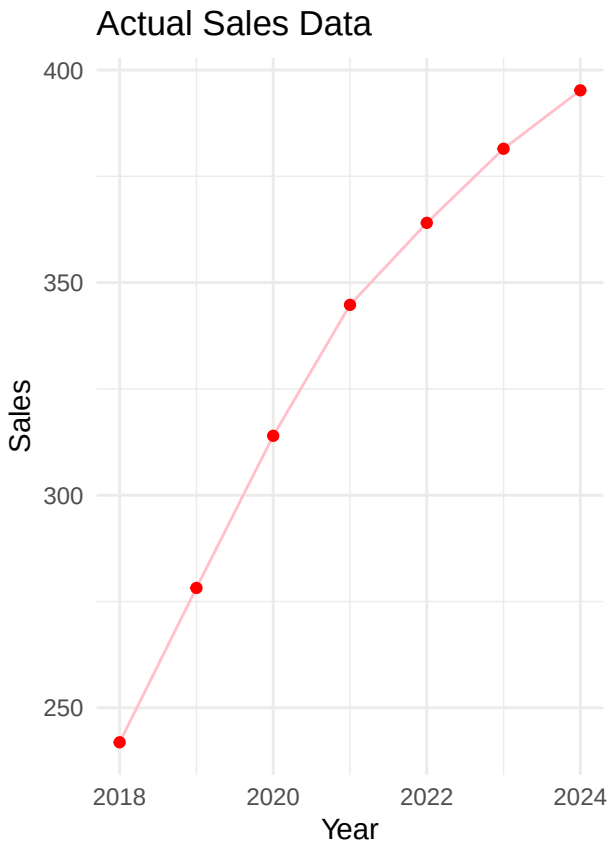
p (coefficient for innovation): 0.0361

q (coefficient for imitation): 0.191

###Predicting the diffusion of the AI Dating Assistant using the estimated parameters.

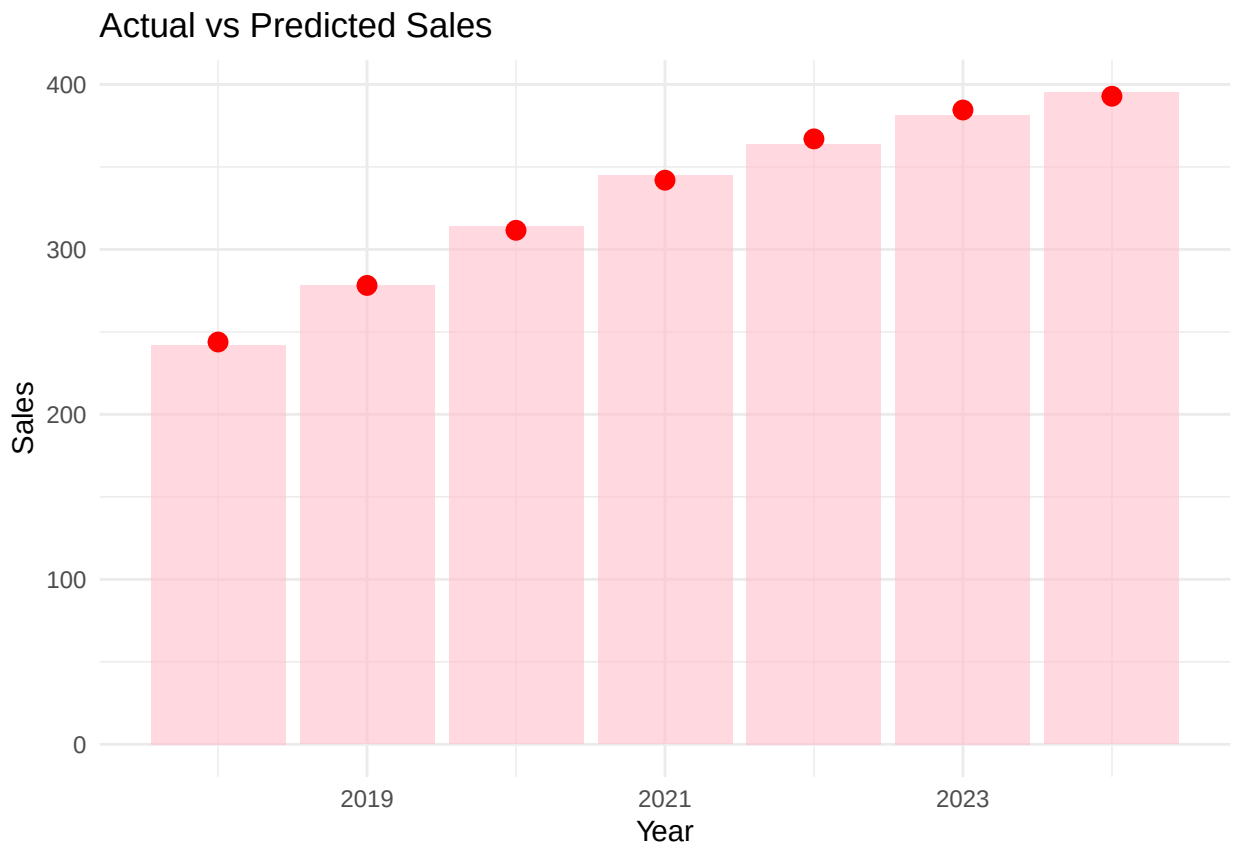
```
# Parameters from the fitted model
p <- 0.0361    # Innovation coefficient
q <- 0.191     # Imitation coefficient

# Create the time steps (t)
t <- 1:length(values)


# Plot the actual sales data (sm_sales)
sm_sales <- ggplot(data.frame(Year = years, Sales = values), aes(x = Year, y = Sales)) +
  geom_line(color = 'pink') +
  geom_point(color = 'red') +
  labs(title = "Actual Sales Data", x = "Year", y = "Sales") +
  theme_minimal()

# Plot the predicted diffusion curve based on the Bass model
time_ad = ggplot(data.frame(t = c(1:14)), aes(t)) +
  stat_function(fun = bass.f, args = c(p = p, q = q)) +
  labs(title = 'Bass Model Diffusion Curve (f(t))', x = "Time", y = "New Adopters") +
  theme_minimal()

# Combine both plots side by side
ggarrange(time_ad, sm_sales, ncol = 2)
```





###Estimating the number of Adoptors

```
users<- data.frame(
  year = c(2018, 2019, 2020, 2021, 2022, 2023, 2024),
  sales = c(241.89, 278.19, 313.97, 344.76, 364.05, 381.48, 395.22)
)

p <- 0.0361
q <- 0.191


# Use the Bass model to predict sales for years 1 to 7 (scaling by 5828)
users$pred_sales <- bass.f(1:7, p = p, q = q) * 5828

# Create the plot
ggplot(data = users, aes(x = year, y = sales)) +
  geom_bar(stat = 'identity', fill = 'pink', alpha = 0.6) +  # Bar plot for actual sales
  geom_point(mapping = aes(x = year, y = pred_sales), color = 'red', size = 3) +  # Predicted sales as
  labs(title = 'Actual vs Predicted Sales', x = 'Year', y = 'Sales') +
  theme_minimal()  # Optional for a cleaner look
```



Sources

Innovation:https://time.com/7094844/rizz/

Dataset:https://www.statista.com/forecasts/891146/eservices-dating-services-online-user-by-segment-worldwide

Article about Rizz: https://www.forbes.com/sites/josipamajic/2024/09/09/rizz-app-how-the-5th-most-downloaded-dating-app-is-redefining-digital-relationships/?utm_source=chatgpt.com