Marketing Analytics HW1

Innovation: Cruz BlenderCap https://time.com/collection/best-inventions-2023/6327704/cruz-blendercap/

SPECIAL MENTION: Smoothie and shake blender options abound, but the Cruz Blender Cap is distinctive because it can turn many popular wide-mouth water bottles into portable blenders, and offers greater power compared to other models on the market.

Look alike: Blenders

The Cruz BlenderCap stands out as an innovative and portable blending solution, allowing users to turn their regular wide-mouth water bottles into powerful blenders. In contrast, traditional blenders, while effective, are typically bulkier and confined to kitchen spaces. The Cruz BlenderCap takes portability and convenience to a new level, making it ideal for people who want to blend smoothies, shakes, or other beverages on the go. Its cordless design and compatibility with various water bottles make it distinct from traditional, stationary blenders.

In terms of technology, traditional blenders have evolved to offer high-powered blending, but they are limited by their size, weight, and the need for dedicated containers. The Cruz BlenderCap, however, leverages modern battery technology and compact design to offer similar blending power in a more versatile, portable form. This innovation opens new market possibilities, particularly for health-conscious, active consumers who value convenience and mobility, whereas traditional blenders are more suited for home use. The Cruz BlenderCap offers a solution for modern, on-the-go lifestyles, thus expanding the market beyond the kitchen.

Data used: Retail sales of blenders in the United States from 2010 to 2019 (in million U.S. dollars) https://www.statista.com/statistics/514578/us-retail-sales-of-blenders/

```
#Loading necessary libraries
library(tidyverse)
```

```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse
2.0.0 ──
## ✓ dplyr     1.1.4     ✓ readr     2.1.5
## ✓ forcats   1.0.0     ✓ stringr   1.5.1
## ✓ ggplot2   3.5.1     ✓ tibble    3.2.1
## ✓ lubridate 1.9.3     ✓ tidyr     1.3.1
## ✓ purrr     1.0.2
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
```

```
## ℹ️ Use the conflicted package (<http://conflicted.r-lib.org/>) to force
all conflicts to become errors

library(ggplot2)
library(gridExtra)

##
## Attaching package: 'gridExtra'
##
## The following object is masked from 'package:dplyr':
##
##     combine

library(readxl)

# Read the data from the Excel file
blender_sales_data <- read_excel("blender_sales.xlsx")

# Extract sales and time variables
sales <- blender_sales_data$`Annual sales`
t <- 1:length(sales)

# Fit the Bass diffusion model
bass_m <- nls(sales ~ m * (((p + q)^2 / p) * exp(-(p + q) * t)) / ((1 + (q /
p) * exp(-(p + q) * t))^2),
              start = list(m = sum(sales), p = 0.02, q = 0.4))

summary(bass_m)

##
## Formula: sales ~ m * (((p + q)^2/p) * exp(-(p + q) * t))/((1 + (q/p) *
##     exp(-(p + q) * t))^2)
##
## Parameters:
##    Estimate Std. Error t value Pr(>|t|)
## m 1.559e+04  2.479e+03   6.291 0.000408 ***
## p 3.315e-02  3.553e-03   9.330 3.37e-05 ***
## q 1.604e-01  3.326e-02   4.824 0.001913 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 56.96 on 7 degrees of freedom
##
## Number of iterations to convergence: 6
## Achieved convergence tolerance: 1.127e-06

# Extracting the parameters
p <- coef(bass_m)["p"]
q <- coef(bass_m)["q"]

cat("Coefficient of innovation (p):", format(round(p, 5), nsmall = 5), "\n")
```

```
## Coefficient of innovation (p): 0.03315
```

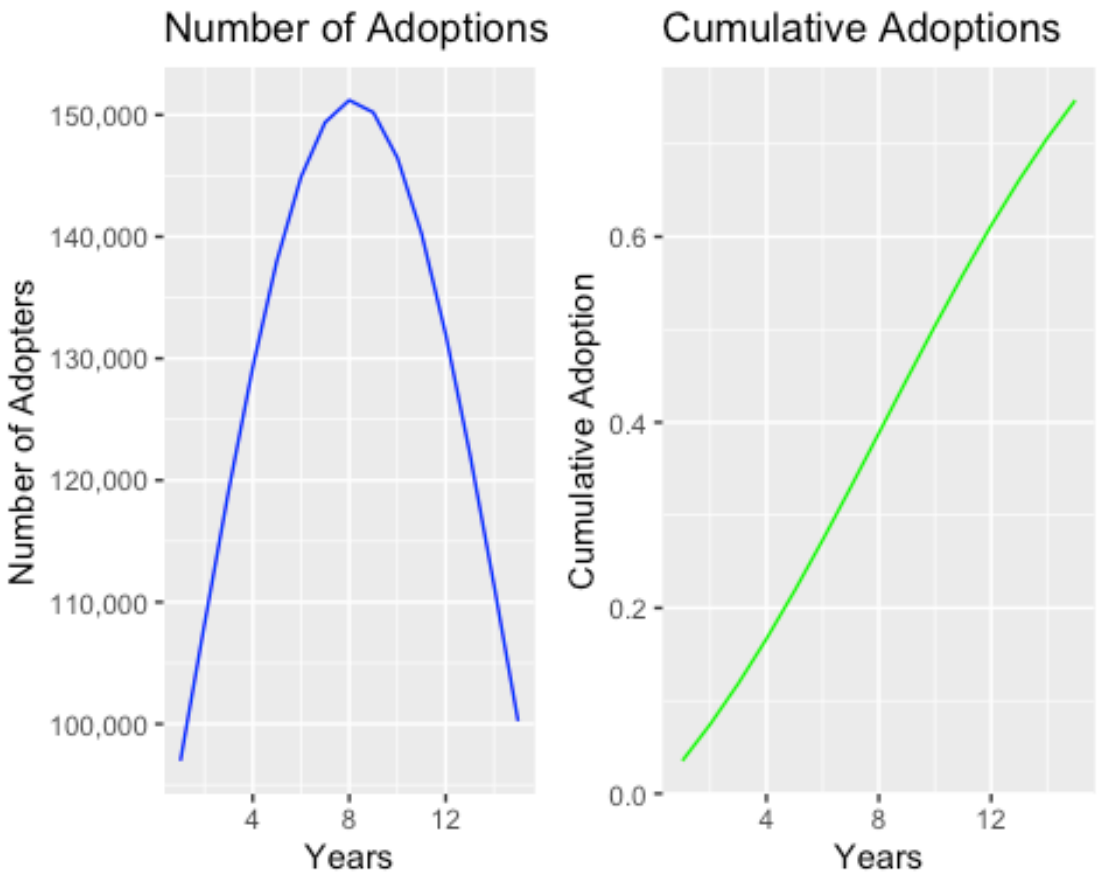
```
cat("Coefficient of imitation (q):", format(round(q, 5), nsmall = 5), "\n")
```

```
## Coefficient of imitation (q): 0.16044
```

According to Cognitive Market Research, the global Household Blender market size is USD 2158.2 million in 2024 (source: https://www.cognitivemarketresearch.com/household-blender-market-report) and the average price of blenders is around 100$, this means approximately 21.58 million units are sold globally. Cruz BlenderCap is bit pricier than the average blender, therefore let's assume only around 60% of people will be able to afford it or would consider buying it for that price. Therefore, it equals to 12,948,000 units. Then let's assume only 20% of that will actually buy the product, therefore we get 2,589,600, which we can consider as our potential market for the chosen product.

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

bass.F <- function(t, p, q) {
  (1 - exp(-(p + q) * t)) / (1 + (q / p) * exp(-(p + q) * t))
}

# Bass Model parameters
m <- 2589600
t <- 1:15

# Predict the number of adopters per period
pred <- bass.f(t = t, p = p, q = q) * m
pred_df <- data.frame(t = t, pred = pred)

# Predict cumulative adopters
pred1 <- bass.F(t = t, p = p, q = q)
pred1_df <- data.frame(t = t, pred = pred1)

# Plot number of new adopters per year
p1 <- ggplot(pred_df, aes(x = t, y = pred)) +
  geom_line(color = "blue") +
  ggtitle("Number of Adoptions at Time t") +
  xlab("Years") + ylab("Number of Adopters") +
  scale_y_continuous(labels = scales::comma)

# Plot cumulative adopters over time
p2 <- ggplot(pred1_df, aes(x = t, y = pred)) +
  geom_line(color = "green") +
  ggtitle("Cumulative Adoptions") +
  xlab("Years") + ylab("Cumulative Adoption") +
  scale_y_continuous()
```

```
grid.arrange(p1, p2, ncol = 2)
```



The cumulative adoption curve shows a steady increase in adopters over time, with growth slowing down as the market becomes saturated. This pattern is consistent with the Bass Diffusion Model, where early adopters are followed by imitators, leading to peak adoption and eventually tapering off as most of the potential market has adopted the innovation.