Project: Facebook and Costco stock Simple Moving Average (SMA)

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Read in Data

```r
# load libraries to read csv and handle format (date and strings)
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
```

```r
library(stringr)
library(readr)
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

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

```r
# load Facebook stock data
fb_stock <- read_csv('Downloads/FB.csv', show_col_types = FALSE)

# clean FB stock data
fb_stock <- fb_stock %>%
  mutate(
    Date = mdy(Date),  # change Date column to YY-DD-MM
    Close = as.numeric(str_replace_all(Close, "\\$", "")),  # remove $
  ) %>%
  filter(!is.na(Date)) %>%  # remove Dates with NA
  select(Date, Close)  # select relevant columns

print(fb_stock)
```

```
## # A tibble: 253 x 2
##    Date       Close
##    <date>     <dbl>
##  1 2024-09-27  567.
```

```
##  2 2024-09-26  568.
##  3 2024-09-25  568.
##  4 2024-09-24  563.
##  5 2024-09-23  564.
##  6 2024-09-20  561.
##  7 2024-09-19  559.
##  8 2024-09-18  538.
##  9 2024-09-17  536.
## 10 2024-09-16  533.
## # i 243 more rows
```

Clean data

```r
#load Costco stock data
costco_stock <- read_csv("Downloads/COST.csv", show_col_types = FALSE)

#clean FB stock data
costco_stock <- costco_stock %>%
    mutate(
    Date = mdy(Date),  # change Date column to YY-DD-MM
    Close = as.numeric(str_replace_all(Close, "\\$", "")),  # remove $
  ) %>%
  filter(!is.na(Date)) %>%  # Remove Dates with NA
  select(Date, Close)  # select relevant columns


print(costco_stock)
```

```
## # A tibble: 253 x 2
##    Date        Close
##    <date>      <dbl>
##  1 2024-09-27  886.
##  2 2024-09-26  901.
##  3 2024-09-25  908.
##  4 2024-09-24  902.
##  5 2024-09-23  917.
##  6 2024-09-20  907.
##  7 2024-09-19  901.
##  8 2024-09-18  893.
##  9 2024-09-17  897.
## 10 2024-09-16  908.
## # i 243 more rows
```

Drop Nas

```r
#load library to drop NAs
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v forcats 1.0.0     v tibble  3.2.1
## v ggplot2 3.4.2     v tidyr   1.3.0
## v purrr   1.0.1
## -- Conflicts ------------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
```

```
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```r
#combine stocks by Date
merged_stock <- full_join(costco_stock, fb_stock, by = "Date", suffix = c("_COST", "_FB"))

#drop rows with NA
merged_stock <- merged_stock %>%
  drop_na()

#print cleaned merged dataset
print(merged_stock)
```

```
## # A tibble: 253 x 3
##    Date        Close_COST Close_FB
##    <date>           <dbl>    <dbl>
##  1 2024-09-27        886.     567.
##  2 2024-09-26        901.     568.
##  3 2024-09-25        908.     568.
##  4 2024-09-24        902.     563.
##  5 2024-09-23        917.     564.
##  6 2024-09-20        907.     561.
##  7 2024-09-19        901.     559.
##  8 2024-09-18        893.     538.
##  9 2024-09-17        897.     536.
## 10 2024-09-16        908.     533.
## # i 243 more rows
```

Summary Statistics

```r
#load library for table
library(knitr)

#summary statistics for Costco
costco_summary <- merged_stock %>%
  summarize(
    Mean_Close = mean(Close_COST),
    Min_Close = min(Close_COST),
    Max_Close = max(Close_COST)
  )

#summary statistics for Facebook
fb_summary <- merged_stock %>%
  summarize(
    Mean_Close = mean(Close_FB),
    Min_Close = min(Close_FB),
    Max_Close = max(Close_FB)
  )

#summary table
summary <- rbind(
  cbind(Company = "Costco", costco_summary),
  cbind(Company = "Facebook", fb_summary)
)
```

```
#kable to create table
kable(summary)
```

Company	Mean_Close	Min_Close	Max_Close
Costco	736.7715	543.03	917.08
Facebook	441.1509	288.35	568.31

Calculating 10-day and 50-day Simple Moving Averages (SMA)

```
#finding 10-day Simple Moving Average (SMA) for Costco
sma10_costco <- rep(NA, nrow(merged_stock)) # create vector for SMA10
for (i in 10:nrow(merged_stock)) {
    sma10_costco[i] <- mean(merged_stock$Close_COST[(i - 9):i]) # assign SMA value
}
merged_stock$SMA10_COST <- sma10_costco # add Costco SMA10 to dataset



#finding 10-day SMA for Facebook
sma10_fb <- rep(NA, nrow(merged_stock)) #create vector for SMA10
for (i in 10:nrow(merged_stock)) {
    sma10_fb[i] <- mean(merged_stock$Close_FB[(i - 9):i]) # assign SMA value
}
merged_stock$SMA10_FB <- sma10_fb # add Facebook SMA10
```

Calculating 50-day Simple Moving Averages (SMA)

```
#finding Costco SMA50
sma50_costco <- rep(NA, nrow(merged_stock)) # vector for SMA50
for (i in 50:nrow(merged_stock)) {
    sma50_costco[i] <- mean(merged_stock$Close_COST[(i - 49):i]) # assign value
}
merged_stock$SMA50_COST <- sma50_costco # add Costco SMA10 to dataset


#finding Facebook SMA50
sma50_fb <- rep(NA, nrow(merged_stock)) # vector for SMA50
for (i in 50:nrow(merged_stock)) {
    sma50_fb[i] <- mean(merged_stock$Close_FB[(i - 49):i]) # assign SMA value
}
merged_stock$SMA50_FB <- sma50_fb # add Facebook SMA50
```

Make Plots

```
#ggplot2 and tidyr to plot and data manipulation
library(ggplot2)
library(tidyr)

#plots to compare Costco and Facebook stock prices with their SMAs
ggplot(merged_stock, aes(x = Date)) +
```

```r
#Costco stock price line
geom_line(aes(y = Close_COST, color = "Costco Stock Price"), linewidth = 1) +

#10-day Costco SMA
geom_line(aes(y = SMA10_COST, color = "Costco SMA10 (10-day)"), linetype = "dashed") +

#50-day Costco SMA
geom_line(aes(y = SMA50_COST, color = "Costco SMA50 (50-day)"), linetype = "dotdash") +



#Facebook stock price
geom_line(aes(y = Close_FB, color = "Facebook Stock Price"), linewidth = 1) +

#10-day Facebook SMA
geom_line(aes(y = SMA10_FB, color = "Facebook SMA10 (10-day)"), linetype = "dashed") +

#50-day Facebook SMA for Facebook
geom_line(aes(y = SMA50_FB, color = "Facebook SMA50 (50-day)"), linetype = "dotdash") +


#colors for the lines
scale_color_manual(values = c(
  "Costco Stock Price" = "blue",
  "Costco SMA10 (10-day)" = "red",
  "Costco SMA50 (50-day)" = "green",
  "Facebook Stock Price" = "orange",
  "Facebook SMA10 (10-day)" = "purple",
  "Facebook SMA50 (50-day)" = "brown"
)) +

#title and labels
labs(title = "Costco and Facebook Stock Prices with SMA10 and SMA50",
     x = "Date",
     y = "Price (USD)") +

#theme for plot
theme_minimal() +

#rotate x-axis labels
theme(axis.text.x = element_text(angle = 45, hjust = 1))
```
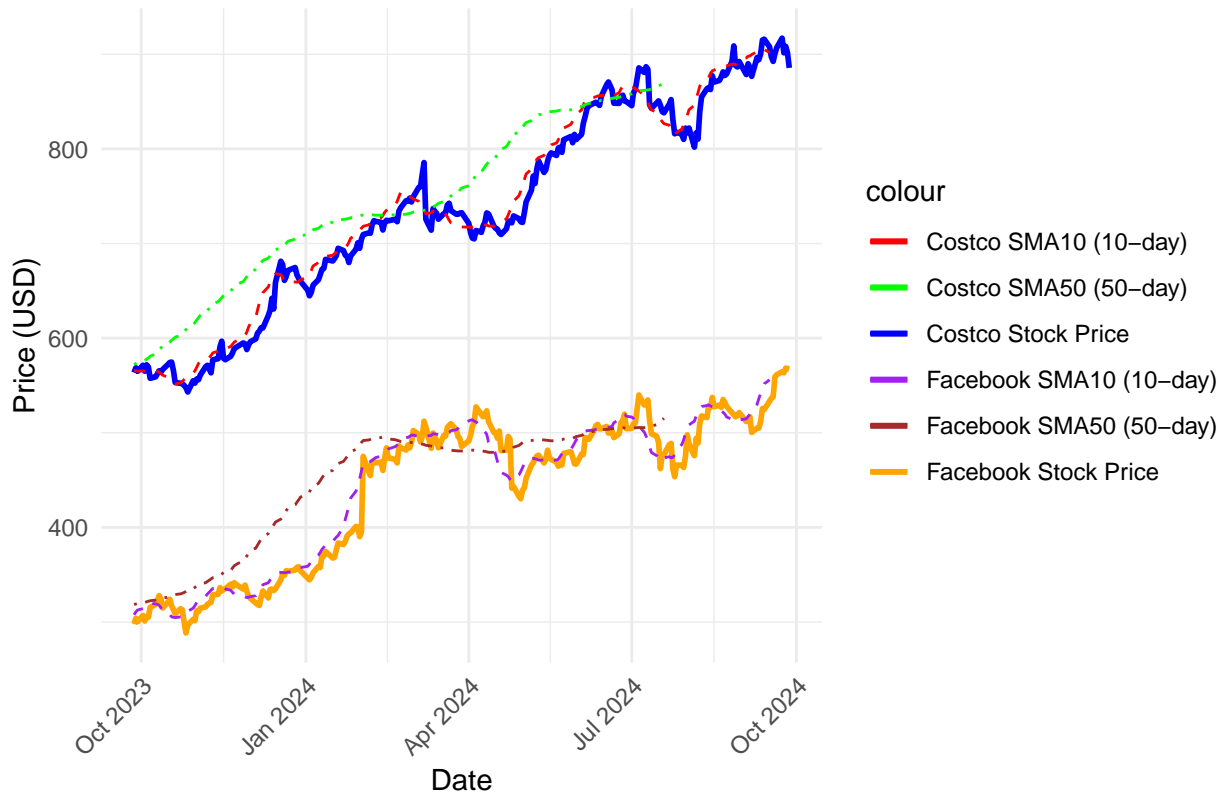
Warning: Removed 9 rows containing missing values (`geom_line()`).

Warning: Removed 49 rows containing missing values (`geom_line()`).

Warning: Removed 9 rows containing missing values (`geom_line()`).

Warning: Removed 49 rows containing missing values (`geom_line()`).

Costco and Facebook Stock Prices with SMA10 and SMA50

Costco Linear Regression Model

```r
#costco regression model
lm_costco <- lm(Close_COST ~ Date + SMA10_COST + SMA50_COST, data = merged_stock)
summary(lm_costco)
```

```
##
## Call:
## lm(formula = Close_COST ~ Date + SMA10_COST + SMA50_COST, data = merged_stock)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -26.863  -7.547  -1.585   5.963  47.066
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -9.436e+03  1.219e+03  -7.742 4.78e-13 ***
## Date         4.951e-01  6.393e-02   7.745 4.69e-13 ***
## SMA10_COST   9.808e-01  3.743e-02  26.204  < 2e-16 ***
## SMA50_COST  -4.697e-01  6.152e-02  -7.636 9.07e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.16 on 200 degrees of freedom
##   (49 observations deleted due to missingness)
## Multiple R-squared:  0.9844, Adjusted R-squared:  0.9841
## F-statistic:  4202 on 3 and 200 DF,  p-value: < 2.2e-16
```

Facebooks Linear Regression Model

```
#facebook regression model
lm_fb <- lm(Close_FB ~ Date + SMA10_FB + SMA50_FB, data = merged_stock)
summary(lm_fb)
```

```
##
## Call:
## lm(formula = Close_FB ~ Date + SMA10_FB + SMA50_FB, data = merged_stock)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -49.723  -8.894  -0.998   8.559  44.089
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.844e+03  5.343e+02  -5.323 2.73e-07 ***
## Date         1.476e-01  2.772e-02   5.326 2.69e-07 ***
## SMA10_FB     1.035e+00  3.954e-02  26.177  < 2e-16 ***
## SMA50_FB    -2.104e-01  4.698e-02  -4.480 1.26e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 14.34 on 200 degrees of freedom
##   (49 observations deleted due to missingness)
## Multiple R-squared:  0.9676, Adjusted R-squared:  0.9671
## F-statistic:  1989 on 3 and 200 DF,  p-value: < 2.2e-16
```

##Analysis and Findings In the regression analyses for Costco and Facebook, we see how their closing stock prices are influenced by time and Simple Moving Averages (SMA10 and SMA50). For Costco, the model explains about 98.44 percent of the variability in its closing price, with significant daily increases of approximately 0.495 dollars. The 10-day SMA shows a strong positive impact, indicating that for every 1 dollar increase, the stock price rises by about 0.981 dollars. However, the 50-day SMA shows a negative relationship, suggesting a decrease in price when long-term averages rises. Facebook's model similarily accounts for 96.76 percent of its price variability, with daily increases around 0.148 dollars and a 1 dollar increase in the 10-day SMA correlating with a price increase of about 1.035 dollars. But just like Costco, its long-term SMA negatively affects the stock price. Overall, both companies show an upward trend, with short-term SMAs indicating positive market performance. However, the negative impact of long-term averages raises some alarms/caution, suggesting that while recent trends may signal buying opportunities, investors should remain careful about potential changes in the market.