Facebook Investment Analysis

University of Toronto SCS - Data Analytics

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Motivation & Summary Slide

- To analyze Facebook stock to find any correlation and the relationship of its closing price and against the following instruments over a two year period(2017-2018):
  - Market Fear using CBOE VIX Data
  - Kaggle Employee's rating Reviews
  - US Effective Federal Funds Rate (Interest rate)
  - US Employment Rate
- The dataset and time period we used provided enough information for the team to draw some insightful information and draw a conclusions
- Our results were mixed with some of the instruments showing a relationship with Facebook stock and others not having a clear and consistent relationship.

Questions & Data

- Should we analyze a single stock or the whole market
- What type of Data Sets to use (Daily, Monthly, Yearly)?
- What time period of analysis is required to provide adequate observations(1yr, 2yrs, 3yrs)?
- Should we used CSV data or Json data pull?
- How should we visually represent the data (line, bar, scatter)?
- Where should we grab our datasets source from, is it reliable, up to date, accurate, extensive?

Data Cleanup & Exploration

- Merged stock data with each independent variable being analyzed using the date as the combining parameter
- Converted daily stock data into the monthly average when analyzing the employment and interest rates since those rates are calculated monthly
- Utilized “groupby” function to create a ‘MM-YYYY’ column to merge data frames
- Merged on inner to grab 1st of the month data points for every month over a two year period.
- Created combined dataframes of the multiple csv data
- Confirm data sets does not have any missing values

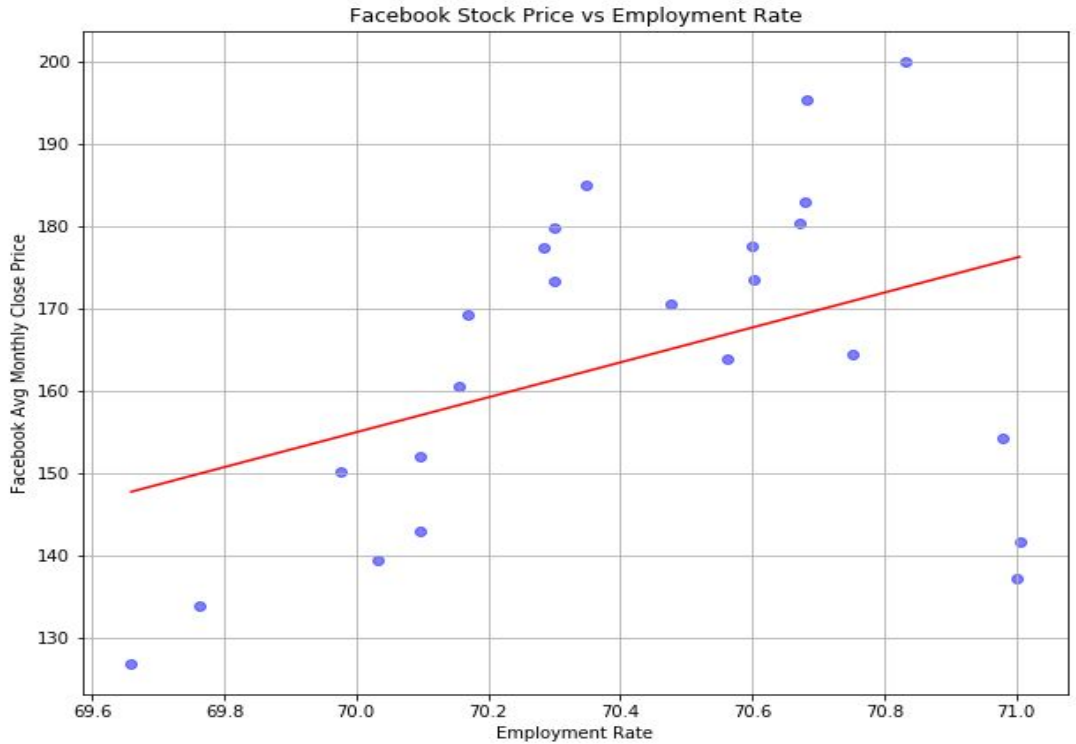
Data ANalytics

- Calculated the monthly stock closing price by calculating the average of the daily closing price for each month
- Joined the feature value data(market fear,employee reviews,employment rate & interest rate)` and the stock closing price data on the month date
- Gathered x and y coordinates to plot data points using dataframes and independent variable to show relationship
- Added a line of best fit on the scatter plot to clarify relationship between variables
- Use linear regression analysis to predict the value of “x” based on the value of “y”
- Use Matplot multiple “y” axis plotting for better relationship visualization

Breakdown of ANalysis by FActors- Employment Rate

- Analyzed if there's a relationship between employment rate and the stock average stock closing price
- Used a scatter plot to visualize the relationship between the variables and used a line of best fit which shows a positive correlation between the variables
- Stock price decreased from oct- dec 2018 other factors where in play: such as company news and performance
- We could possibly run another analysis which controls the "company news" variable to improve the efficacy of our hypothesis

Employment Rate vs Facebook Price - Visualization

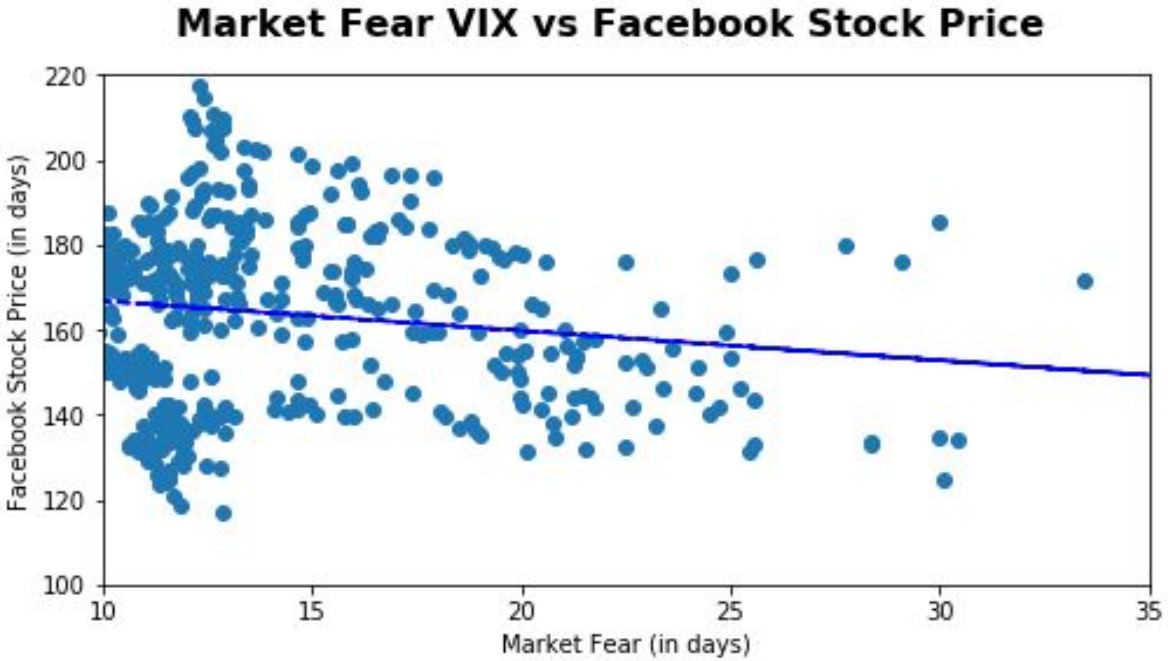


Market Fear

- Introduced in 1993 by the “Chicago Board Options Exchange® (CBOE®)”. The CBOE Volatility Index®, VIX®, is the benchmark for stock market volatility.
- VIX is often referred to as the “investor fear gauge”
- VIX is based on S&P 500 index option prices
- Market fear analysis was done using Scatter plot with line regression and Matplot multiple “y” axis plotting.
- Scatter plot with line regression did not provide any meaningful information to draw meaningful conclusion
- Matplot dual “y” axis plotting did provide clear correlation and relationship

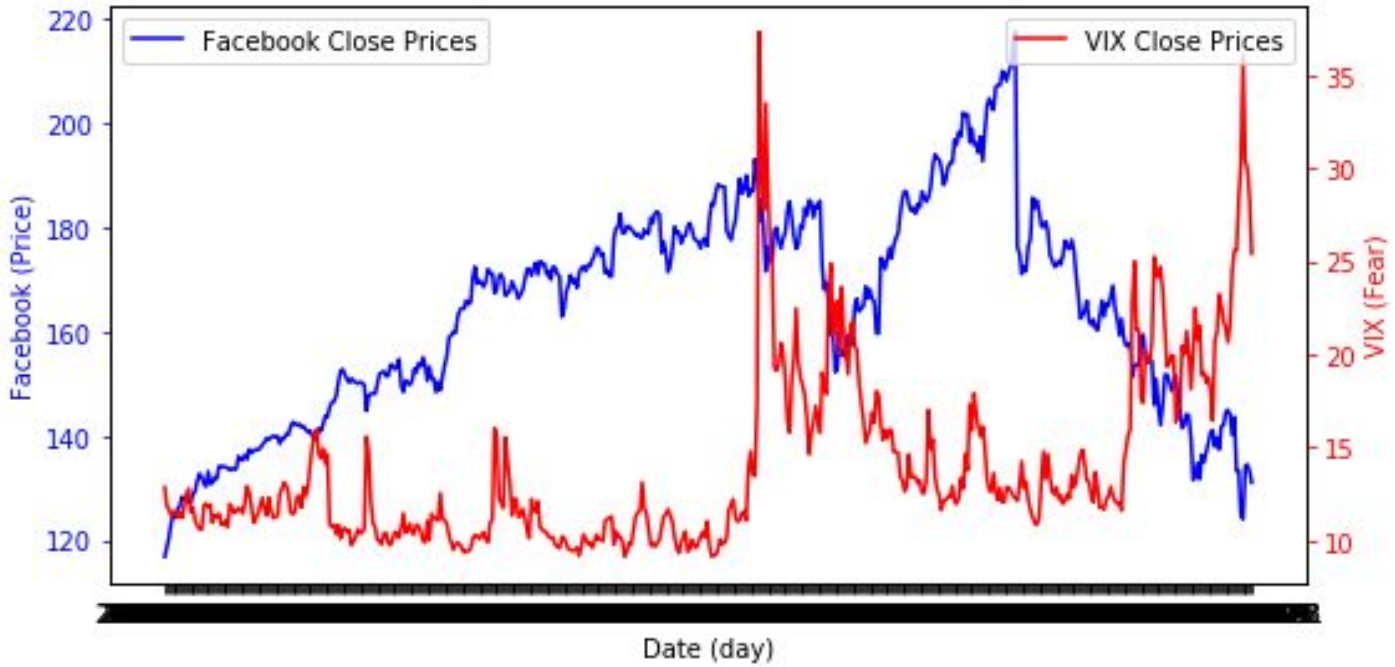
VIX Index vs Facebook Price - Visualization

Scatter plot with line regression



VIX Index vs Facebook Price - Visualization

Matplot dual "y" axis plotting

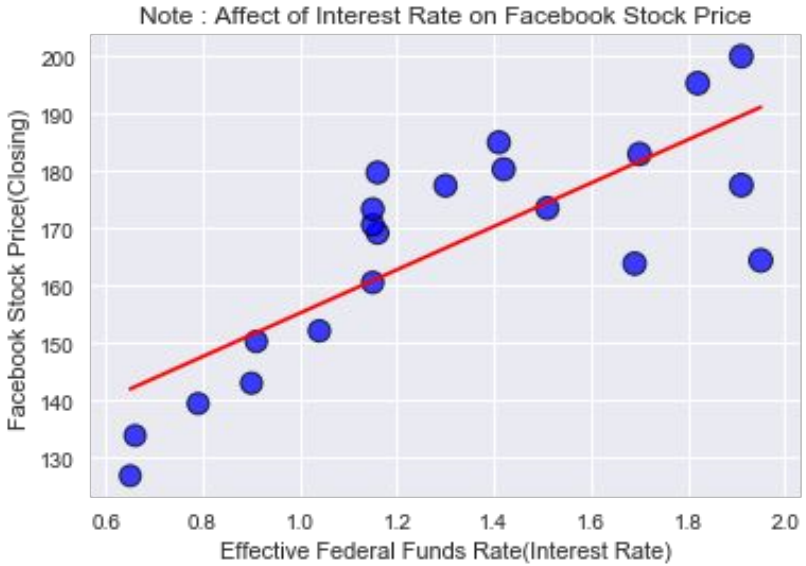


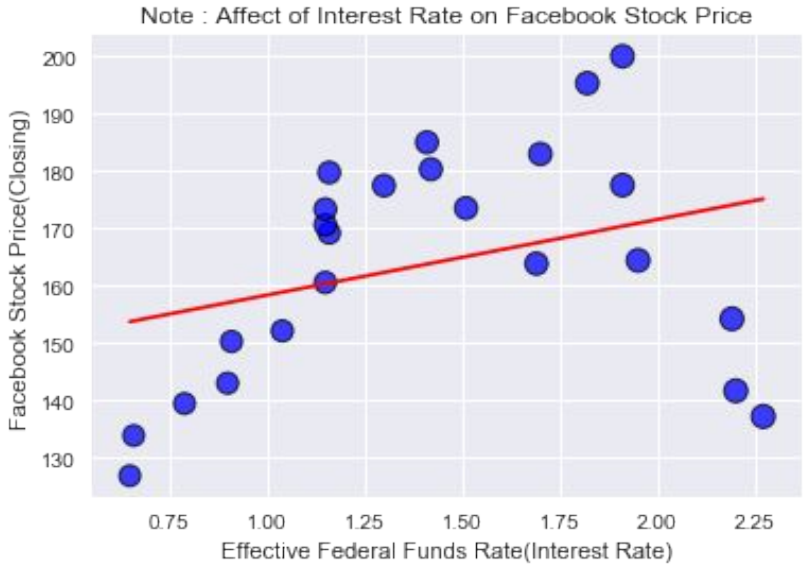
Interest Rate(effective federal funds rate)

Hypothesis: The interest rate has a strong impact on stock price. Changes in the interest will cause a corresponding change in Facebook stock price. If interest rate goes up then so will Facebook stock price.

-The interest rate mostly grew steadily month over month for the time period that was analyzed and Facebook stock price experienced both rises and falls over that period.

Interest Rate Continued





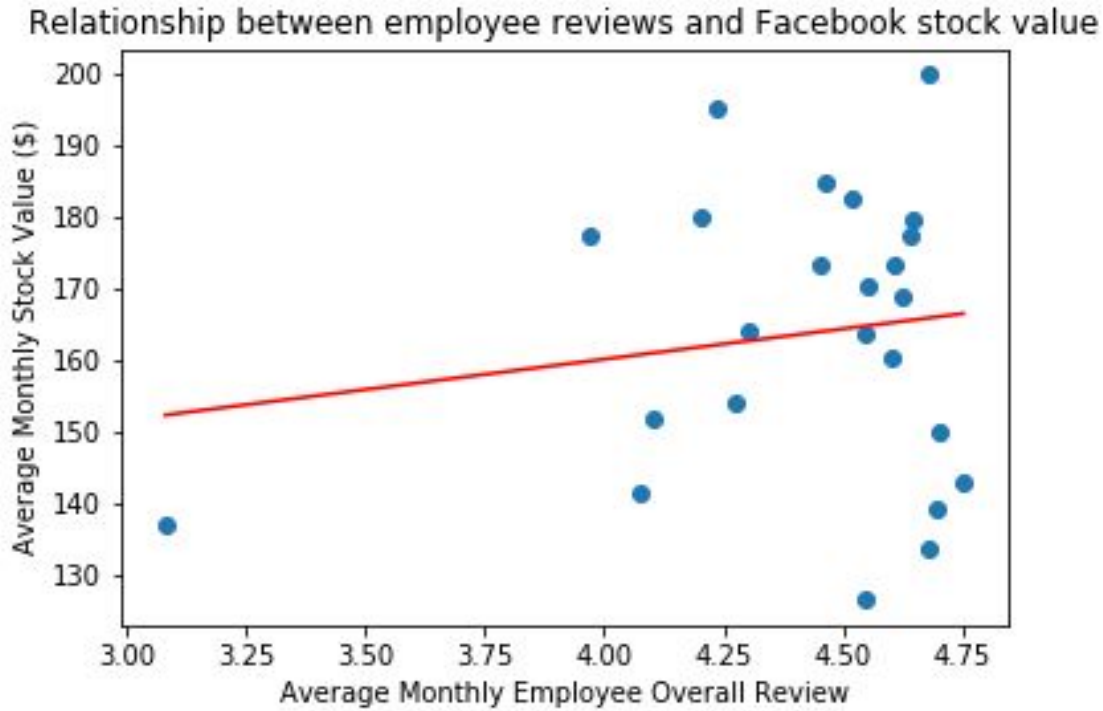
Employee Reviews

Hypothesis: There is a direct relationship between the overall Facebook employee rating review and the Facebook stock price.

Employee Reviews from Kaggle Data scraped from Glassdoor:

- 67,529 reviews from Amazon, Microsoft, Apple, Google, Facebook and Netflix
- 1,590 reviews from Jun 14,2008 - Dec 11, 2018
- 634 reviews in 2017 - 2018.

Employee Reviews vs Facebook Price - Visualization



CONCLUSIONS

- There are various factors that could influence stock price and we wanted to analyze a few to identify relationships and possible patterns
- Using stock data for one company does not truly represent the overall market. In the case of Facebook, there was market noise which in turn causes impact it’s stock value.
- Using a bigger data sample such as a company listed in the S&P500 index would provide more data points and a more nuanced relationship between variables
- Using advanced tools such as machine learning to filter data which can be tailored for specific purposes would help refined the data points as well.

Questions