COVID-19's Impact on the Stock Market

Alexander Daou, Uliks Sekiraqa, JingTing Yan, Samuel Bedeau, Akshara Ayyadurai

Introduction

- Data pertaining to the stock of eight high-performing financial firms across the UK and USA has been gathered through the Alpha Vantage API.

- Data pertaining to eight major stock indices across the globe has been gathered through yfinance.

- Data pertaining to Twitter sentiment analysis has been gathered through the GetOldTweets3 API.

- Pandas and Matplotlib are used to analyse and visualise the stock-related data gathered as line graphs, comparing the various stocks and indices over time. The Twitter sentiment data is visualised as a bar chart, for positive and negative reactions over time.

Financial Firm Stocks

- **Goal: Illustrate how the COVID-19 affected top financial firms in US and UK stock market.**

4 from US:
JP Morgan
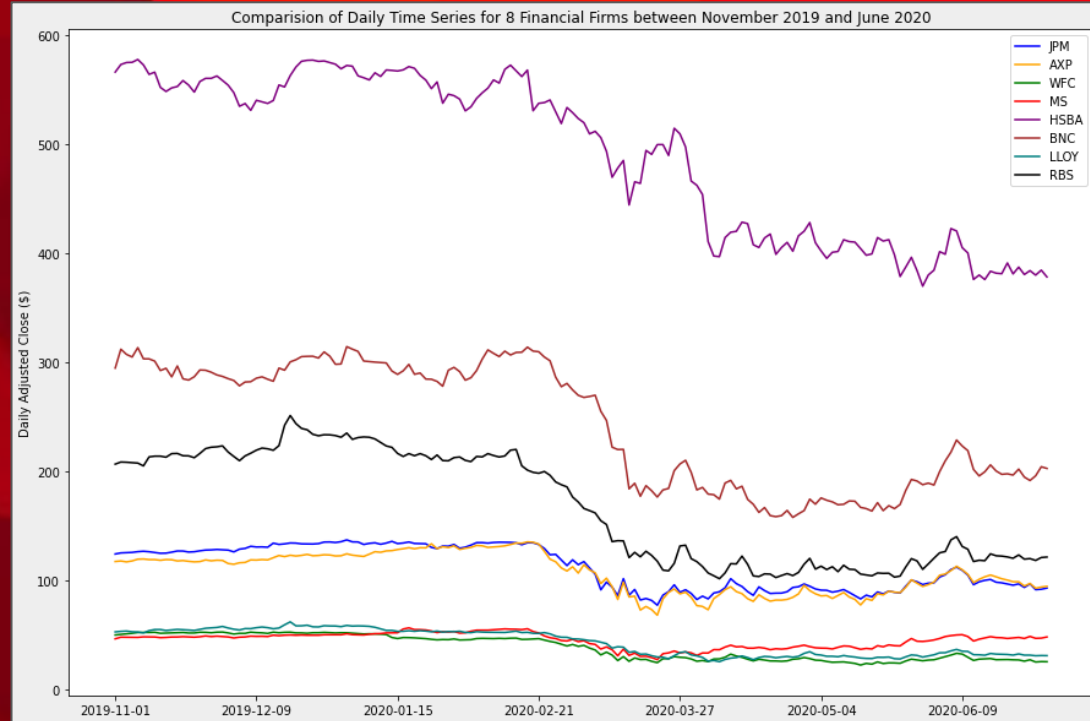American Express
Wells Fargo
Morgan Stanley

4 from UK:
HSBA
Banco Santander
Lloyds Banking
Royal Bank of Scotland

Data Collection
Fetched real-time and historical stock prices from AlphaVantage API.

Data Analysis & Visualisation

Comparision of Daily Time Series for 8 Financial Firms between November 2019 and June 2020

Stock Indices (Yahoo Finance)

- **Goal: See trends with the stocks closing price throughout this year.**

Reading data through Web Scraping

Data Cleaning

Operated on the data

Created graphs to visually see relationships

Conclusion on data

8 Stock Indices: NASDAQ, DOW JONES, S&P500, FTSE100, NIKKEI 225, DAX, EURO STOXX, SSE

	Open	High	Low	Close	Volume	Dividends	Stock Splits
Date							
2019-07-16	7531.7	7590.1	7524.5	7577.2	607182100	0	0
2019-07-17	7577.2	7577.2	7519.2	7535.5	576654300	0	0
2019-07-18	7535.5	7535.5	7482.6	7493.1	504046800	0	0
2019-07-19	7493.1	7546.7	7475.5	7508.7	575615700	0	0
2019-07-22	7508.7	7549.7	7491.8	7514.9	513122700	0	0

We only wanted the values from the 'Close' column

	Close
Date	
2019-07-16	7577.2
2019-07-17	7535.5
2019-07-18	7493.1
2019-07-19	7508.7
2019-07-22	7514.9

Data Loading

STOCK INDEX DATA

PIP install yfinance

Import yfinance

Ticker module

eg.
`yf.Ticker(“MSFT”).history(period=“1y”)`

COVID DATA

Import Pandas

read_csv module

Reading the url of data from WHO

eg.
`pd.read_csv("https://covid19.who.int/data.csv")`

Data Cleaning

1. Checking for Nan values using isnull()

1. Checking for Duplicate Records using duplicated()

1. Dropping the duplicate records using drop_duplicates()

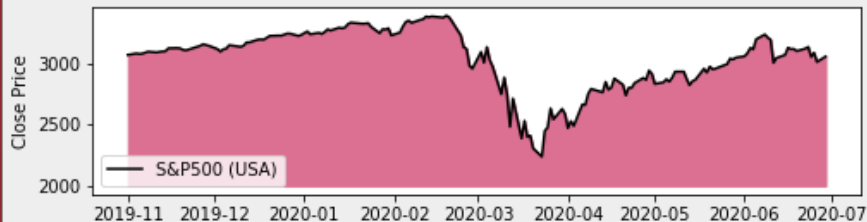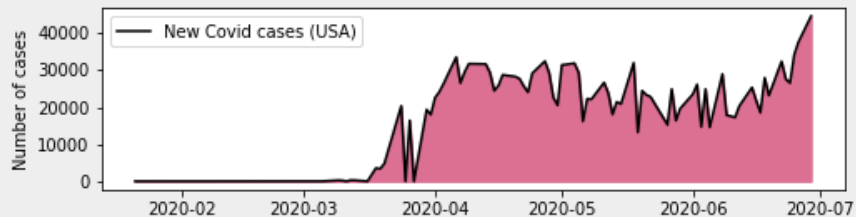1. Replacing negative values in No. of cases column of covid data to 0.

```
Number of records before and after dropping the duplicates
-------------------------------------------------------------
Before (dowjones): 254
After (dowjones): 253
Before (ftse): 255
After (ftse): 252
Before (SSE): 243
After (SSE): 240
```
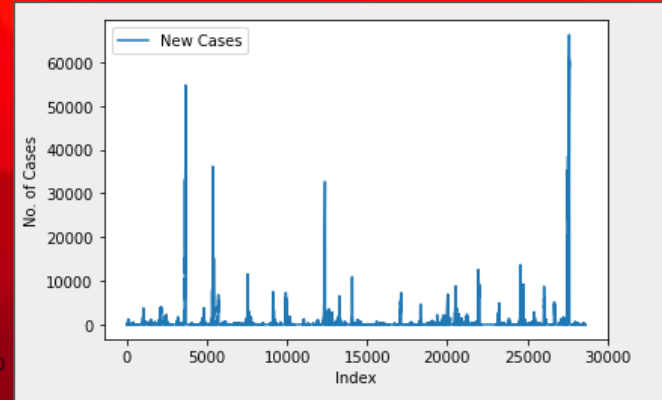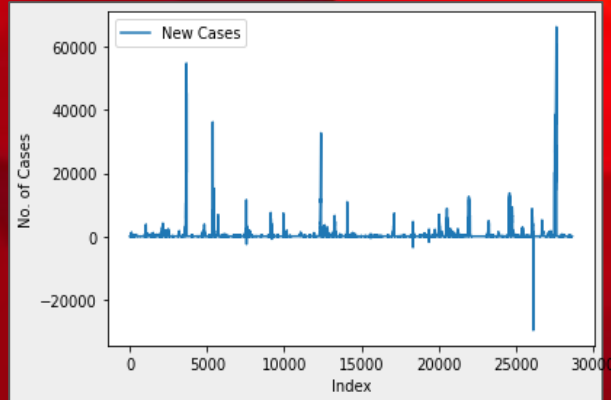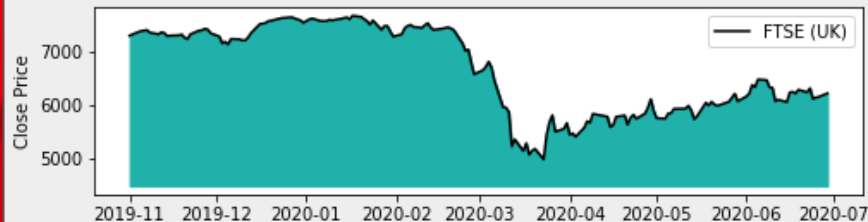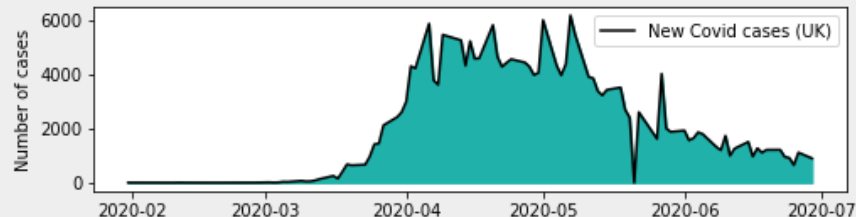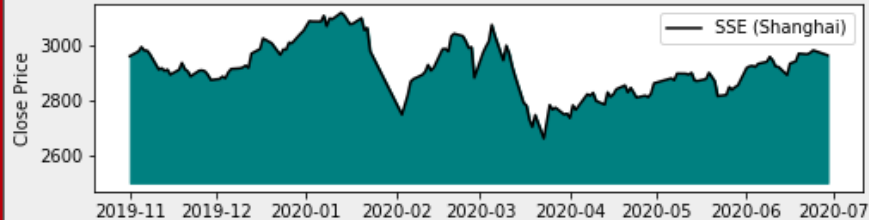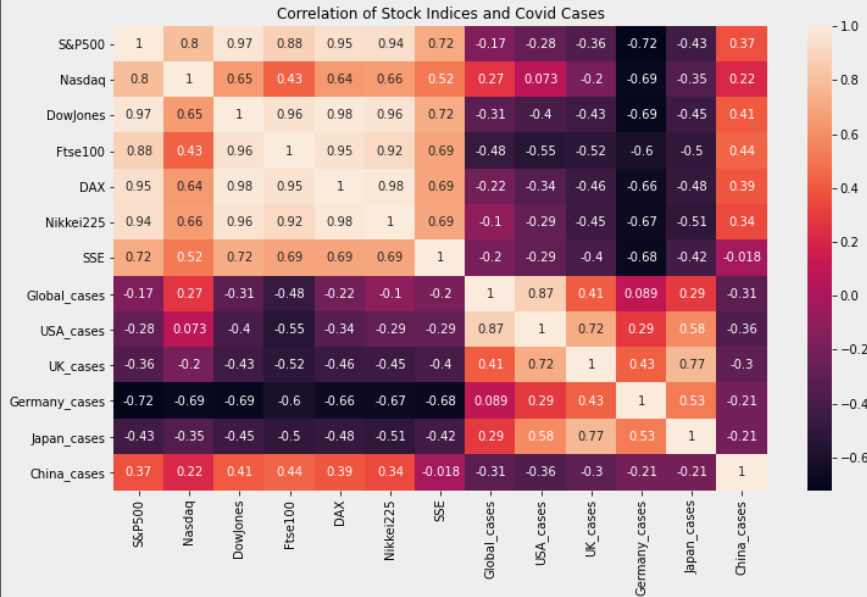
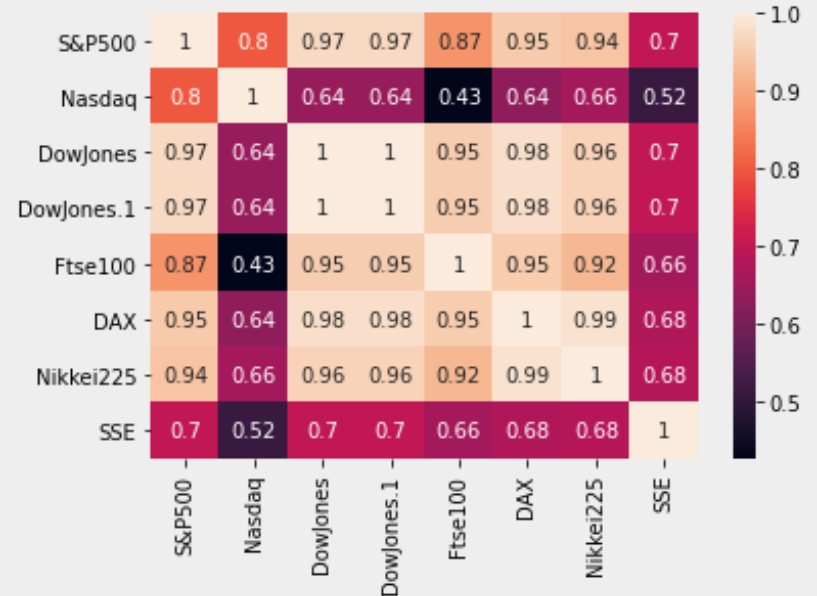# Data Visualization - Covid vs Stock

Data Visualization
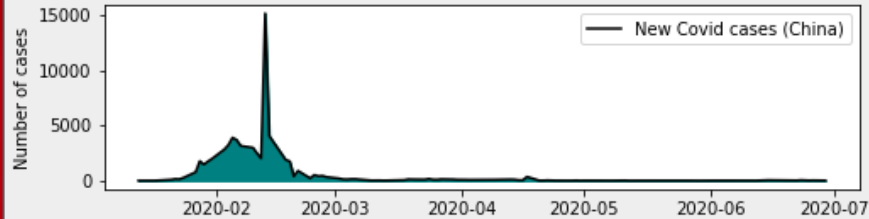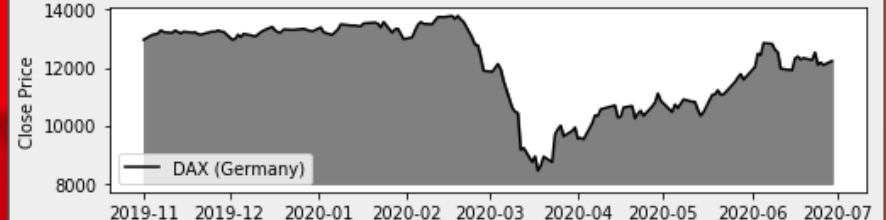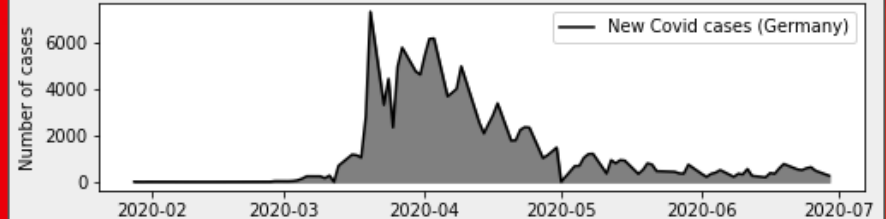
Correlation

Stock Indices and Covid Cases

Among Stock Indices
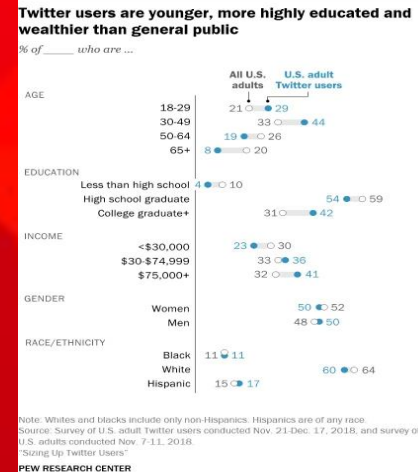
Twitter Sentiment Analysis

- **Goal: Analyse the public moods toward COVID-19 from Feb 2020 to Jun 2020, and see if there are any correlations between public moods and stock market conditions.**

Benefits of sentiment analysis:
- Provides an understanding of the general public's feelings - 330 million users as of April 2019.
- As shown in the graphic below, the average Twitter user being highly educated and more wealthy provides us with a more representative sample of people that could be involved in investment and trading

Limitations with sentiment analysis:
- Nuance is missed (sarcasm/ironic tweets can be misinterpreted)
- Data samples - limited to tweets from certain regions/areas, as well as timescale.
- Is still a new part of data science, so exploration into the field is still shallow - thus limited access to fully functional APIs

Twitter users are younger, more highly educated and wealthier than general public

% of _____ who are ...

	All U.S. adults	U.S. adult Twitter users
AGE		
18-29	21	29
30-49	33	44
50-64	19	26
65+	8	20
EDUCATION		
Less than high school	4	10
High school graduate	54	59
College graduate+	31	42
INCOME		
<$30,000	23	30
$30-$74,999	33	36
$75,000+	32	41
GENDER		
Women	50	52
Men	48	50
RACE/ETHNICITY		
Black	11	11
White	60	64
Hispanic	15	17

Note: Whites and blacks include only non-Hispanics. Hispanics are of any race.
Source: Survey of U.S. adult Twitter users conducted Nov. 21-Dec. 17, 2018, and survey of U.S. adults conducted Nov. 7-11, 2018.
"Sizing Up Twitter Users".

PEW RESEARCH CENTER

Twitter Sentiment Analysis

Process:
- Train a text classification model using the Sentiment140 dataset
  1. Load & explore the dataset
  2. Text preprocessing
  3. Split train and test dataset
  4. Tokenization
  5. Label encoding
  6. Word embedding using Word2Vec
  7. Sequence model training using LSTM
  8. Evaluation
- Predict the sentiment of COVID-19 tweets
  1. Tweets extraction using GetOldTweets3
  2. Text cleaning
  3. Sentiment prediction
  4. Visualise the results

Criteria: keyword = **COVID**, location = **New York**, max tweets per day = **1000**

Analysed **32,856** tweets in total.
The model has **78.84%** accuracy, **44.95%** loss.

Sentiment Analysis for Tweets between Feb 2020 and Jun 2020
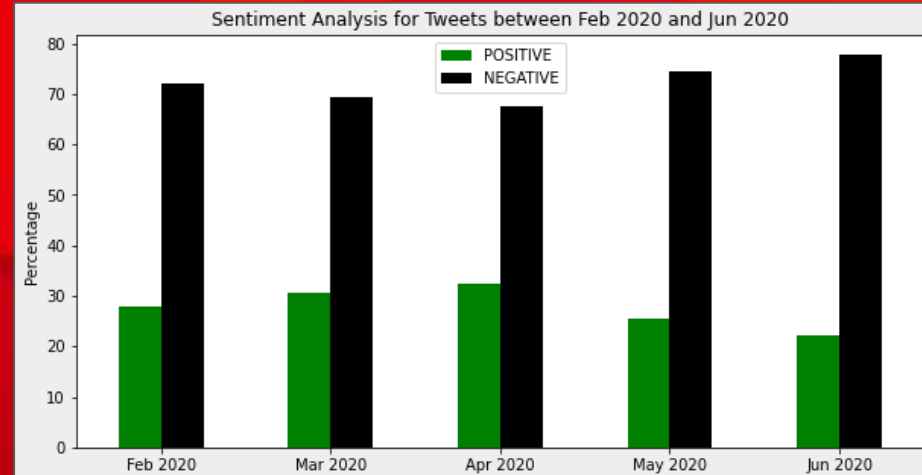
Causation

- Brought on by the pandemic's uncertainty, stock indices plummeted as a result of traders panic-selling. The S&P 500 circuit breaker was triggered four times in March alone, on the 9th, 12th, 16th, and 18th.

- Central banks in many countries slashed interest rates in response to this. The Bank of England did so in mid-March, making borrowing cheaper and encouraging spending to boost the economy.

- The pandemic has also indirectly caused stock values to suffer, by altering the world population's lifestyle. With most individuals remaining indoors, oil stock has tanked as many are no longer driving. The commercial airline industry has been impacted severely, with heavy hitters such as EasyJet completely dropping off the FTSE 100 index after all flights were cancelled.

Conclusion
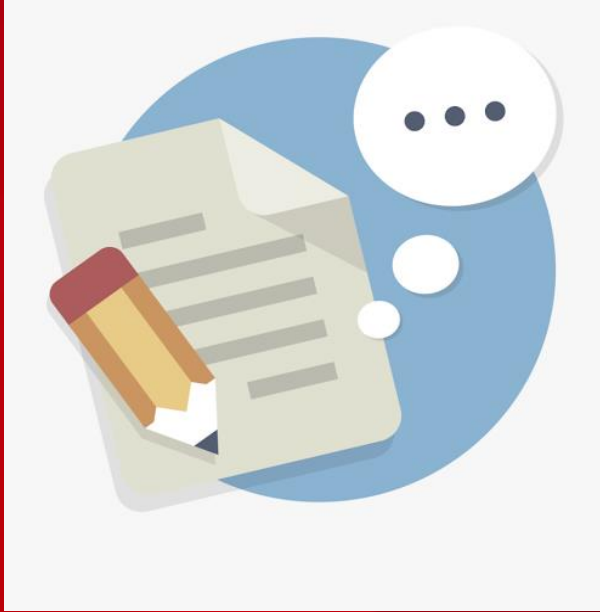
Future Works:

Comparison of Foreign Exchange Market and GDP with Covid and Stock Exchange

References

- **Mad March: how the stock market is being hit by COVID-19**
  https://www.weforum.org/agenda/2020/03/stock-market-volatility-coronavirus/
- **Coronavirus: A visual guide to the economic impact**
  https://www.bbc.co.uk/news/business-51706225
- **Coronavirus impact to push Carnival and easyJet out of FTSE 100**
  https://www.theguardian.com/business/2020/jun/02/coronavirus-impact-to-push-carnival-and-easyjet-out-of-ftse-100
- **Coronavirus: EasyJet falls out of the FTSE 100 after outbreak hits its market value**
  https://news.sky.com/story/coronavirus-easyjet-falls-out-of-the-ftse-100-after-outbreak-hits-its-market-value-11999900
- **Q1 2019 Earnings Report - Non-GAAP Financial Measures**
  https://s22.q4cdn.com/826641620/files/doc_financials/2019/q1/Q1-2019-Slide-Presentation.pdf
- **What can trends in hospital deaths from COVID-19 tell us about the progress and peak of the pandemic? An analysis of death counts from England announced up to 25 April 2020**
  https://www.medrxiv.org/content/10.1101/2020.04.21.20073049v2
- **Sentiment140 dataset with 1.6 million tweets**
  https://www.kaggle.com/kazanova/sentiment140
- **NLP Beginner - Text Classification using LSTM**
  https://www.kaggle.com/arunrk7/nlp-beginner-text-classification-using-lstm
- **Twitter Sentiment Analysis**
  https://www.kaggle.com/paolorinamonti/twitter-sentiment-analysis

Contributions

- Project Outline: Alex

- Financial Firm Stocks: JingTing, Uliks, Alex

- Stock Indices: Akshara, Sam

- Twitter Sentiment: Uliks, JingTing

- Causation: Alex, Akshara

GitHub: https://github.com/UliksSekiraqa/StockMarketAnalysis