Stocks vs COVID19

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Question 1: Which market showed largest volatility as the virus spread?

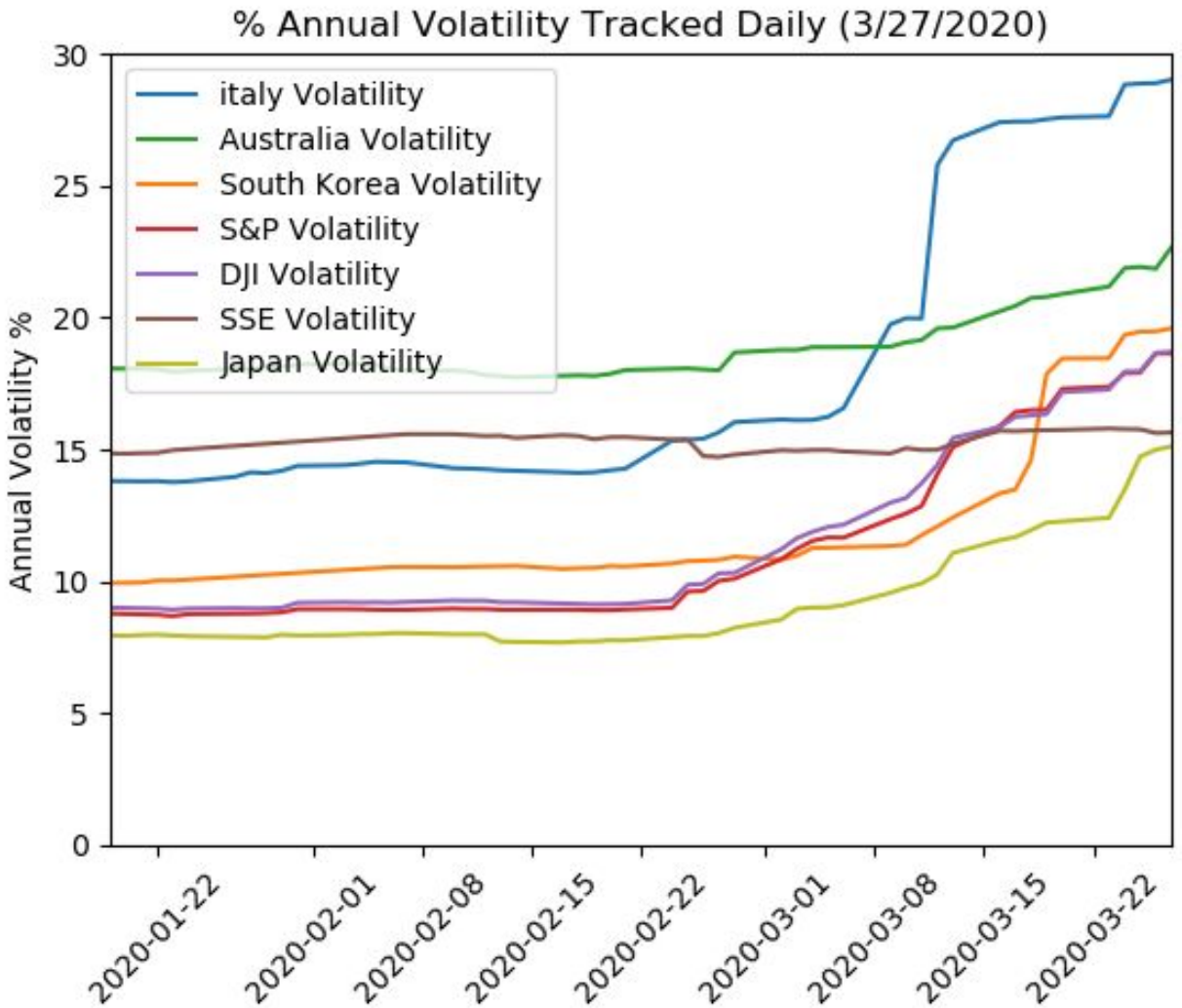
1. Motivation: To track the volatility through confirmed COVID19 cases and recovered cases discover a trend as each country encounters COVID19.
2. Data Sources
    a. Yahoo Finance API (Rapid API)
    b. Investing.com (Italy Stock Data)
    c. John Hopkins (COVID 19 Data)
3. Cleaning and Challenges
    a. Comparing unix timestamp data to string format dates
        i. Incorporated Datetime objects
    b. Calculating moving Volatility.
        i. Each country had a unique number of trading days

$$Annual\ Volatility = \sqrt{Trading\ Days} \cdot \sqrt{Variance}$$

$$Annual\ Volatility = \sqrt{Trading\ Days} \cdot (Std\ Dev)$$

```
1
2  volatile_yr_avg = []
3  yearlyGroups = []
4
5  for i in range(0,len(italy_df['Date'])):
6      try:
7          cond1 = italy_df['Date']<=italy_df['Date'][i]
8          cond2 = (pd.Series(italy_df['Date']>=(italy_df['Date'][i]-datetime.timedelta(days = 365))))
9          df = italy_df[cond1 & cond2]
10         #print('working')
11         if len(df)>251:  #avoids sets less than a full year
12             volatile_yr_avg.append(df.std()['Change %']*math.sqrt(252))
13             yearlyGroups.append(italy_df['Date'][i])
14
15     except:
16         print('Error Found')
17 volatile_italy_dict = {"Date":yearlyGroups,
18                     "Annual Volatility":volatile_yr_avg
19                     }
20 volatile_italy_df = pd.DataFrame(volatile_italy_dict)
21 volatile_italy_df.to_csv("cleaned_dataframes/volatile_italy_df.csv")
22 volatile_italy_df.head()
```

Question 1: Which market showed largest volatility as the virus spread?



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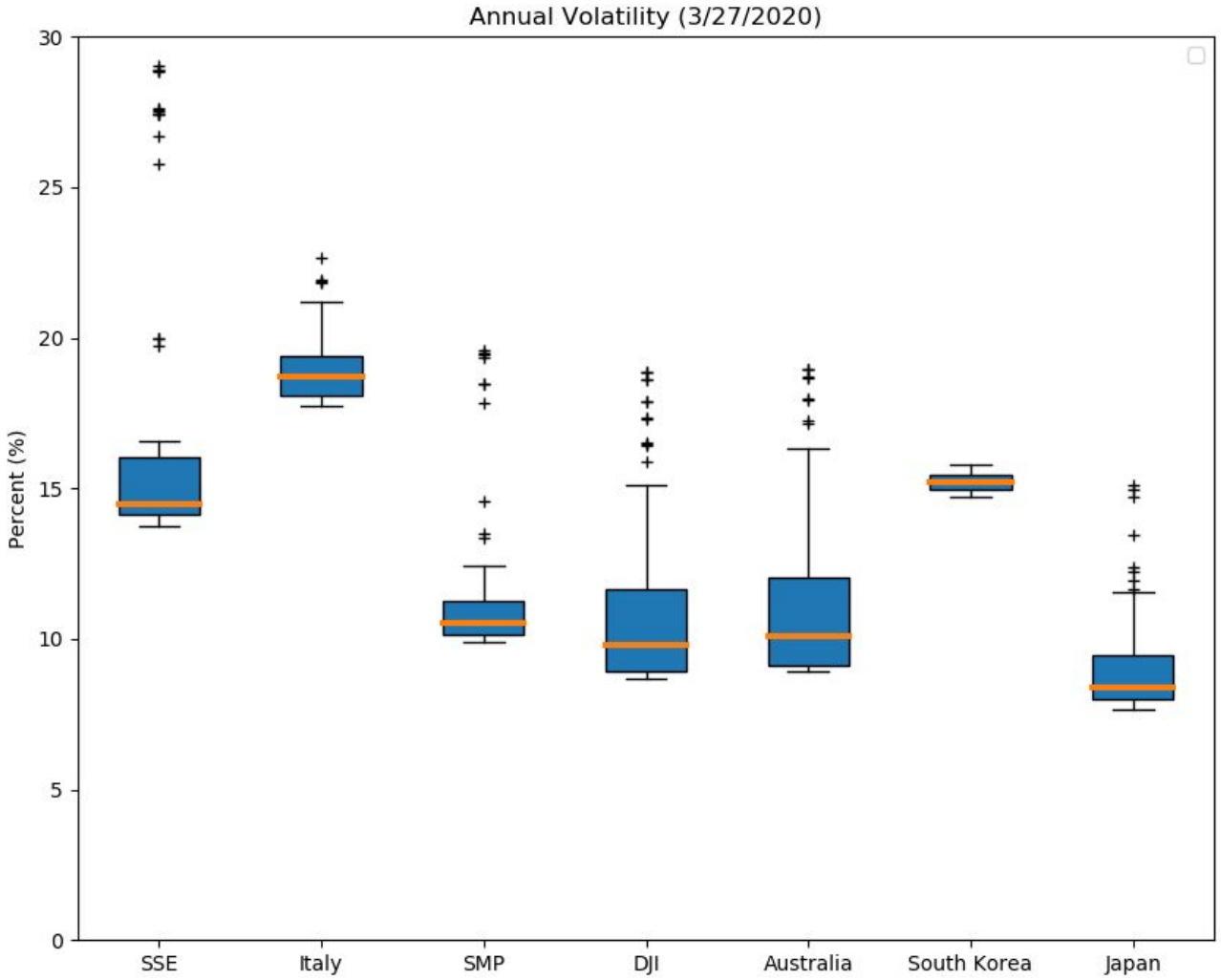
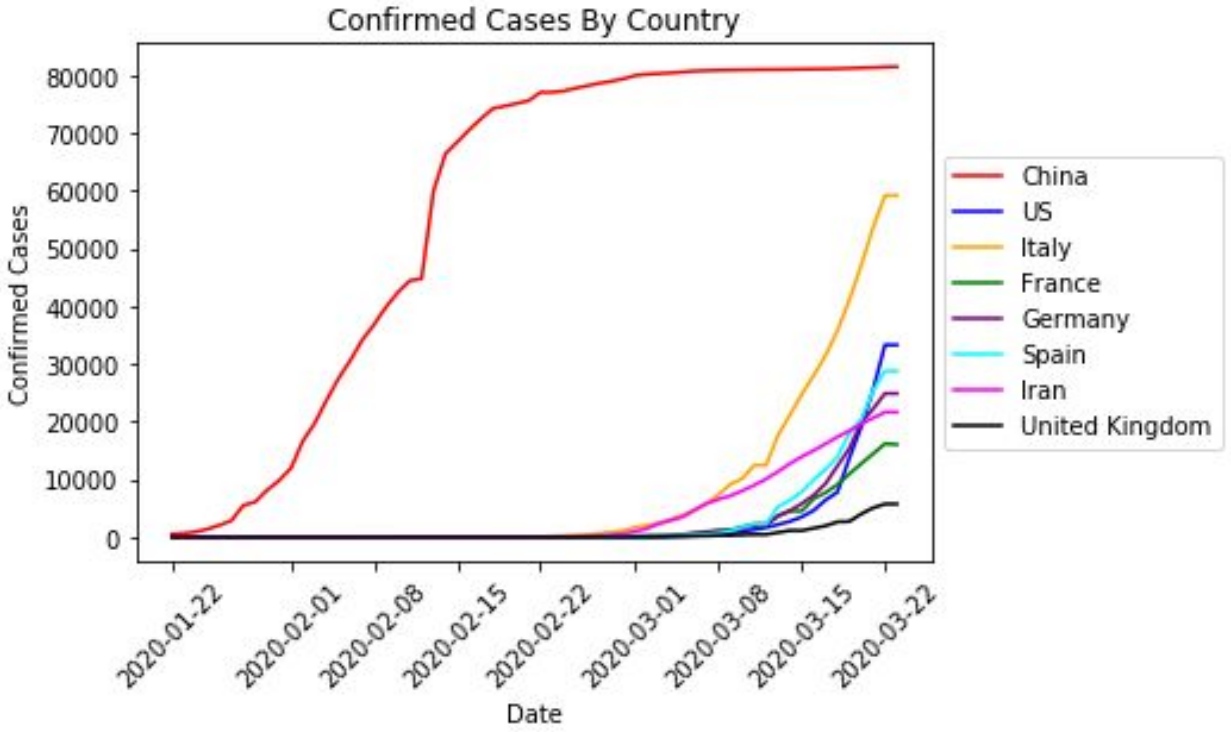


Question 1: Which market showed largest volatility as the virus spread?

1. Conclusions:
   a. FTSE Italia All Share(FTITLMS) showed the highest volatility of selected markets
   b. S&P500 and Dow Jones Index behaved similarly
   c. China's SSE has a relatively flat volatility (**pvalue=4.67e-11** after Min-Max Scaling)
2. Limitations:
   a. The spread of COVID 19 is still on an exponential growth path and it's too early to see the data for recovered Covid 19 patients.
   b. Limited study to selected markets with high numbers of confirmed COVID19 or high correlation to US markets.

Question 2: Did the COVID-19 infection rate of certain countries have a larger impact on markets than others?

Motivation: Understanding this may allow us to better predict how markets will react to large scale global events like this in the future.



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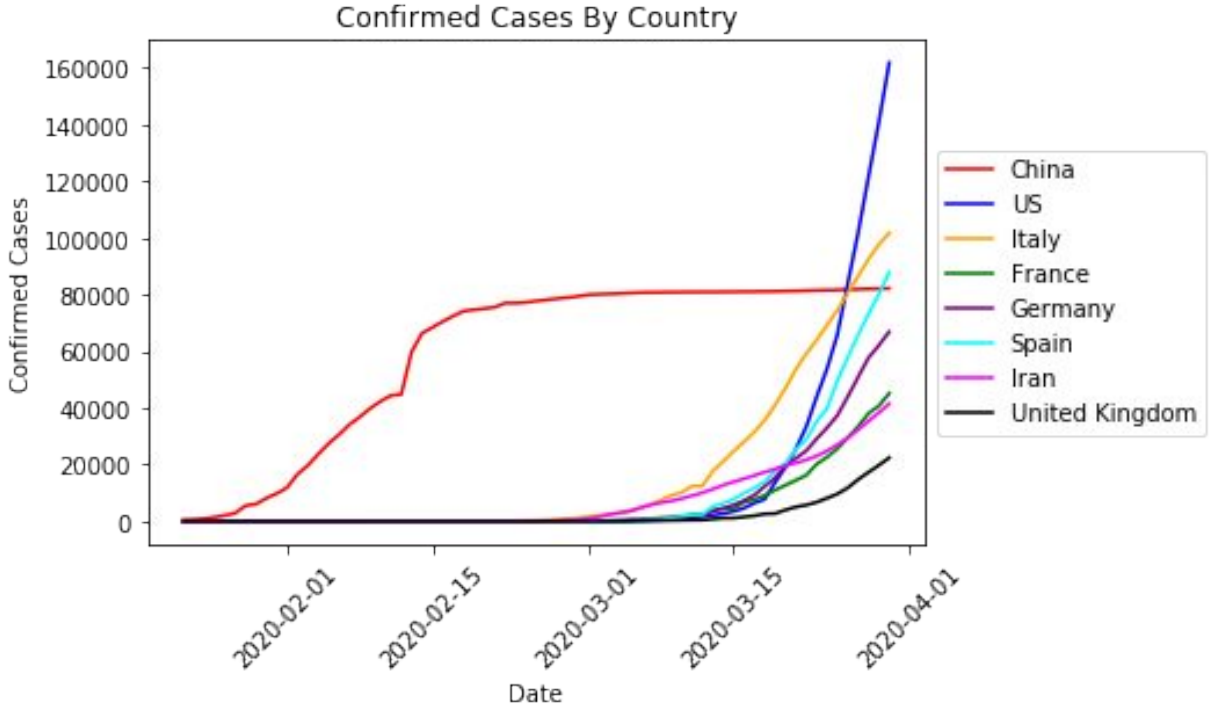

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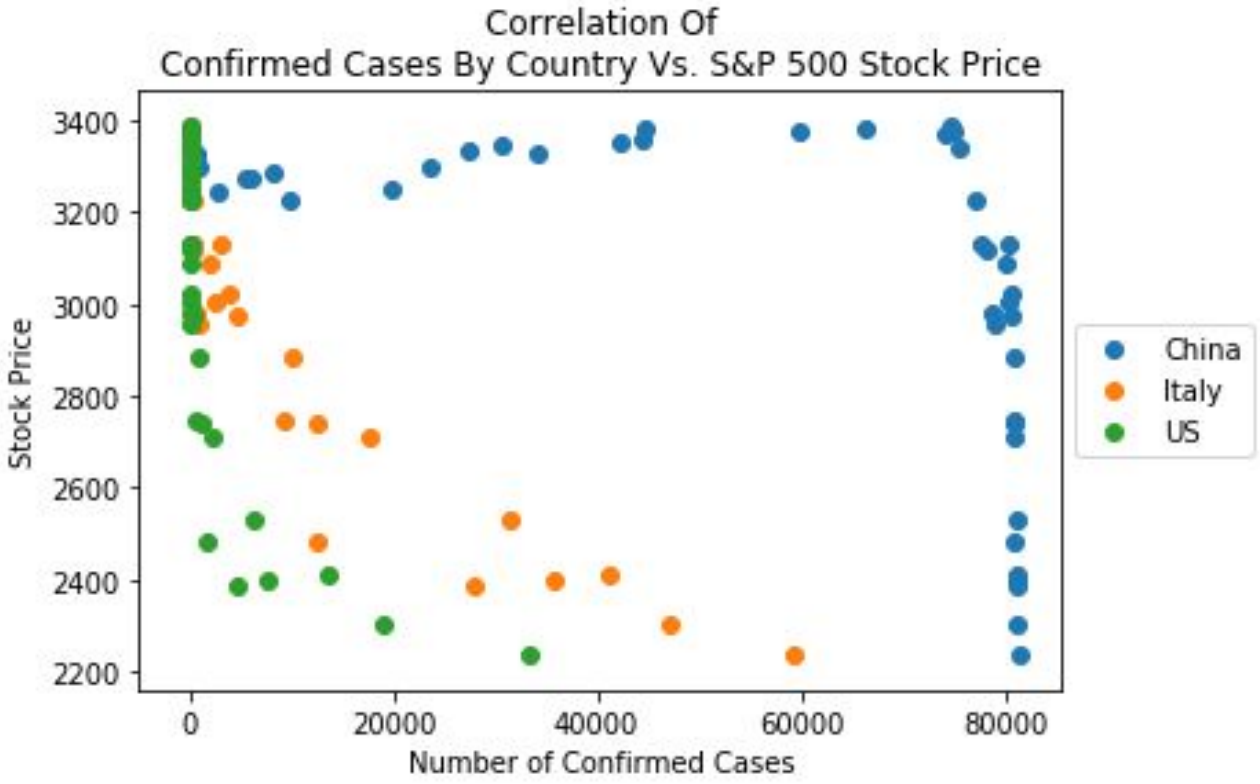
Question 2: Did the COVID-19 infection rate of certain countries have a larger impact on markets than others?

Absolute Value of r	Strength of Correlation
$r < 0.3$	None or very weak
$0.3 \leq r < 0.5$	Weak
$0.5 \leq r < 0.7$	Moderate
$r \geq 0.7$	Strong

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Correlation Coefficient By Country:
China: -0.56
Italy: -0.9
US: -0.71
```

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Country	S&P Death Correlation	S&P Confirm Correlation
Korea, South	-0.90	-0.94
Qatar	-0.15	-0.88
Japan	-0.87	-0.88
Bahrain	-0.63	-0.87
San Marino	-0.78	-0.86
Iran	-0.80	-0.83
Brunei	-0.15	-0.80
West Bank and Gaza	-0.29	-0.80
Denmark	-0.51	-0.80

Conclusions

China's rapid growth in infections did not have as strong of an impact as other countries in terms of the way the stock market reacted.

Limitations

- Dates of impactful countries infection rates can potentially skew data for less important ones.
- Data is constantly updating and changing

Question 3: Were countries' financial markets impacted more by cases in their country or global cases?

- Motivation: The goal of this question is to provide insight into how the spread and containment of the virus will impact global markets.
    - Focus Countries: South Korea, China, Italy & US.
- Data Sources:
    - Yahoo Finance API
    - Investing.com (Italy Finance Data)
    - Johns Hopkins (COVID 19 Data)
- Cleaning and Challenges:
    - One of our largest challenges was formatting, unix vs datetime.
        - Data sources are updated daily.
    - Figuring out if there a delay from cases being reported to markets responding
    - Also deciphering if it is local cases disrupting markets or global cases hitting critical levels.

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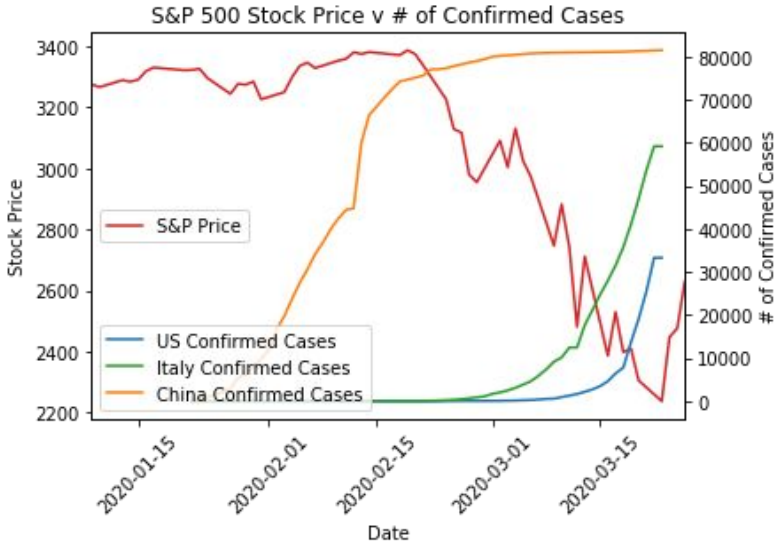
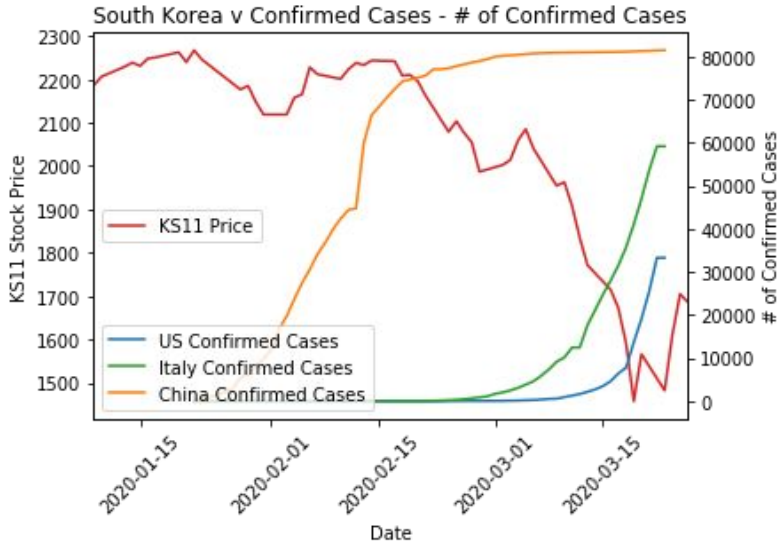
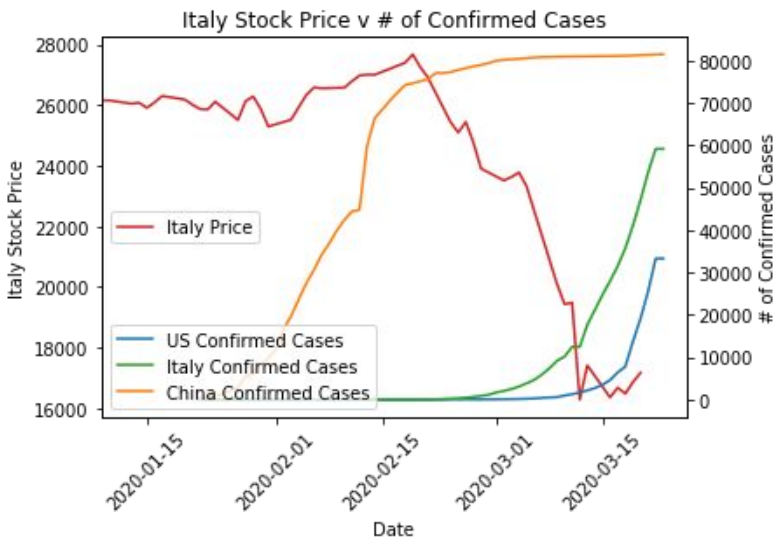
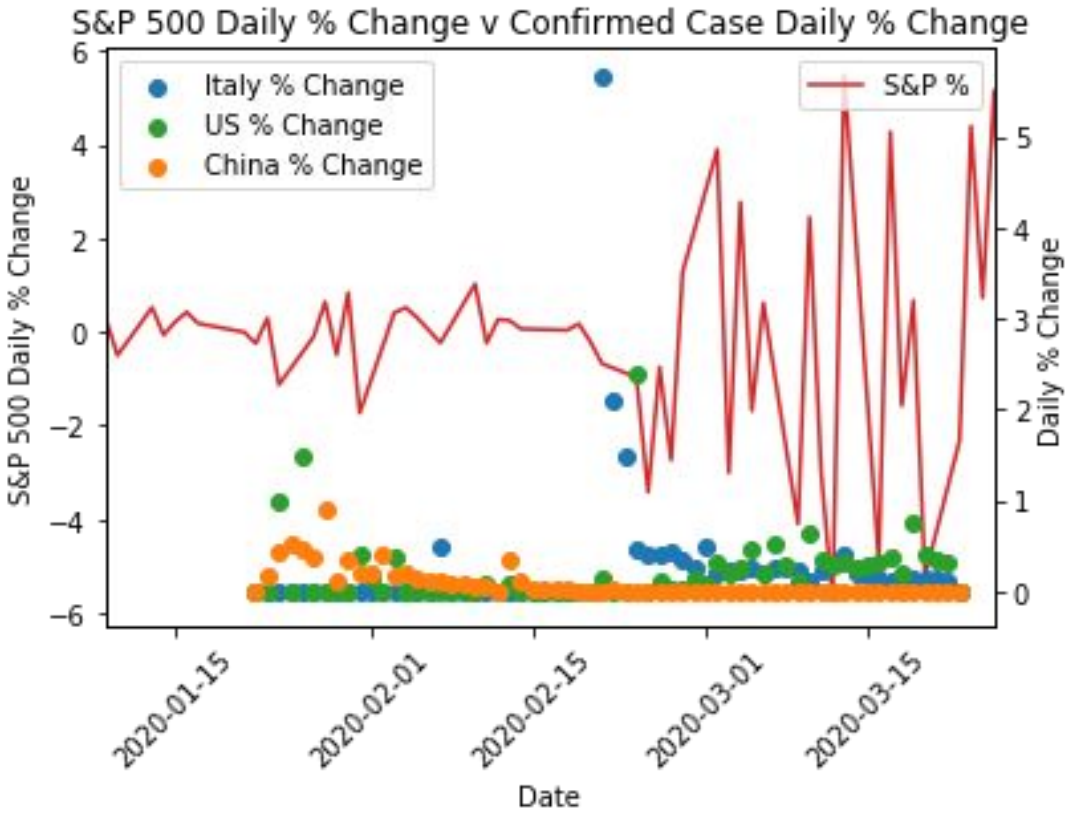


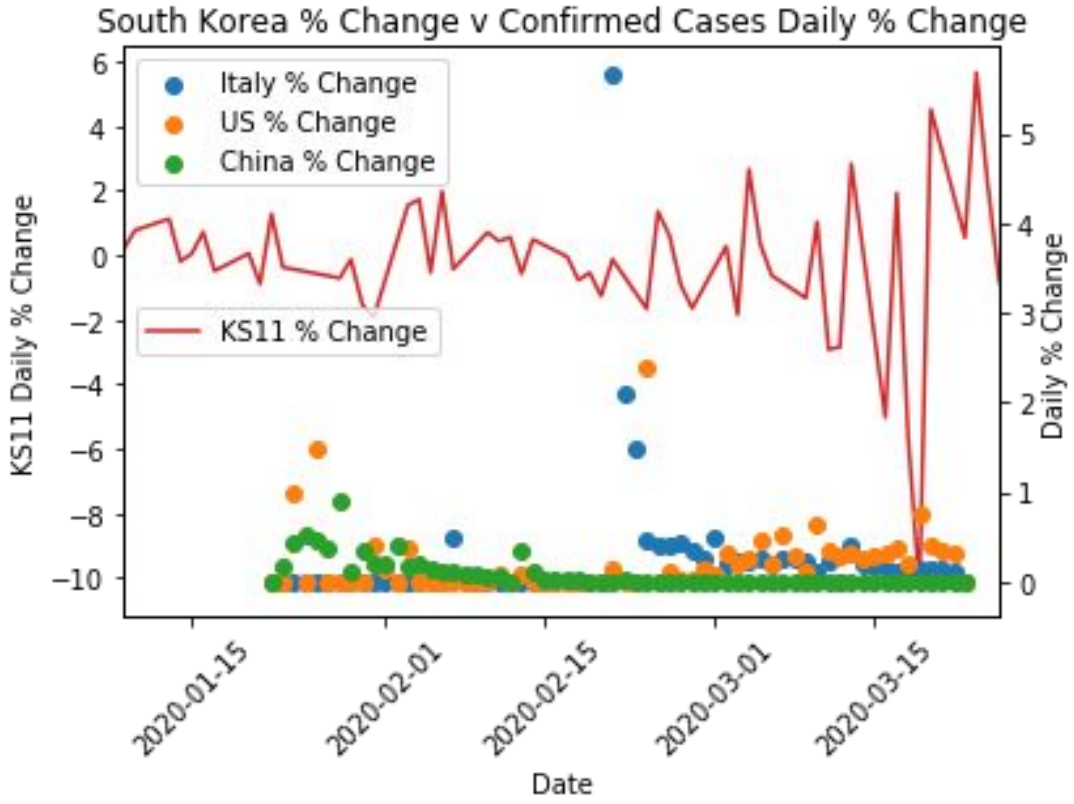




The charts above show the Index fund of the 3 countries most commonly reported in the news, in regards to COVID19 cases, in conjunction with the number of cases reported by each country.

Question 3: Where countries' financial markets impacted more by cases in their country or global cases?





Question 3: Were countries' financial markets impacted more by cases in their country or global cases?

- Conclusions:
  - The S&P500 appeared to react relatively balanced between global and US cases. It experienced large percent changes when Italian cases surged, implying that the global scale of virus spread drove fear in the market.
    - There have also been increased signs of volatility as US cases have grown and there has been little to mitigate spread.
  - South Korea's market has shown more stability through the global spread of the virus, until recently when they showed increased signs of volatility.
    - South Korea's market did not experience large daily changes even as cases surged globally.

- Limitations:
  - We are still early in the spread and containment of the virus, challenges understanding how recoveries will impact markets.
  - Not enough historical data to do a time series model to understand how new cases, recoveries and deaths will drive markets.

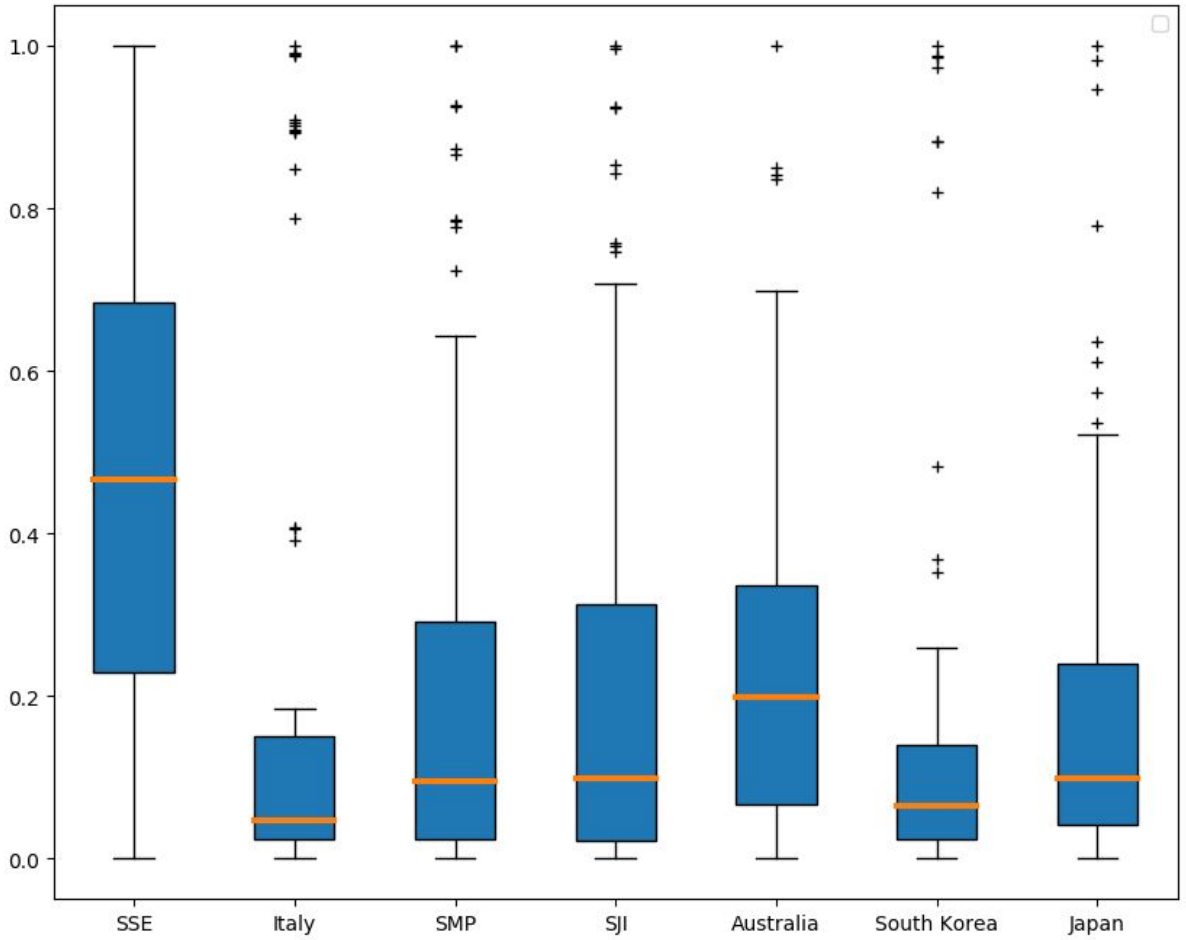
Questions and Answers

Dataset Sources:

- https://data.humdata.org/dataset/novel-coronavirus-2019-ncov-cases
- https://www.investing.com/indices/ftse-italia-all-share-historical-data
- RapidAPI(yahoo finance)

Extra Slides

Min-Max Scaling



pvalue=4.673927557129442e-11

without SSE: pvalue=0.554347785351154

Extra Slides