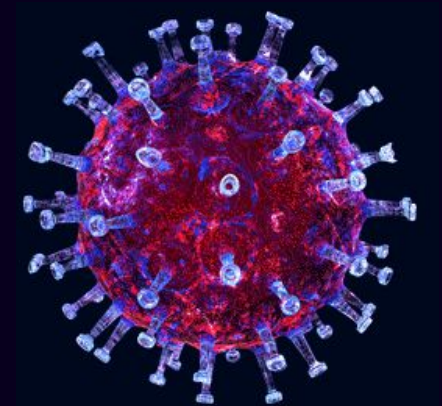
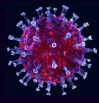


COVID-19 and its impact among USA

- Industries

Team 2

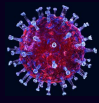




1

Overview

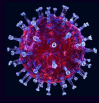
Key concepts and goal definition



Objective

Find out the real economic impact and correlation that COVID-19 has had over USA Industries for the last year focusing on three main features:

- Covid-19 deaths and confirmed cases
- Stock Market – Sector SPDRs ETFs
- Unemployment rates per Industry
- Bankrupted Companies along 2020



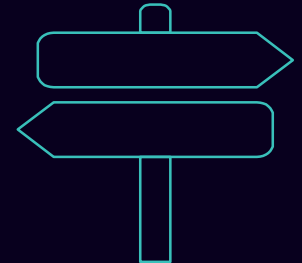
Hypotheses

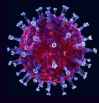


COVID-19 cases are proportional to the rate of industries affected.



There is a negative correlation between COVID-19 and Stock Market Rates as well as with Employees Rate.

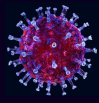




Data Sources

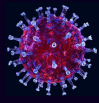
- U.S. Bureau of Labor Statistic. Retrieved on February 09th 2021, from: https://www.bls.gov/bls/api_features.htm
- Yahoo Finance. Retrieved on February 09th 2021, from: <https://github.com/ranaroussi/yfinance>
- COVID-19 API. Retrieved on February 09th 2021, from: <https://covid19api.com/>
- Bloomberg. Retrieved on February 09th 2021, from: <https://www.bloomberg.com/graphics/2020-us-bankruptcies-corona-virus/>





What are we looking for with this analysis?

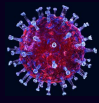
- Which industries have been more affected since COVID-19 began?
- How the employment rate is related to the impact across industries?
- What is the impact of COVID-19 in the SPDRs ETFs?



2

Data collection process

Sources and collection walkthrough

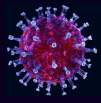


COVID-19 Cases in the USA

1. This API imports COVID World Wide info.
2. First of all we created a USA DataFrame.
3. Afterwards, we grouped the USA DataFrame by months.
4. Our main variables to analyze are:
 - o Cumulative COVID Confirmed Cases.
 - o COVID Delta Cases (Difference in between months cases)
 - o COVID Deaths
 - o COVID Delta Deaths (Difference in between Deaths because of COVID).
5. Two graphics were created using Plotly:
 - o COVID Cumulative vs COVID Delta
 - o COVID Deaths vs COVID Delta Deaths

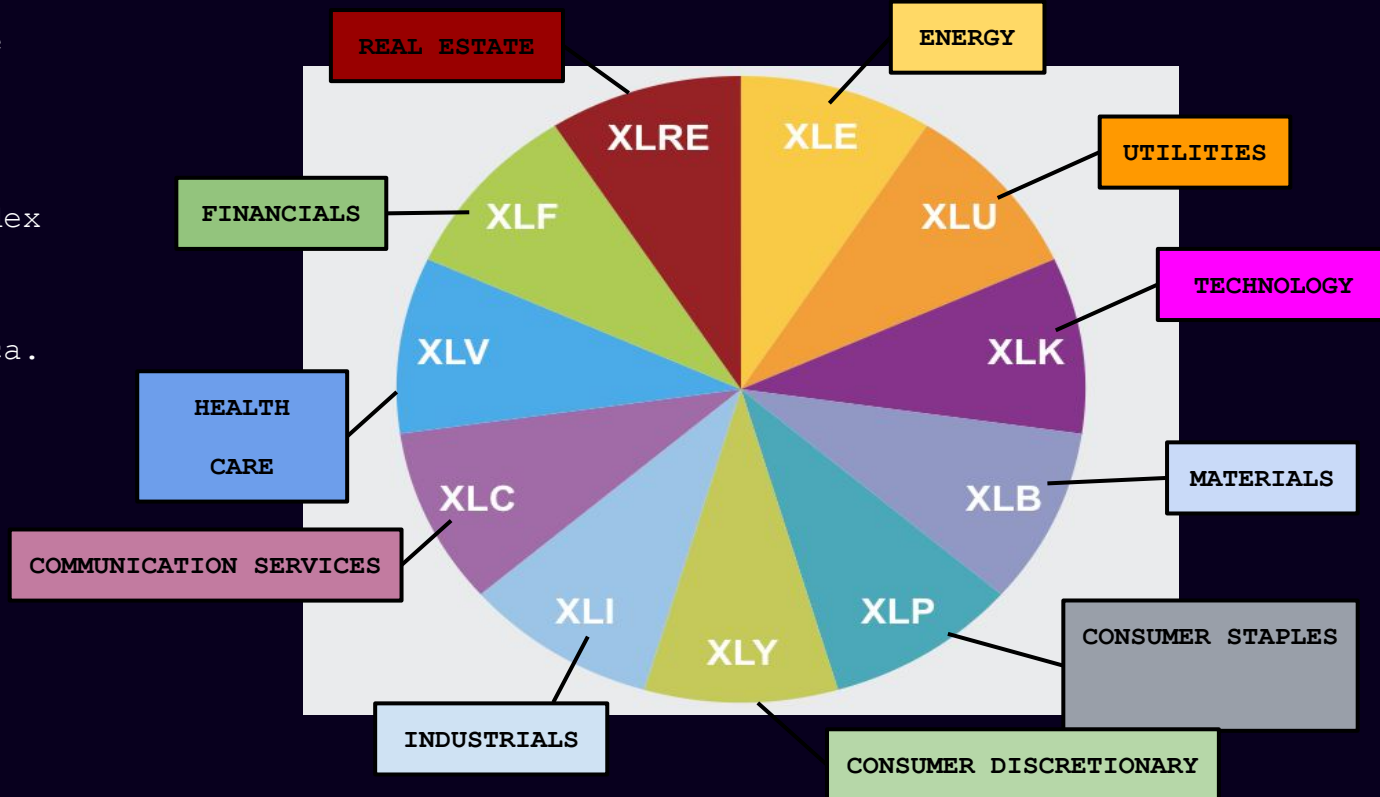


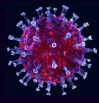
The whole data was exported from the platform [COVID-19-API](#) and afterwards cleaned and transformed for the aim of this study.



Select Sector SPDR ETFs

Unique Exchange Traded Funds (ETFs) that divide the S&P into eleven index funds traded throughout the day on NYSE Arca.

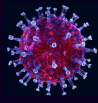




Stock Market - Sector SPDRs ETFs

- By using yfinance library we were able to download historical market data of SPDRs ETFs.
- Once we got the data from the API we realized that records only included weekdays without holidays.
- We also checked for nulls and zero values.
- XLC ETF (Telecomm) had more than 300 null values, so we decided to drop all of its values from the dataframe.
- Finally, we updated the names (ETF Tickers) of the columns of our dataframe to their corresponding industry.



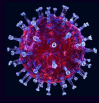


● Employment rates per industry

- In this regard, we searched on the net for either Dataframes or API that could be useful and meaningful for our project.
- Data Analysis: studied the information on how to manipulate the data using the US Bureau of Labour Statistics API.
- Data wrangling in Jupyter
- Cross checking data vs Industry Codes and Titles (NAICS)
- Data standardization to join with the other dataframes.



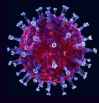
The Current Employment Statistics (CES) program is a monthly survey conducted by the Bureau of Labor Statistics. The survey provides employment, hours, and earnings estimates based on payroll records of business establishments.



Bankruptcy data processing

- From Bloomberg we obtained data from about 340 companies that declared bankruptcy.
- Data was grouped by industries to obtain the most affected ones.
- String data representing numbers was changed to float type.
- Bankruptcy date format was standardized to count just the months.
- A line chart was obtained from the month data obtained to plot a time series chart

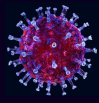




Final output

As the result of our analysis, we created a main notebook covering all of the sections above mentioned:

- COVID-19 Cases in the USA
- Stock Market - Sector SPDRs ETFs
- Employment Rates Per Industry
- Correlation between COVID and different Industries behaviour
- Bankruptcy data processing



Roadmap

Main Study Topics
Decision

1

Data Cleansing and
Correlation
between fields of
study

3

Stamping and
presentation of
the Project

5

Look for the Data

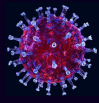
2

Graphics
visualization to
better explain the
outputs

4

Main conclusions
and next possible
steps to follow if
continuing with
the study.

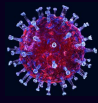
6



3

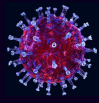
Data analysis process

Task description



Describe the analysis process (accompanied by your Jupyter Notebook)

- Three variables were selected on each data category
 - COVID: Deaths, number of cases
 - Financial overview: ETF stock prices, company bankruptcies
 - Employment landscape: Number of employees per industry
- Exploratory analysis to understand the nature of the variables
- We created Line and bar charts to display the data and have a general overview.
- With our hypotheses questions we selected variables that could be correlated, then we displayed our results in a clustermap that helped us to spot this correlations



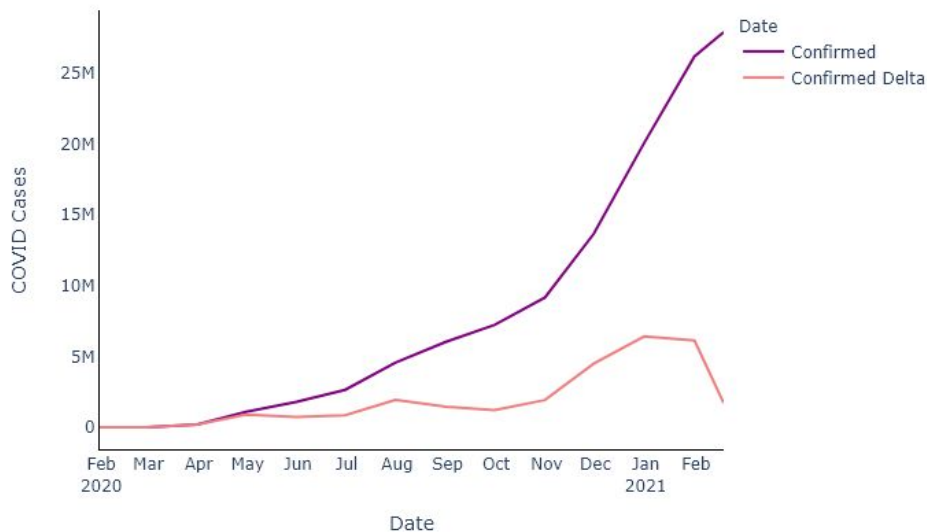
4

Results, graphics and conclusions

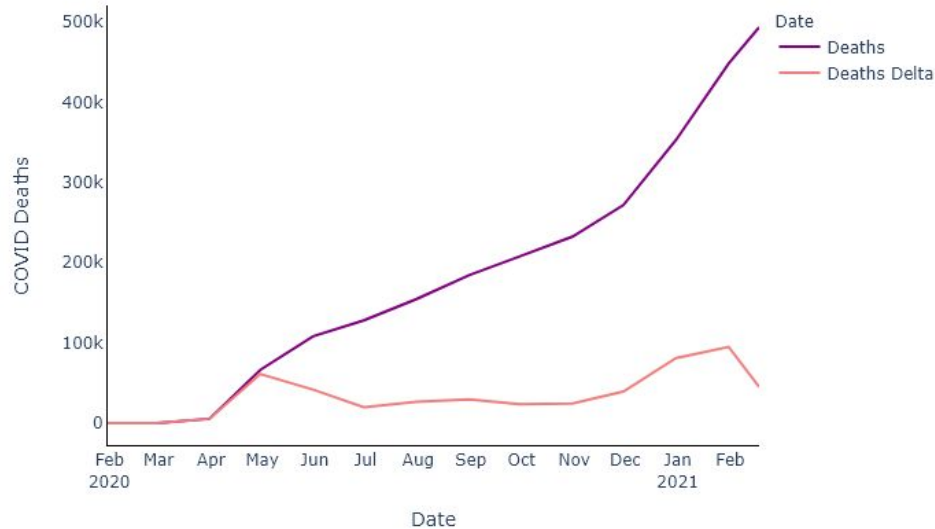
What are our findings?

In these graphics we can notice how the number of **COVID Cases and Deaths** have been **increasing** continuously since the beginning of the pandemic, specially in the months from November to February. So, according to our hypothesis we suppose Stock Markets, Employment Rate and Bankruptcy will also display some atypical behaviour for the last 12 months.

Cumulative COVID Confirmed Cases



COVID Confirmed Deaths



2020's **ETF** Daily Price Variation and ETF Close Price **Performance were atypical** according to the historic data, achieving increasing and decreasing rates out of the normal rates. All of this related with the arrival of COVID and Pandemic.

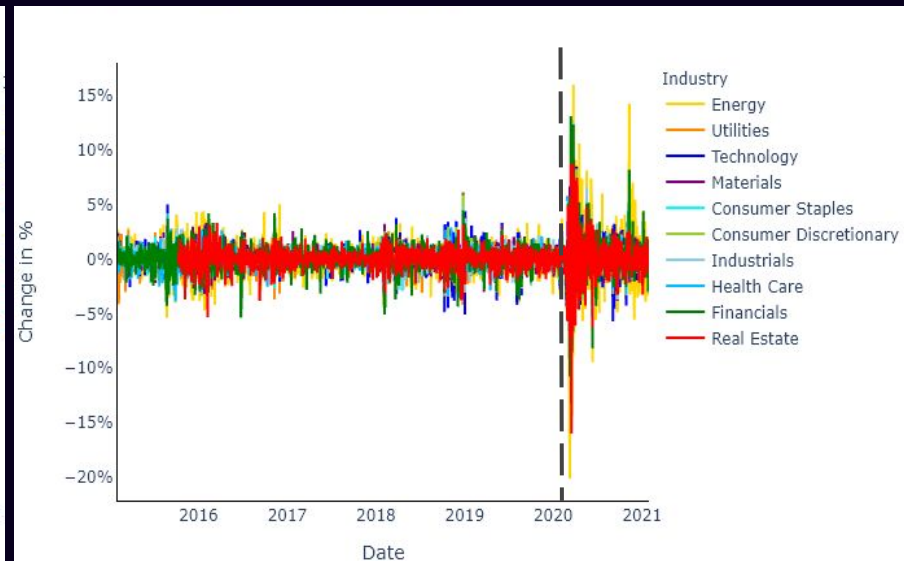
ETF Close Price Performance 2015-2021



Top 3 Industries by Higher Avg Close Price:

1. Consumer Discretionary - \$94.79
2. Health Care - \$80.43
3. Energy - \$67.88

ETF Daily Price Variation 2015-2021

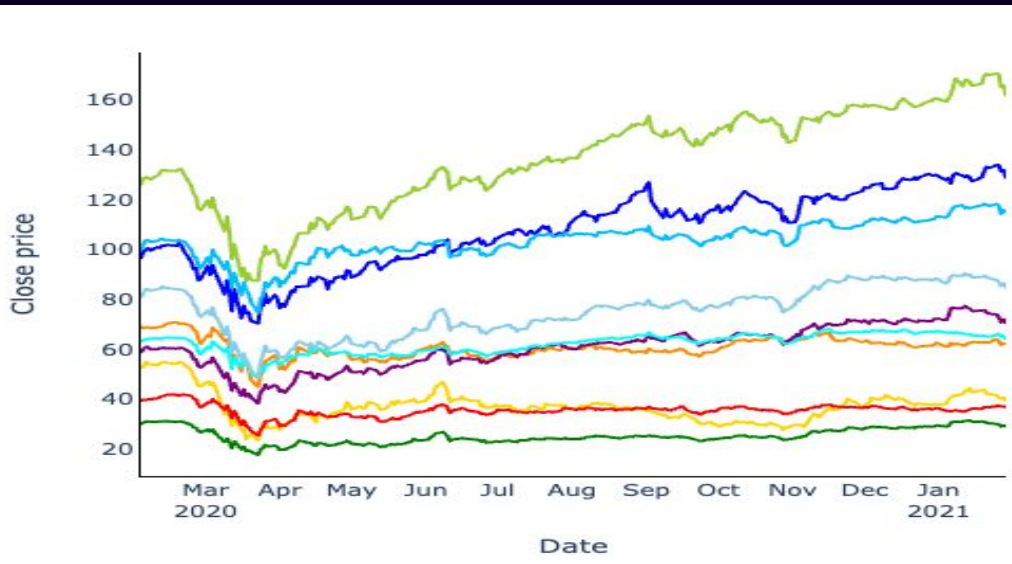


Top 3 Industries by Lower Avg Close Price:

1. Financials - \$23.95
2. Real Estate - \$33.14
3. Utilities - \$51.72

As we just found out, Pandemics impacted Stock Market. If we zoom-in, we can notice that beginning of Pandemics was the time when all the rates became more unstable and have been struggling for the next months. There is still uncertainty about Economic Recovery, which will be highly reflected on ETFs rates, among other Stock Market indicators.

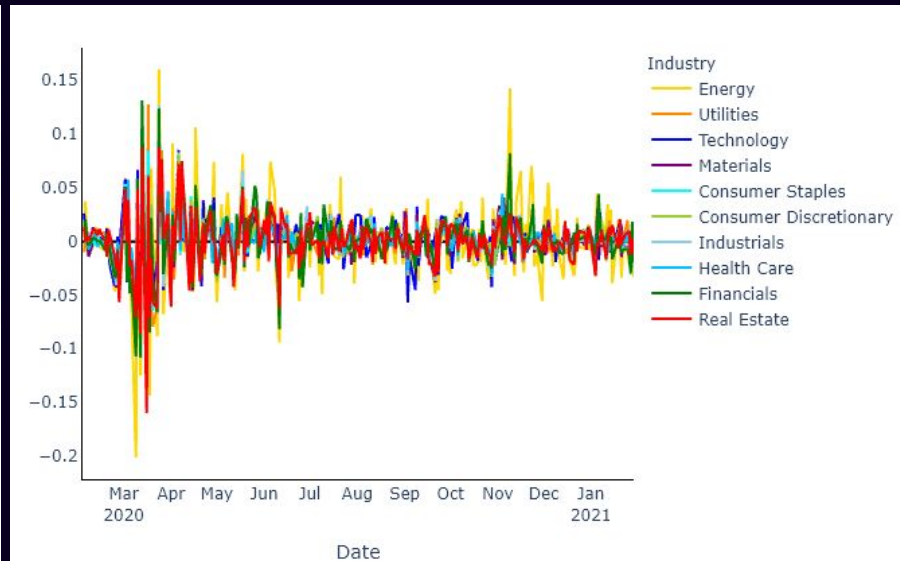
ETF Close Price Performance COVID-19



Top 3 Industries by Higher Avg Close Price:

1. Consumer Discretionary - \$136.19 +43.67%
2. Technology - \$107.90 - +82.97%
3. Health Care - \$103.67 - +28.89%

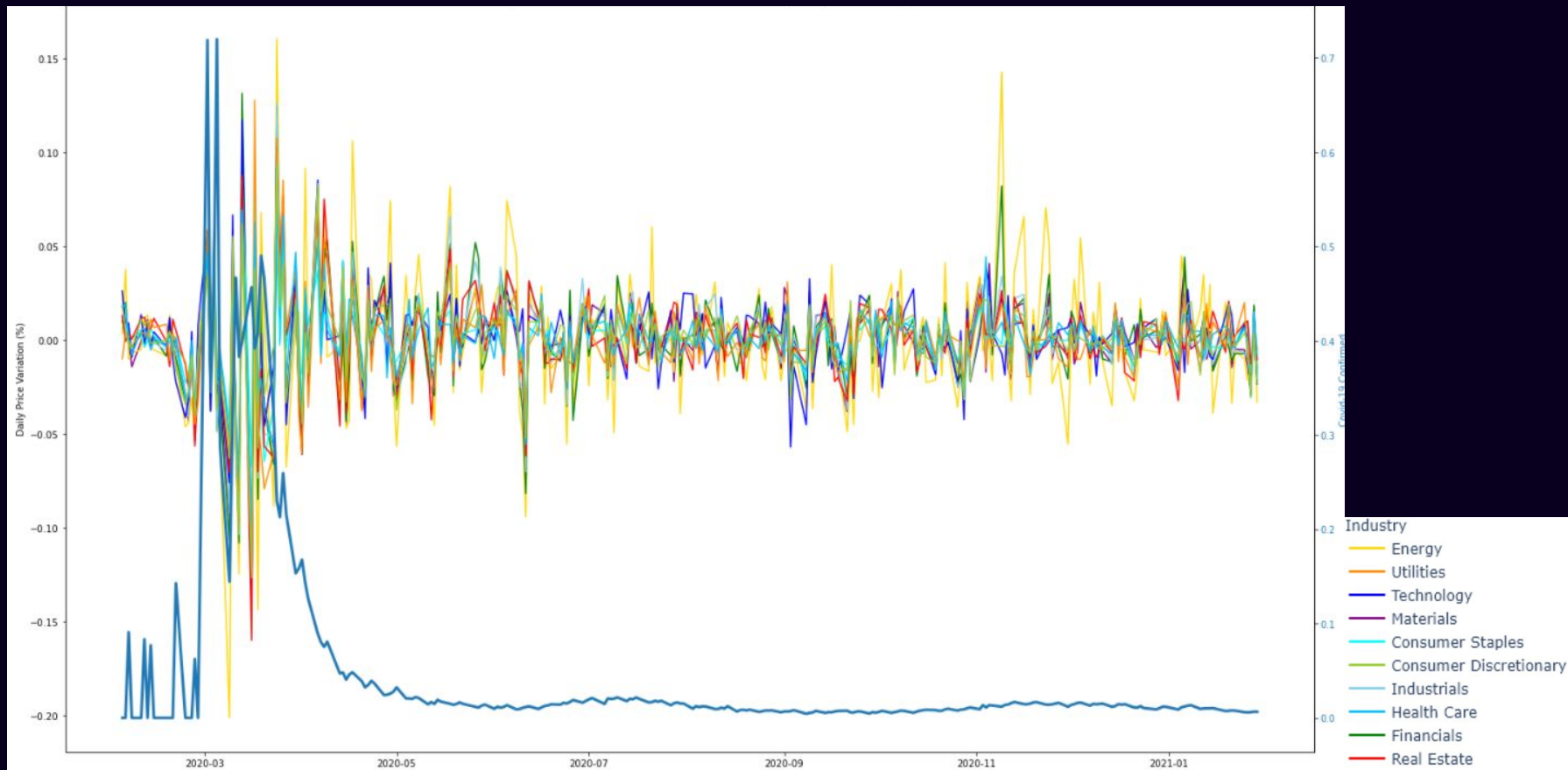
ETF Daily Price Variation COVID-19



Top 3 Industries by Lower Avg Close Price:

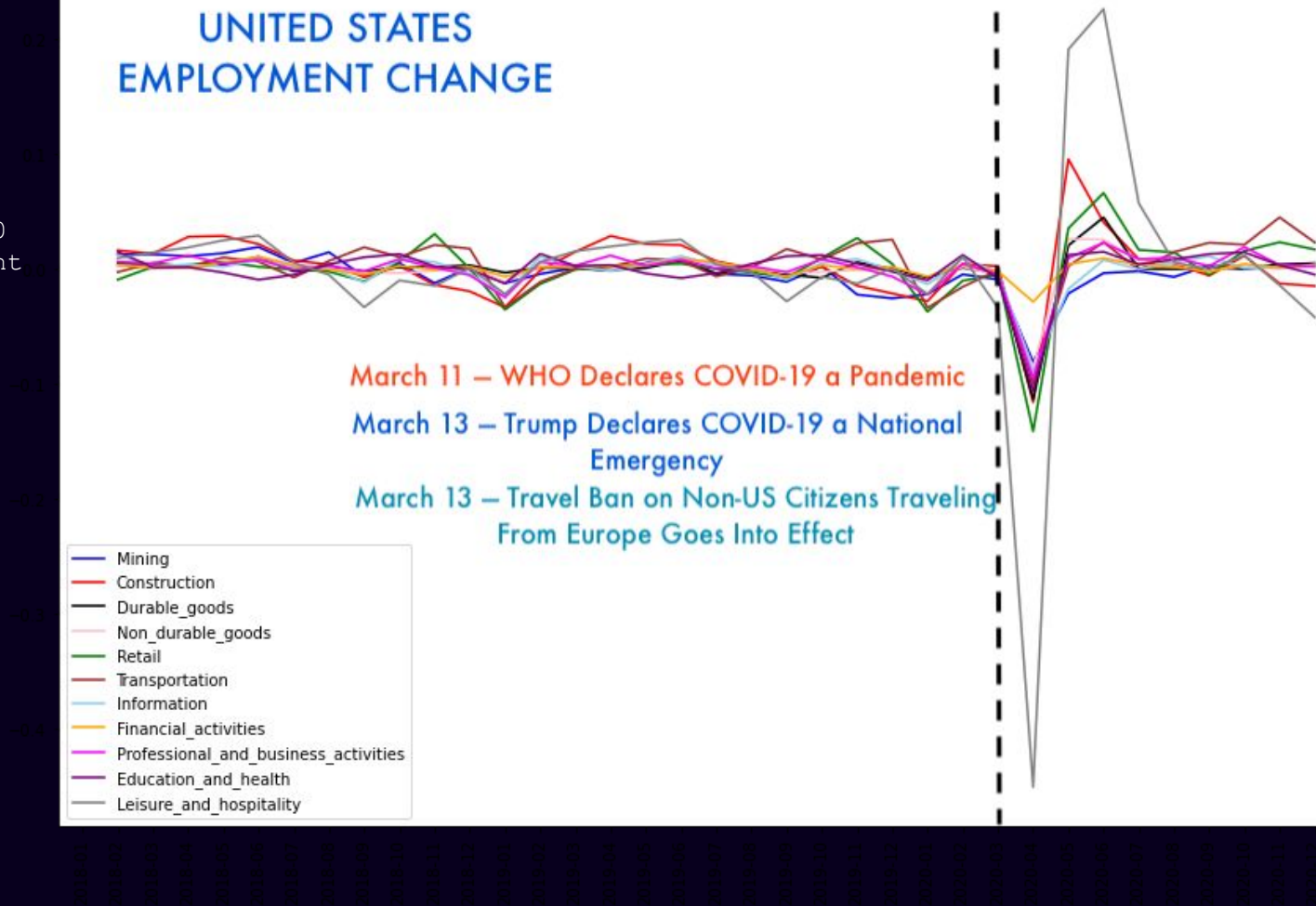
1. Financials - \$25.25 - +5.42%
2. Real Estate - \$35.50 - +7.12%
3. Energy - \$37.17 - -45.24%

Daily Change on Price Variation and Covid-19 Confirmed Cases



Current Employment Statistics

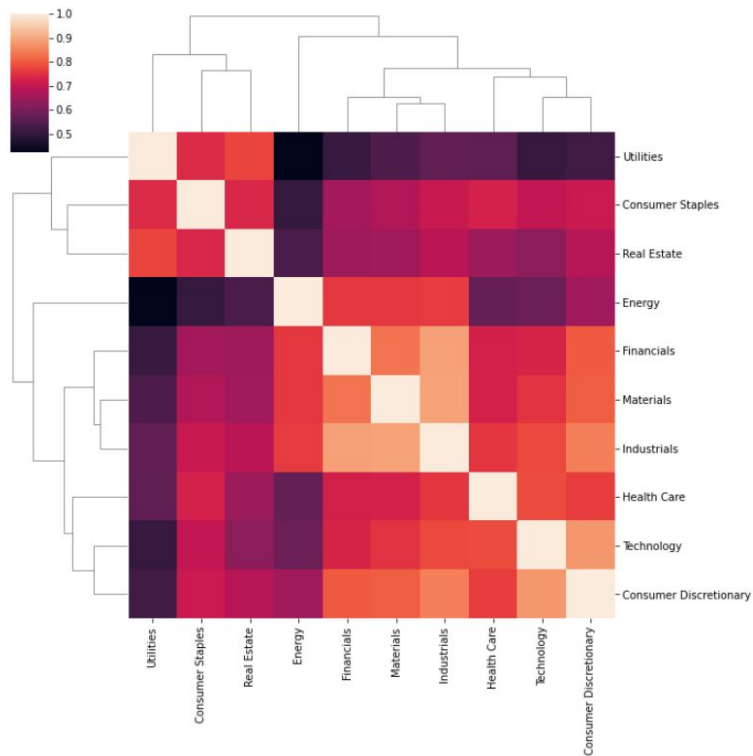
The CES survey is based on approximately 144,000 businesses and government agencies representing approximately 697,000 individual worksites throughout the United States.



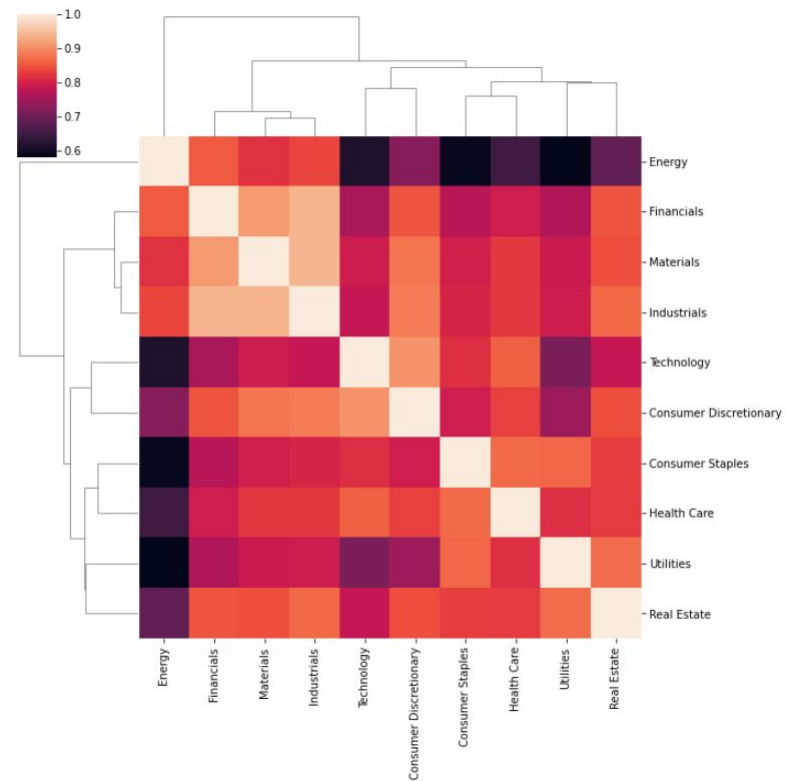
Cluster of Industries that Reacted on Covid-19

Measured by Daily Earnings

Correlation between industries 2015-2021

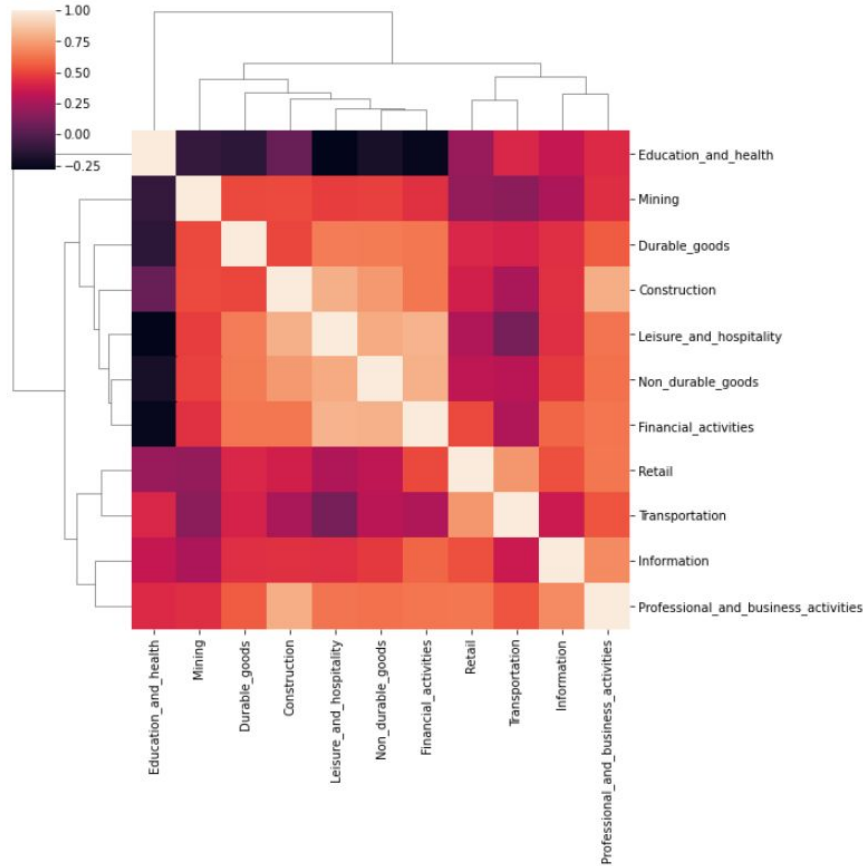


Daily Earnings Correlation on COVID-19

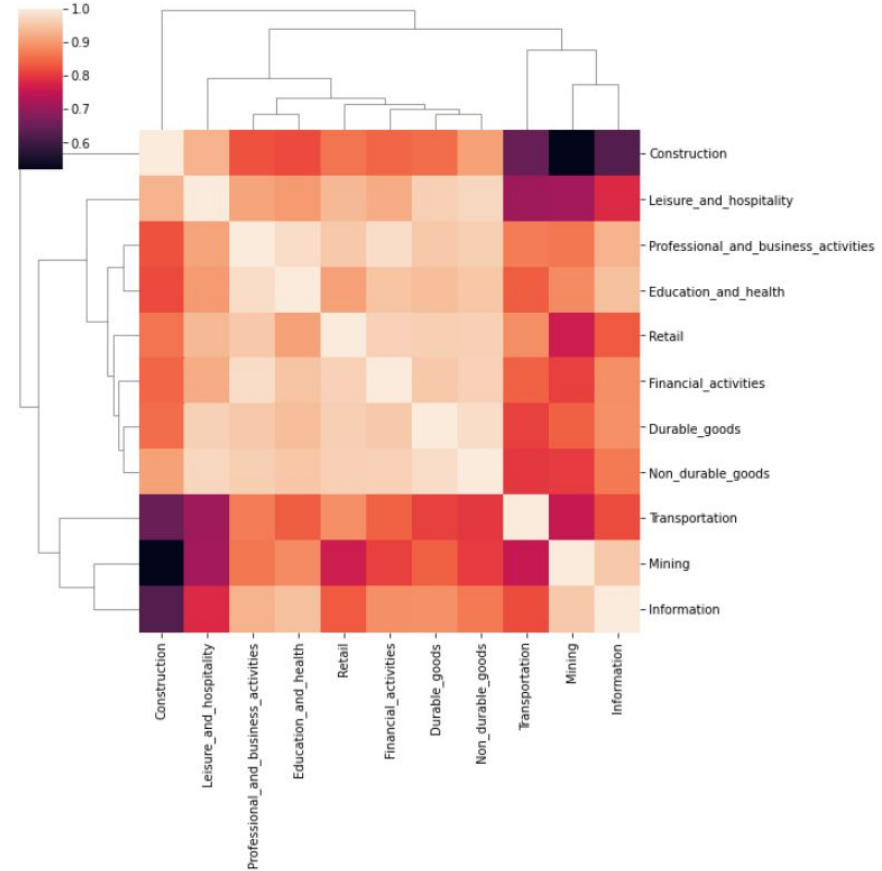


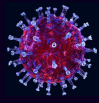
Cluster of Industries that Reacted on Covid-19 Measured by Employment

Correlation for Industries on NO COVID Months



Correlation for Industries on COVID Months





Insights from Heatmaps

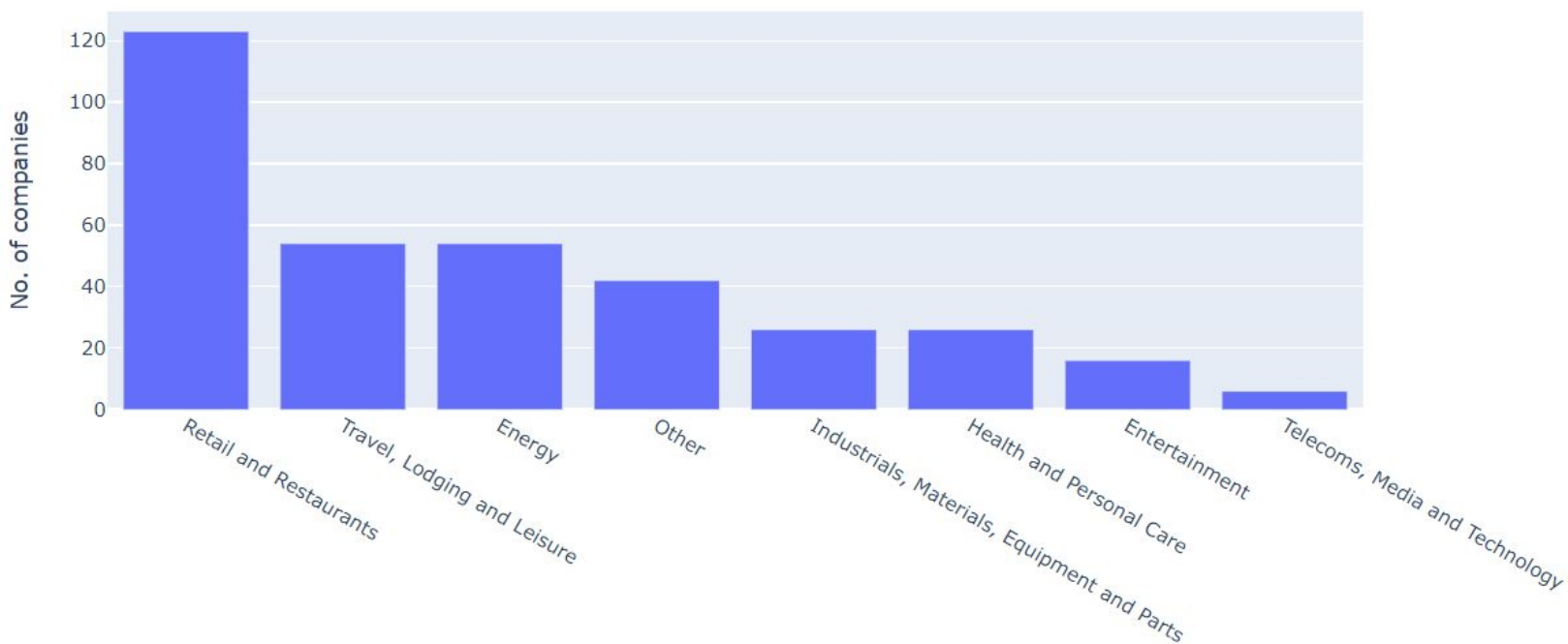
Based on Earnings:

- In **all times**, including Covid-19, **Financials**, **Materials** and **Industrial**, have maintained a strong correlation.
- There was big increase on correlation with **utilities**, against the other industries, on **Covid months**.

Based on Employment:

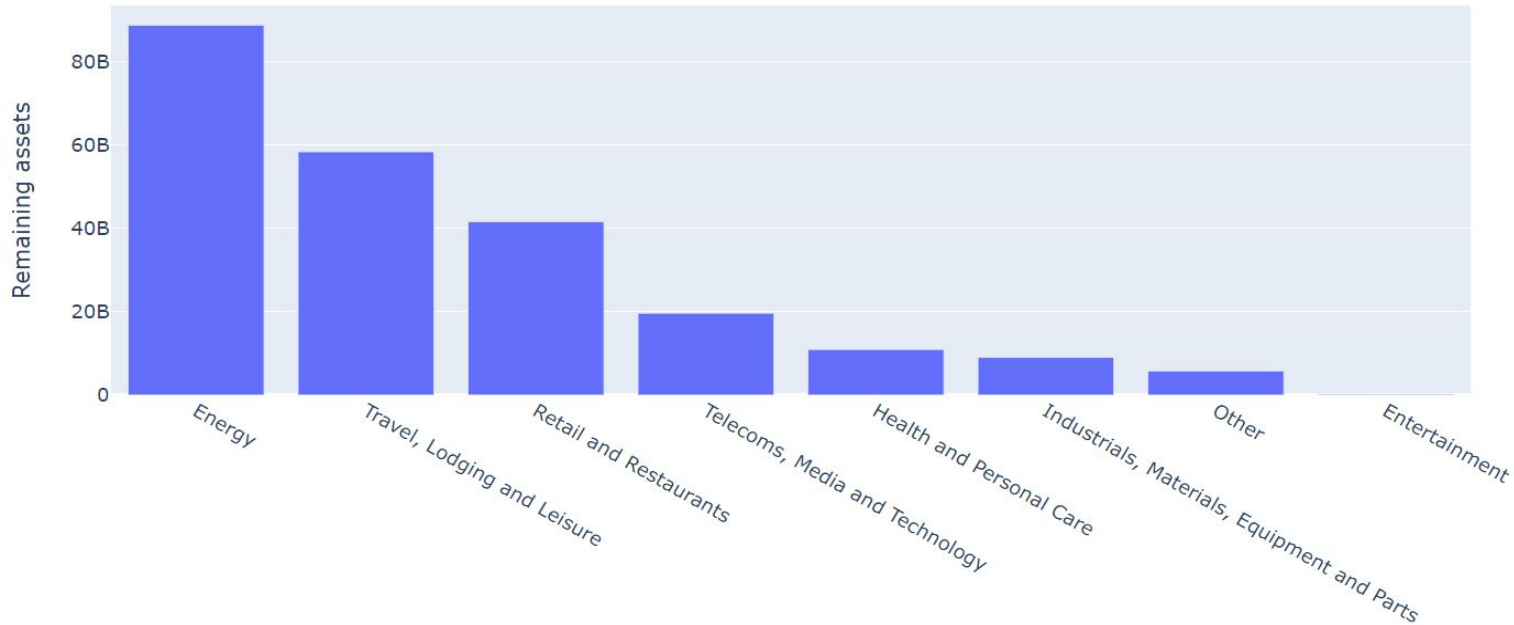
- On **Covid** months there is a strong correlation on **Education and Health** and **Professional** and **Business** Activities.
- On **No Covid** months, there is a strong correlation between Leisure and Hospitality, Non Durable Goods and Financial Activities.

Number of Bankrupt Companies per Industry



As seen in past charts, **Retail & Restaurants** was by far one of the **most affected** industries with 123 company that declared bankruptcy, followed by Travel, lodging and leisure and Energy with 54 each one

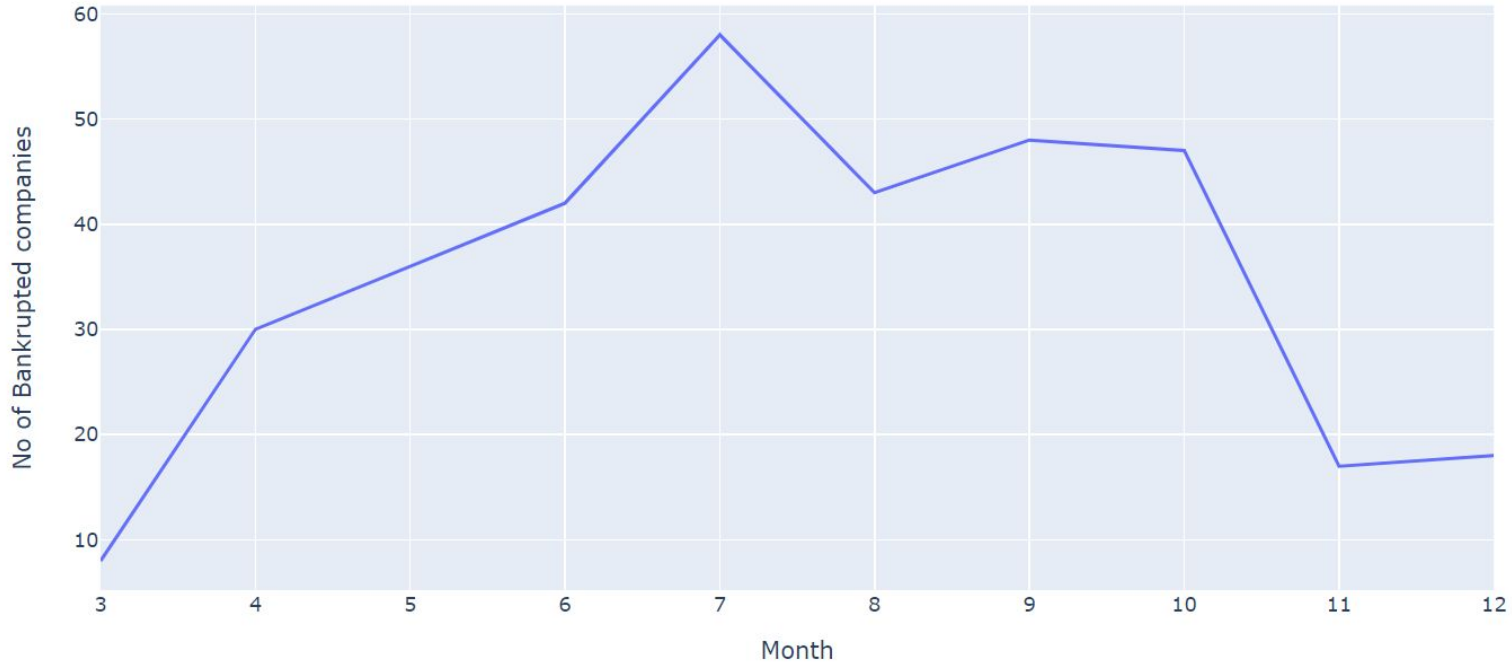
Remaining Assets per Industry after Bankruptcy



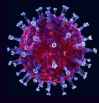
These same industries where the ones with most assets after declaring bankruptcy:

- Energy : \$8.8 billions
- Travel, lodging and leisure: \$5.8 billions
- Retail and restaurants: \$4.1 billions

Total Bankrupted Companies per Month in 2020

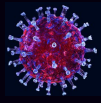


- July was the month with the highest number of bankrupted companies this was 5 months after COVID was declared international emergency.



● Main conclusions

1. There is no Industry that has not been affected by COVID-19. Trends have changed all over the world.
2. There was a lot of volatility due to the uncertainty in the first months of the Pandemic, which can be assumed by fear and nervousness caused by the unknown effects of this crisis.
3. The lack of data and its quality in developing and under-developed countries represents a constraint for analysis and outcome predictions.



Next steps if continuing with the Study:

1. Extend the research to other geographies such as LatAm, Asia, etc.
2. Using Machine Learning, forecast 2022 and 2023 Employment, Bankruptcy and ETFs Rates according to COVID-19 behaviour.
3. Standardize the Study and Data in order to complete a Machine Learning Prevention ToolBook in order to use it in case of being affected by another Pandemic in the Future.
4. Based on ETF close prices after the lowest point on March 2020, calculate the linear regression to have the slope to know which industries have a faster recovery.