Coronavirus the latest pandemic of the 21st century has impacted the stock market, unlike any other.

Before we start our deep dive into impact on the markets, below are the news which we are seeing all around us or are expected.

* Business closures and manufacturing plant shutdowns
* Job losses and an increase in the unemployment rate
* Supply chain disruption
* Shortages of daily essentials
* Pressure on healthcare systems
* Exponentially rising infection and death tolls

We see that a lot of non-essential shops are closing down, many manufacturing plants are shutting down which directly affects the life of daily wage workers . Unemployment has increased; Layoffs and uncertain furloughs are at an all-time high as companies are struggling to stay afloat. There is a disruption in the supply chain, and people are hoarding daily essentials including toilet papers. This will result in shortages. The number of cases related to infections is rising which is causing tremendous pressure on healthcare systems. The developed markets are coping somewhat with this unprecedented situation.

Combined with these are steep falls in financial markets. In these circumstances, the question which might come to you is when we can expect some good news, when will markets recover. Many industry sectors took a direct hit, quarantining has hurt the transport industry, as the whole industry came to a standstill. Other sectors like real estate and materials took an indirect hit as consumers become more stringent with their wallets.

This analysis dives deep into the individual sectors comprising the S&P500 index.

* sector\_analysis.ipynb

red line is the date on which WHO declared a public health emergency.

Blue line indicates when the US government declared National Emergency.

A close up of a map

Description automatically generated

One observation from this graph is that you can see Pharma and Technology are two sectors which are relatively less impacted. In the graph above, Technology is this orange line which you can see at the very top which is followed by Pharma as the blue line. Overall, you can see that all the sectors are in the same direction but the relative magnitude, or the fall, is different.

You can see the pink line representing energy as the most impacted. This is logical considering how crude oil was the most impacted, which in turn impacted the energy sector since they both are directly related. Another observation is the green line, which indicates financials, has also fallen. The reason for this is that whenever the economy slows down there are a lot of loan defaults which result in the rise of non-performing assets for a bank and eventually they will take a hit on their Profit and loss statement.

While retail chains like J.C. Penney are going out of business, the pandemic has skyrocketed the stocks of other companies which saw more than normal usage. Video communication companies like Zoom and houseparty saw an increase in activity, home improvement companies like Lowe’s, wayfair and home depot saw an increase in online orders as consumers are stuck at home and the work from home culture becomes more and more relevant.

The following notebooks dive deep into building a portfolio in each of the sectors.

* portfolio-comms.ipynb - Communication industry, while companies implementing 5G took a hit due to conspiracy theories, overall the market has been stable.
* portfolio-consumer.ipynb – The Consumer discretionary industry was divided into two parts during this pandemic circumstance, companies which had relatively large sales through websites have managed to stabilize while the ones which depended on in-store shopping struggled.
* portfolio-energy.ipynb – Crude oil took a massive hit as manufacturing plants came to a standstill.
* portfolio-estate.ipynb
* portfolio-financial.ipynb
* portfolio-healthcare.ipynb
* portfolio-industrial.ipynb – This sector saw major losses dude to social distancing rules.
* portfolio-materials.ipynb
* portfolio-staples.ipynb – This industry continues to be stable and the safest stock option.
* portfolio-tech.ipynb – The information technology industry has always supported remote collaboration of work, the work from home culture was easily adopted by them
* portfolio-gaming.ipynb – This was a personal interest of mine; twitch streaming and e-sports is a growing industry under current circumstances the industry has increased viewership as people have resorted to gaming as a way to pass time.

The stock data considered is from Jan 2019 to May 2020.

The simple returns and log returns of the stock were calculated.

Using the financial concept of sharpe ratio(Risk-adjusted return), the Markovitz efficient frontier theory was implemented to generate random portfolios and select the optimal portfolios based on

* Maximum Sharpe Ratio
* Minimum Volatility

The efficient frontier line was plotted to give us a better idea of the sector. (Treasury Rate: 0.73% for May 2020)

The above was then implemented on the top stock across sectors, to build a diverse portfolio based on the modern portfolio theory.

* Analyzing\_top\_stocks.ipynb

Based on current circumstances I wanted to see what the call option would be prices on some of the big stock in the foreseeable future. I took the stocks of Amazon and Microsoft , and using Black Scholes Merton formula and through monte Carlo simulation I predicted stock price and then calculated the approximate call option price. There are many methods to calculate this, my aim was just to implement one of these methods to get a perspective.

* Prediciting\_call\_option\_price.ipynb

Considering how vast and the deep the finance field is, I have probably only scratched the surface. But I had fun going through coding and trying to understand the concept. And I am learning every day. After finishing this implementation, I definitely know better than yesterday’s me. My implementation might be rather naïve and erroneous, but thanks for reading.