

PROJECT REPORT

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DATA 433*

*Gabriel Medeiros
Oscar Bustos
McKayla Babinat*

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ABSTRACT

In our modern world stock trading has become more and more accessible to everyday people. With more people, we find that many do not research enough to make educated decisions on what to invest in. In our project we will simulate a scenario in which our client wants guidance on what he should invest his \$100,000. We will use exploratory analysis to find trends in the stocks that show their performance and use many weight strategies to help find the portfolios with the best returns for our client. During our work on our project, we saw that one of our stocks, Fiat/Chrysler (FCAU), no longer exist. They are now part of a multinational automotive manufacturer called Stellantis (STLA). A lot of work has already been done when we learned about the situation, so we collectively decided to leave Fiat/Chrysler in our analysis.

According to The Balance, “The average investor underperformed the market for the 25th year in a row. For 2018, the S&P 500 retreated 4.38%, while the average investor lost 9.42%.”¹

Introduction

In our report we are simulating a scenario where we help our client decide where he should allocate his \$100,000. Our client has two portfolios that he is already considering, so what we will do is help him determine how much he should allocate to each stock. We will also recommend our own portfolio using the stocks he is considering by finding which has the best overall returns. To help better show what stocks are performing best, we will use exploratory analysis to show the trends in various measures of performance.

¹ Friedberg, B. (2020, August 24). Why people lose money in the market (and how to bounce back). Retrieved March 14, 2021, from <https://www.thebalance.com/why-people-lose-money-in-the-market-4144737#:~:text=The%20most%20recent%20Dalbar%20study,%EF%BB%BF%20The%20reasons%20are%20simple.>

**“Buy not on
optimism, but on
arithmetic.”**

By Benjamin Graham

Dataset Description

In this project, we will be using 2 datasets. 1 for stock analysis and another to perform fundamental analysis.

Dataset 1

The first dataset is downloaded directly from python using yahoo finance library. With yahoo finance we can access 5 years of data that add up to 1825 rows.

The columns consist of:

Name of Variable	Type of Variable	Description
Date	Categorical	This variable represents the date it contains most of the days of the year.
Open	Numerical	Open represents the first trading price of the day.
High	Numerical	High represents the highest price at which a stock was traded for during that day.
Low	Numerical	Low represents the lowest price at which a stock was traded for during that day.
Close	Numerical	Close represents the last trading price paid for a share during that day.
Adj Close	Numerical	Adj Close represents the price of the stock after taking other factors into account, like dividends, to determine a value.
Volume	Numerical	Volume represents the number of stocks traded during the given day.

*There are no missing values.

Dataset 2

The second dataset is focused on downloading Financial Ratios which are used to perform the Fundamental Analysis. To download this data, we are using the python library called *FundamentalAnalysis*, which is available at <https://github.com/JerBouma/FundamentalAnalysis>. This documentation retrieves data from FinancialModelingPrep, a website that contains financial data containing a wide range of worldwide companies. The dataset contains 4 columns, and 2,701 rows.

Name of Variable	Type of Variable	Description
Year	Categorical	Corresponding year for the collected data
Amount	Numerical	Currency/Percentage for each analyzed ratio
Company	Categorical	Name of the company
Breakdown	Categorical	Type of ratio being calculated

*There are 483 null values.

Companies Description

In this section, we will provide a brief description of each company listed by our client, so we can understand what each company does and what their prospects/product releases are in the future.

Netflix (NASDAQ: NFLX)

Netflix is a subscription-based streaming service that allows members to watch television shows as well as movies without commercials on an internet-connected device. Netflix operated through segments, such as, Domestic Streaming, International Streaming and Domestic DVD. These segments derive revenues from monthly membership fees for services of streaming content to the members inside and outside the United States, it also covers revenues from services consisting of DVD-by-mail. Netflix will continue to add more television shows and movies to its platform in the coming years.

Walt Disney Co (NYSE: DIS)

The Walt Disney Company is an international family entertainment and media enterprise. Operating through segments such as, Media Networks, Parks, Experiences, Products, and Studio Entertainment. These segments use cable and broadcasting. The Disney World Resort and Disneyland Resort produce live-action, animated motion pictures, licensing the company's trade names, characters and visual properties, and distributing brand merchandise directly through retail.

Spotify Technology SA (NYSE: SPOT)

Spotify Technology is a digital music service offering music fans instant access to music without commercial breaks. Spotify operates through segments: Premium and Ad-Supported. The Premium segment provides subscribers with high-quality streaming, unlimited online and offline access to music and podcasts on computers, tablets, and mobile devices. The Ad-Supported segment provides users with limited on-demand online access of music and unlimited online access of podcasts on compatible mobile devices.

[Amazon.com, INC \(NASDAQ: AMZN\)](#)

Amazon is a vast internet-based enterprise that sells books, movies, housewares, electronics, music, toys, and other goods, directly to consumers or between other retailers. Amazon operates through the business segments of North America, International, and Amazon Web Services. These segments include retail sales of consumer products and subscriptions through North American-focused and internationally focused websites, and global sales of computing, storage, database, and services offerings for start-ups, enterprises, government agencies, and academic institutions.

[Apple INC \(NASDAQ: AAPL\)](#)

Apple Inc. designs, manufactures, and markets mobile communication and media devices, personal computers, and portable digital music players. Apple Inc. sells a range of software, services, networking solutions, accessories, and digital content and applications from third parties. The segments include, North and South America, Europe, China, Japan, and the rest of Asia Pacific. Apple Inc. is working on a new version of the iPad Pro that will feature a mini-LED display.

[Ford Motor Company \(NYSE: F\)](#)

The Ford Motor Company is an automobile company that designs, manufactures, markets, and services a full line of Ford trucks, cars, utility vehicles, as well as Lincoln luxury vehicles. The Ford Motor Company operates in three segments: Automotive, Mobility, and Ford Credit. These segments engage in developing, manufacturing, distributing, and servicing the vehicles, parts, and accessories of the Ford and Lincoln vehicles. Ford plans to come out with a line of Raptors in the coming year.

[Tesla \(NASDAQ: TSLA\)](#)

Tesla is involved in the design, development, manufacture, and sale of fully electric vehicles, energy generation and storage systems. Tesla also provides vehicle service centers, supercharger stations, and self-driving capabilities. Tesla has the following segments: Automotive and Energy Generation and Storage. These segments include the designing, development, manufacture, and sale of electric vehicles, as well as the installation, sale, and lease of stationary energy storage products and solar energy systems. According to Tesla, there will be a new Model S Plaid Plus that will launch in late 2021. It will be able to go 60 mph in under two seconds and go an estimated 520 miles on a single charge.

[Fiat Chrysler Automobiles \(NYSE: FCAU\)](#)

Fiat Chrysler Automobiles designs, engineers, manufactures, and sells vehicles and related parts, services and production systems worldwide. They operate over 100 manufacturing facilities and over 40 R&D centers, selling through dealers and distributors in more than 130 countries.

[Toyota Motor Corp \(TM\)](#)

The Toyota Motor Corporation is a company based in Japan that is involved in the automobile business and finance business. The automobile segment is engaged in the design, manufacturing, and sale of sedans, minivans, sports utility vehicles, and trucks, as well as the related parts and products.

[Ferrari \(RACE\)](#)

Ferrari is an Italian luxury sports car manufacturer based in Maranello, Italy. Ferrari is a holding company, which is involved in the design, engineering, production, and the sale of luxury sports cars. Ferrari has revealed a new car for the 2021 Formula 1 season, the SF21.

Questions We Want to Answer.

- Which portfolio will perform better?
- What companies have a consistent and solid financial background?
- Does a company that performs better in the financial analysis perform better with their stocks?
- Which stocks should be kept in each portfolio?
- What stocks present higher volatility and risk return?
- Will our portfolio, created by analyzing each company's financial background, perform better than the client's portfolio, that was created by choosing stocks of interest?

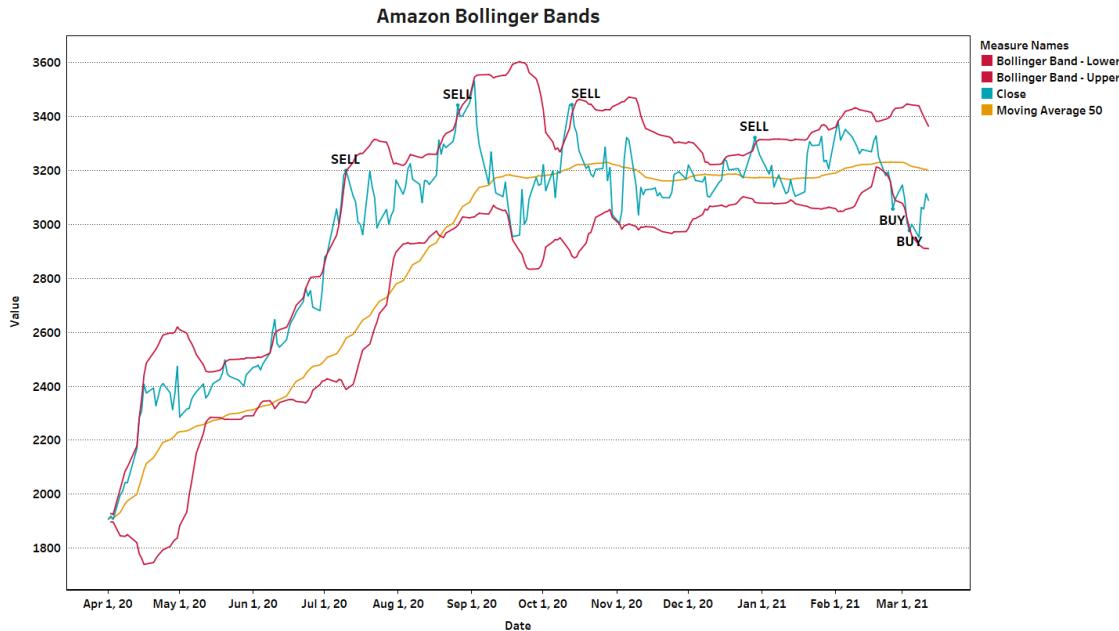
Exploratory Analysis

Here we will look at a variety of graphs to analyze each stock's performance over the last 5 years.

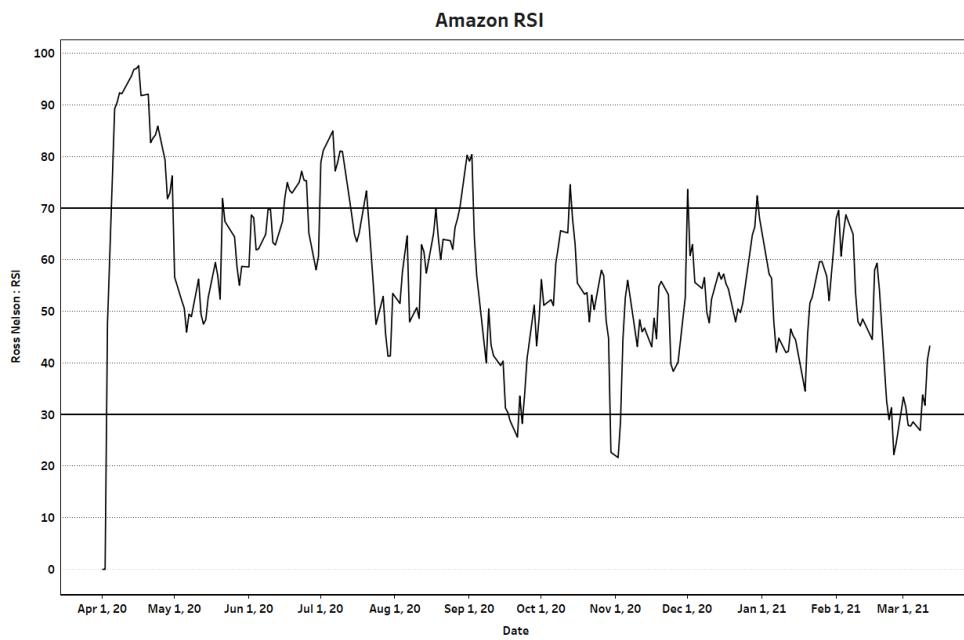
Amazon



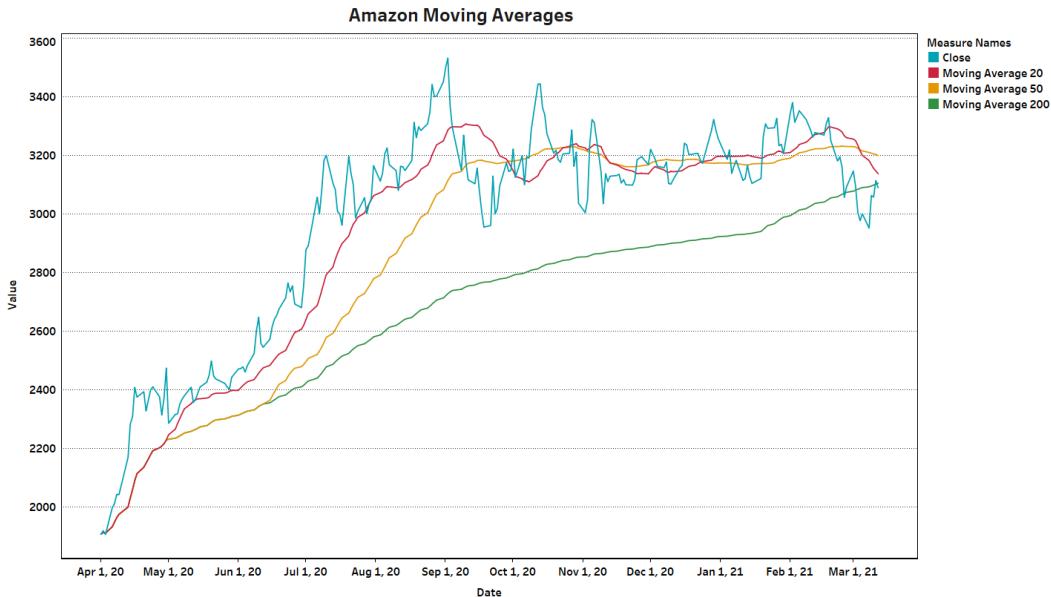
In this graph, we can see the Close price behavior from 2016 to 2021. The stock grew consistently until the end of the first quarter in 2020, and then it grew at a higher rate in which the close price went from \$2,200.00 to \$3,400.00.



In this graph we can see the Bollinger Bands graph for Amazon close price data from January 1st, 2020 to March 12th, 2020. We can also see in yellow the 50-day moving average. When the blue line hits the upper red line, it is considered overbought so we should sell. When it touches the lower red line, it means the investor should consider buying the stock.



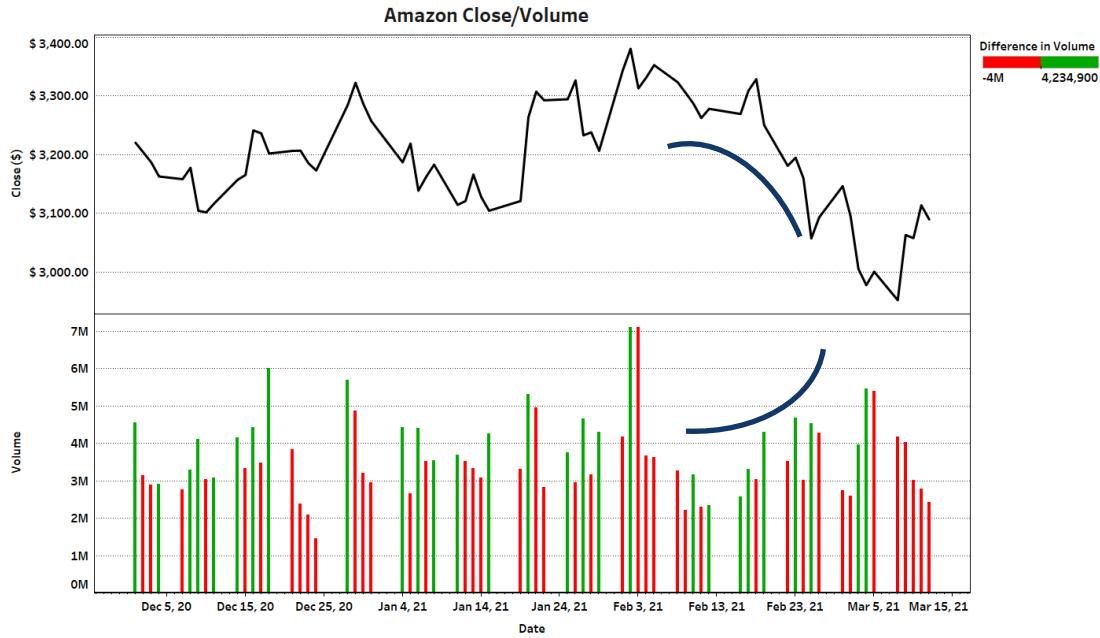
In the Relative Strength Index graph, we can see the points in which a stock has been overbought or oversold. When a stock reaches an RSI above 70, the stock is considered overbought, so an investor should consider buying into the stock. On the other hand, when the RSI reaches a value below 30, it means the stock has been oversold, and the investor should consider selling the stock since the stock price will probably go down.



The Moving Average graph shows the values of the close price, and the 20-day, 50-day, and 200-day moving averages for the last year. At the end of the graph, we can see that the close price closed below the 200-day moving average, giving investors a good opportunity to buy the stock.



A candlestick graph shows the high and lows of the stock for each day as a thin line, and it shows the open and close prices in red and green. When the Open price is lower than the Close price, we assign it the green color, representing an increase in the stock price. When the Open price is higher than the Close price, we assign it the red color that represents a drop in stock price. For this graph, we are using data from the last 4 months for better visualization.

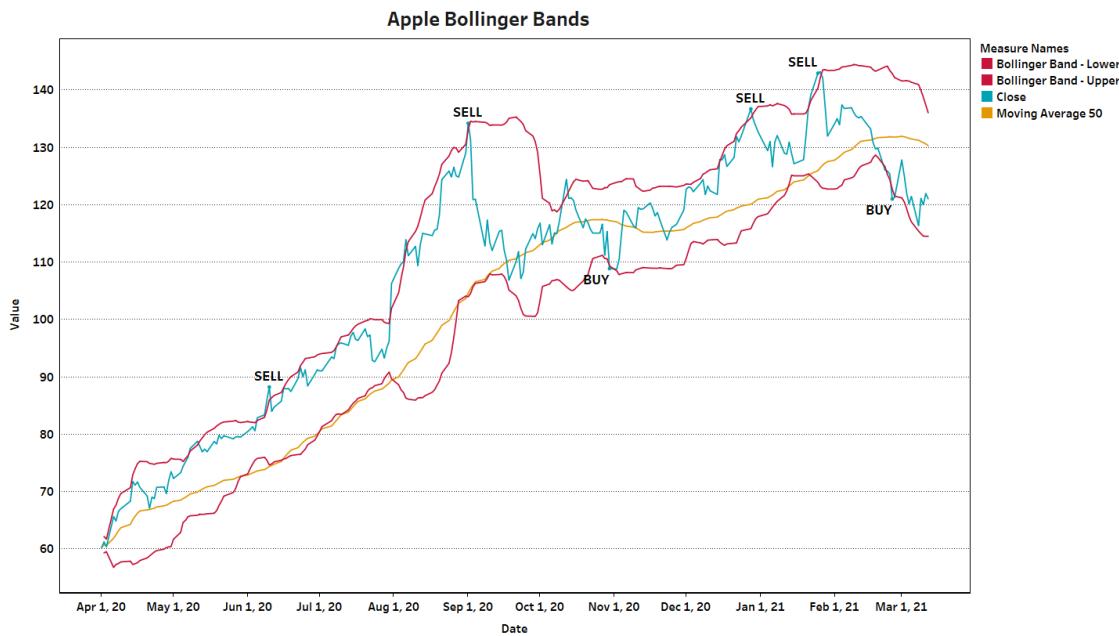


In this graph, we can see the close price line, and the volume bars. The green volume bar represents an increase in volume when compared to the previous day. A red volume bar represents a decrease in volume when compared to the previous day. In the graph, we used blue lines to highlight the moment when the stock price started to fall, at the same time volume started to grow. Meaning that the buyers wanted to buy the stock at a lower price. Here we are using data from the last 4 months for better visualization.

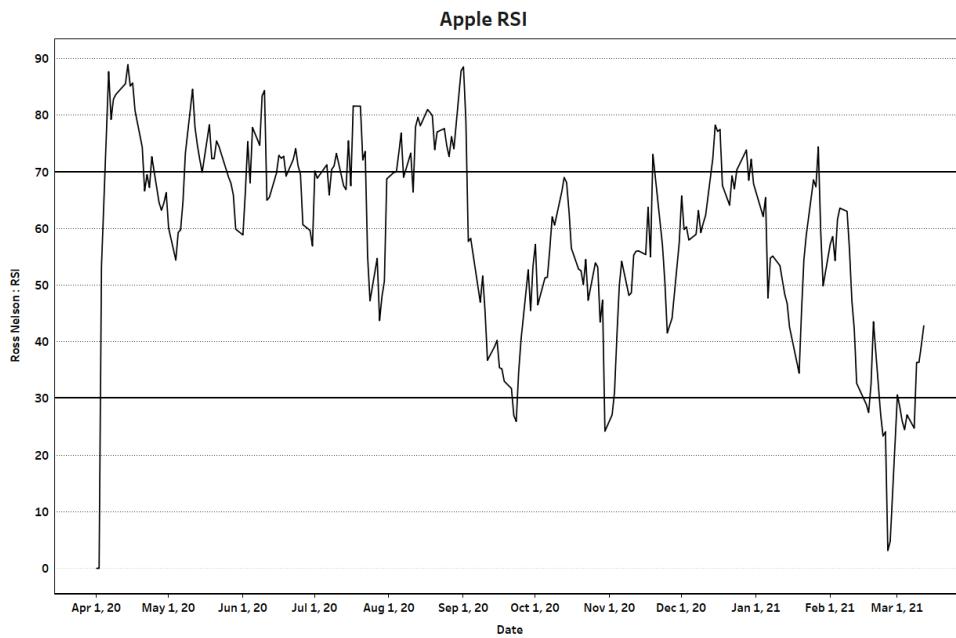
Apple



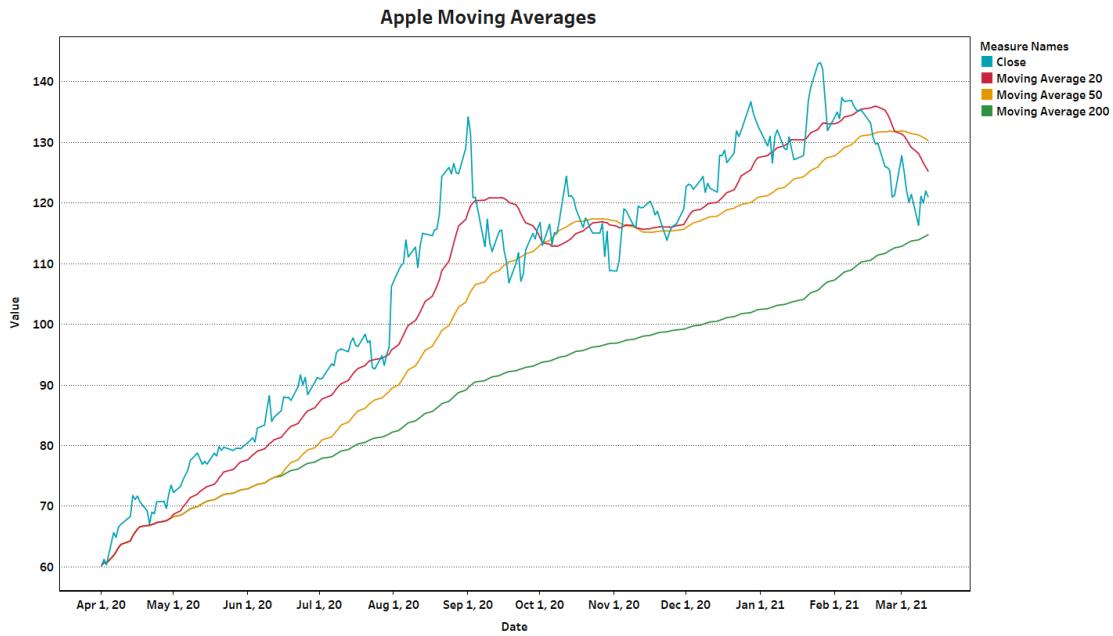
In Apple's stock price data, we can see how there was a drop in the end of the 4th quarter of 2019 and in the end of the 2nd quarter of 2020. After the drop in March 2020, due to COVID-19, the stock price went from \$60,00 to \$120,00, a growth of about 100%.



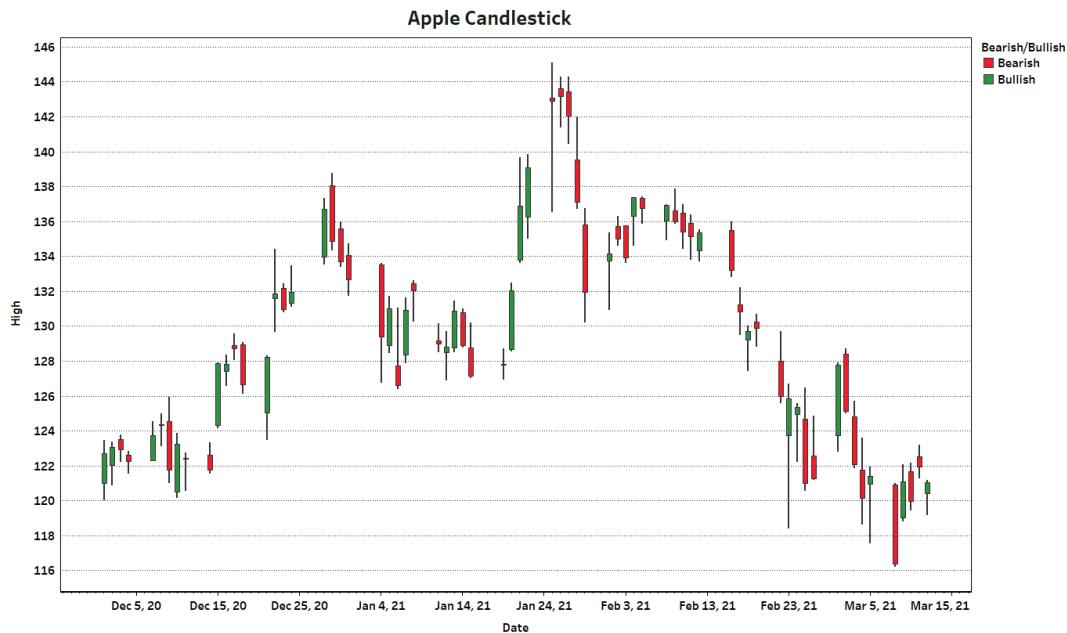
In this graph spanning one year we see the close prices for Apple stock data. We can see buy opportunities at a low price in November 2020 and March 2021. Also, we see are good sell opportunities for stock owners in June 2020, September 2020, and January 2021.



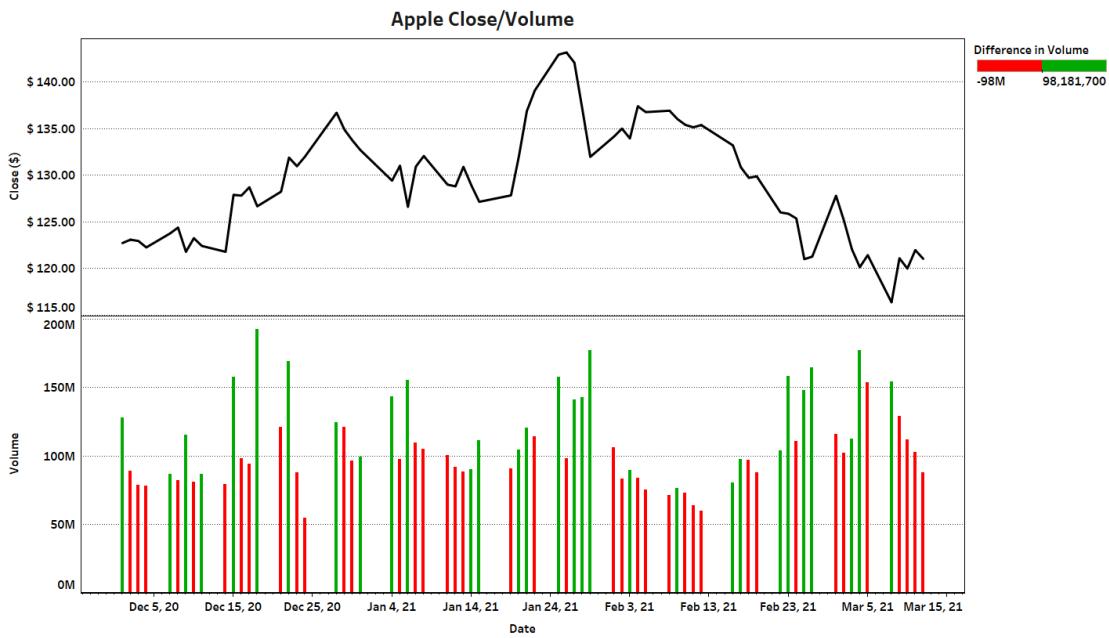
In Apple's RSI graph, we can see some overbuys from April 2020 to September 2020, which makes sense since Apple's stock price was low, and people began to buy it when the stock started growing after the pandemic hit.



Looking at this graph spanning one year, we can see that Apple's stock price close to hitting the 200 moving average line, which could be a good opportunity to buy the stock.

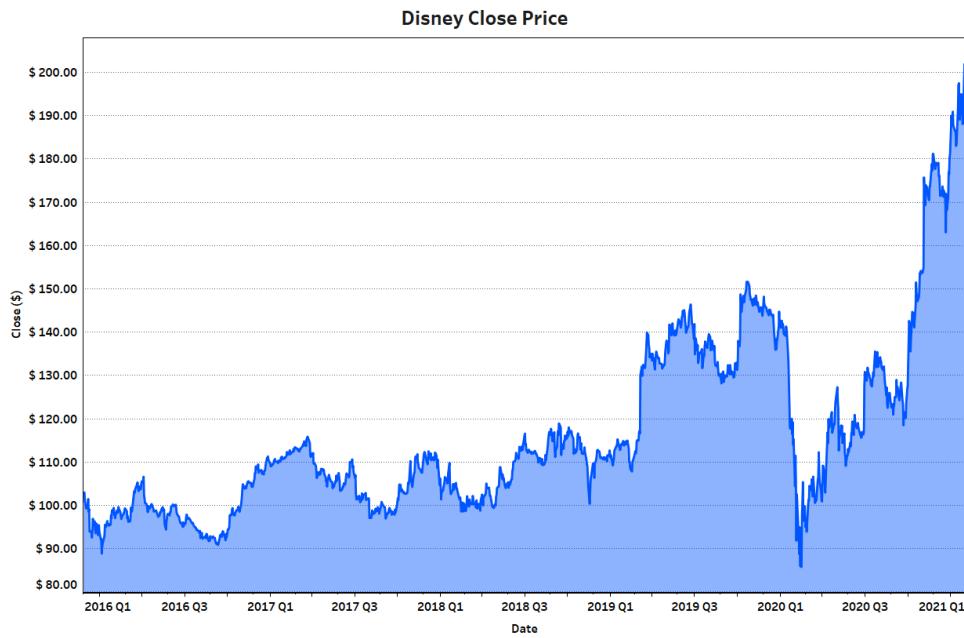


In Apple's candlestick graph of the last 4 months, we can see how the price has been keeping a consistent "size" in change on high and low, and a downward trend since January 2021.

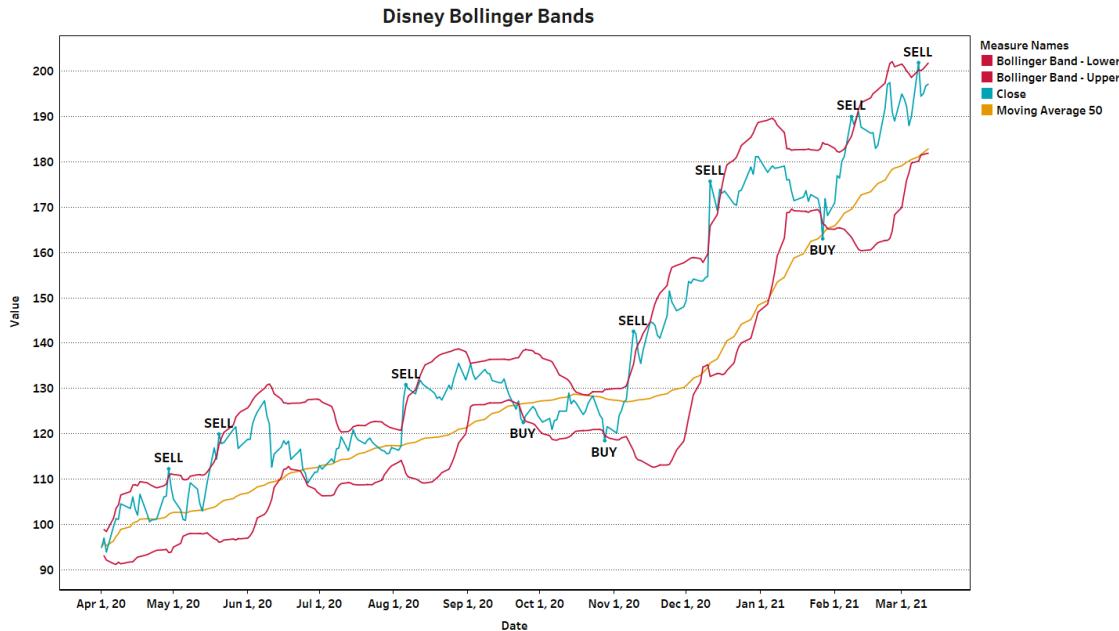


In this graph we can see how the stock behaves in the last 4 months regarding volume and close price. We can see how the volume went up as the close price went up, probably because of sells from people trying to reach a higher profit. At the end of the graph, we can see the price going down and volume going up, probably because there were people buying the stock at a lower price.

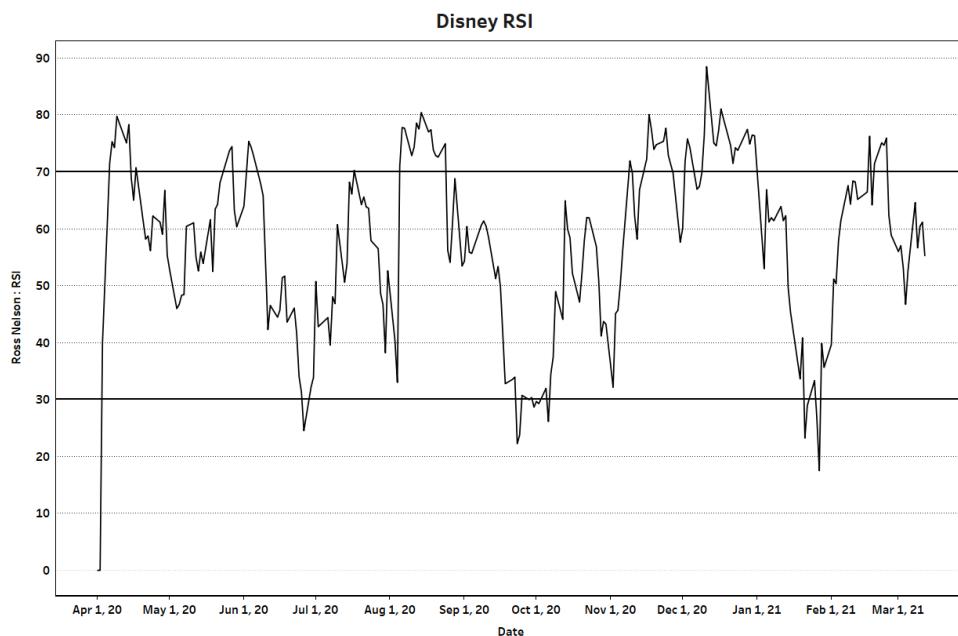
Disney



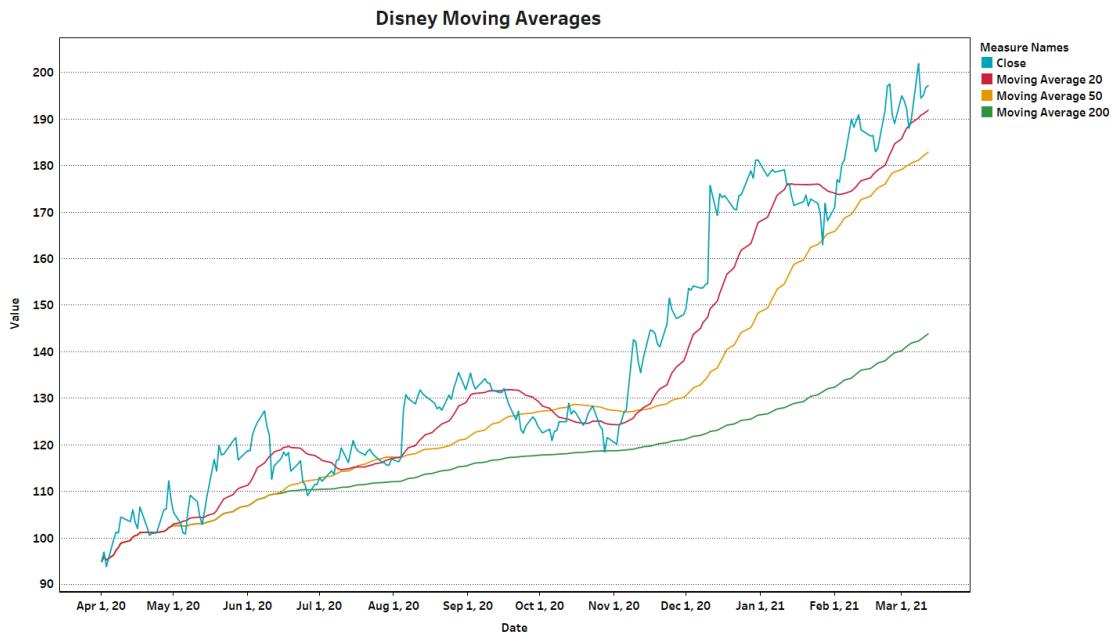
In the stock price data for Disney, we can see how the pandemic effected Disney stocks in the first quarter of 2020. This drop was the highest drop of the stock in 5 years. After the drop, there was a huge growth in the stock, with the price going from \$90.00 to \$130.00 in 1 quarter.



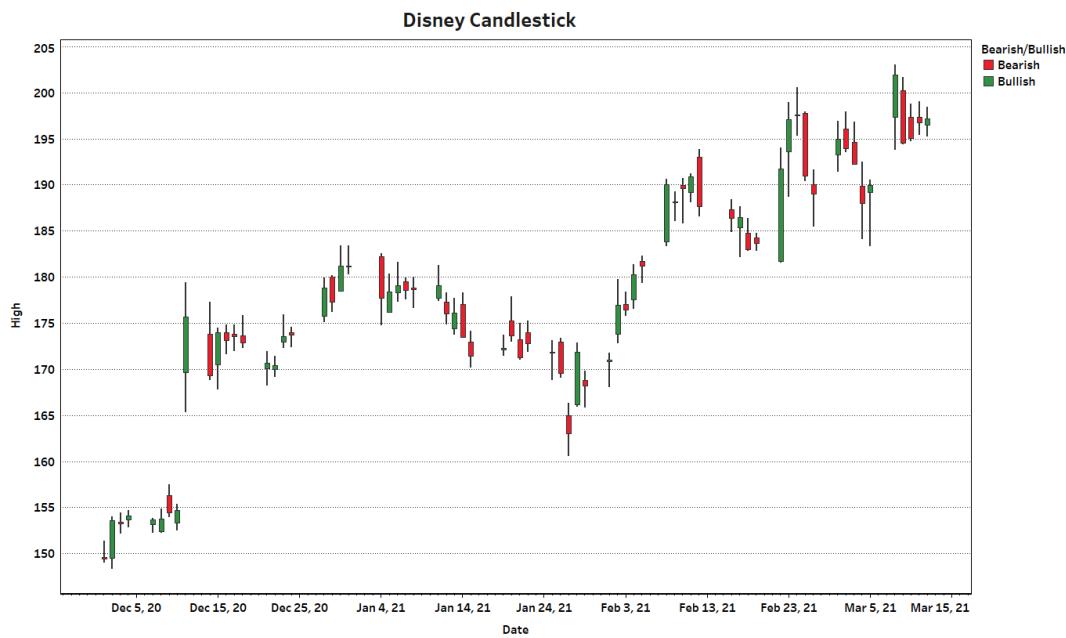
In this graph, we can see 7 explicit sell indicators, and 3 explicitly shown buy indicators. Even though they are clearly shown, it does not mean an investor should solely make an investing decision based on these indicators.



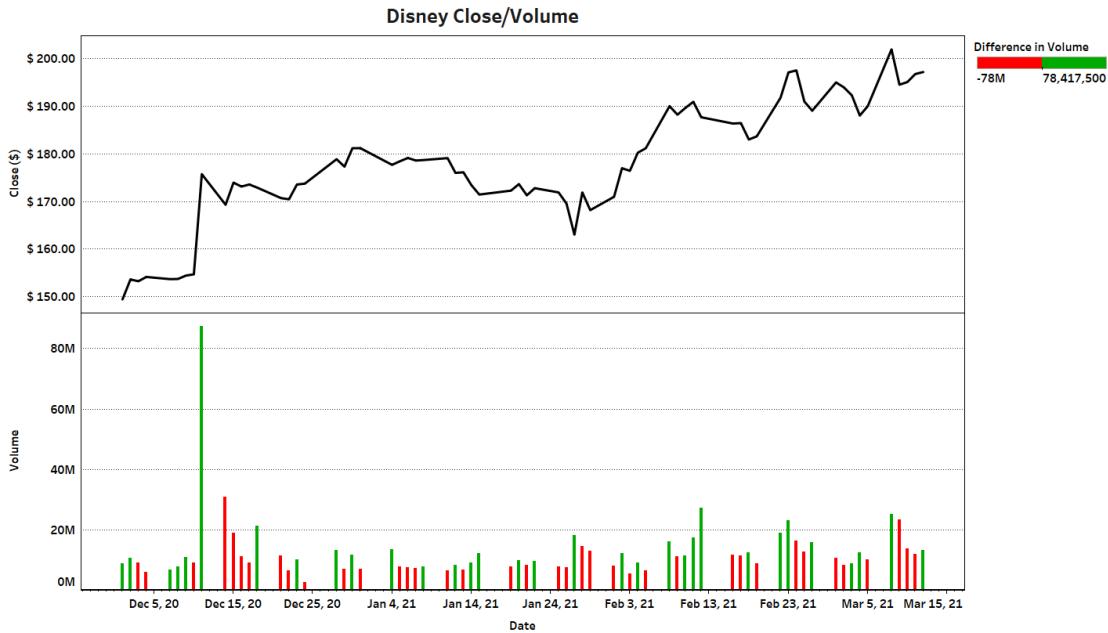
Disney's RSI graph shows more overbuy than oversell points, which indicates investors could consider buying the stock many times in the last year.



In this graph, we can see how the close price reached a price \$60,00 higher than the moving average of the last 200 days.

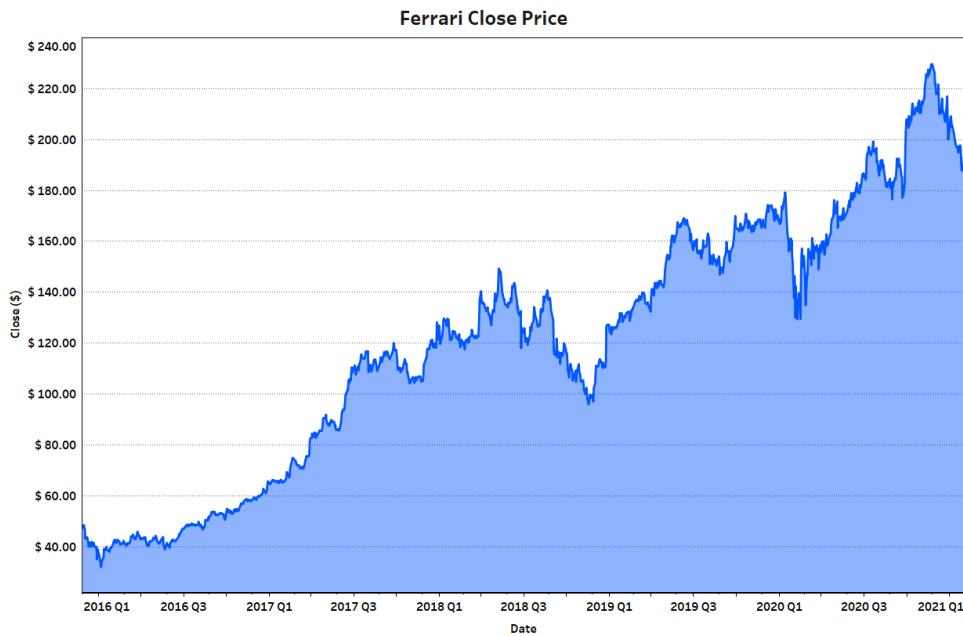


Based on the last 4 months, we can see by looking at the candlestick graph how the open/close and high/lows have grown about \$50.00.

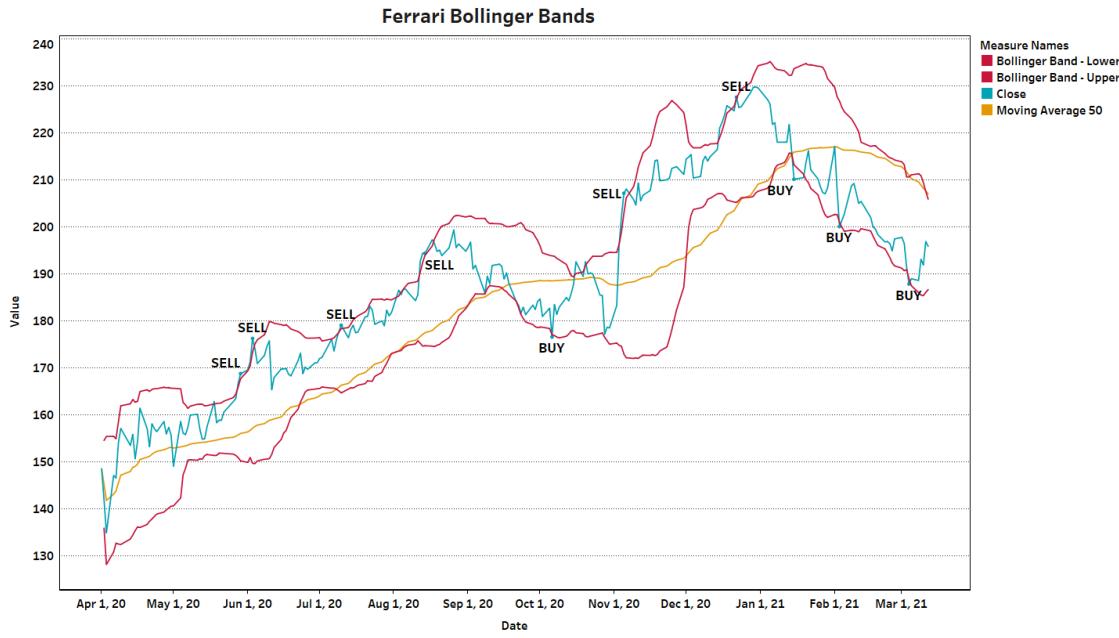


In this graph we analyze how the stock price and volume behave in the last 4 months. We can see in this graph that the price has been going up in the last 4 months, but the volume has kept consistent after a huge volume uptick between 5th and 15th December.

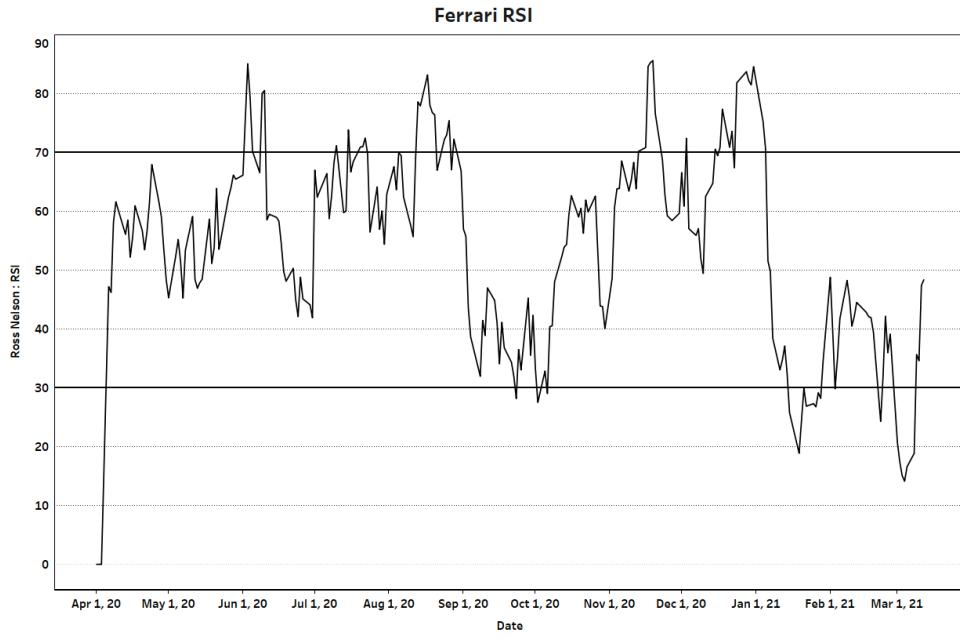
Ferrari



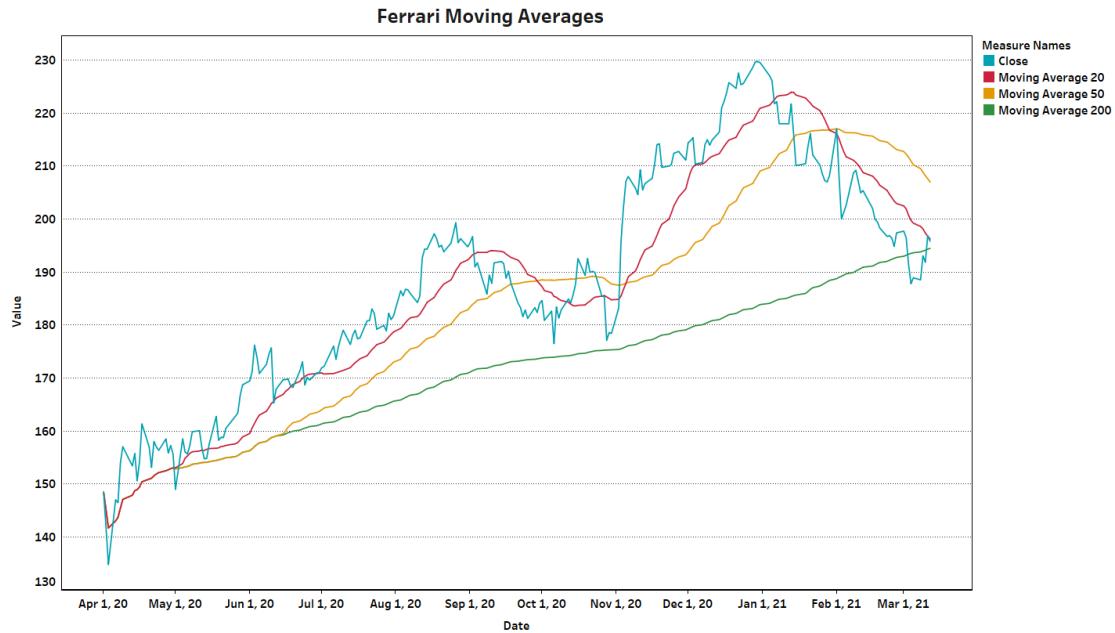
In Ferrari's close price graph, we can see how the stock has consistently grown since 2016. Mostly attributed to being able to do fast recoveries from drops, even when covid-19 hit in 2020. Since the drop in 2020, the stock has grown about \$80.00.



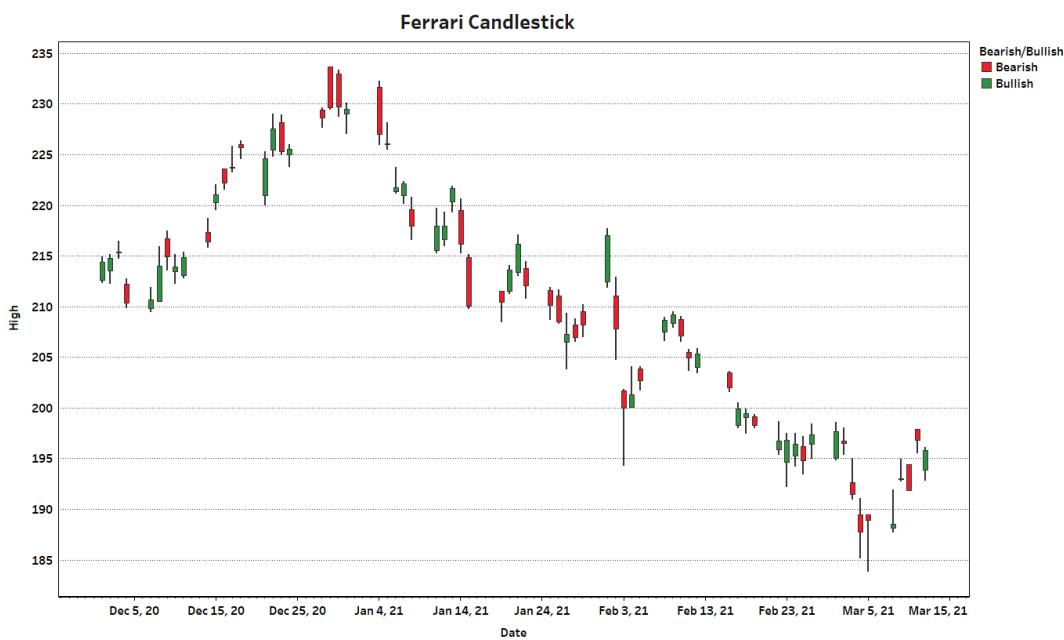
Looking at the Bollinger bands graph, we can see several sell opportunities, and some buy indicators as well. In this graph containing 1 year of stock data, we can also see the growth from April 2020 to January 1st, when the stock had a \$100.00 growth.



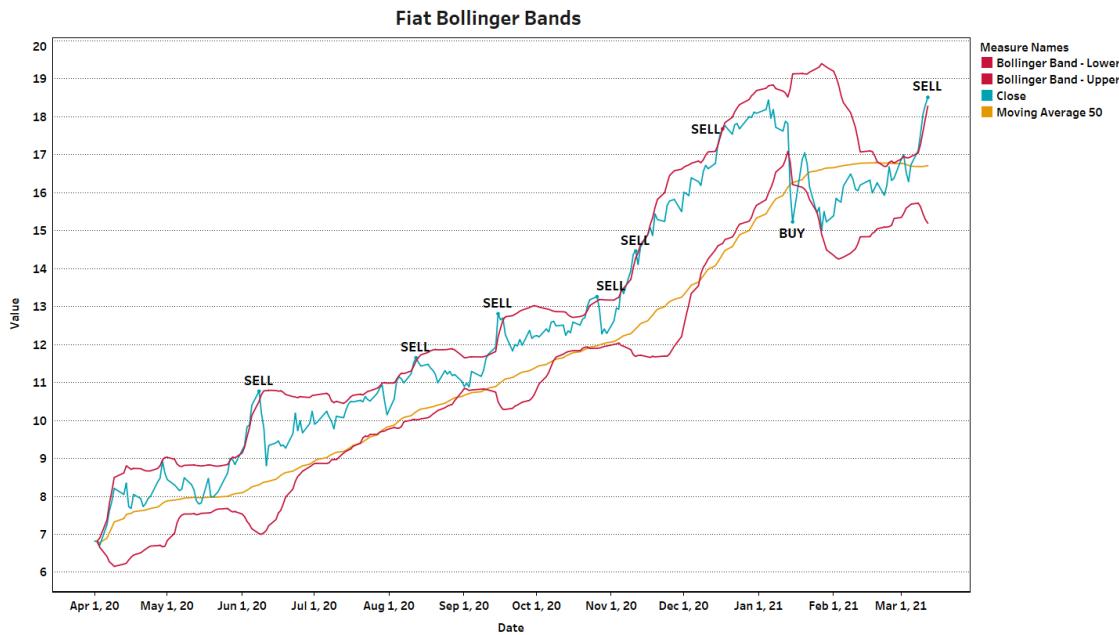
In Ferrari's RSI graph, we can see a couple of buys before the price reached its peak in January 2021. After the peak, when the price started going down, people started to sell the stock, which resulted in an oversell period since January 2021. Comparing the RSI with the previous graph, we can see how the price went down just like the RSI went down in the last 3 months.



Looking at the moving averages, we can see how the close price went below the 20,50, and 200-day moving averages in the last couple of days. It indicates a buy opportunity since the price has reached a price below the average of the 200 days, meaning the investor could buy it cheaper than any other day in the last 200 days.



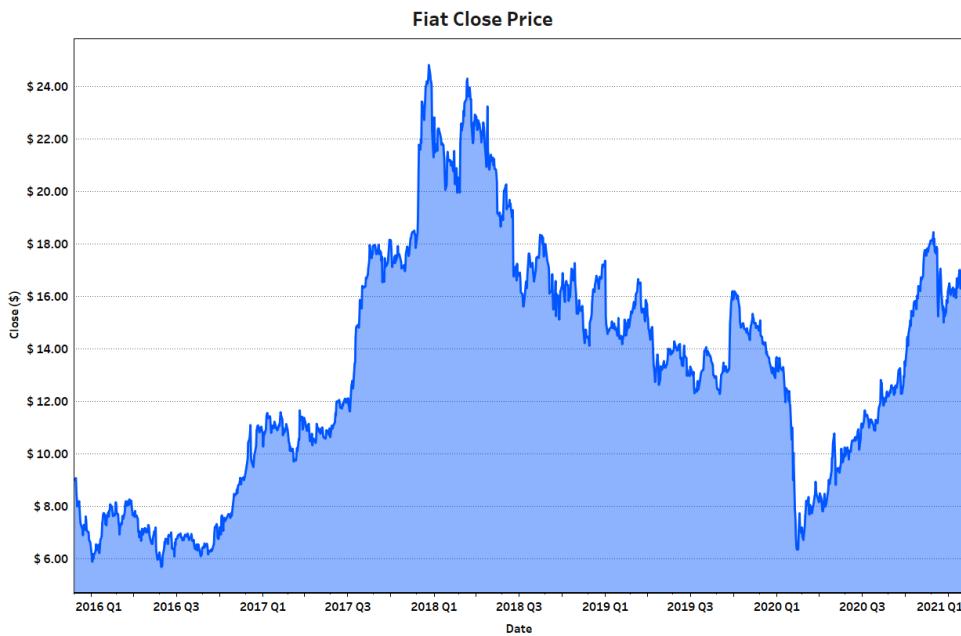
The candlestick graph shows a consistent decrease in Ferrari's stock price in the last 4 months, which summed up with the previous graph, shows that investors could buy the stock at a cheaper price.



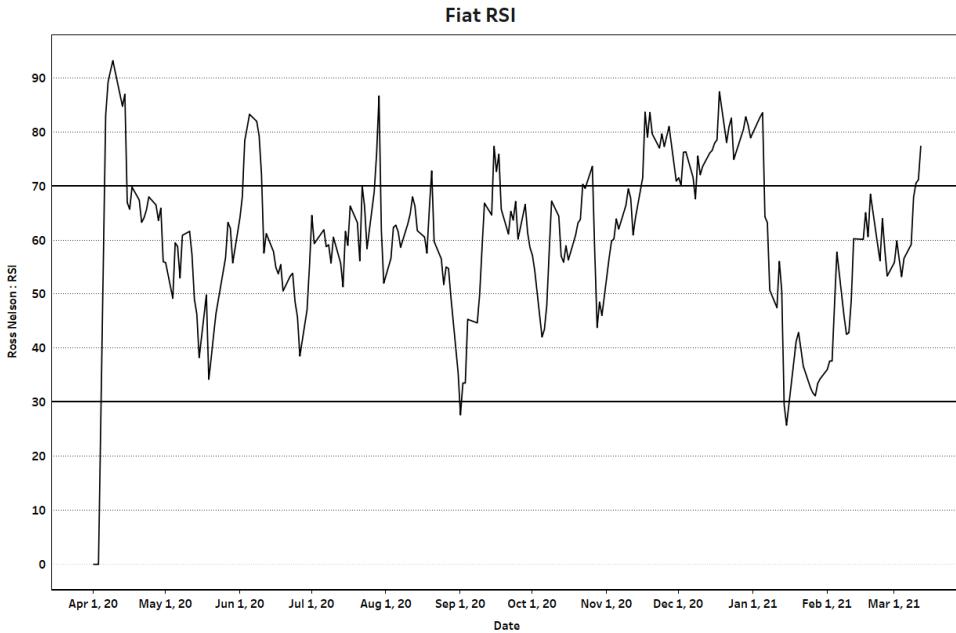
In Ferrari's close price/volume graph, we can see how the volume has been relatively consistent, while the close price has kept a downward trend since December 2020.

Fiat

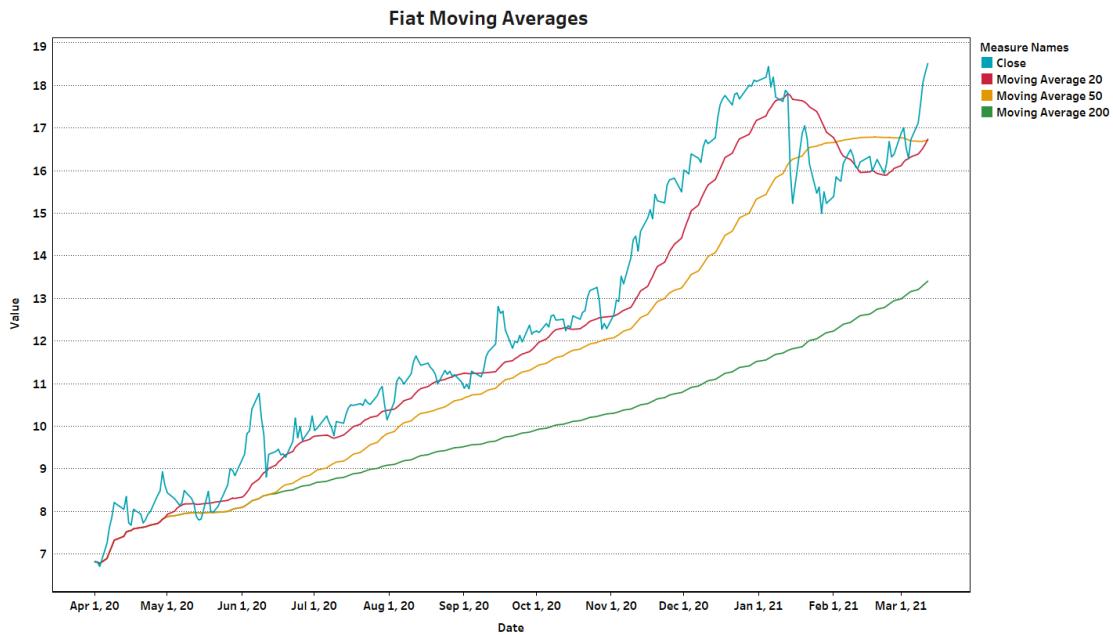
Fiat's close prices do not look as good as the other stocks. We can see that the stock has been unstable in the last 6 years. While the other stocks presented an upward trend even after covid, Fiat showed a downward trend since the first quarter of 2018, with a \$6.00 or 50% drop in the first quarter of 2020.



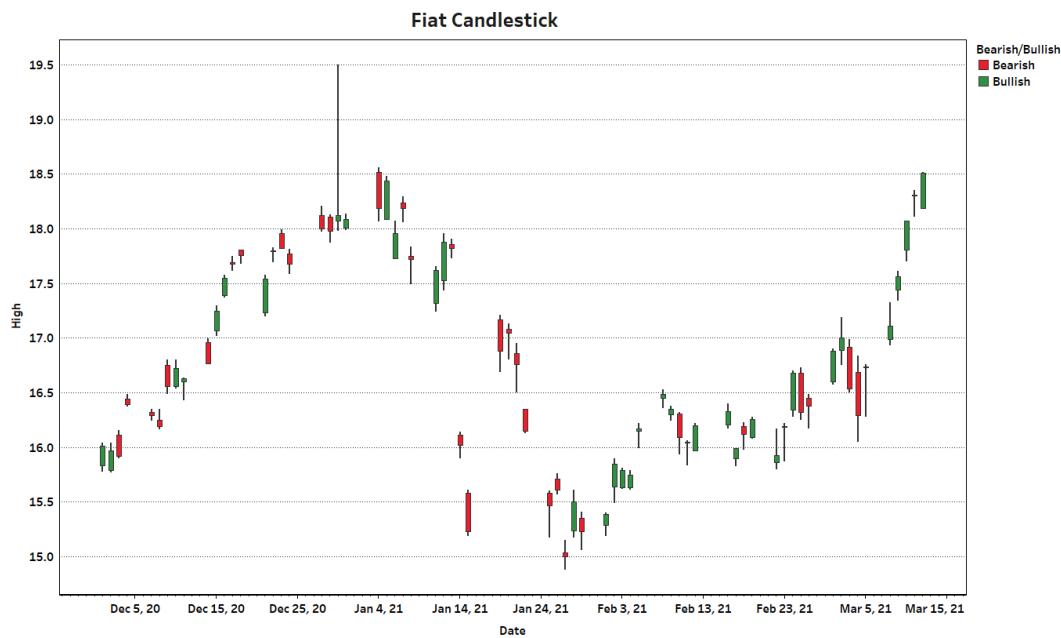
In the last year, Fiat has shown an increase in close price, giving investors opportunities to sell the stock at a higher price if they bought it before the covid drop in the last year. We can see one buy indicator by the end of January 2021, when the close price crossed the lower bound.



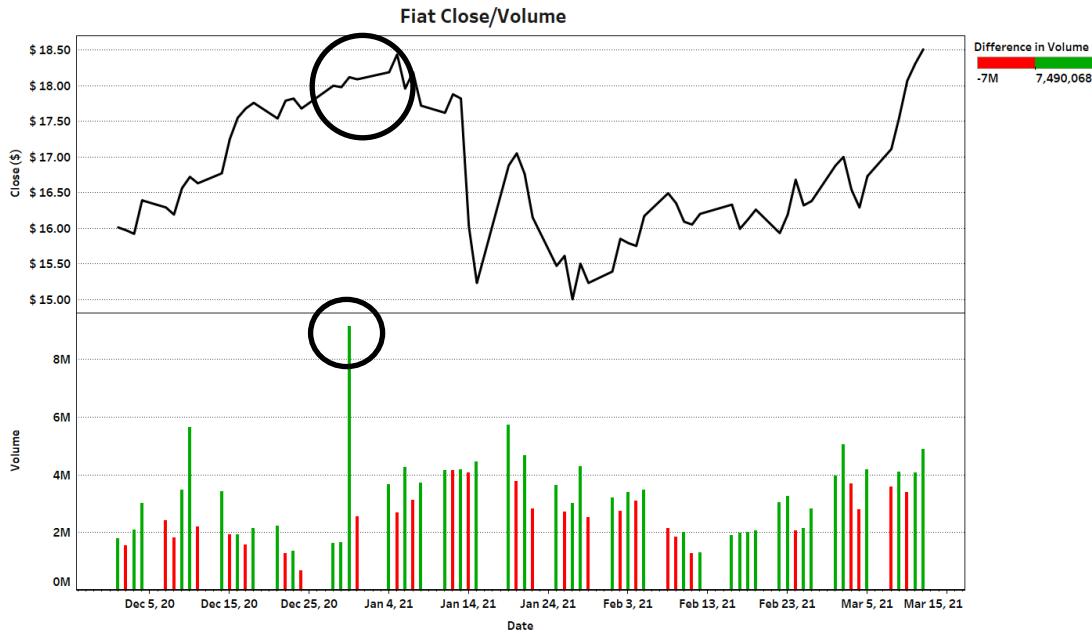
In Fiat's RSI, we can see how the stock has been overbought more than it oversold. We can also see how the RSI followed the close price's trend. The RSI kept an overbought trend as the stock kept going up, then it was oversold as the price went down. Therefore, investors should keep an eye on the RSI. As soon as there was an oversell, the price went down, and the investor could have lost an opportunity to sell the stock at a higher price. Besides, it is important to consider buying a stock in a overbuy. In this situation, we could see how the price kept going up as the stock was being overbought.



By analyzing the moving averages for Fiat's stock price, we can see how the price rose in the last year, costing \$6.00 higher than the moving average of the last 200 days.

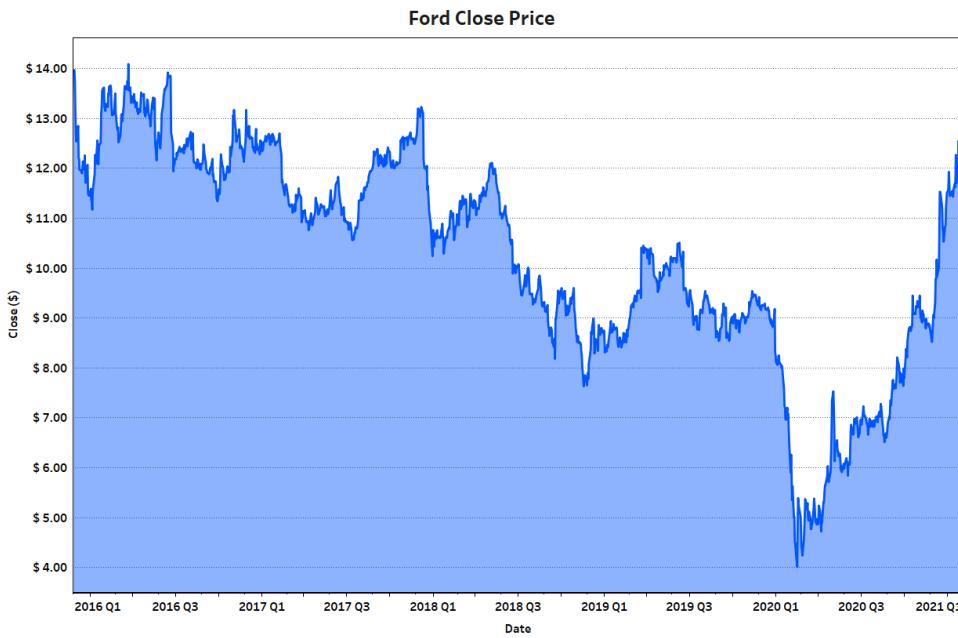


In this candlestick graph, we can see the price variation over the last 4 months. Day traders had a good buying opportunity in between December 25th and January 4th, when the price reached its highest difference in high and low when compared to the other days in the last 4 months.

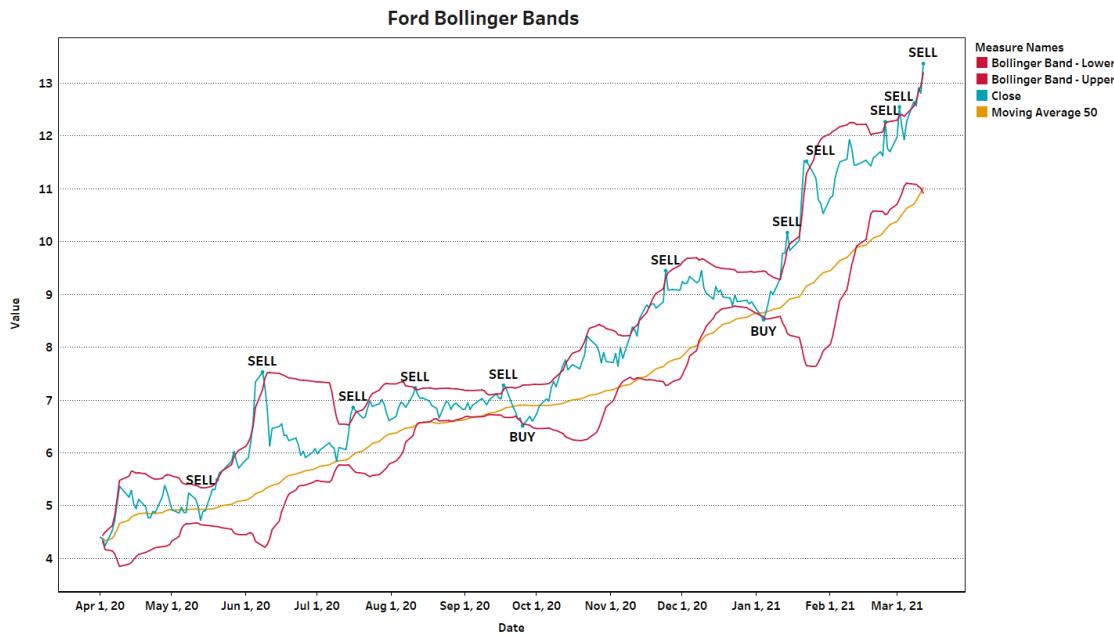


The close/volume graph for Fiat shows how there was a higher volume right before a drop in the close price, which probably means people sold their shares before the price dropped. Around the same time, we saw a selling indicator in the Bollinger bands graph, which coincides with a high volume of people selling their stocks in Fiat to maximize profit.

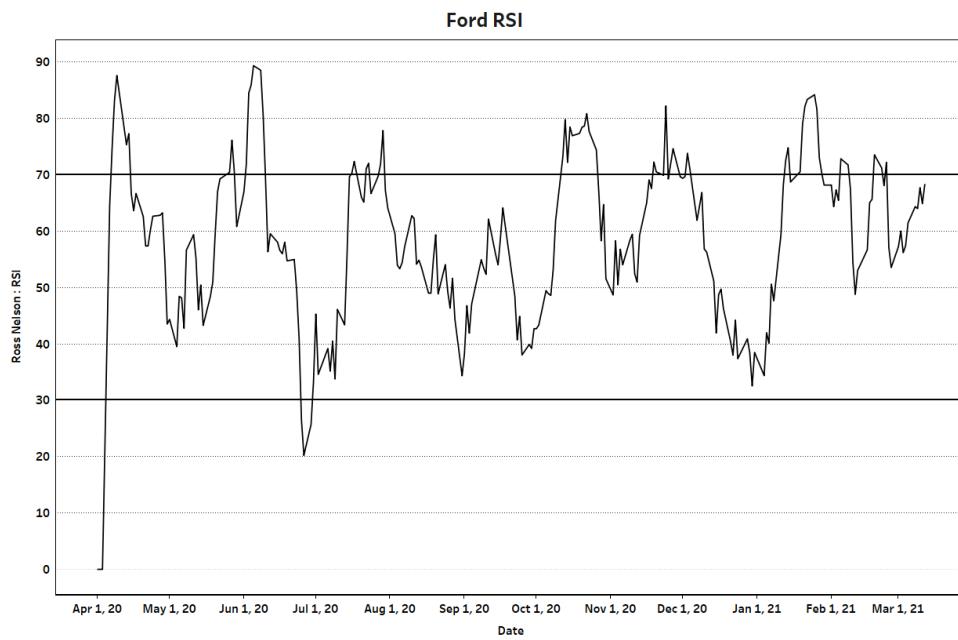
Ford



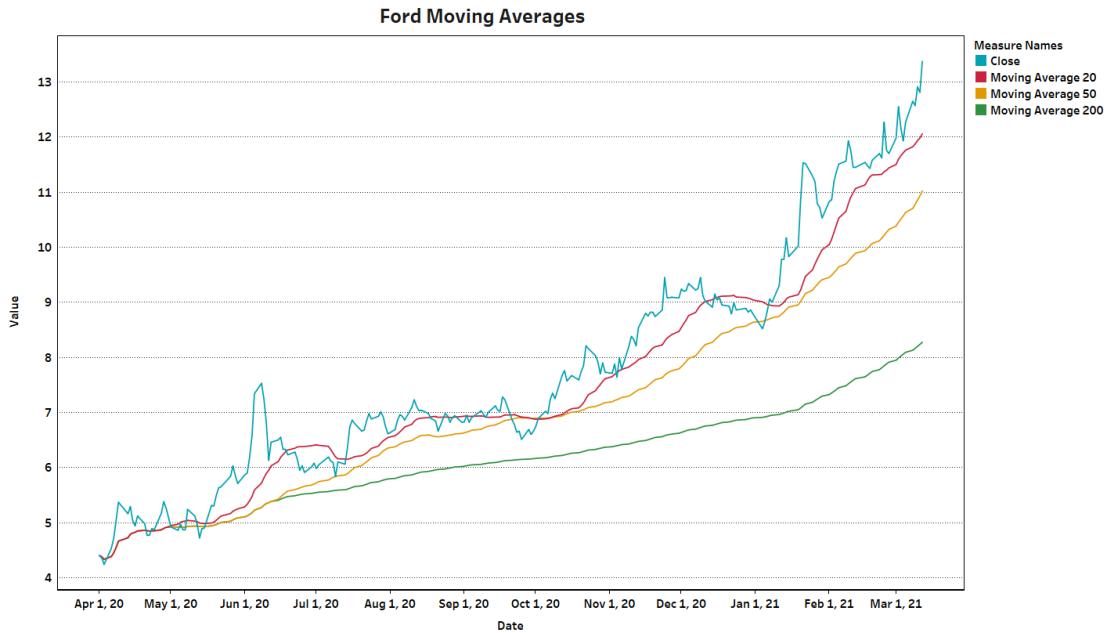
Ford's stock price followed a similar trend with Fiat's stock price. Both stocks had a downward trend before COVID-19 effects and both stocks had a huge recovery after the pandemic. Even though both stocks did not reach their last maximum close price from 5 years ago, Ford managed to get closest previous maximum.



Ford's Bollinger bands show different sell opportunities during the last year. If an investor followed the buy and sell indicators, they could have made good profits since the price tended to drop after the sell indicators, and a rise after the buy indicators. Although, in the last 3 months, it seems like the stock kept an upward trend crossing over the upper band multiple times, which gives investors uncertainty on when to sell to get the most profit from the investment.



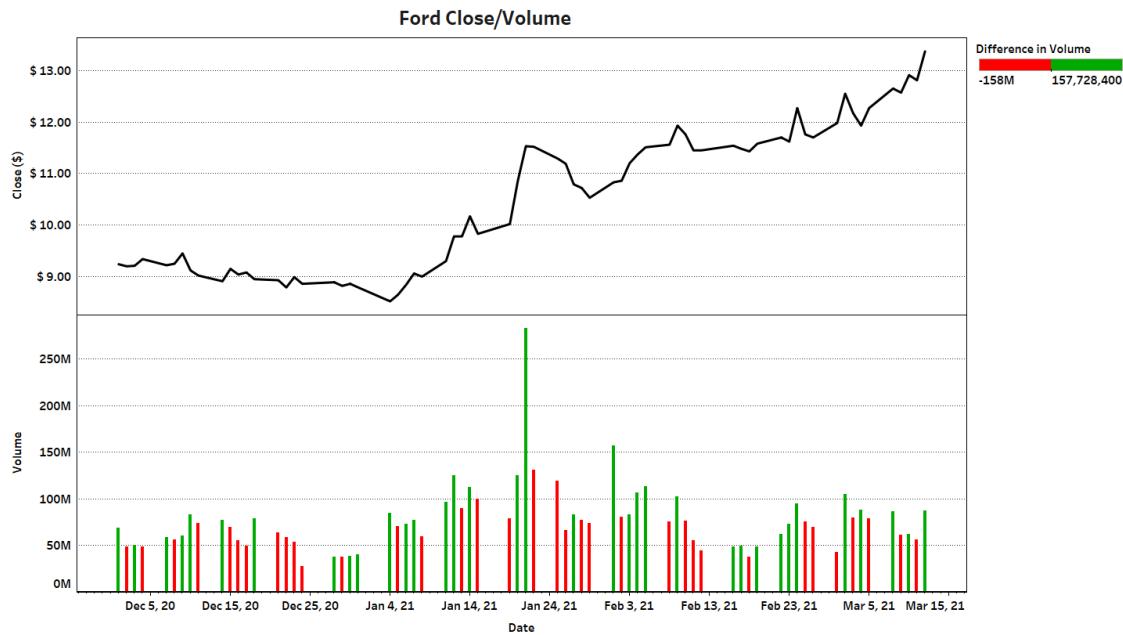
Ford's RSI graph shows the stock behavior in the last 4 months. We can see that the stock is in an overbuy pattern, which is a buy indicator for investors. As soon as the RSI hit the 30ish line, the investors should sell the stock since its price might instantly go down after a period of overbuy.



In this graph, we can see how the stock behaved in the last year. When compared to its stock price average from the last 200 days, we can see that the stock has had an increase in price. An investor who invested in the stock 200 days ago has now made some good profit out of the stock, since its price kept a consistent upwards trend.

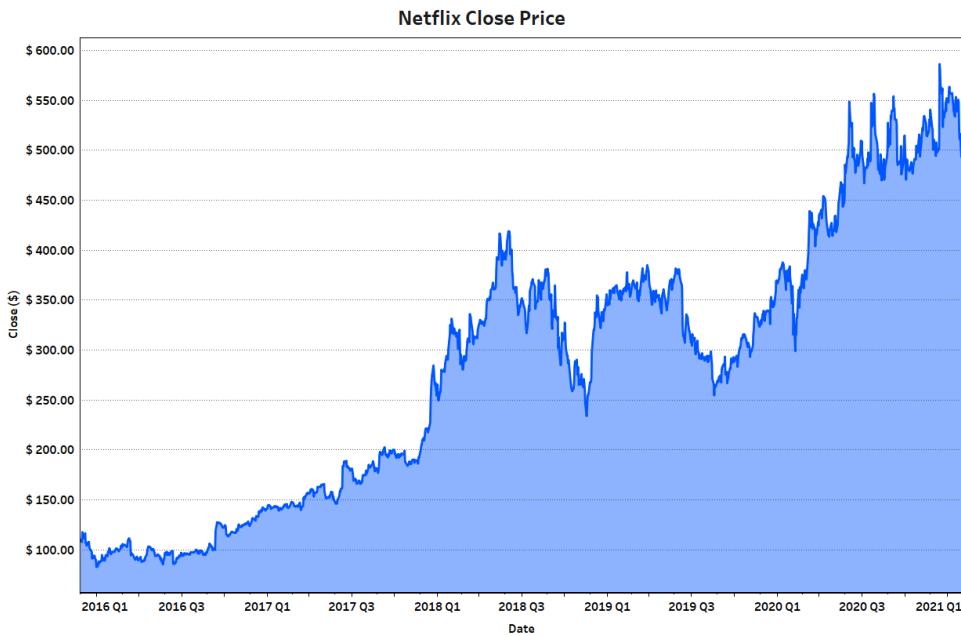


Looking at the candlestick graph, we can see the stock's upward trend in the last 4 months. The changes in price were not significative initially, but in the last 3 months, the highs and lows have had a higher variance in price, allowing day traders to have better profits since the highest changes in price were from a lower open price to a higher close price (green bars).

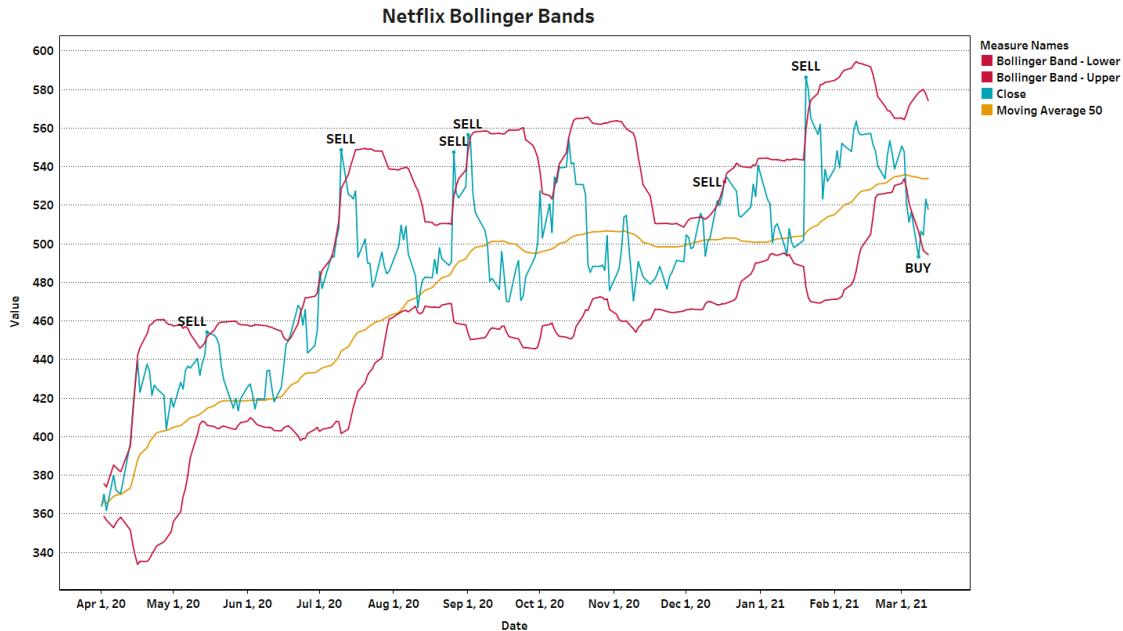


The close/volume graph for Ford shows a peak in volume in the middle of the graph. At the same time the volume went up, the stock price went up, meaning that the volume was much higher for buys than it was for stock sales. After the peak, the stock kept a constant behavior in volume, and an upward trend in close price.

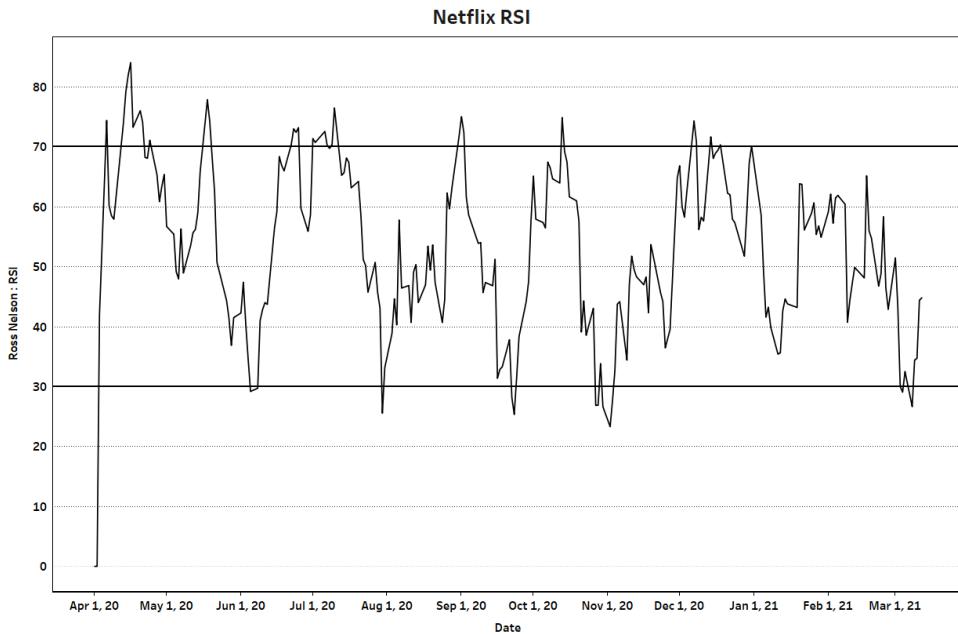
Netflix



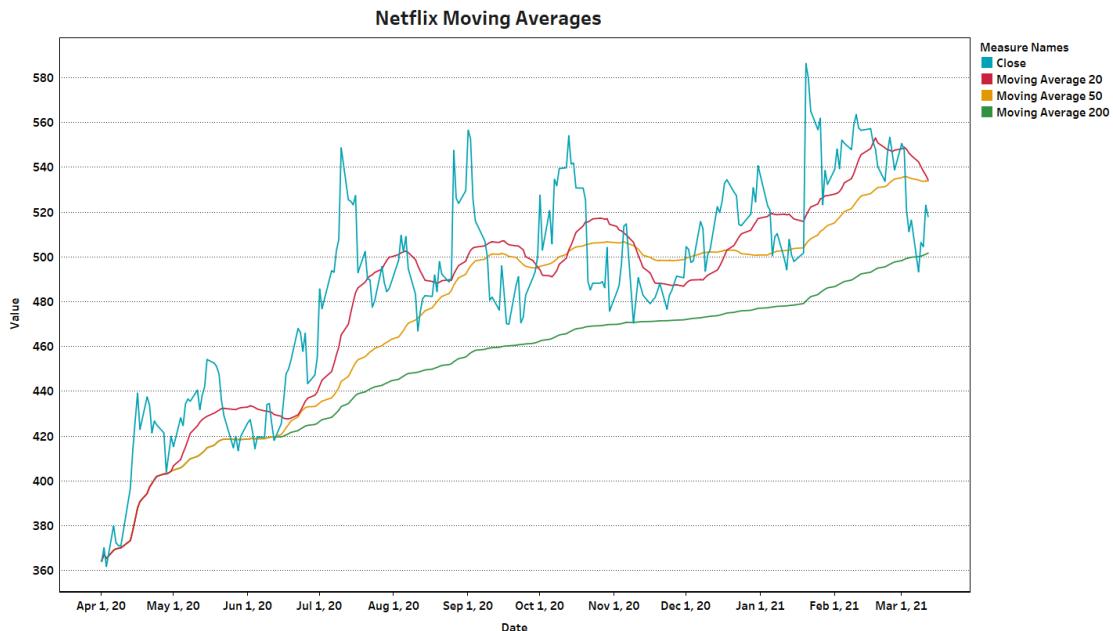
In Netflix's stock price graph, we can see that the company have had an upward trend since 2016, and an even higher growth after the pandemic. It makes sense that this company had a big increase in stocks after the pandemic since most people were in lockdown, having more time to spend in front of a device streaming movies/TV shows.



This yearlong graph shows several sell opportunities. Other than the first sell indicator, the sell opportunities did not differ a lot in the stock price they were found at. There was only one good opportunity to buy the stock. It is right after a drop in the stock price that kept a high variation in prices during the last year. The 50-day moving average shows us that even though the stock has variations in price, it has shown an overall upward trend.



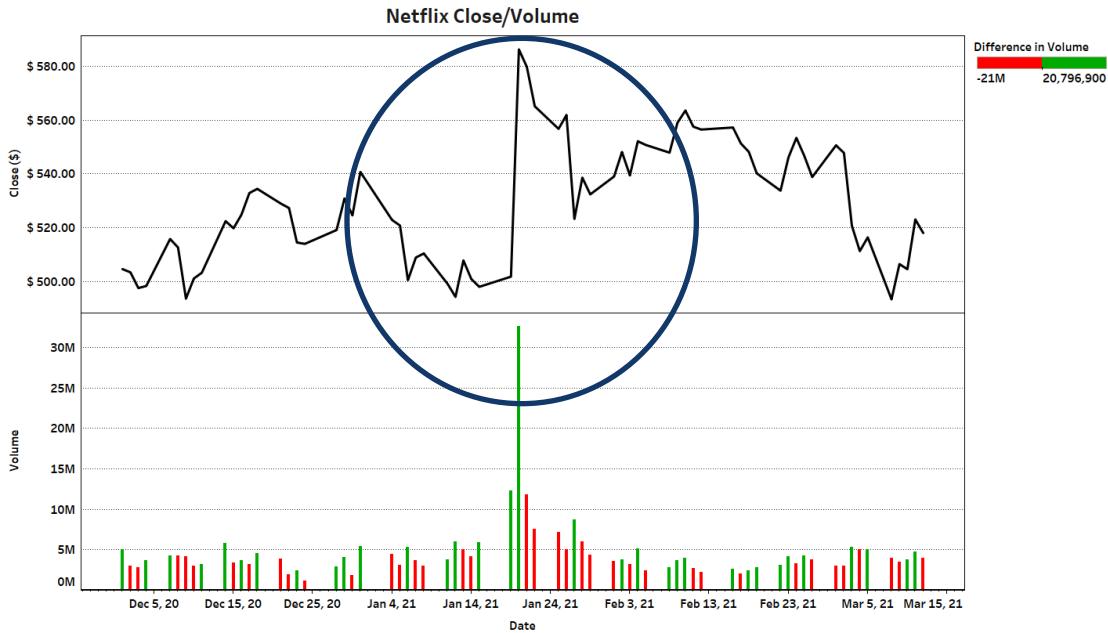
It is interesting to see how the RSI imitated the stock behavior. We can see the exact same downward trend at the end of both graphs. Meaning that investors started selling the stock and the price went down. Giving new investors an opportunity to buy the stock and holders to sell it after the stock reached a high price due to being overbought, that made the price reach a temporary peak.



As seen in this graph, the stock price has recently crossed down the 200-day moving average. Which means that the price was below the average of the last 200 days, giving investors the opportunity to buy the stock for a cheaper price.

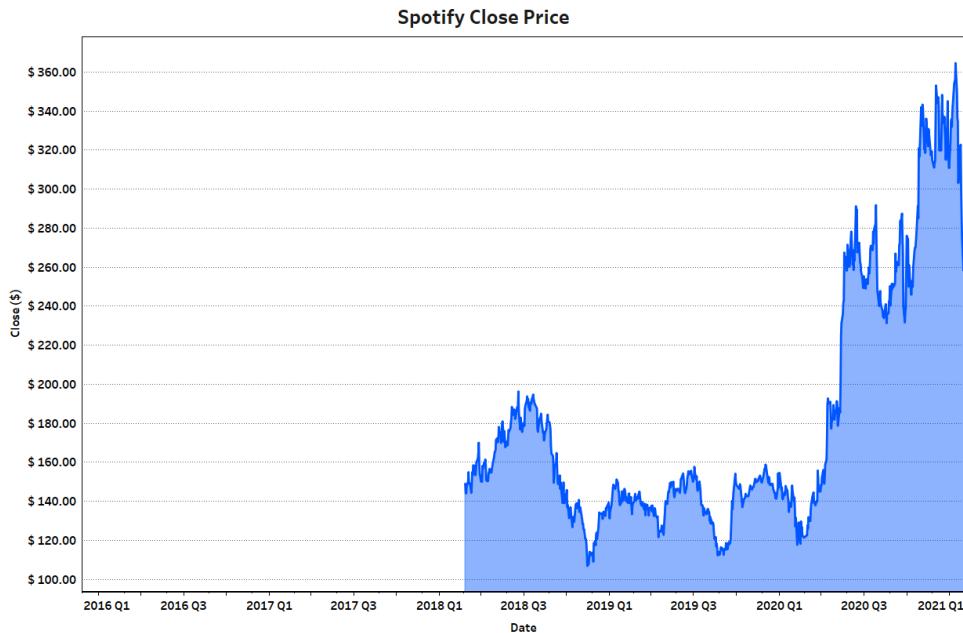


In Netflix's candlestick graph, we can see a big difference in open price in the middle of the graph. After this sudden increase in stock price, the stock has been in a downward trend for 2 months. The variation of prices has had days in which the price fluctuated about \$30.00.

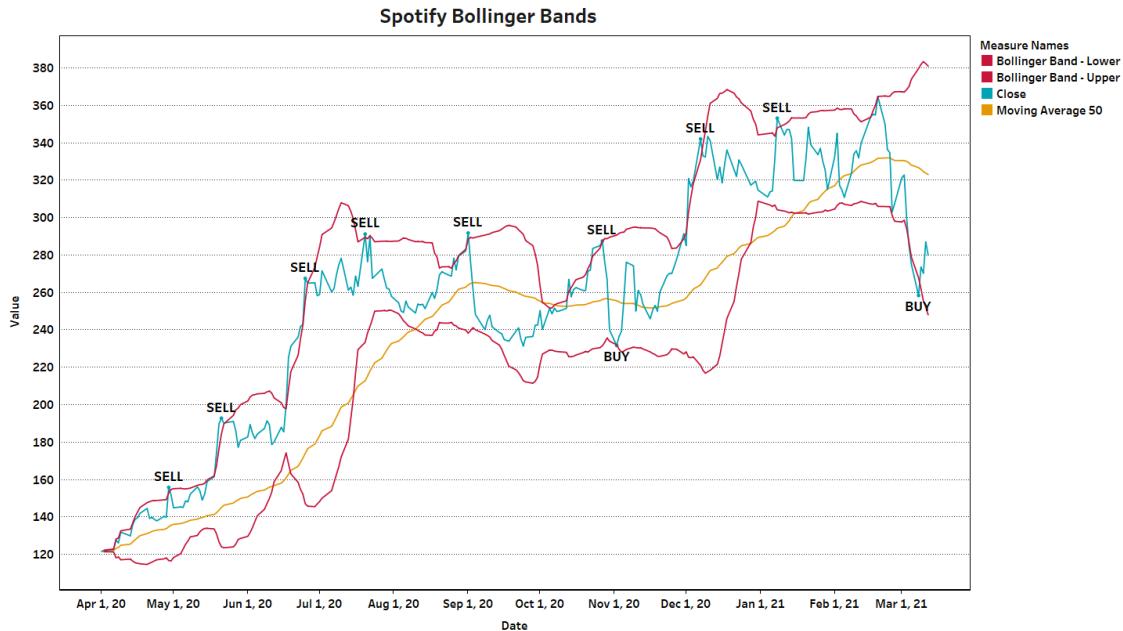


In Netflix's close/volume chart, we can see a higher volume at the end of January. It is possible to assume there was a high volume of people buying the stock because there is an increase in price during the same date it had the high volume.

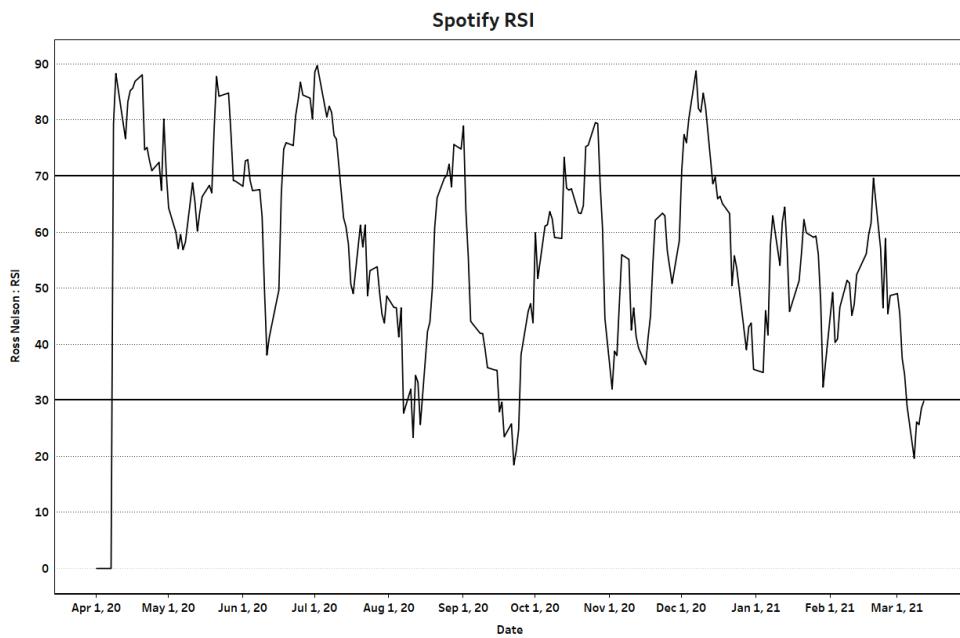
Spotify



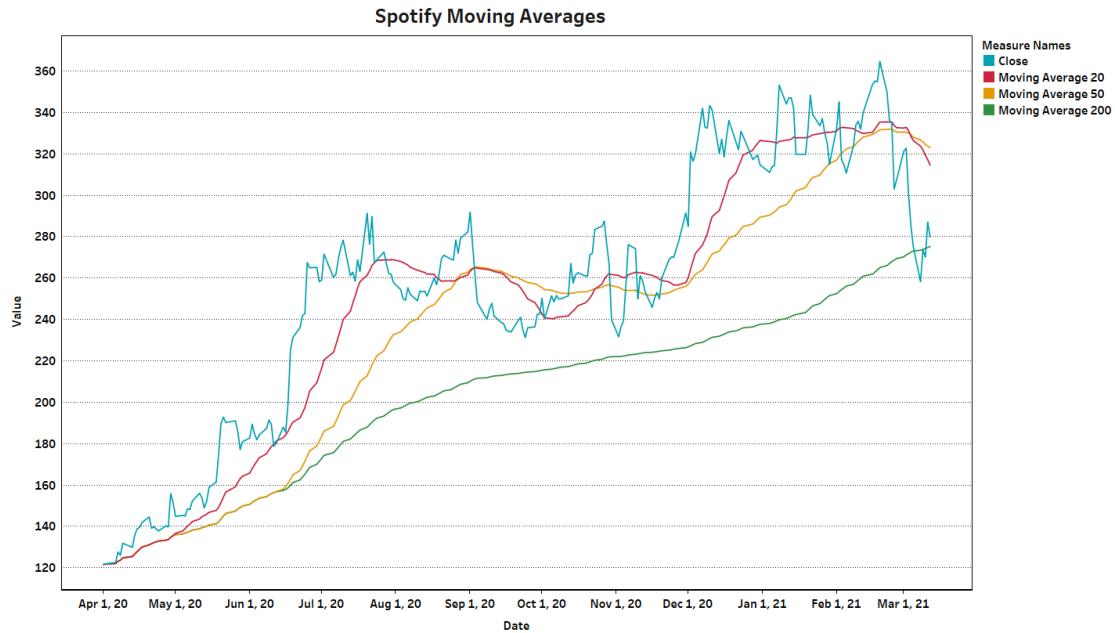
Spotify Technology S.A. went public in the first quarter of 2018, meaning that there is no data before then. Spotify initially had a rocky start, but after the pandemic its stock had a major growth, going from \$120.00 to almost \$300.00.



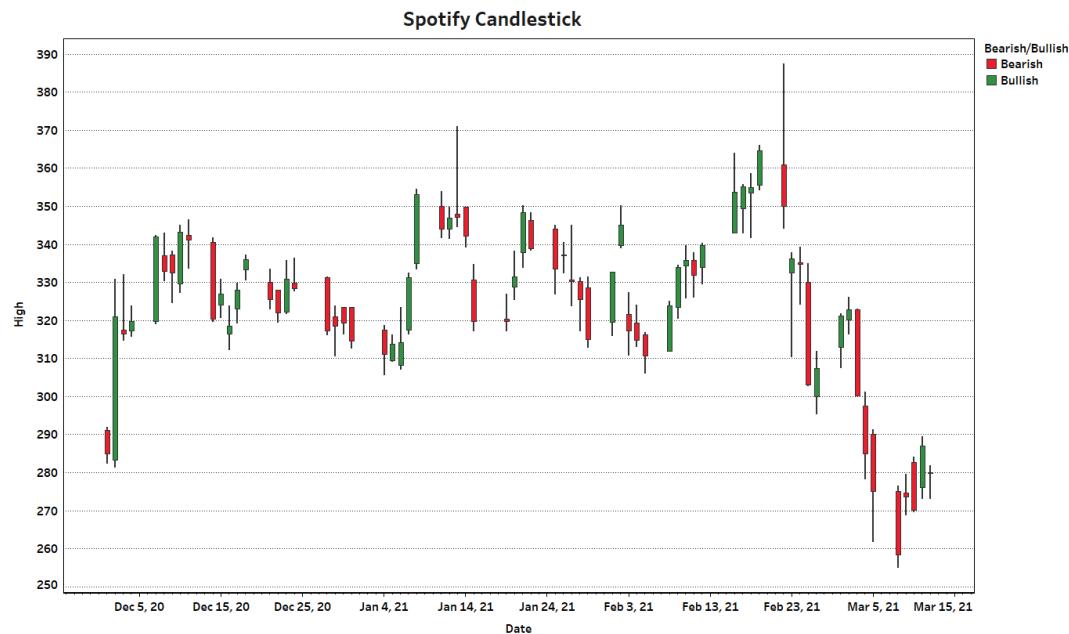
In Spotify's Bollinger bands graph, we can see several sell indicators and a few buy indicators. Since the stock is in an upward trend, it is likely it will have more sell opportunities in the future since the price keeps going up and crossing the upper band. There were a few drops in the price, which resulted in buy opportunities.



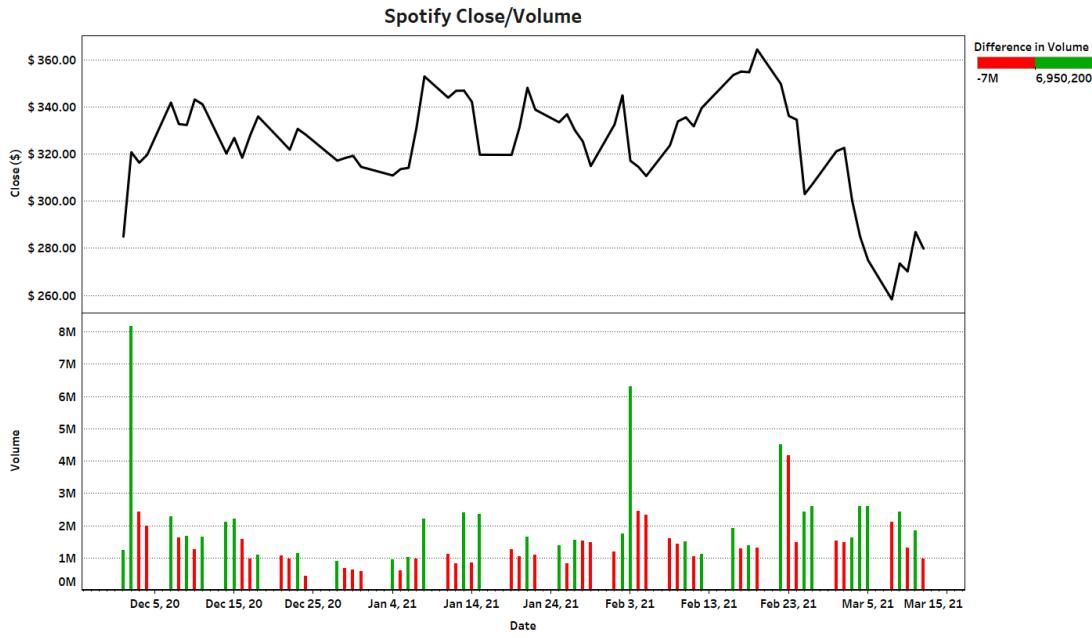
In the graph for Spotify's Relative Strength Index, we can see how the investors behaved in the last year. Recently, the RSI has been below/close to the 30 line, which means that the stock has been oversold. It is a sell indicator since the investor should sell the stock because the price might go down, which has already happened since the beginning of February, when the stock prices started to drop and kept a downward trend since then. For new investors, it is important to keep an eye on Spotify's RSI because when it starts to be overbought again, the price might go up, which would result in returns on investments.



It is interesting to compare last year's Spotify and Netflix stock prices. Both streaming services had good buy opportunities since both prices crossed below the 200-day moving average. Also, both stocks had a drop in the middle of the graph and their overall trend look similar.

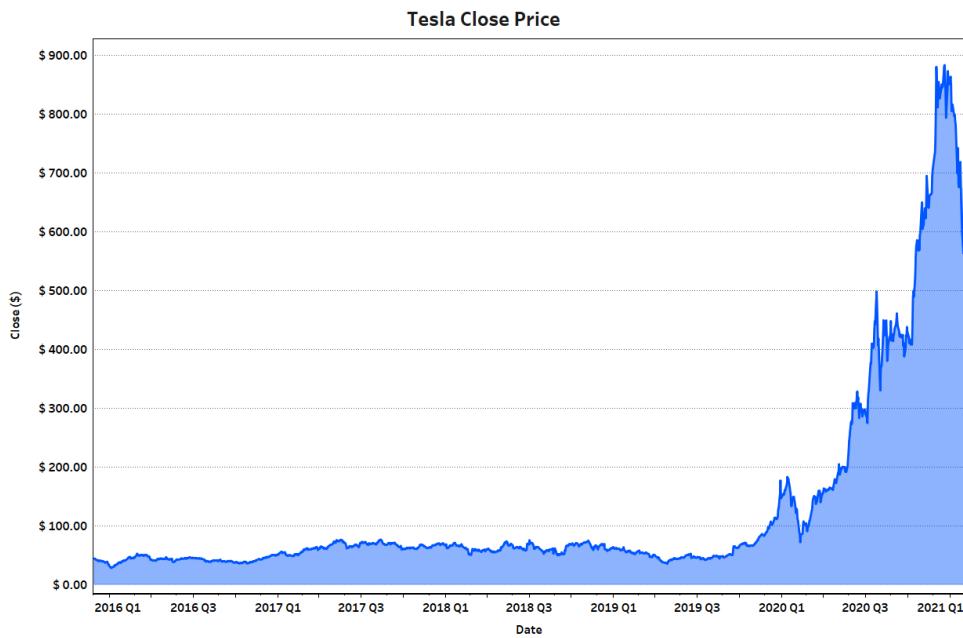


Spotify's candlestick graph shows 3 months of stability, with the last month going in a downward trend.

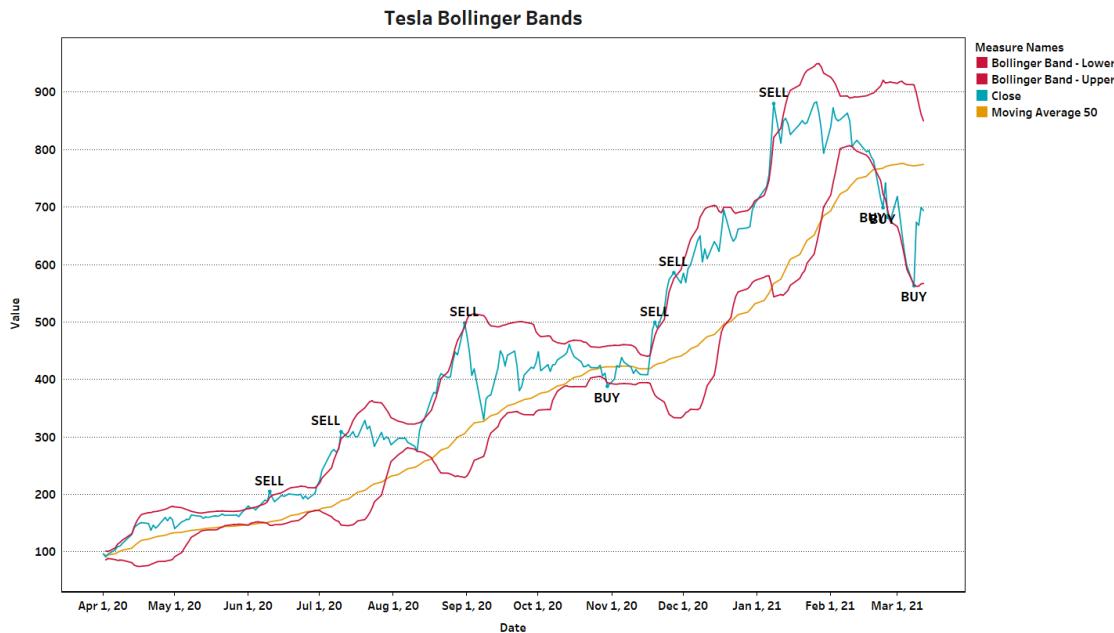


In this chart, we can see Spotify's behavior in volume and close price. This graph shows how the volume increased twice since the stock price increased with those high volumes. We can also see how the price went down in the last peak of volume, meaning that this stock had a higher volume of sells in that day.

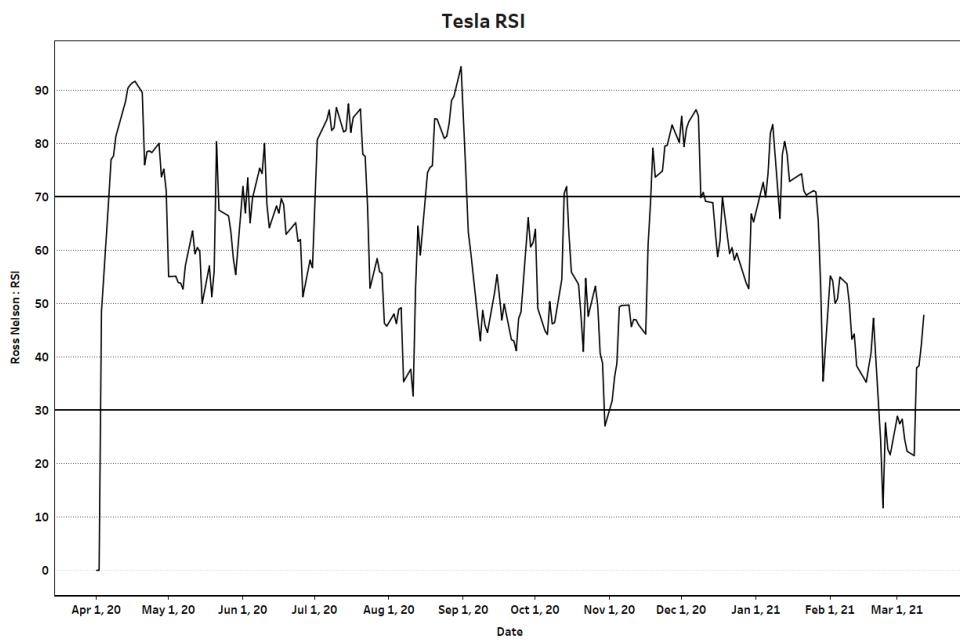
Tesla



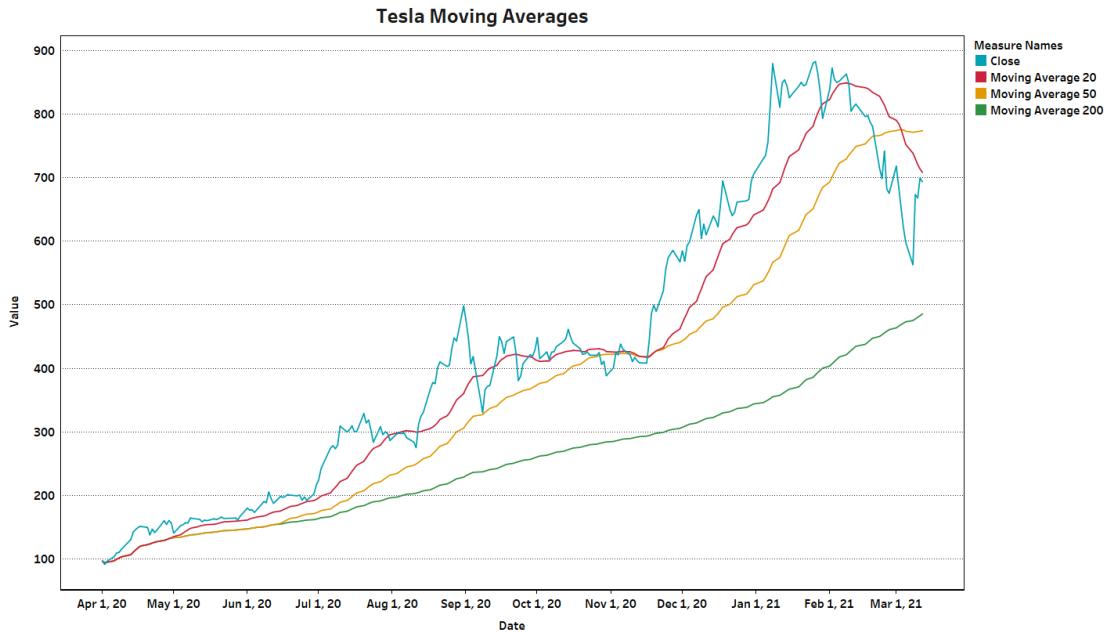
Tesla's stock price has shown a huge growth since the pandemic. After spiking up from \$100.00 to almost \$900.00, the stock had a drop to \$600.00, and it is now at \$700.00.



This chart shows multiple sell opportunities while the stock was still growing, and during the dip in the last two months, there are multiple buy opportunities. The buy opportunities for Tesla stock appeared all below both the 50-day moving average, and below the lower Bollinger band.



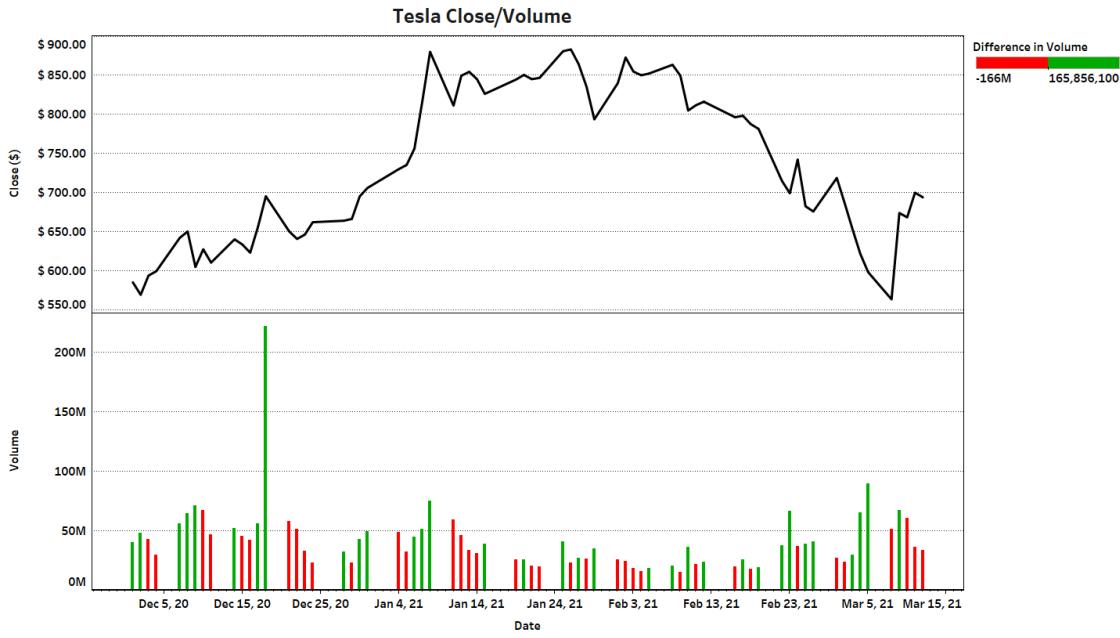
Tesla's RSI had been in an overbought trend, and it is now in an oversold trend, meaning that the stock price might go down more than it has already has. Investors wanting to buy the stock should keep an eye on the stock for when the RSI starts to hit over 70, which means that the price will go back up. It is important to keep in mind the references used to understand the stock's behavior is not guaranteed. So, predicting what will happen in the future won't be 100% accurate, since many external factors are involved when analyzing a stock.



In the last two months we see Tesla's stock is in a downward trend. We can see that this stock did not cross below the 200-day moving average like other stocks did. Though it crossed below the 20 and 50-day moving average, meaning the stock is still at a low price when compared to its historical price. Besides, the stock did not cross below the 50-day moving average as much as it has crossed in the last couple weeks.

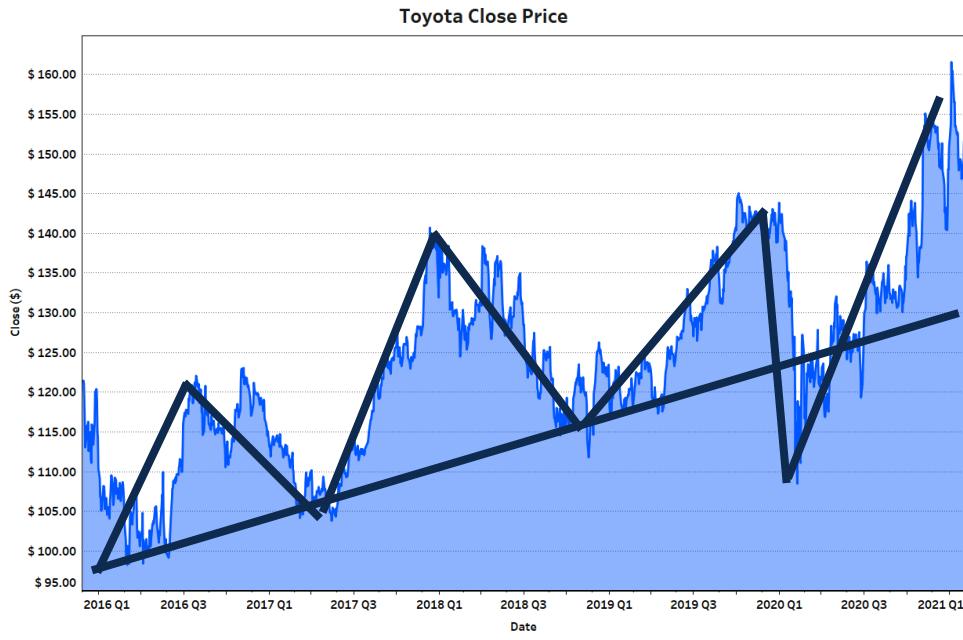


Tesla's candlestick graph shows something interesting on March 4th. The Open and Close price changed very little, but the High was close to \$900.00, while the Low was around \$600.00. A day trader could have either won or lost a lot of money if they invested on this day.

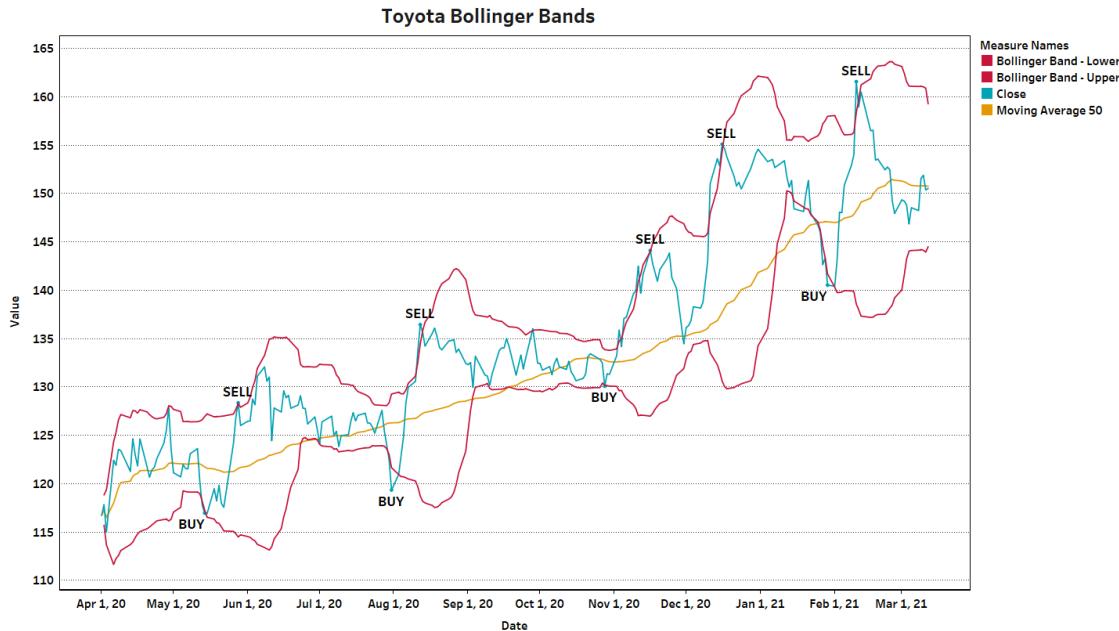


In this graph, we can see that Tesla's stock price variations did not correlate much with the volume on buys and sells of the stock. There was only one day in which the volume was higher and based on the fact that the price went slightly up, we can assume that on this date there were significantly more buys than sells.

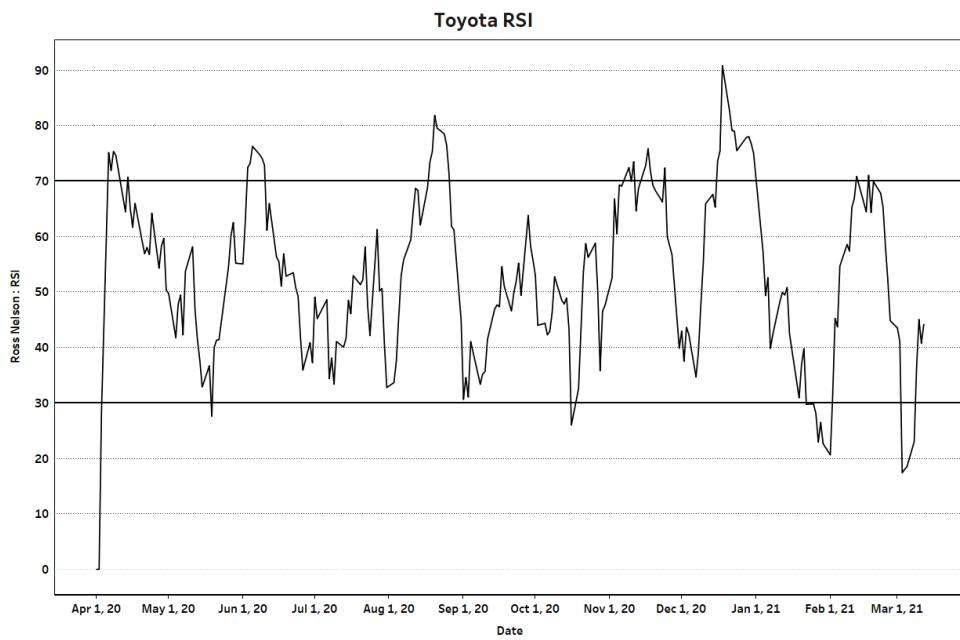
Toyota



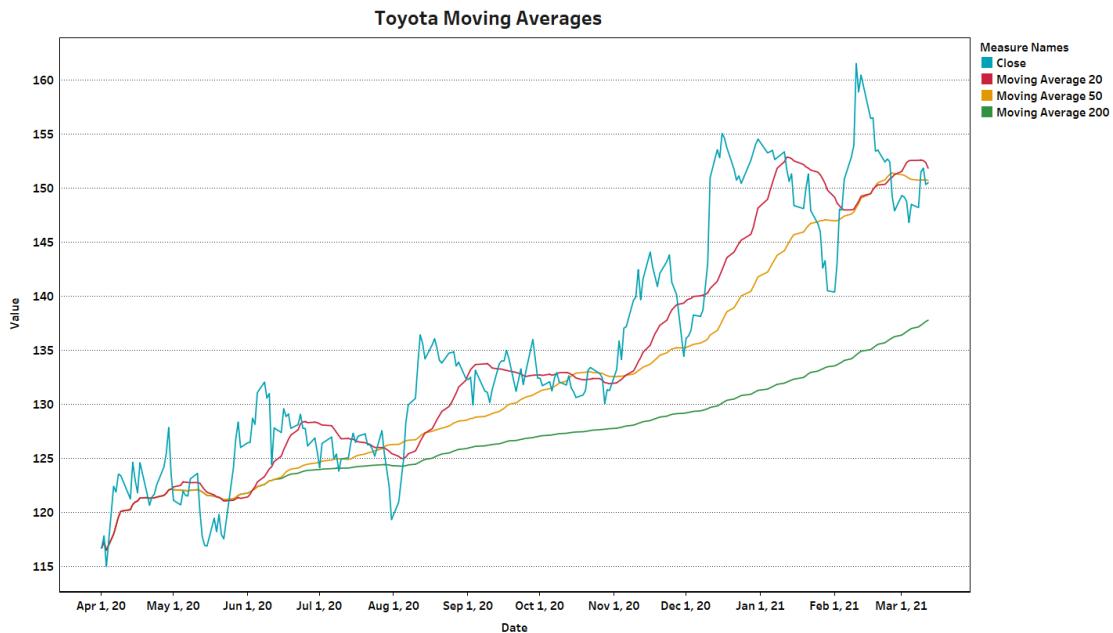
Toyota's stock price has shown an overall upward trend. This stock has been dealing with growths and drops in price, but it is still an upward trend. Except during the pandemic, the stock has kept consistently going up and down, but not enough to cross below its previous drop price. Which kept the company overall trending upward. What could be a problem is the difficulty in predicting when the next drop will happen and if it does in a significant way.



Toyota's Bollinger bands graph shows how consistent the Buy/Sell strategy was during the last year. Every time the stock had a drop enough to cross below the lower Bollinger band, the price had a spike, creating an opportunity to sell and wait for the next drop to buy the stock again and increase profits. Although there were spikes up and down, the stock price kept an upward trend, meaning that both long-term and short-term investors could have made profit.



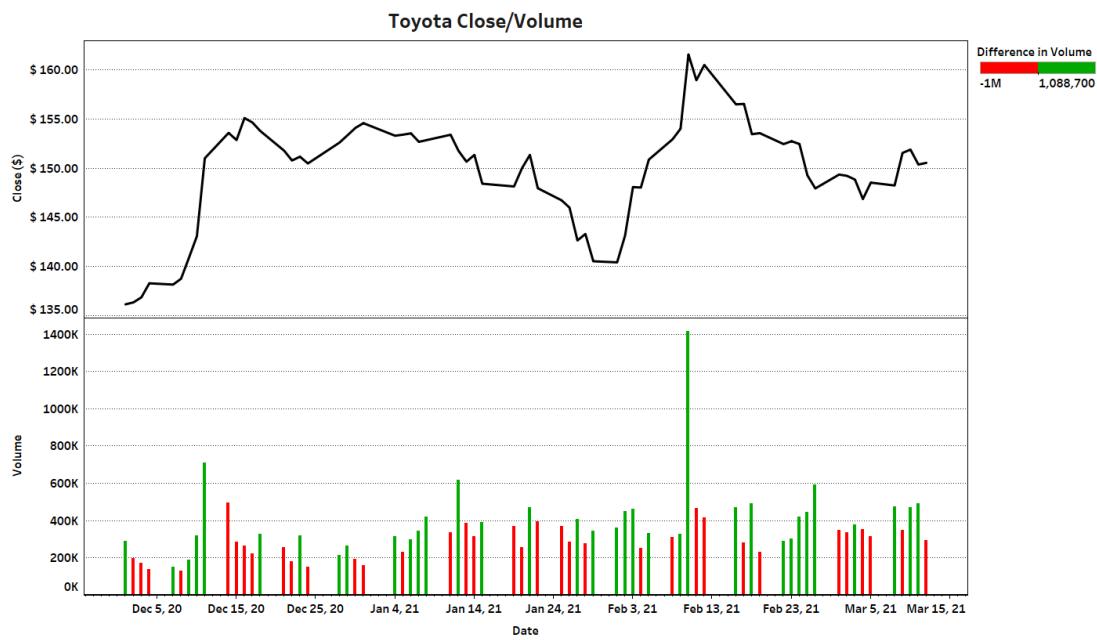
The RSI for Toyota shows how it has a correlation with the stock prices. When the RSI went up, the stock went up as well, and when the RSI went down, the stock dropped in the price. Once again, RSI has shown its importance for investors in this exploratory analysis.



Unlike other stocks, Toyota kept a solid upward trend since August 2020, when the last drop crossed below the 200-day moving average. Though, the stock had drops below the 20 and 50-day moving average, it gave investors opportunities to buy the stock before the price spiked up again.



Toyota's candlestick graph shows the variances that occurred in price open/closes in the last 4 months, and we can see how different days ended up having different variances in price, with the beginning of February 2021 showing higher variance in close/open, high/low.



Toyota's close/volume graph shows one specific day in which the volume of trades was huge when compared to the last 4 month's trading behavior. It is interesting to see how the price was down then started going up and after the high volume the price went even higher. Meaning more people were buying than selling.

Fundamental Analysis

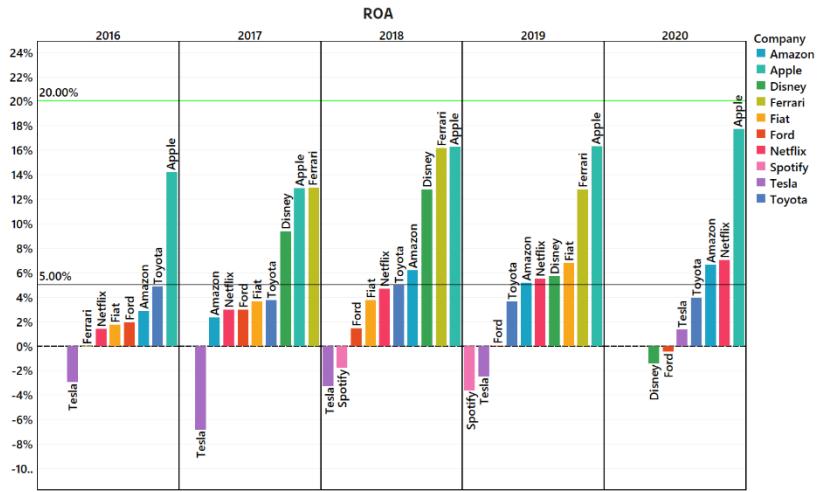
In this section, we will evaluate each company's financial healthiness conditions by analyzing their financial ratios. We will be analyzing Profitability, Asset Management, Financial Leverage, Liquidity, and Market Value.

Profitability

By analyzing profitability, we can measure how profitable a company is. According to Warren Buffet, it is important to analyze the profit of a company and how consistent this profit has been. It is important to remember that at the end of the day, it will result in more equity money!

ROA

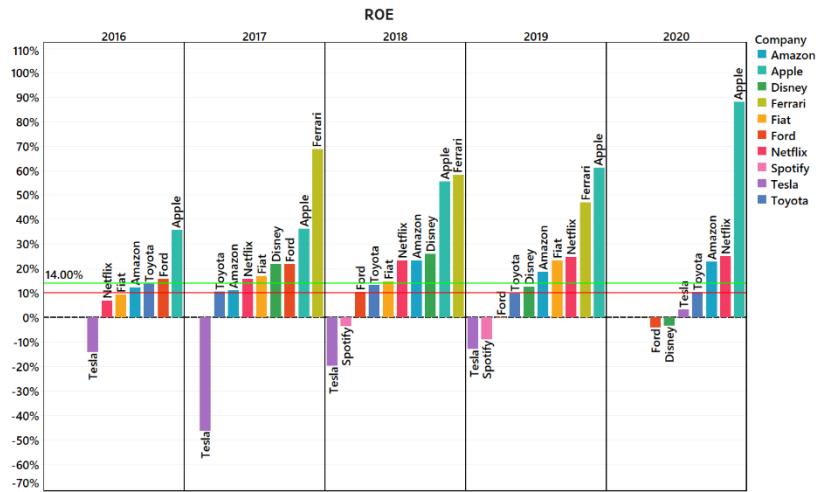
ROA stands for Return on Assets. The higher the ROA, the more a company generates profit from its total assets. According to Warren Buffet, a ROA above 5% is good, and above 20% is excellent.



As seen in the historical ROA, we can see that Apple and Ferrari have held a consistent ROA, almost reaching 20% in 2018. On the other hand, Tesla and Spotify have shown a poor Return on Assets. Toyota has kept consistency at a mark of 2% to 4%.

ROE

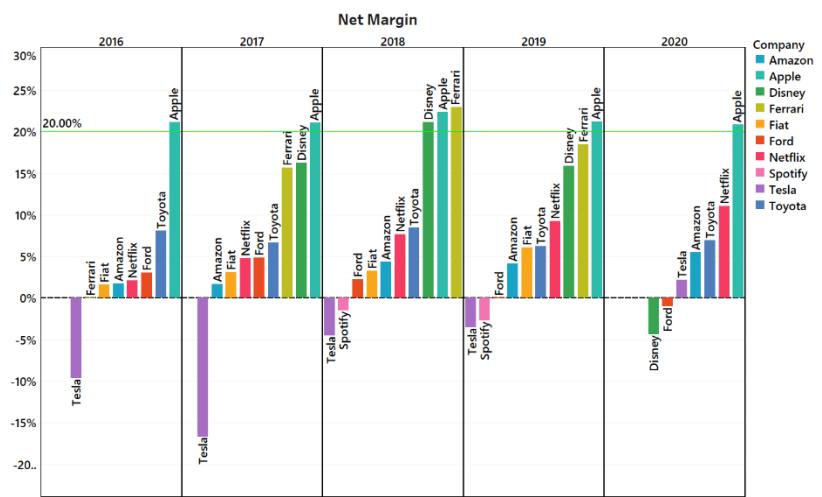
ROE stands for Return on Equity. It measures how efficiently a company has been generating profit from the Stockholders' Equity. A ROE around 14% is acceptable, but less than 10% is poor.



One more time, Ferrari and Apple have kept a high and consistent ratio. Netflix and Fiat have been keeping a consistent and above 10% ROE. Tesla and Spotify have kept a bad ROE.

Net Profit Margin

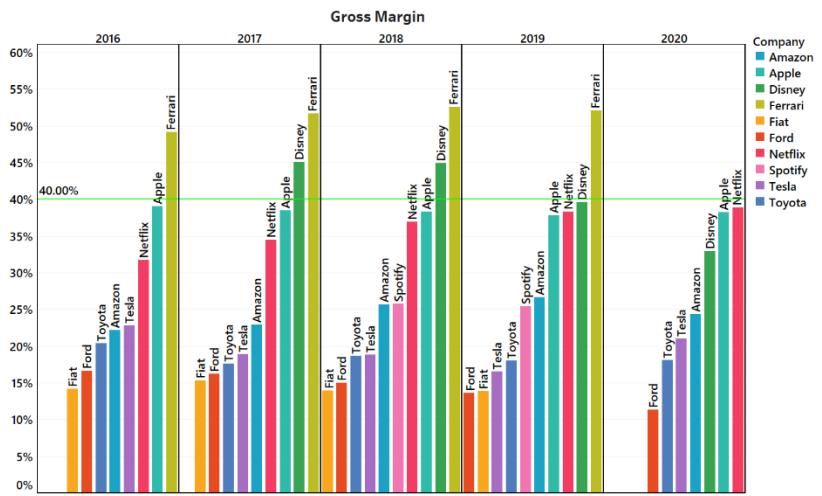
This ratio is used to estimate how much each collected dollar translated into profit. As a reference, Warren Buffet points out that an investor should be looking for companies with a Net Profit Margin above 20%. A company with a high and consistent Net Profit Margin tends to have a competitive advantage.



As seen on the graph, Apple was the only company to keep consistent and Net Profit Margin above 20%. Tesla has kept a bad Net Profit Margin, and the other companies have kept a stable, but poor Net Profit Margin

Gross Profit Margin

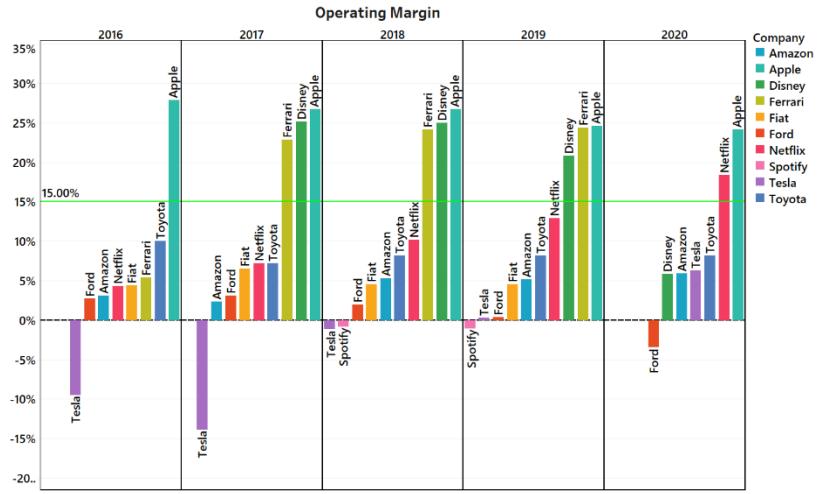
This ratio measures the profit of a company before deducting selling, general, and administrative costs. The greater this ratio, more profit a company generates from its sales. Buffet suggests a Gross Margin above 40% as reference.



In this graph we can see that Ferrari has kept the greatest performance in keeping a Gross Margin above 40%. Disney, Netflix, and Apple have also kept a consistent Gross Margin. The other companies have kept an average performance.

Operating Profit Margin

This ratio represents how efficiently a company is turning its sales into profits. It is commonly said that a company should have an Operating Profit Margin above 15%.



Apple, Ferrari, and Disney have kept a high Operating Profit Margin. Netflix has been growing its Operating Margin and have reached a ratio above 15% in the last year. Tesla and Spotify have kept a poor Operating Margin. Ford had a drop from a positive ratio to a negative ratio. The other companies have kept an average performance.

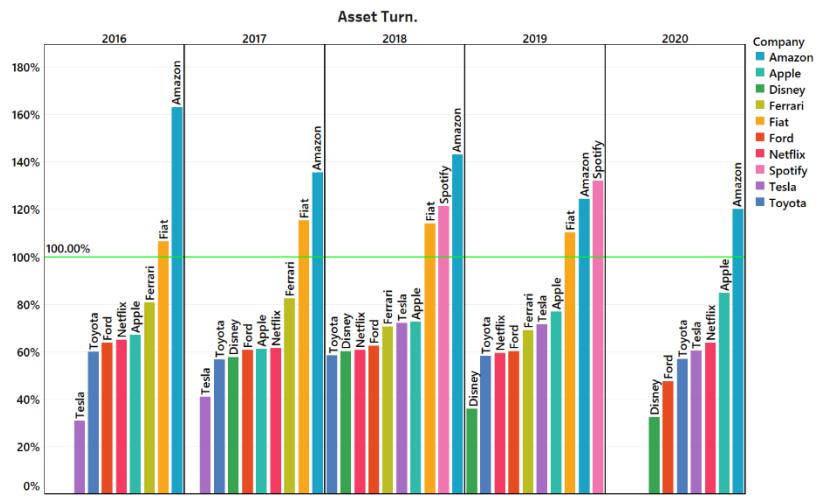
Overall, the companies with the best performance in the Profitability section were Apple and Ferrari. These companies can generate high profits from its equity and assets.

Assets Management

By analyzing the assets management of a company, we can evaluate how efficiently a company uses its assets to produce sales.

Asset Turnover

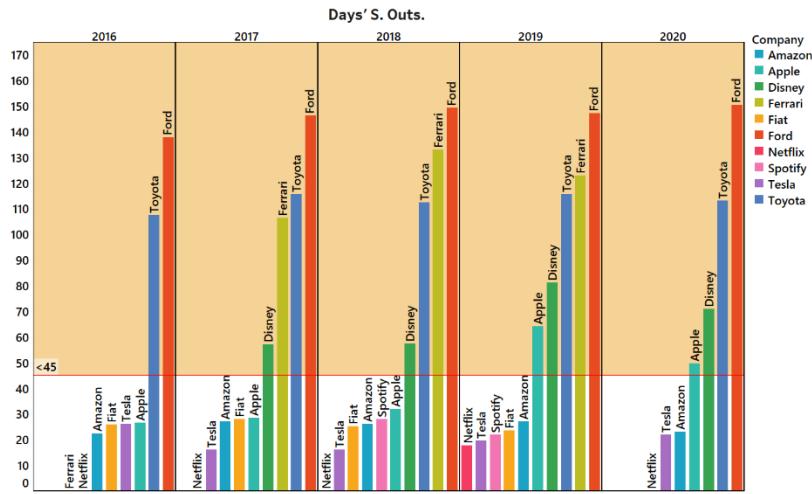
Asset Turnover measures the company's performance in generating revenue from its assets. If a company has an Asset Turnover greater than one (100% since it is a ratio), it can generate enough revenue for itself.



As seen on the graph, Amazon, Fiat, and Spotify have kept an Asset Turnover above 100%. The other companies have not been able to generate enough revenue for itself.

Days' Sales Outstanding

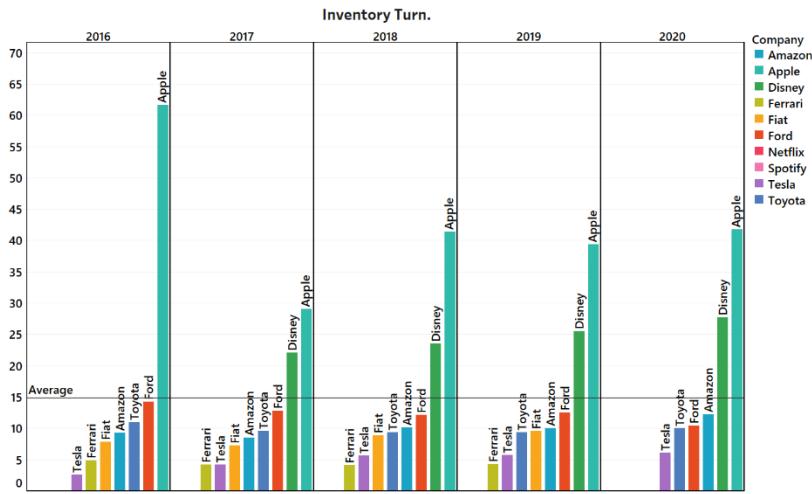
DSO represents the average days it takes a company to receive payments for a sale. If this indicator exceeds 45, it means there is a higher probability there will be a delay in the payments, and it might interfere with the cash flow.



Ford, Toyota, Disney, and Ferrari have kept a high and undesirable Days' Sales Outstanding. The other companies managed to stay lower than 45 days.

Inventory Turnover

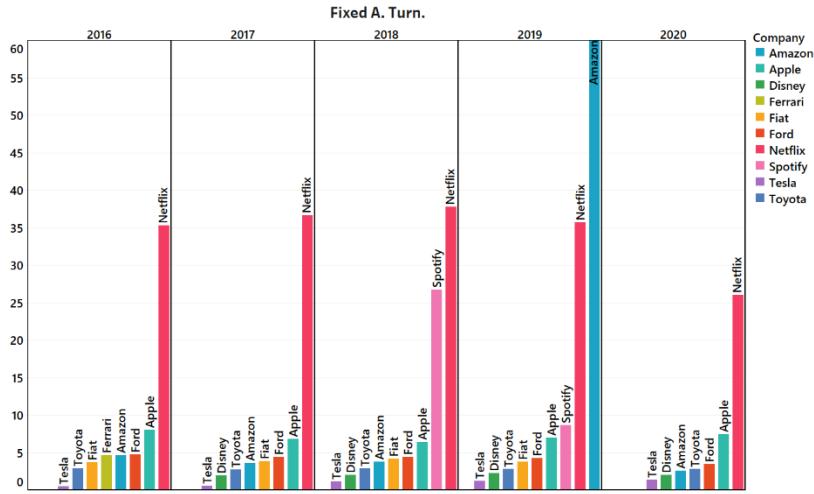
Investors should look for companies with a high Inventory Turnover since it reduces the amount of capital they have tied up in inventory, which improves liquidity and financial strength. There is no benchmark, but we will analyze the overall average for the listed companies.



Apple and Disney have the highest Inventory Turnover, being the two companies above the average, while Tesla and Ferrari have the lowest Inventory Turnover.

Fixed Assets Turnover

Measures how efficiently a company can generate sales from its existing fixed assets. As a benchmark, we will just use the average from the listed companies, even though we have 2 different types of industries.



For this visualization, we excluded Amazon's Fixed Assets Turnover (except 2019) because its value was too high it would interfere in the visualization of the other companies. Besides that, Netflix and Spotify have the highest values, with Apple being always close to the higher end. It would be interesting to see Spotify's performance in the years its data is missing. Since Netflix and Spotify are both exclusively streaming services, it makes sense its Fixed Assets Turnover are quite higher. It would also be interesting to see the actual benchmark for this measure for each industry to analyze.

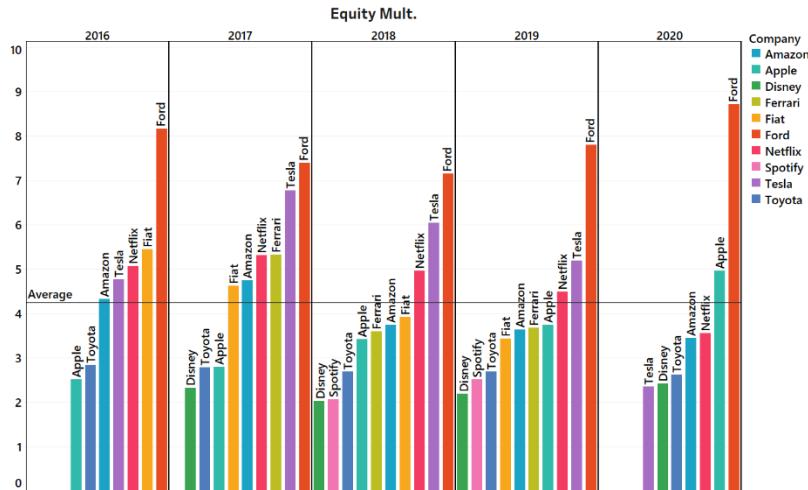
In this section, no company has presented a consistent performance with their Assets Management.

Financial Leverage

Analyzing the financial leverage is important for investors so they can evaluate the performance of a company using debt to acquire additional assets. A good performing financial leverage will cause the returns on the owner's cash investment to be amplified.

Equity Multiplier

As a rule of thumb, a high Equity Multiplier means a company has a large amount of debt to finance assets. On the other hand, a low Equity multiplier means a company has fewer debts to finance assets. Usually, it is preferable to have a lower Equity Multiplier. When this ratio is equal to 2, it means that half of the company is financed by debt, and the other half is financed with equity.



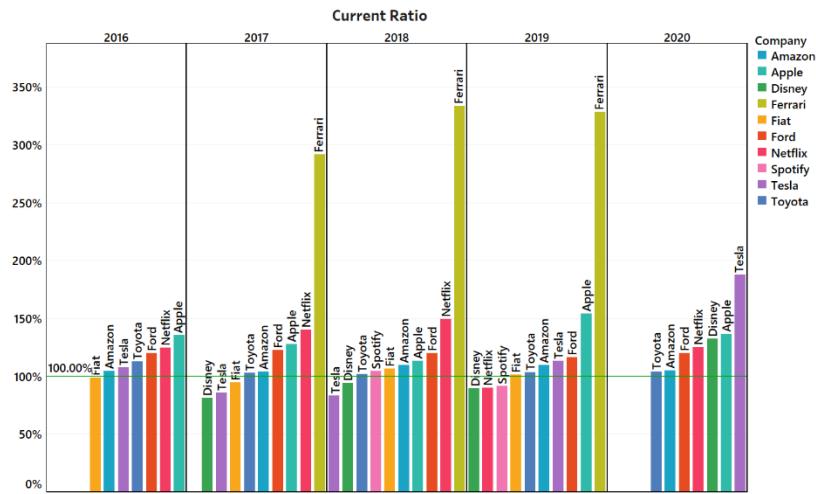
As seen on the graph, Disney, Spotify, and Toyota have kept their Equity Multiplier close to 2. Besides, those companies have had the best performance when compared to the other companies. Ford, Tesla, and Netflix have been consistently between the companies with the highest Equity Multiplier.

Liquidity

Measuring the liquidity of a company allows an investor to analyze the ability of a company to pay off current debt obligations without raising extra capital.

Current Ratio

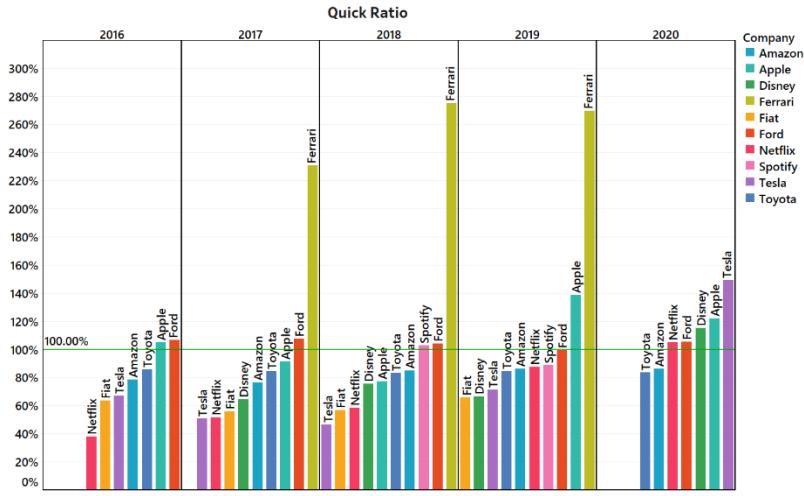
Current Ratio measures the company's ability to pay its current/short term liabilities with its current/short term assets. A Current Ratio less than 1 means the company does not have capital to pay short terms or current obligations. As a note, it is important to remember that a short-term liability is any liability that will be paid in less than 12 months.



Ford has been the only company to keep a Current Ratio above 1 (100%) in the last 5 years. All the companies without missing values were able to keep its value above 100% last year. It would be interesting to see if Ferrari kept its Current Ratio as high as 2018 or 2019 during the year of 2016 and 2020. Netflix and Apple have both kept a Current Ratio above 1 in 2016, 2017, and 2018, but failed to keep this performance in 2019.

Quick Ratio

Quick ratio measures a company's ability to pay current liabilities without selling inventory or obtaining additional financing. As a rule of thumb, the higher is better, while if its value is lower than one, the company might not be able to pay its current liabilities in the short term.



In the years Ferrari has no missing values, it has kept the highest Quick Ratio. Ford has stayed consistently above 1 all years. Apple has had 3 years above the 100% line. In the last year, Tesla (which has shown growth since 2017), Apple, Disney, Ford, and Netflix have shown a Quick Ratio above one.

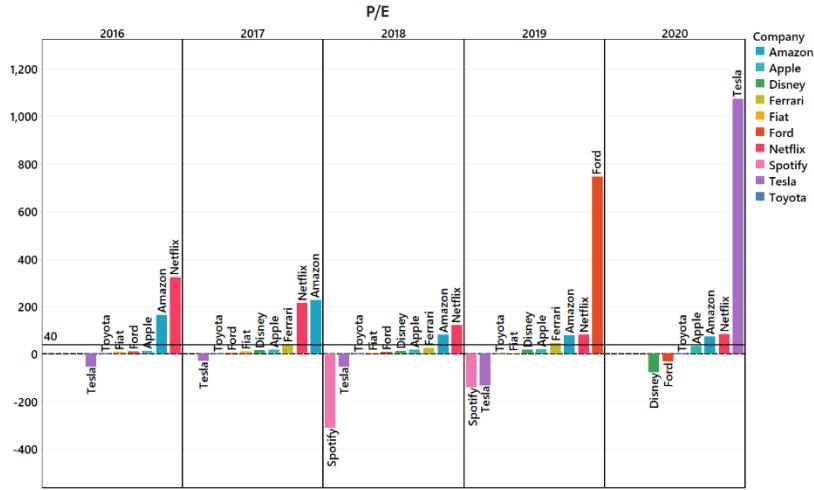
In this section, Ferrari has kept the best performance in the Liquidity analysis. Ford, Netflix, and Apple have also shown strong performance in this section.

Market Ratios

Market Ratios are used to measure whether a stock has been over/under-valued.

Price to Earnings (P/E)

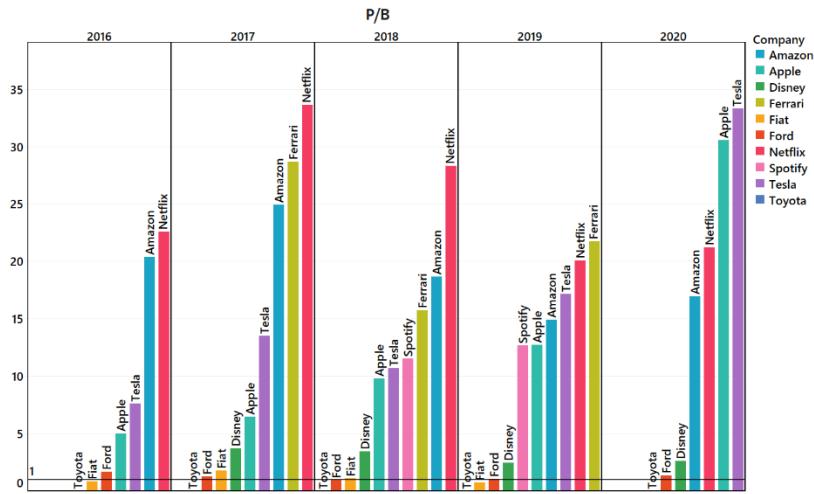
The P/E is used to measure a company's share price to its earnings per share. Warren Buffet suggests that a company with a P/E indicator above 40 means that the investor might think about selling the stock since when its value is considerably larger than 40 its value is being over-valued.



As seen in the graph, Tesla has had its value under-valued from 2016 to 2019, then it was over-valued in 2020. Spotify presented under-valuation in its years where the data is not missing. Amazon and Netflix have been over-valued since 2016. Ford was over-valued in 2019 and under-valued in 2020 together with Disney.

Price to Book (P/B)

P/B measures a firm's market capitalization to its book value. If a company is below 1, it's considered a solid investment.



Fiat and Ford have shown the best performance with this measure. Disney has shown a consistent and small P/B when compared to other company's P/B.

Based on P/B and P/E we have Ford and Fiat as being considered strong investments.

Portfolio Analysis

To analyze each portfolio, we will use different methods learned throughout the semester using Python programming language.

Weighted Portfolios

To find the best strategy, we decided to test various weights for each company in each portfolio. We will use 2 strategies here: A loop in Python to test multiple weights which will return the weights with the highest return and we will test an equal weighted portfolio for each portfolio.

Maximized Returns

For this analysis, we created a method to test different weights for a portfolio. In this test, we select the number of random lists we want to test. To get as many results as possible, we ran the test with 100,000 lists.

The list with the highest performance for the Streaming Services portfolio:

NFLX: 16.5%,
AAPL: 26.41%,
DIS: 16.02%,
SPOT: 15.91%,
AMZN: 25.16%.

The return of this portfolio was 240.84%.

The parameters given to the model were that each set of percentages to be tested should be around 15% and 25%. It is since customers might prefer to invest at least more than 15% in a stock. Since we have 5 stocks in the portfolio, it should be a value around 15 and 25 for each stock that would total 100%.

The return from each stock:

Netflix: \$30,510.23,
Apple: \$86,829.96,
Disney: \$30,013.09,
Spotify: \$34,104.54,
Amazon: \$59,384.69.

The total return of the portfolio was \$240842.5.

For the Car Manufacturer portfolio, the best weight distribution was...

FORD: 16.13%,
FERRARI: 24.6%,
TSLA: 26.67%,
FIAT: 16.35%,
TOYOTA: 16.25%.

The return of this portfolio was 615.23%. This portfolio has had quite a higher return than the streaming services portfolio.

The return from each stock was...

Ford: \$ 13,431.48,
Ferrari: \$124,790.03,
Tesla: \$414,673.00,
Fiat: \$41,142.86,
Toyota: \$21,322.61.

The total return of the portfolio was \$615,234.61.

Equal Weighted Portfolios

By using 20% for each stock, the return for the Streaming Services Portfolio was 164.53%. For the car Manufacturers portfolio, the return using an equal weighted portfolio was 505.65%. In both cases, our random testing model performed better than the equal weighted portfolios.

ES and VaR analysis

By using the weights specified in the previous steps, we figured that considering an investor with \$100,000.00 on hand that wanted to invest in the Streaming Services portfolio would have a risk of 5% chance to lose \$1,263.52. If the losses exceed \$\$1,263.524, there is a 5% chance this investor would lose, on average, \$1,811.124.

If the investor wanted to invest in the Car Manufacturers portfolio, there would be a 5% risk chance that the investor would lose \$420.508. If the losses go over \$420.508, there is a 5% risk that the investor would lose on average \$703.023. The Car Manufacturers have had a better performance in returns, and a better result in the Value at Risk and Expected Shortfall.

Sharpe Ratio

By using the Sharpe ratio, we can analyze the risk-adjusted return of a stock. For the Streaming Services stocks, Sharpe Ratio is 3.812 and the Car Manufacturers Sharpe Ratio was 1.907. While the Benchmark was 0.046. Both portfolios outperformed the benchmark, but the Streaming Services portfolio has a much higher Sharpe Value. It is important to remember that the higher the Sharpe Ratio, the higher the risk-adjusted return will be, which is better for an investor.

Garman-Klass

By using the Garman-Klass formula to estimate the volatilities of each stock for each portfolio, we ended up with the following results:

Streaming Services:

NFLX: 0.025
AAPL: 0.0163
DIS: 0.0157
SPOT: 0.0312
AMZN: 0.0178

The mean volatility in the Streaming Services portfolio is 0.021.

Car Manufacturers:

FORD: 0.02
FERRARI: 0.0154
TSLA: 0.033
TOYOTA: 0.0081
FIAT: 0.0189

The mean volatility in the Car Manufacturers portfolio is 0.019.

The Streaming portfolio had a slightly higher volatility. For the Streaming portfolio, Spotify had the highest volatility (0.0312), and Disney had the lowest volatility (0.0157). For the Manufacturers portfolio, Tesla had the highest volatility (0.033), and Toyota had the lowest volatility (0.0081).

Minimized Variance and Maximized Sharpe

Using the minimized variance formula, we obtained the following distribution for both portfolios:

Streaming Portfolio Minimized Variance

NFLX: 5.962 %
AAPL: 10.213 %
DIS: 42.054 %
SPOT: 9.709 %
AMZN: 32.062 %

Returns using weights above: 213.94 %

Car Manufacturers Minimized Variance

FORD: 2.503 %
FERRARI: 17.155 %
TSLA: 1.745 %
TOYOTA: 78.597 %
FIAT: 0.0 %

Returns using weights above: 205.66 %

Streaming Portfolio Maximized Sharpe

NFLX: 0.0 %
AAPL: 54.577 %
DIS: 24.495 %
SPOT: 4.894 %
AMZN: 16.033 %

Returns using weights above: 257.01 %

Car Manufacturers Maximized Sharpe

FORD: 0.0 %
FERRARI: 58.537 %
TSLA: 39.684 %
TOYOTA: 0.0 %
FIAT: 1.779 %

Returns using weights above: 860.27 %

Alternative Portfolios Analysis

In this section, we will analyze alternative portfolios, given the client's stock options provided. Instead of using one portfolio for each type of industry, we will now create a portfolio with the best performing companies using fundamental analysis. We will also have a portfolio that gathers all of the stock provided by the client. The portfolio created from the best performing companies in the fundamental analysis will be referenced in this analysis as Financial Portfolio. The portfolio that gathers all the stocks will be referenced in this analysis as Full Portfolio.

Weighted portfolios

Here, we will analyze each portfolio's performance using both weight strategies and the model that generates the best weights to obtain maximum returns.

Maximized Returns

Using the maximized returns model, we got a return of 493.28% for the Financial Portfolio.

The weights used to get the result were:

NFLX: 19.99%,
AAPL: 22.27%,
DIS: 13.56%,
RACE: 21.86%,
AMZN: 22.33%.

The number of tests was 100,000, meaning that we tried 100k lists of weights to see which combination of weights would work better.

The results for each stock were:

Netflix: \$ 100,496.21,
Apple: \$ 115,079.35,
Disney: \$ 26,383.55,
Ferrari: \$ 127,664.18,
Amazon: \$ 123,671.12.

The sum of returns was \$ 493,294.41 from an initial investment of \$100,000.00.

The same method was used with the Full portfolios, and the return obtained was 416.92%.

The weights used to obtain this result were:

NFLX: 6.88%,
AAPL: 11.12%,
DIS: 7.74%,
SPOT: 14.63%,
AMZN: 7.09%,
FORD: 9.06%,
FERRARI: 9.13%,
TSLA: 20.28%,
FIAT: 6.96%,
TOYOTA: 7.11%.

The returns for each stock were:

Netflix: \$ 12,728.81,
Apple: \$ 36,551.75,
Disney: \$ 14,511.15,
Spotify: \$ 31,354.33,
Amazon: \$ 16,737.08,
Ford: \$ 8,171.03,
Ferrari: \$ 17,784.04,
Tesla: \$ 26,3348.26,
Fiat: \$ 7,230.28,
Toyota: \$ 8,531.35.

The sum of returns was \$ 416924.13.

Equal Weighted Portfolios

The equal weighted returns for the Financial portfolio were 470%, while the returns in percentage for the equal weighted Full Portfolio was 295.89%, meaning that the maximized returns model played an important role in selecting the most profitable weights for the Full portfolio.

The results are slightly different when we look at the Maximized Weight Returns. A big difference was seen when comparing both portfolio's equal weighted returns. Although, based on returns (from last year's stocks), we cannot provide enough information on what the client's next steps should be. To better analyze the portfolios, let us look at more detailed analysis. In this way, we can provide a better rationalization about what might happen with the given stocks. Past results on stocks does not determine future results, even more if we are just looking at stock prices.

ES and VaR analysis

The Financial portfolio, using the maximized weights, presented a VaR of \$12,002.98, with an ES of \$18,072.43. The equal weighted result was Value-at-Risk equal to \$11,471.06, and ES equal to \$17,094.09. The equal weighted return provided a slightly better performance in the ES and VaR analysis.

The full portfolio provided a much better result, with a maximized weight resulting in a VaR equal to \$647.13, and an ES equal to \$1,013.75. The equal weighted portfolio obtained a result of \$892.74 for the VaR, and \$1332.55 for the ES. The best VaR and ES combination was using the maximized Full Portfolio. Returns were not too different from the best performing portfolio in returns.

Sharpe Ratio

We have a better understanding of risk-return. We will now compare the portfolio's Sharpe ratios. The Financial Portfolio had a Sharpe Ratio of 2.447, and the Full Portfolio resulted in a Sharpe Ratio of 2.003. Both portfolios outperformed the benchmark of 0.046. The Financial Portfolio slightly outperformed the Full Portfolio but had quite a bad performance in the VaR and ES when compared to the Full portfolio.

Garman-Klass

By using the Garman-Klass formula to compute the stocks variance, we obtained the following results:

NFLX: 0.025
AAPL: 0.0163
DIS: 0.0157
SPOT: 0.0312
AMZN: 0.0178
FORD: 0.02
FERRARI: 0.0154
TSLA: 0.033
TOYOTA: 0.0081
FIAT: 0.0189

By attributing each stock to their belonging portfolio, we obtained that the Mean volatility for the Financial Portfolio was 0.018, while the Full Portfolio obtained a Mean Volatility of 0.04.

Financial Portfolio Minimized Variance

NFLX: 4.569 %
AAPL: 13.954 %
DIS: 40.257 %
AMZN: 22.932 %
RACE: 18.289 %

Returns using weights above: 471.34 %

Full Portfolio Minimized Variance

FORD 0.0 %
FERRARI 2.61 %
TSLA 0.0 %
TOYOTA 56.38 %
FIAT 0.0 %
NFLX 2.603 %
AAPL 2.856 %
DIS 20.134 %
SPOT 0.0 %
AMZN 15.417 %

Returns using weights above: 396.26 %

Financial Portfolio Maximized Sharpe

NFLX: 9.855 %
AAPL: 31.41 %
DIS: 0.0 %
AMZN: 28.302 %
RACE: 30.433 %

Returns using weights above: 358.29 %

Full Portfolio Maximized Sharpe

FORD 0.0 %
FERRARI 24.694 %
TSLA 20.975 %
TOYOTA 0.0 %
FIAT 0.0 %
NFLX 6.611 %
AAPL 24.279 %
DIS 0.0 %
SPOT 0.0 %
AMZN 23.44 %

Returns using weights above: : 194.3 %

Results

Based on the analysis above, we were able to highlight the following:

- Using the maximized returns, Car Manufacturers portfolio obtained a return of 615%, beating all the other portfolios we analyzed.
- Financial Portfolio had a return of 471%, having the highest returns when using the minimized variance weights.
- Car Manufacturers obtained a return of 860.27 % using the Maximized Sharpe Ratio formula. Car Manufacturers portfolio obtained the best performance when analyzing vaR and ES. Its vaR is \$420.508, and its ES is \$703.023.

- Streaming Services have the highest Sharpe Ratio, reaching a value of 3.812, which beats the other portfolios and the S&P500.
- Car Manufacturers(0.019) and Financial Portfolio(0.018) had the better Garman Klass volatility mean. Although, Car Manufacturers has the most volatile stock, Tesla, and the Financial Portfolio has the most balanced variance when comparing its stocks.
- All of our portfolios beat the S&P500 when analyzing the ratios, which is considerably good. In this project, it ended up being a matter of choosing the right portfolio that beats all of our analyzed portfolios,

Other Things to Consider

In our analysis we see that there are various ways our client can distribute his money for maximum returns, but there are other things we could use to better our analysis. First, we see in our exploratory analysis there are plenty of gaps in some of our stocks when considering performance measures. With that information we would be better able to see how these performance measures correlate with how they did in the stock market. Second, we should consider how these stocks performed historically. Where there any patterns that we have missed or is there something there we could use to our advantage. Finally, we should consider other measures of performances, like the Information Ratio, to see how well they fare there.

Conclusion

After performing an exploratory analysis, a fundamental analysis to evaluate the company's financial health, and a ratios and risk performance analysis using historical data, we were able to figure out the best portfolio using our client's stocks. After analyzing the most important factor, that is the performance of the portfolios against each other and against the S&P 500, we concluded that the Car Manufacturers portfolio have had a better performance and will be recommended to our client. To evaluate when to invest the money, we will closely analyze the RSI, Bollinger bands, and the candlestick graphs so we can buy the stock in the lowest price possible. The objective of this portfolio is to be a long-term investment, but we will check the company's performance in the market because it is not possible to ensure a company will not bankrupt or be outperformed by other companies in the future. In order to indicate the weights, we will first present the options and the risks, and see whether the client is willing to risk more or not. If the client would like to risk more, we will indicate the Maximized Returns weights and the Maximized Sharpe ratio weights. If the client prefers to stay safe in the long-term investment, we will indicate the Minimized Variance weights. In both cases the portfolio still beats the S&P500.

References

Friedberg, B. (2020, August 24). Why people lose money in the market (and how to bounce back). Retrieved March 14, 2021, from <https://www.thebalance.com/why-people-lose-money-in-the-market-4144737#:~:text=The%20most%20recent%20Dalbar%20study,%EF%BB%BF%20The%20reasons%20are%20simple.>

Data source/Python Library description and documentation can be found at
<https://pypi.org/project/yfinance/>.