

Nathaniel Loken
Andres Hernandez
Ali Ahsan Muhammad Muzaheed
Afzal Hossain
Nathan Gonzalez
CS487/519
Final Report
5/1/2021

Bitcoin Price Prediction

Motivation:

Bitcoin is a currency designed to exist outside of governmental entities and therefore has a lot of variability. Unlike regular currency the price is based on what people believe it to be rather than based on a country's GDP or other factors. Due to the boom we have seen in the past few years this has caused the Bitcoin market to become extremely unpredictable and volatile. Moreover, there are many alternative cryptocurrencies arising such as Ethereum, Tether, Litecoin, etc. however, this group will only be focusing on Bitcoin as it is the most prominent, but this research could be applied to other crypto currency in the future. The motivations we have as a group are based on the want to implement the code and concepts for learning, and the possibility of financial gain.

Problem Definition:

The main issue with this currency is that due to the volatility of the Bitcoin market, because of its decentralized nature, it has made the currency extremely unpredictable. For instance the price of this currency fluctuates so much that if a payment of \$20,000 was made to some entity by the time the payment is processed the Bitcoin could be worth only \$15,000 which is a massive difference. This creates a problem when attempting to use this currency and creating accurate pricing for companies, meaning that bitcoin cannot be used as it was intended in its current state. Therefore, from the perspective of social financial security it would be beneficial to solve this problem.

There are various calculations utilized on financial exchange information for value forecasts. The parameters influencing Bitcoin are extraordinary, hence it is important to anticipate the estimation of Bitcoin so correct venture choices can be made. Thus, from the perspective of implementation, it would be beneficial to solve this problem. Bitcoin is only the beginning and this similar problem will be the risk one is going to have to take when venturing into this new frontier of digital currency.

Solution:

The Bitcoin's worth fluctuates simply like a stock though in an unexpected way as it is highly volatile. However, the cost of Bitcoin doesn't rely upon the business occasions nor mediating government like securities exchange. Hence, predicting the future of Bitcoin is no easy task. Many people may regret not buying Bitcoin in 2012 but how were they supposed to know then? This is the dilemma we now face in regards to Bitcoin. How can we potentially solve this dilemma? Maybe ML can tell us the answer. ML models can likely give us the insight we need to learn about the future of Bitcoin. There are various calculations utilized on financial exchange information for value forecasts. The parameters influencing Bitcoin are extraordinary. Hence, it is important to anticipate the estimation of Bitcoin so the right venture choices can be made. To anticipate the worth we can use ML models to foresee the cost of Bitcoin. In this project we will try to find the feature price accuracy. The ML algorithms will improve the feature idea of crypto currencies. This will help to have an estimation about Bitcoin.

Explanation:

The purpose of the machine learning algorithms used to predict the prices are that algorithms like linear regression and learning models can take in many data points and create an accurate prediction based on trends that would otherwise be too difficult or time consuming for a human to determine. For this specific project the group decided to use Facebook's Prophet algorithm, which is similar to linear regression, in their own words "We propose a modular regression model with interpretable parameters that can be intuitively adjusted by analysts with domain knowledge about the time series". This model should help us to predict non-linear trends and seasonality.

Data Description:

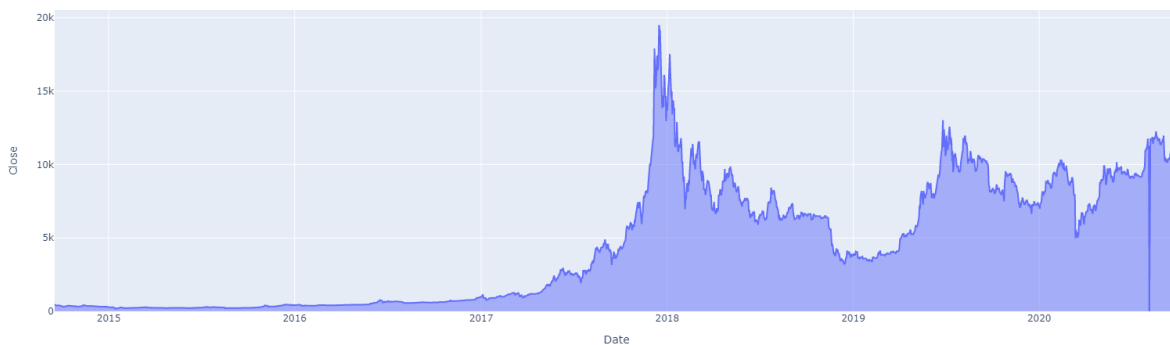
This is the data as is and the attributes of the dataframe are as follows: Date, Open price, Highest price, Lowest Price, Close Price, Adjusted Close Price, Volume Sold, and Currency type.

Figure 1.1

Date	Open	High	Low	Close	Adj. Close	Volume	Currency
10/1/2015	236.00400000000002	238.445	235.61599999999999	237.549	237.549	20488800	Bitcoin
10/2/2015	237.264	238.541	236.60299999999998	237.293	237.293	19677900	Bitcoin
10/3/2015	237.202	239.315	236.94400000000002	238.73	238.73	16482700	Bitcoin
10/4/2015	238.53099999999998	238.968	237.94	238.25900000000001	238.25900000000001	12999000	Bitcoin
10/5/2015	238.14700000000002	240.38299999999998	237.035	240.38299999999998	240.38299999999998	23335900	Bitcoin
10/6/2015	240.364	245.935	240.136	246.063	246.063	27535100	Bitcoin
10/7/2015	246.17	246.68099999999998	242.585	242.96900000000002	242.96900000000002	22999200	Bitcoin
10/8/2015	243.075	244.25099999999998	242.179	242.304	242.304	18515300	Bitcoin
10/9/2015	242.498	244.22799999999998	242.122	243.93099999999998	243.93099999999998	17353100	Bitcoin
10/10/2015	243.74	245.31900000000002	243.074	244.94099999999997	244.94099999999997	15912700	Bitcoin

Next a graph of the closing prices was plotted, and it shows the leap in price around 2018, when there was a large bubble in which Bitcoin went from about \$1,000 per coin to \$20,000 per coin at its peak. Moreover, you can see the trend in which after this large bubble popped you can see an almost immediate decrease to about \$8,000 and goes even lower as the year goes on and finally in 2019 it stables out at about \$10,000.

Figure 1.2



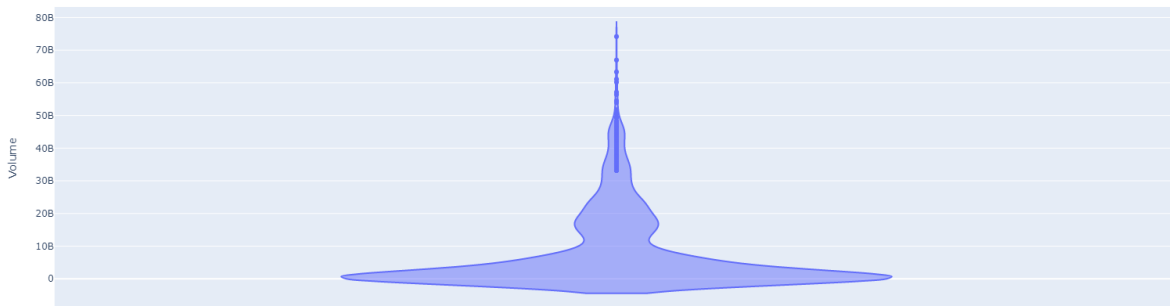
Next, this graph shows the plot of the volume of Bitcoin sold daily, and it shows that there is a large rise of Bitcoin being sold around the time of the bubble, but interestingly there is a large drop of Bitcoin being sold after the crash. This could be due to unwillingness of people to sell the coins they already owned and are waiting for another bubble. Lastly this graph shows that as the price returned to normal the volume of Bitcoin being sold skyrocketed likely due to have more popularity than ever before.

Figure 1.3



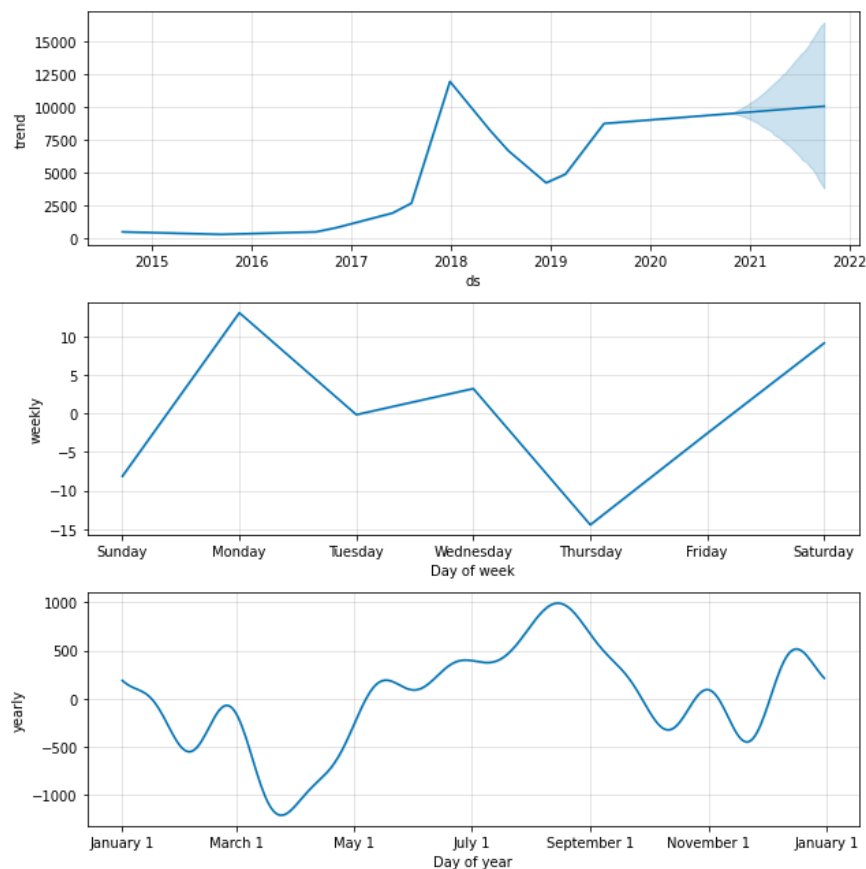
The next graph is a violin plot of the volume of the Bitcoin sold, from the data the maximum volume sold is 74.16 Billion and the minimum sold is 5.91 Million, and the median is 2.02 Billion. Moreover, it is shown that some regions are very narrow, namely the upper region, indicating that the price of Bitcoin has been the same for a small number of days, and vice versa for the larger region.

Figure 1.4



The next three plots describe the price changes from year to year, day to day, and month to month. In them we see the large price spike around 2018. However in the day to day graph we see some interesting data where the price is lowest on Thursdays and spikes back up to its highest on Monday, which could indicate a buying trend. Then in the month to month graph there is no discernible pattern, however, the month to month and year to year graphs both show an upward trend meaning that the price could go up higher.

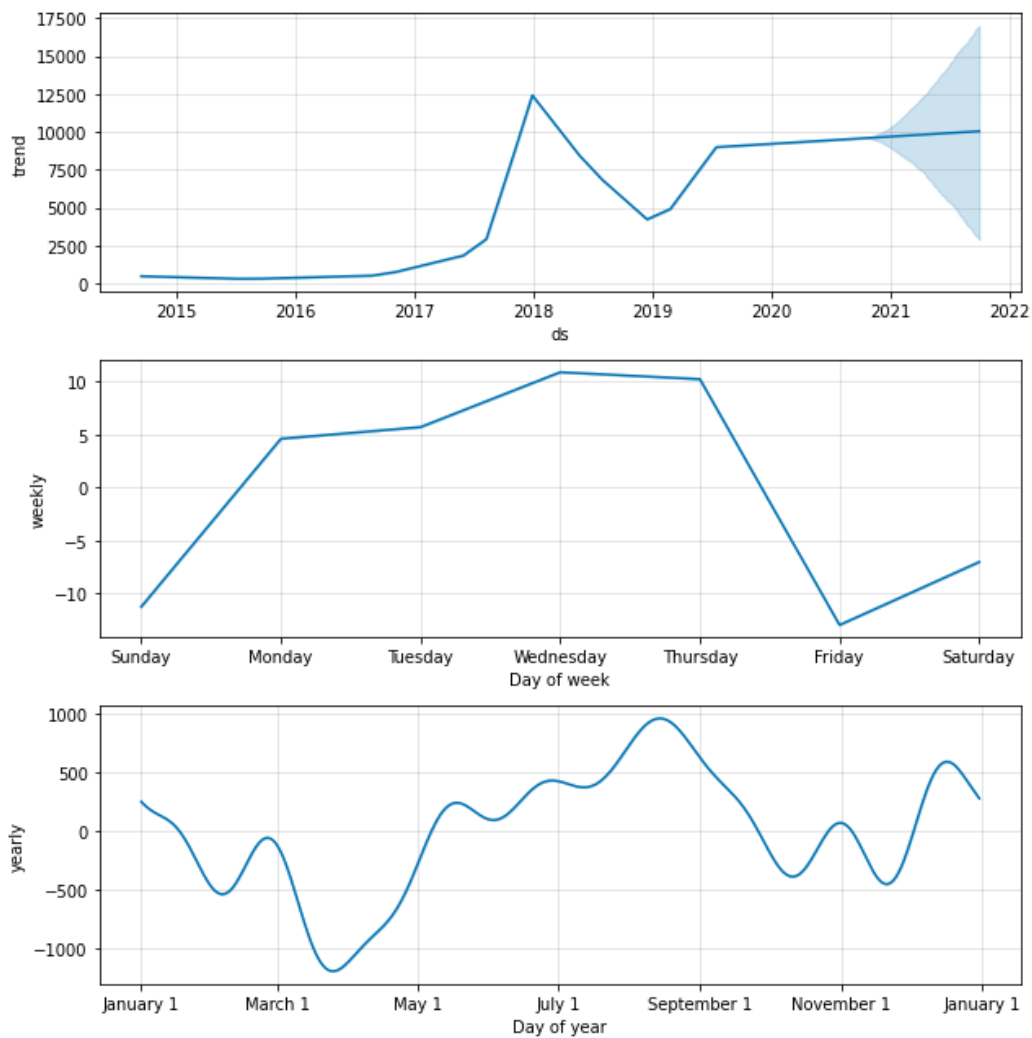
Figure 1.5(a) (for 'Close' price data)



The accuracy for the ‘Close’ price are as follows:

```
accuracy : 0.9109592769948772
mean_squared_error : 1350317.42292312
mean_absolute_error: 700.9789675735923
```

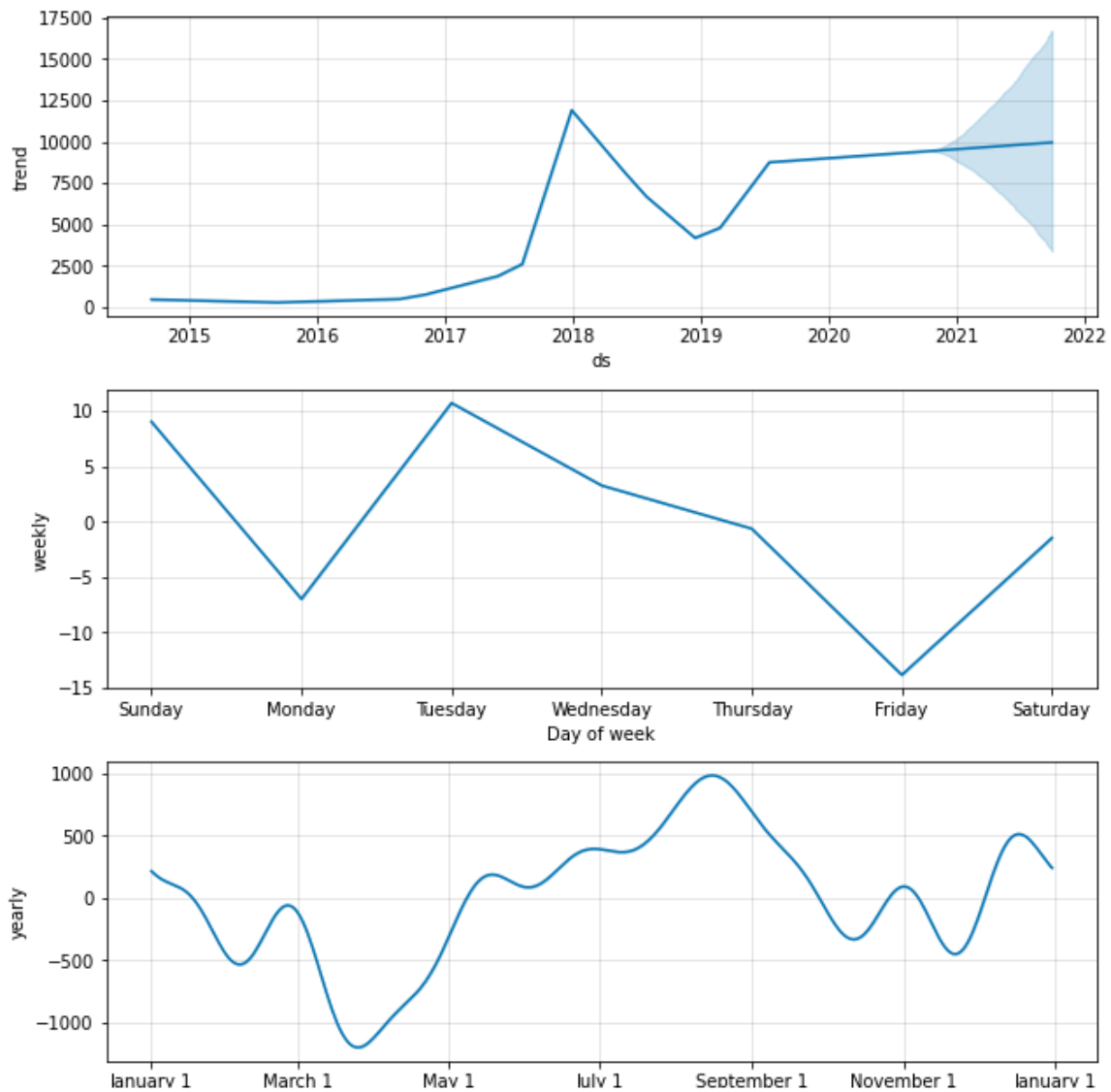
Figure 1.5(b) (for ‘High’ price data)



The accuracy for the ‘High’ price are as follows:

```
accuracy : 0.9103816027104612
mean_squared_error : 1433768.5893459765
mean_absolute_error: 706.6254881742984
```

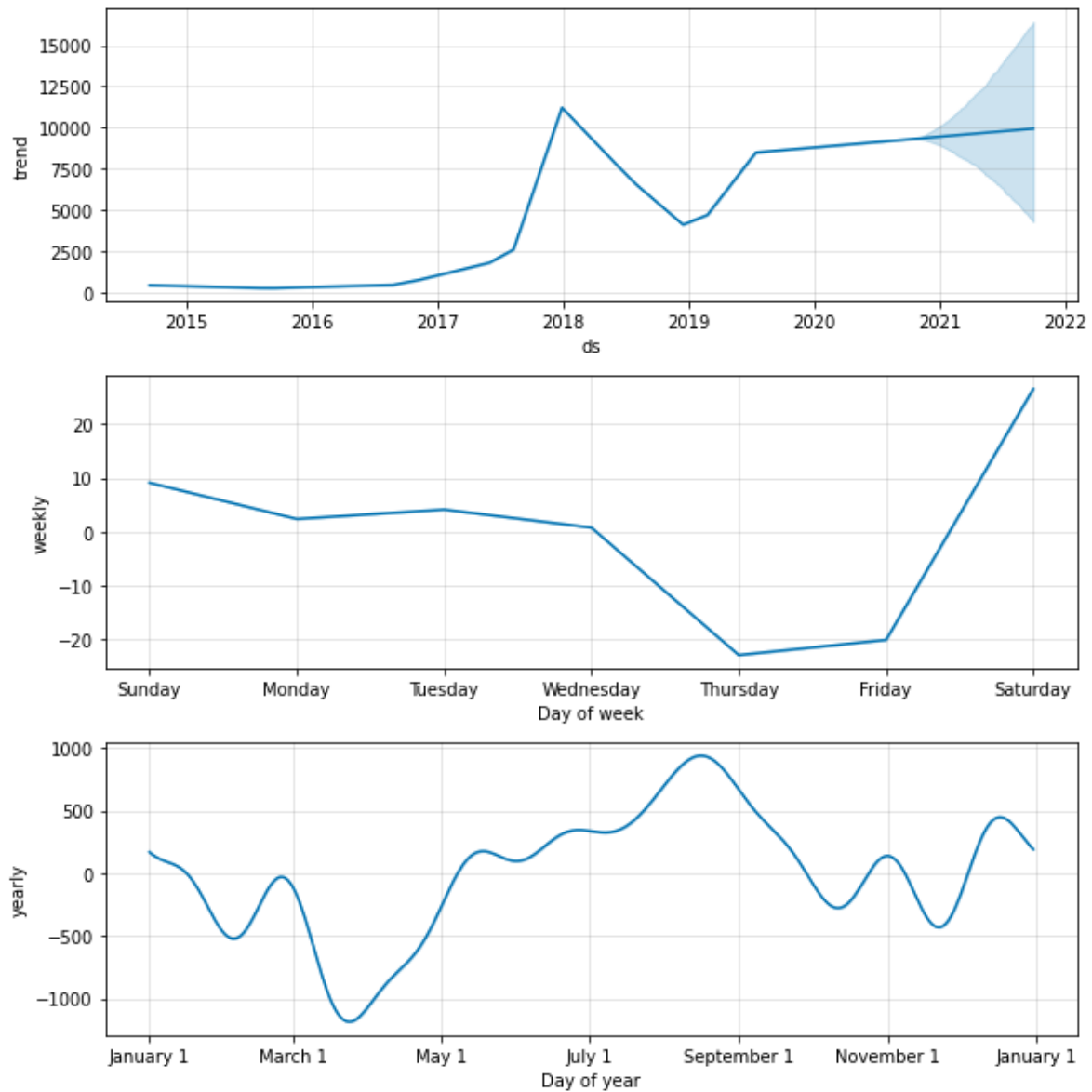
Figure 1.5(c) (for 'Open' price data)



The accuracy for the 'Open' price are as follows:

```
accuracy : 0.9117448032819339
mean_squared_error : 1340289.3099724397
mean_absolute_error: 694.8852296559054
```

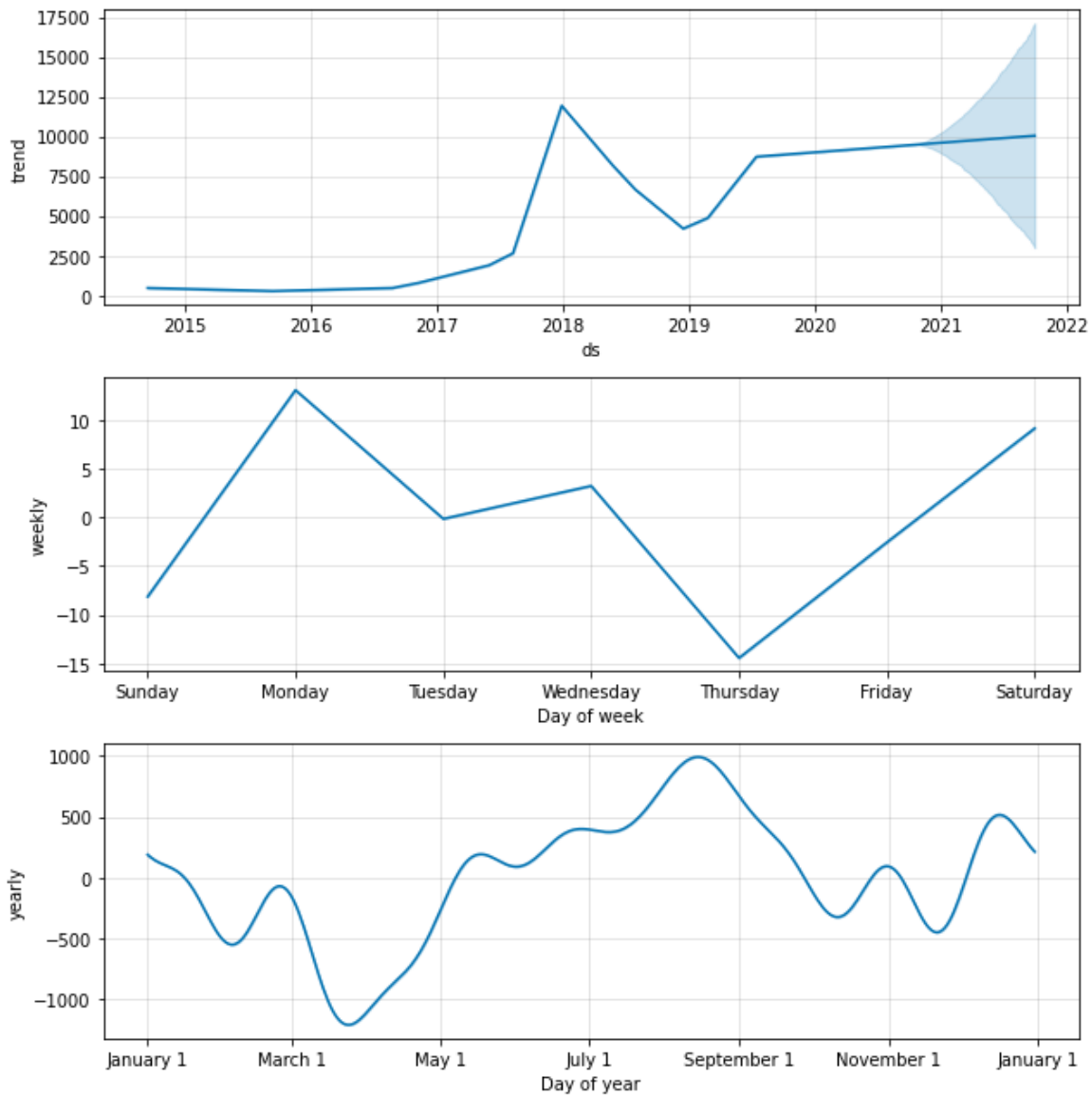
Figure 1.5(d) (for 'Low' price data)



The accuracy for the 'Low' price are as follows:

```
accuracy : 0.9143219647099761
mean_squared_error : 1220724.3926872085
mean_absolute_error: 666.8820690553923
```

Figure 1.5(e) (for 'Adj Close' price data)



The accuracy for the 'Adj Close' price are as follows:

```
accuracy : 0.9109592769948772
mean_squared_error : 1350317.42292312
mean_absolute_error: 700.9789675735923
```

It can be seen from the results that we are getting the maximum accuracy 91.43% when we are using the 'Low' price data.

Result Analysis:

With having gone over the bitcoin dataset we were able to determine that the price is highly volatile at certain times over others. Such as the price being much cheaper towards the beginning of the year in some instances where the buyers are just selling off and not buying. In terms of trying to make a profit one would want to buy during these times versus buying at a high price and possibly missing out at buying much cheaper prices. Moreover, from our analysis with the Facebook Prophet algorithm, we have an accuracy of 91.096%, however, the mean squared error is quite high as 1,350317.423 and a mean absolute error of 700.979. This means that despite having a good accuracy of predictions, the error for incorrect predictions is extremely high with the mean error between predictions of about 700. However, because we are dealing in thousands of dollars and more often in tens of thousands of dollars, this score is actually quite accurate as \$700 one way or another for something that costs \$10,000 would be close enough to determine a good estimate. An example of this would be the data that was predicted shown:

Figure 2.1

Date	Predicted Value	Actual Value
2014-09-17	468.1426	457.3340
2014-09-18	467.5854	424.4400
2014-09-19	467.0282	394.7960
2014-09-20	466.4711	408.9040
2014-09-21	465.9140	398.8210

So as shown the predicted results are only slightly above the actual results ranging from between ~ \$10-\$70 which is quite close to the actual data. This means that this algorithm could be a viable way of predicting future Bitcoin or other cryptocurrency prices.