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Analyzing Tesla (TSLA) Stock Prediction and Trends

Karim Elbahloul

Abstract – Predicting a particular stock is one of the toughest tasks to do when deciding whether to invest in Tesla (TSLA), or by using a known method also known as “Buy Low, Sell High”. In this research, we will be exploring Tesla and discussing the company background, analyzing the trends, as well as predicting the stock price of Tesla to see if it would be a good investment when deciding to buy shares in the NASDAQ Stock Exchange.

Company Background

Tesla (TSLA) is known for its 100% all electric vehicles. Tesla’s aim is to ensure gasoline and diesel-powered vehicles we have on the road in our present time are obsolete. The company today is performing well in the NASDAQ exchange because this is all in part to drive innovation as well as encouraging clean energy and environmentally friendly to deter away pollution. Furthermore, Tesla will keep up on bringing successful innovation and drive up the market value to ensure its drivers are going all electric.

Introduction

Stock market prediction is a widely known method to aid investors and stock analysts make the appropriate investment decisions on behalf of clients and those who are looking to drive up passive income in the long term. Predicting a stock trend is not a one and done overnight. Monitoring the stock trends require special skills such as, precise when to execute sell or buy shares, watching the trend line and seeing which way it would lead (bull – high or bear – low). This analysis will deep dive into the trends, using various machine learning methods, and other python libraries that will be used for the purpose of this research.

Background

Using the Statistical method approach, one way to predict stock prices is to utilize Logistic Regression. Utilizing this method will allow us to see Tesla’s Buy/Sell trend and allow us to make a reasonable decision on whether it will be a good investment in the long term or vice-versa. Deploying Logistic Regression is one of the most common Stock prediction models used in machine learning. Like Linear Regression but they both differ outputs. Since this research is solely on Logistic Regression, we will not go into Linear Regression.

Accuracy score (f1-score) will also be part of this analysis as well. This will visualize how accurate it would be to buy shares of Tesla vs to sell Tesla shares. The outputted model would come from the classification report which we will be discussing in this paper. The classification reports will depend on historical trends and how accurate the model would learn about the stock trends.

Deploying the above-mentioned trends would allow the model to better predict the stock and this research will help us look at historical data which would be derived from Yahoo Finance. Furthermore, using the historical datasets will visualize the trend in price per share.

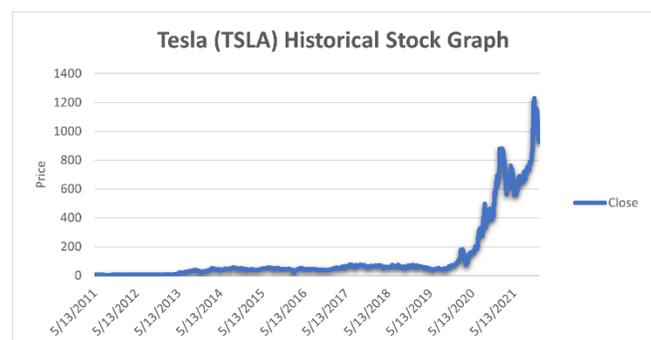


Figure 1: Historical Data of the Tesla (TSLA) Stock. 05/13/2011 – 12/18/2021

Dataset Description

For this paper, the dataset from Tesla (TSLA) will be analyzed. Tesla was founded in 2003 by a group of engineers and its Chair and CEO Elon Musk is the leader of the Electric car company. The company is currently listed in the NASDAQ Exchange. The Tesla Stock dataset is publicly available on Yahoo Finance. It consists of historical trends, daily opening and closing along with a few additional data parameters. Figure 1 shows the daily closing price of Tesla from May 13, 2011, to December 18, 2021. Furthermore, it is an excellent gauge for the overall performance of the stock market. [1]

Experimental Environment

The following python libraries were used in conducting the logistic regression and accuracy analysis:

- **NumPy**: used to perform matrix operations, such as flip, reshape, and create random matrices. [2]
- **Pandas**: Utilized for data manipulation and analysis.
- **Talib**: used for technical analysis for stock trading.
- **Sklearn**: is a machine learning python library for regression, classification, and other machine learning algorithms.
- **Matplotlib**: Used for plotting the graphs for the actual time-series as well as predicted trends. This is used for general data visualization.
- **YFinance**: Yahoo Finance API to extract historical stock data from Yahoo Servers.

Methodology

The machine learning tools utilized in this research are Logistic Regression and Accuracy score model.

First, Logistic Regression is used as a Sell/Buy analysis to describe the given data as well as using binary values in which our stock model is Buy (1) or Sell (-1). This method is useful to forecast buy or sell trends of Tesla's stock model.

Lastly, Accuracy score is a classification report by examining the buy and sell trend. Accuracy scores are used to show a representation of the current model that can learn from the given data interval and attempt to follow the actual stock data. Accuracy score are usually an indicator to determine whether it should be considered a good predictor.

For the general prediction of the Tesla stock direction, Excel Data Analysis forecasting was used for the purpose for general visualization for stock trends.

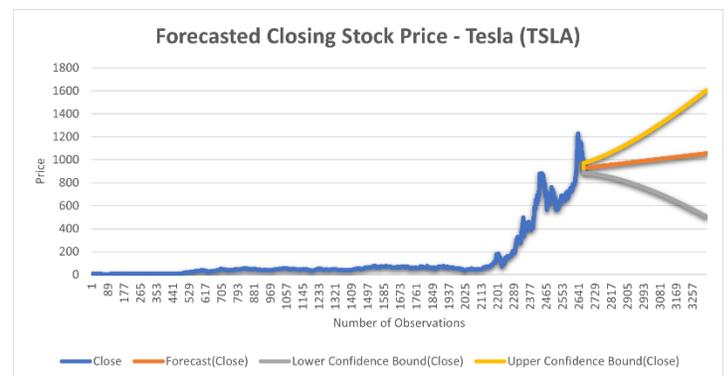


Figure 2: shows a general visualization of the Tesla (TSLA) stock. This representation shows the prediction trend line. (Orange line) is the predicted closing price.

Results and Discussion

Logistic Regression

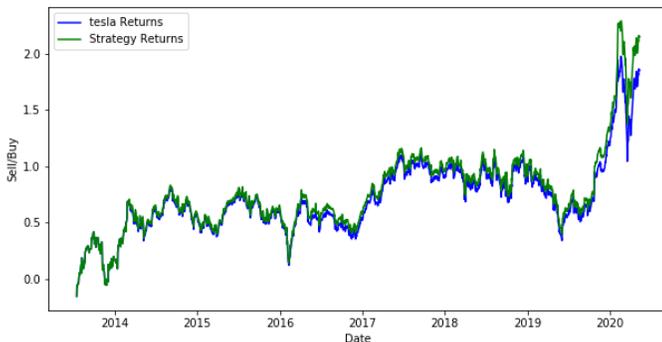


Figure 3: Logistic Regression of the Tesla (TSLA) stock. This representation shows the actual trend line (Blue), and the predicted strategy trading is the (Green) trend line.

The above results of the logistic regression showed it started with a strong bull market output for Tesla. The forecasted trading trend line (Green) shows it had followed the actual returns of Tesla. Thus, according to the outputted model, we can see the trend is heading towards a Buy (1) because the stock had made gains as this can happen to good news also known as Sentimental Analysis. Another reason the stock trend is up could be the company announcing new products or services. Any given news at any given time interval can cause the stock's behavior in a certain way to react.

Based on the given output of the logistic regression, it indicates that investing in Tesla shares would be a good investment. However, the end of the chart shows a downward trend late 2020 as it may be a good buy, but Investors would be cautioned not to lose too much money in the stock market because Tesla's market value is volatile because it may go way upward and then straight downward trend. Investors and other financial analysts would need to be precise when deciding on executing a buy or sell order. Overall, this model outputted shows to be a good predictor.

Accuracy Score

	precision	recall	f1-score	support
-1	0.64	0.01	0.02	842
1	0.51	1.00	0.68	877
accuracy			0.51	1719
macro avg	0.57	0.50	0.35	1719
weighted avg	0.57	0.51	0.35	1719

Figure 4: This is the classification report that will show the accuracy score (f1-score) of the outputted Logistic Regression Model.

The results and findings of the overall accuracy score of the model has achieved a 51.1%. This score is not a bad score, but barely acceptable model predictor. With that score it still shows the model is learning the actual stocks trajectory trend. The classification report shows that the f1-score achieved a 68% accuracy which is a good indicator that it is best to buy shares of Tesla stock. This explains why Tesla is more of a bull market. However, the sell strategy trading only achieved a very low 0.2% which is low and should be rejected since it is not a good predictor as well as its findings show a very low f1-score (accuracy) is not a good sell model. Overall, with the Logistic regression and accuracy scores, Tesla's predicted model shows its good to buy the stock rather than sell shares of that stock.

Future Research

Even though stock prediction is a good aid for the biggest financial institutions such as the NYSE (New York Stock Exchange), there are much ways research can be done when predicting any stock exchange that is publicly traded. Future work may include Linear Regression and various machine learning models aiming to make a good model and tool to decide whether to buy shares or sell.

Conclusion

This research has aided in producing forecast buy or sell shares of Tesla stock approaches. Stock Trading is intense, and it takes time to develop and build a machine learning model to better project the stocks directional trend. Even though the outputted forecasted trended a buy, we cannot be so certain it will stay that way because again, findings did show it is considered a volatile stock since it can boost upward and then boost downward. Overall, machine learning takes time and requires a lot of research and gathering reliable datasets to develop a good learning model.

References

Yahoo! (2021, December 18). *Tesla, Inc. (TSLA) Stock Historical Prices & Data*. Yahoo! Finance. Retrieved December 18, 2021, from <https://finance.yahoo.com/quote/TSLA/history?period1=1305244800&period2=1639699200&interval=1d&filter=history&frequency=1d&includeAdjustedClose=true> [1]

Numpy [Online], (2018). Available: <http://www.numpy.org/>. [Accessed December 18, 2021] [2]