Prediction of profitable entry for high momentum stocks using machine learning

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Abstract

The stock market is so unpredictable that makes it very difficult to come up with a model to predict the prices. Many internal and external factors such as geopolitical news, economic data, FED decisions, unemployment data, and company fundamentals impact daily stock prices. So, predicting the future price of a stock is not an easy task. This research is not intended to predict any long-term prices of a stock, but to identify the price range for momentum stocks to enter and exit and make a quick profit in short term. Momentum stocks are stocks with a high daily rate of change. There are many good momentum stocks in the market, but for this study, three stocks SHOPIFY, AMAZON, and TESLA have been chosen. The prices of these stocks have strong upward movement on some days, which is a good indicator for quick in and quick out strategy. The data used for this study has been taken from yahoo finance.

Keywords: Stocks, SHOPIFY, AMZN, TESLA,

Background

Various prediction models are being in use today to predict long term stock prices. But not all of these models are successful. As part of this research, the day to day fluctuations in momentum stocks is taken into consideration to determine the entry and exit price in the short term. Momentum stocks swing a lot every day. So when entered within the correct price range, a good profit can be made upon exit. However, it is easy to lose money when the stock price goes down because the momentum stocks fluctuate in the opposite direction with the same velocity. So, the main purpose of this study is to take three fundamentally strong companies (SHOPIFY, AMZN, TESLA,) and focus on the stock entry price, peak price, close price, and overall stock growth to identify the price range for profitable entry.

Data

The input data file has the date of the stock transaction, opening, closing, high and low prices. The volume involved in each transaction also have been included in the input data. The dataset has ten years

of Amazon, five years of Shopify, and ten years of Tesla data. The data shows that the value of these stocks has multiplied several times over last five to ten years. Recent data indicates that the daily price fluctuations of these stocks are higher than many other stocks that are available in the exchange.

Data Features

There are 8 features in the dataset.

Date: The date the stock price is recorded

Open price: This is the opening price of the stock on a given day

High price: The highest price of the stock

Low price: The lowest price of the stock

Close price: The closing price of the stock

Adj.Close: This is the adjusted close price of the stock

Volume: This is the total volume used in the transaction of the stock

Data Analysis and Methods

Various data exploration methods have been used as part of this research study to analyze the relationship between features. Scatter plots, histograms, and line charts have been created to find the relationship between open, close, high, and low prices. The delta or price differences between the opening and peak price, opening, and closing prices have been calculated to create linear regression models. This linear regression model uses the opening price of the stock as the input or predictor variable and the price difference between the opening price and peak price of the day as the dependent variable. The same methods have been applied for all three stocks. However, only Shopify stock charts were listed in this paper. The following plots are used to research the stock value.

- Scatter plots
- Line plots
- Histograms
- Linear regression model

Questions

This following research questions have been answered as part of this study

- How to identify momentum stocks?
- What is the maximum and minimum range of stock prices for these stocks?
- How much profit can be made per stock?
- How much loss can be made if the market turns south?
- What does it mean by quick in and quick out?
- Does opening price affect the profit?
- What is the probability of making profits and losses?
- How many days that stock needs to be held to make profit?

Results

1) As shown in Figure 1, the prices of the Shopify stock have gone up tremendously in recent years. The high price fluctuations of Tesla, Shopify and Amazon show that these stocks can be considered as momentum stocks.

2) Figure 2, 3, and 4 show the daily price fluctuations for these three stocks. The price range of Tesla is found to be +/-$5 to +/-$20, Amazon +/-$10 to +/-$200, and Shopify +/-$5 to +/-$80 per day.

3) The chart in Figure 5 shows the difference between the peak price and the opening price of the day. It is observed that the difference has been on a steady rise and reached the highest in 2020.

4) The scatter plot in Figure 6 shows the variation of the price difference (The highest price of the day and the opening price) based on the opening price of Shopify stock. This chart shows the price difference has kept on increasing once Shopify stock reached the $500 price point.

5) The histograms in Figure 7 shows the distribution of the delta (The highest price of the day and the opening price). This distribution shows that the delta, which is the difference between the opening price and peak price of the day is zero for 500 days, which indicates that the price dropped and reached lows on those 500 days

7) The histograms in Figures 8 and 9 show the actual and predicted values derived from linear regression. The root mean square error is found to be 20.85

8) Two linear regression models have been developed to predict the profit (The difference between the opening price and the peak price) for each stock. If Shopify stock price is greater than $900.00, the mean value of the predicted profit when bought with any opening price is $21.60, whereas the actual value is found to be $15.70

9) If Shopify stock price is greater than $500.00, the mean value of the predicted profit when bought with any opening price is $20.30, whereas the actual value is found to be $16.20

10) If Tesla stock price is greater than $400.00, the mean value of the predicted profit when bought with any opening price is $10.30, whereas the actual value is found to be $8.40.

11) If Amazon stock price is greater than $3000.00, the mean value of the predicted profit when bought with any opening price is $44.00, whereas the actual value is found to be $34.30.

Conclusions

The study finds that all three stocks (Shopify, Tesla, and Amazon) have changed with the highest rate of growth in the last three years. The daily stock fluctuations have been on a steady increase over the life of the stock. For example, the Shopify stock daily fluctuations are between +/-$5 to +/-$80 per day. Amazon has a range between +/-$10 and +/-$200 per day. These observations indicate that the Shopify, Tesla, and Amazon stocks are part of high momentum stocks where profit can be made in the order of $5 to $ 200 per stock if entered at an appropriate price. However, these stocks can also give losses in the same magnitude if bought at the wrong price.

- The linear regression model shows that when SHOPIFY stock is purchased at the opening price of the day, a mean profit of $21.60 can be made when the price of the stock is greater than $900. The actual value is found to be at $15.70, and the accuracy of prediction is 72%.
- The linear regression model also shows that when AMAZON stock is purchased at the opening price of the day, a mean profit of $44.00 can be made when the price of the stock is greater than $900. The actual value is found to be at $34.30, and the accuracy of prediction is 77%.
- For TESLA stock, the model predicts a mean profit of $10.30 when the stock is purchased at a price greater than $400. The actual value is found to be at $8.40, and the accuracy of prediction is 81.5%.

Limitations:

This study uses three fundamentally strong companies for research and may not be applied to other company stocks. This model cannot be used as investment guidance or professional advice. This study is just based on historical price action.

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References

[1] https://finance.yahoo.com/most-active?.tsrc=fin-srch

[2] https://www.analyticsvidhya.com/blog/2018/10/predicting-stock-price-machine-learningnd-deep - learning-techniques-python/

[3] https://arxiv.org/abs/2009.10819

[4] https://www.sciencedirect.com/science/article/pii/S1877050920307924

[5] https://towardsdatascience.com/stock-price-prediction-based-on-deep-learning-3842ef697da0

[6] https://link.springer.com/article/10.1186/s40537-020-00333-6

[7] https://ieeexplore.ieee.org/document/8821776

[8] https://scholarworks.lib.csusb.edu/cgi/viewcontent.cgi?article=1435&context=jitim

[9]https://scholarworks.sjsu.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1639&context=etd_projects

[10] https://eprints.soton.ac.uk/437785/1/FEMIB_2020_6.pdf

Appendix (Figures)

The following graphs are developed as part of this study

Figure 1: Shopify price history

Figure 2: Shopify stock daily price fluctuations

Figure 3: Tesla stock daily price fluctuations

Figure 4: Amazon stock daily price fluctuations

Figure 5: The peak price and opening price difference vs Date (Shopify stock)

Figure 6: The peak price and opening price difference vs Opening Price (Shopify stock)

Figure 7: The peak price and opening price difference distribution (Shopify stock)

Figure 8: The predicted profit when stocks are bought at any opening price

Figure 9: The predicted profit when stocks are bought at the opening price > $900


Shop Stock - Price History
Opening Price
Closing Price
Price($)
1160
1110
1060
1010
960
910
860
810
760
710
660
610
560
510
460
410
360
310
260
210
160
110
60
10
2016
2017
2018
2019
2020
2021
Date

Figure 1

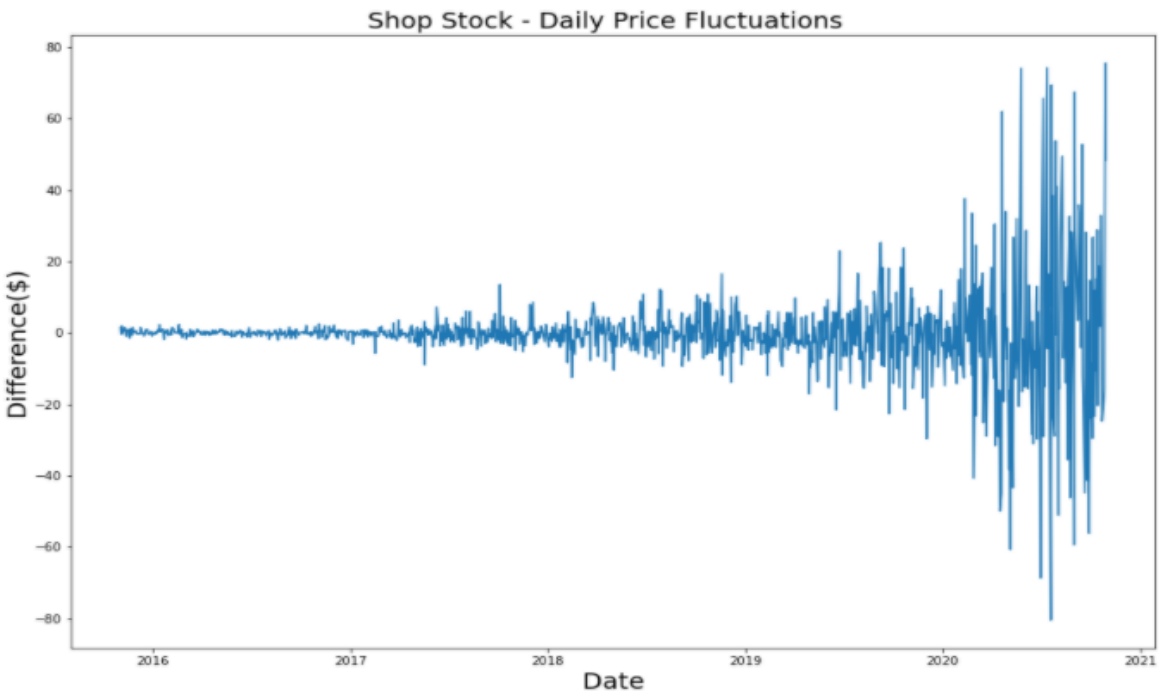
Shop Stock - Daily Price Fluctuations
Difference($)
80
60
40
20
0
−20
−40
−60
−80
2016
2017
2018
2019
2020
2021
Date

Figure 2

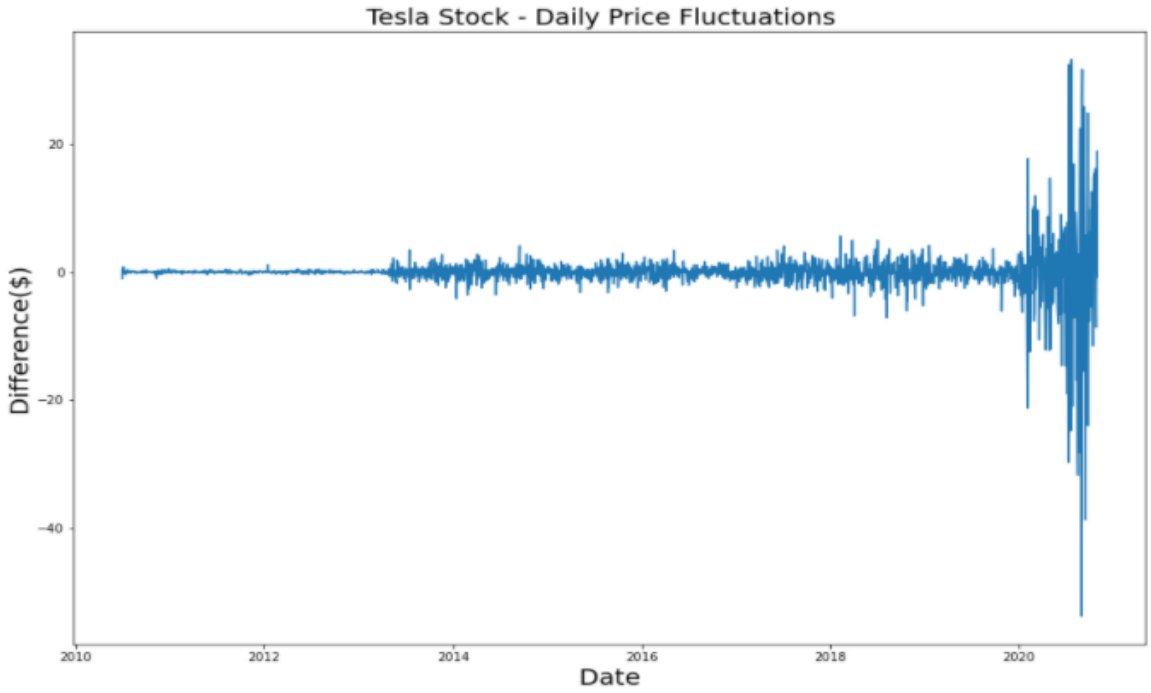

Figure 3

Figure 4

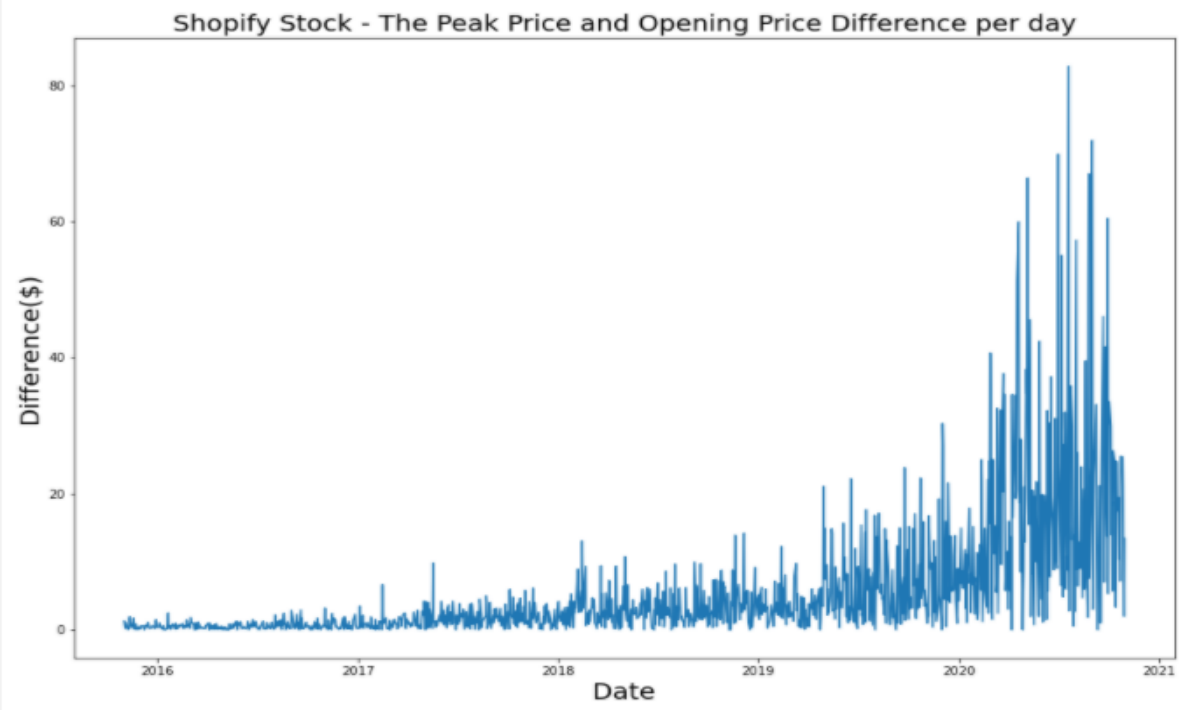

Figure 5

Figure 6

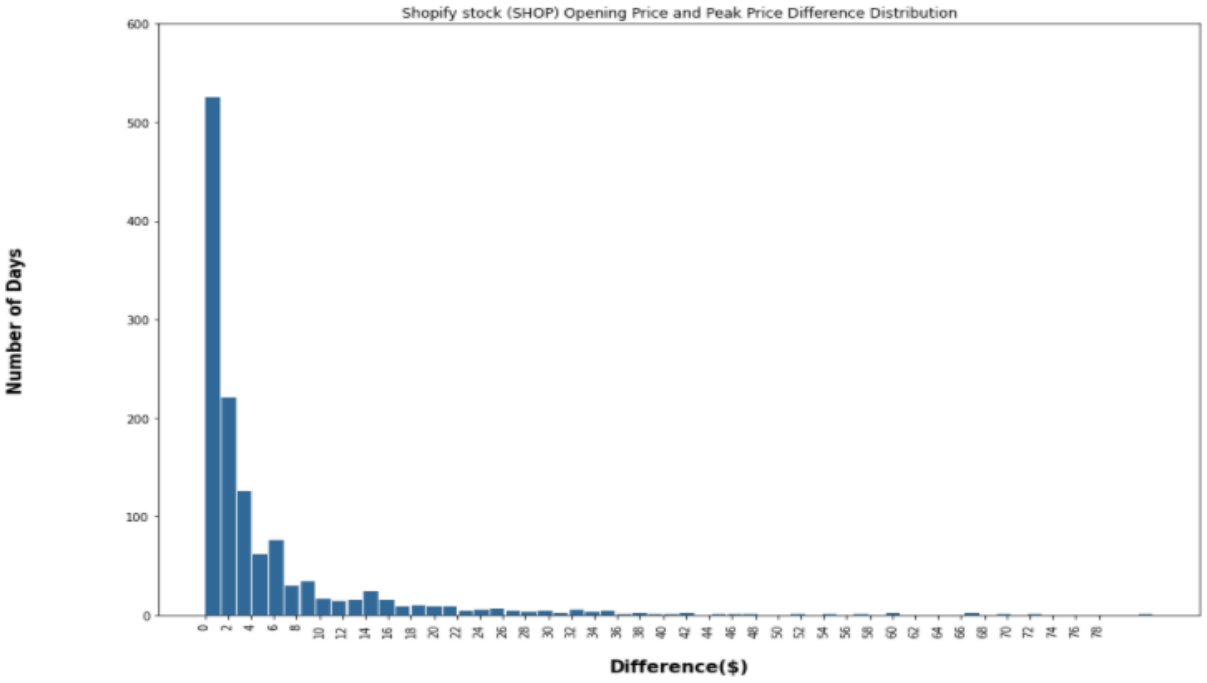

Figure 7

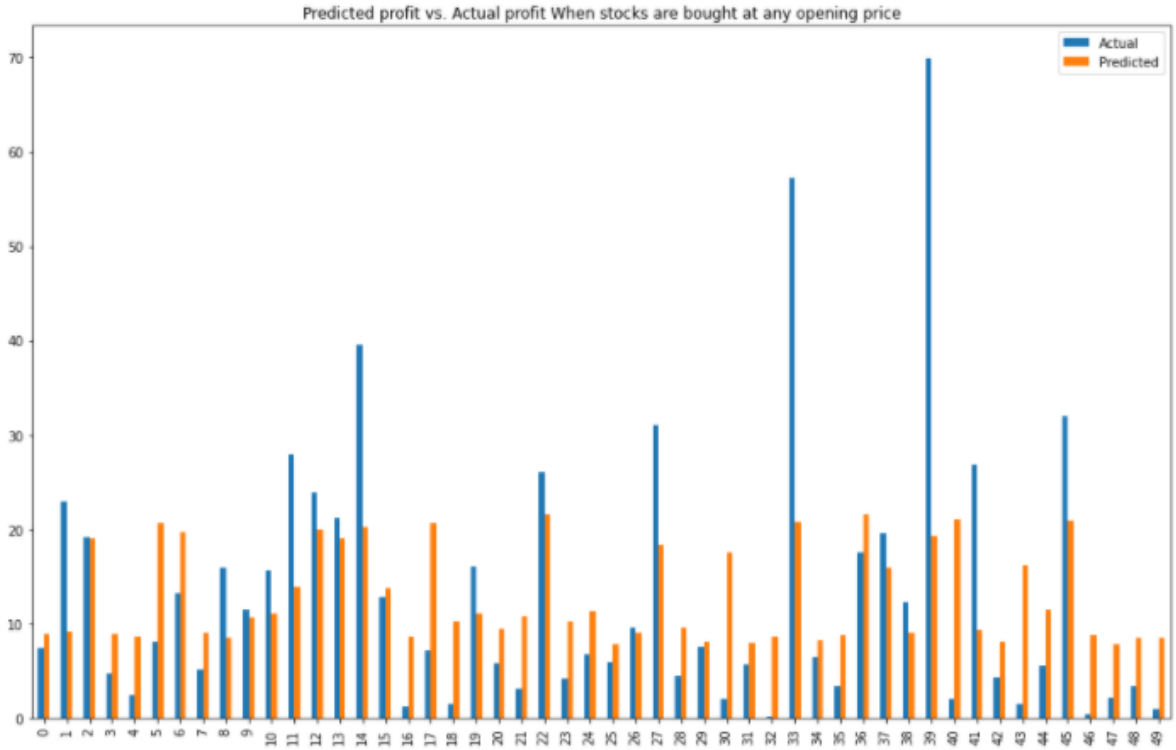

Figure 8

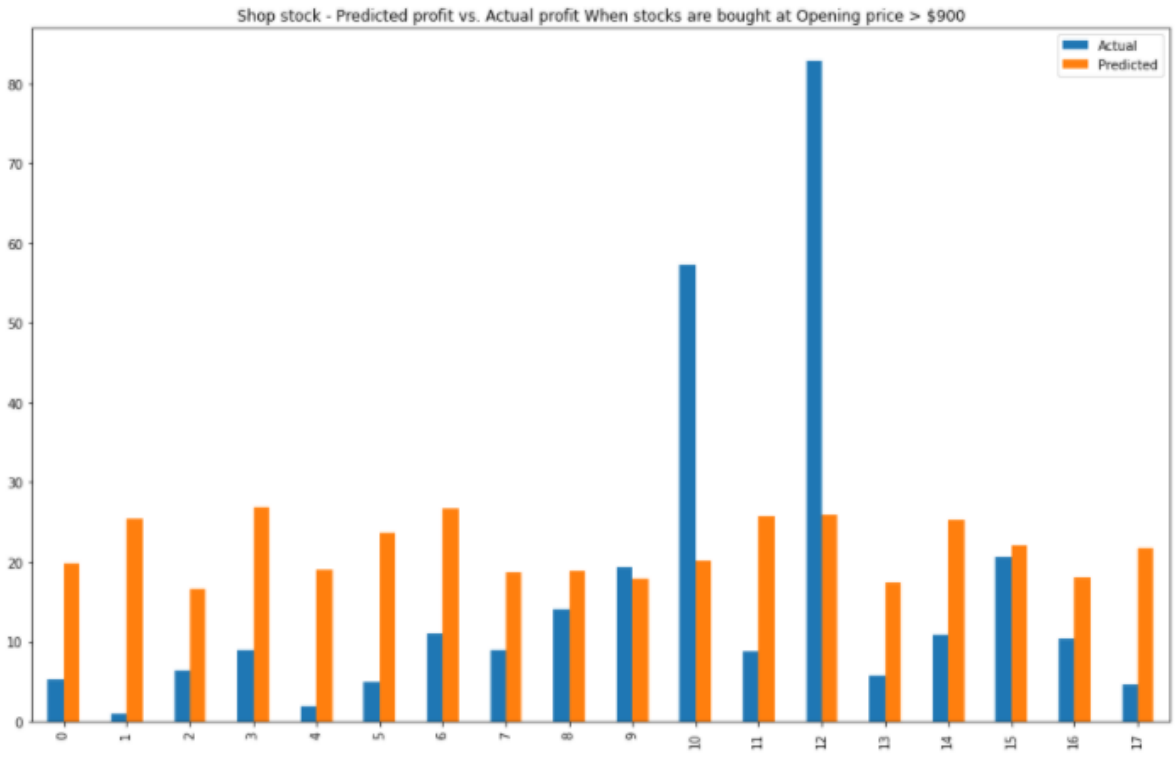
Shop stock - Predicted profit vs. Actual profit When stocks are bought at Opening price > $900
Actual
Predicted
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Figure 9