Magnificent Seven Stocks Prediction Analysis

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Independent Study Project

ACENET Microcredential in Advanced Computing

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Outline

Introduction

- "Magnificent Seven Stocks."
  - Microsoft
  - Apple
  - Nvidia
  - Alphabet
  - Amazon
  - Meta
  - Tesla
- Objective

  Method 1: Predict stock closing price using the history of stock prices.

  Method 2: Predict stock closing price using the history of **other** stock prices.
  - Compare the prediction methods.

Method 1

- ARIMA stands for AutoRegressive Integrated Moving Average.
- It's a widely used time series analysis technique.
- Components include AutoRegressive (AR), Integrated (I), and Moving Average (MA).

$$Y_t = c + \phi_1 Y_{t-1} + \ldots + \phi_p Y_{t-p} + \theta_1 \epsilon_{t-1} + \ldots + \theta_q \epsilon_{t-q} + \epsilon_t \quad (1)$$

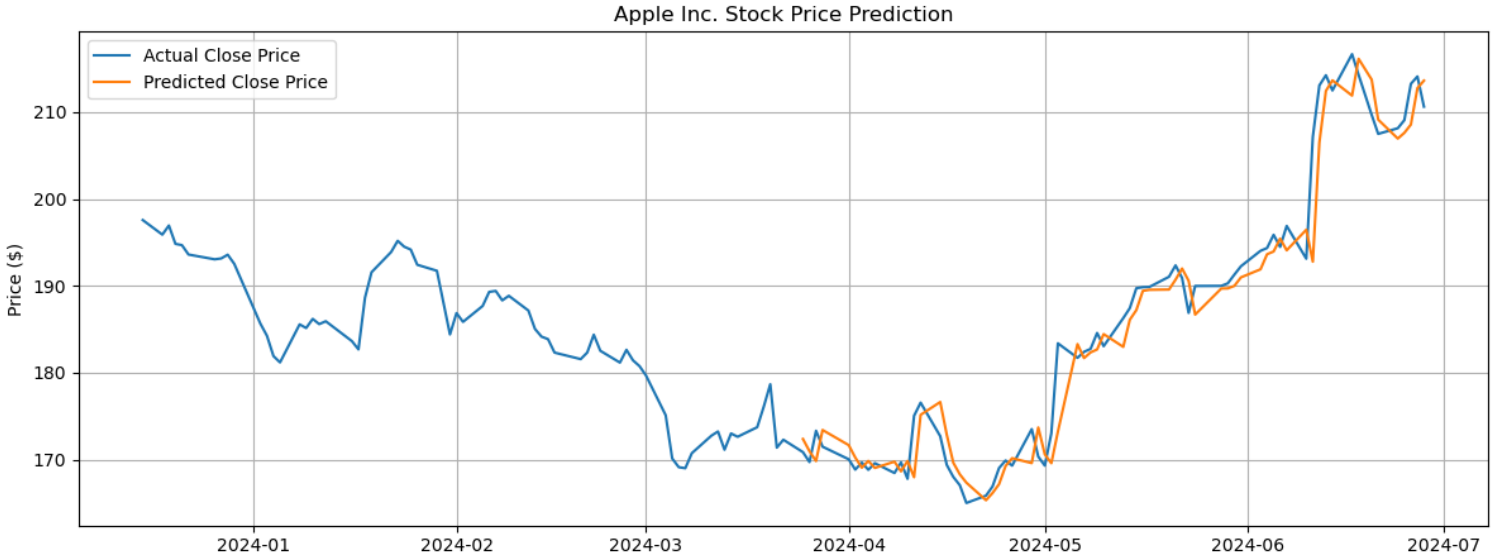
Where:

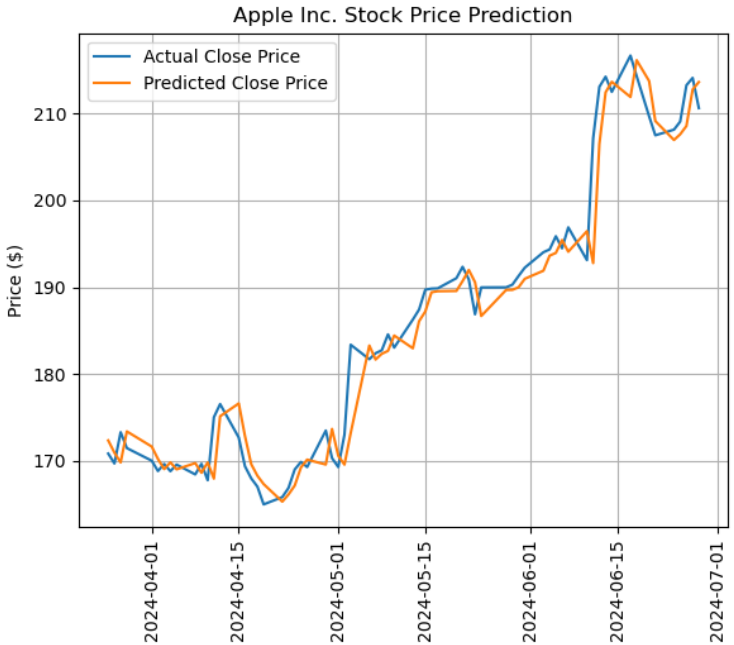
- Y_t: Time series data at time t
- c: Constant term
- $\phi_1, \ldots, \phi_p$: AutoRegressive parameters
- $\theta_1, \ldots, \theta_q$: Moving Average parameters
- ϵ_t: Error term at time t

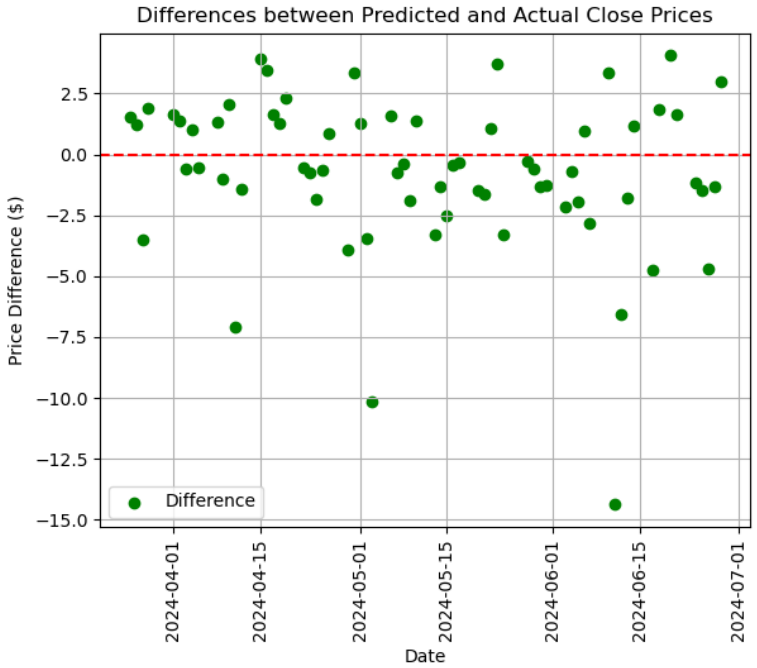
- For simplicity Auto Regressive models are considered in this project.
- An AR(p) can be formulated as

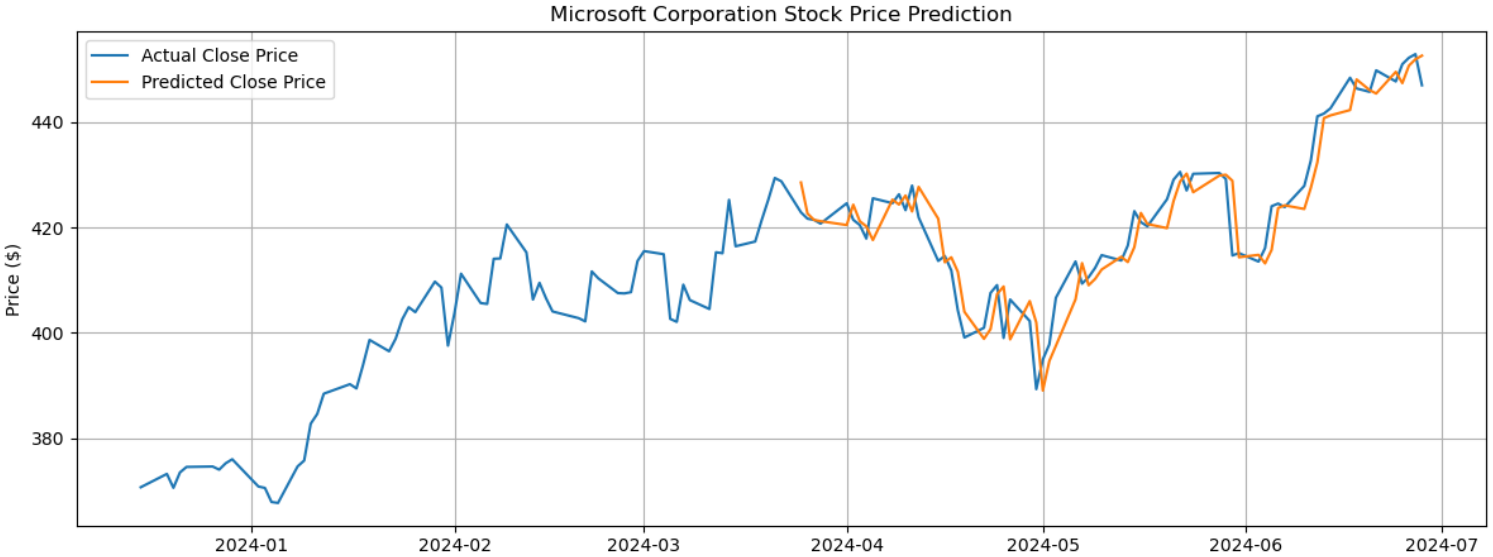
$$Y_t = \phi_1 Y_{t-1} + \ldots + \phi_p Y_{t-p} + \epsilon_t \quad (2)$$

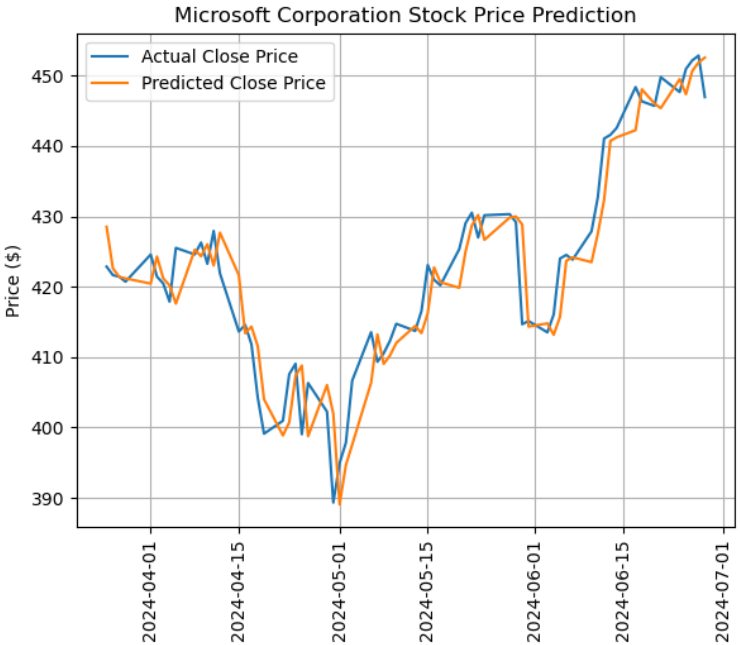
- This study can be extended to full ARIMA models.

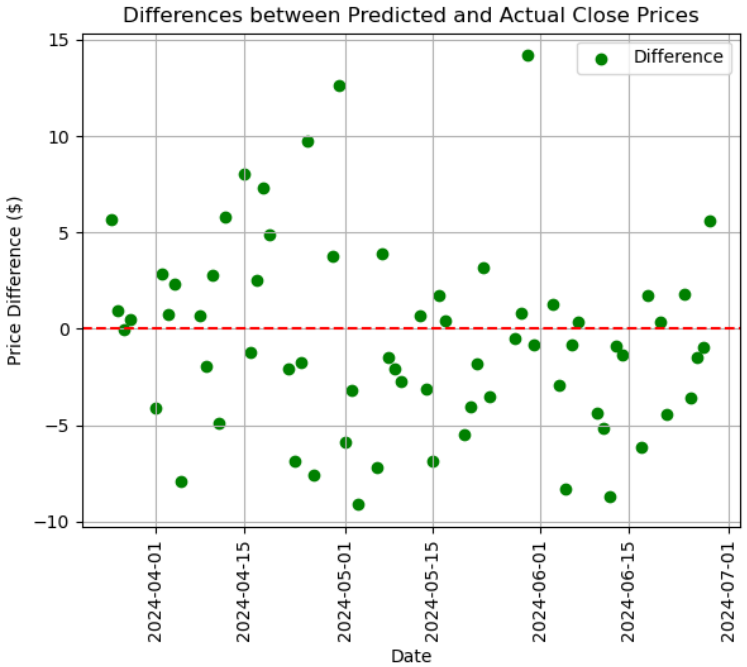

Apple Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
210
200
190
180
170
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07

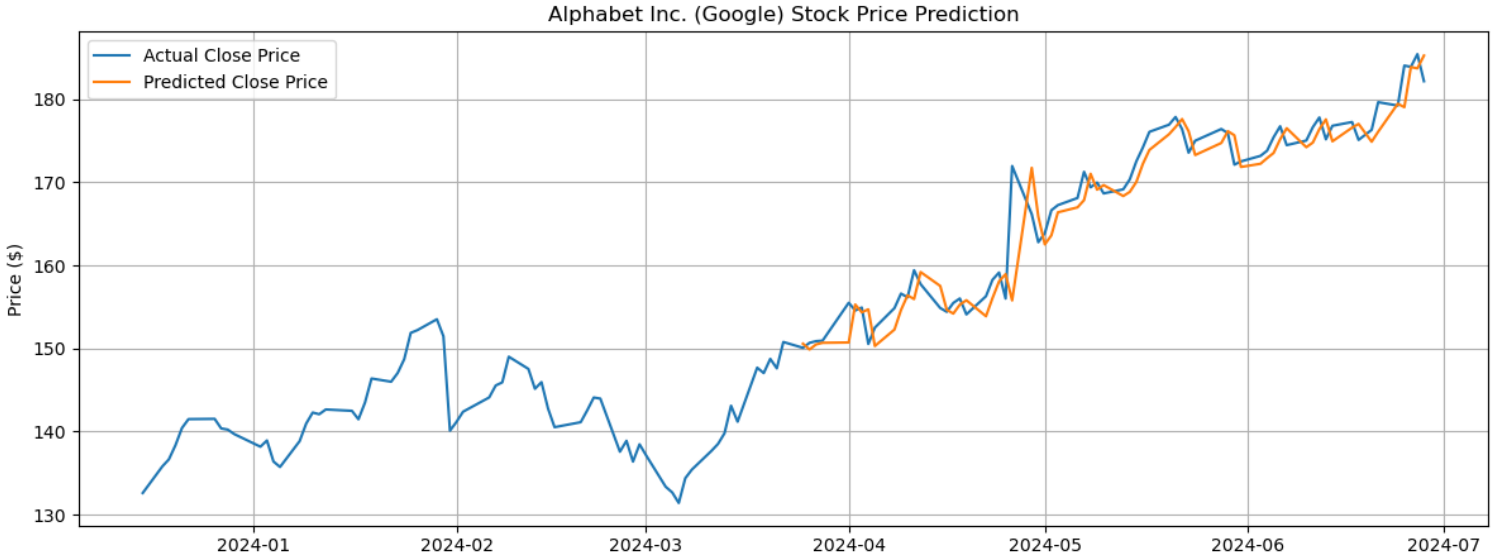

Apple Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
210
200
190
180
170
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01

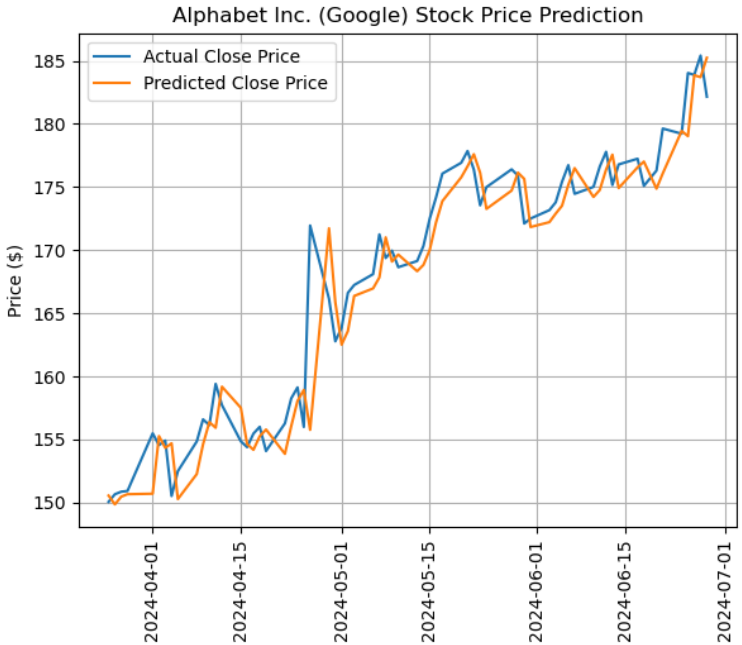

Differences between Predicted and Actual Close Prices
Price Difference ($)
2.5
0.0
−2.5
−5.0
−7.5
−10.0
−12.5
−15.0
Difference
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

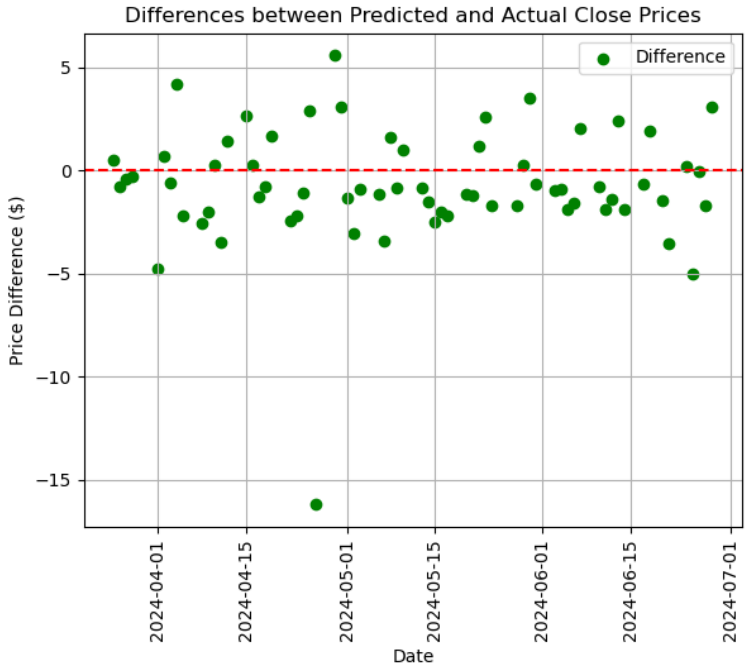

Microsoft Corporation Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
440
420
400
380
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07

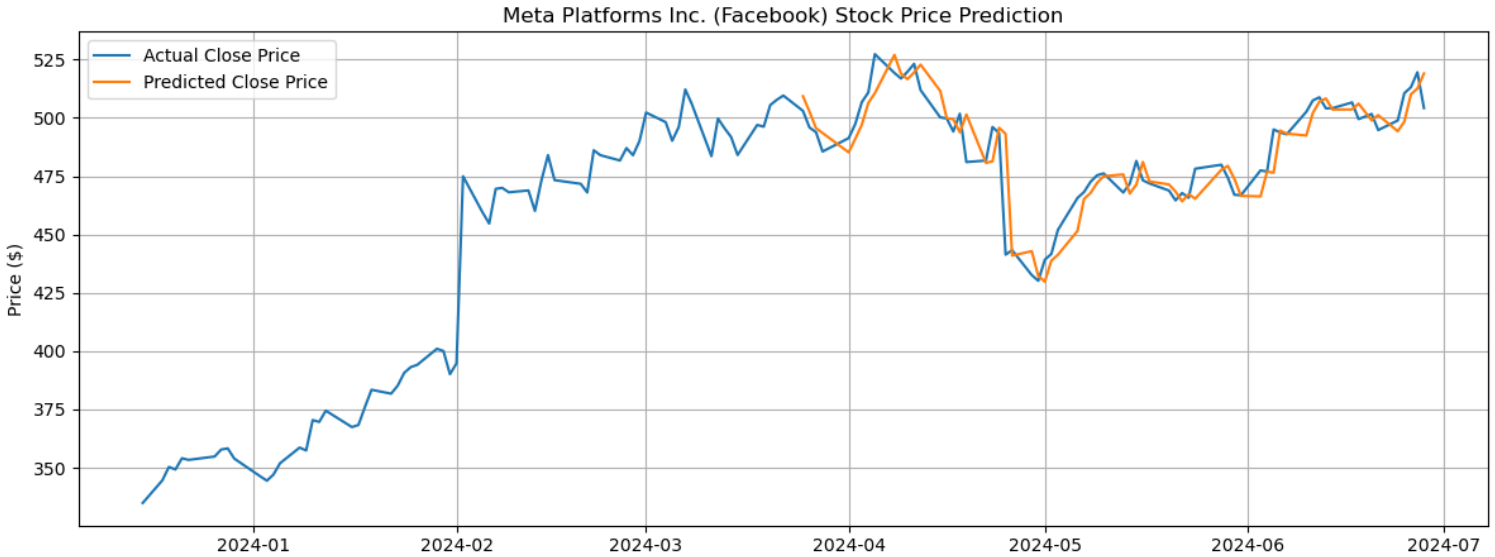

Microsoft Corporation Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
450
440
430
420
410
400
390
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01

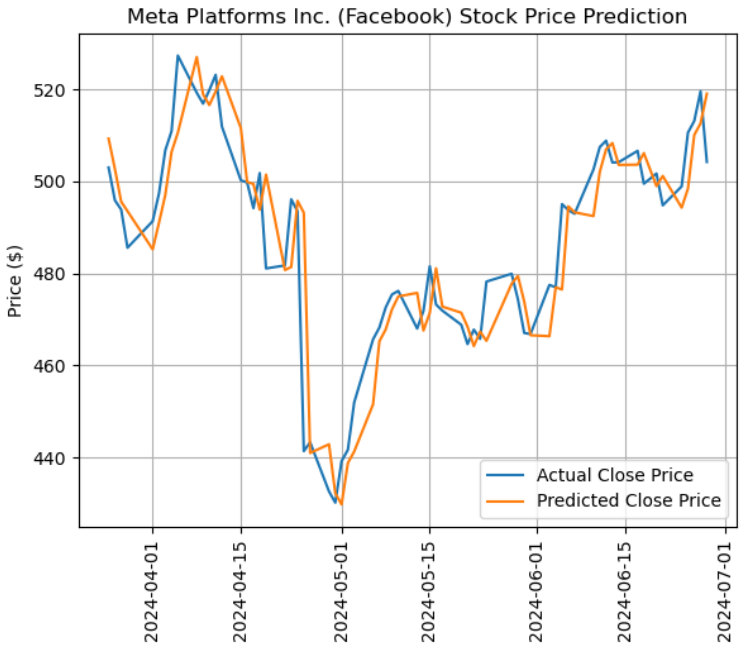

Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
15
10
5
0
−5
−10
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

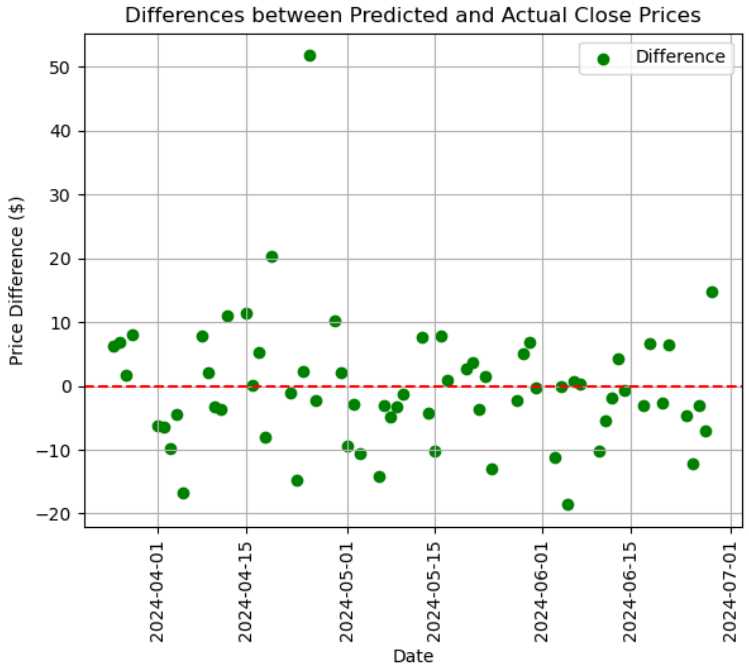

Alphabet Inc. (Google) Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
180
170
160
150
140
130
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07

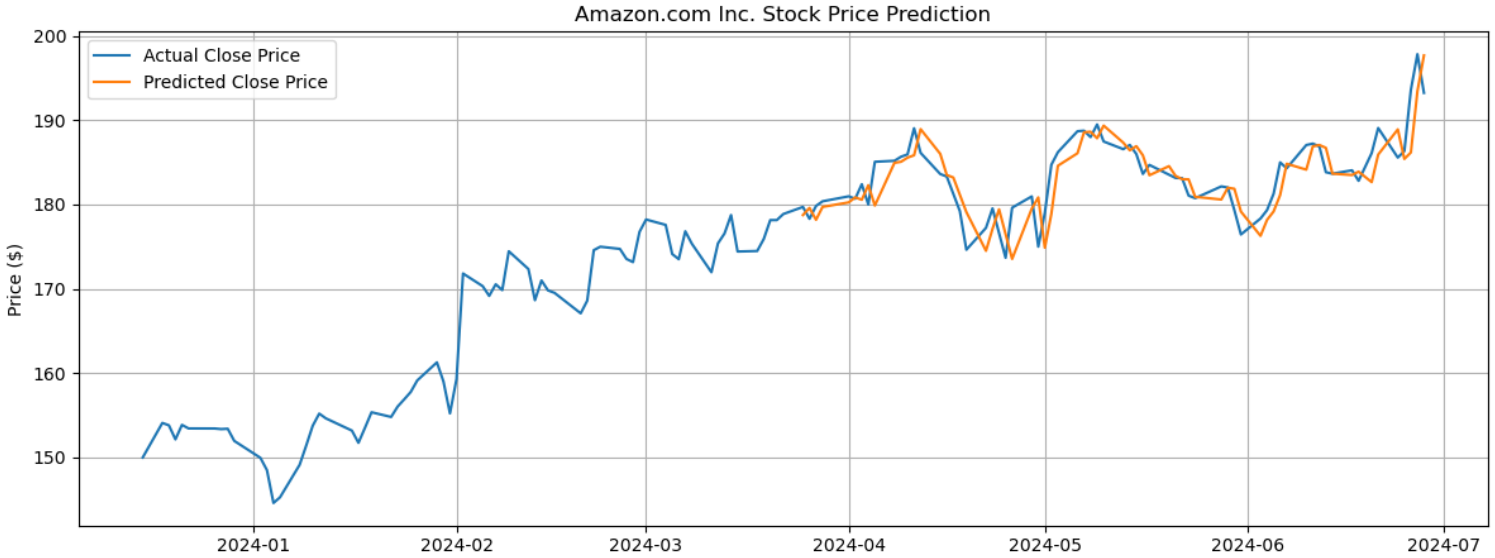

Alphabet Inc. (Google) Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
185
180
175
170
165
160
155
150
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01

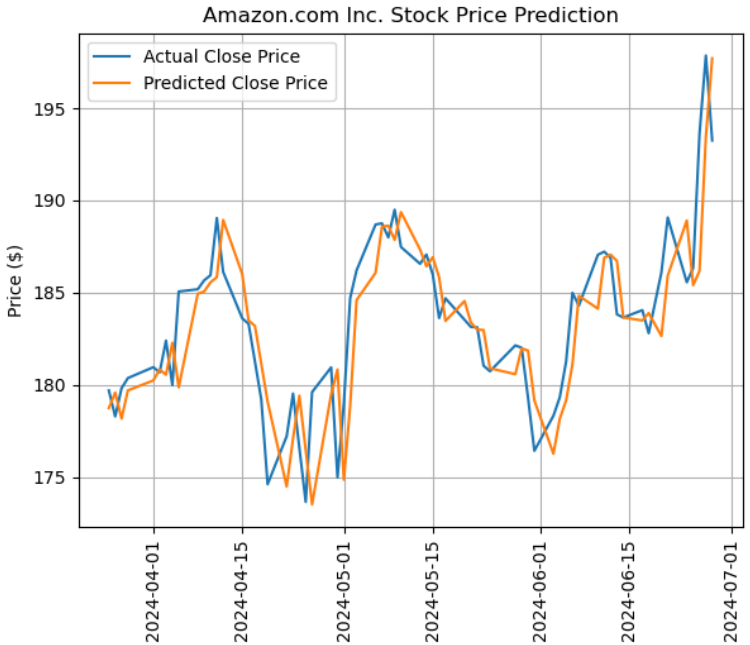

Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
5
0
−5
−10
−15
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

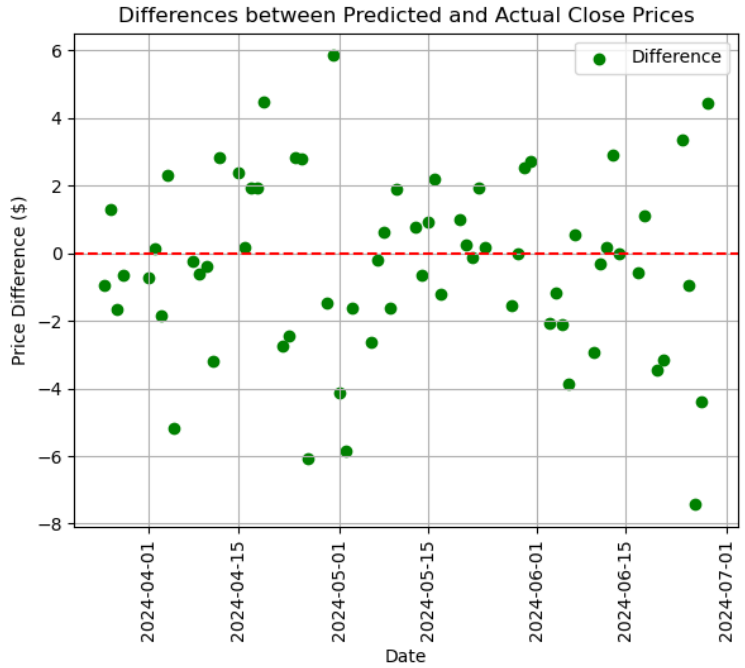

Meta Platforms Inc. (Facebook) Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
525
500
475
450
425
400
375
350
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07

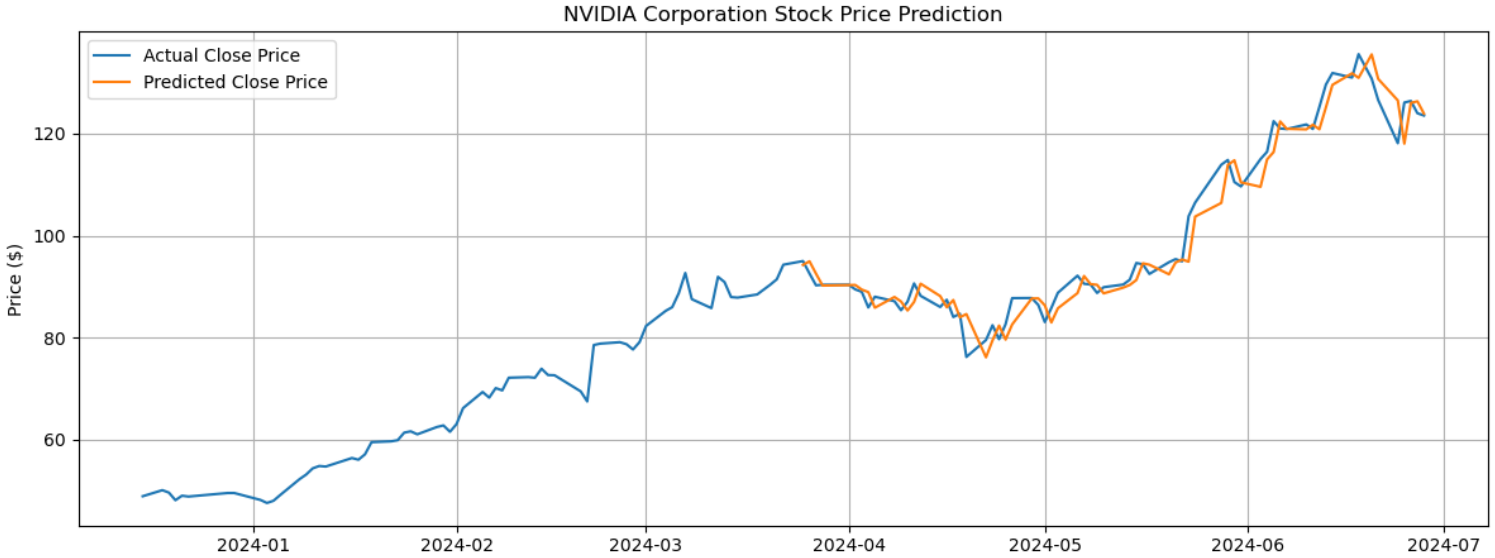

Meta Platforms Inc. (Facebook) Stock Price Prediction
Price ($)
520
500
480
460
440
Actual Close Price
Predicted Close Price
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01

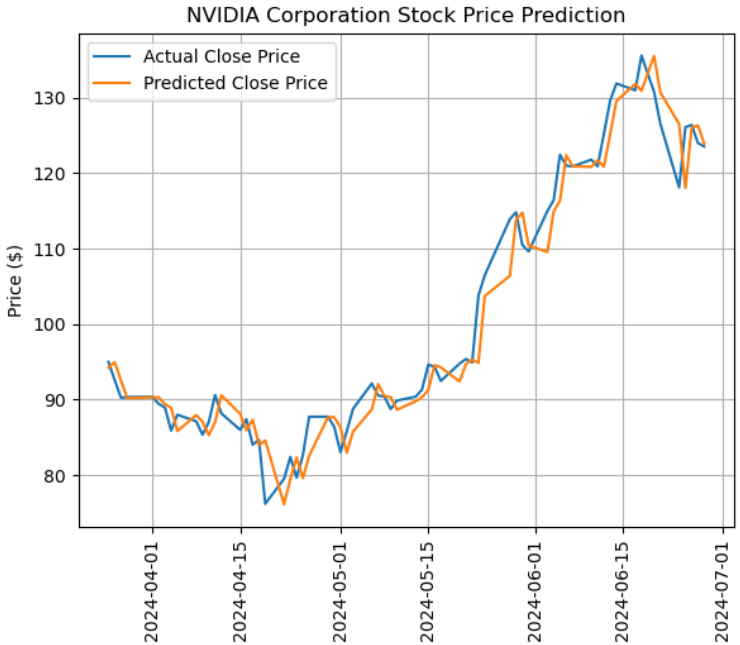

Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
50
40
30
20
10
0
−10
−20
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

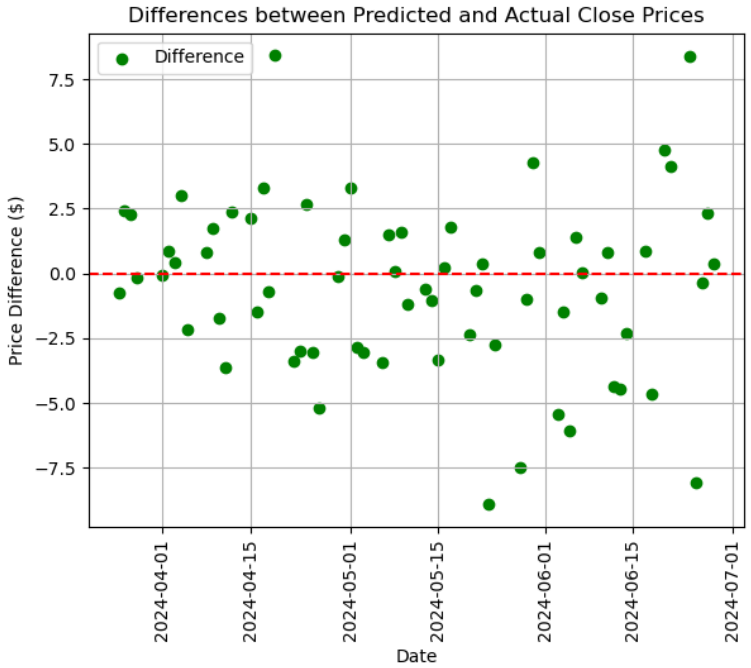

Amazon.com Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
200
190
180
170
160
150
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07

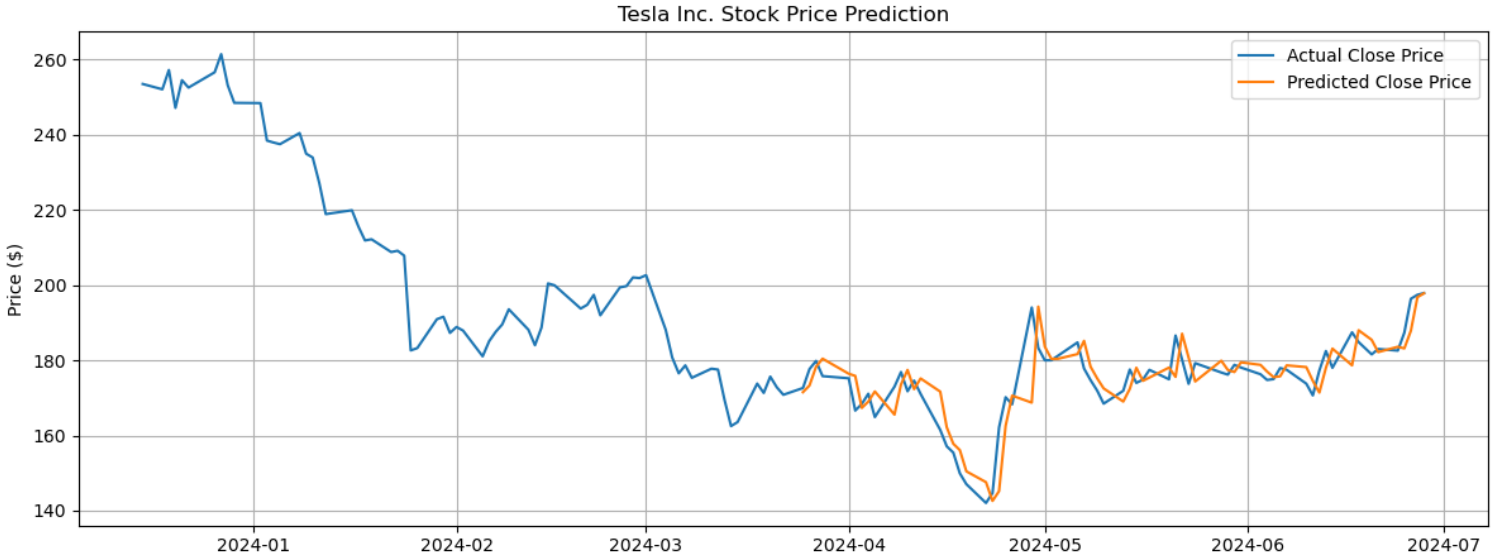

Amazon.com Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
195
190
185
180
175
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01

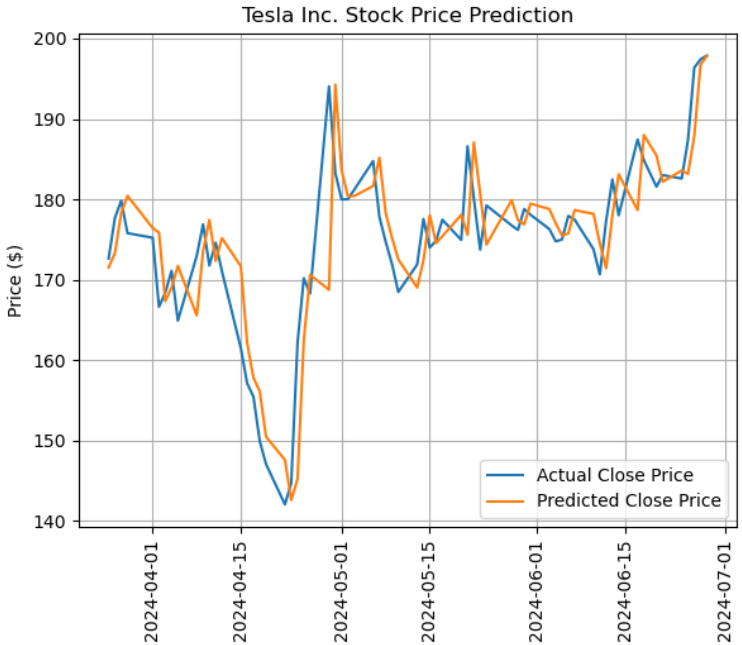

Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
6
4
2
0
−2
−4
−6
−8
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

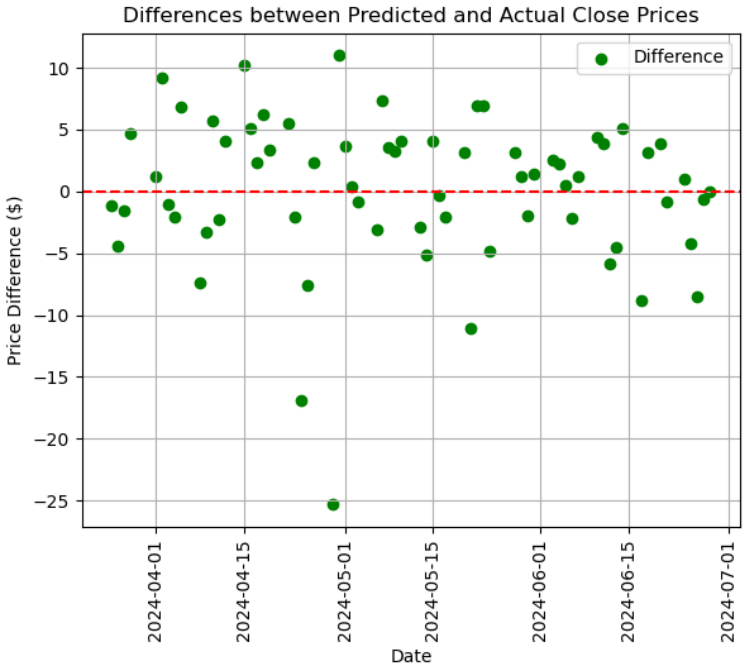

NVIDIA Corporation Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
120
100
80
60
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07


NVIDIA Corporation Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
130
120
110
100
90
80
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01


Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date


Tesla Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
260
240
220
200
180
160
140
2024-01
2024-02
2024-03
2024-04
2024-05
2024-06
2024-07


Tesla Inc. Stock Price Prediction
Actual Close Price
Predicted Close Price
Price ($)
200
190
180
170
160
150
140
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01


Differences between Predicted and Actual Close Prices
Difference
Price Difference ($)
10
5
0
−5
−10
−15
−20
−25
2024-04-01
2024-04-15
2024-05-01
2024-05-15
2024-06-01
2024-06-15
2024-07-01
Date

Method 2

- Let's define $AR(p) + AR_1(p_1) + \ldots + AR_6(p_6)$ as

$$\begin{aligned} Y_t =& \phi_1 Y_{t-1} + \ldots + \phi_p Y_{t-p} \\ &+ \phi_{1,1} X_{1,t-1} + \ldots + \phi_{1,p} X_{1,t-p_1} \\ &+ \ldots \\ &+ \phi_{6,1} X_{6,t-1} + \ldots + \phi_{6,p} X_{6,t-p_6} + \epsilon_t \end{aligned} \tag{3}$$