DAL_ENDSEM_Part_2_AE20B007

November 26, 2023

1 Importing Libraries

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import tensorflow as tf
import time
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import mean_absolute_error, mean_squared_error,␣
 ↪mean_absolute_percentage_error
from keras.models import Sequential
from keras.layers import Dense, LSTM, Dropout

seed = 0 # Setting seed for consistent results
np.random.seed(seed)
tf.random.set_seed(seed)
```

2 Loading and Visualizing Data

[2]:
```
def get_path(file_ext = 'csv', update = ''):
    '''
    Function: To get the paths of all datasets

    file_ext = File Extension of the Data File
    update = String containing the update parameter

    returns:
    folders: dictionary with keys as company/dataset name and values as file␣
 ↪location
    '''
    folders = {
        'Cognizant': 'Datasets/Cognizant Share Prices 2019_2021' + update + '.'␣
 ↪+ file_ext,
        'HCL Technologies': 'Datasets/HCL Technologies Share Prices 2019_2021'␣
 ↪+ update + '.' + file_ext,
```

```
        'HDFC Bank': 'Datasets/HDFC Bank Share Prices 2019_2021' + update + '.'␣
↪+ file_ext,
        'ICICI Bank': 'Datasets/ICICI Bank Share Prices 2019_2021' + update + '.
↪' + file_ext,
        'Infosys': 'Datasets/Infosys Share Prices 2019_2021' + update + '.' +␣
↪file_ext,
        'SBI': 'Datasets/SBI Share Prices 2019_2021' + update + '.' + file_ext,
        'USD-INR Exchange Rate': 'Datasets/USD-INR Exchange Rate 2019_2021' +␣
↪update + '.' + file_ext
    }
    return folders

def import_data(folder, file_ext='csv', update = ''):
    '''
    Function: To import data for a given dataset

    file_ext = File Extension of the Data File
    update = String containing the update parameter
    folder = folder/dataset name

    returns:
    data: dataset as Pandas Dataframe
    '''
    folders = get_path(file_ext, update)
    if file_ext == 'xlsx':
        data = pd.read_excel(folders[folder])
    else:
        data = pd.read_csv(folders[folder])
    return data

folders = get_path() # Importing dictionary of all datasets and their locations
```

[4]:
```
def fill_entire_missing_data(df):
    '''
    Function: To fill missing data of all columns for a given dataset

    df: Dataset
    '''
    cols = list(df.columns)
    cols.pop(0)
    for col in cols:
        fill_missing_data(df, col)

def fill_missing_data(df, col):
    '''
    Function: To fill missing data of a particular column for a given dataset
```

```
    df: Dataset
    col: Column name
    '''
    i, ind = 0, 0
    start, start_idx = [], []
    end, end_idx = [], []
    while i < len(df[col]):
        if pd.isna(df[col][i]):
            if pd.isna(df[col][i-1]) == False:
                start.append(df[col][i-1])
                start_idx.append(i-1)
                ind = 1
        elif ind == 1:
            end.append(df[col][i])
            end_idx.append(i)
            ind = 2
        i += 1

    for i in range(len(start)):
        slope = (end[i] - start[i])/(end_idx[i] - start_idx[i])
        for idx in range(start_idx[i]+1, end_idx[i]):
            df.loc[idx, col] = slope*(idx - start_idx[i]) + start[i]

def fill_all_datasets():
    '''
    Function: To fill missing values in all datasets
    '''
    folders = get_path('xlsx')
    for dataset, path in folders.items():
        print(f"Working on {dataset} Dataset...")
        data = import_data(dataset)
        fill_entire_missing_data(data)
        save_data(data, path)
        print(f"Saved filled {dataset} Dataset at this location: {path}.\n")

def save_data(df, path):
    '''
    Function: To save dataset as excel file

    df: Dataset
    path: path/location where the data has to be stored
    '''
    df.to_excel(path, index=False)
```

[5]:
```
fill_all_datasets()
```

```
Working on Cognizant Dataset...
Saved filled Cognizant Dataset at this location: Datasets/Cognizant Share Prices
```

```
2019_2021.xlsx.

Working on HCL Technologies Dataset…
Saved filled HCL Technologies Dataset at this location: Datasets/HCL
Technologies Share Prices 2019_2021.xlsx.

Working on HDFC Bank Dataset…
Saved filled HDFC Bank Dataset at this location: Datasets/HDFC Bank Share Prices
2019_2021.xlsx.

Working on ICICI Bank Dataset…
Saved filled ICICI Bank Dataset at this location: Datasets/ICICI Bank Share
Prices 2019_2021.xlsx.

Working on Infosys Dataset…
Saved filled Infosys Dataset at this location: Datasets/Infosys Share Prices
2019_2021.xlsx.

Working on SBI Dataset…
Saved filled SBI Dataset at this location: Datasets/SBI Share Prices
2019_2021.xlsx.

Working on USD-INR Exchange Rate Dataset…
Saved filled USD-INR Exchange Rate Dataset at this location: Datasets/USD-INR
Exchange Rate 2019_2021.xlsx.
```

[6]:
```python
def get_title(folder):
    '''
    Function: To get the title to be used in plots when dataset name is given

    folder: Dataset name
    '''
    if folder[-1] == 's':
        return folder + '\''
    else:
        return folder + '\'s'

def get_label(col):
    '''
    Function: To give the label for a given column

    col: Column name

    returns: label of given column to be used in a plot
    '''
    label_dict = {
```

```
        'Open': 'Opening Price',
        'High': 'High Price',
        'Low': 'Low Price',
        'Close': 'Closing Price',
        'Volume': 'Volume',
        'Adj Close': 'Adjusted Closing Price',
    }
    return label_dict[col]

def get_color(col):
    '''
    Function: To give the color for a given column

    col: Column name

    returns: color of given column to be used in a plot
    '''
    color_dict = {
        'Open': 'blue',
        'High': 'green',
        'Low': 'red',
        'Close': 'magenta',
        'Volume': 'tab:orange',
        'Adj Close': 'tab:brown',
    }
    return color_dict[col]

def get_currency(folder):
    '''
    Function: To give the currency for a given folder/dataset

    folder: Folder name

    returns: currency of given folder/dataset to be used in a plot
    '''
    if folder == 'Cognizant':
        currency = '$'
    else:
        currency = u"\u20B9"
    return currency

def get_unit(folder, col):
    '''
    Function: To give the unit for a given column

    folder: Folder name
    col: Column name
```

```
    returns: unit of given column to be used in a plot
    '''
    currency = get_currency(folder)
    unit_dict = {
        'Open': f'(in {currency})',
        'High': f'(in {currency})',
        'Low': f'(in {currency})',
        'Close': f'(in {currency})',
        'Volume': '(in units)',
        'Adj Close': f'(in {currency})',
    }
    return unit_dict[col]
```

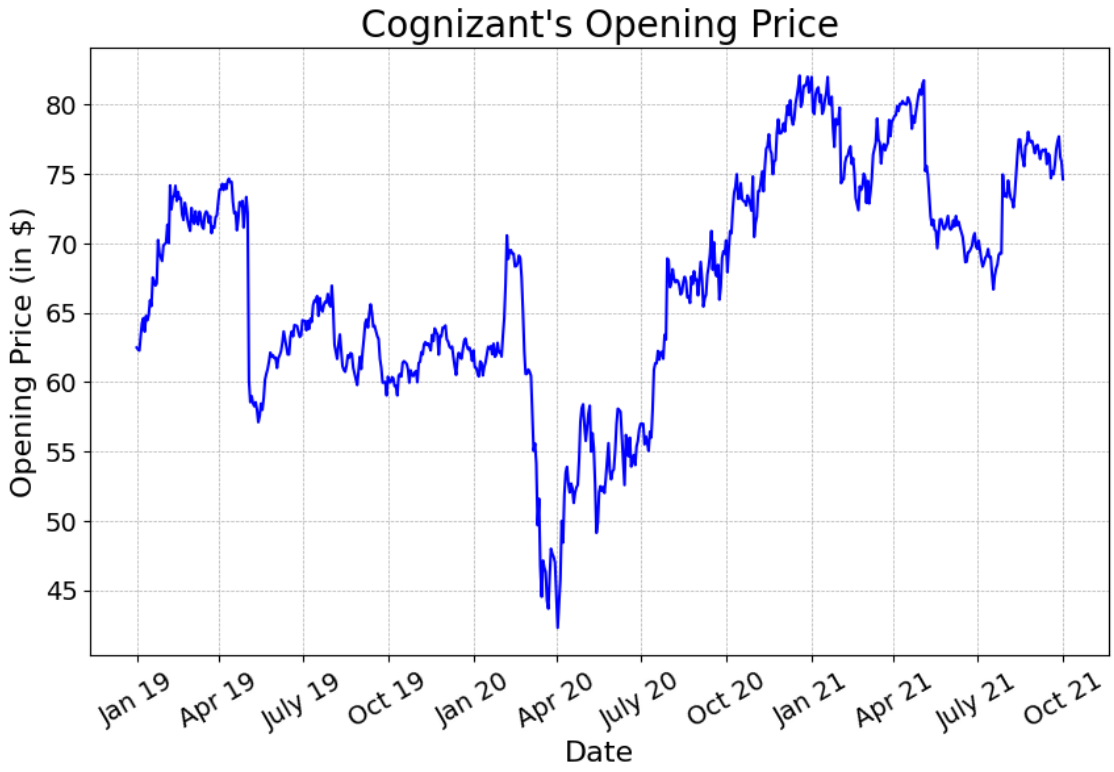
[7]:
```
def label_generator(date, method = 'quarterly'):
    '''
    Function: Generates labels for dates

    date: date in string form
    method: method of generating labels, namely, quarterly, monthly

    returns: label of date
    '''
    yy, mm, dd = int(date[2:4]), int(date[5:7]), int(date[8:])
    month = {
        1: 'Jan',
        2: 'Feb',
        3: 'Mar',
        4: 'Apr',
        5: 'May',
        6: 'June',
        7: 'July',
        8: 'Aug',
        9: 'Sep',
        10: 'Oct',
        11: 'Nov',
        12: 'Dec'
    }
    if method == 'quarterly':
        month_list = [1, 4, 7, 10]
    elif method == 'monthly':
        month_list = [i for i in range(1, 13)]
    if mm in month_list:
        return month[mm] + ' ' + str(yy)
    else:
        return None
```

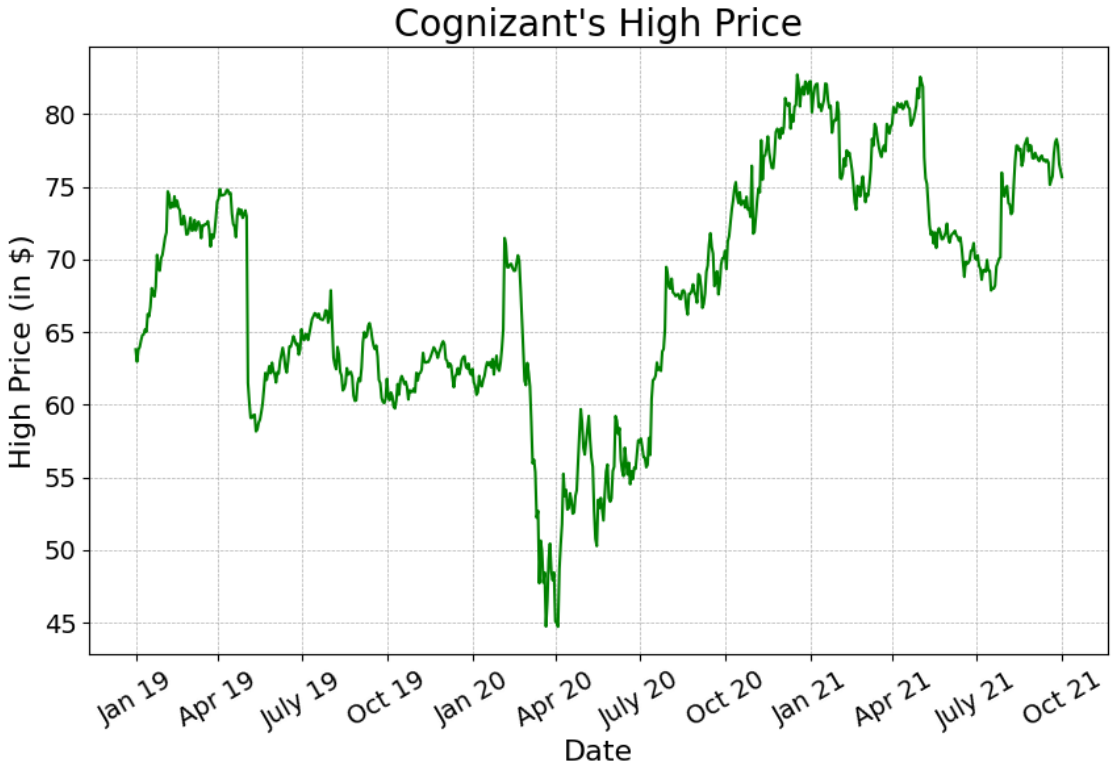
```
def date_label_generator(data, method='quarterly'):
    '''
    Function: To return indices and corresponding labels

    data: dataset
    method: method of generating labels, namely, quarterly, monthly

    returns: indices and labels of dates
    '''
    idx = []
    xlabels = []
    for i in range(data.shape[0]):
        op = label_generator(data.loc[i, 'Date'], method)
        if op and op not in xlabels:
            idx.append(i)
            xlabels.append(op)
    return [idx, xlabels]
```

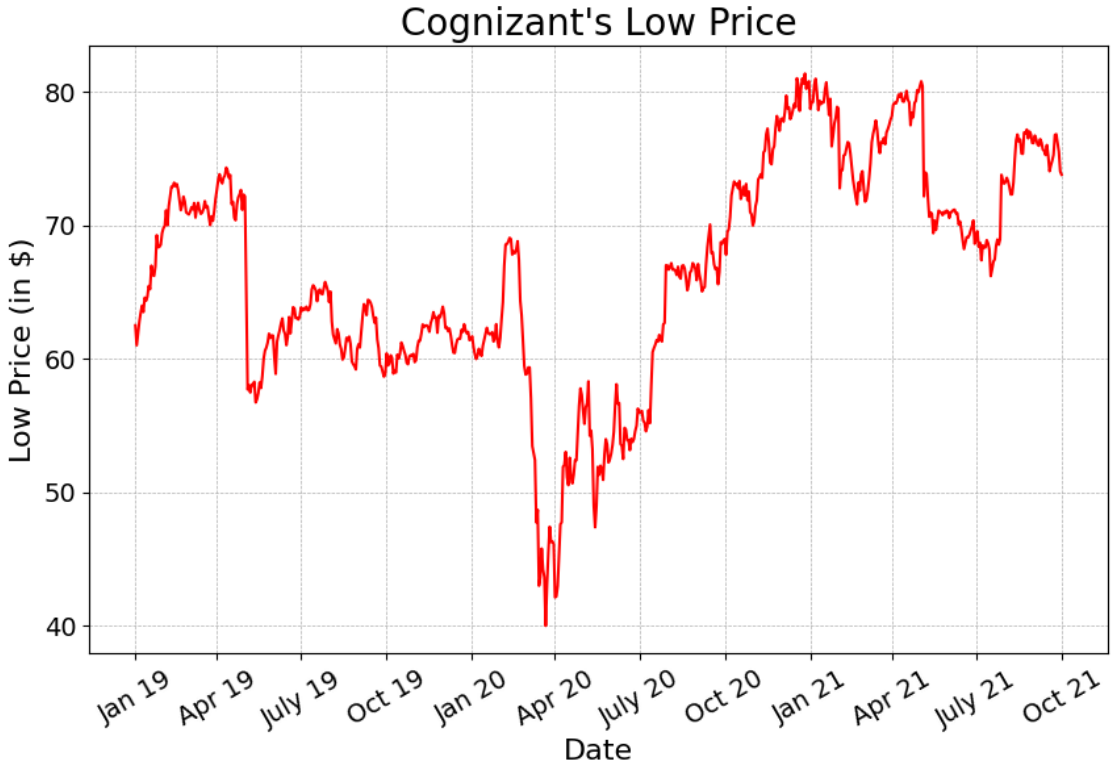
[8]:
```
def plot_shares(data, col, folder, save_fig=False):
    '''
    Function: To plot the shares for a particular column of given dataset

    data: dataset
    col: column name
    folder: folder name
    save_fig: indicator for choosing to save the plot
    '''
    plt.figure(figsize=(10,6))
    [idx, xlabels] = date_label_generator(data)
    data[col].plot(color = get_color(col))
    plt.xlabel("Date", fontsize=16)
    plt.ylabel(get_label(col) + ' ' + get_unit(folder, col), fontsize=16)
    plt.xticks(idx, xlabels, rotation=30, fontsize=14)
    plt.yticks(fontsize=14)
    title = get_title(folder) + ' ' + get_label(col)
    plt.title(title, fontsize=20)
    plt.grid(linestyle='--', linewidth=0.5)
    if save_fig:
        plt.savefig(folder + "/Original Data/" + title + ".png",␣
 ↪bbox_inches="tight", dpi=500)

def visualize_data(folder, file_ext='xlsx', save_fig=False):
    '''
    Function: To plot the shares for a particular column of given dataset

    folder: folder name
    file_ext = extension of dataset source file
```

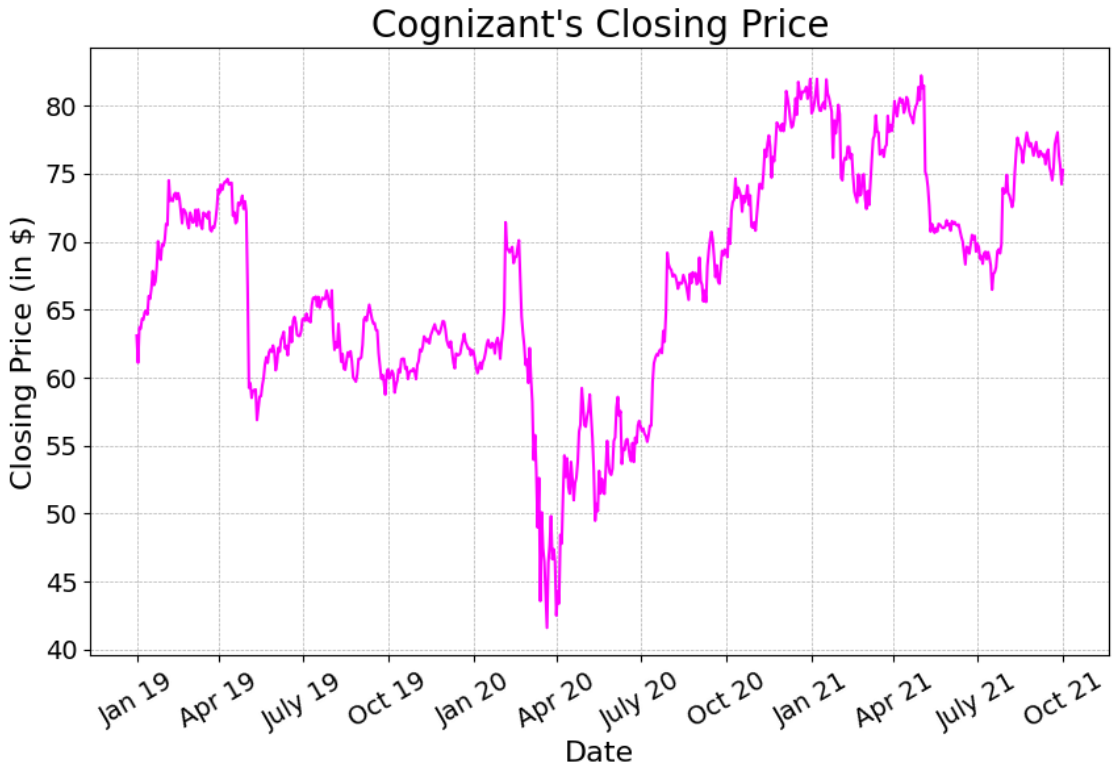
```
    save_fig: indicator for choosing to save the plot
    '''
    data = import_data(folder, file_ext)
    cols = list(data.columns)
    cols.pop(0)
    for col in cols:
        plot_shares(data, col, folder, save_fig=save_fig)
```

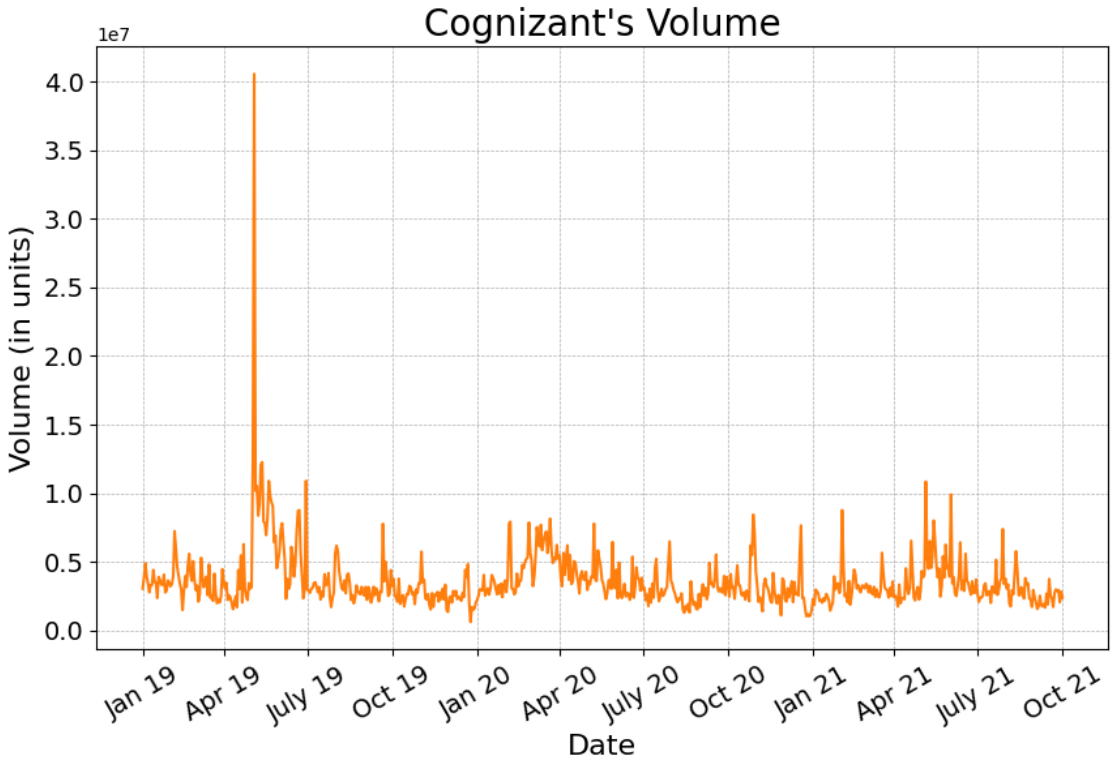
[9]:
```
visualize_data('Cognizant', save_fig=True)
```




Cognizant's High Price
High Price (in $)
80
75
70
65
60
55
50
45
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


Cognizant's Low Price
Low Price (in $)
80
70
60
50
40
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

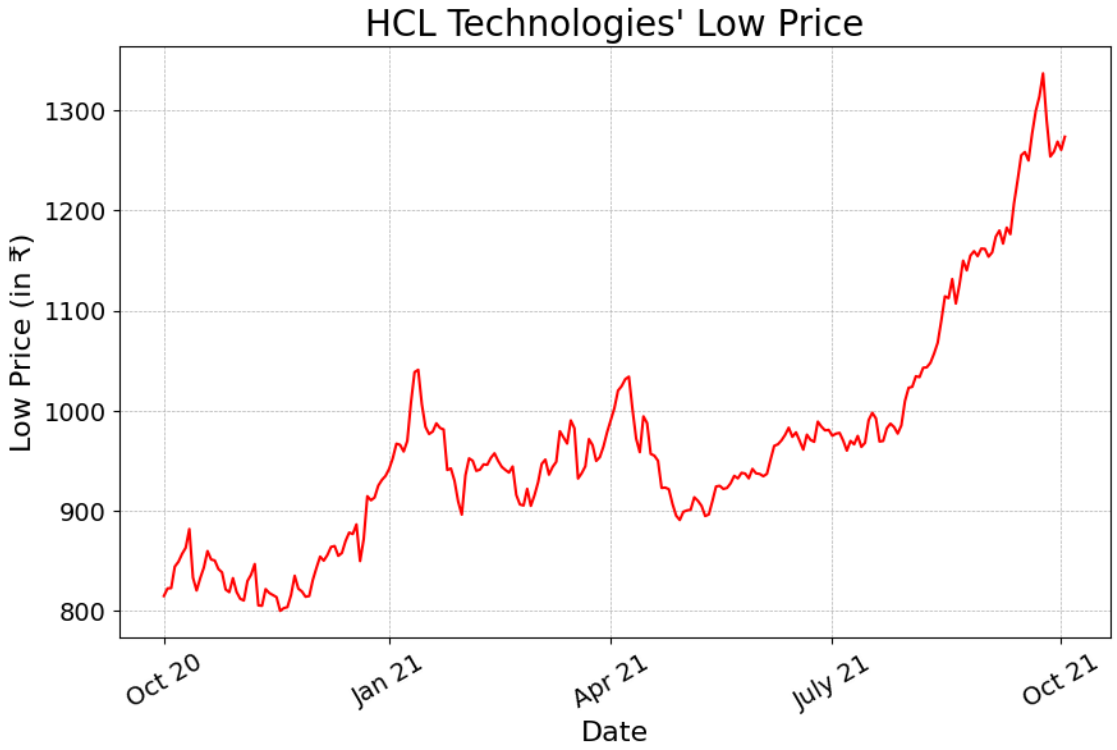

Cognizant's Closing Price
Closing Price (in $)
80
75
70
65
60
55
50
45
40
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

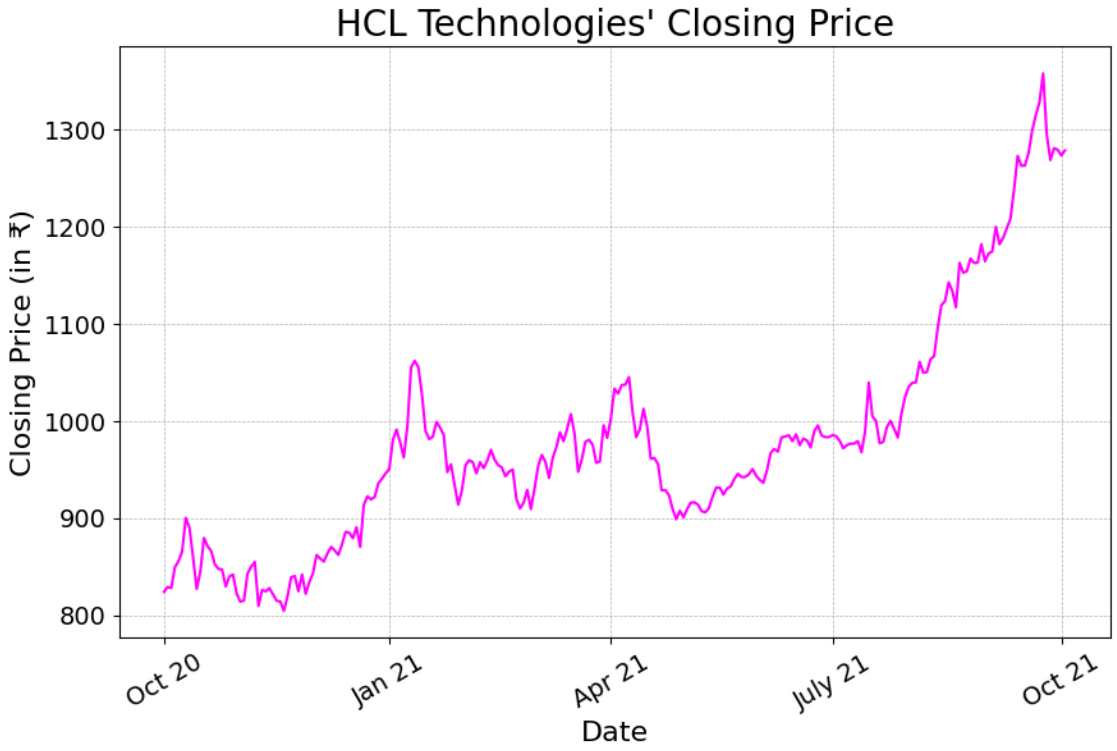


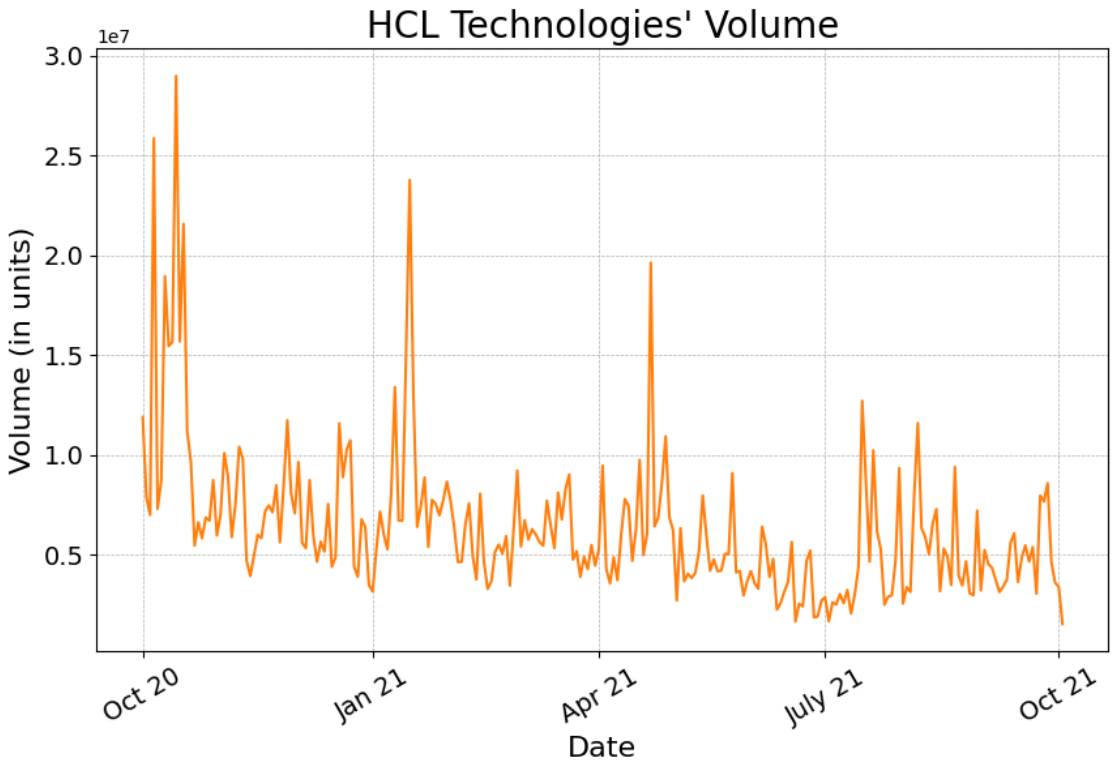
[10]:
```
visualize_data('HCL Technologies', save_fig=True)
```


HCL Technologies' Opening Price
Opening Price (in ₹)
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

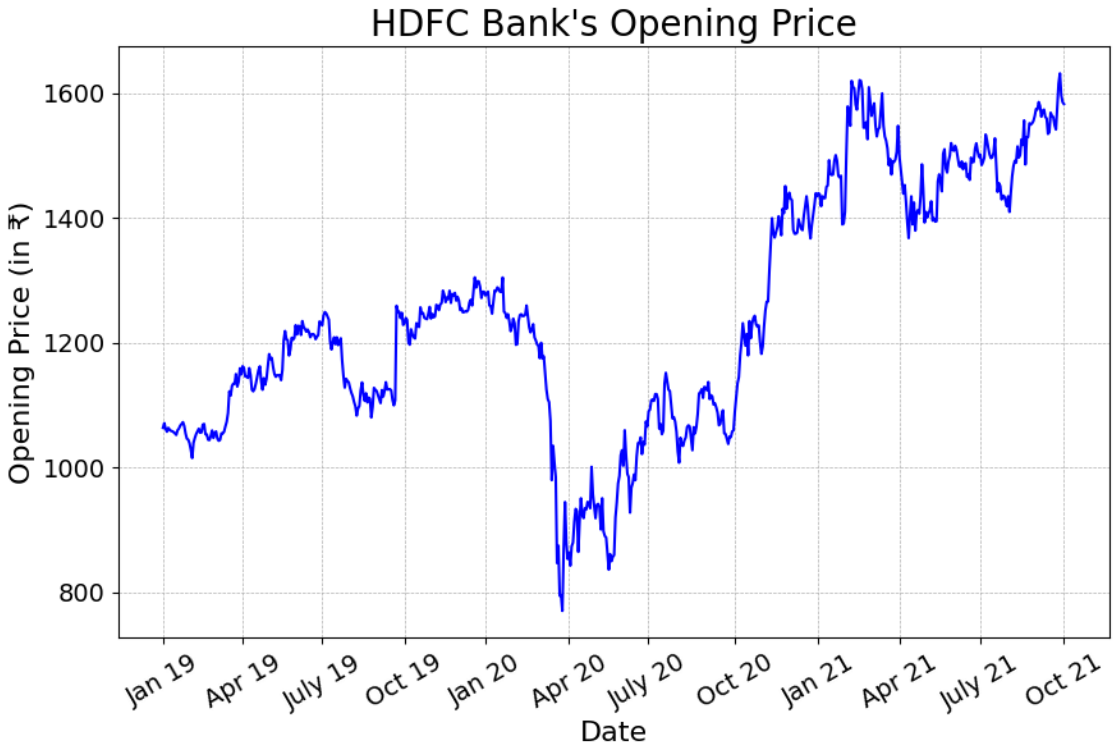

HCL Technologies' High Price
High Price (in ₹)
1400
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

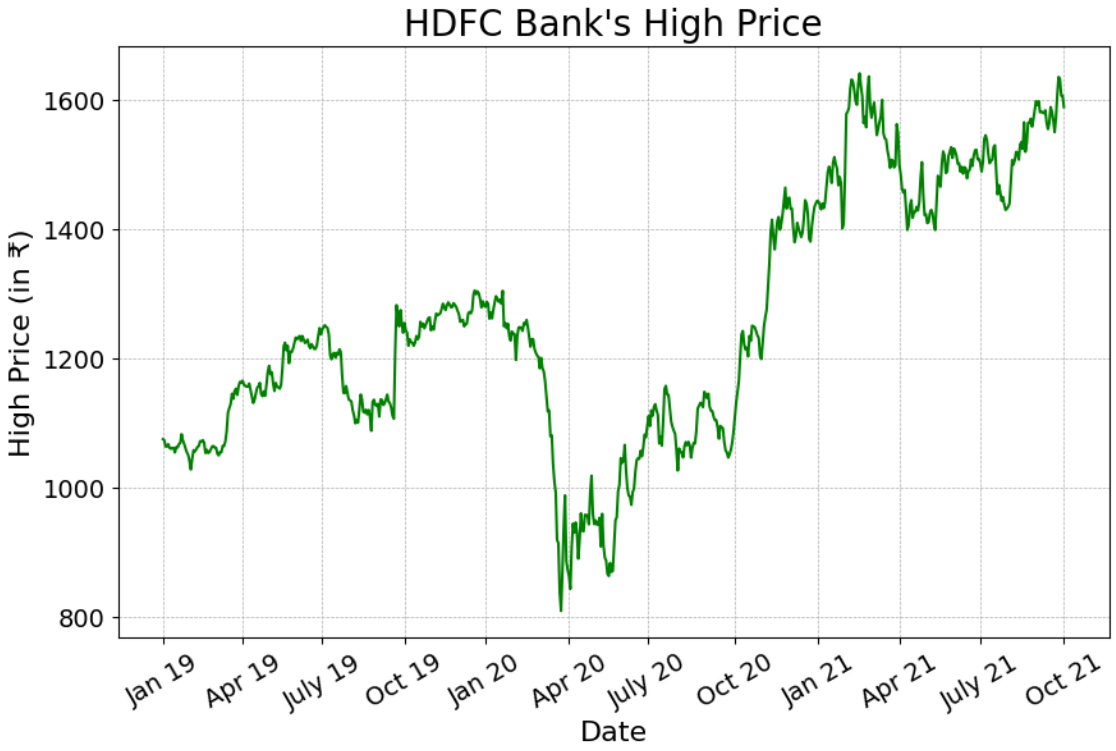

HCL Technologies' Low Price
Low Price (in ₹)
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

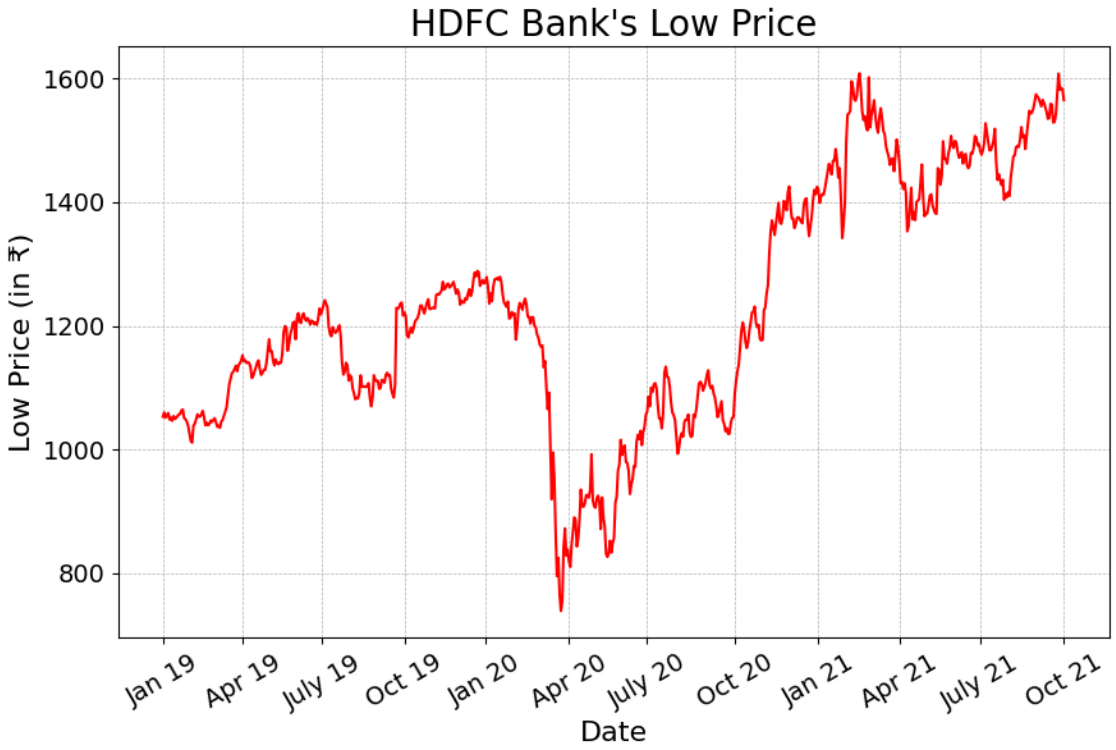

HCL Technologies' Closing Price
Closing Price (in ₹)
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

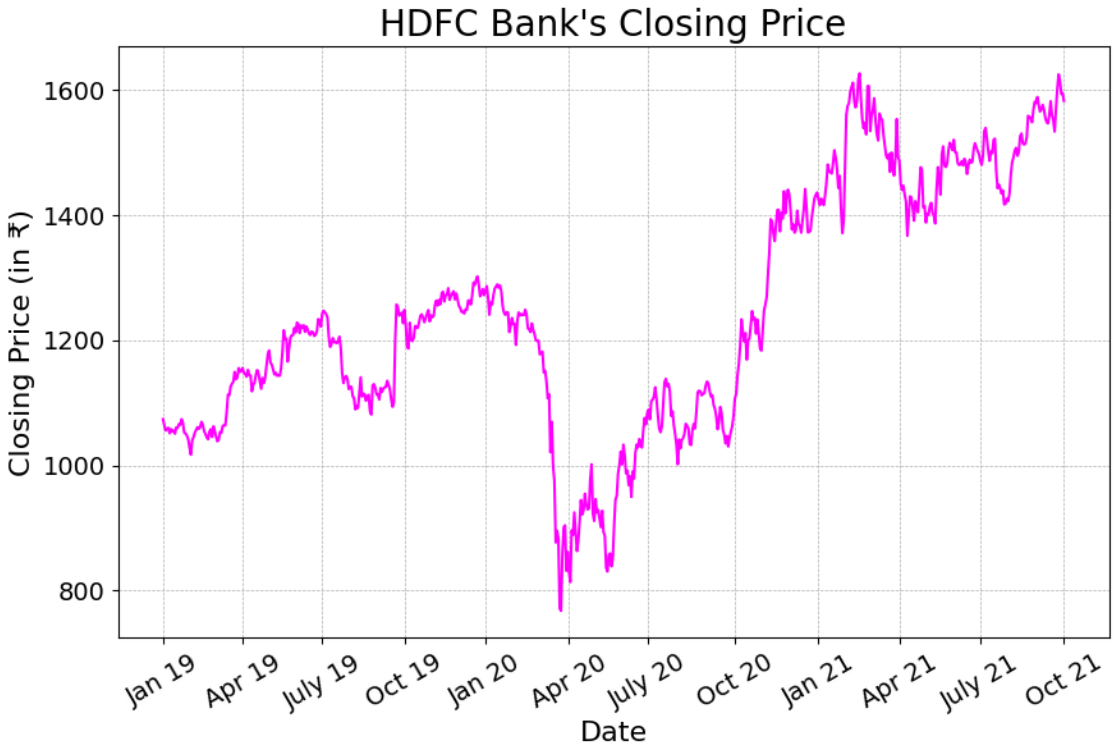


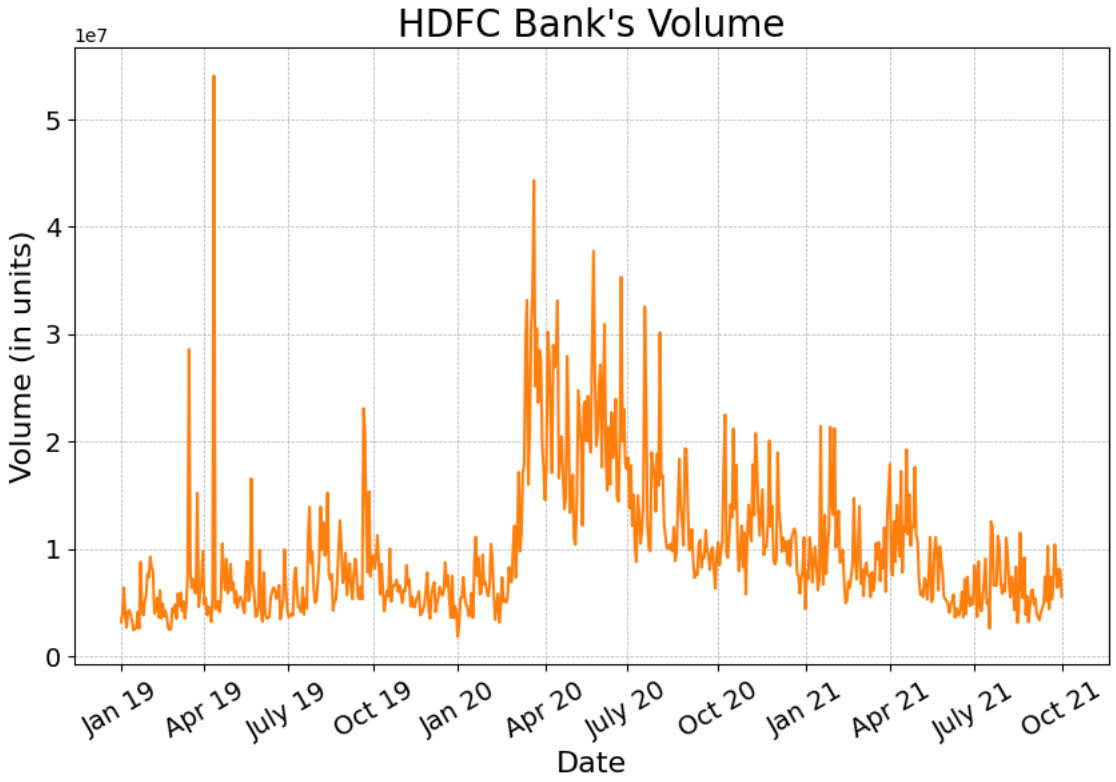
[11]:
```
visualize_data('HDFC Bank', save_fig=True)
```


HDFC Bank's Opening Price
Opening Price (in ₹)
1600
1400
1200
1000
800
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

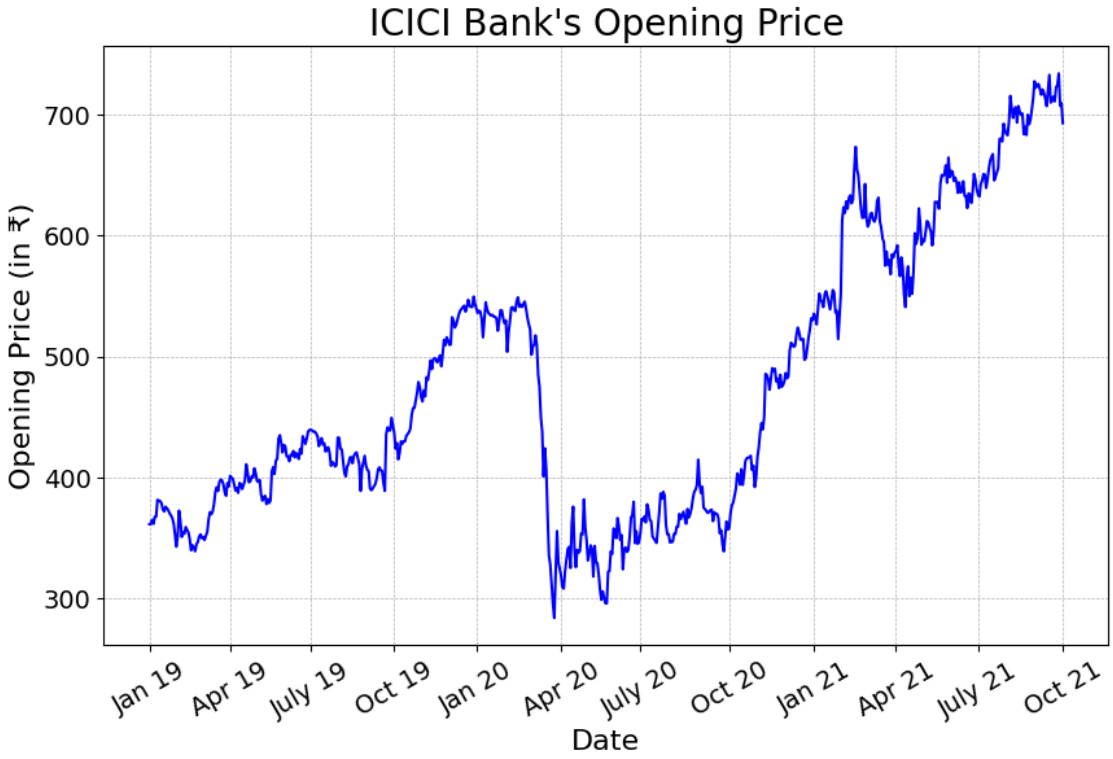

HDFC Bank's High Price
High Price (in ₹)
1600
1400
1200
1000
800
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

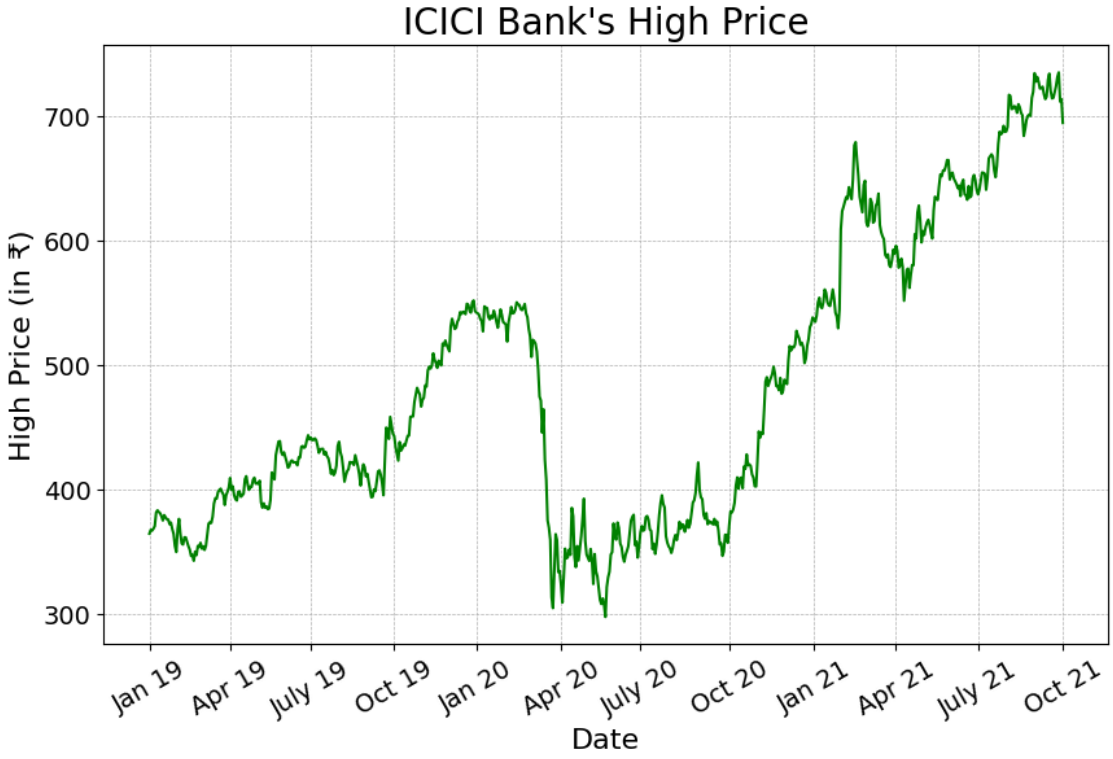

HDFC Bank's Low Price
Low Price (in ₹)
1600
1400
1200
1000
800
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

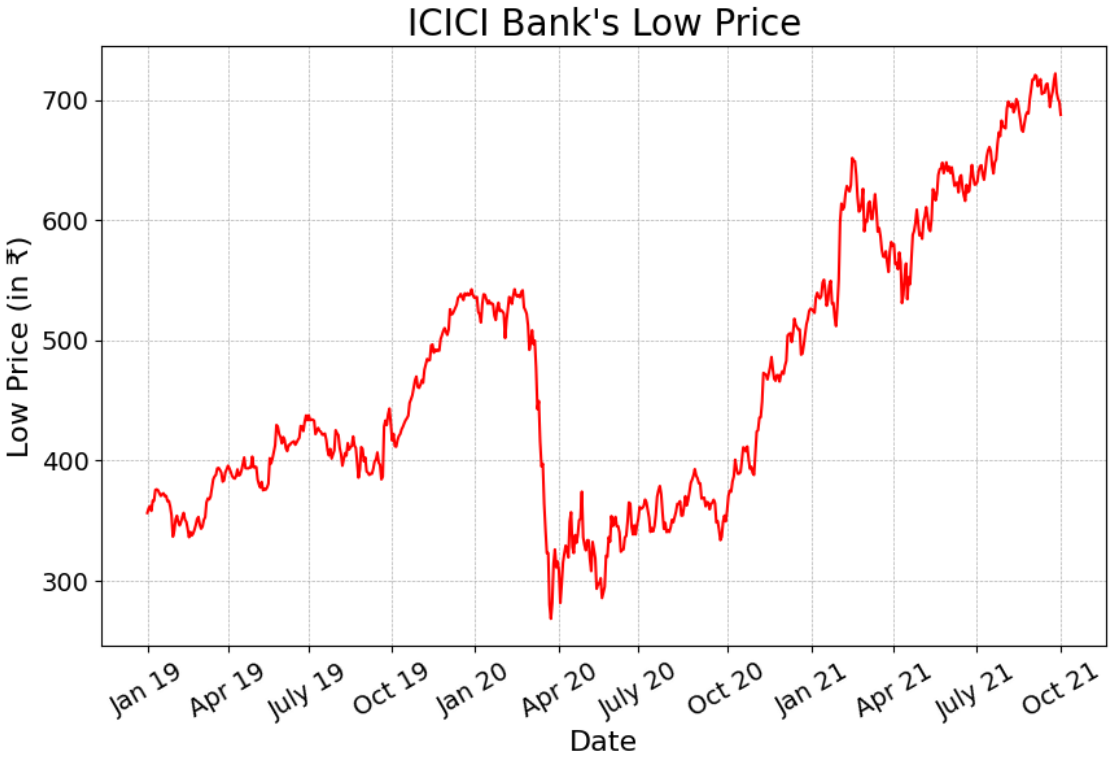

HDFC Bank's Closing Price
Closing Price (in ₹)
1600
1400
1200
1000
800
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

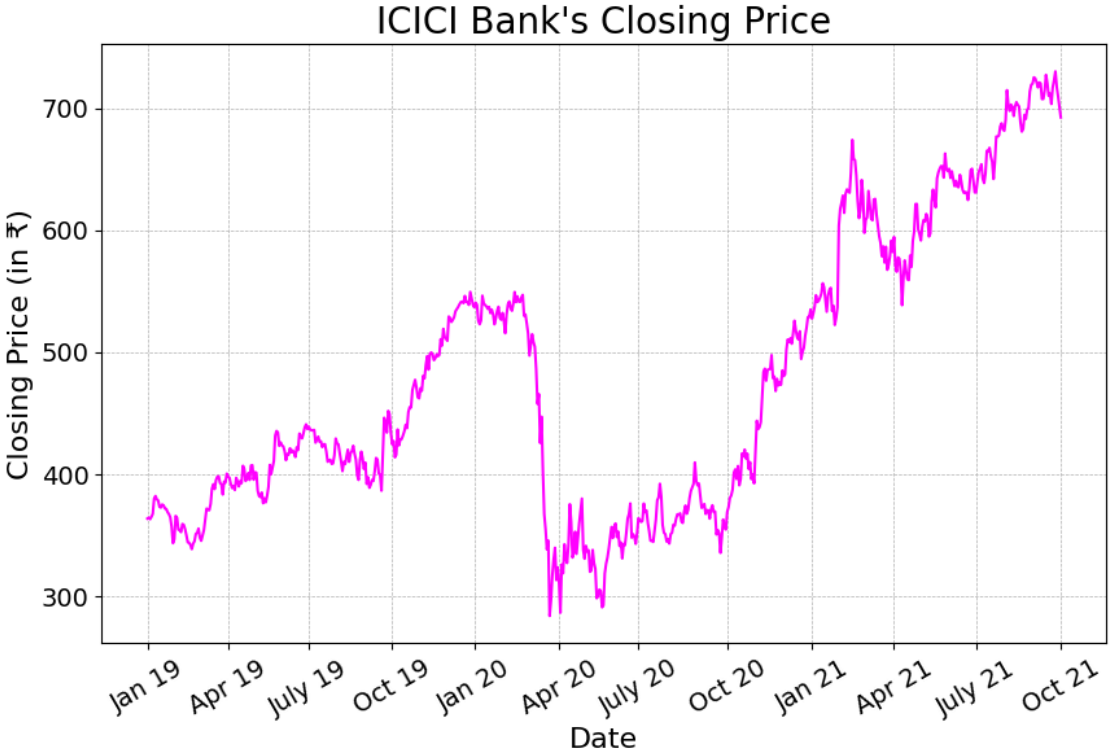


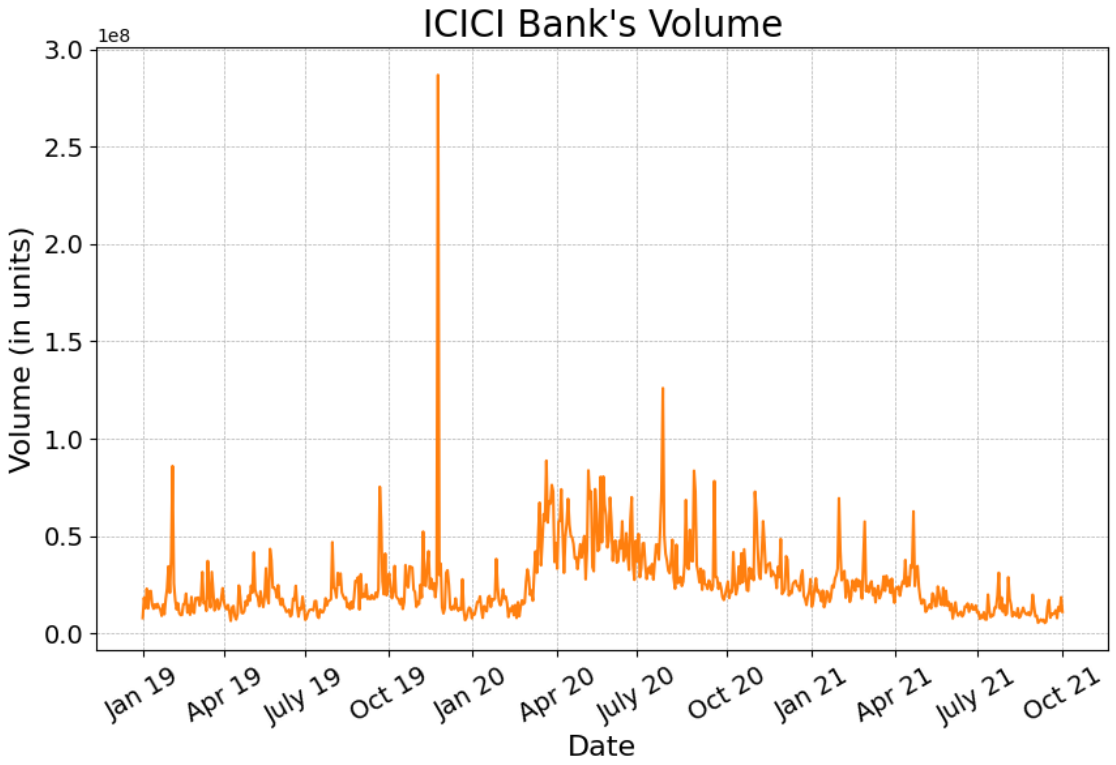
[12]:
```
visualize_data('ICICI Bank', save_fig=True)
```


ICICI Bank's Opening Price
Opening Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

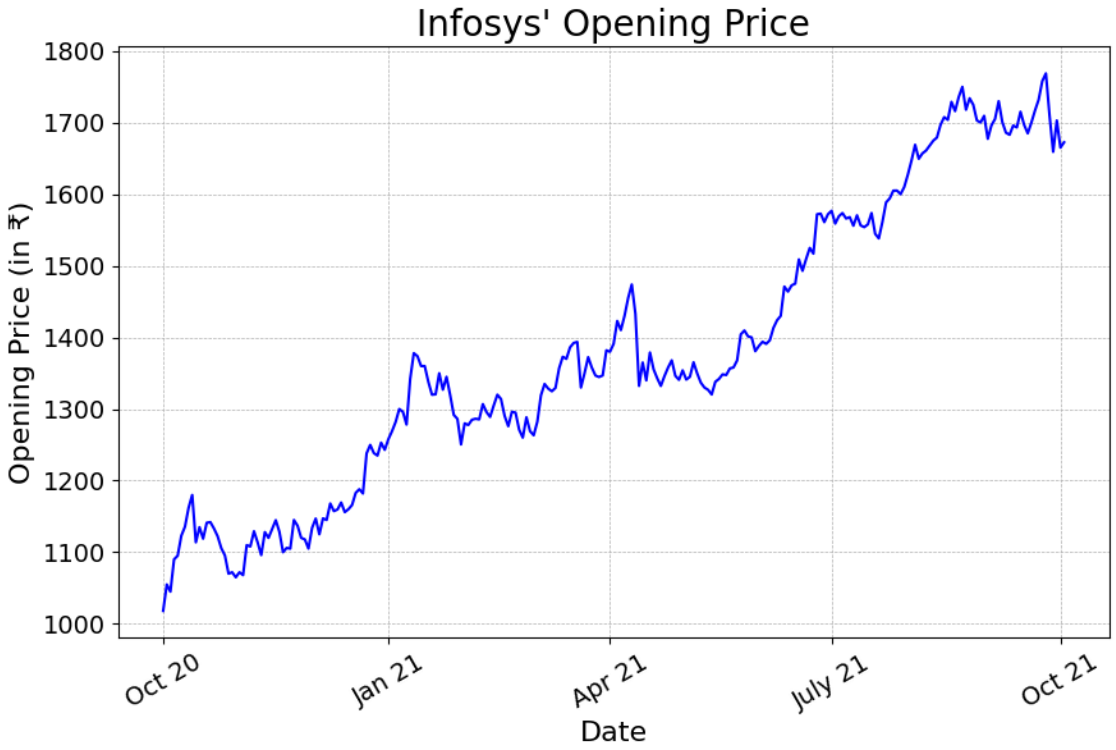

ICICI Bank's High Price
High Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

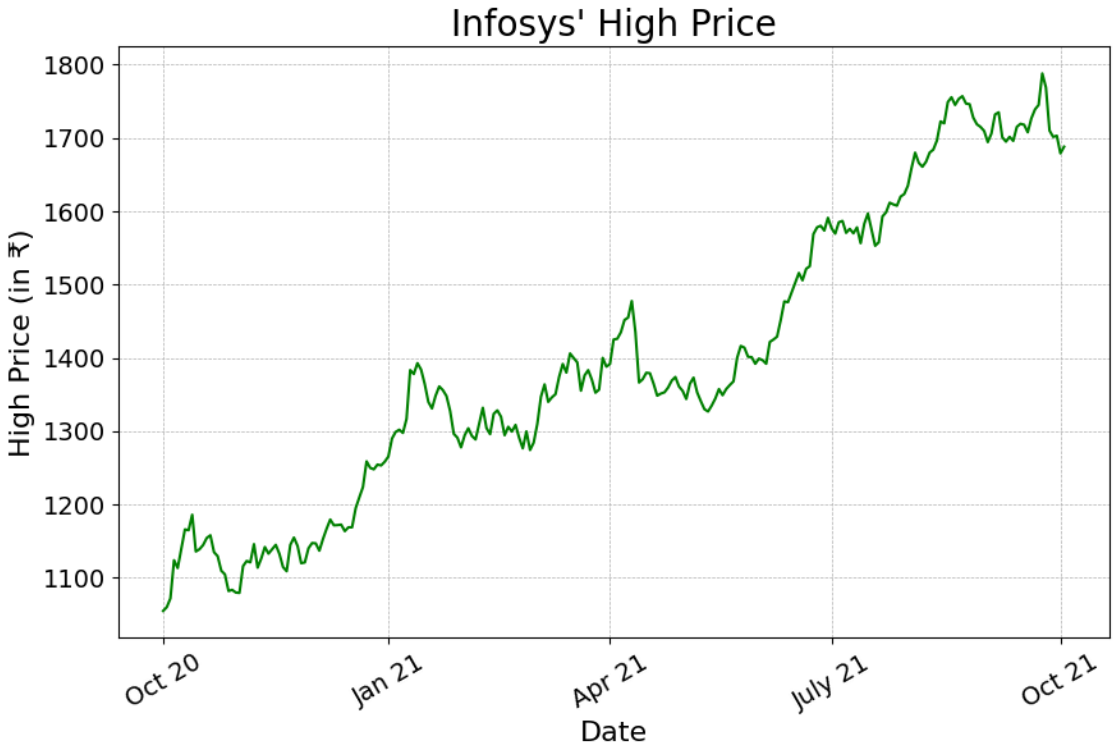

ICICI Bank's Low Price
Low Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

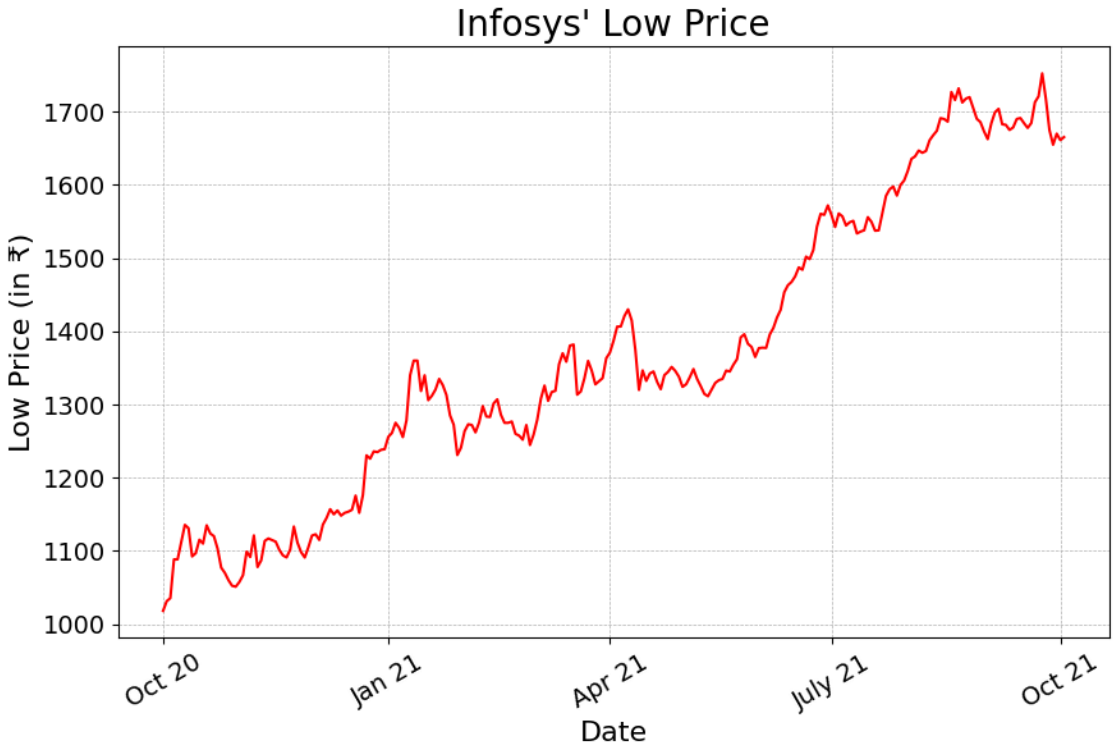

ICICI Bank's Closing Price
Closing Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

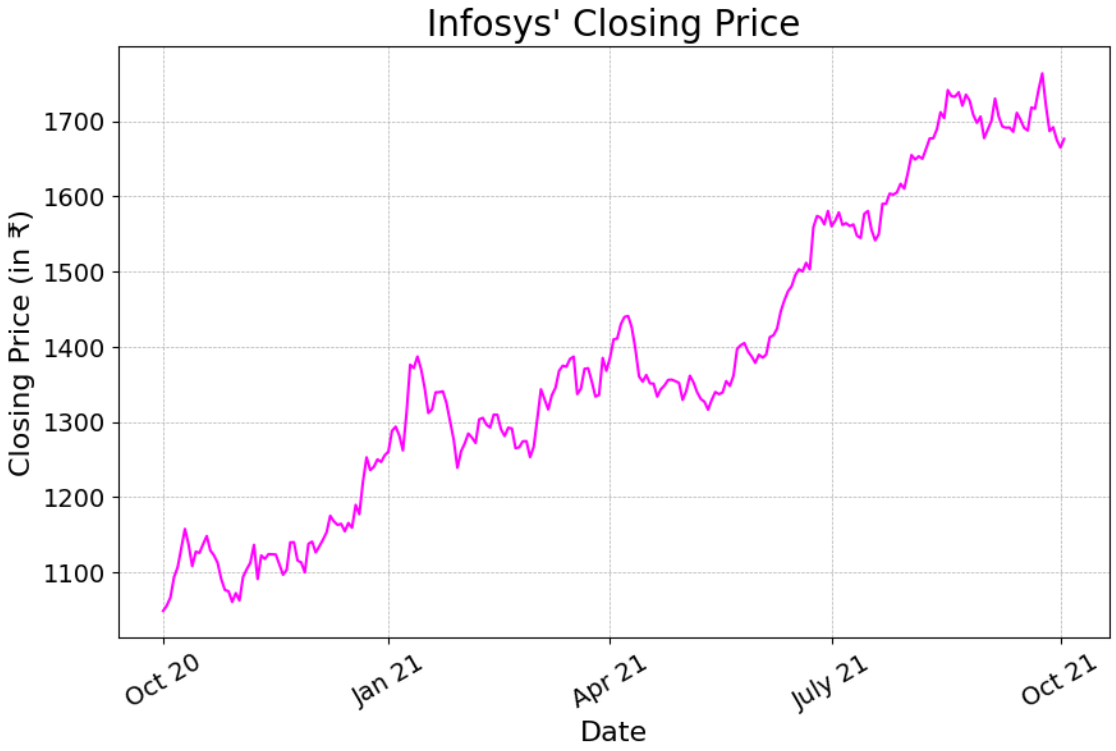


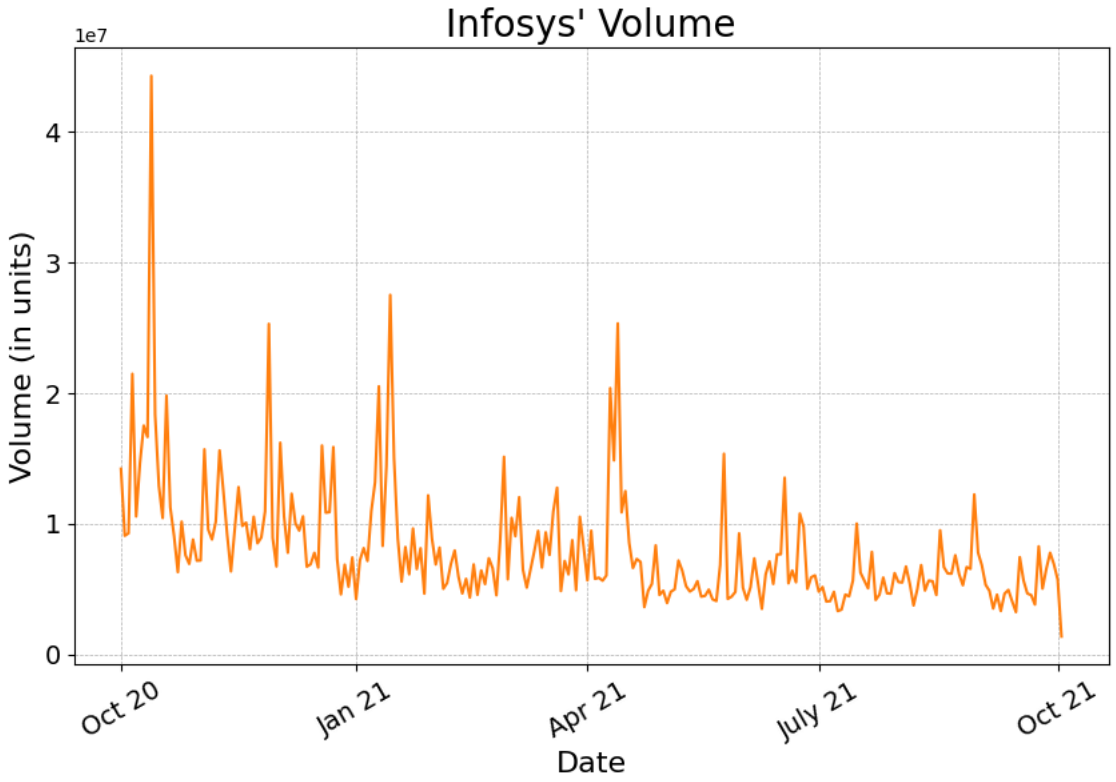
[13]:
```
visualize_data('Infosys', save_fig=True)
```


Infosys' Opening Price
Opening Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
1000
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

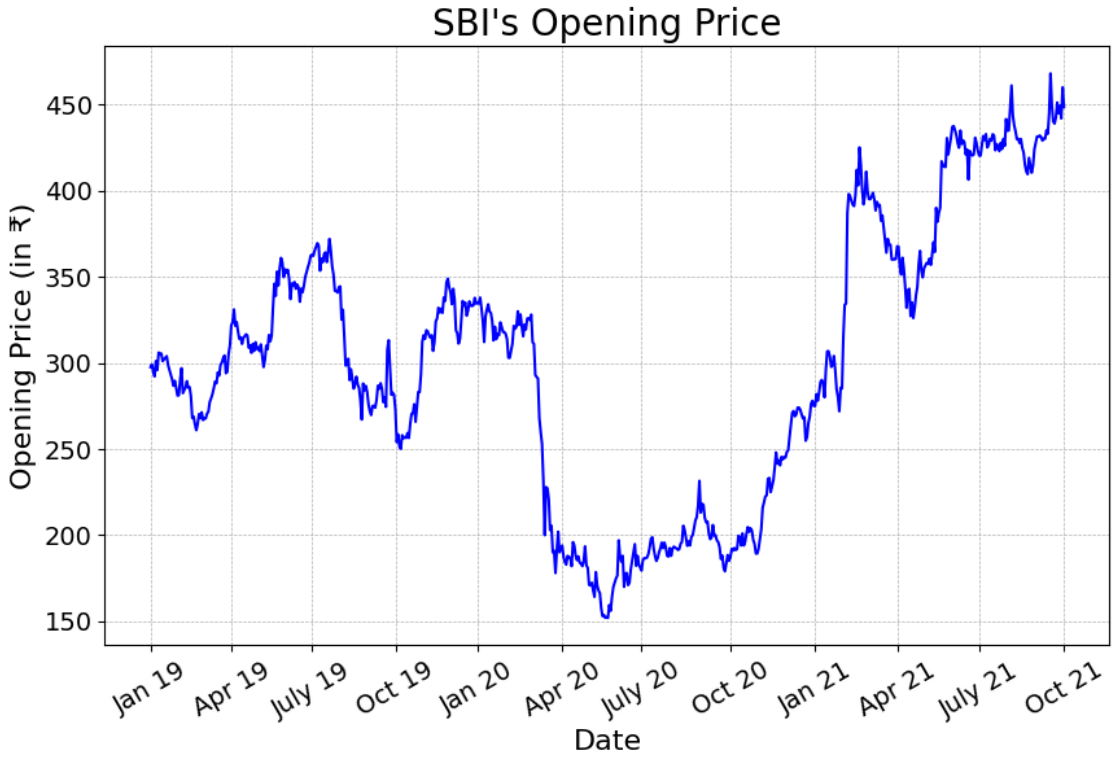

Infosys' High Price
High Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

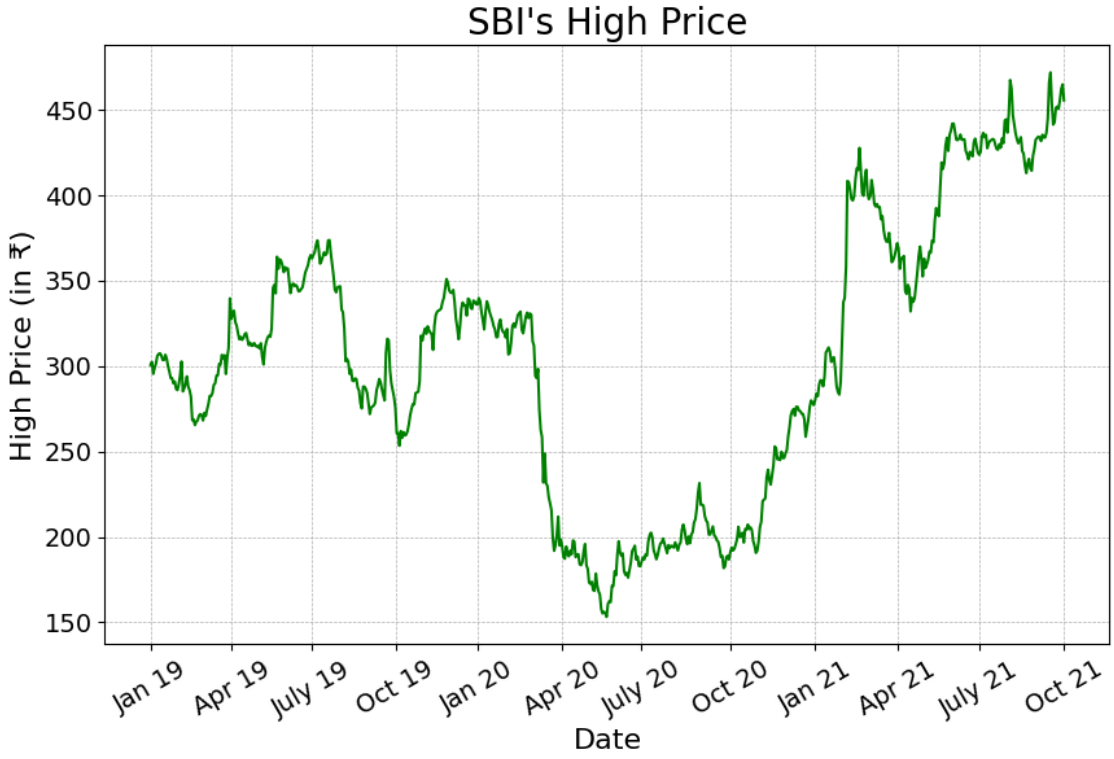

Infosys' Low Price
Low Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
1000
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

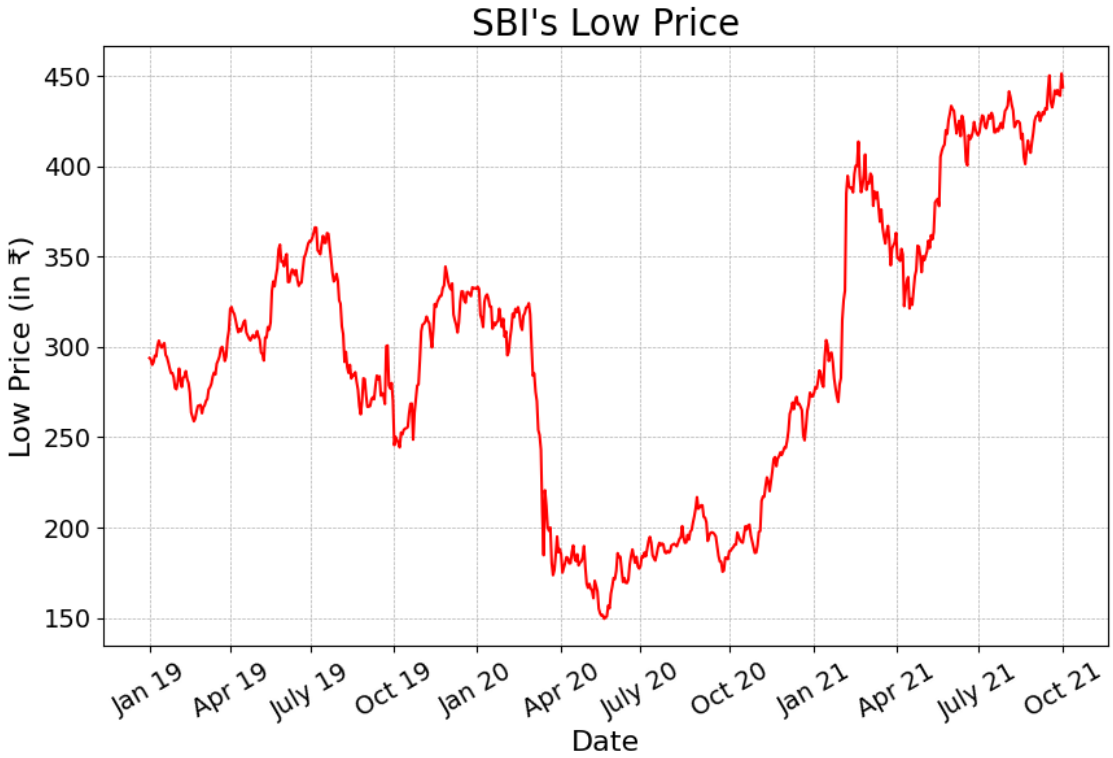

Infosys' Closing Price
Closing Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

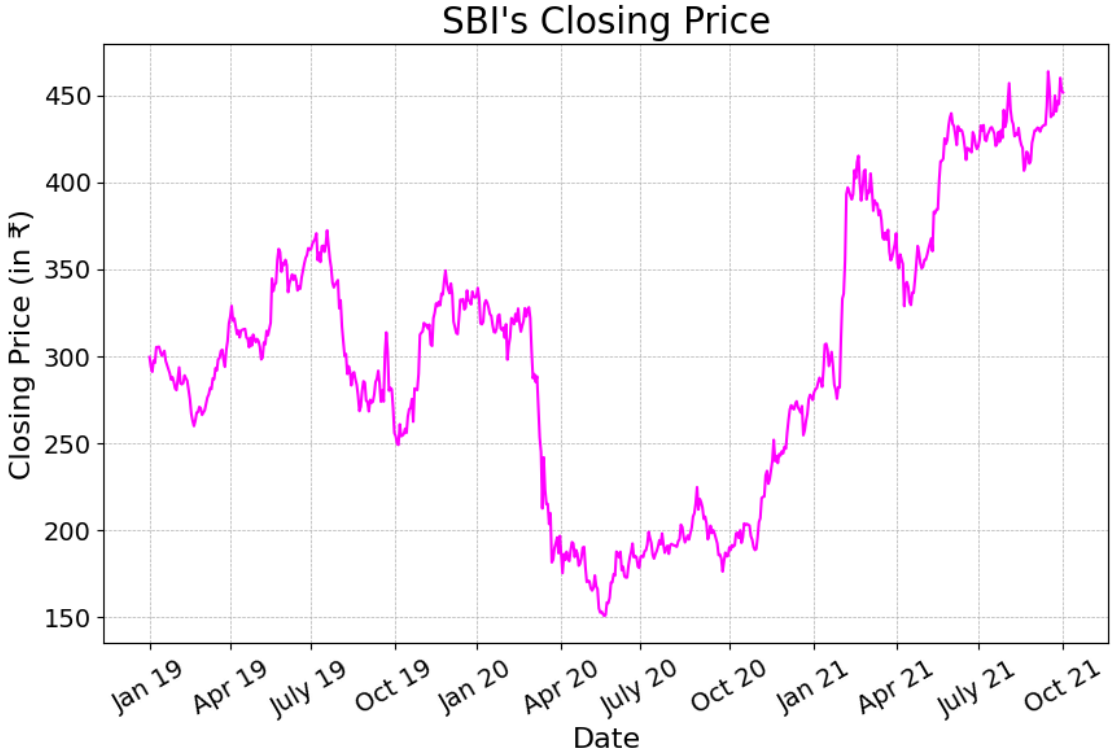


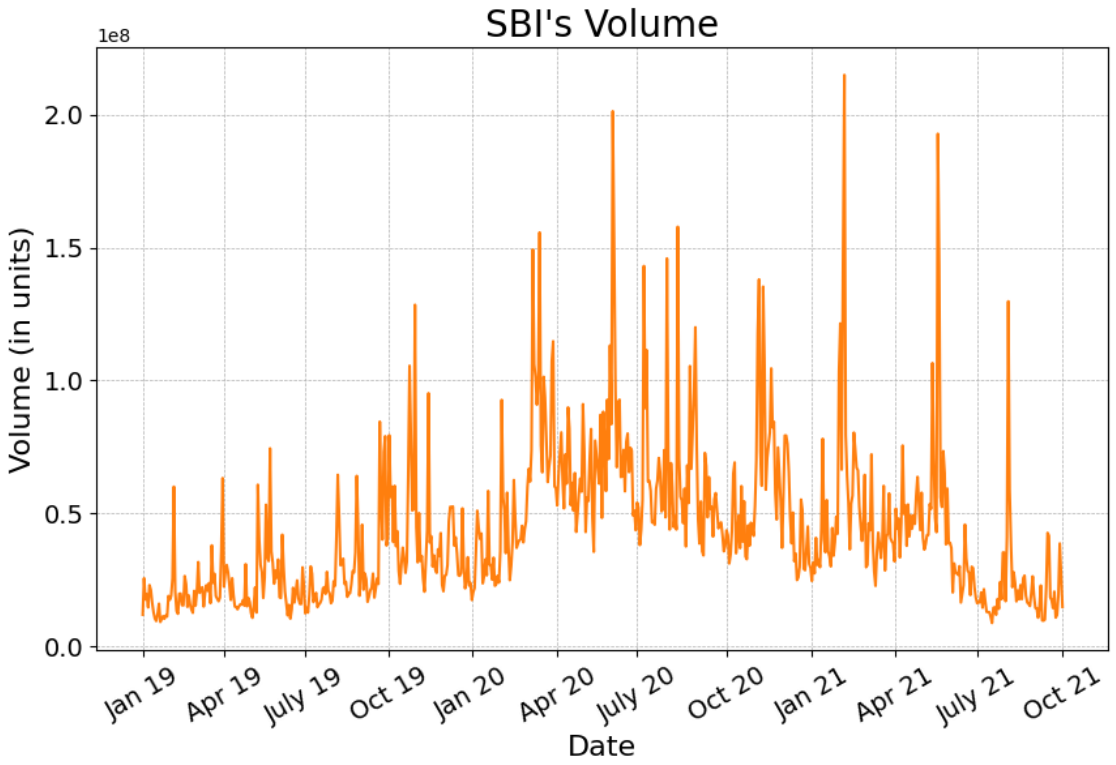
[14]:
```
visualize_data('SBI', save_fig=True)
```


SBI's Opening Price
Opening Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

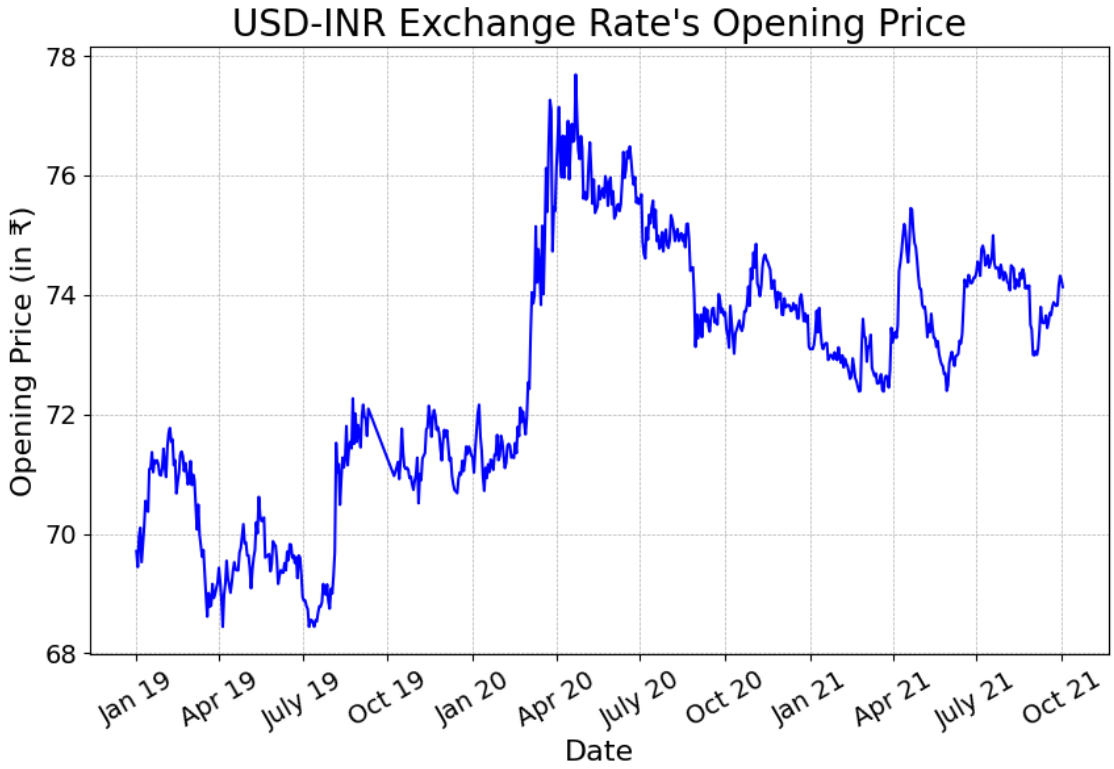

SBI's High Price
High Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

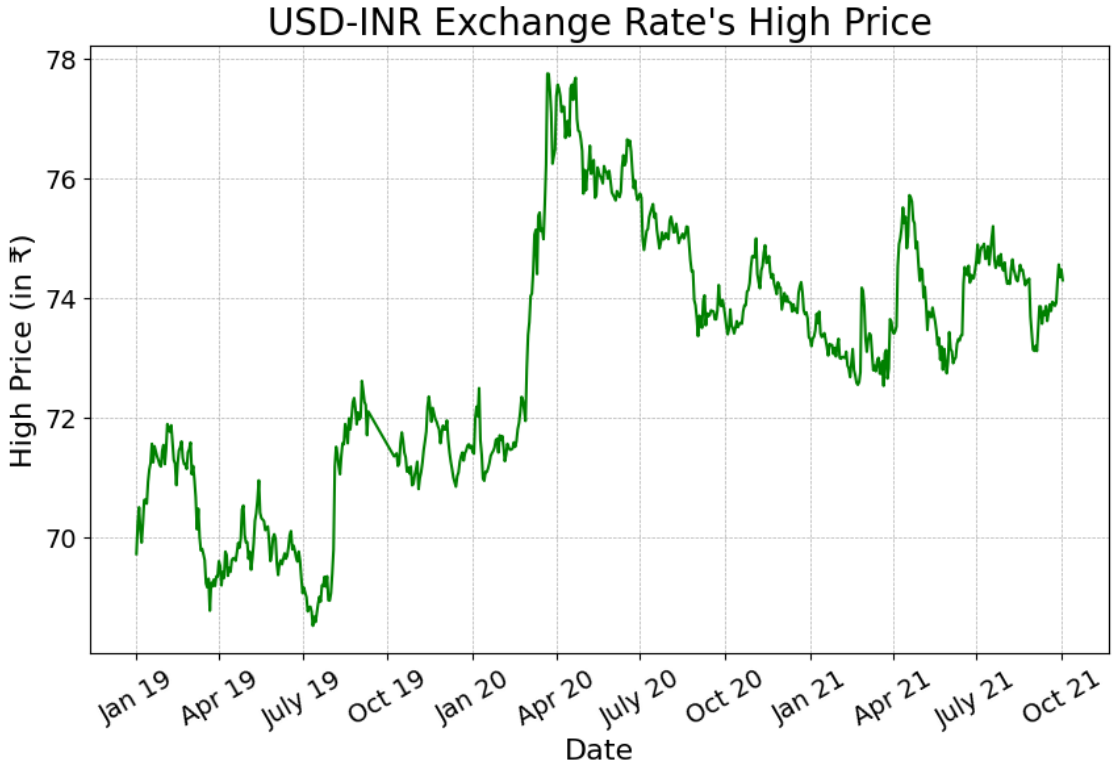

SBI's Low Price
Low Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

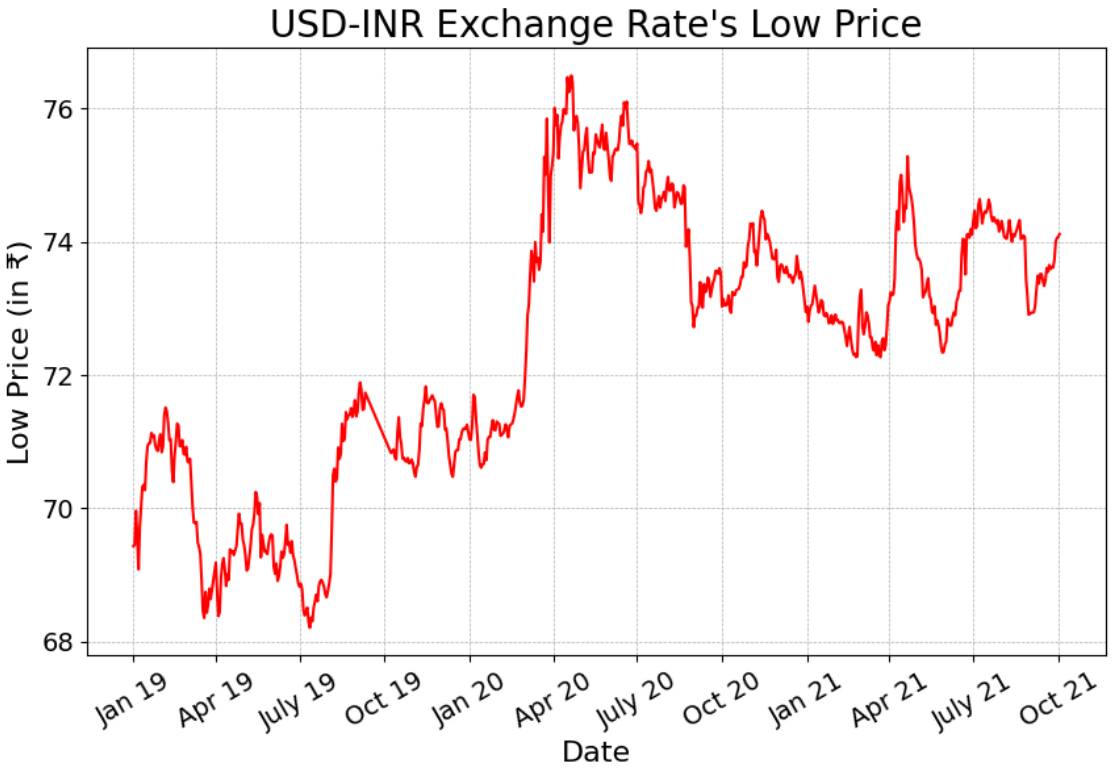

SBI's Closing Price
Closing Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

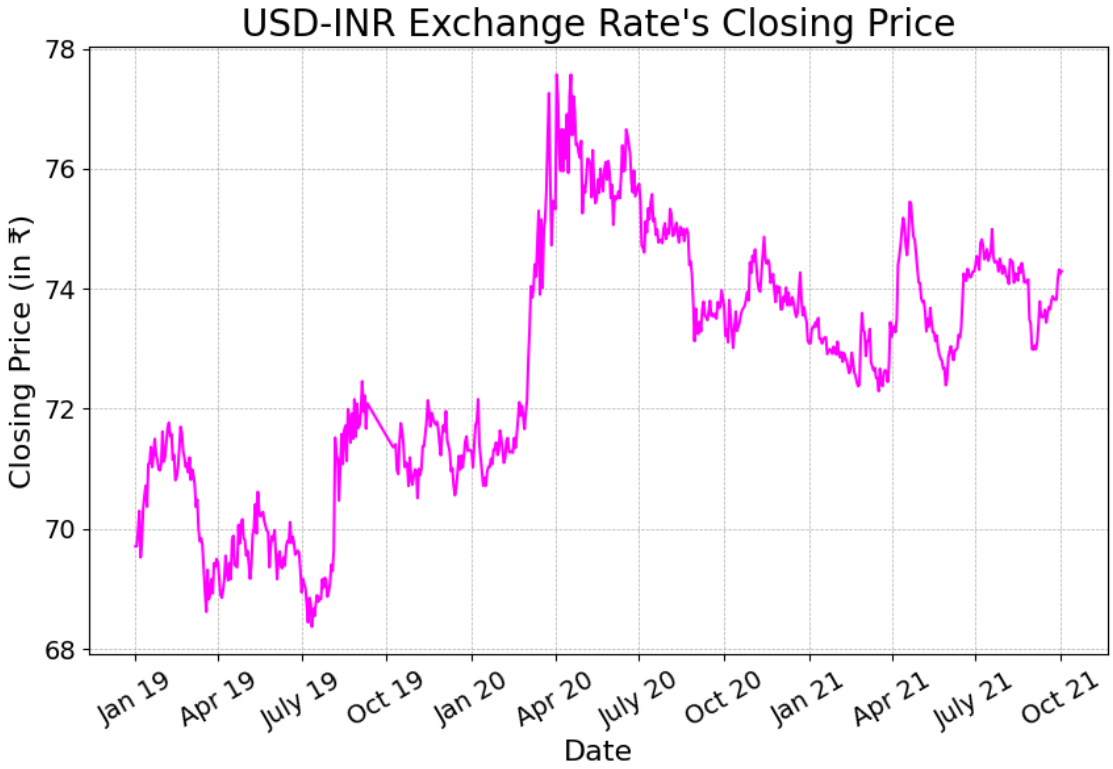


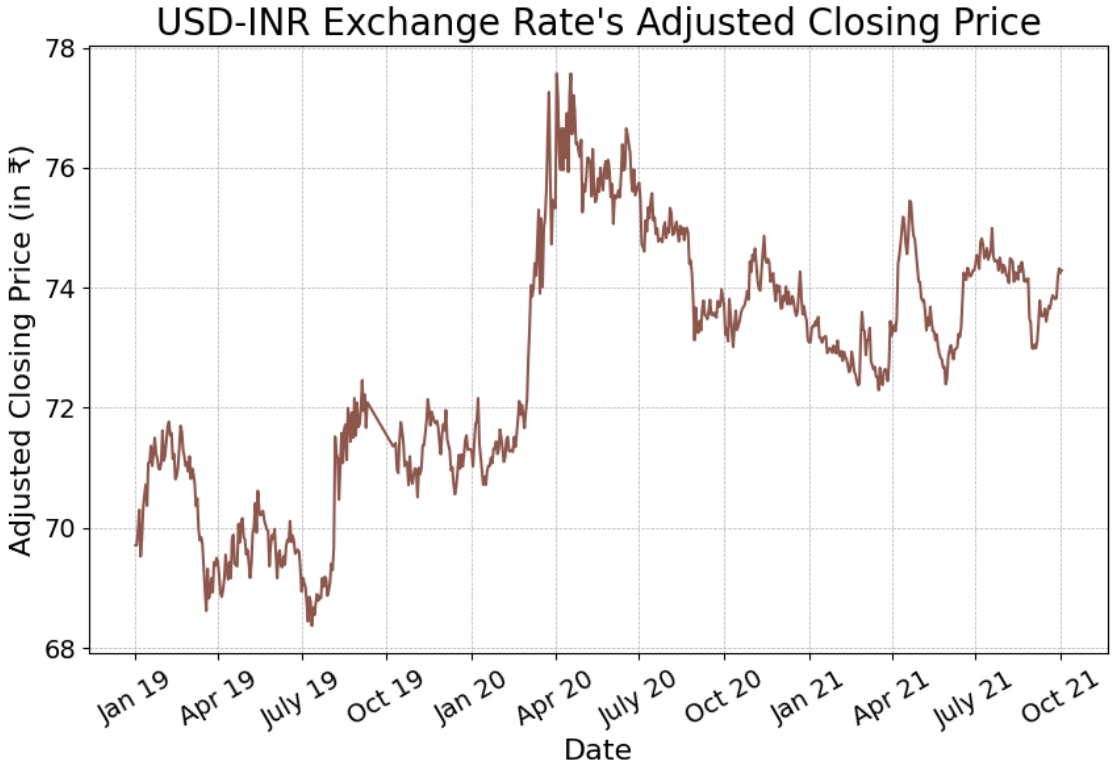
[15]:
```
visualize_data('USD-INR Exchange Rate', save_fig=True)
```


USD-INR Exchange Rate's Opening Price
Opening Price (in ₹)
78
76
74
72
70
68
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's High Price
High Price (in ₹)
78
76
74
72
70
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Low Price
Low Price (in ₹)
76
74
72
70
68
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Closing Price
Closing Price (in ₹)
78
76
74
72
70
68
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Adjusted Closing Price
Adjusted Closing Price (in ₹)
78
76
74
72
70
68
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

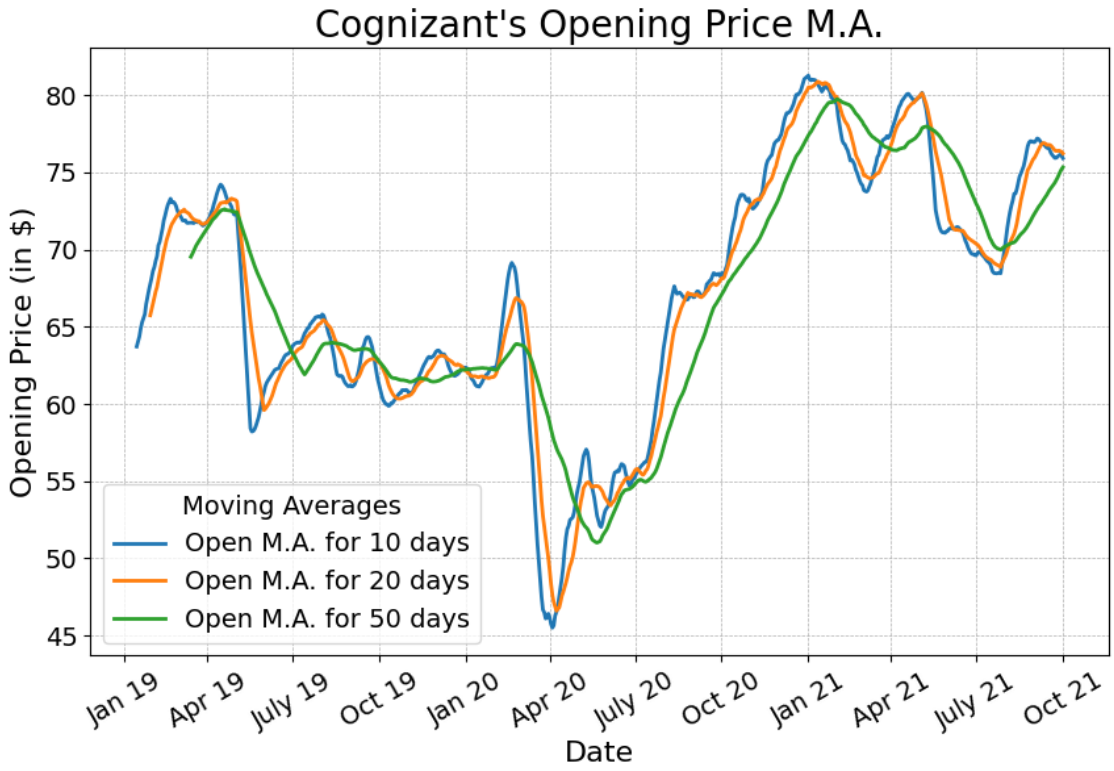
3 Moving Averages

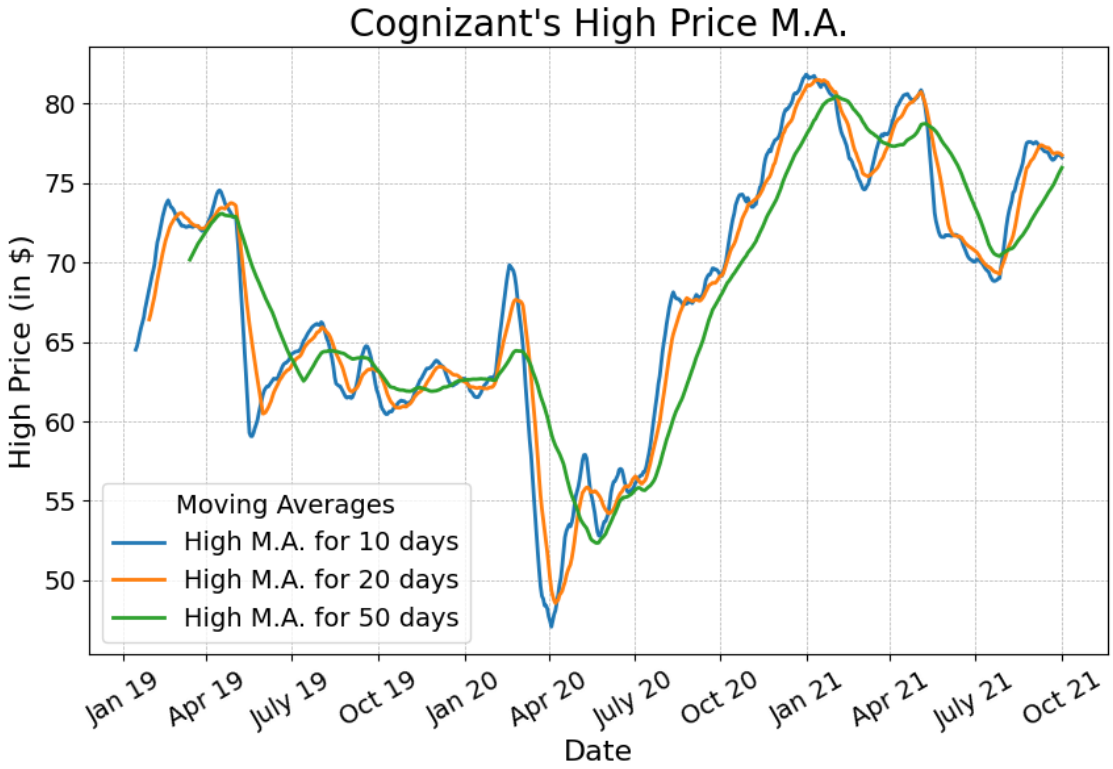
[16]:
```
def generate_moving_averages(dataset, save_fig=False):
    '''
    Function: To find and plot moving averages of given dataset

    dataset: dataset name
    save_fig: indicator for choosing to save the plot
    '''
    moving_average_periods = [10, 20, 50]
    data = import_data(dataset, 'xlsx')
    cols = list(data.columns)
    cols.pop(0)
    folders_new = get_path('xlsx', ' With MA')
    path = folders_new[dataset]
    for col in cols:
        for ma in moving_average_periods:
            data[f"{col} M.A. for {ma} days"] = data[col].rolling(ma).mean()
    save_data(data, path)
    print(f"Saved {dataset} Dataset with M.A.s at this location: {path}.\n")
    plot_moving_averages(dataset, save_fig=save_fig)

def plot_moving_averages(dataset, save_fig=False):
    '''
    Function: To plot moving averages of given dataset

    dataset: dataset name
    save_fig: indicator for choosing to save the plot
    '''
    data = import_data(dataset, 'xlsx')
    data_new = import_data(dataset, 'xlsx', update = ' With MA')
    cols = list(data.columns)
    cols.pop(0)

    for col in cols:
        data_new[[f"{col} M.A. for 10 days", f"{col} M.A. for 20 days", f"{col}␣
 ↪M.A. for 50 days"]].plot(figsize = (10, 6), linewidth=2)
        [idx, xlabels] = date_label_generator(data)
        plt.xlabel("Date", fontsize=16)
        plt.ylabel(get_label(col) + ' ' + get_unit(dataset, col), fontsize=16)
        plt.xticks(idx, xlabels, rotation=30, fontsize=14)
        plt.yticks(fontsize=14)
        title = get_title(dataset) + ' ' + get_label(col) + " M.A."
        plt.title(title, fontsize=20)
```

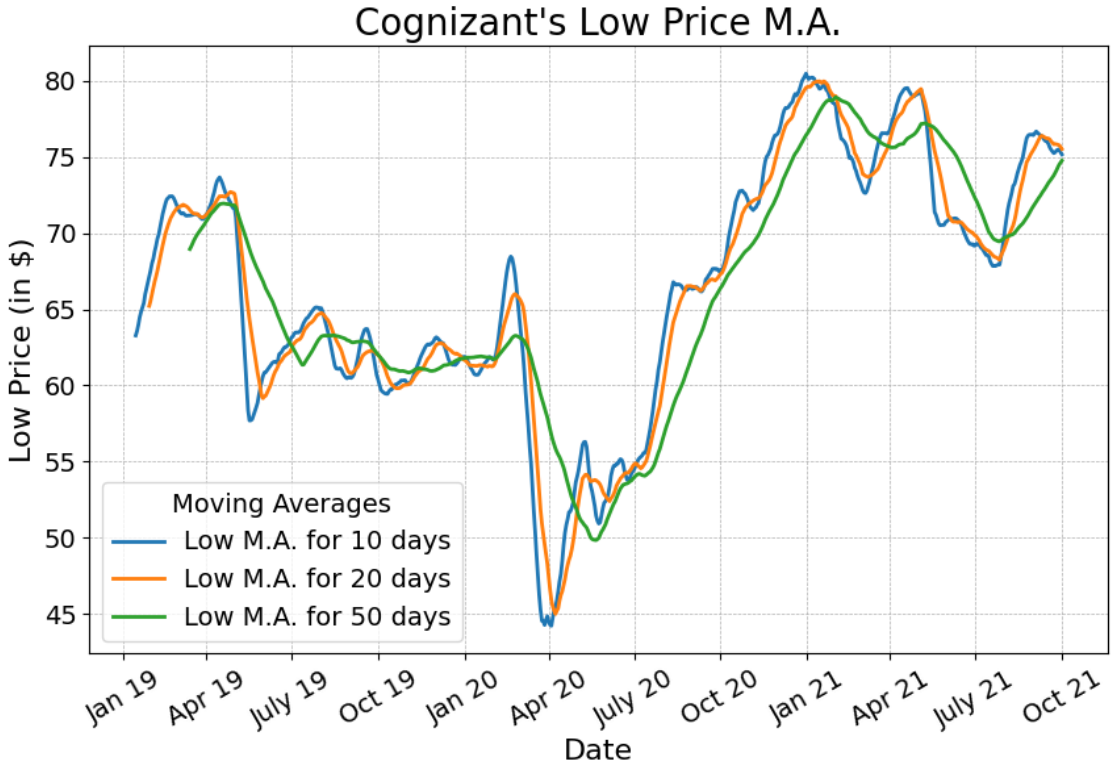
```
        plt.grid(linestyle='--', linewidth=0.5)
        plt.legend(title = "Moving Averages", loc='best', prop = {"size": 14},␣
↪title_fontproperties = {"size": 14})
        if save_fig:
            plt.savefig(dataset + "/Moving Averages/" + title + ".png",␣
↪bbox_inches="tight", dpi=500)
```

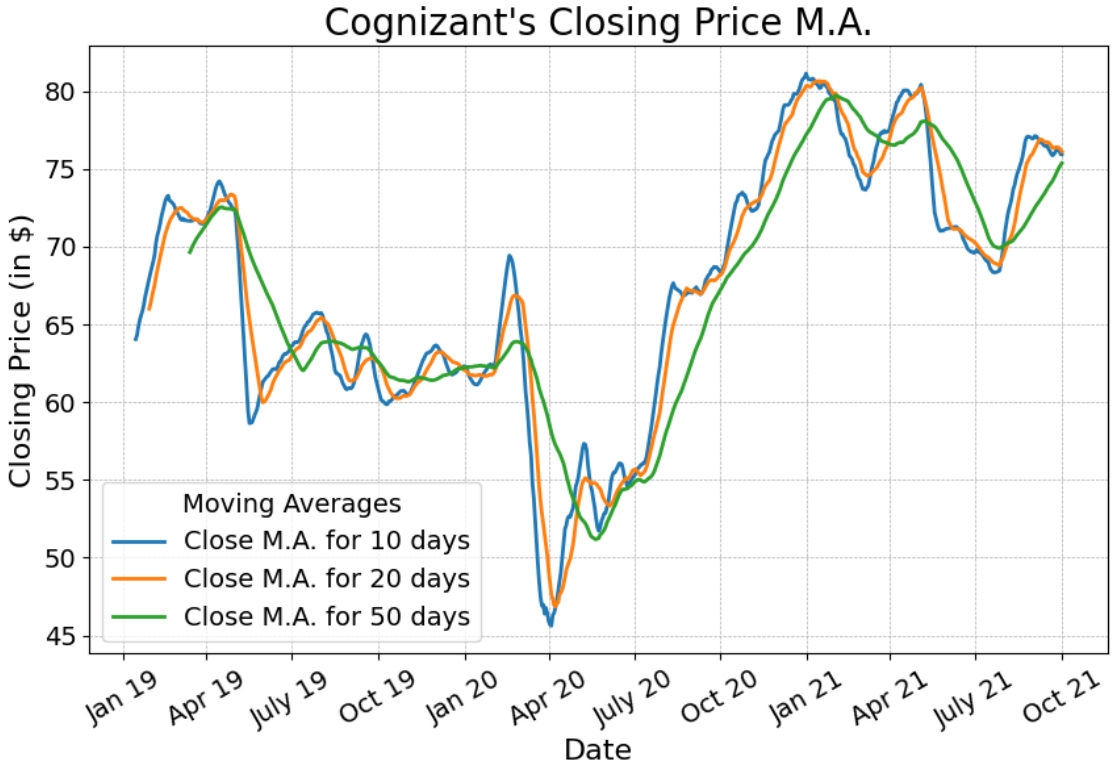
[17]:
```
generate_moving_averages('Cognizant', save_fig=True)
```

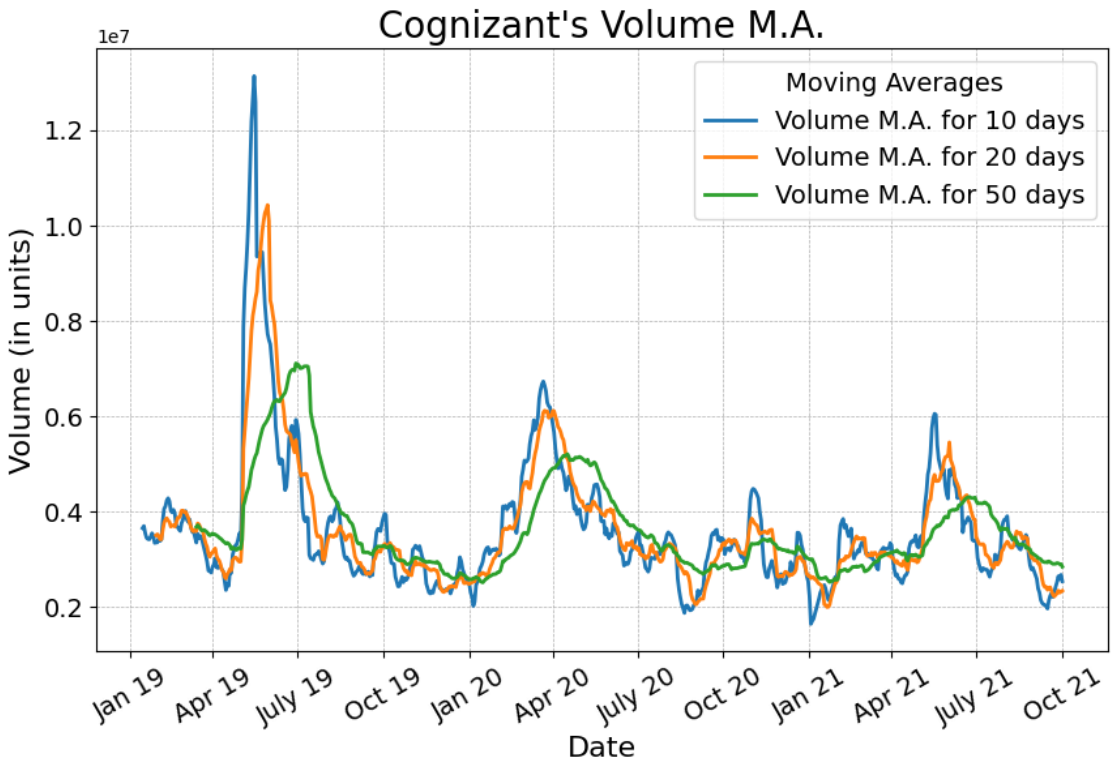
```
Saved Cognizant Dataset with M.A.s at this location: Datasets/Cognizant Share
Prices 2019_2021 With MA.xlsx.
```




Cognizant's High Price M.A.
High Price (in $)
80
75
70
65
60
55
50
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

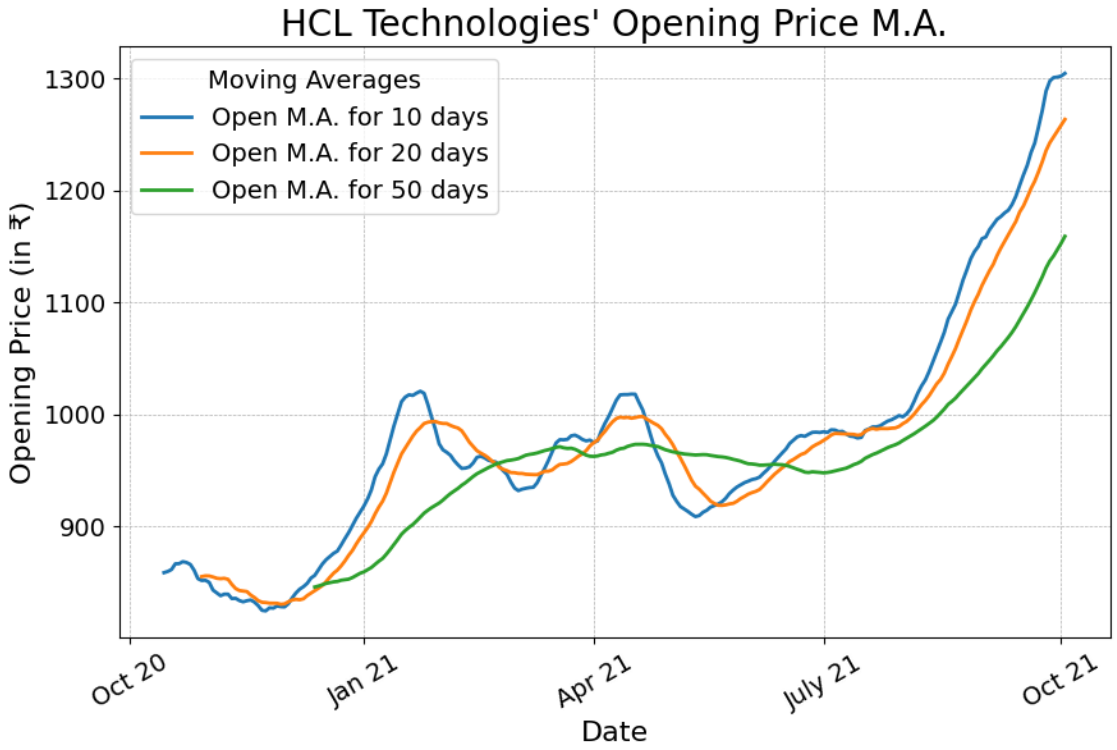

Cognizant's Low Price M.A.
Low Price (in $)
80
75
70
65
60
55
50
45
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

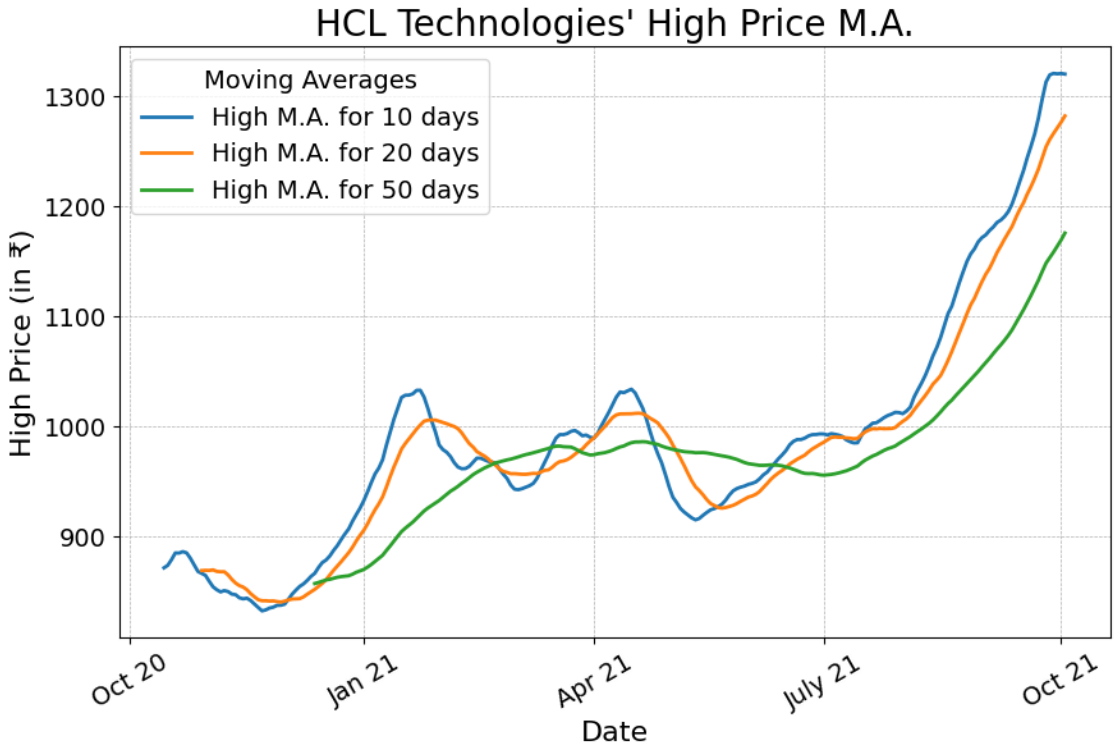

Cognizant's Closing Price M.A.
Closing Price (in $)
80
75
70
65
60
55
50
45
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

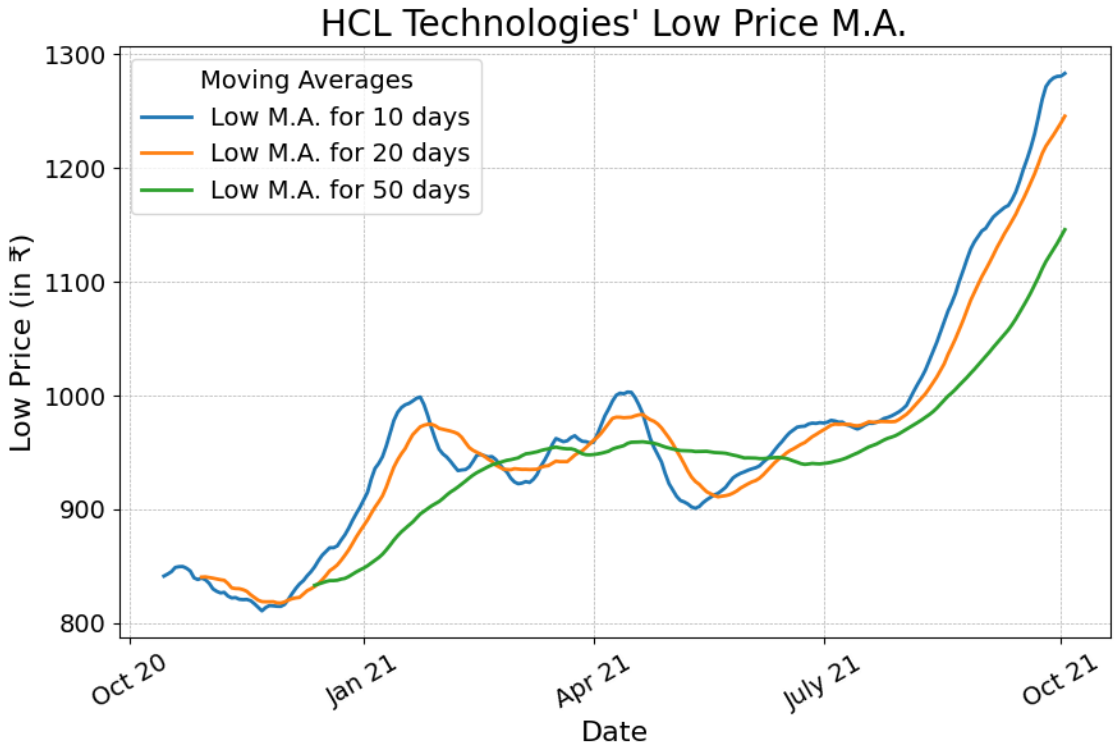


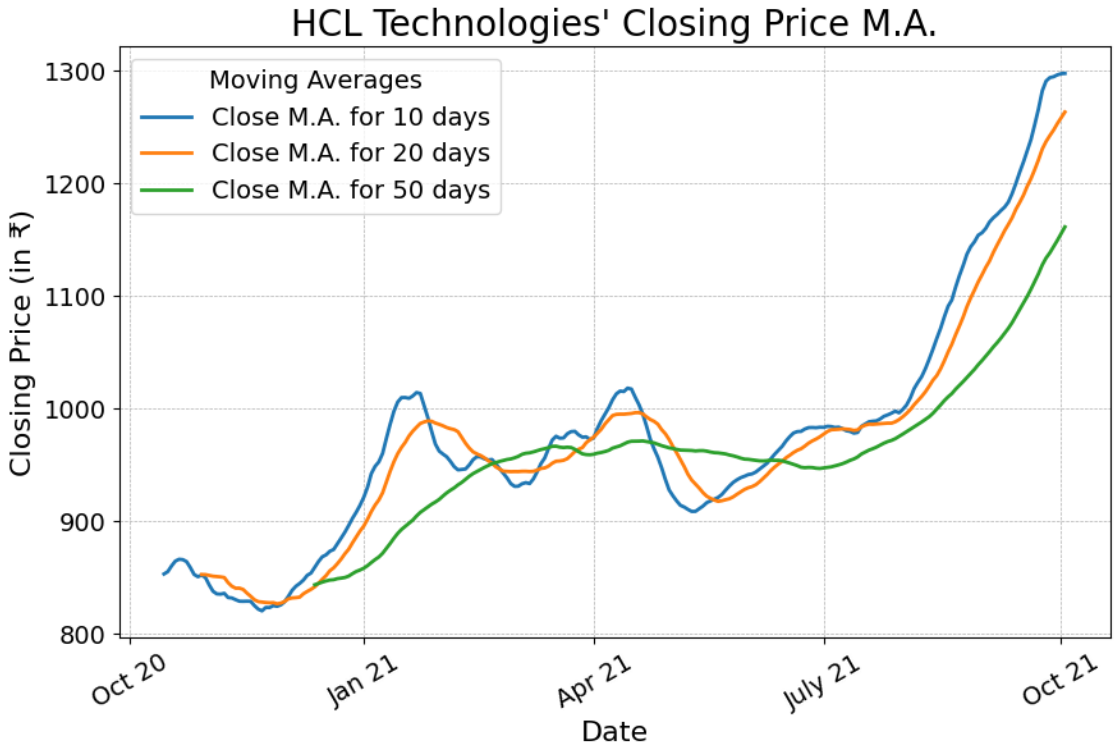
[18]:
```
generate_moving_averages('HCL Technologies', save_fig=True)
```

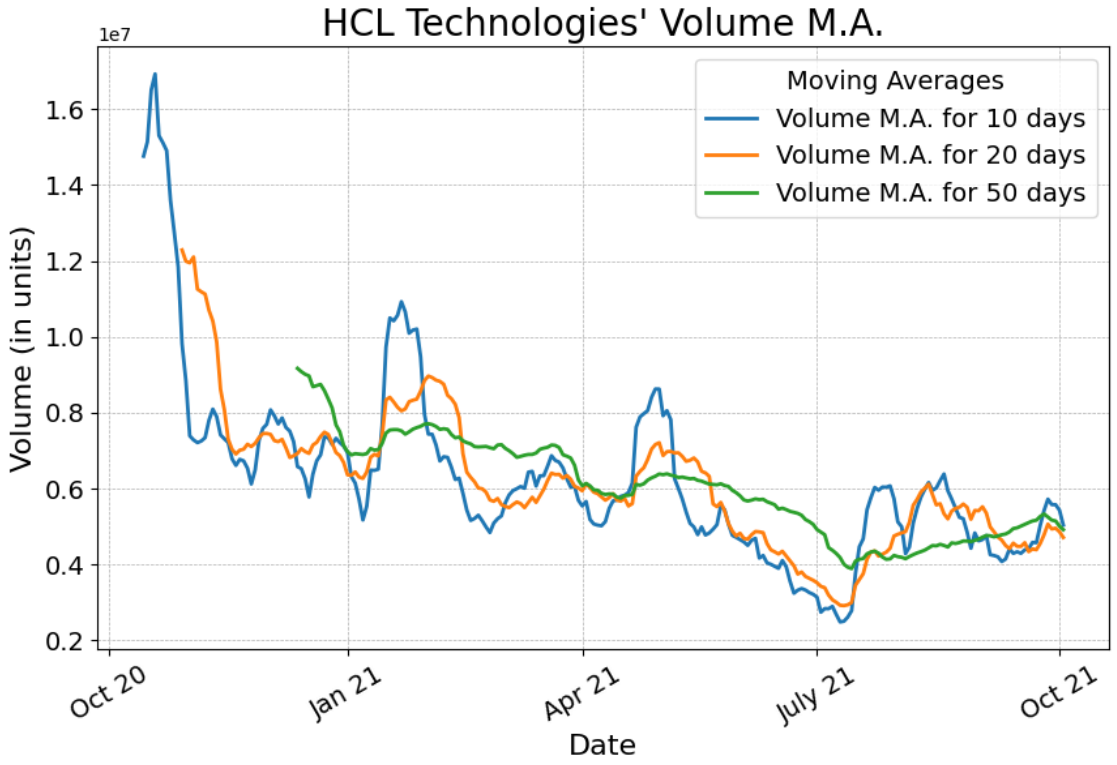
```
Saved HCL Technologies Dataset with M.A.s at this location: Datasets/HCL
Technologies Share Prices 2019_2021 With MA.xlsx.
```


HCL Technologies' Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
1300
1200
1100
1000
900
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


HCL Technologies' High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
1300
1200
1100
1000
900
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

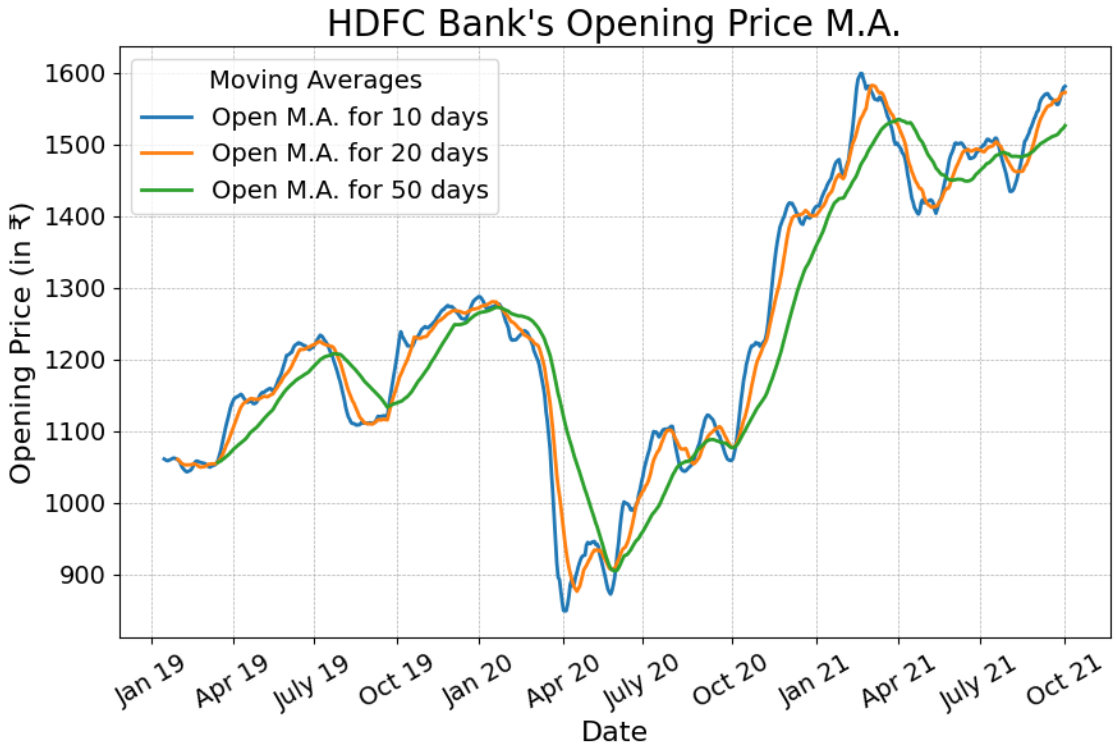

HCL Technologies' Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

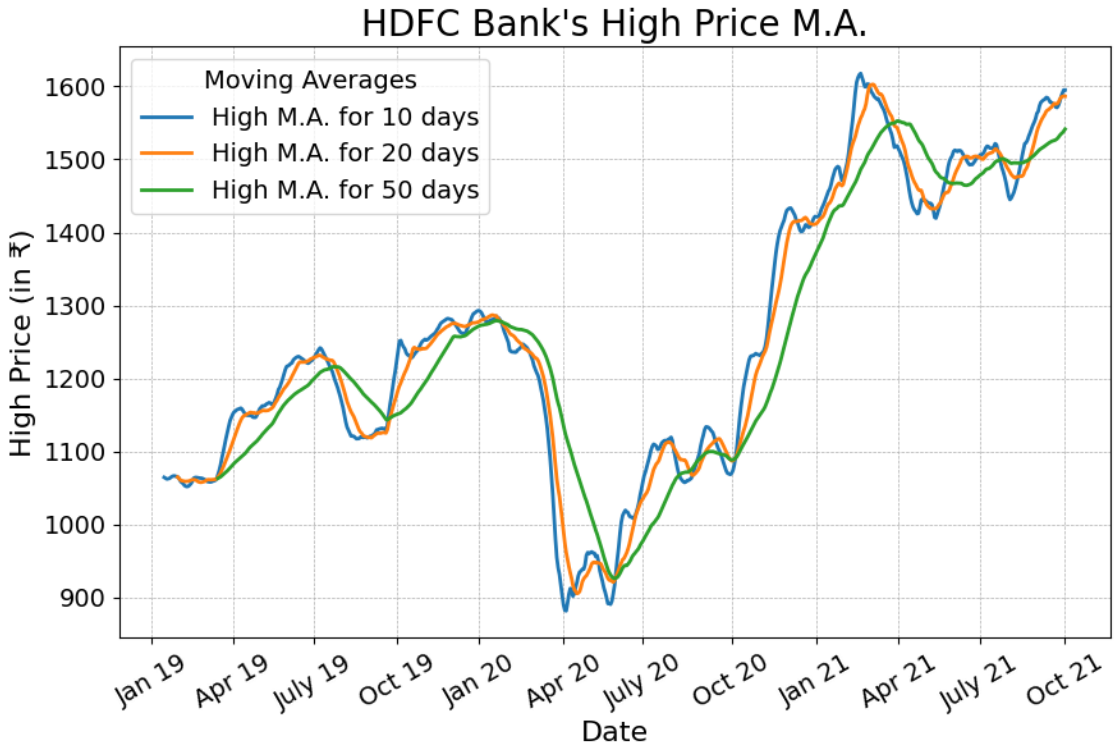

HCL Technologies' Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
1300
1200
1100
1000
900
800
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

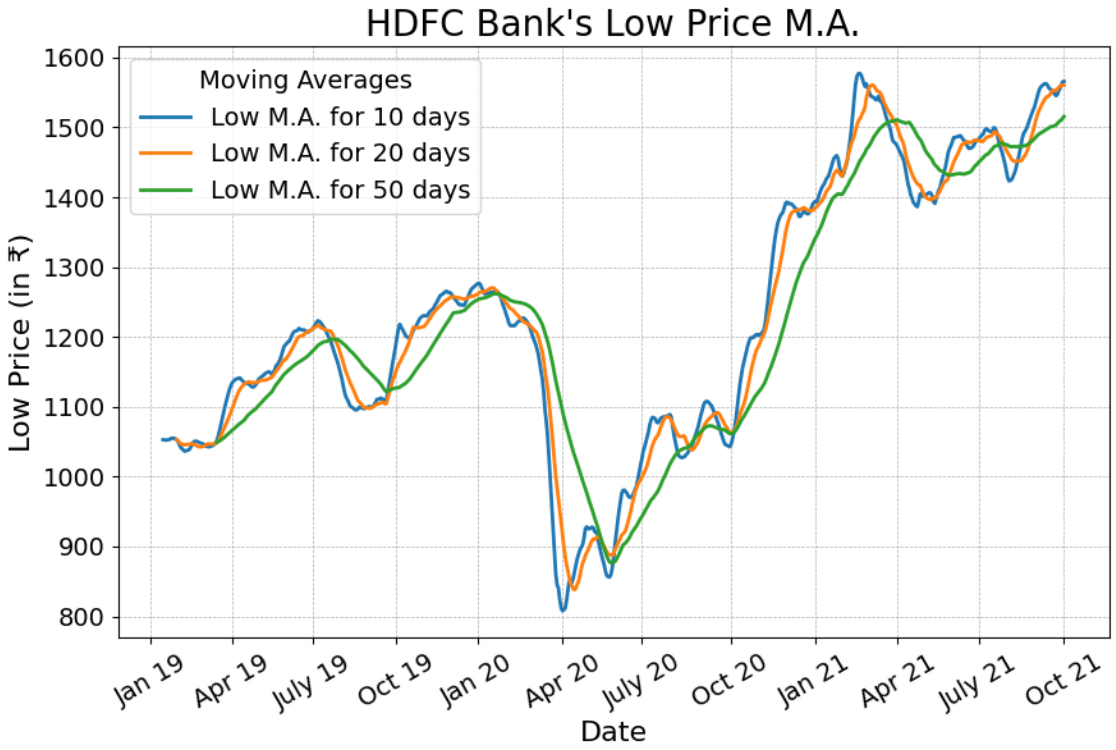


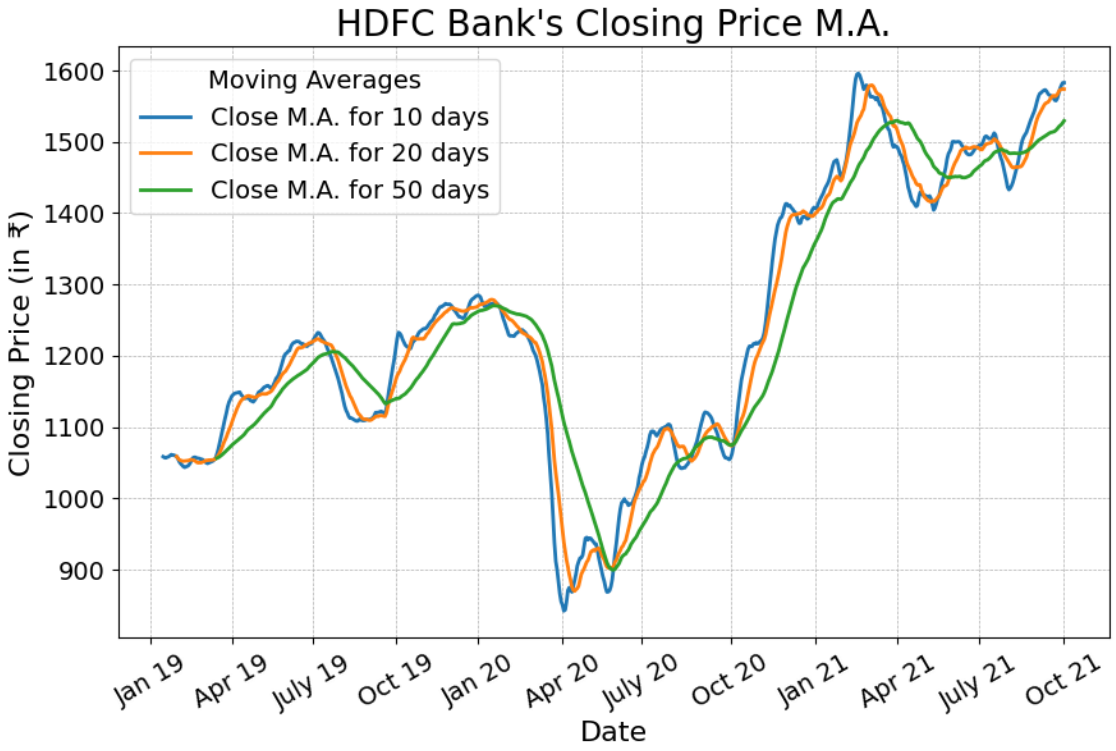
[19]:
```
generate_moving_averages('HDFC Bank', save_fig=True)
```

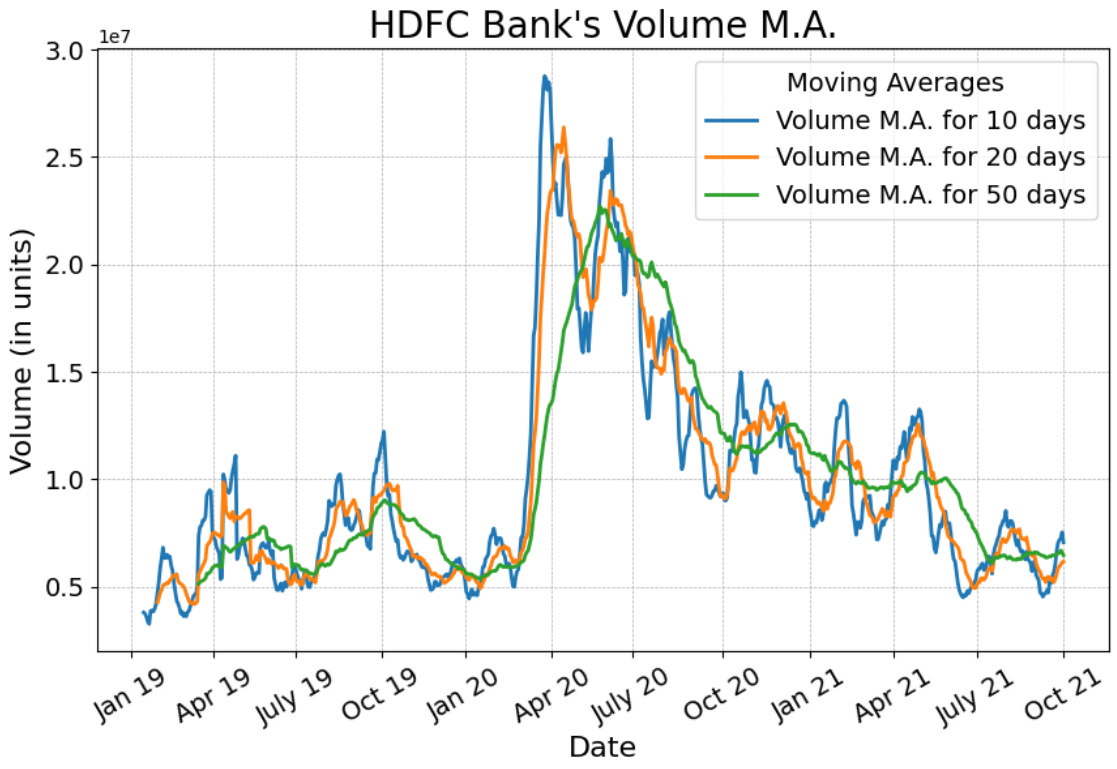
```
Saved HDFC Bank Dataset with M.A.s at this location: Datasets/HDFC Bank Share
Prices 2019_2021 With MA.xlsx.
```


HDFC Bank's Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
1600
1500
1400
1300
1200
1100
1000
900
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


HDFC Bank's High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
1600
1500
1400
1300
1200
1100
1000
900
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

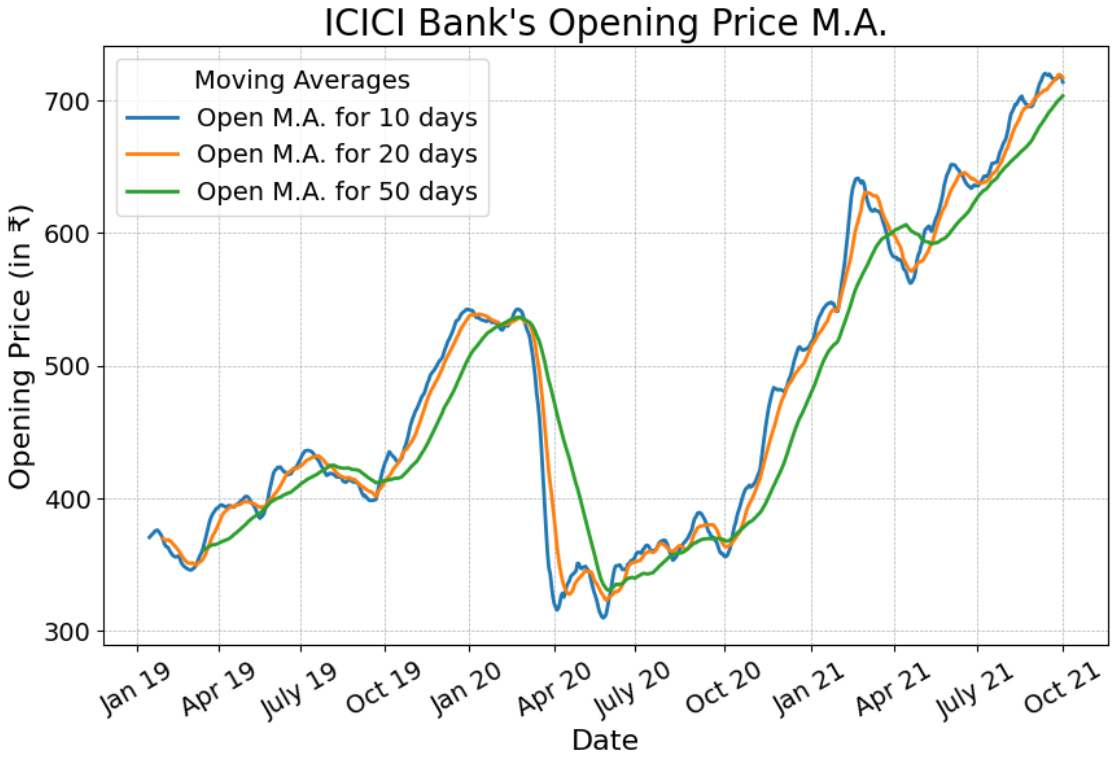

HDFC Bank's Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
1600
1500
1400
1300
1200
1100
1000
900
800
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

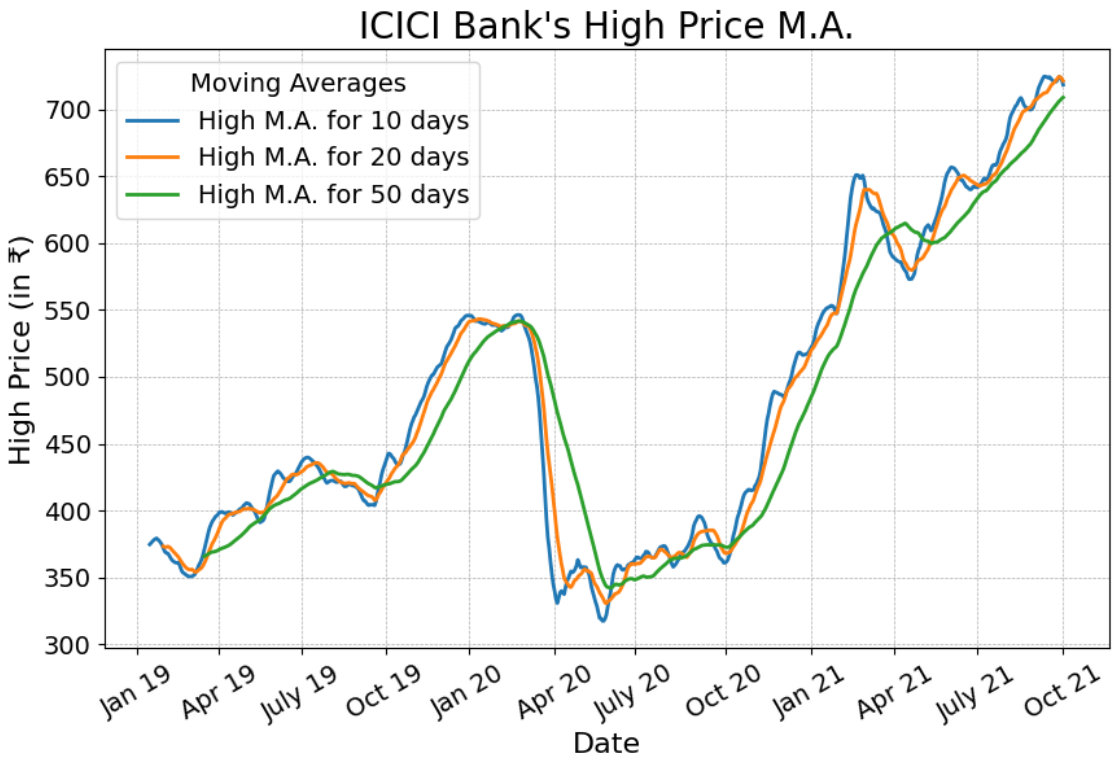

HDFC Bank's Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
1600
1500
1400
1300
1200
1100
1000
900
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

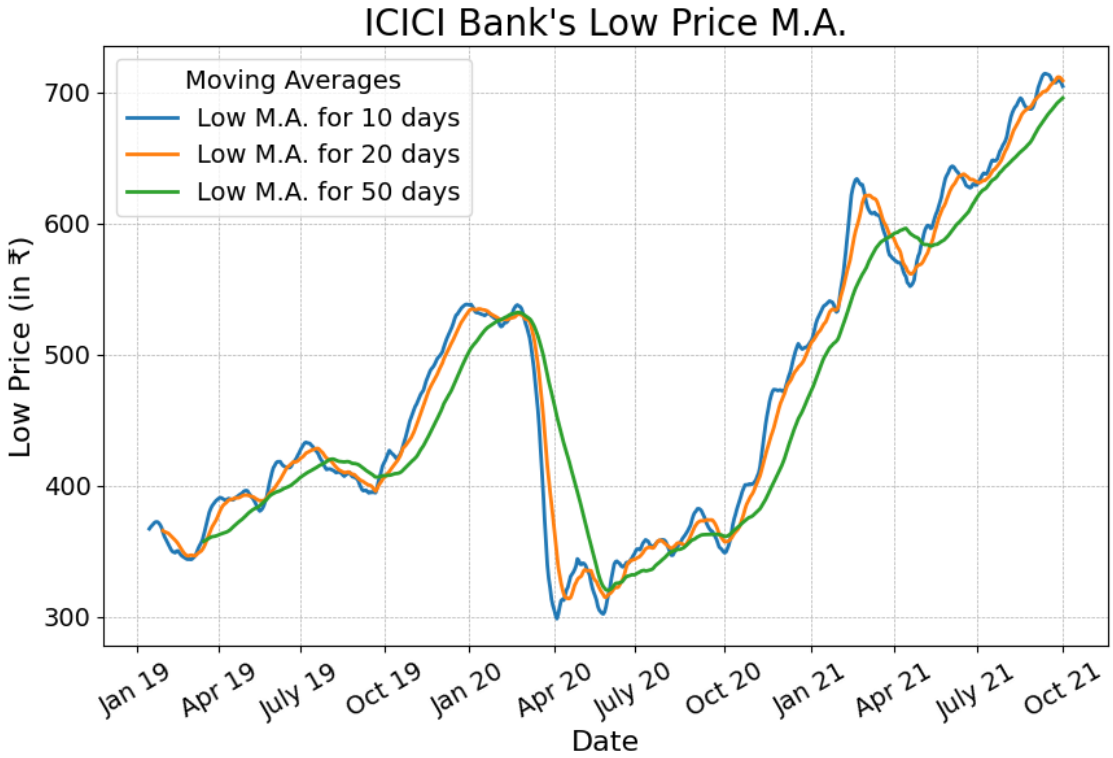


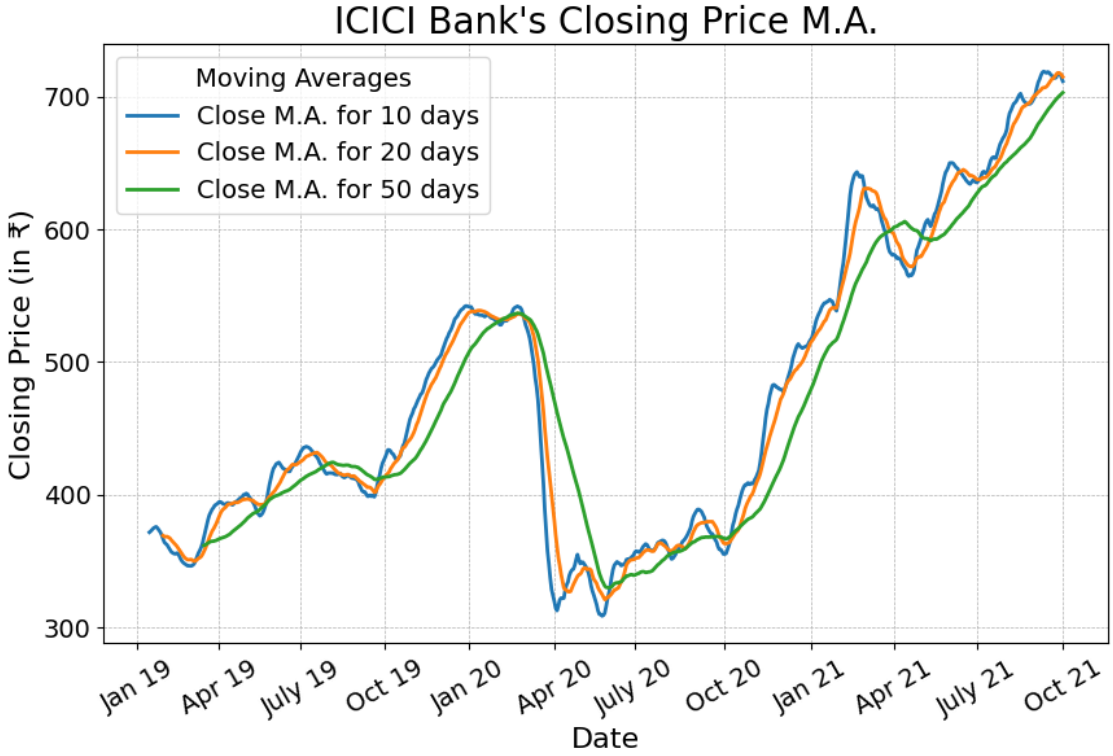
[20]:
```
generate_moving_averages('ICICI Bank', save_fig=True)
```

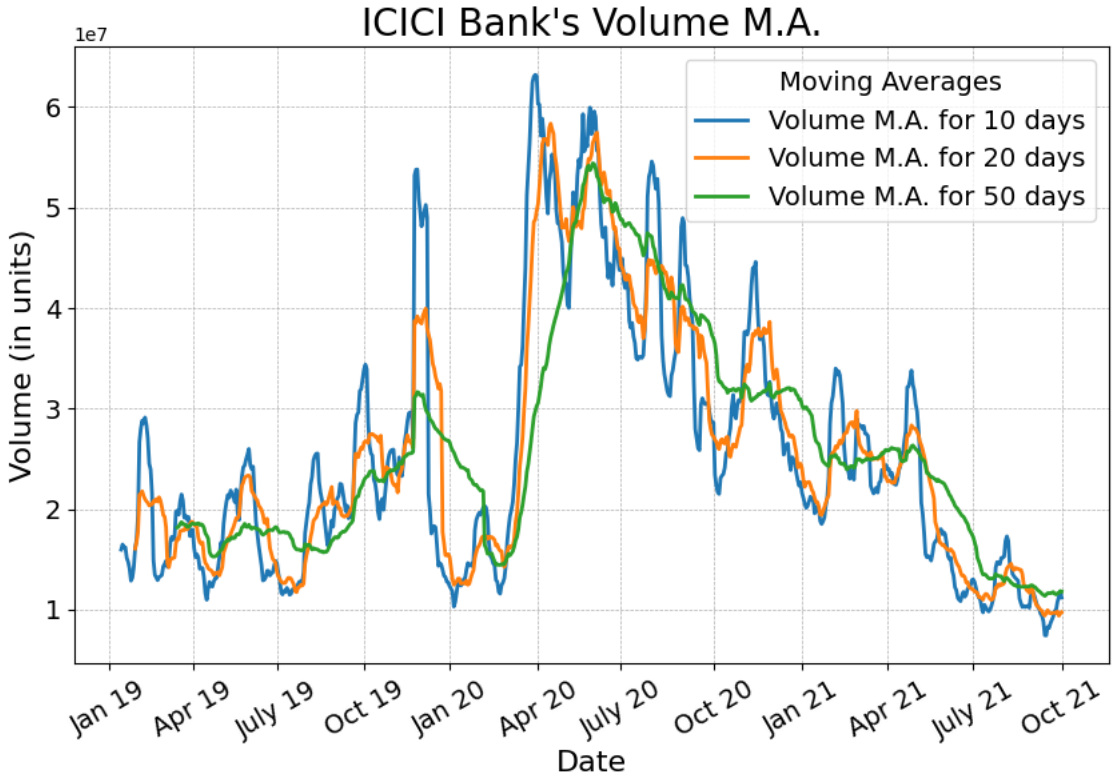
```
Saved ICICI Bank Dataset with M.A.s at this location: Datasets/ICICI Bank Share
Prices 2019_2021 With MA.xlsx.
```


ICICI Bank's Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


ICICI Bank's High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
700
650
600
550
500
450
400
350
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

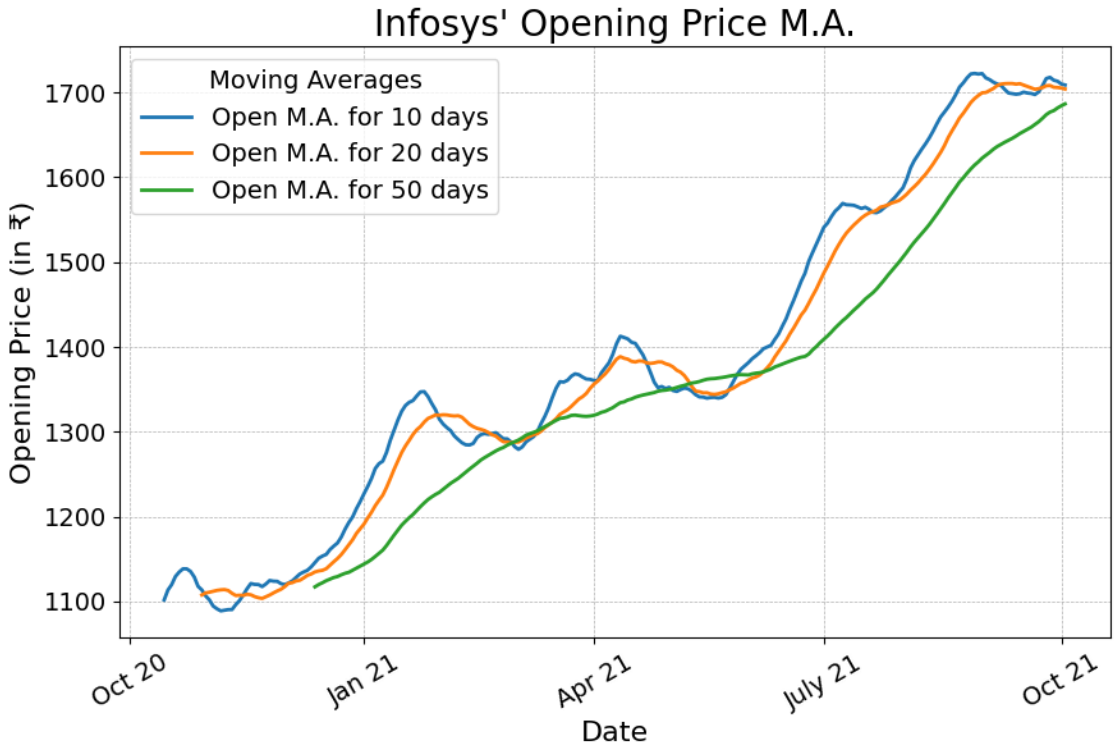

ICICI Bank's Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

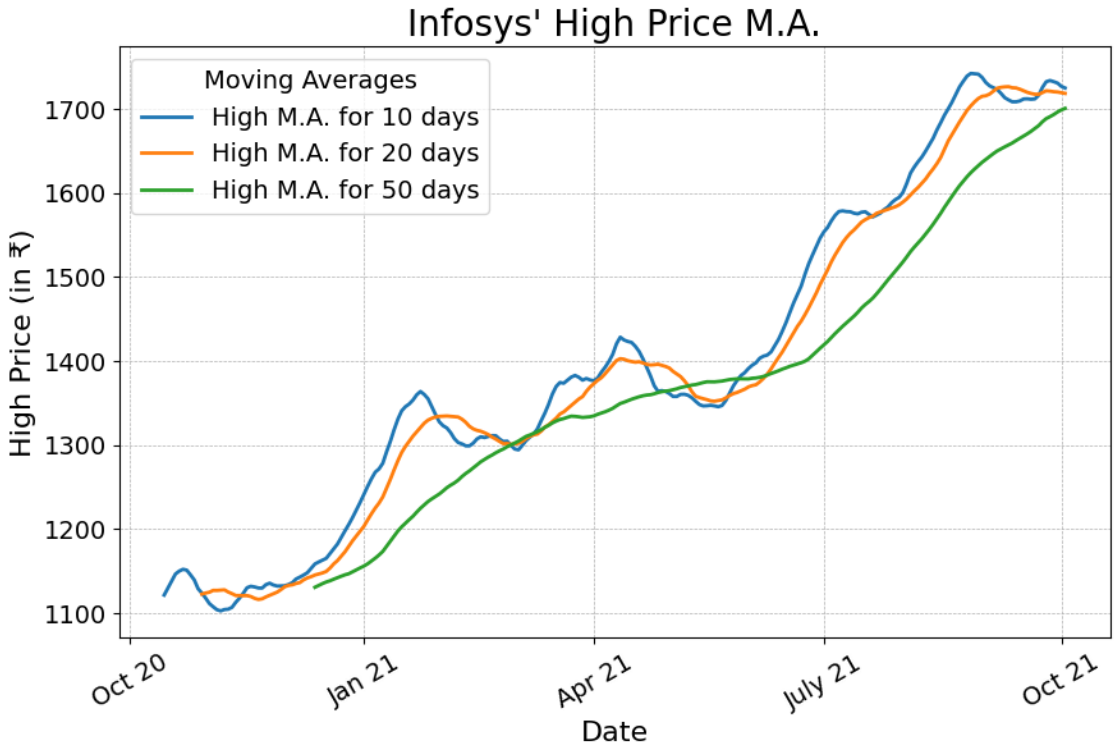

ICICI Bank's Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
700
600
500
400
300
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

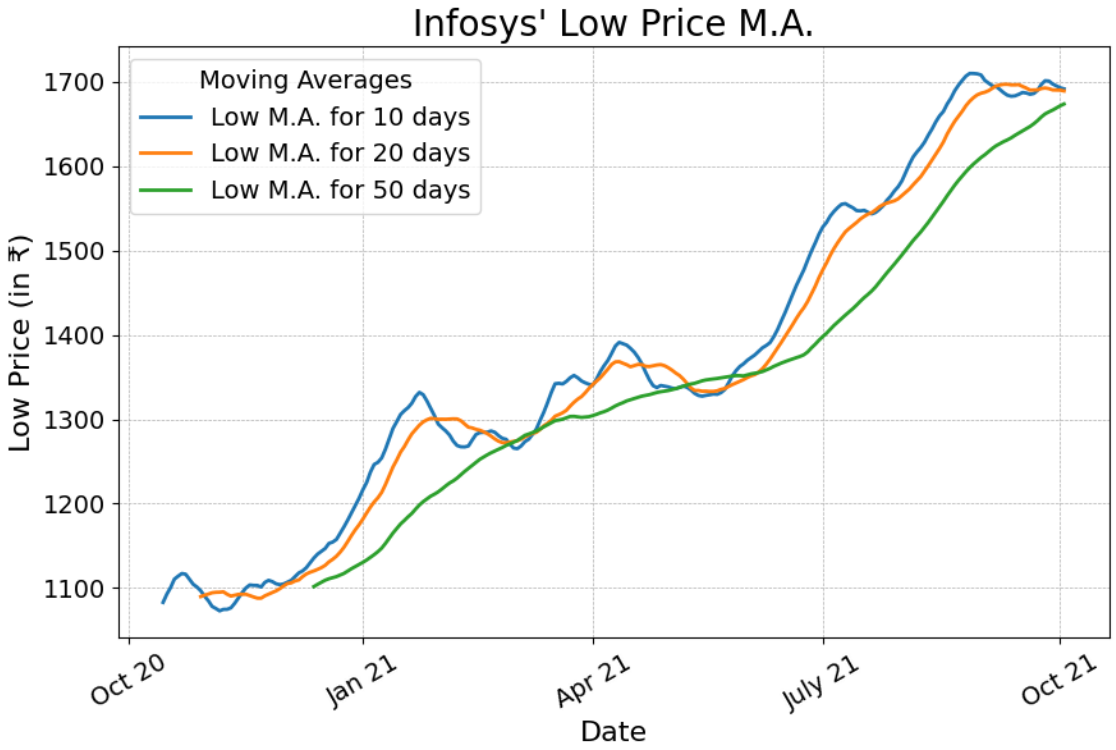


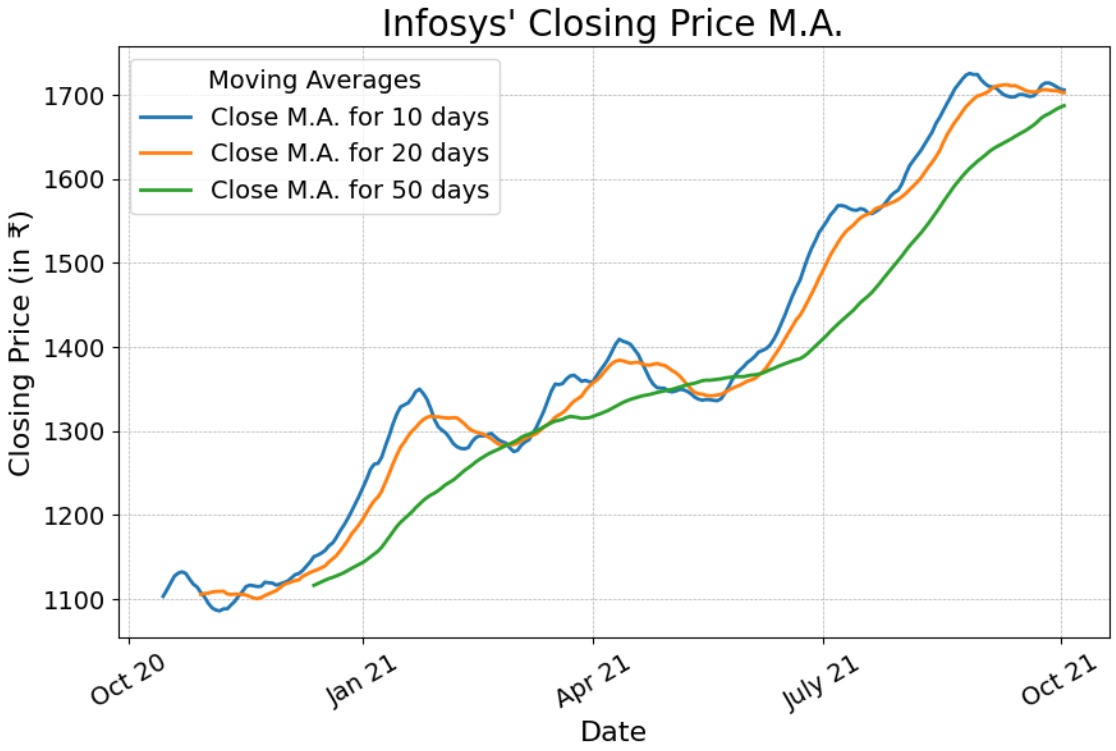
[21]:
```
generate_moving_averages('Infosys', save_fig=True)
```

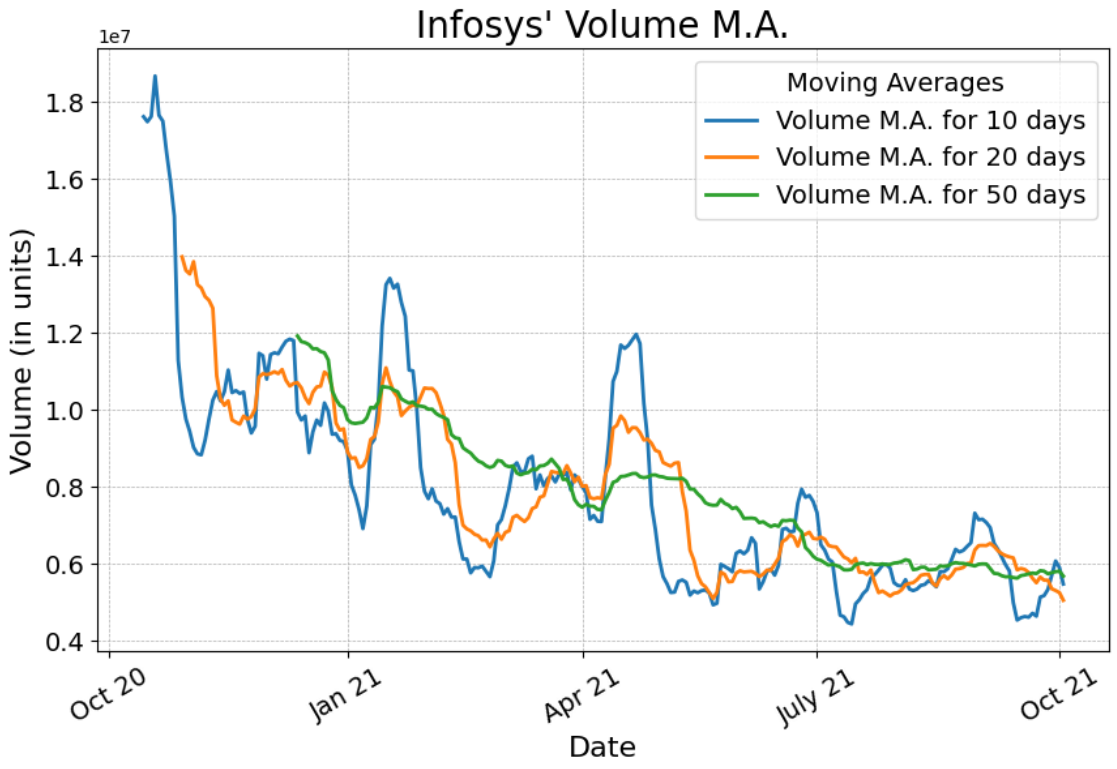
```
Saved Infosys Dataset with M.A.s at this location: Datasets/Infosys Share Prices
2019_2021 With MA.xlsx.
```


Infosys' Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

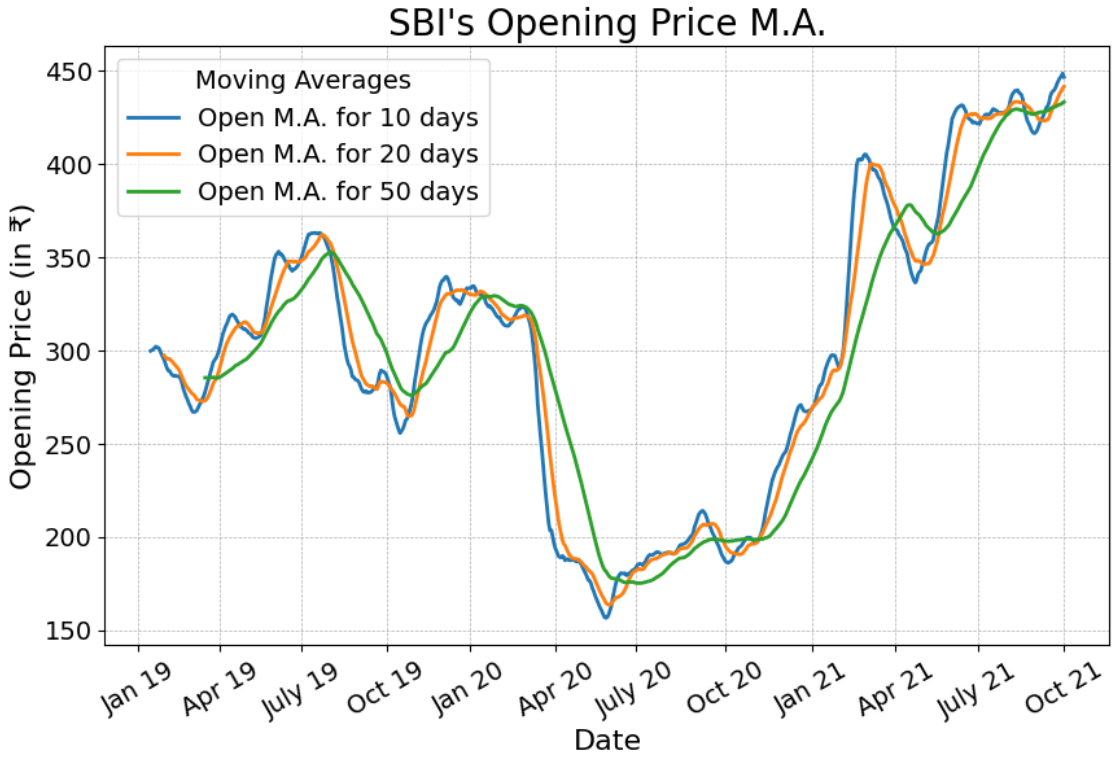

Infosys' Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

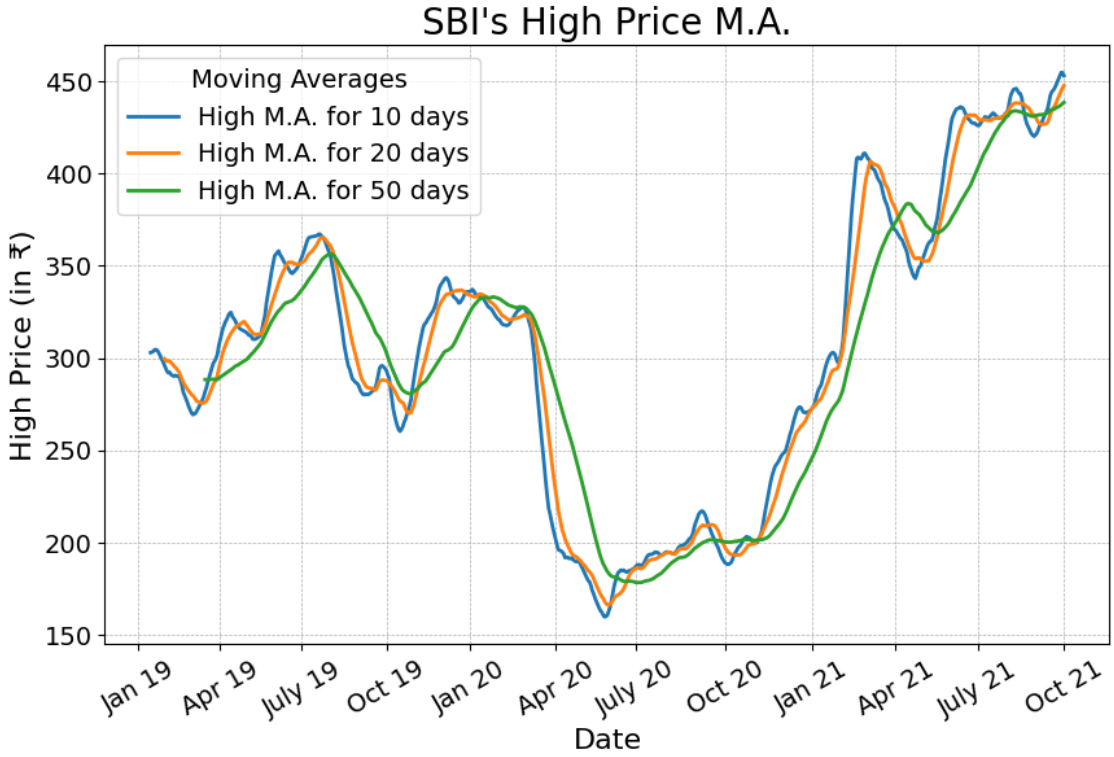

Infosys' Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

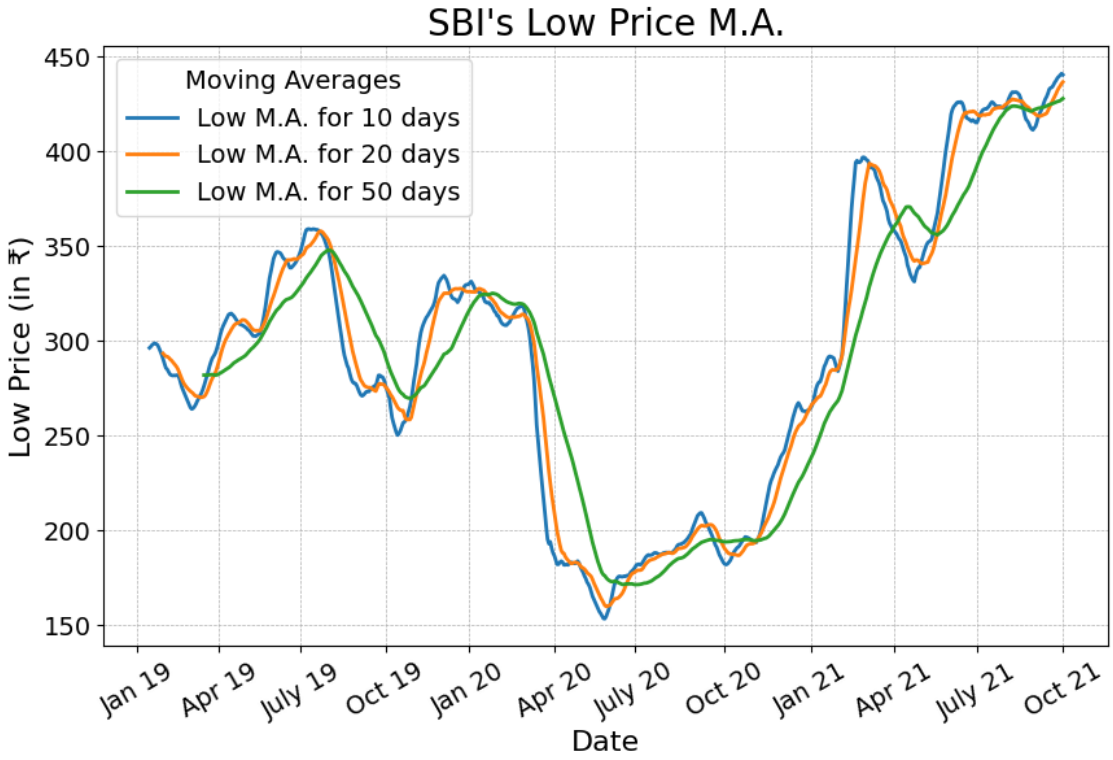


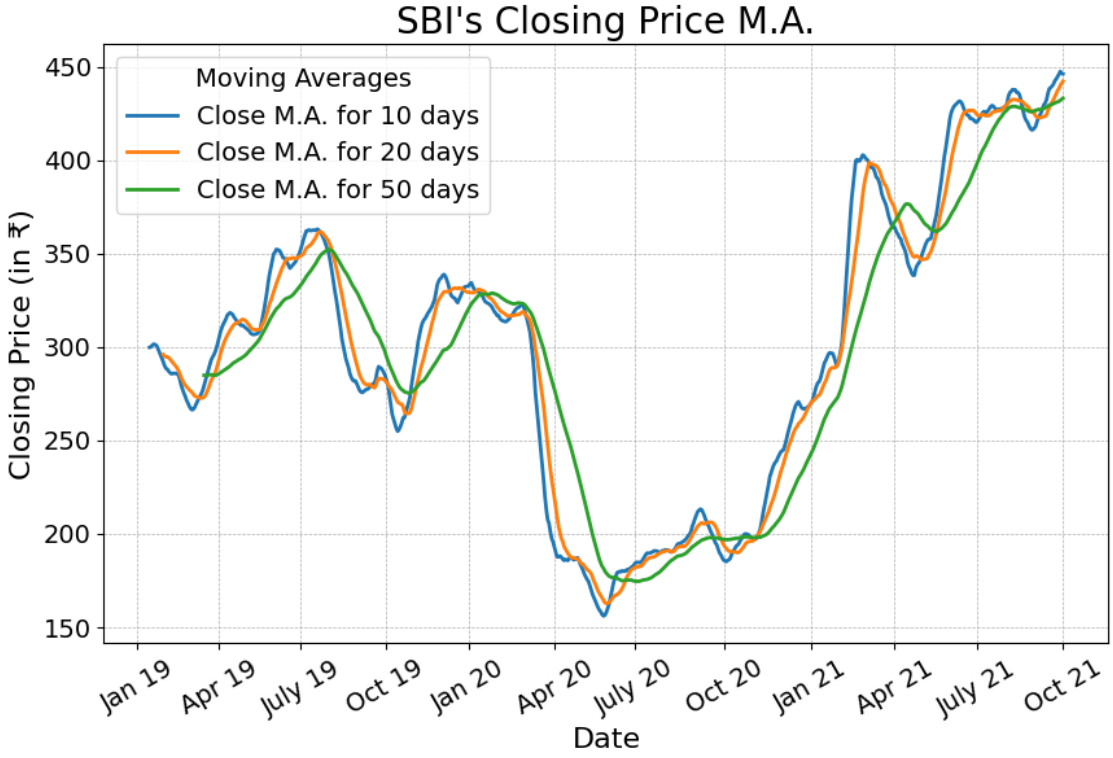
[22]:
```
generate_moving_averages('SBI', save_fig=True)
```

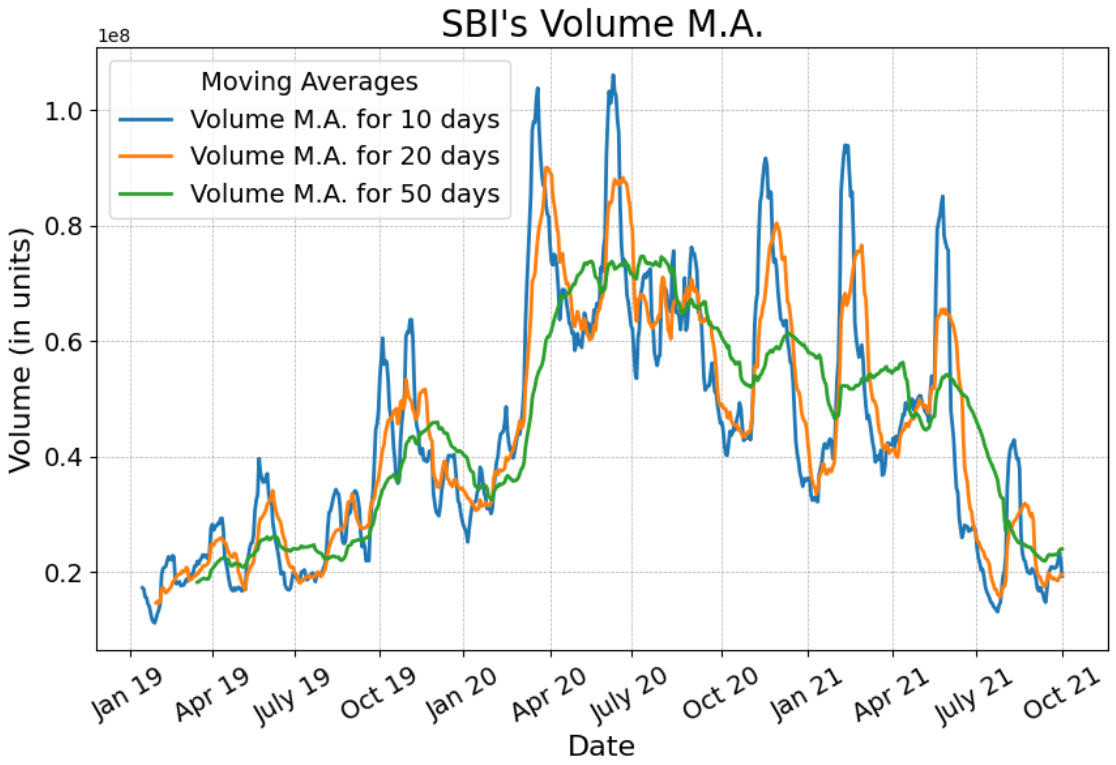
```
Saved SBI Dataset with M.A.s at this location: Datasets/SBI Share Prices
2019_2021 With MA.xlsx.
```


SBI's Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


SBI's High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

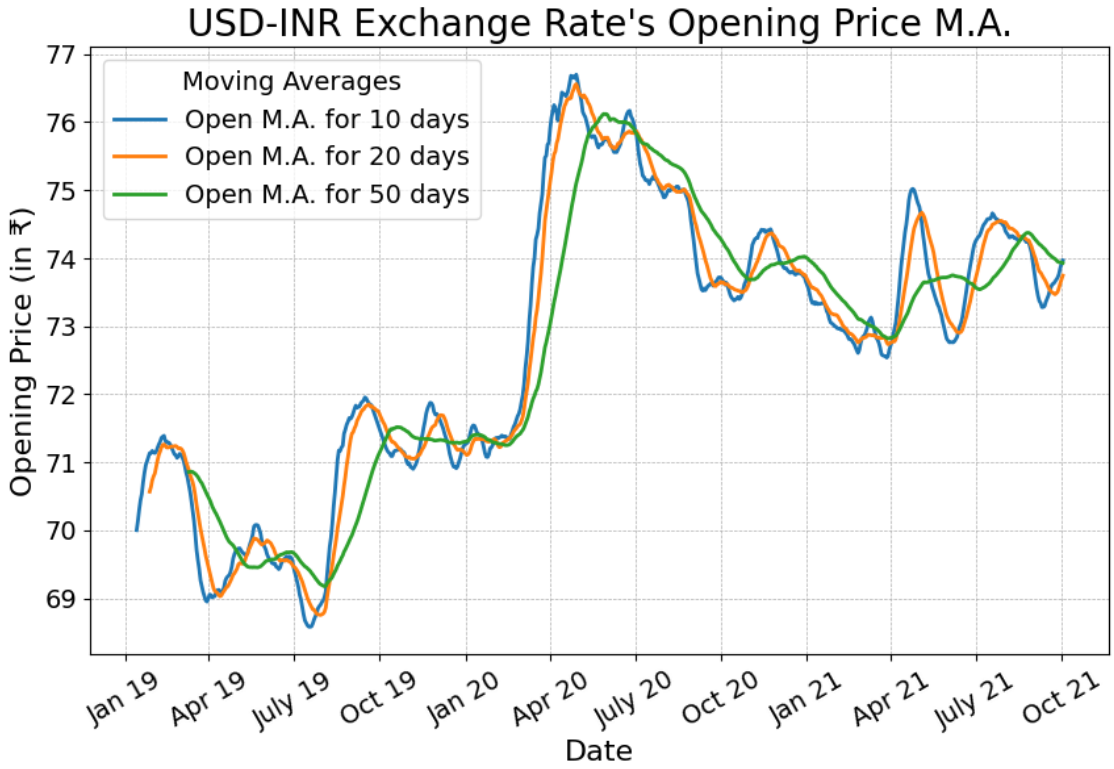

SBI's Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

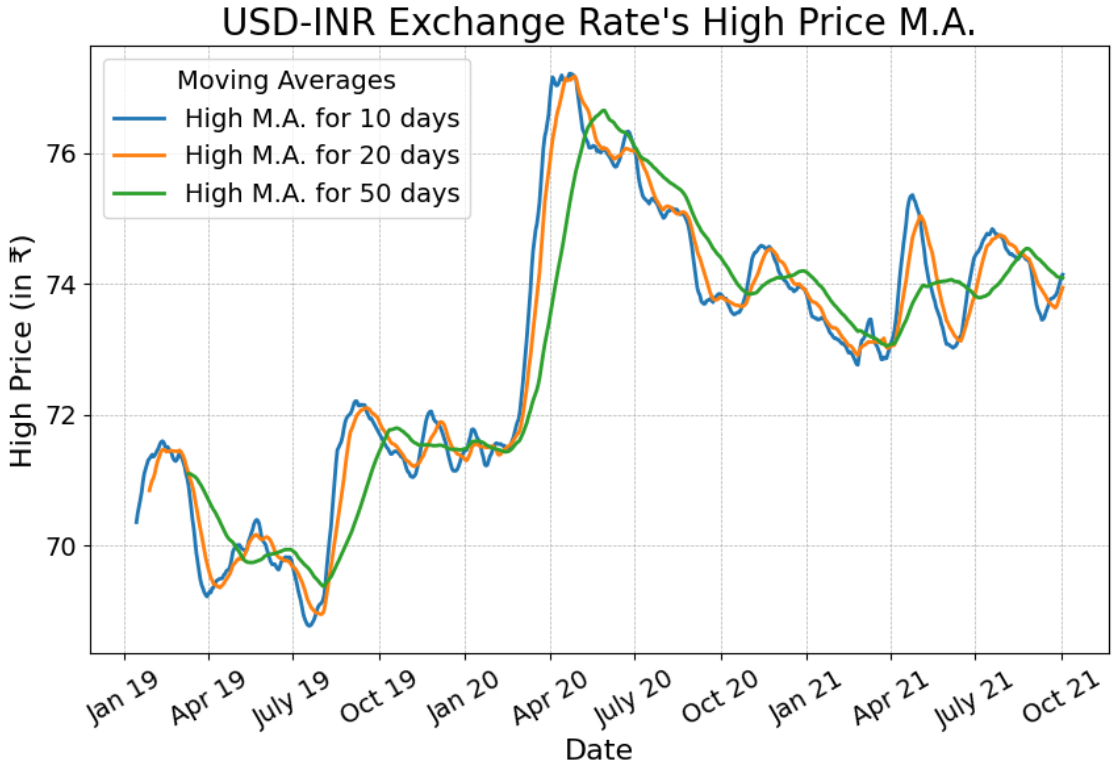

SBI's Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
450
400
350
300
250
200
150
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

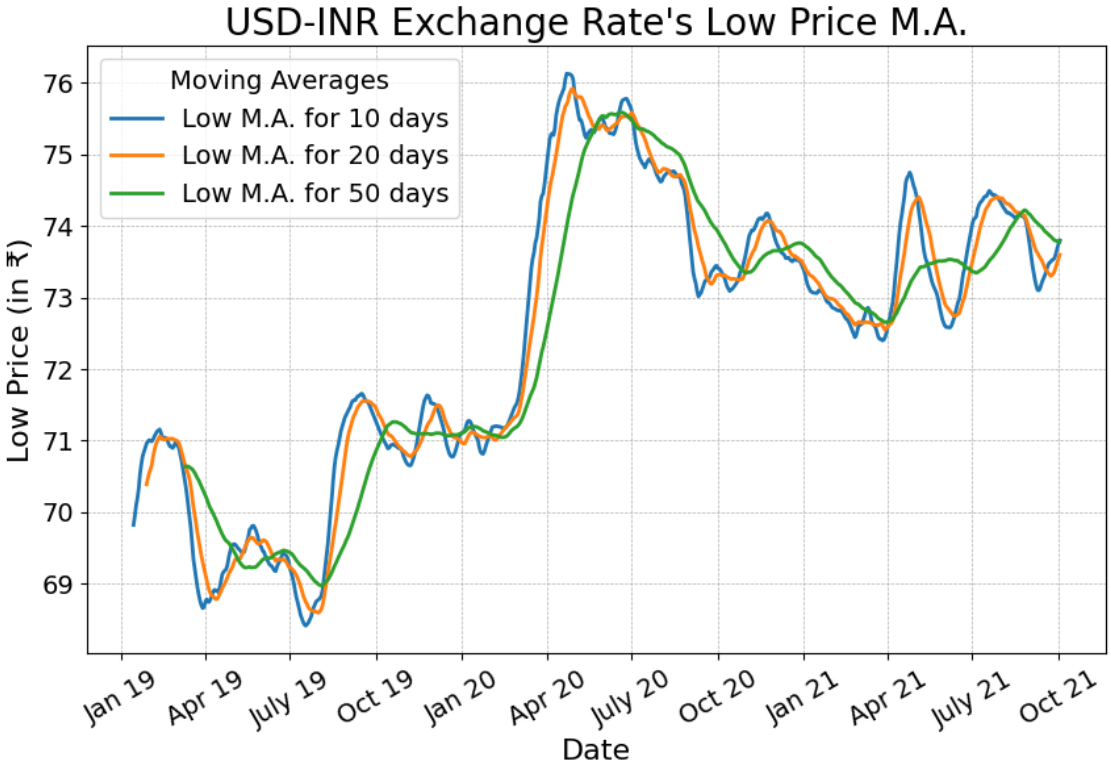


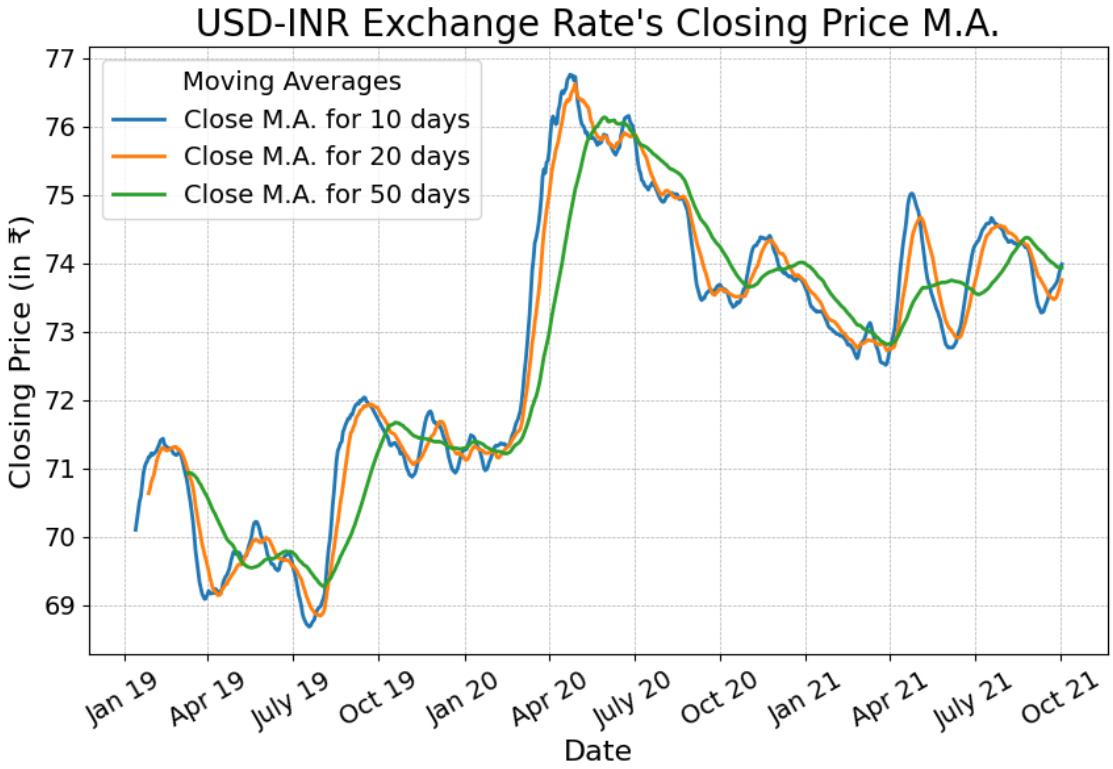
[23]:
```
generate_moving_averages('USD-INR Exchange Rate', save_fig=True)
```

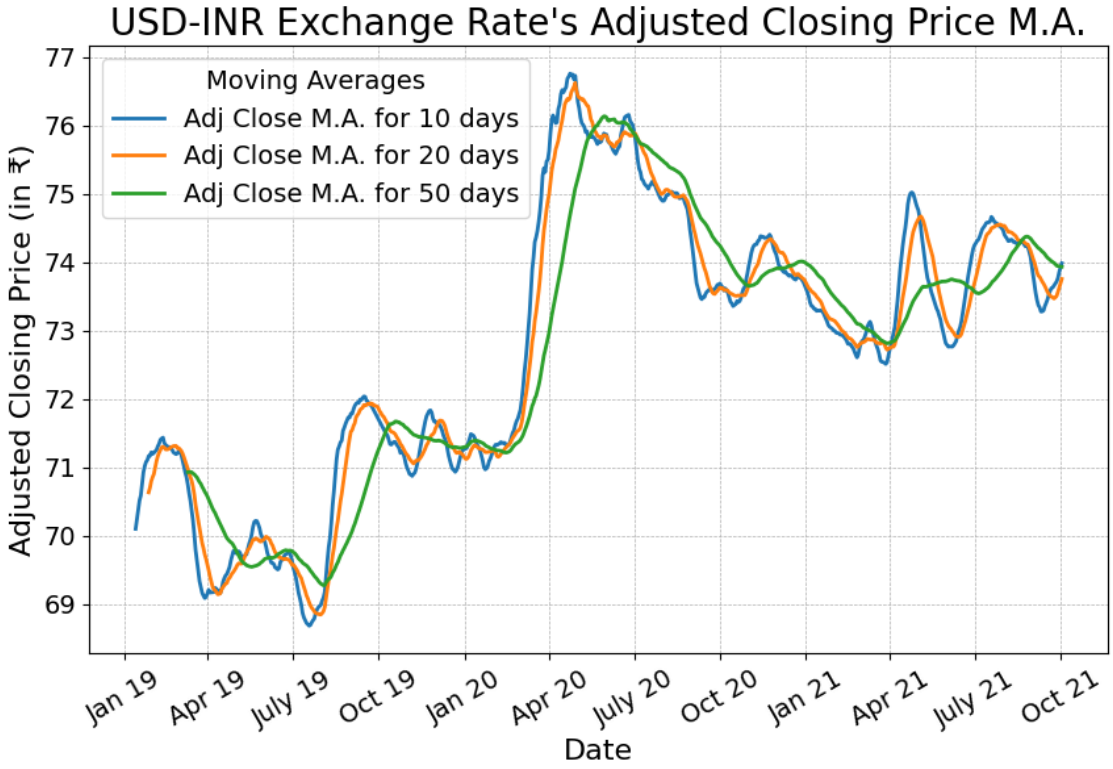
```
Saved USD-INR Exchange Rate Dataset with M.A.s at this location: Datasets/USD-
INR Exchange Rate 2019_2021 With MA.xlsx.
```


USD-INR Exchange Rate's Opening Price M.A.
Moving Averages
Open M.A. for 10 days
Open M.A. for 20 days
Open M.A. for 50 days
Opening Price (in ₹)
77
76
75
74
73
72
71
70
69
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's High Price M.A.
Moving Averages
High M.A. for 10 days
High M.A. for 20 days
High M.A. for 50 days
High Price (in ₹)
76
74
72
70
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Low Price M.A.
Moving Averages
Low M.A. for 10 days
Low M.A. for 20 days
Low M.A. for 50 days
Low Price (in ₹)
76
75
74
73
72
71
70
69
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Closing Price M.A.
Moving Averages
Close M.A. for 10 days
Close M.A. for 20 days
Close M.A. for 50 days
Closing Price (in ₹)
77
76
75
74
73
72
71
70
69
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Adjusted Closing Price M.A.
Moving Averages
Adj Close M.A. for 10 days
Adj Close M.A. for 20 days
Adj Close M.A. for 50 days
Adjusted Closing Price (in ₹)
77
76
75
74
73
72
71
70
69
Jan 19
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

4 Fitting LSTM Model

[38]:
```
def generate_predictions(dataset, save_fig=False, train_ratio = 0.8, n_epochs =␣
↪50, interval = 60):
    '''
    Function: To fit LSTM model on given dataset and plot predictions

    dataset: dataset name
    save_fig: indicator for choosing to save the plot
    train_ratio: fraction of original data to be used as training data
    n_epochs: number of epochs
    interval: length of a batch of training data
    '''
    data = import_data(dataset, 'xlsx')
    training_data_len = int(np.ceil(data.shape[0]*train_ratio))
    [idx, xlabels] = date_label_generator(data.loc[interval:].
↪reset_index(drop=True))
    [idx_test, xlabels_test] = date_label_generator(data.loc[training_data_len:
↪].reset_index(drop=True), method='monthly')
    cols = list(data.columns)
    cols.pop(0)

    for col in cols:
        print(f"\nFitting LSTM Model for {col} Column of {dataset} Dataset")
        df = data.filter([col])
        df_vals = df.values
        MM = MinMaxScaler()
        scaled_data = MM.fit_transform(df_vals)
        train_data = scaled_data[0:int(training_data_len), :]
        test_data = scaled_data[int(training_data_len)-interval:, :]

        X_train = []
        Y_train = []
        for i in range(interval, len(train_data)):
            X_train.append(train_data[i - interval:i, 0])
            Y_train.append(train_data[i, 0])

        X_test = []
        Y_test = []
        for i in range(interval, len(test_data)):
            X_test.append(test_data[i - interval:i, 0])
            Y_test.append(test_data[i, 0])
```

```
        X_train, Y_train = np.array(X_train), np.array(Y_train)
        print(f"Shape of X_train: {X_train.shape}")
        print(f"Shape of Y_train: {Y_train.shape}")

        X_test, Y_test = np.array(X_test), np.array(Y_test)

        X_train = np.reshape(X_train, (X_train.shape[0], X_train.shape[1], 1))
        X_test = np.reshape(X_test, (X_test.shape[0], X_test.shape[1], 1))

        model = fit_model(dataset, col, X_train, Y_train, n_epochs)

        print("The Performance of Model on Train Set is as follows:-")
        calculate_performance(dataset, col, model, X_train, Y_train, MM)

        print("The Performance of Model on Test Set is as follows:-")
        calculate_performance(dataset, col, model, X_test, Y_test, MM)

        X = []
        Y = []
        for i in range(interval, len(scaled_data)):
            X.append(scaled_data[i - interval:i, 0])
            Y.append(df_vals[i, 0])
        X, Y = np.array(X), np.array(Y)
        print(f"Shape of X: {X.shape}")
        print(f"Shape of Y: {Y.shape}")
        X = np.reshape(X, (X.shape[0], X.shape[1], 1))

        plot_predictions(dataset, col, model, X, Y, MM, idx, xlabels,␣
 ↪save_fig=save_fig, split = training_data_len-interval)
        plot_predictions(dataset, col, model, X_test, MM.
 ↪inverse_transform(Y_test.reshape(-1, 1)), MM, idx_test, xlabels_test,␣
 ↪save_fig=save_fig, test_set_ind=True)

def fit_model(dataset, col, X_train, Y_train, n_epochs):
    '''
    Function: To fit LSTM model on given dataset

    dataset: Dataset name
    col: Column name
    X_train: Training Input
    Y_train: Training Output
    n_epochs: number of epochs
    '''
    if dataset != 'HCL Technologies':
        model = Sequential()
        model.add(LSTM(128, return_sequences=True, input_shape= (X_train.
 ↪shape[1], 1)))
```

```
        if col != 'Volume':
            model.add(Dropout(0.2))
        model.add(LSTM(64, return_sequences=False))
        if col != 'Volume':
            model.add(Dropout(0.2))
        model.add(Dense(25))
        model.add(Dense(1))
    else:
        print("Fitting smaller model")
        model = Sequential()
        model.add(LSTM(100, return_sequences=False, input_shape= (X_train.
 ↪shape[1], 1)))
        if col != 'Volume':
            model.add(Dropout(0.2))
        model.add(Dense(1))
    if col == 'Volume':
        n_epochs = 100
    model.compile(optimizer='adam', loss='mean_squared_error')
    print(f"Fitting the LSTM Model on the Train Set for {col} Column of␣
 ↪{dataset} Dataset")
    start = time.time()
    model.fit(X_train, Y_train, epochs=n_epochs, batch_size=16)
    end = time.time()
    print(f"Time required for fitting model: {(end-start):.4f} seconds.\n")
    return model

def calculate_performance(dataset, col, model, X, Y_true, scaler, true_ind =␣
 ↪'scaled'):
    '''
    Function: To calculate performance of model on given data

    dataset: Dataset name
    col: Column name
    model: Trained LSTM model
    X: Input
    Y_true: Known Output
    scaler: scaler transform
    true_ind: indicating whether Y_true is scaled or not
    '''
    Y_pred = model.predict(X)
    if true_ind == 'scaled':
        Y_true_new = scaler.inverse_transform(Y_true.reshape(-1, 1))
    else:
        Y_true_new = Y_true.reshape(-1, 1)
    Y_pred_new = scaler.inverse_transform(Y_pred.reshape(-1, 1))
    MSE = mean_squared_error(Y_true_new, Y_pred_new)
    RMSE = mean_squared_error(Y_true_new, Y_pred_new, squared=False)
```

```
    MAE = mean_absolute_error(Y_true_new, Y_pred_new)
    MAPE = mean_absolute_percentage_error(Y_true_new, Y_pred_new)*100
    if col == 'Volume':
        print(f"MAE is {MAE:.2f} units.")
        print(f"MSE is {MSE:.2f} sq. units.")
        print(f"RMSE is {RMSE:.2f} units.")
    else:
        print(f"MAE is {get_currency(dataset)}{MAE:.2f}.")
        print(f"MSE is sq. {get_currency(dataset)} {MSE:.2f}.")
        print(f"RMSE is {get_currency(dataset)}{RMSE:.2f}.")
    print(f"MAPE is {MAPE:.2f}%.")

def plot_predictions(dataset, col, model, X, Y, scaler, idx, xlabels,␣
 ↪save_fig=False, test_set_ind=False, split = None):
    '''
    Function: To plot predictions

    dataset: Dataset name
    col: Column name
    model: Trained LSTM model
    X: Input
    Y: Output
    scaler: scaler transform
    idx: indices for dates
    xlabels: labels for dates
    save_fig: indicator for saving plot
    test_set_ind: indicates if data is from test set or not
    split: value used to demarcate separation between train and test data
    '''
    Y_pred_inv = scaler.inverse_transform(model.predict(X))
    plt.figure(figsize=(10, 6))
    Y = Y[:-1]
    Y_pred_inv = Y_pred_inv[1:]
    plt.plot(Y, color='red', label = 'Actual', linewidth=2)
    plt.plot(Y_pred_inv, color='blue', label = 'Predicted', linewidth=2)
    plt.xlabel("Date", fontsize=16)
    plt.ylabel(get_label(col) + ' ' + get_unit(dataset, col), fontsize=16)
    plt.xticks(idx, xlabels, rotation=30, fontsize=14)
    plt.yticks(fontsize=14)
    if test_set_ind:
        title = 'Test Dataset'
    else:
        title = 'Entire Dataset'
        plt.axvline(x = split, color = 'green', label = 'Train-Test Split',␣
 ↪linestyle = '--', linewidth=1)
    suptitle = get_title(dataset) + ' ' + get_label(col) + ' Prediction'
    plt.suptitle(suptitle, fontsize=20)
```

```
    plt.title(title, fontsize=14)
    plt.grid(linestyle='--', linewidth=0.5)
    plt.legend(loc='best', prop = {"size": 14}, title_fontproperties = {"size":␣
↪14})
    if save_fig:
        plt.savefig(dataset + "/Predictions/" + suptitle + " On " + title +  ".
↪png", bbox_inches="tight", dpi=500)
```

[25]:
```
generate_predictions('Cognizant', save_fig = True)
```

```
Fitting LSTM Model for Open Column of Cognizant Dataset
Shape of X_train: (496, 60)
Shape of Y_train: (496,)
Fitting the LSTM Model on the Train Set for Open Column of Cognizant Dataset
Epoch 1/50
31/31 [==============================] - 7s 72ms/step - loss: 0.0467
Epoch 2/50
31/31 [==============================] - 2s 67ms/step - loss: 0.0106
Epoch 3/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0086
Epoch 4/50
31/31 [==============================] - 2s 67ms/step - loss: 0.0072
Epoch 5/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0071
Epoch 6/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0067
Epoch 7/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0058
Epoch 8/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0057
Epoch 9/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0054
Epoch 10/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0049
Epoch 11/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0046
Epoch 12/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0047
Epoch 13/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0043
Epoch 14/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0042
Epoch 15/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0044
Epoch 16/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0040
Epoch 17/50
```

```
31/31 [==============================] - 2s 74ms/step - loss: 0.0044
Epoch 18/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0042
Epoch 19/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0047
Epoch 20/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0038
Epoch 21/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0036
Epoch 22/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0036
Epoch 23/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0031
Epoch 24/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0036
Epoch 25/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0038
Epoch 26/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0034
Epoch 27/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0031
Epoch 28/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0031
Epoch 29/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0038
Epoch 30/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0032
Epoch 31/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0032
Epoch 32/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0029
Epoch 33/50
31/31 [==============================] - 2s 67ms/step - loss: 0.0028
Epoch 34/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0030
Epoch 35/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0033
Epoch 36/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0031
Epoch 37/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0028
Epoch 38/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0028
Epoch 39/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0026
Epoch 40/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0025
Epoch 41/50
```

```
31/31 [==============================] - 2s 71ms/step - loss: 0.0028
Epoch 42/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0028
Epoch 43/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0026
Epoch 44/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0028
Epoch 45/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 46/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0023
Epoch 47/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0024
Epoch 48/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0028
Epoch 49/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0025
Epoch 50/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0025
Time required for fitting model: 112.0721 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 39ms/step
MAE is $1.12.
MSE is sq. $ 2.69.
RMSE is $1.64.
MAPE is 1.80%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 33ms/step
MAE is $0.83.
MSE is sq. $ 1.52.
RMSE is $1.23.
MAPE is 1.12%.
Shape of X: (634, 60)
Shape of Y: (634,)
20/20 [==============================] - 1s 37ms/step
5/5 [==============================] - 0s 35ms/step

Fitting LSTM Model for High Column of Cognizant Dataset
Shape of X_train: (496, 60)
Shape of Y_train: (496,)
Fitting the LSTM Model on the Train Set for High Column of Cognizant Dataset
Epoch 1/50
31/31 [==============================] - 7s 69ms/step - loss: 0.0477
Epoch 2/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0098
Epoch 3/50
31/31 [==============================] - 2s 67ms/step - loss: 0.0079
```

```
Epoch 4/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0069
Epoch 5/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0062
Epoch 6/50
31/31 [==============================] - 3s 101ms/step - loss: 0.0061
Epoch 7/50
31/31 [==============================] - 3s 84ms/step - loss: 0.0063
Epoch 8/50
31/31 [==============================] - 2s 76ms/step - loss: 0.0061
Epoch 9/50
31/31 [==============================] - 2s 76ms/step - loss: 0.0056
Epoch 10/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0050
Epoch 11/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0043
Epoch 12/50
31/31 [==============================] - 2s 76ms/step - loss: 0.0045
Epoch 13/50
31/31 [==============================] - 2s 76ms/step - loss: 0.0039
Epoch 14/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0039
Epoch 15/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0041
Epoch 16/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0040
Epoch 17/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0048
Epoch 18/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0044
Epoch 19/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0047
Epoch 20/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0041
Epoch 21/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0036
Epoch 22/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0038
Epoch 23/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0034
Epoch 24/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0037
Epoch 25/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0038
Epoch 26/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0032
Epoch 27/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0033
```

```
Epoch 28/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0033
Epoch 29/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0036
Epoch 30/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0029
Epoch 31/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0030
Epoch 32/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0029
Epoch 33/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0028
Epoch 34/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0030
Epoch 35/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0030
Epoch 36/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0030
Epoch 37/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0028
Epoch 38/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0027
Epoch 39/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 40/50
31/31 [==============================] - 2s 69ms/step - loss: 0.0024
Epoch 41/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0028
Epoch 42/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0029
Epoch 43/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 44/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0027
Epoch 45/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0025
Epoch 46/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0023
Epoch 47/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0025
Epoch 48/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0026
Epoch 49/50
31/31 [==============================] - 2s 70ms/step - loss: 0.0025
Epoch 50/50
31/31 [==============================] - 2s 68ms/step - loss: 0.0024
Time required for fitting model: 115.5938 seconds.
```

```
The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 39ms/step
MAE is $1.05.
MSE is sq. $ 2.39.
RMSE is $1.55.
MAPE is 1.67%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 36ms/step
MAE is $0.86.
MSE is sq. $ 1.48.
RMSE is $1.22.
MAPE is 1.14%.
Shape of X: (634, 60)
Shape of Y: (634,)
20/20 [==============================] - 1s 37ms/step
5/5 [==============================] - 0s 35ms/step

Fitting LSTM Model for Low Column of Cognizant Dataset
Shape of X_train: (496, 60)
Shape of Y_train: (496,)
Fitting the LSTM Model on the Train Set for Low Column of Cognizant Dataset
Epoch 1/50
31/31 [==============================] - 7s 72ms/step - loss: 0.0303
Epoch 2/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0091
Epoch 3/50
31/31 [==============================] - 2s 79ms/step - loss: 0.0077
Epoch 4/50
31/31 [==============================] - 2s 79ms/step - loss: 0.0060
Epoch 5/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0059
Epoch 6/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0063
Epoch 7/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0054
Epoch 8/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0059
Epoch 9/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0054
Epoch 10/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0057
Epoch 11/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0042
Epoch 12/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0042
Epoch 13/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0041
Epoch 14/50
```

```
31/31 [==============================] - 2s 73ms/step - loss: 0.0037
Epoch 15/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0041
Epoch 16/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0038
Epoch 17/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0037
Epoch 18/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0037
Epoch 19/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0042
Epoch 20/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0036
Epoch 21/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0034
Epoch 22/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0035
Epoch 23/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0031
Epoch 24/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0032
Epoch 25/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0031
Epoch 26/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0030
Epoch 27/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0028
Epoch 28/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0029
Epoch 29/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0034
Epoch 30/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0026
Epoch 31/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0028
Epoch 32/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0027
Epoch 33/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0026
Epoch 34/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0030
Epoch 35/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0031
Epoch 36/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0026
Epoch 37/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0024
Epoch 38/50
```

```
31/31 [==============================] - 2s 73ms/step - loss: 0.0024
Epoch 39/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0024
Epoch 40/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0022
Epoch 41/50
31/31 [==============================] - 2s 78ms/step - loss: 0.0026
Epoch 42/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0024
Epoch 43/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0026
Epoch 44/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0023
Epoch 45/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0022
Epoch 46/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0019
Epoch 47/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0020
Epoch 48/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0023
Epoch 49/50
31/31 [==============================] - 2s 74ms/step - loss: 0.0024
Epoch 50/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0020
Time required for fitting model: 119.5181 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 39ms/step
MAE is $1.11.
MSE is sq. $ 2.50.
RMSE is $1.58.
MAPE is 1.81%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 38ms/step
MAE is $0.83.
MSE is sq. $ 1.58.
RMSE is $1.26.
MAPE is 1.13%.
Shape of X: (634, 60)
Shape of Y: (634,)
20/20 [==============================] - 1s 40ms/step
5/5 [==============================] - 0s 39ms/step

Fitting LSTM Model for Close Column of Cognizant Dataset
Shape of X_train: (496, 60)
Shape of Y_train: (496,)
Fitting the LSTM Model on the Train Set for Close Column of Cognizant Dataset
```

```
Epoch 1/50
31/31 [==============================] - 7s 70ms/step - loss: 0.0381
Epoch 2/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0093
Epoch 3/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0083
Epoch 4/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0071
Epoch 5/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0067
Epoch 6/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0069
Epoch 7/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0061
Epoch 8/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0055
Epoch 9/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0053
Epoch 10/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0053
Epoch 11/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0044
Epoch 12/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0043
Epoch 13/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0039
Epoch 14/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0038
Epoch 15/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0041
Epoch 16/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0038
Epoch 17/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0041
Epoch 18/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0041
Epoch 19/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0042
Epoch 20/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0040
Epoch 21/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0038
Epoch 22/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0036
Epoch 23/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0033
Epoch 24/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0031
```

```
Epoch 25/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0035
Epoch 26/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0028
Epoch 27/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0030
Epoch 28/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0032
Epoch 29/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0038
Epoch 30/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0027
Epoch 31/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0030
Epoch 32/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0029
Epoch 33/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0027
Epoch 34/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0032
Epoch 35/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0031
Epoch 36/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0030
Epoch 37/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0028
Epoch 38/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0026
Epoch 39/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0023
Epoch 40/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0023
Epoch 41/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0026
Epoch 42/50
31/31 [==============================] - 2s 73ms/step - loss: 0.0025
Epoch 43/50
31/31 [==============================] - 2s 75ms/step - loss: 0.0025
Epoch 44/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0026
Epoch 45/50
31/31 [==============================] - 2s 71ms/step - loss: 0.0023
Epoch 46/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0022
Epoch 47/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0023
Epoch 48/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0026
```

```
Epoch 49/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0024
Epoch 50/50
31/31 [==============================] - 2s 72ms/step - loss: 0.0022
Time required for fitting model: 116.4807 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 41ms/step
MAE is $1.12.
MSE is sq. $ 2.65.
RMSE is $1.63.
MAPE is 1.80%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 36ms/step
MAE is $0.89.
MSE is sq. $ 1.57.
RMSE is $1.25.
MAPE is 1.19%.
Shape of X: (634, 60)
Shape of Y: (634,)
20/20 [==============================] - 1s 39ms/step
5/5 [==============================] - 0s 33ms/step

Fitting LSTM Model for Volume Column of Cognizant Dataset
Shape of X_train: (496, 60)
Shape of Y_train: (496,)
Fitting the LSTM Model on the Train Set for Volume Column of Cognizant Dataset
Epoch 1/100
31/31 [==============================] - 7s 67ms/step - loss: 0.0036
Epoch 2/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0031
Epoch 3/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0031
Epoch 4/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0030
Epoch 5/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0030
Epoch 6/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0029
Epoch 7/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0030
Epoch 8/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0028
Epoch 9/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0027
Epoch 10/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0027
Epoch 11/100
```

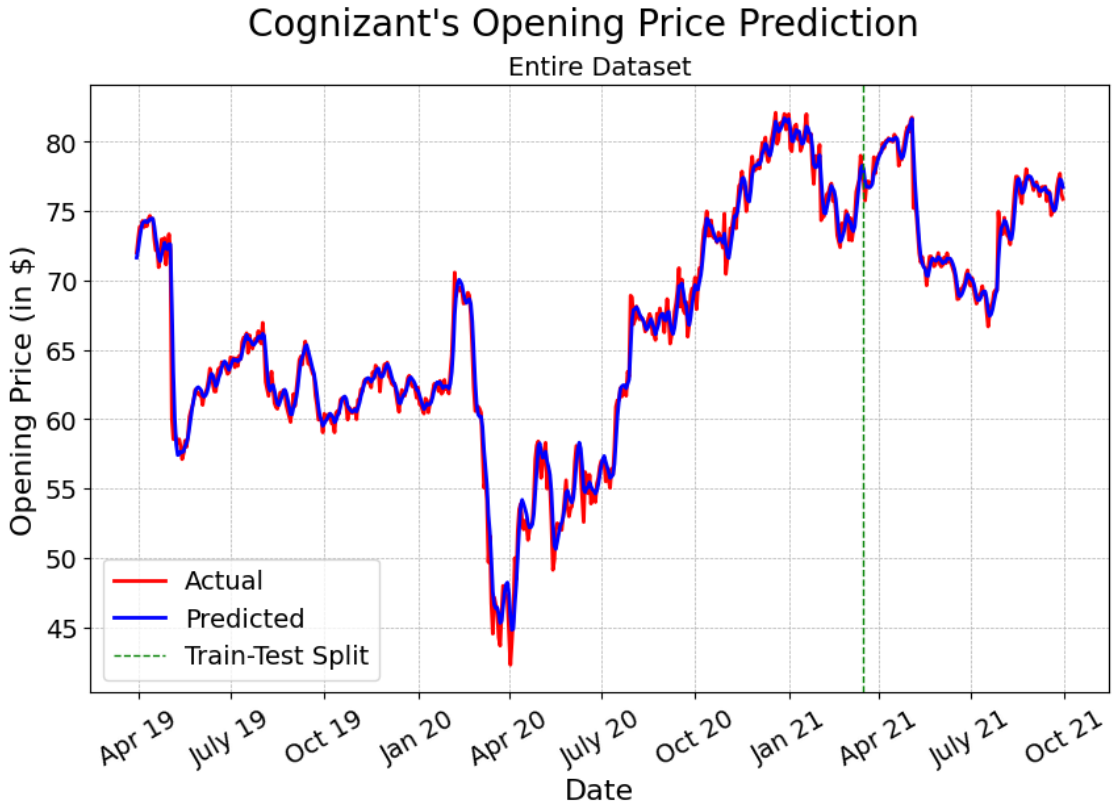
```
31/31 [==============================] - 2s 70ms/step - loss: 0.0027
Epoch 12/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0027
Epoch 13/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0028
Epoch 14/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0027
Epoch 15/100
31/31 [==============================] - 2s 68ms/step - loss: 0.0026
Epoch 16/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0026
Epoch 17/100
31/31 [==============================] - 2s 69ms/step - loss: 0.0027
Epoch 18/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 19/100
31/31 [==============================] - 2s 72ms/step - loss: 0.0027
Epoch 20/100
31/31 [==============================] - 2s 74ms/step - loss: 0.0027
Epoch 21/100
31/31 [==============================] - 2s 73ms/step - loss: 0.0027
Epoch 22/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0027
Epoch 23/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0026
Epoch 24/100
31/31 [==============================] - 2s 77ms/step - loss: 0.0026
Epoch 25/100
31/31 [==============================] - 2s 75ms/step - loss: 0.0027
Epoch 26/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 27/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 28/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0025
Epoch 29/100
31/31 [==============================] - 2s 74ms/step - loss: 0.0026
Epoch 30/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0026
Epoch 31/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0026
Epoch 32/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 33/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0026
Epoch 34/100
31/31 [==============================] - 2s 72ms/step - loss: 0.0025
Epoch 35/100
```

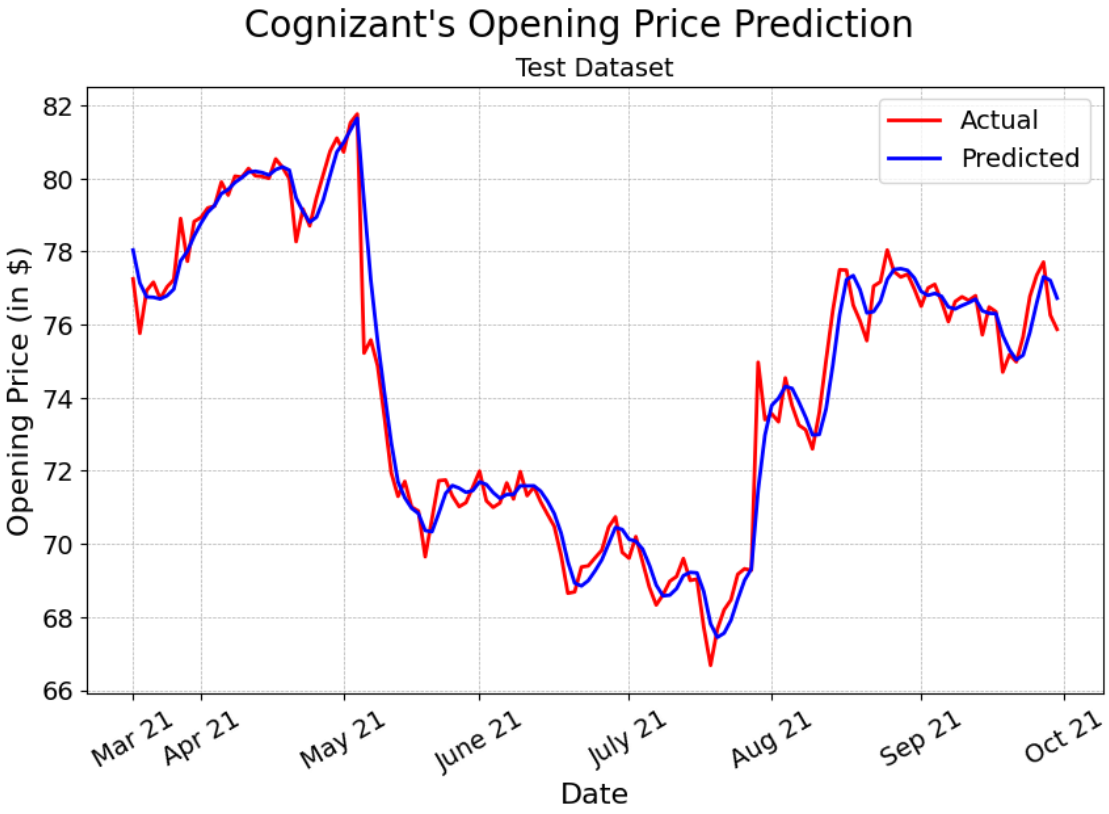
```
31/31 [==============================] - 2s 70ms/step - loss: 0.0027
Epoch 36/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 37/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 38/100
31/31 [==============================] - 2s 74ms/step - loss: 0.0025
Epoch 39/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 40/100
31/31 [==============================] - 2s 73ms/step - loss: 0.0025
Epoch 41/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 42/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0025
Epoch 43/100
31/31 [==============================] - 2s 72ms/step - loss: 0.0024
Epoch 44/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0026
Epoch 45/100
31/31 [==============================] - 2s 73ms/step - loss: 0.0024
Epoch 46/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0025
Epoch 47/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0025
Epoch 48/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 49/100
31/31 [==============================] - 2s 72ms/step - loss: 0.0024
Epoch 50/100
31/31 [==============================] - 2s 71ms/step - loss: 0.0025
Epoch 51/100
31/31 [==============================] - 2s 70ms/step - loss: 0.0026
Epoch 52/100
31/31 [==============================] - 3s 83ms/step - loss: 0.0025
Epoch 53/100
31/31 [==============================] - 3s 104ms/step - loss: 0.0024
Epoch 54/100
31/31 [==============================] - 3s 97ms/step - loss: 0.0024
Epoch 55/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0026
Epoch 56/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0025
Epoch 57/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 58/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0024
Epoch 59/100
```

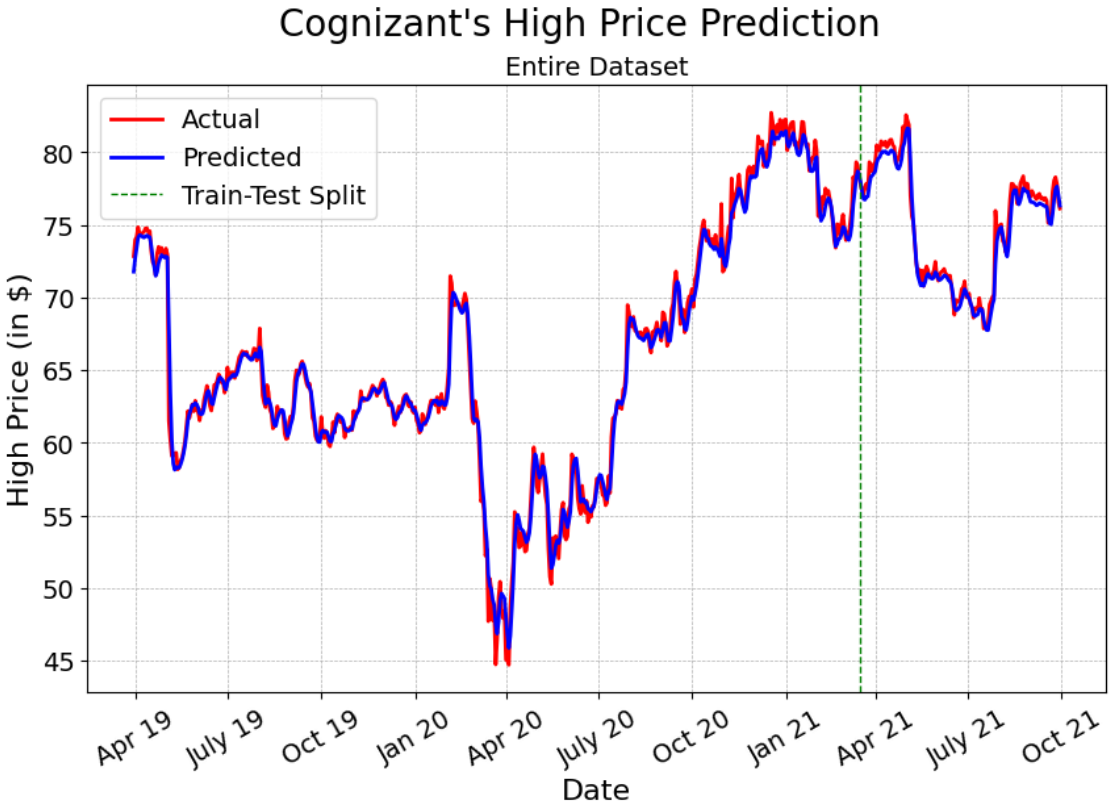
```
31/31 [==============================] - 3s 87ms/step - loss: 0.0024
Epoch 60/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0024
Epoch 61/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0024
Epoch 62/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0024
Epoch 63/100
31/31 [==============================] - 4s 122ms/step - loss: 0.0025
Epoch 64/100
31/31 [==============================] - 3s 105ms/step - loss: 0.0025
Epoch 65/100
31/31 [==============================] - 4s 118ms/step - loss: 0.0025
Epoch 66/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0024
Epoch 67/100
31/31 [==============================] - 3s 81ms/step - loss: 0.0024
Epoch 68/100
31/31 [==============================] - 2s 78ms/step - loss: 0.0024
Epoch 69/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0024
Epoch 70/100
31/31 [==============================] - 2s 74ms/step - loss: 0.0024
Epoch 71/100
31/31 [==============================] - 2s 81ms/step - loss: 0.0024
Epoch 72/100
31/31 [==============================] - 3s 113ms/step - loss: 0.0024
Epoch 73/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0024
Epoch 74/100
31/31 [==============================] - 3s 81ms/step - loss: 0.0024
Epoch 75/100
31/31 [==============================] - 3s 111ms/step - loss: 0.0024
Epoch 76/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0024
Epoch 77/100
31/31 [==============================] - 4s 115ms/step - loss: 0.0024
Epoch 78/100
31/31 [==============================] - 4s 116ms/step - loss: 0.0024
Epoch 79/100
31/31 [==============================] - 4s 122ms/step - loss: 0.0024
Epoch 80/100
31/31 [==============================] - 5s 148ms/step - loss: 0.0024
Epoch 81/100
31/31 [==============================] - 4s 129ms/step - loss: 0.0024
Epoch 82/100
31/31 [==============================] - 4s 118ms/step - loss: 0.0024
Epoch 83/100
```

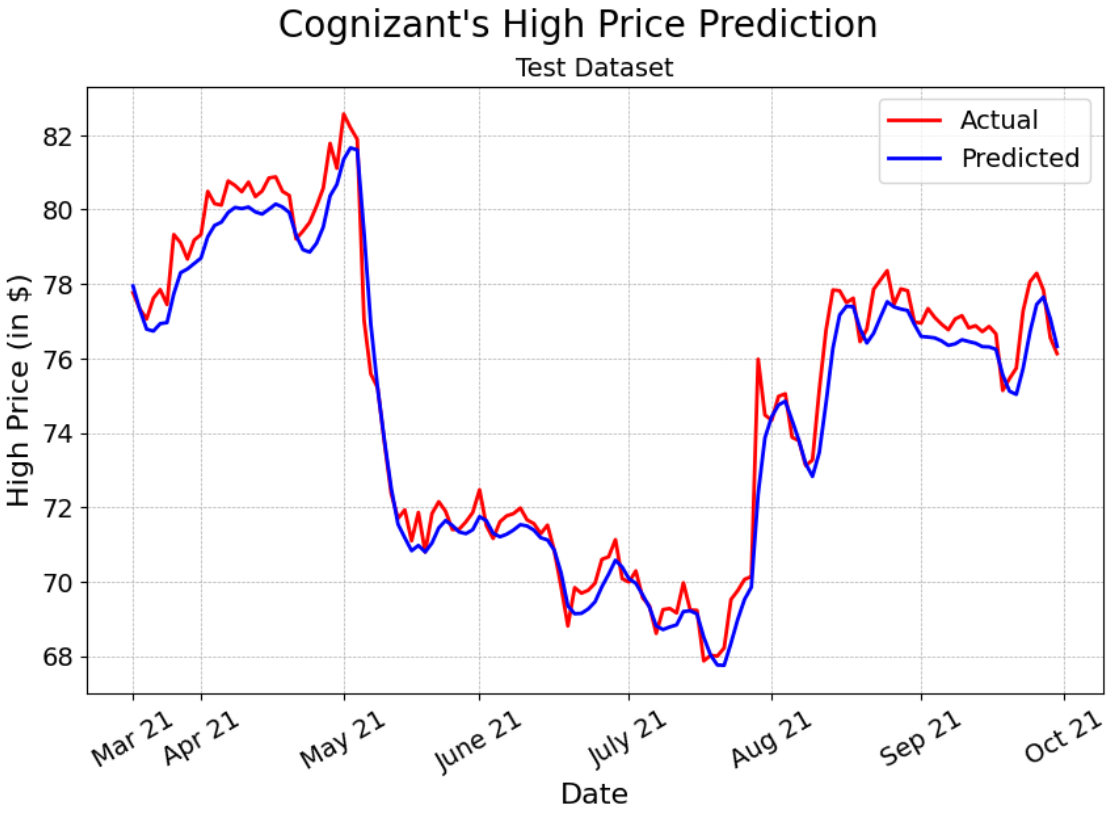
```
31/31 [==============================] - 3s 97ms/step - loss: 0.0024
Epoch 84/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0024
Epoch 85/100
31/31 [==============================] - 3s 83ms/step - loss: 0.0024
Epoch 86/100
31/31 [==============================] - 2s 79ms/step - loss: 0.0024
Epoch 87/100
31/31 [==============================] - 2s 78ms/step - loss: 0.0024
Epoch 88/100
31/31 [==============================] - 3s 82ms/step - loss: 0.0024
Epoch 89/100
31/31 [==============================] - 2s 76ms/step - loss: 0.0024
Epoch 90/100
31/31 [==============================] - 3s 81ms/step - loss: 0.0024
Epoch 91/100
31/31 [==============================] - 2s 78ms/step - loss: 0.0024
Epoch 92/100
31/31 [==============================] - 2s 77ms/step - loss: 0.0024
Epoch 93/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0023
Epoch 94/100
31/31 [==============================] - 3s 82ms/step - loss: 0.0024
Epoch 95/100
31/31 [==============================] - 2s 74ms/step - loss: 0.0023
Epoch 96/100
31/31 [==============================] - 2s 79ms/step - loss: 0.0024
Epoch 97/100
31/31 [==============================] - 2s 77ms/step - loss: 0.0024
Epoch 98/100
31/31 [==============================] - 2s 75ms/step - loss: 0.0023
Epoch 99/100
31/31 [==============================] - 2s 76ms/step - loss: 0.0024
Epoch 100/100
31/31 [==============================] - 2s 75ms/step - loss: 0.0024
Time required for fitting model: 261.2226 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 16s 57ms/step
MAE is 932672.98 units.
MSE is 3609149105777.21 sq. units.
RMSE is 1899776.07 units.
MAPE is 25.98%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 44ms/step
MAE is 955068.75 units.
MSE is 2068123894819.11 sq. units.
RMSE is 1438097.32 units.
```

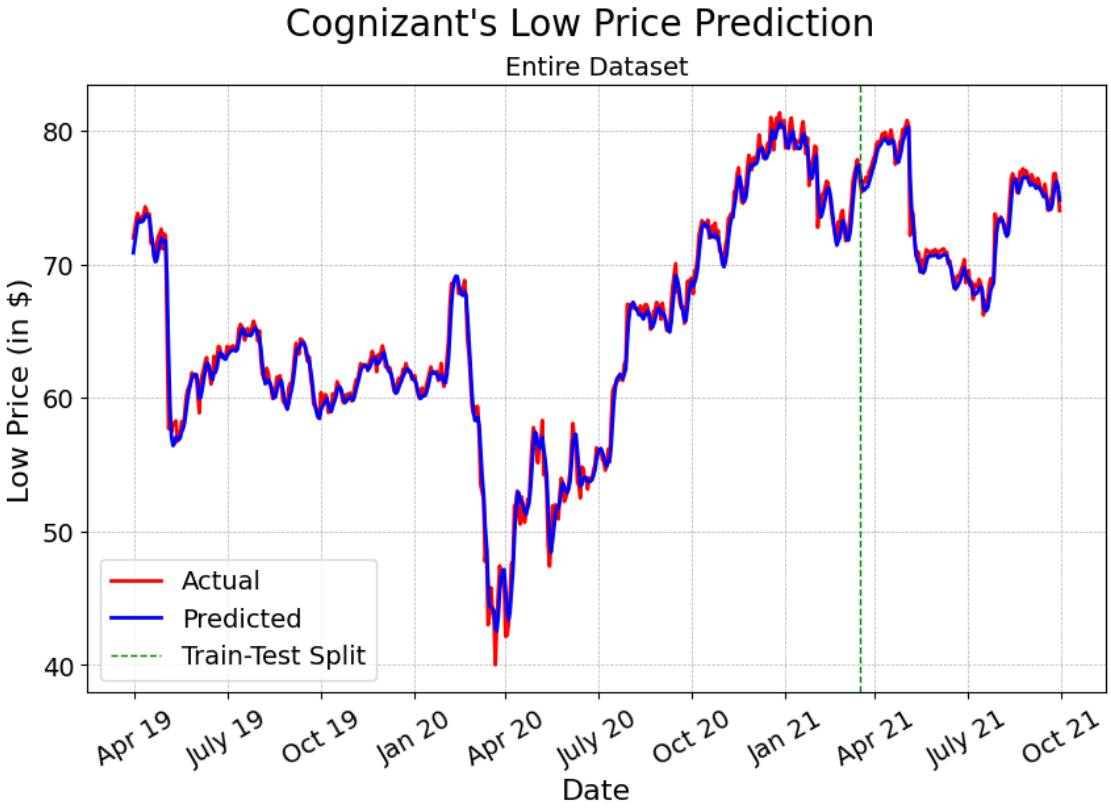
```
MAPE is 26.70%.
Shape of X: (634, 60)
Shape of Y: (634,)
20/20 [==============================] - 1s 48ms/step
5/5 [==============================] - 1s 52ms/step
```

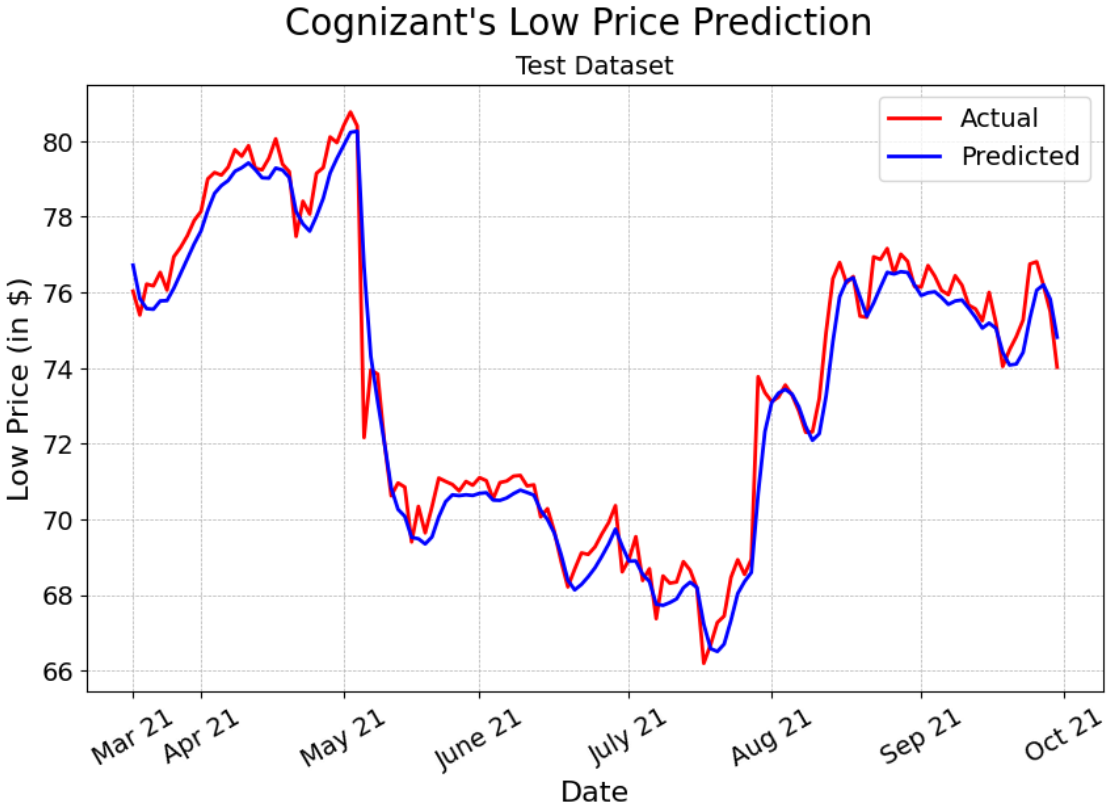


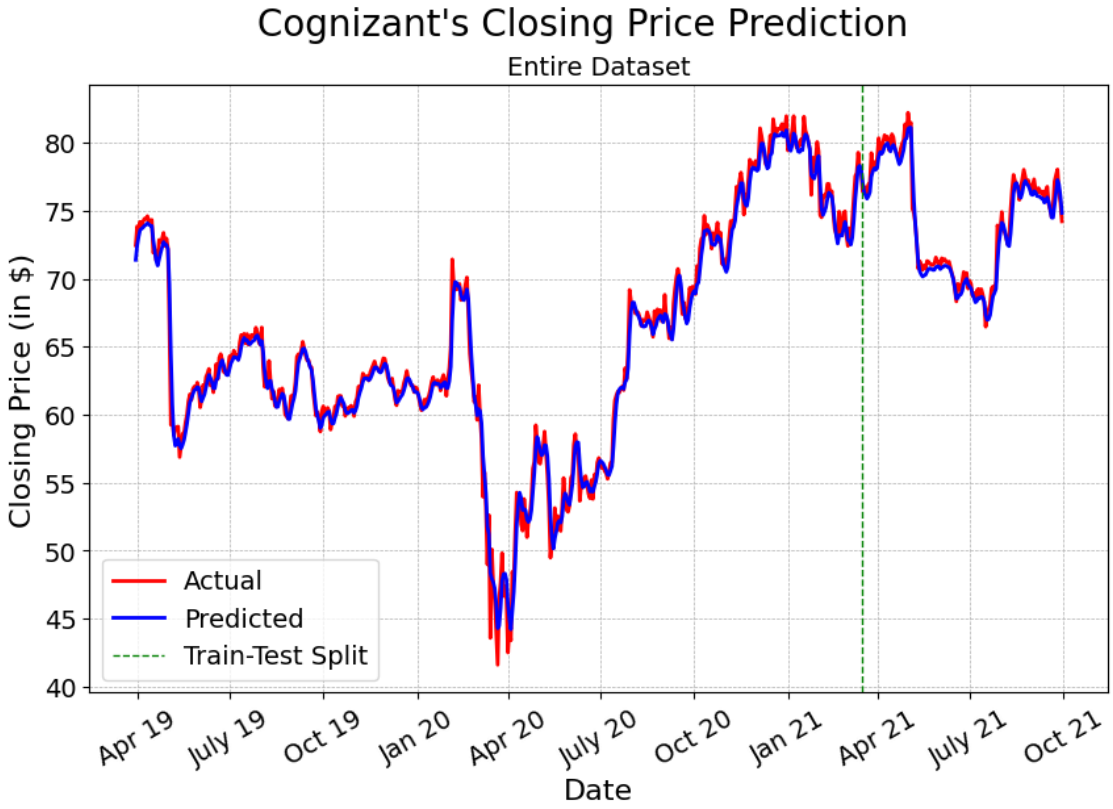

Cognizant's Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in $)
82
80
78
76
74
72
70
68
66
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

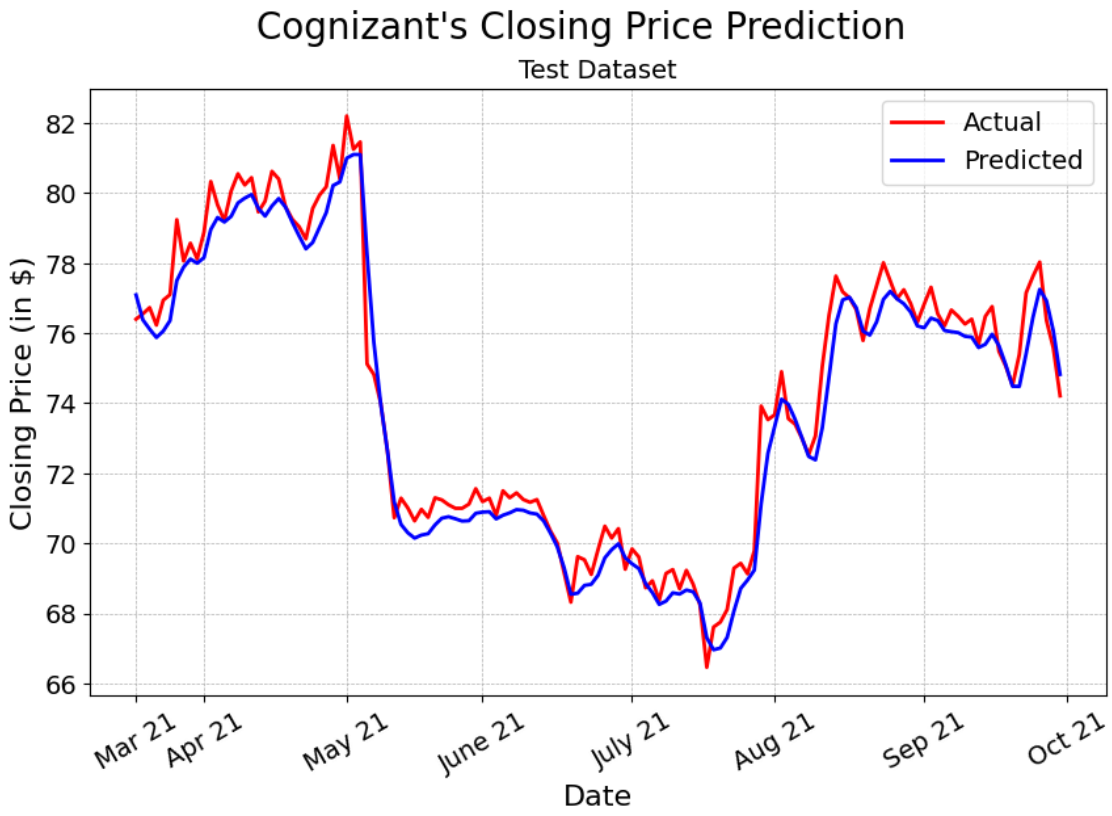

Cognizant's High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in $)
80
75
70
65
60
55
50
45
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

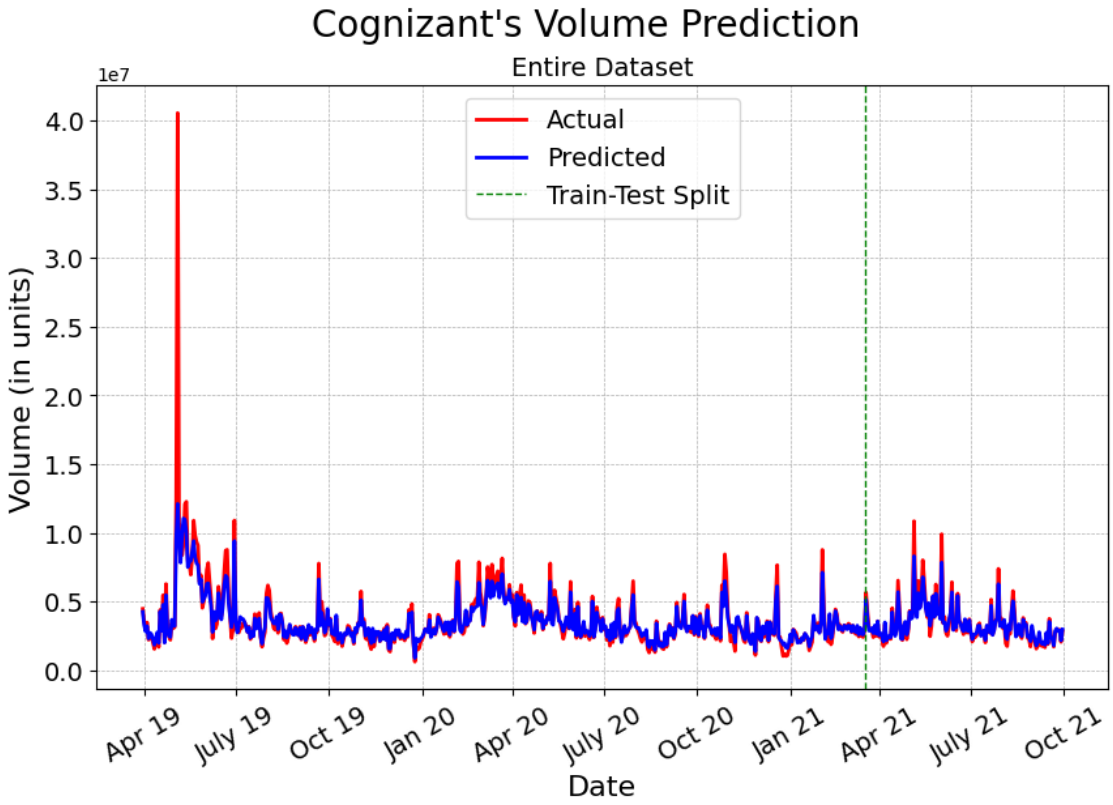

Cognizant's High Price Prediction
Test Dataset
Actual
Predicted
High Price (in $)
82
80
78
76
74
72
70
68
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

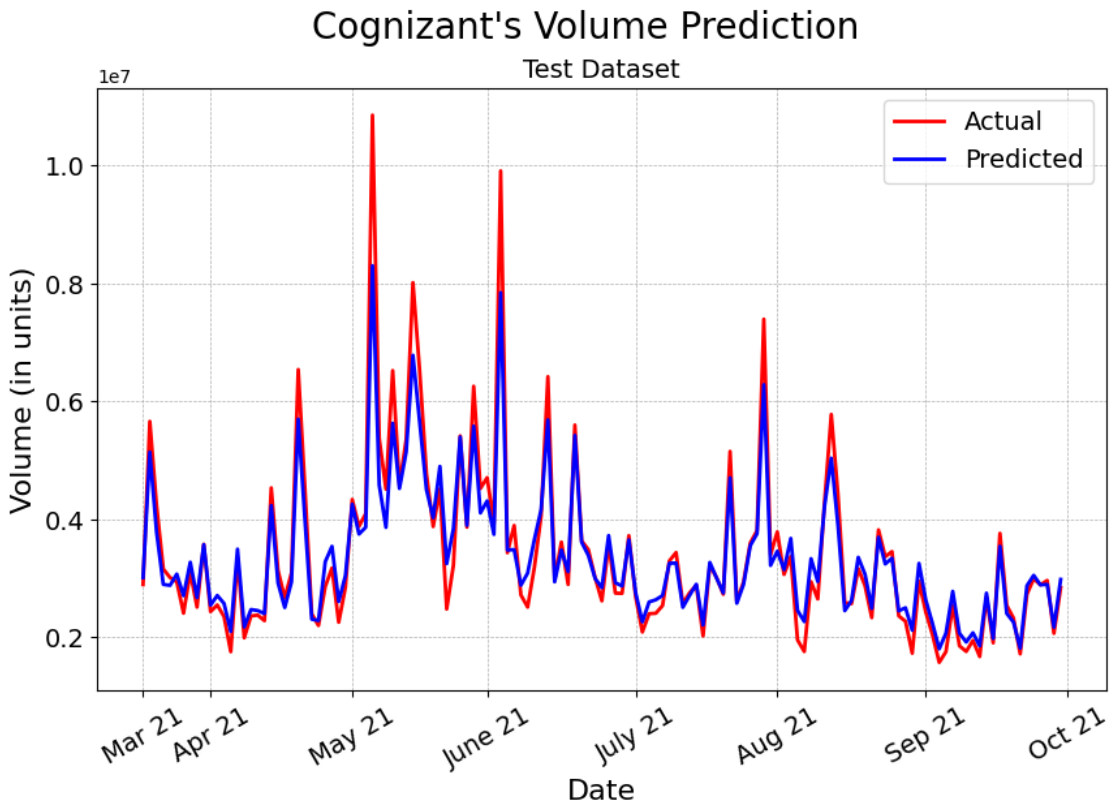

Cognizant's Low Price Prediction
Entire Dataset
Low Price (in $)
80
70
60
50
40
Actual
Predicted
Train-Test Split
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


Cognizant's Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in $)
80
78
76
74
72
70
68
66
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


Cognizant's Closing Price Prediction
Entire Dataset
Closing Price (in $)
80
75
70
65
60
55
50
45
40
Actual
Predicted
Train-Test Split
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


Cognizant's Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in $)
82
80
78
76
74
72
70
68
66
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


Cognizant's Volume Prediction
Entire Dataset
1e7
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Volume (in units)
Actual
Predicted
Train-Test Split
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date



[26]:
```
generate_predictions('HCL Technologies', interval=30, n_epochs=50, save_fig =␣
↪True) # Best
```

```
Fitting LSTM Model for Open Column of HCL Technologies Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Open Column of HCL Technologies
Dataset
Epoch 1/50
11/11 [==============================] - 5s 25ms/step - loss: 0.0302
Epoch 2/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0066
Epoch 3/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0038
Epoch 4/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0035
Epoch 5/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0030
Epoch 6/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0029
Epoch 7/50
```

```
11/11 [==============================] - 0s 23ms/step - loss: 0.0027
Epoch 8/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0025
Epoch 9/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0024
Epoch 10/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0024
Epoch 11/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0025
Epoch 12/50
11/11 [==============================] - 0s 28ms/step - loss: 0.0024
Epoch 13/50
11/11 [==============================] - 0s 27ms/step - loss: 0.0024
Epoch 14/50
11/11 [==============================] - 0s 34ms/step - loss: 0.0025
Epoch 15/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0022
Epoch 16/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0021
Epoch 17/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0020
Epoch 18/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0021
Epoch 19/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0023
Epoch 20/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0020
Epoch 21/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0019
Epoch 22/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0022
Epoch 23/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0022
Epoch 24/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0023
Epoch 25/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0020
Epoch 26/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0019
Epoch 27/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0019
Epoch 28/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0017
Epoch 29/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0017
Epoch 30/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0019
Epoch 31/50
```

```
11/11 [==============================] - 0s 25ms/step - loss: 0.0017
Epoch 32/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 33/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0018
Epoch 34/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0015
Epoch 35/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0016
Epoch 36/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 37/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0014
Epoch 38/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0016
Epoch 39/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 40/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0013
Epoch 41/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 42/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 43/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 44/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 45/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0015
Epoch 46/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 47/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0013
Epoch 48/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0016
Epoch 49/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0012
Epoch 50/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0015
Time required for fitting model: 18.3341 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 13ms/step
MAE is  13.93.
MSE is sq.  367.58.
RMSE is  19.17.
MAPE is 1.45%.
The Performance of Model on Test Set is as follows:-
```

```
2/2 [==============================] - 0s 13ms/step
MAE is  52.89.
MSE is sq.  3741.66.
RMSE is  61.17.
MAPE is 4.39%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 12ms/step
2/2 [==============================] - 0s 30ms/step

Fitting LSTM Model for High Column of HCL Technologies Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for High Column of HCL Technologies
Dataset
Epoch 1/50
11/11 [==============================] - 6s 26ms/step - loss: 0.0144
Epoch 2/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0049
Epoch 3/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0034
Epoch 4/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0033
Epoch 5/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0027
Epoch 6/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0025
Epoch 7/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0024
Epoch 8/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0023
Epoch 9/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0023
Epoch 10/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0024
Epoch 11/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0019
Epoch 12/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0020
Epoch 13/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0022
Epoch 14/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0021
Epoch 15/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0020
Epoch 16/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0019
Epoch 17/50
```

```
11/11 [==============================] - 0s 23ms/step - loss: 0.0017
Epoch 18/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0019
Epoch 19/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0019
Epoch 20/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0017
Epoch 21/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0015
Epoch 22/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0020
Epoch 23/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0017
Epoch 24/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0021
Epoch 25/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0017
Epoch 26/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 27/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0017
Epoch 28/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0016
Epoch 29/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0016
Epoch 30/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0016
Epoch 31/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 32/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0013
Epoch 33/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0014
Epoch 34/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0015
Epoch 35/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0015
Epoch 36/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0013
Epoch 37/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0014
Epoch 38/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0014
Epoch 39/50
11/11 [==============================] - 0s 27ms/step - loss: 0.0015
Epoch 40/50
11/11 [==============================] - 0s 29ms/step - loss: 0.0012
Epoch 41/50
```

```
11/11 [==============================] - 0s 25ms/step - loss: 0.0014
Epoch 42/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0015
Epoch 43/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0013
Epoch 44/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0015
Epoch 45/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0010
Epoch 46/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0014
Epoch 47/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0011
Epoch 48/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0014
Epoch 49/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0011
Epoch 50/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0014
Time required for fitting model: 19.5759 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 9ms/step
MAE is  13.15.
MSE is sq.  316.51.
RMSE is  17.79.
MAPE is 1.36%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 16ms/step
MAE is  37.94.
MSE is sq.  2074.80.
RMSE is  45.55.
MAPE is 3.11%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 14ms/step
2/2 [==============================] - 0s 17ms/step

Fitting LSTM Model for Low Column of HCL Technologies Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Low Column of HCL Technologies
Dataset
Epoch 1/50
11/11 [==============================] - 4s 21ms/step - loss: 0.0284
Epoch 2/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0061
Epoch 3/50
```

```
11/11 [==============================] - 0s 25ms/step - loss: 0.0037
Epoch 4/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0033
Epoch 5/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0029
Epoch 6/50
11/11 [==============================] - 0s 37ms/step - loss: 0.0029
Epoch 7/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0026
Epoch 8/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0024
Epoch 9/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0024
Epoch 10/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0025
Epoch 11/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0024
Epoch 12/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0023
Epoch 13/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0024
Epoch 14/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0023
Epoch 15/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0022
Epoch 16/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0022
Epoch 17/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0020
Epoch 18/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0022
Epoch 19/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0022
Epoch 20/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0020
Epoch 21/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0019
Epoch 22/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0022
Epoch 23/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0021
Epoch 24/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0024
Epoch 25/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0020
Epoch 26/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0018
Epoch 27/50
```

```
11/11 [==============================] - 0s 22ms/step - loss: 0.0020
Epoch 28/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0017
Epoch 29/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0018
Epoch 30/50
11/11 [==============================] - 0s 20ms/step - loss: 0.0019
Epoch 31/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0016
Epoch 32/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 33/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 34/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0015
Epoch 35/50
11/11 [==============================] - 0s 20ms/step - loss: 0.0018
Epoch 36/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 37/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 38/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0016
Epoch 39/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0017
Epoch 40/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0014
Epoch 41/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0014
Epoch 42/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0013
Epoch 43/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0016
Epoch 44/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0015
Epoch 45/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0013
Epoch 46/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0014
Epoch 47/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0013
Epoch 48/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0014
Epoch 49/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0014
Epoch 50/50
11/11 [==============================] - 0s 20ms/step - loss: 0.0015
Time required for fitting model: 16.7617 seconds.
```

```
The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 13ms/step
MAE is  13.53.
MSE is sq.  329.85.
RMSE is  18.16.
MAPE is 1.44%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 11ms/step
MAE is  43.55.
MSE is sq.  2563.22.
RMSE is  50.63.
MAPE is 3.66%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 13ms/step
2/2 [==============================] - 0s 11ms/step

Fitting LSTM Model for Close Column of HCL Technologies Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Close Column of HCL Technologies
Dataset
Epoch 1/50
11/11 [==============================] - 9s 23ms/step - loss: 0.0271
Epoch 2/50
11/11 [==============================] - 0s 21ms/step - loss: 0.0065
Epoch 3/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0045
Epoch 4/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0039
Epoch 5/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0033
Epoch 6/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0031
Epoch 7/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0029
Epoch 8/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0026
Epoch 9/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0028
Epoch 10/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0027
Epoch 11/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0026
Epoch 12/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0026
Epoch 13/50
```

```
11/11 [==============================] - 0s 23ms/step - loss: 0.0025
Epoch 14/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0026
Epoch 15/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0022
Epoch 16/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0022
Epoch 17/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0022
Epoch 18/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0023
Epoch 19/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0022
Epoch 20/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0022
Epoch 21/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0021
Epoch 22/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0024
Epoch 23/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0022
Epoch 24/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0024
Epoch 25/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0021
Epoch 26/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0016
Epoch 27/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0020
Epoch 28/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0021
Epoch 29/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0019
Epoch 30/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0019
Epoch 31/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0017
Epoch 32/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0018
Epoch 33/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0018
Epoch 34/50
11/11 [==============================] - 1s 61ms/step - loss: 0.0017
Epoch 35/50
11/11 [==============================] - 0s 43ms/step - loss: 0.0018
Epoch 36/50
11/11 [==============================] - 0s 27ms/step - loss: 0.0015
Epoch 37/50
```

```
11/11 [==============================] - 0s 24ms/step - loss: 0.0017
Epoch 38/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0016
Epoch 39/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0019
Epoch 40/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0015
Epoch 41/50
11/11 [==============================] - 0s 24ms/step - loss: 0.0015
Epoch 42/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 43/50
11/11 [==============================] - 0s 25ms/step - loss: 0.0015
Epoch 44/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0015
Epoch 45/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 46/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0015
Epoch 47/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0014
Epoch 48/50
11/11 [==============================] - 0s 26ms/step - loss: 0.0014
Epoch 49/50
11/11 [==============================] - 0s 23ms/step - loss: 0.0016
Epoch 50/50
11/11 [==============================] - 0s 22ms/step - loss: 0.0016
Time required for fitting model: 23.1939 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 11ms/step
MAE is  14.44.
MSE is sq.  383.26.
RMSE is  19.58.
MAPE is 1.52%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 0s/step
MAE is  40.88.
MSE is sq.  2301.67.
RMSE is  47.98.
MAPE is 3.40%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 12ms/step
2/2 [==============================] - 0s 12ms/step

Fitting LSTM Model for Volume Column of HCL Technologies Dataset
Shape of X_train: (170, 30)
```

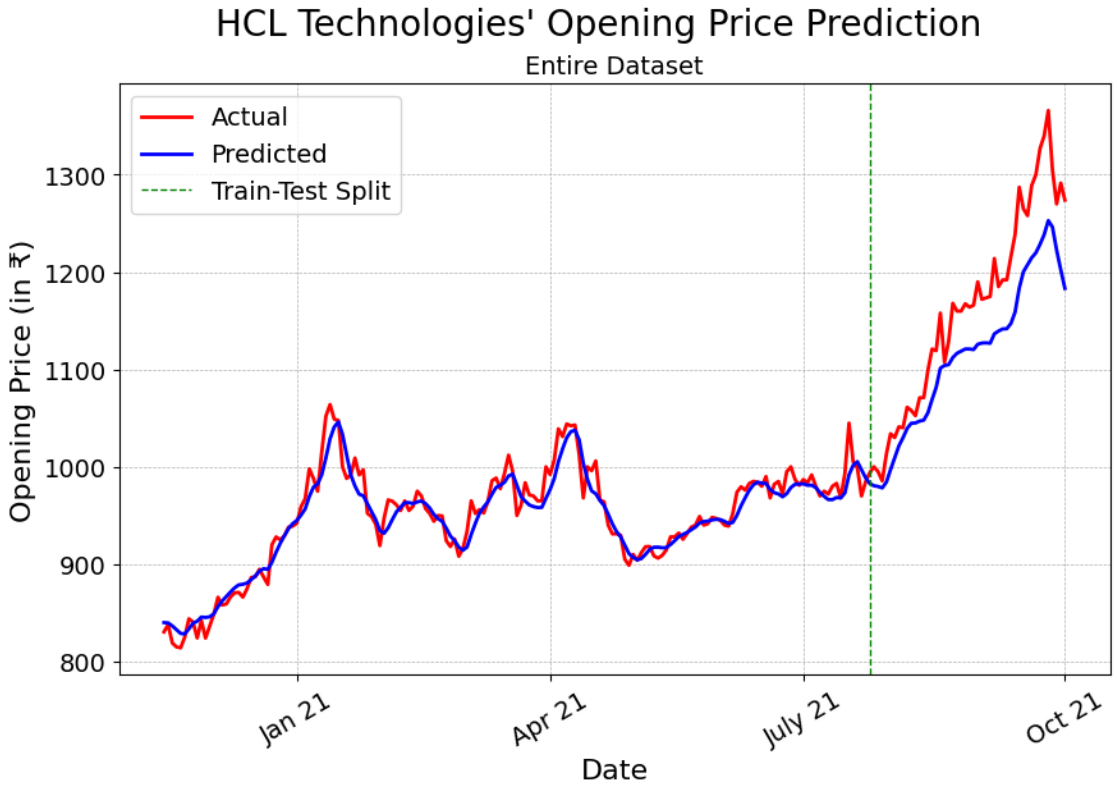
```
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Volume Column of HCL Technologies
Dataset
Epoch 1/100
11/11 [==============================] - 3s 23ms/step - loss: 0.0237
Epoch 2/100
11/11 [==============================] - 0s 27ms/step - loss: 0.0108
Epoch 3/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0105
Epoch 4/100
11/11 [==============================] - 0s 41ms/step - loss: 0.0102
Epoch 5/100
11/11 [==============================] - 0s 42ms/step - loss: 0.0103
Epoch 6/100
11/11 [==============================] - 0s 32ms/step - loss: 0.0100
Epoch 7/100
11/11 [==============================] - 0s 26ms/step - loss: 0.0099
Epoch 8/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0099
Epoch 9/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0098
Epoch 10/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0098
Epoch 11/100
11/11 [==============================] - 0s 25ms/step - loss: 0.0098
Epoch 12/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0098
Epoch 13/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0097
Epoch 14/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0095
Epoch 15/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0096
Epoch 16/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0095
Epoch 17/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0095
Epoch 18/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0095
Epoch 19/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0094
Epoch 20/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0094
Epoch 21/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0095
Epoch 22/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0094
Epoch 23/100
```

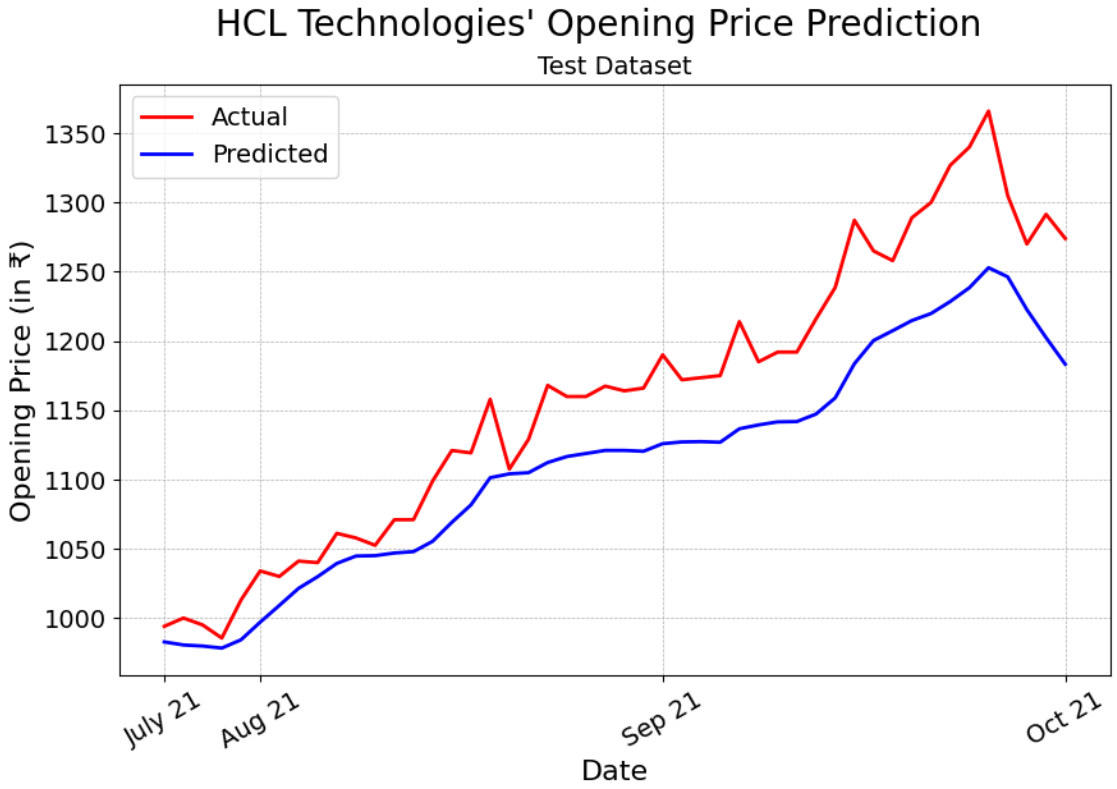
```
11/11 [==============================] - 0s 24ms/step - loss: 0.0098
Epoch 24/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0097
Epoch 25/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0092
Epoch 26/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0093
Epoch 27/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0092
Epoch 28/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0093
Epoch 29/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0092
Epoch 30/100
11/11 [==============================] - 0s 26ms/step - loss: 0.0091
Epoch 31/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0092
Epoch 32/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 33/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0092
Epoch 34/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 35/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0092
Epoch 36/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 37/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0090
Epoch 38/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0091
Epoch 39/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 40/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0090
Epoch 41/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0091
Epoch 42/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 43/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0091
Epoch 44/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 45/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0090
Epoch 46/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 47/100
```

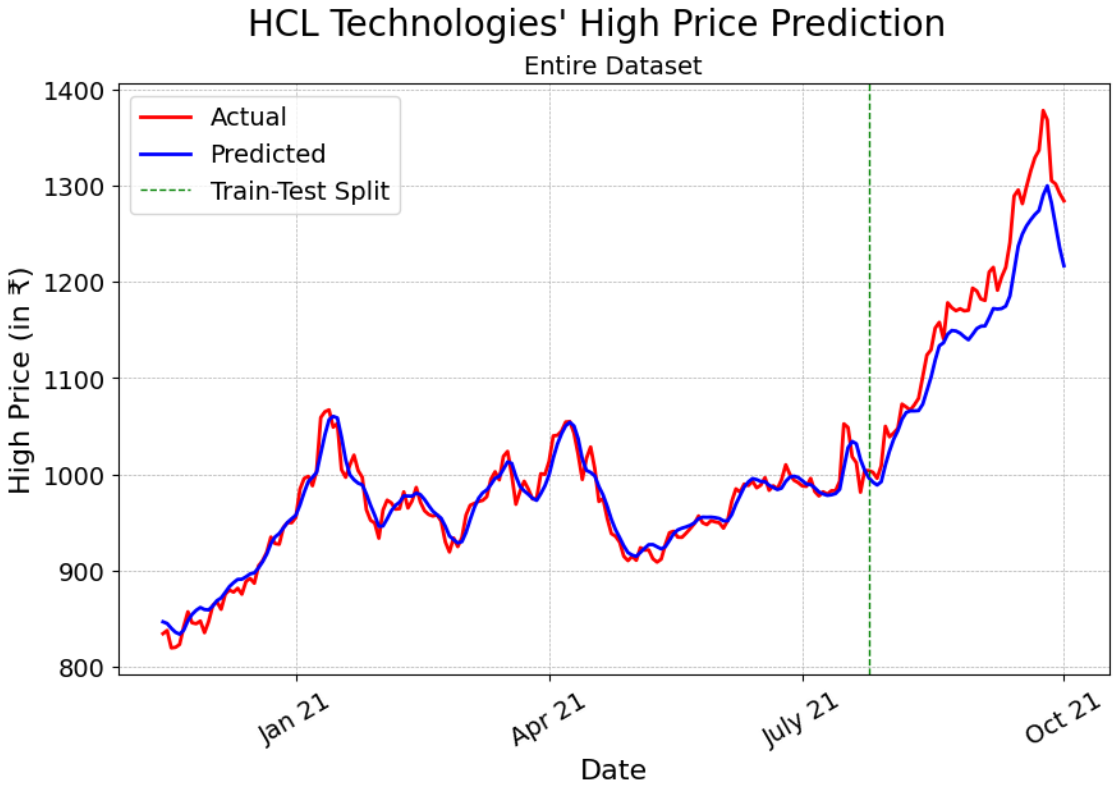
```
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 48/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 49/100
11/11 [==============================] - 0s 25ms/step - loss: 0.0091
Epoch 50/100
11/11 [==============================] - 0s 25ms/step - loss: 0.0091
Epoch 51/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0090
Epoch 52/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0091
Epoch 53/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 54/100
11/11 [==============================] - 0s 21ms/step - loss: 0.0091
Epoch 55/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0095
Epoch 56/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0090
Epoch 57/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0092
Epoch 58/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0091
Epoch 59/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 60/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0090
Epoch 61/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0090
Epoch 62/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0090
Epoch 63/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0090
Epoch 64/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 65/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 66/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 67/100
11/11 [==============================] - 0s 25ms/step - loss: 0.0089
Epoch 68/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0089
Epoch 69/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0091
Epoch 70/100
11/11 [==============================] - 0s 21ms/step - loss: 0.0089
Epoch 71/100
```

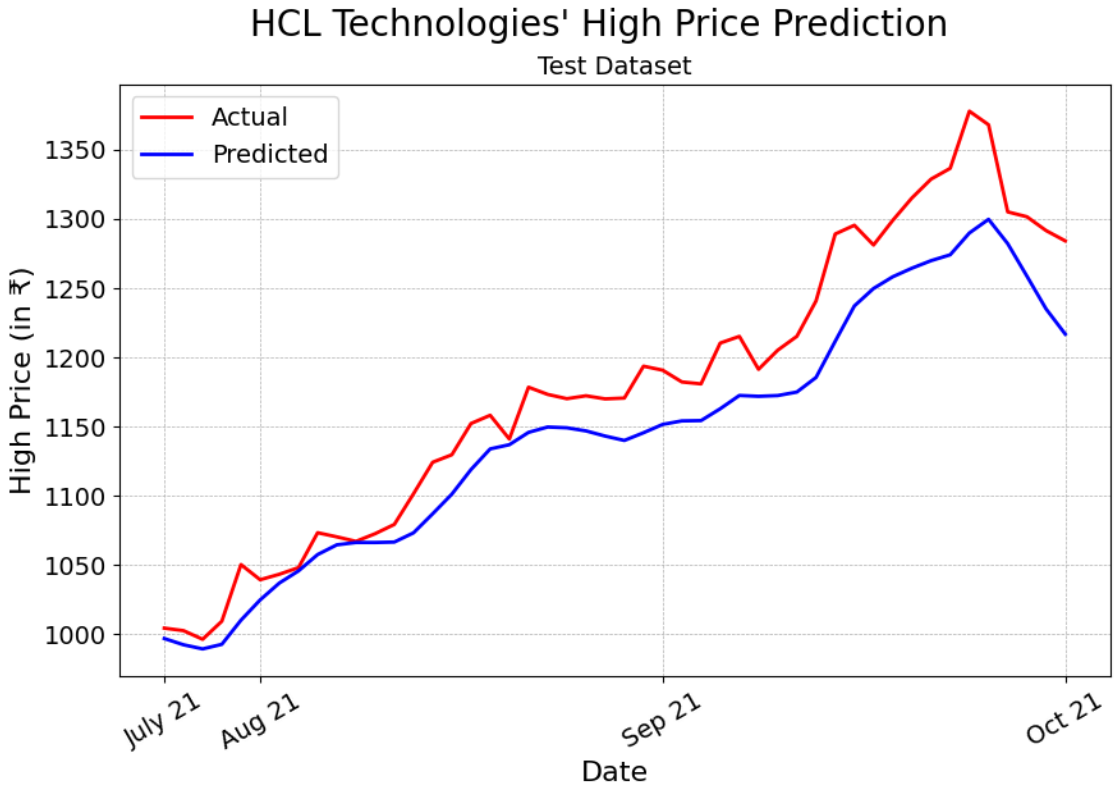
```
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 72/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0092
Epoch 73/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0093
Epoch 74/100
11/11 [==============================] - 0s 25ms/step - loss: 0.0089
Epoch 75/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 76/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 77/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 78/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 79/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 80/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 81/100
11/11 [==============================] - 0s 21ms/step - loss: 0.0089
Epoch 82/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0088
Epoch 83/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 84/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0090
Epoch 85/100
11/11 [==============================] - 0s 21ms/step - loss: 0.0089
Epoch 86/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 87/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0089
Epoch 88/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 89/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0089
Epoch 90/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0088
Epoch 91/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 92/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 93/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0090
Epoch 94/100
11/11 [==============================] - 0s 24ms/step - loss: 0.0088
Epoch 95/100
```

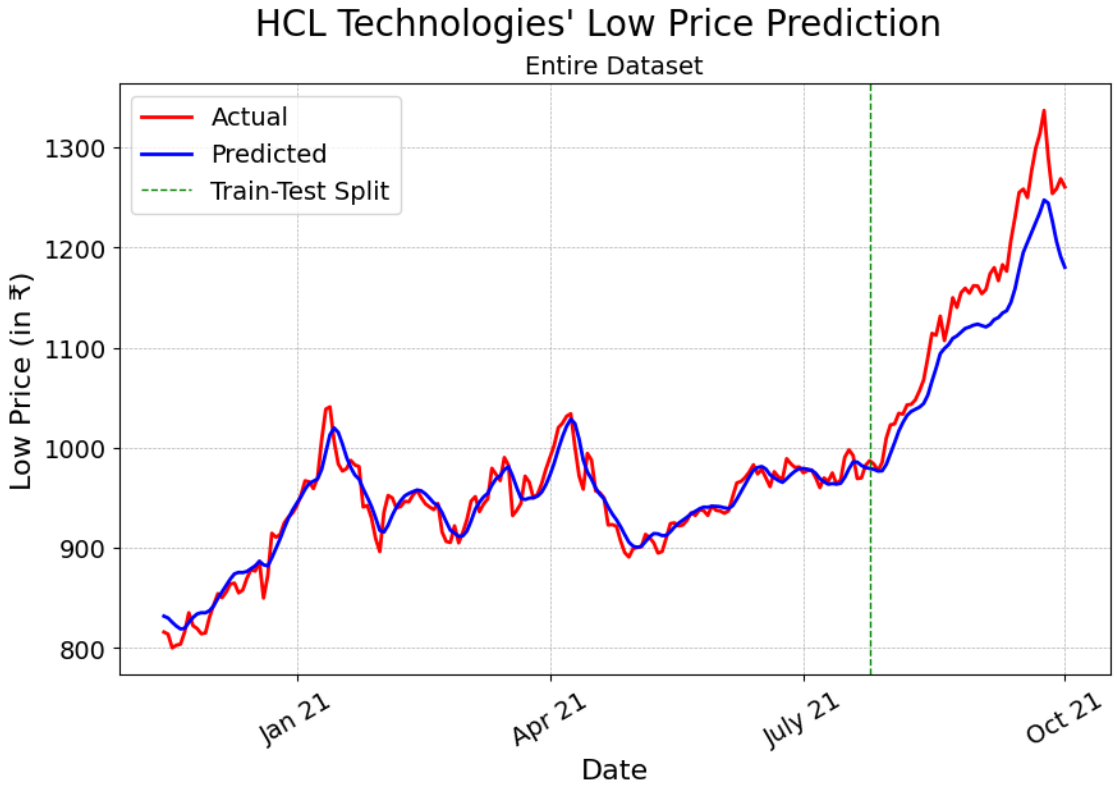
```
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 96/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Epoch 97/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0088
Epoch 98/100
11/11 [==============================] - 0s 22ms/step - loss: 0.0088
Epoch 99/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0088
Epoch 100/100
11/11 [==============================] - 0s 23ms/step - loss: 0.0089
Time required for fitting model: 30.0640 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 11ms/step
MAE is 1736479.83 units.
MSE is 6567445249193.04 sq. units.
RMSE is 2562702.72 units.
MAPE is 32.20%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 16ms/step
MAE is 1814105.74 units.
MSE is 4980999776250.12 sq. units.
RMSE is 2231815.35 units.
MAPE is 43.79%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 14ms/step
2/2 [==============================] - 0s 11ms/step
```

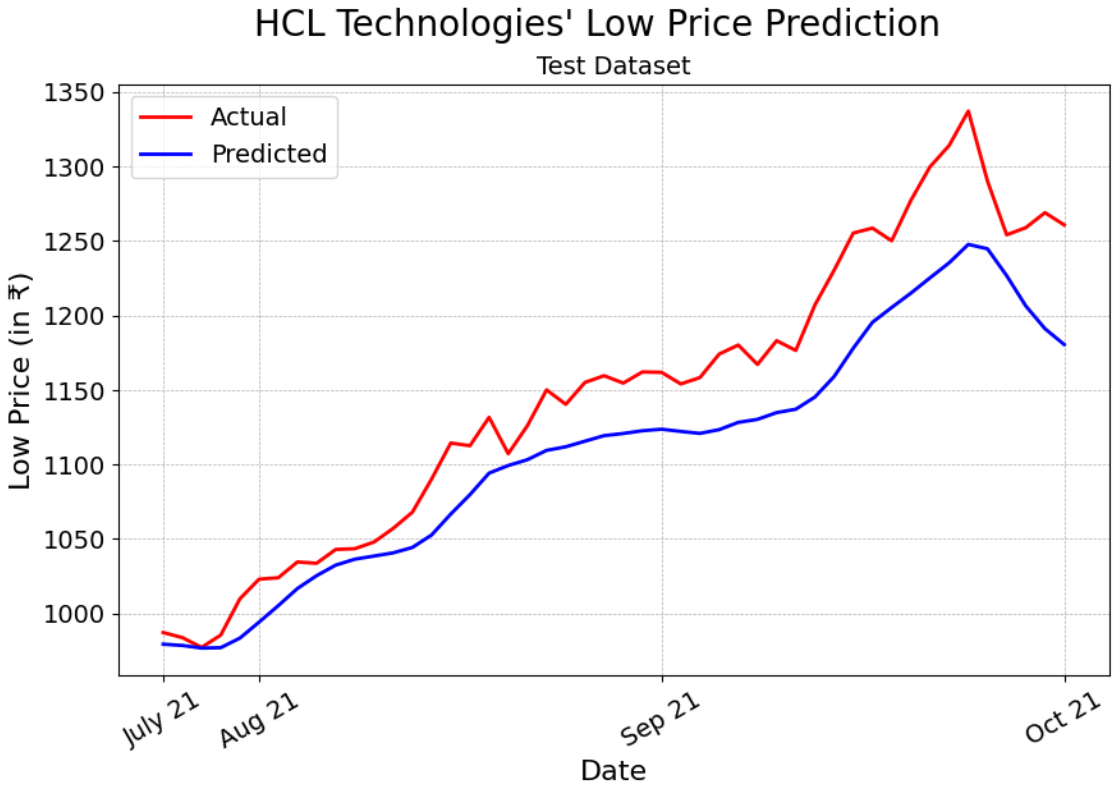

HCL Technologies' Opening Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Opening Price (in ₹)
1300
1200
1100
1000
900
800
Jan 21
Apr 21
July 21
Oct 21
Date

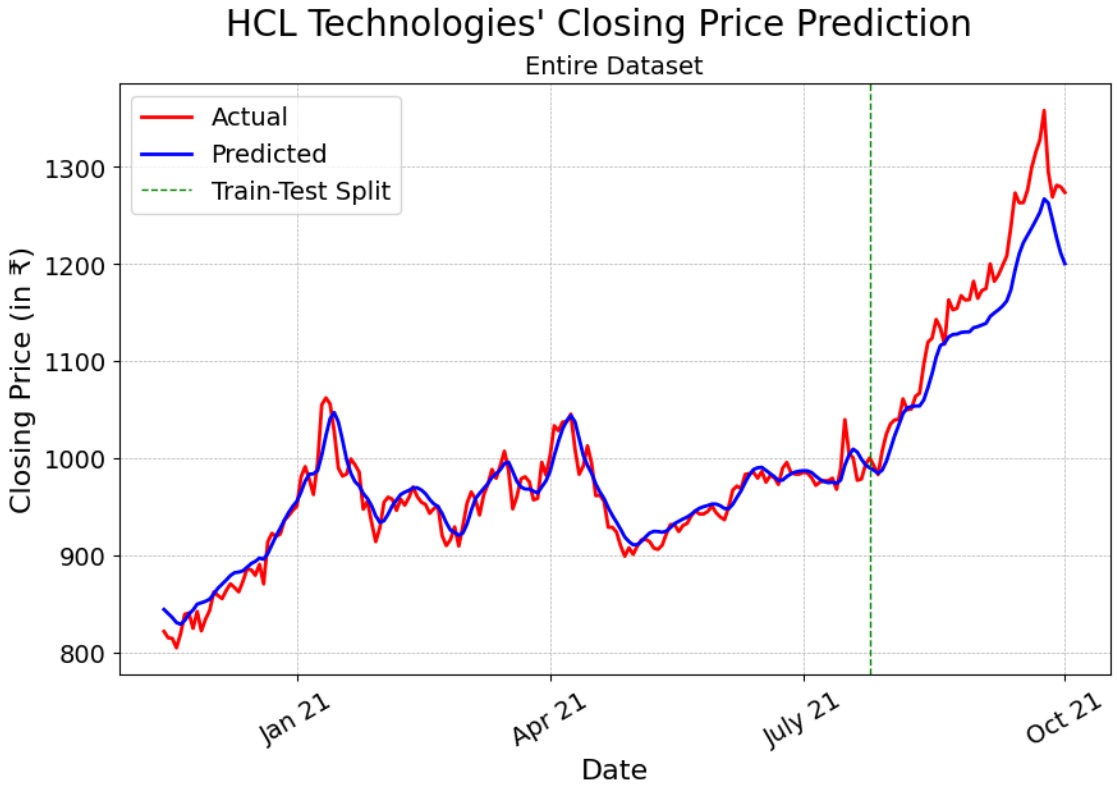

HCL Technologies' Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
1350
1300
1250
1200
1150
1100
1050
1000
July 21
Aug 21
Sep 21
Oct 21
Date

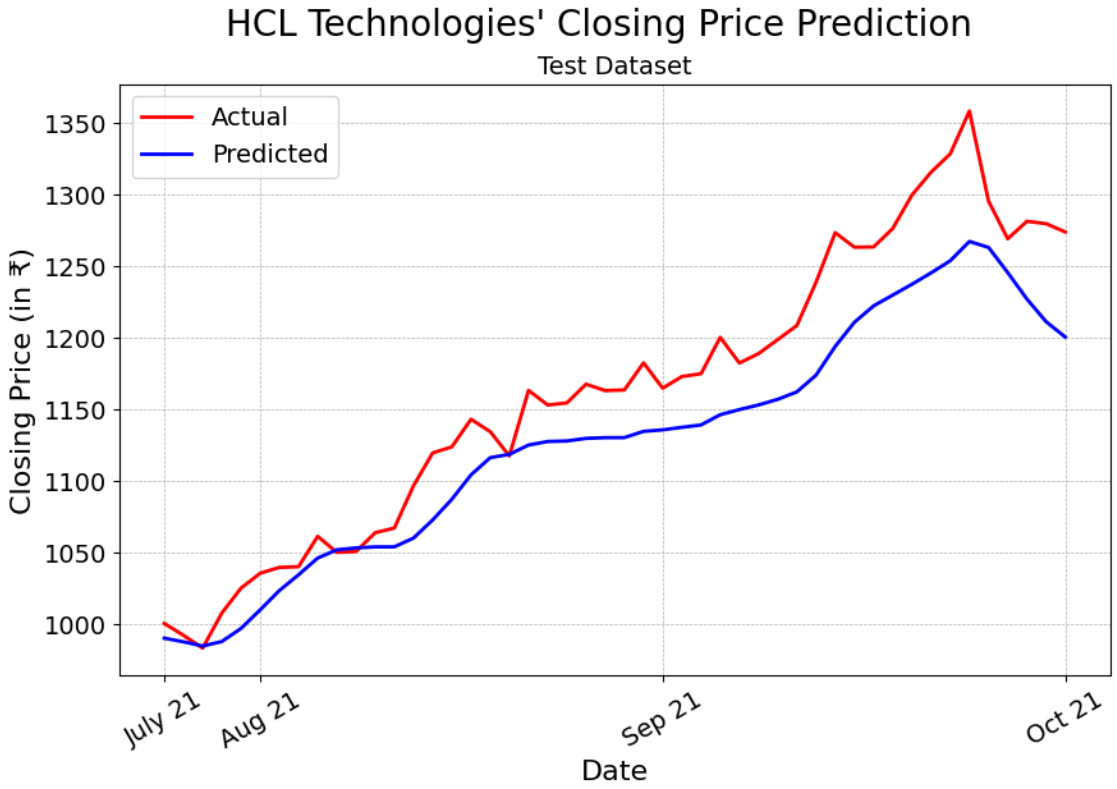

HCL Technologies' High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
1400
1300
1200
1100
1000
900
800
Jan 21
Apr 21
July 21
Oct 21
Date

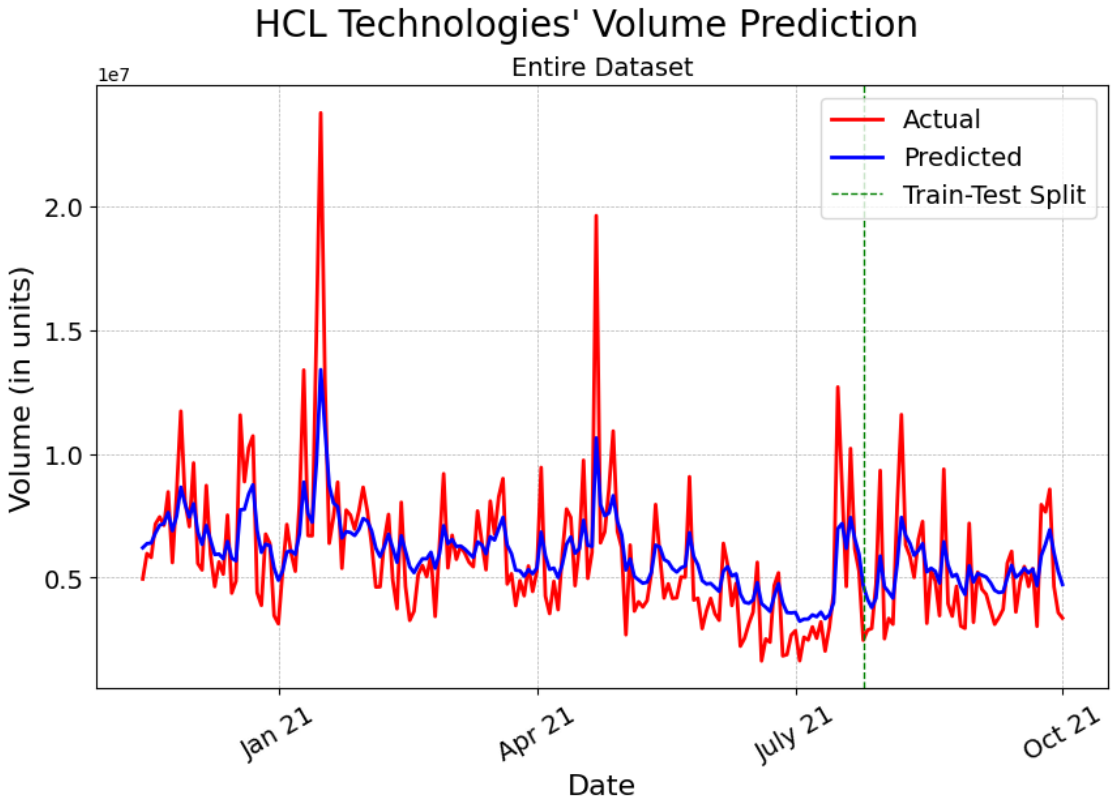

HCL Technologies' High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
1350
1300
1250
1200
1150
1100
1050
1000
July 21
Aug 21
Sep 21
Oct 21
Date

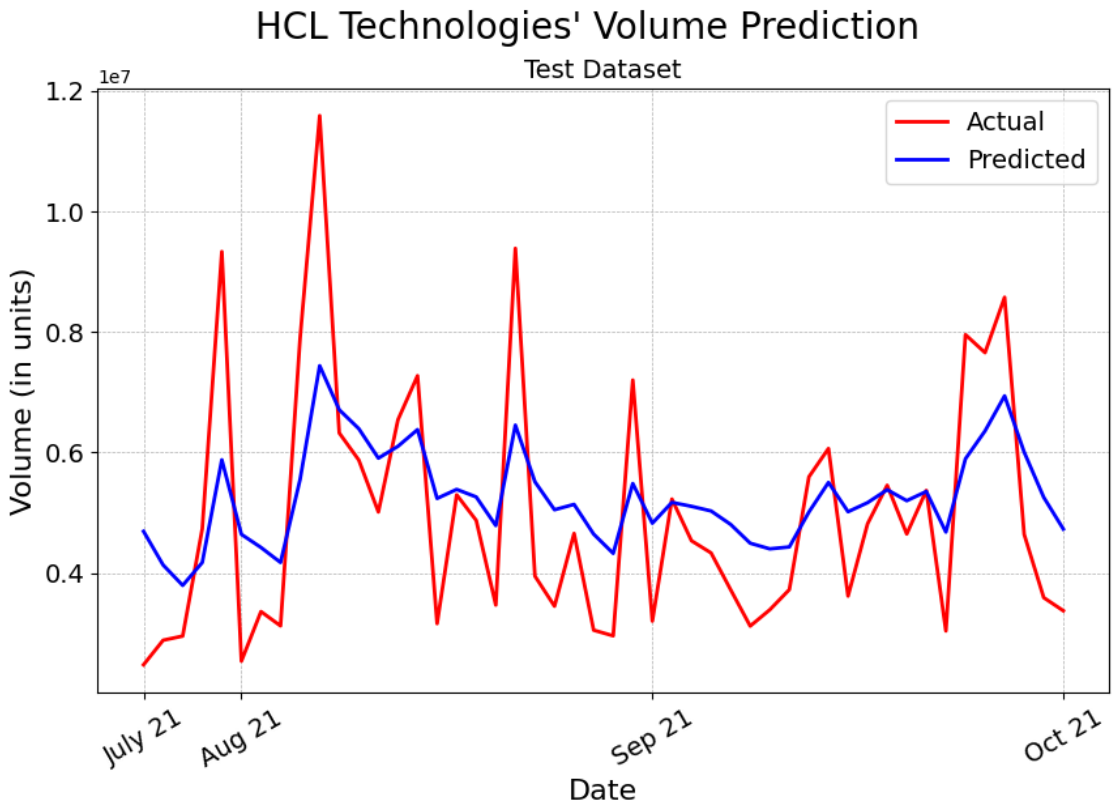

HCL Technologies' Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
1300
1200
1100
1000
900
800
Jan 21
Apr 21
July 21
Oct 21
Date


HCL Technologies' Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
1350
1300
1250
1200
1150
1100
1050
1000
July 21
Aug 21
Sep 21
Oct 21
Date


HCL Technologies' Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
1300
1200
1100
1000
900
800
Jan 21
Apr 21
July 21
Oct 21
Date


HCL Technologies' Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
1350
1300
1250
1200
1150
1100
1050
1000
July 21
Aug 21
Sep 21
Oct 21
Date


HCL Technologies' Volume Prediction
Entire Dataset
1e7
Actual
Predicted
Train-Test Split
Volume (in units)
2.0
1.5
1.0
0.5
Jan 21
Apr 21
July 21
Oct 21
Date



[28]:
```
generate_predictions('ICICI Bank', save_fig = True)
```

```
31/31 [==============================] - 3s 92ms/step - loss: 0.0013
Epoch 40/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0015
Epoch 41/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0014
Epoch 42/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0014
Epoch 43/50
31/31 [==============================] - 3s 97ms/step - loss: 0.0013
Epoch 44/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0013
Epoch 45/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0013
Epoch 46/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0014
Epoch 47/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0015
Epoch 48/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0012
Epoch 49/50
```

```
31/31 [==============================] - 3s 95ms/step - loss: 0.0012
Epoch 50/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0012
Time required for fitting model: 155.8481 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 3s 52ms/step
MAE is  10.04.
MSE is sq.  193.72.
RMSE is  13.92.
MAPE is 2.37%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 55ms/step
MAE is  13.36.
MSE is sq.  262.58.
RMSE is  16.20.
MAPE is 2.07%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 62ms/step
5/5 [==============================] - 0s 42ms/step

Fitting LSTM Model for High Column of ICICI Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for High Column of ICICI Bank Dataset
Epoch 1/50
31/31 [==============================] - 10s 90ms/step - loss: 0.0255
Epoch 2/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0050
Epoch 3/50
31/31 [==============================] - 3s 81ms/step - loss: 0.0040
Epoch 4/50
31/31 [==============================] - 3s 84ms/step - loss: 0.0031
Epoch 5/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0032
Epoch 6/50
31/31 [==============================] - 6s 181ms/step - loss: 0.0030
Epoch 7/50
31/31 [==============================] - 5s 153ms/step - loss: 0.0036
Epoch 8/50
31/31 [==============================] - 4s 140ms/step - loss: 0.0026
Epoch 9/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0027
Epoch 10/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0027
Epoch 11/50
31/31 [==============================] - 4s 138ms/step - loss: 0.0024
```

```
Epoch 12/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0024
Epoch 13/50
31/31 [==============================] - 3s 107ms/step - loss: 0.0024
Epoch 14/50
31/31 [==============================] - 4s 140ms/step - loss: 0.0023
Epoch 15/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0025
Epoch 16/50
31/31 [==============================] - 3s 107ms/step - loss: 0.0022
Epoch 17/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0020
Epoch 18/50
31/31 [==============================] - 4s 130ms/step - loss: 0.0022
Epoch 19/50
31/31 [==============================] - 3s 102ms/step - loss: 0.0019
Epoch 20/50
31/31 [==============================] - 3s 107ms/step - loss: 0.0019
Epoch 21/50
31/31 [==============================] - 3s 102ms/step - loss: 0.0020
Epoch 22/50
31/31 [==============================] - 3s 97ms/step - loss: 0.0017
Epoch 23/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0017
Epoch 24/50
31/31 [==============================] - 4s 116ms/step - loss: 0.0019
Epoch 25/50
31/31 [==============================] - 6s 187ms/step - loss: 0.0017
Epoch 26/50
31/31 [==============================] - 7s 227ms/step - loss: 0.0018
Epoch 27/50
31/31 [==============================] - 5s 146ms/step - loss: 0.0016
Epoch 28/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0015
Epoch 29/50
31/31 [==============================] - 3s 102ms/step - loss: 0.0016
Epoch 30/50
31/31 [==============================] - 4s 136ms/step - loss: 0.0015
Epoch 31/50
31/31 [==============================] - 3s 104ms/step - loss: 0.0015
Epoch 32/50
31/31 [==============================] - 3s 99ms/step - loss: 0.0015
Epoch 33/50
31/31 [==============================] - 3s 104ms/step - loss: 0.0014
Epoch 34/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0014
Epoch 35/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0018
```

```
Epoch 36/50
31/31 [==============================] - 3s 102ms/step - loss: 0.0016
Epoch 37/50
31/31 [==============================] - 5s 162ms/step - loss: 0.0015
Epoch 38/50
31/31 [==============================] - 4s 133ms/step - loss: 0.0014
Epoch 39/50
31/31 [==============================] - 3s 104ms/step - loss: 0.0014
Epoch 40/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0015
Epoch 41/50
31/31 [==============================] - 4s 118ms/step - loss: 0.0015
Epoch 42/50
31/31 [==============================] - 4s 146ms/step - loss: 0.0013
Epoch 43/50
31/31 [==============================] - 4s 120ms/step - loss: 0.0012
Epoch 44/50
31/31 [==============================] - 3s 111ms/step - loss: 0.0013
Epoch 45/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0014
Epoch 46/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0014
Epoch 47/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0014
Epoch 48/50
31/31 [==============================] - 4s 119ms/step - loss: 0.0013
Epoch 49/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0012
Epoch 50/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0012
Time required for fitting model: 190.1050 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 5s 70ms/step
MAE is  9.35.
MSE is sq.  168.78.
RMSE is  12.99.
MAPE is 2.18%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 62ms/step
MAE is  9.37.
MSE is sq.  132.92.
RMSE is  11.53.
MAPE is 1.44%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 61ms/step
5/5 [==============================] - 0s 92ms/step
```

```
Fitting LSTM Model for Low Column of ICICI Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Low Column of ICICI Bank Dataset
Epoch 1/50
31/31 [==============================] - 14s 105ms/step - loss: 0.0266
Epoch 2/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0056
Epoch 3/50
31/31 [==============================] - 3s 101ms/step - loss: 0.0042
Epoch 4/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0034
Epoch 5/50
31/31 [==============================] - 3s 104ms/step - loss: 0.0033
Epoch 6/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0028
Epoch 7/50
31/31 [==============================] - 3s 101ms/step - loss: 0.0036
Epoch 8/50
31/31 [==============================] - 3s 100ms/step - loss: 0.0028
Epoch 9/50
31/31 [==============================] - 3s 100ms/step - loss: 0.0026
Epoch 10/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0023
Epoch 11/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0024
Epoch 12/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0021
Epoch 13/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0024
Epoch 14/50
31/31 [==============================] - 3s 111ms/step - loss: 0.0023
Epoch 15/50
31/31 [==============================] - 4s 113ms/step - loss: 0.0021
Epoch 16/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0020
Epoch 17/50
31/31 [==============================] - 4s 129ms/step - loss: 0.0022
Epoch 18/50
31/31 [==============================] - 4s 113ms/step - loss: 0.0023
Epoch 19/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0021
Epoch 20/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0017
Epoch 21/50
31/31 [==============================] - 4s 120ms/step - loss: 0.0019
Epoch 22/50
```

```
31/31 [==============================] - 3s 107ms/step - loss: 0.0017
Epoch 23/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0017
Epoch 24/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0018
Epoch 25/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0017
Epoch 26/50
31/31 [==============================] - 4s 124ms/step - loss: 0.0018
Epoch 27/50
31/31 [==============================] - 4s 118ms/step - loss: 0.0015
Epoch 28/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0017
Epoch 29/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0015
Epoch 30/50
31/31 [==============================] - 4s 114ms/step - loss: 0.0014
Epoch 31/50
31/31 [==============================] - 4s 118ms/step - loss: 0.0015
Epoch 32/50
31/31 [==============================] - 4s 121ms/step - loss: 0.0014
Epoch 33/50
31/31 [==============================] - 3s 111ms/step - loss: 0.0014
Epoch 34/50
31/31 [==============================] - 3s 111ms/step - loss: 0.0012
Epoch 35/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0015
Epoch 36/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0016
Epoch 37/50
31/31 [==============================] - 3s 110ms/step - loss: 0.0014
Epoch 38/50
31/31 [==============================] - 3s 102ms/step - loss: 0.0014
Epoch 39/50
31/31 [==============================] - 3s 108ms/step - loss: 0.0014
Epoch 40/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0015
Epoch 41/50
31/31 [==============================] - 4s 113ms/step - loss: 0.0015
Epoch 42/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0012
Epoch 43/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0013
Epoch 44/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0013
Epoch 45/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0014
Epoch 46/50
```

```
31/31 [==============================] - 4s 117ms/step - loss: 0.0013
Epoch 47/50
31/31 [==============================] - 3s 111ms/step - loss: 0.0013
Epoch 48/50
31/31 [==============================] - 4s 114ms/step - loss: 0.0012
Epoch 49/50
31/31 [==============================] - 4s 114ms/step - loss: 0.0011
Epoch 50/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0012
Time required for fitting model: 182.0872 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 4s 85ms/step
MAE is  9.23.
MSE is sq.  165.20.
RMSE is  12.85.
MAPE is 2.25%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 1s 96ms/step
MAE is  9.95.
MSE is sq.  144.43.
RMSE is  12.02.
MAPE is 1.58%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 2s 122ms/step
31/31 [==============================] - 5s 156ms/step - loss: 0.0022
Epoch 18/50
31/31 [==============================] - 7s 221ms/step - loss: 0.0022
Epoch 19/50
31/31 [==============================] - 5s 154ms/step - loss: 0.0019
Epoch 20/50
31/31 [==============================] - 4s 124ms/step - loss: 0.0019
Epoch 21/50
31/31 [==============================] - 4s 116ms/step - loss: 0.0019
Epoch 22/50
31/31 [==============================] - 4s 117ms/step - loss: 0.0017
Epoch 23/50
31/31 [==============================] - 3s 112ms/step - loss: 0.0017
Epoch 24/50
31/31 [==============================] - 6s 194ms/step - loss: 0.0018
Epoch 25/50
31/31 [==============================] - 6s 202ms/step - loss: 0.0018
Epoch 26/50
31/31 [==============================] - 7s 241ms/step - loss: 0.0019
Epoch 27/50
31/31 [==============================] - 4s 113ms/step - loss: 0.0015
Epoch 28/50
```

```
31/31 [==============================] - 4s 144ms/step - loss: 0.0016
Epoch 29/50
31/31 [==============================] - 6s 196ms/step - loss: 0.0015
Epoch 30/50
31/31 [==============================] - 5s 176ms/step - loss: 0.0016
Epoch 31/50
31/31 [==============================] - 5s 165ms/step - loss: 0.0015
Epoch 32/50
31/31 [==============================] - 4s 127ms/step - loss: 0.0014
Epoch 33/50
31/31 [==============================] - 4s 126ms/step - loss: 0.0016
Epoch 34/50
31/31 [==============================] - 4s 119ms/step - loss: 0.0014
Epoch 35/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0018
Epoch 36/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0018
Epoch 37/50
31/31 [==============================] - 4s 121ms/step - loss: 0.0015
Epoch 38/50
31/31 [==============================] - 4s 128ms/step - loss: 0.0014
Epoch 39/50
31/31 [==============================] - 4s 126ms/step - loss: 0.0014
Epoch 40/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0015
Epoch 41/50
31/31 [==============================] - 4s 130ms/step - loss: 0.0015
Epoch 42/50
31/31 [==============================] - 5s 158ms/step - loss: 0.0013
Epoch 43/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0013
Epoch 44/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0014
Epoch 45/50
31/31 [==============================] - 4s 127ms/step - loss: 0.0015
Epoch 46/50
31/31 [==============================] - 4s 134ms/step - loss: 0.0014
Epoch 47/50
31/31 [==============================] - 4s 136ms/step - loss: 0.0014
Epoch 48/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0012
Epoch 49/50
31/31 [==============================] - 5s 159ms/step - loss: 0.0012
Epoch 50/50
31/31 [==============================] - 6s 180ms/step - loss: 0.0014
Time required for fitting model: 264.4789 seconds.

The Performance of Model on Train Set is as follows:-
```

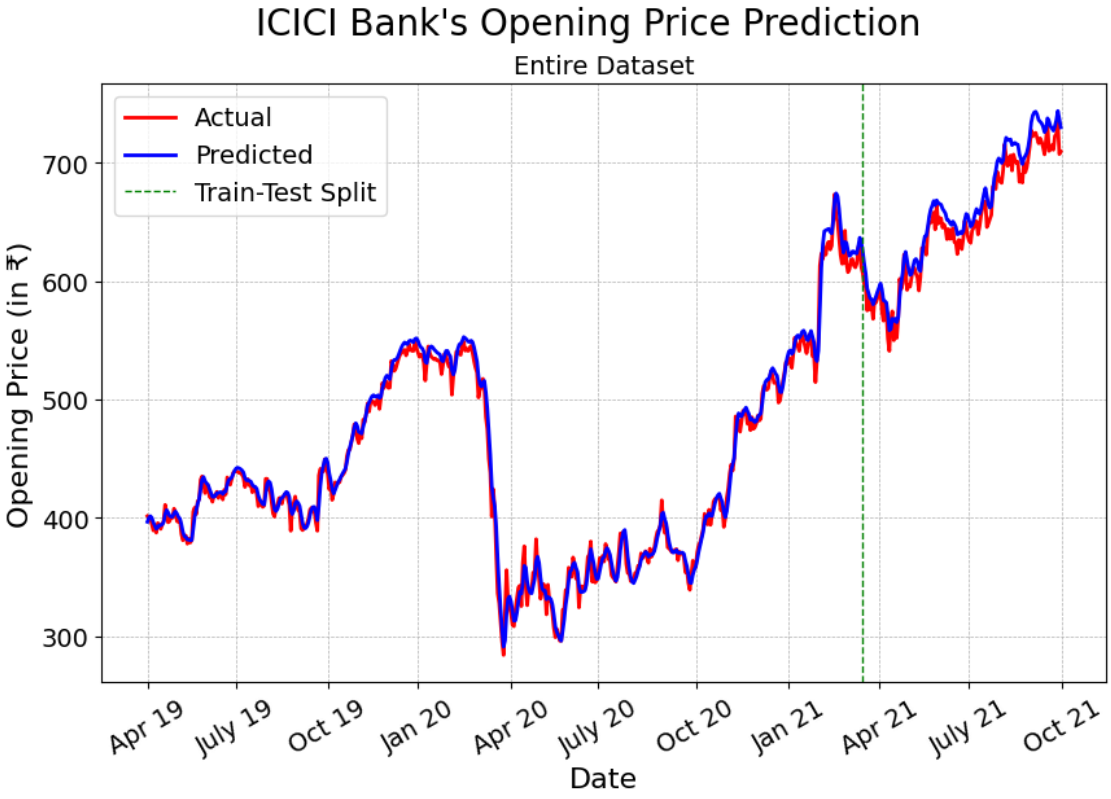
```
16/16 [==============================] - 6s 79ms/step
MAE is  10.19.
MSE is sq.  197.11.
RMSE is  14.04.
MAPE is 2.43%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 70ms/step
MAE is  9.60.
MSE is sq.  139.12.
RMSE is  11.79.
MAPE is 1.50%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 2s 80ms/step
5/5 [==============================] - 0s 75ms/step

Fitting LSTM Model for Volume Column of ICICI Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Volume Column of ICICI Bank Dataset
Epoch 1/100
31/31 [==============================] - 16s 121ms/step - loss: 0.0050
Epoch 2/100
31/31 [==============================] - 5s 163ms/step - loss: 0.0039
Epoch 3/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0040
Epoch 4/100
31/31 [==============================] - 4s 129ms/step - loss: 0.0039
Epoch 5/100
31/31 [==============================] - 4s 123ms/step - loss: 0.0038
Epoch 6/100
31/31 [==============================] - 4s 120ms/step - loss: 0.0037
Epoch 7/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0039
Epoch 8/100
31/31 [==============================] - 4s 122ms/step - loss: 0.0040
Epoch 9/100
31/31 [==============================] - 3s 111ms/step - loss: 0.0038
Epoch 10/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0038
Epoch 11/100
31/31 [==============================] - 5s 174ms/step - loss: 0.0039
Epoch 12/100
31/31 [==============================] - 5s 154ms/step - loss: 0.0038
Epoch 13/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0038
Epoch 14/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0039
```

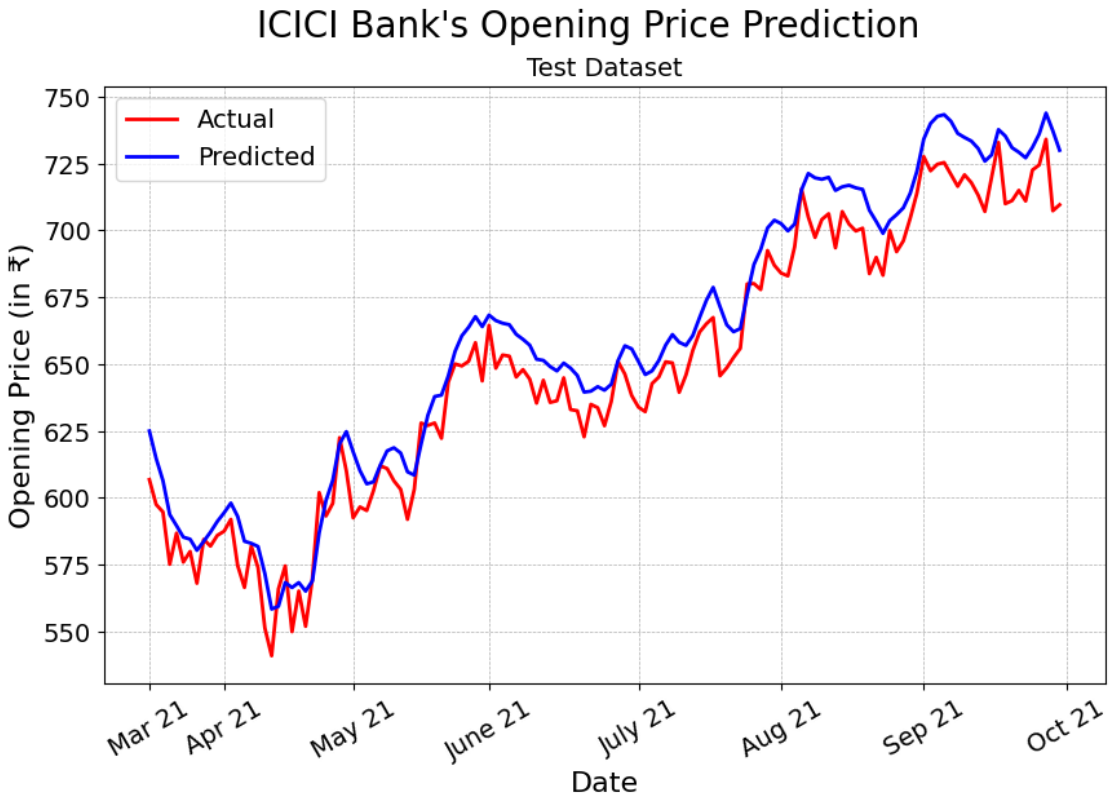
```
Epoch 15/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0039
Epoch 16/100
31/31 [==============================] - 4s 131ms/step - loss: 0.0037
Epoch 17/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0039
Epoch 18/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0037
Epoch 19/100
31/31 [==============================] - 5s 175ms/step - loss: 0.0037
Epoch 20/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0039
Epoch 21/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0038
Epoch 22/100
31/31 [==============================] - 4s 137ms/step - loss: 0.0038
Epoch 23/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0037
Epoch 24/100
31/31 [==============================] - 4s 117ms/step - loss: 0.0037
Epoch 25/100
31/31 [==============================] - 3s 112ms/step - loss: 0.0037
Epoch 26/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0037
Epoch 27/100
31/31 [==============================] - 5s 148ms/step - loss: 0.0038
Epoch 28/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0036
Epoch 29/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0036
Epoch 30/100
31/31 [==============================] - 4s 123ms/step - loss: 0.0036
Epoch 31/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0037
Epoch 32/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0037
Epoch 33/100
31/31 [==============================] - 4s 135ms/step - loss: 0.0037
Epoch 34/100
31/31 [==============================] - 4s 139ms/step - loss: 0.0039
Epoch 35/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0036
Epoch 36/100
31/31 [==============================] - 4s 142ms/step - loss: 0.0038
Epoch 37/100
31/31 [==============================] - 5s 145ms/step - loss: 0.0036
Epoch 38/100
31/31 [==============================] - 5s 149ms/step - loss: 0.0037
```

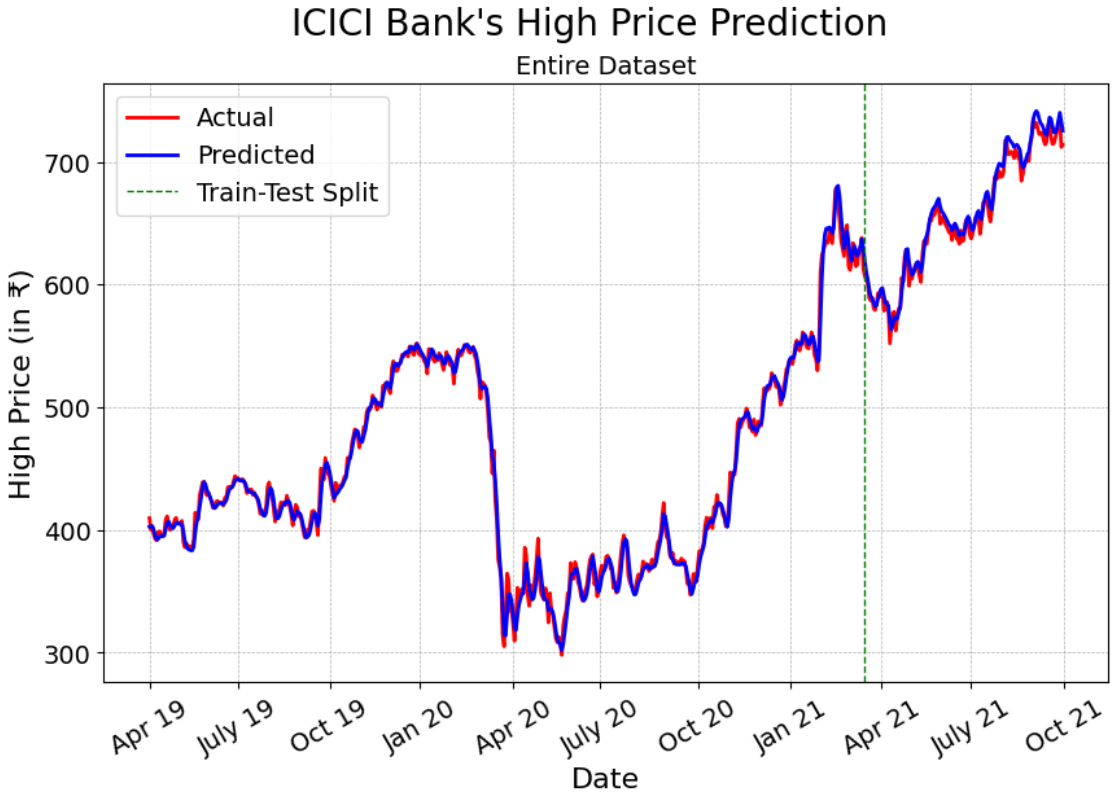
```
Epoch 39/100
31/31 [==============================] - 4s 136ms/step - loss: 0.0038
Epoch 40/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0036
Epoch 41/100
31/31 [==============================] - 4s 139ms/step - loss: 0.0037
Epoch 42/100
31/31 [==============================] - 5s 147ms/step - loss: 0.0036
Epoch 43/100
31/31 [==============================] - 5s 147ms/step - loss: 0.0036
Epoch 44/100
31/31 [==============================] - 4s 135ms/step - loss: 0.0036
Epoch 45/100
31/31 [==============================] - 4s 142ms/step - loss: 0.0039
Epoch 46/100
31/31 [==============================] - 4s 138ms/step - loss: 0.0035
Epoch 47/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0036
Epoch 48/100
31/31 [==============================] - 5s 157ms/step - loss: 0.0037
Epoch 49/100
31/31 [==============================] - 5s 164ms/step - loss: 0.0035
Epoch 50/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0035
Epoch 51/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0035
Epoch 52/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0035
Epoch 53/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0035
Epoch 54/100
31/31 [==============================] - 4s 131ms/step - loss: 0.0035
Epoch 55/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0035
Epoch 56/100
31/31 [==============================] - 4s 125ms/step - loss: 0.0035
Epoch 57/100
31/31 [==============================] - 4s 125ms/step - loss: 0.0035
Epoch 58/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0035
Epoch 59/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0036
Epoch 60/100
31/31 [==============================] - 4s 131ms/step - loss: 0.0036
Epoch 61/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0035
Epoch 62/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0035
```

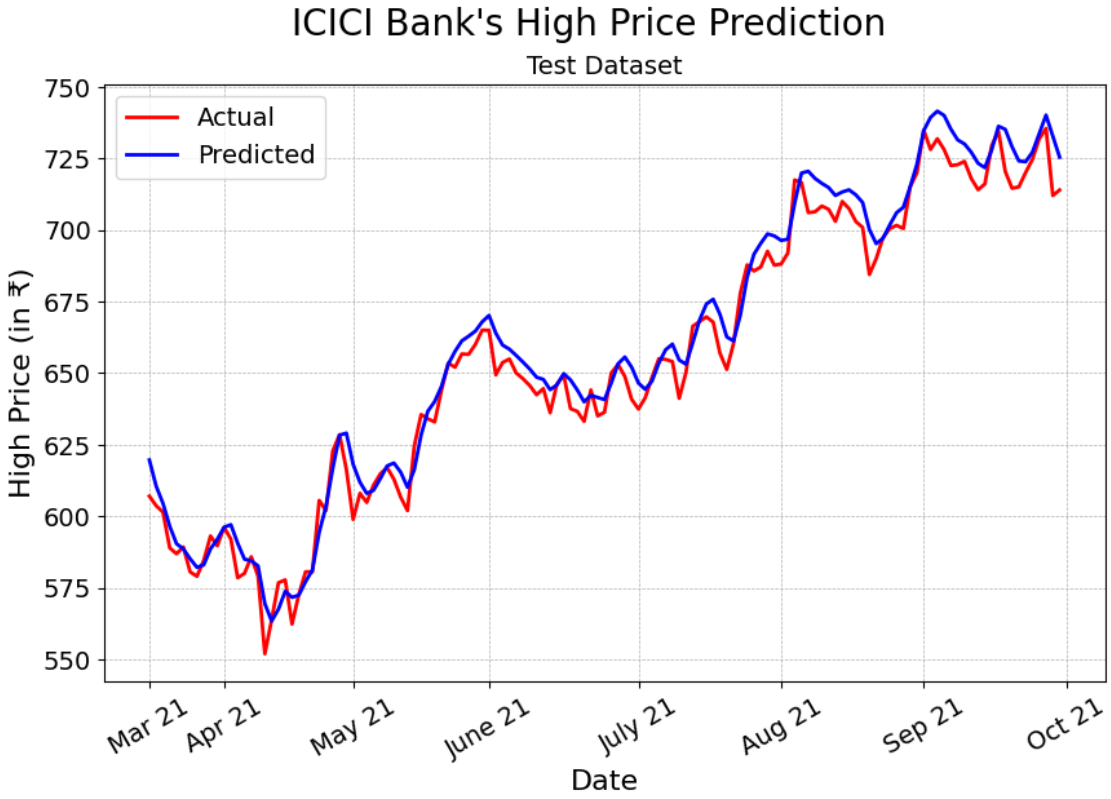
```
Epoch 63/100
31/31 [==============================] - 4s 137ms/step - loss: 0.0037
Epoch 64/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0035
Epoch 65/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0035
Epoch 66/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0035
Epoch 67/100
31/31 [==============================] - 4s 133ms/step - loss: 0.0035
Epoch 68/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0036
Epoch 69/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0036
Epoch 70/100
31/31 [==============================] - 4s 122ms/step - loss: 0.0035
Epoch 71/100
31/31 [==============================] - 4s 123ms/step - loss: 0.0035
Epoch 72/100
31/31 [==============================] - 4s 124ms/step - loss: 0.0034
Epoch 73/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0034
Epoch 74/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0034
Epoch 75/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0035
Epoch 76/100
31/31 [==============================] - 3s 108ms/step - loss: 0.0034
Epoch 77/100
31/31 [==============================] - 4s 125ms/step - loss: 0.0035
Epoch 78/100
31/31 [==============================] - 4s 131ms/step - loss: 0.0034
Epoch 79/100
31/31 [==============================] - 5s 157ms/step - loss: 0.0034
Epoch 80/100
31/31 [==============================] - 5s 139ms/step - loss: 0.0034
Epoch 81/100
31/31 [==============================] - 5s 166ms/step - loss: 0.0034
Epoch 82/100
31/31 [==============================] - 4s 133ms/step - loss: 0.0034
Epoch 83/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0034
Epoch 84/100
31/31 [==============================] - 4s 139ms/step - loss: 0.0034
Epoch 85/100
31/31 [==============================] - 4s 133ms/step - loss: 0.0034
Epoch 86/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0034
```

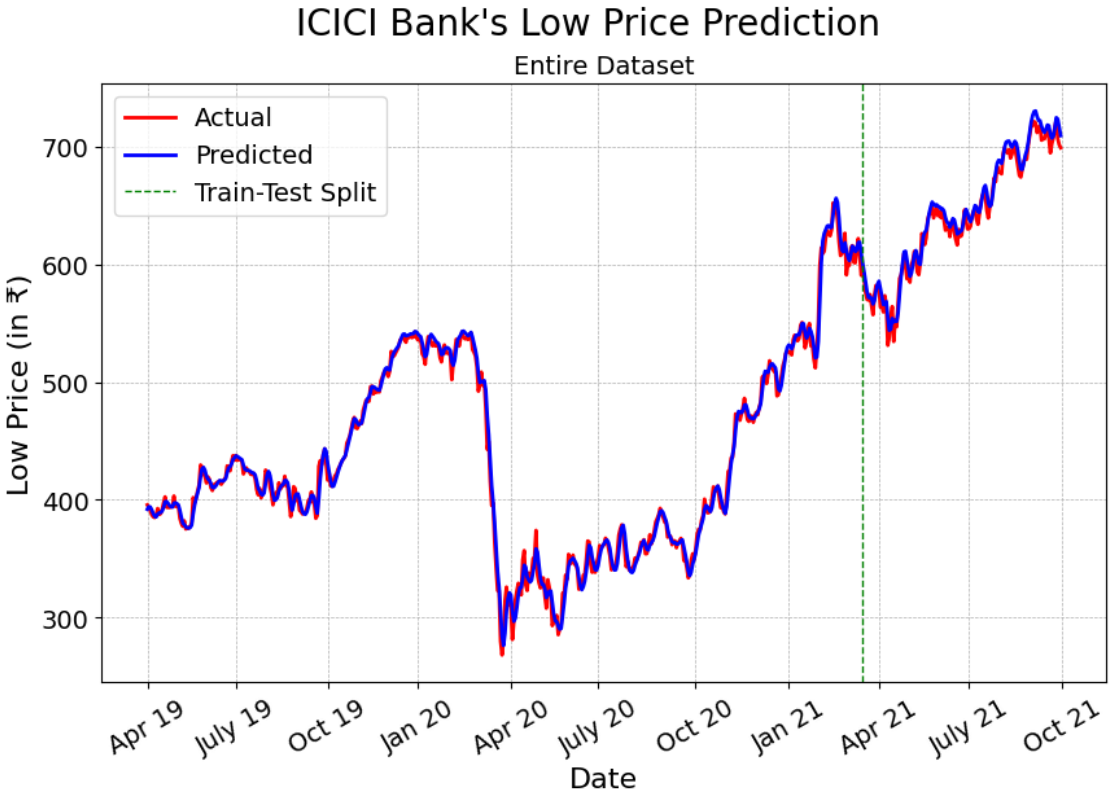
```
Epoch 87/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0034
Epoch 88/100
31/31 [==============================] - 4s 125ms/step - loss: 0.0034
Epoch 89/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0034
Epoch 90/100
31/31 [==============================] - 4s 131ms/step - loss: 0.0034
Epoch 91/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0033
Epoch 92/100
31/31 [==============================] - 4s 127ms/step - loss: 0.0034
Epoch 93/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0033
Epoch 94/100
31/31 [==============================] - 4s 129ms/step - loss: 0.0034
Epoch 95/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0034
Epoch 96/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0033
Epoch 97/100
31/31 [==============================] - 4s 130ms/step - loss: 0.0034
Epoch 98/100
31/31 [==============================] - 4s 126ms/step - loss: 0.0034
Epoch 99/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0035
Epoch 100/100
31/31 [==============================] - 4s 132ms/step - loss: 0.0036
Time required for fitting model: 425.5109 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 4s 73ms/step
MAE is 9330863.78 units.
MSE is 268490133945643.25 sq. units.
RMSE is 16385668.55 units.
MAPE is 38.49%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 79ms/step
MAE is 7020258.75 units.
MSE is 66519139496614.73 sq. units.
RMSE is 8155926.65 units.
MAPE is 57.87%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 2s 76ms/step
5/5 [==============================] - 0s 65ms/step
```

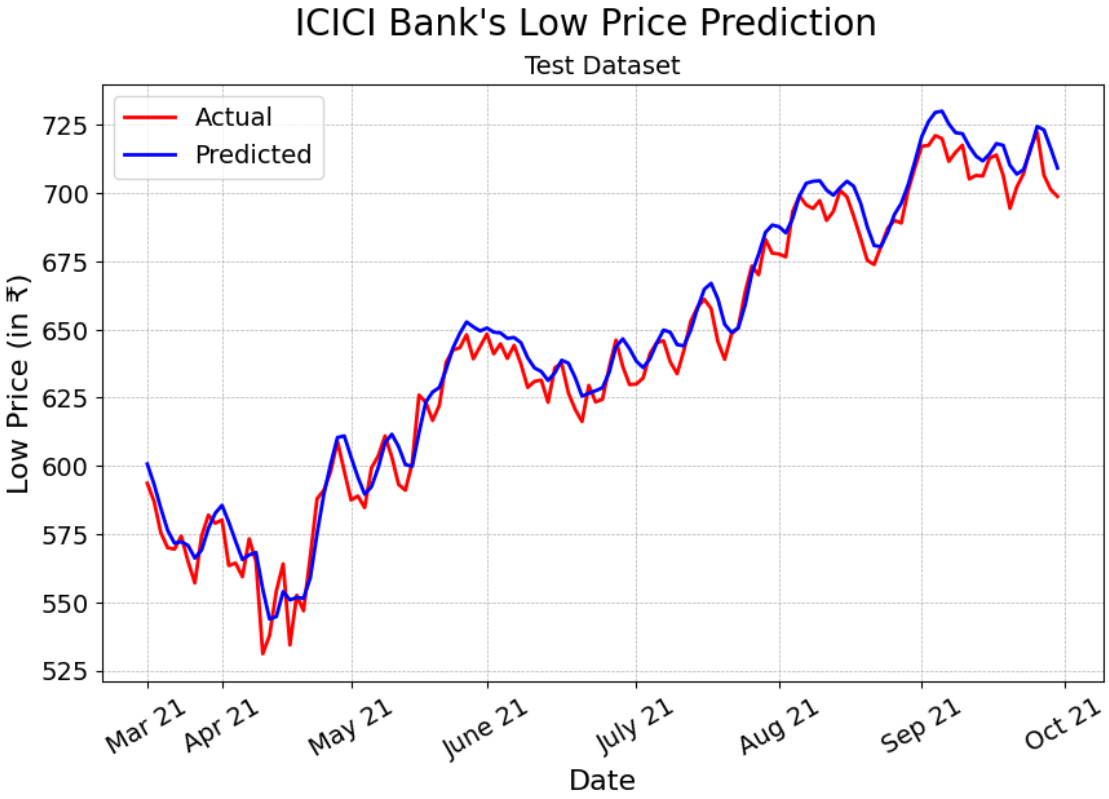

ICICI Bank's Opening Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Opening Price (in ₹)
700
600
500
400
300
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

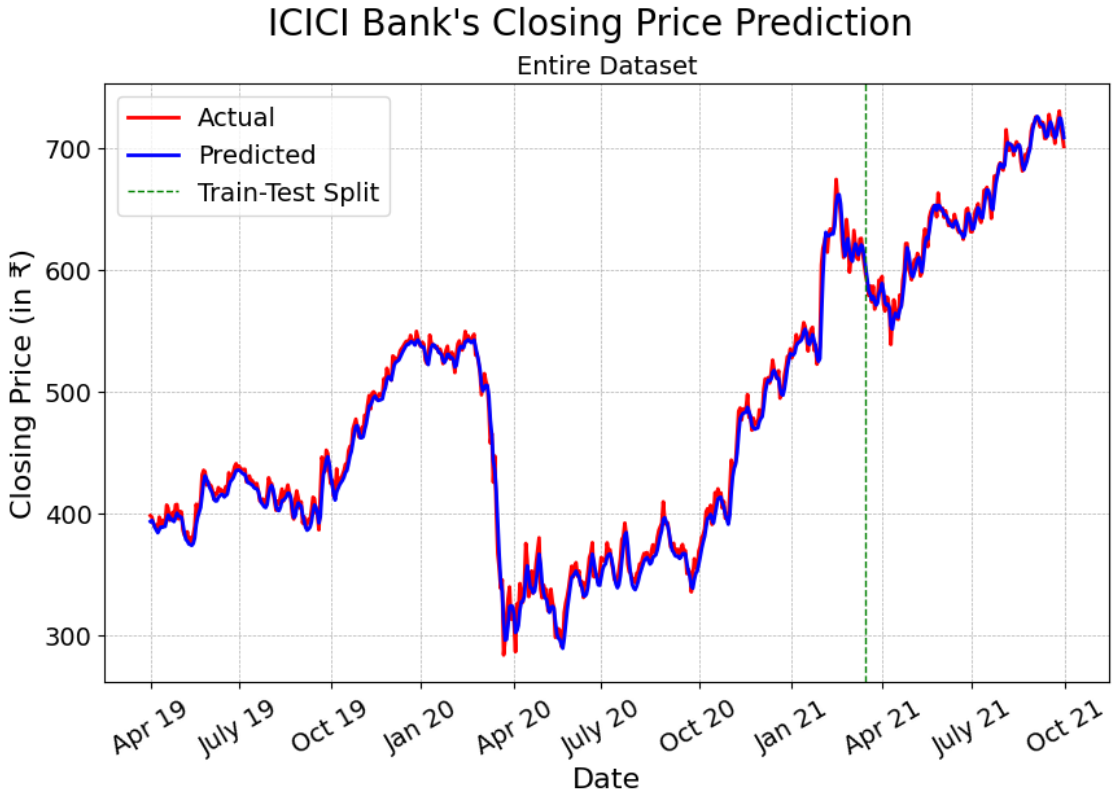

ICICI Bank's Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
750
725
700
675
650
625
600
575
550
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

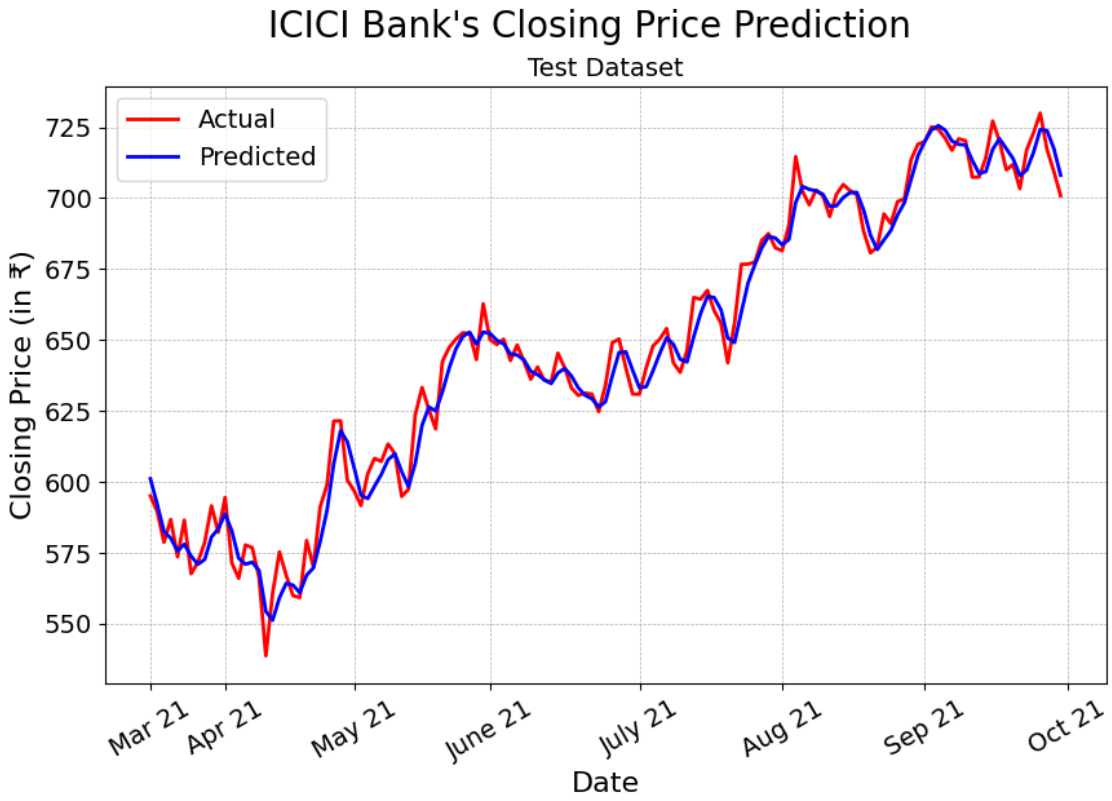

ICICI Bank's High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
700
600
500
400
300
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

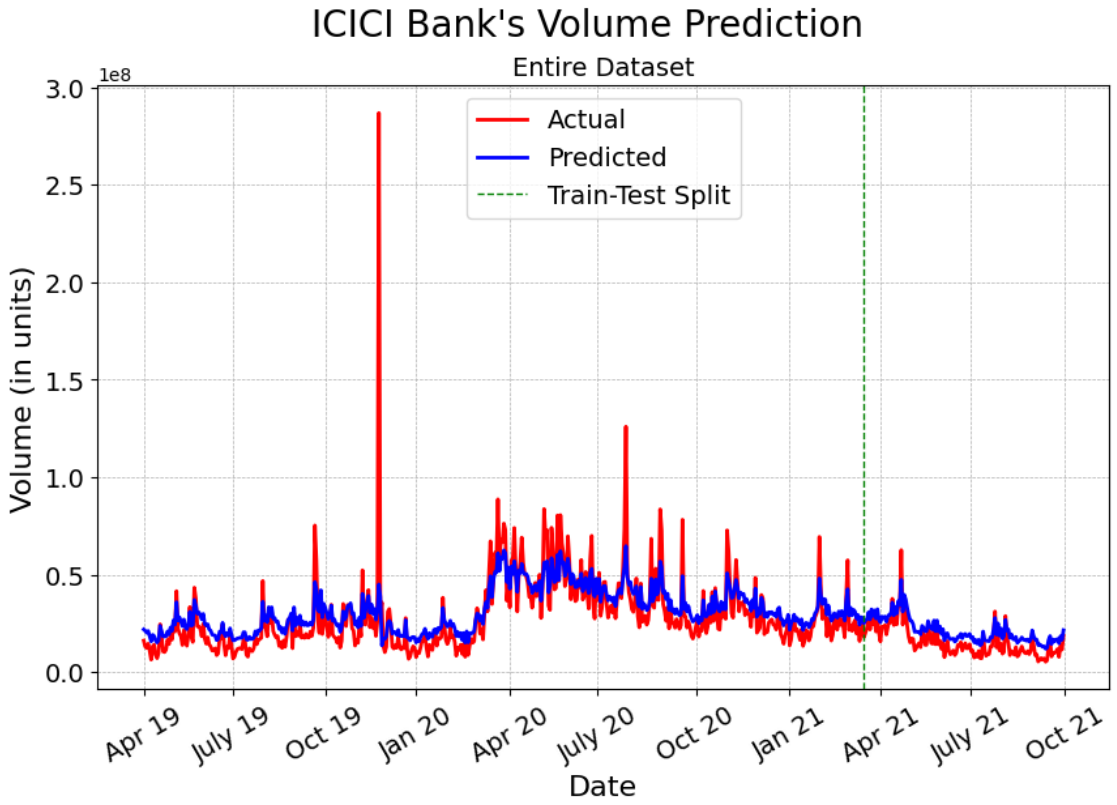

ICICI Bank's High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
750
725
700
675
650
625
600
575
550
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

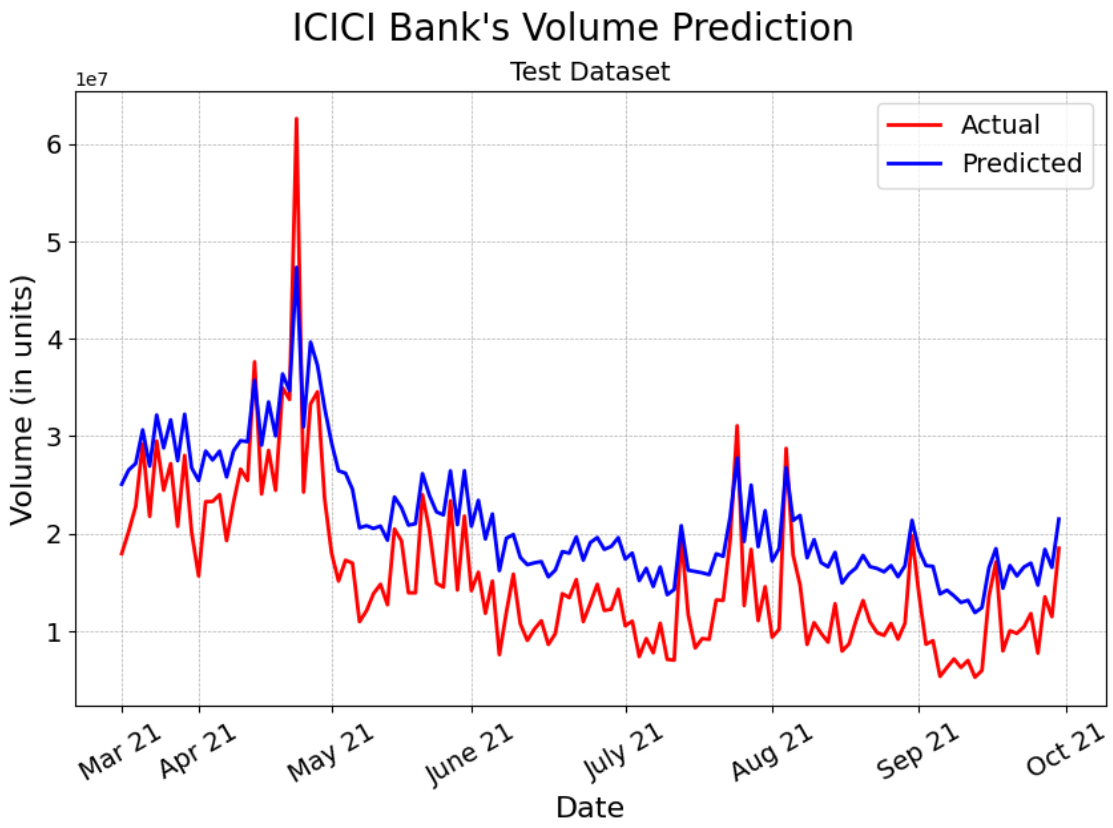

ICICI Bank's Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
700
600
500
400
300
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


ICICI Bank's Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
725
700
675
650
625
600
575
550
525
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


ICICI Bank's Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
700
600
500
400
300
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


ICICI Bank's Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
725
700
675
650
625
600
575
550
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


ICICI Bank's Volume Prediction
Entire Dataset
1e8
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Volume (in units)
Actual
Predicted
Train-Test Split
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date



[29]:
```
generate_predictions('Infosys', interval=30, n_epochs=100, save_fig = True)
```

```
Fitting LSTM Model for Open Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Open Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 14s 89ms/step - loss: 0.0493
Epoch 2/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0114
Epoch 3/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0066
Epoch 4/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0058
Epoch 5/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0049
Epoch 6/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0034
Epoch 7/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0040
```

```
Epoch 8/100
11/11 [==============================] - 1s 71ms/step - loss: 0.0036
Epoch 9/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0033
Epoch 10/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0041
Epoch 11/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0036
Epoch 12/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0038
Epoch 13/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0028
Epoch 14/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0034
Epoch 15/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0030
Epoch 16/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0029
Epoch 17/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0036
Epoch 18/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0025
Epoch 19/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0030
Epoch 20/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0029
Epoch 21/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0024
Epoch 22/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0027
Epoch 23/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0027
Epoch 24/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0026
Epoch 25/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0034
Epoch 26/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0032
Epoch 27/100
11/11 [==============================] - 1s 66ms/step - loss: 0.0029
Epoch 28/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0027
Epoch 29/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0025
Epoch 30/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0025
Epoch 31/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0021
```

```
Epoch 32/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0025
Epoch 33/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0026
Epoch 34/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 35/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0022
Epoch 36/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0023
Epoch 37/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0023
Epoch 38/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 39/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0026
Epoch 40/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 41/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 42/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0023
Epoch 43/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0021
Epoch 44/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0021
Epoch 46/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0022
Epoch 47/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 48/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0028
Epoch 49/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0022
Epoch 50/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0025
Epoch 51/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0032
Epoch 52/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0023
Epoch 53/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0021
Epoch 54/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0019
Epoch 55/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0023
```

```
Epoch 56/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0020
Epoch 57/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0019
Epoch 58/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0024
Epoch 59/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0018
Epoch 60/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0020
Epoch 61/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0022
Epoch 62/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0028
Epoch 63/100
11/11 [==============================] - 1s 66ms/step - loss: 0.0021
Epoch 64/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0018
Epoch 65/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0018
Epoch 66/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0023
Epoch 67/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0021
Epoch 68/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0019
Epoch 69/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0018
Epoch 70/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0017
Epoch 71/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0017
Epoch 72/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0016
Epoch 73/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0016
Epoch 74/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0019
Epoch 75/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0014
Epoch 76/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0016
Epoch 77/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0014
Epoch 78/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0014
Epoch 79/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0015
```

```
Epoch 80/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0021
Epoch 81/100
11/11 [==============================] - 1s 71ms/step - loss: 0.0016
Epoch 82/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0018
Epoch 83/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0016
Epoch 84/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0016
Epoch 85/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0018
Epoch 86/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0015
Epoch 87/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0015
Epoch 88/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0018
Epoch 89/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0017
Epoch 90/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0017
Epoch 91/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0014
Epoch 92/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0019
Epoch 93/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0016
Epoch 94/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0019
Epoch 95/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0015
Epoch 96/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0014
Epoch 97/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0015
Epoch 98/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0015
Epoch 99/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0016
Epoch 100/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0013
Time required for fitting model: 94.6648 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 2s 35ms/step
MAE is  18.66.
MSE is sq.   626.37.
```

```
RMSE is  25.03.
MAPE is 1.39%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 37ms/step
MAE is  25.18.
MSE is sq.   915.01.
RMSE is  30.25.
MAPE is 1.49%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 36ms/step
2/2 [==============================] - 0s 37ms/step

Fitting LSTM Model for High Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for High Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 14s 77ms/step - loss: 0.0557
Epoch 2/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0107
Epoch 3/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0065
Epoch 4/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0053
Epoch 5/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0048
Epoch 6/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0036
Epoch 7/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0046
Epoch 8/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0034
Epoch 9/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0031
Epoch 10/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0036
Epoch 11/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0039
Epoch 12/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0040
Epoch 13/100
11/11 [==============================] - 1s 129ms/step - loss: 0.0035
Epoch 14/100
11/11 [==============================] - 1s 61ms/step - loss: 0.0043
Epoch 15/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0035
Epoch 16/100
```

```
11/11 [==============================] - 1s 89ms/step - loss: 0.0031
Epoch 17/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0032
Epoch 18/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0029
Epoch 19/100
11/11 [==============================] - 1s 71ms/step - loss: 0.0029
Epoch 20/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0031
Epoch 21/100
11/11 [==============================] - 2s 143ms/step - loss: 0.0028
Epoch 22/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0032
Epoch 23/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0025
Epoch 24/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0030
Epoch 25/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0035
Epoch 26/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0034
Epoch 27/100
11/11 [==============================] - 1s 88ms/step - loss: 0.0030
Epoch 28/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0029
Epoch 29/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0026
Epoch 30/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0027
Epoch 31/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0021
Epoch 32/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0025
Epoch 33/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0022
Epoch 34/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0024
Epoch 35/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0021
Epoch 36/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0024
Epoch 37/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0024
Epoch 38/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0025
Epoch 39/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0026
Epoch 40/100
```

```
11/11 [==============================] - 1s 82ms/step - loss: 0.0026
Epoch 41/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0024
Epoch 42/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0019
Epoch 43/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0022
Epoch 44/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0022
Epoch 46/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0019
Epoch 47/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0026
Epoch 48/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0028
Epoch 49/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0023
Epoch 50/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0025
Epoch 51/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0024
Epoch 52/100
11/11 [==============================] - 1s 94ms/step - loss: 0.0018
Epoch 53/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0021
Epoch 54/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0018
Epoch 55/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0022
Epoch 56/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0019
Epoch 57/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0019
Epoch 58/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0025
Epoch 59/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0018
Epoch 60/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0020
Epoch 61/100
11/11 [==============================] - 1s 96ms/step - loss: 0.0019
Epoch 62/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0021
Epoch 63/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0018
Epoch 64/100
```

```
11/11 [==============================] - 1s 83ms/step - loss: 0.0016
Epoch 65/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0014
Epoch 66/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0021
Epoch 67/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0022
Epoch 68/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0023
Epoch 69/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0019
Epoch 70/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0017
Epoch 71/100
11/11 [==============================] - 1s 88ms/step - loss: 0.0019
Epoch 72/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0016
Epoch 73/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0015
Epoch 74/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0019
Epoch 75/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0015
Epoch 76/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0016
Epoch 77/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0014
Epoch 78/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0014
Epoch 79/100
11/11 [==============================] - 1s 92ms/step - loss: 0.0017
Epoch 80/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0020
Epoch 81/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0015
Epoch 82/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0018
Epoch 83/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0015
Epoch 84/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0017
Epoch 85/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0019
Epoch 86/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0014
Epoch 87/100
11/11 [==============================] - 1s 92ms/step - loss: 0.0017
Epoch 88/100
```

```
11/11 [==============================] - 1s 85ms/step - loss: 0.0018
Epoch 89/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0015
Epoch 90/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0015
Epoch 91/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0013
Epoch 92/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0014
Epoch 93/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0015
Epoch 94/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0016
Epoch 95/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0014
Epoch 96/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0014
Epoch 97/100
11/11 [==============================] - 1s 92ms/step - loss: 0.0014
Epoch 98/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0014
Epoch 99/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0016
Epoch 100/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0015
Time required for fitting model: 103.5965 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 3s 42ms/step
MAE is  19.05.
MSE is sq.   609.47.
RMSE is  24.69.
MAPE is 1.39%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 31ms/step
MAE is  26.05.
MSE is sq.   948.37.
RMSE is  30.80.
MAPE is 1.53%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 47ms/step
2/2 [==============================] - 0s 45ms/step

Fitting LSTM Model for Low Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Low Column of Infosys Dataset
```

```
Epoch 1/100
11/11 [==============================] - 15s 79ms/step - loss: 0.0353
Epoch 2/100
11/11 [==============================] - 1s 97ms/step - loss: 0.0089
Epoch 3/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0051
Epoch 4/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0042
Epoch 5/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0034
Epoch 6/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0038
Epoch 7/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0046
Epoch 8/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0036
Epoch 9/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0031
Epoch 10/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0036
Epoch 11/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0033
Epoch 12/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0029
Epoch 13/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0030
Epoch 14/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0032
Epoch 15/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0028
Epoch 16/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0036
Epoch 17/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0028
Epoch 18/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0025
Epoch 19/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0028
Epoch 20/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0030
Epoch 21/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0026
Epoch 22/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0035
Epoch 23/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0026
Epoch 24/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0024
```

```
Epoch 25/100
11/11 [==============================] - 1s 96ms/step - loss: 0.0034
Epoch 26/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0040
Epoch 27/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0036
Epoch 28/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0024
Epoch 29/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0025
Epoch 30/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0023
Epoch 31/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0022
Epoch 32/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0024
Epoch 33/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0024
Epoch 34/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0026
Epoch 35/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0022
Epoch 36/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0026
Epoch 37/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0022
Epoch 38/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0022
Epoch 39/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0026
Epoch 40/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0024
Epoch 41/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0024
Epoch 42/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0020
Epoch 43/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0021
Epoch 44/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0021
Epoch 46/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0022
Epoch 47/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0025
Epoch 48/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0030
```

```
Epoch 49/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0022
Epoch 50/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0022
Epoch 51/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0030
Epoch 52/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0022
Epoch 53/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0022
Epoch 54/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0017
Epoch 55/100
11/11 [==============================] - 1s 72ms/step - loss: 0.0020
Epoch 56/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0017
Epoch 57/100
11/11 [==============================] - 1s 74ms/step - loss: 0.0018
Epoch 58/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0026
Epoch 59/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0020
Epoch 60/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0018
Epoch 61/100
11/11 [==============================] - 1s 73ms/step - loss: 0.0021
Epoch 62/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0022
Epoch 63/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0017
Epoch 64/100
11/11 [==============================] - 1s 96ms/step - loss: 0.0017
Epoch 65/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0017
Epoch 66/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0022
Epoch 67/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0020
Epoch 68/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0020
Epoch 69/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0018
Epoch 70/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0016
Epoch 71/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0019
Epoch 72/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0016
```

```
Epoch 73/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0015
Epoch 74/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0017
Epoch 75/100
11/11 [==============================] - 1s 65ms/step - loss: 0.0014
Epoch 76/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0014
Epoch 77/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0014
Epoch 78/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0015
Epoch 79/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0015
Epoch 80/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0017
Epoch 81/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0015
Epoch 82/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0017
Epoch 83/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0015
Epoch 84/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0016
Epoch 85/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0020
Epoch 86/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0014
Epoch 87/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0013
Epoch 88/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0017
Epoch 89/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0016
Epoch 90/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0015
Epoch 91/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0011
Epoch 92/100
11/11 [==============================] - 1s 75ms/step - loss: 0.0013
Epoch 93/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0014
Epoch 94/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0014
Epoch 95/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0014
Epoch 96/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0014
```

```
Epoch 97/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0015
Epoch 98/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0017
Epoch 99/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0018
Epoch 100/100
11/11 [==============================] - 1s 104ms/step - loss: 0.0014
Time required for fitting model: 100.8860 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 3s 53ms/step
MAE is  17.55.
MSE is sq.  541.45.
RMSE is  23.27.
MAPE is 1.32%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 45ms/step
MAE is  17.91.
MSE is sq.  503.76.
RMSE is  22.44.
MAPE is 1.07%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 39ms/step
2/2 [==============================] - 0s 35ms/step

Fitting LSTM Model for Close Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Close Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 11s 75ms/step - loss: 0.0396
Epoch 2/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0099
Epoch 3/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0058
Epoch 4/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0054
Epoch 5/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0050
Epoch 6/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0038
Epoch 7/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0053
Epoch 8/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0036
Epoch 9/100
```

```
11/11 [==============================] - 1s 78ms/step - loss: 0.0038
Epoch 10/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0042
Epoch 11/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0037
Epoch 12/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0039
Epoch 13/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0034
Epoch 14/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0037
Epoch 15/100
11/11 [==============================] - 1s 97ms/step - loss: 0.0033
Epoch 16/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0029
Epoch 17/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0033
Epoch 18/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0028
Epoch 19/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0034
Epoch 20/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0033
Epoch 21/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0028
Epoch 22/100
11/11 [==============================] - 1s 95ms/step - loss: 0.0033
Epoch 23/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0029
Epoch 24/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0033
Epoch 25/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0042
Epoch 26/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0034
Epoch 27/100
11/11 [==============================] - 1s 108ms/step - loss: 0.0029
Epoch 28/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0030
Epoch 29/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0028
Epoch 30/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0026
Epoch 31/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0020
Epoch 32/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0026
Epoch 33/100
```

```
11/11 [==============================] - 1s 110ms/step - loss: 0.0025
Epoch 34/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0027
Epoch 35/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0023
Epoch 36/100
11/11 [==============================] - 1s 121ms/step - loss: 0.0025
Epoch 37/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0025
Epoch 38/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0024
Epoch 39/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0022
Epoch 40/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0024
Epoch 41/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0023
Epoch 42/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0021
Epoch 43/100
11/11 [==============================] - 1s 106ms/step - loss: 0.0021
Epoch 44/100
11/11 [==============================] - 1s 102ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0021
Epoch 46/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0021
Epoch 47/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0022
Epoch 48/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0027
Epoch 49/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0022
Epoch 50/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0022
Epoch 51/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0026
Epoch 52/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0020
Epoch 53/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0024
Epoch 54/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0021
Epoch 55/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0020
Epoch 56/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0020
Epoch 57/100
```

```
11/11 [==============================] - 1s 79ms/step - loss: 0.0020
Epoch 58/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0024
Epoch 59/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0018
Epoch 60/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0019
Epoch 61/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0019
Epoch 62/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0020
Epoch 63/100
11/11 [==============================] - 1s 95ms/step - loss: 0.0018
Epoch 64/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0017
Epoch 65/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0013
Epoch 66/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0019
Epoch 67/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0021
Epoch 68/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0021
Epoch 69/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0019
Epoch 70/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0017
Epoch 71/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0018
Epoch 72/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0017
Epoch 73/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0017
Epoch 74/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0021
Epoch 75/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0015
Epoch 76/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0015
Epoch 77/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0015
Epoch 78/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0016
Epoch 79/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0017
Epoch 80/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0020
Epoch 81/100
```

```
11/11 [==============================] - 1s 85ms/step - loss: 0.0017
Epoch 82/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0019
Epoch 83/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0017
Epoch 84/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0017
Epoch 85/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0019
Epoch 86/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0016
Epoch 87/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0016
Epoch 88/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0019
Epoch 89/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0017
Epoch 90/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0015
Epoch 91/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0014
Epoch 92/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0014
Epoch 93/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0014
Epoch 94/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0015
Epoch 95/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0014
Epoch 96/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0014
Epoch 97/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0015
Epoch 98/100
11/11 [==============================] - 1s 97ms/step - loss: 0.0015
Epoch 99/100
11/11 [==============================] - 1s 103ms/step - loss: 0.0017
Epoch 100/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0015
Time required for fitting model: 102.9256 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 3s 43ms/step
MAE is  18.59.
MSE is sq.   590.50.
RMSE is  24.30.
MAPE is 1.38%.
The Performance of Model on Test Set is as follows:-
```

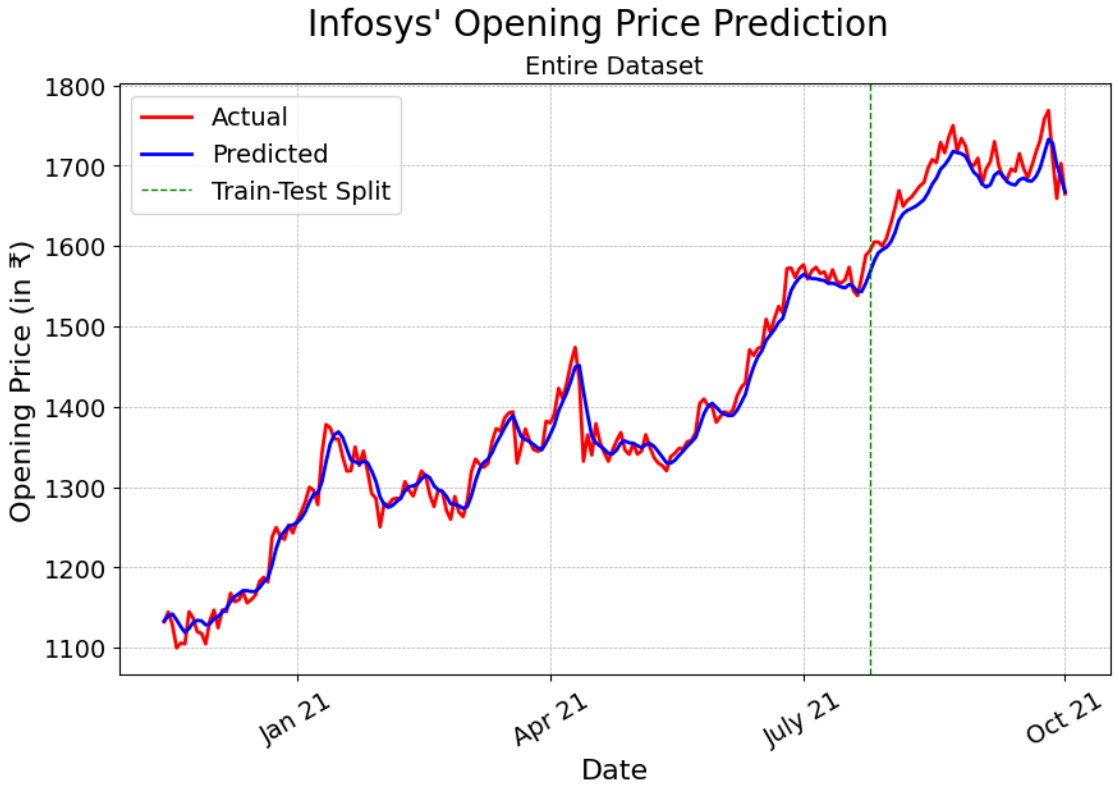
```
2/2 [==============================] - 0s 32ms/step
MAE is  19.39.
MSE is sq.   543.88.
RMSE is  23.32.
MAPE is 1.14%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 41ms/step
2/2 [==============================] - 0s 29ms/step

Fitting LSTM Model for Volume Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Volume Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 11s 83ms/step - loss: 0.0158
Epoch 2/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0103
Epoch 3/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0087
Epoch 4/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0083
Epoch 5/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0083
Epoch 6/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0082
Epoch 7/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0079
Epoch 8/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0081
Epoch 9/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0080
Epoch 10/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0079
Epoch 11/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0080
Epoch 12/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0078
Epoch 13/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0078
Epoch 14/100
11/11 [==============================] - 1s 76ms/step - loss: 0.0079
Epoch 15/100
11/11 [==============================] - 1s 79ms/step - loss: 0.0078
Epoch 16/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0076
Epoch 17/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0075
```

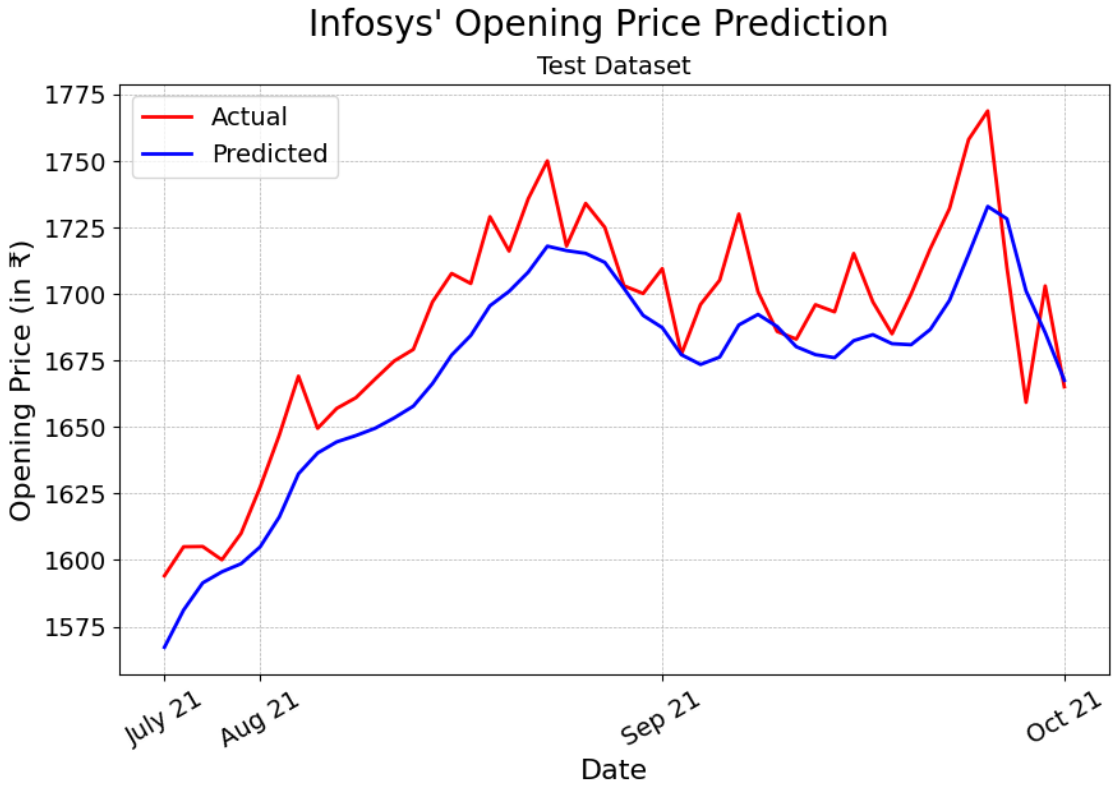
```
Epoch 18/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0075
Epoch 19/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0075
Epoch 20/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0074
Epoch 21/100
11/11 [==============================] - 1s 115ms/step - loss: 0.0076
Epoch 22/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0076
Epoch 23/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0073
Epoch 24/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0074
Epoch 25/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0072
Epoch 26/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0072
Epoch 27/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0073
Epoch 28/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0072
Epoch 29/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0073
Epoch 30/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0072
Epoch 31/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0073
Epoch 32/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0071
Epoch 33/100
11/11 [==============================] - 1s 81ms/step - loss: 0.0071
Epoch 34/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0072
Epoch 35/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0072
Epoch 36/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0073
Epoch 37/100
11/11 [==============================] - 1s 78ms/step - loss: 0.0073
Epoch 38/100
11/11 [==============================] - 1s 77ms/step - loss: 0.0073
Epoch 39/100
11/11 [==============================] - 1s 95ms/step - loss: 0.0071
Epoch 40/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0071
Epoch 41/100
11/11 [==============================] - 1s 80ms/step - loss: 0.0073
```

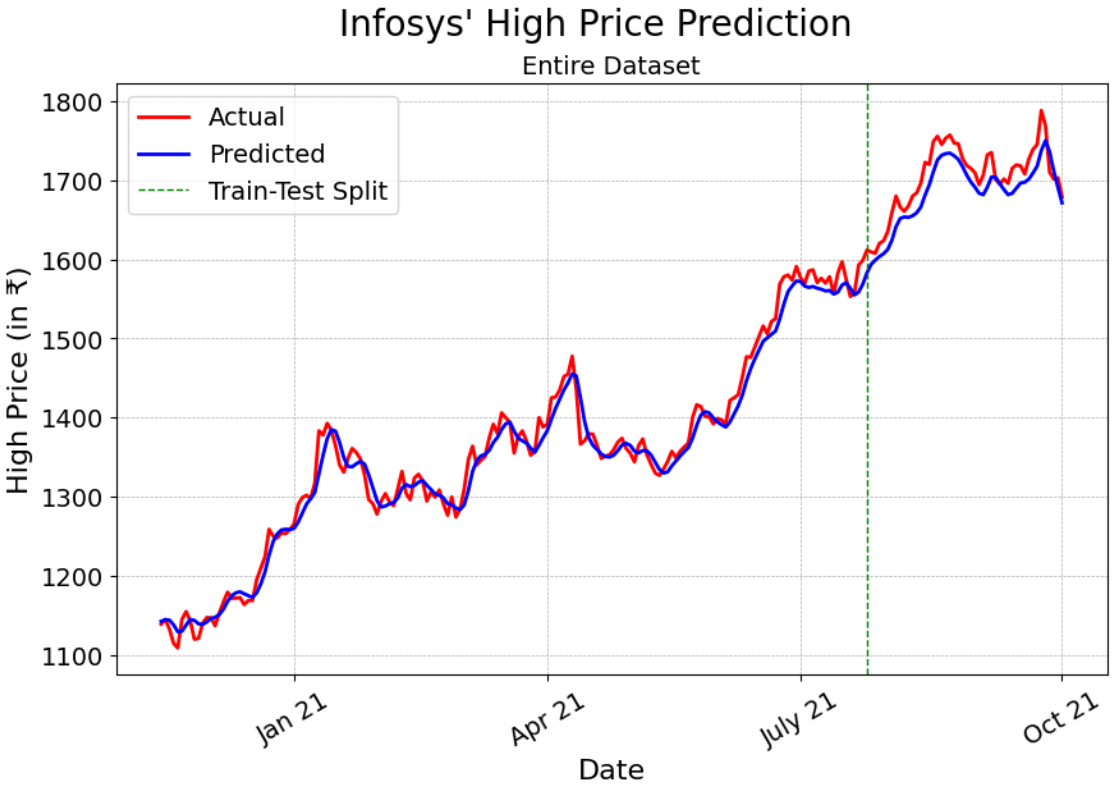
```
Epoch 42/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0073
Epoch 43/100
11/11 [==============================] - 1s 82ms/step - loss: 0.0076
Epoch 44/100
11/11 [==============================] - 1s 103ms/step - loss: 0.0078
Epoch 45/100
11/11 [==============================] - 2s 153ms/step - loss: 0.0072
Epoch 46/100
11/11 [==============================] - 2s 214ms/step - loss: 0.0071
Epoch 47/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0071
Epoch 48/100
11/11 [==============================] - 2s 159ms/step - loss: 0.0076
Epoch 49/100
11/11 [==============================] - 1s 115ms/step - loss: 0.0070
Epoch 50/100
11/11 [==============================] - 1s 105ms/step - loss: 0.0075
Epoch 51/100
11/11 [==============================] - 1s 112ms/step - loss: 0.0077
Epoch 52/100
11/11 [==============================] - 1s 101ms/step - loss: 0.0071
Epoch 53/100
11/11 [==============================] - 1s 105ms/step - loss: 0.0071
Epoch 54/100
11/11 [==============================] - 1s 104ms/step - loss: 0.0070
Epoch 55/100
11/11 [==============================] - 1s 98ms/step - loss: 0.0072
Epoch 56/100
11/11 [==============================] - 1s 103ms/step - loss: 0.0076
Epoch 57/100
11/11 [==============================] - 1s 102ms/step - loss: 0.0078
Epoch 58/100
11/11 [==============================] - 1s 99ms/step - loss: 0.0075
Epoch 59/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0074
Epoch 60/100
11/11 [==============================] - 1s 111ms/step - loss: 0.0070
Epoch 61/100
11/11 [==============================] - 1s 103ms/step - loss: 0.0073
Epoch 62/100
11/11 [==============================] - 1s 121ms/step - loss: 0.0075
Epoch 63/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0072
Epoch 64/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0071
Epoch 65/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0071
```

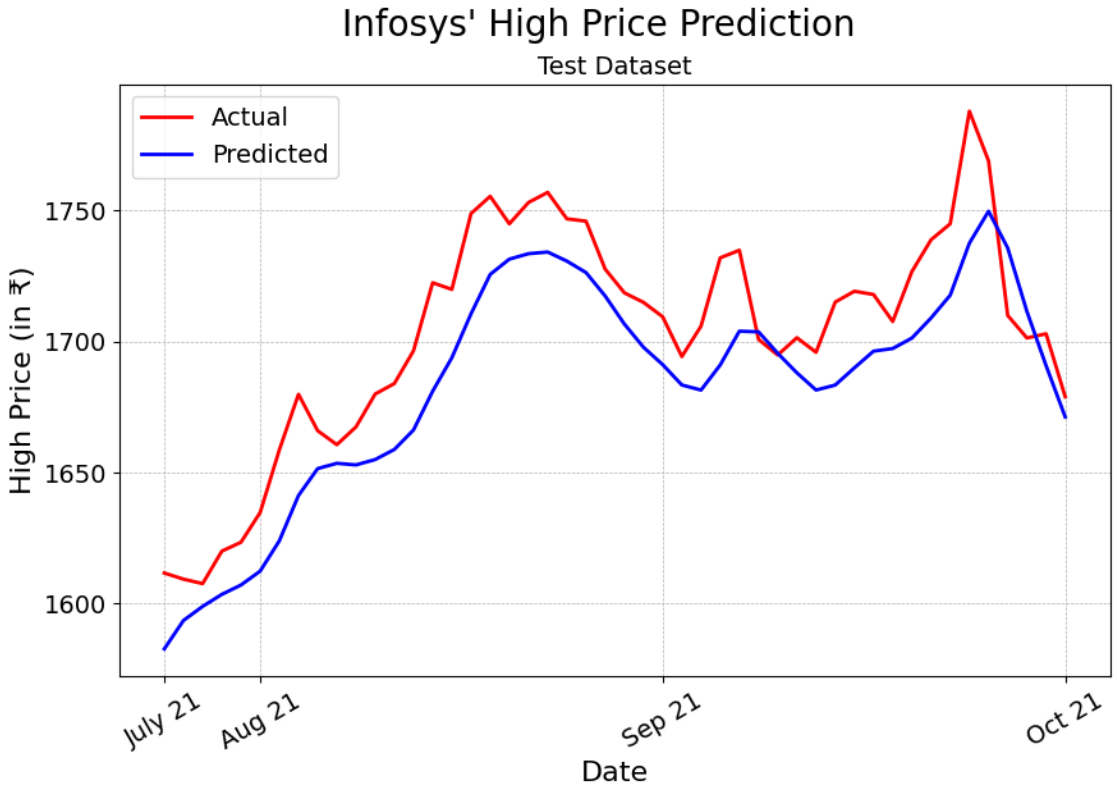
```
Epoch 66/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0074
Epoch 67/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0074
Epoch 68/100
11/11 [==============================] - 1s 88ms/step - loss: 0.0076
Epoch 69/100
11/11 [==============================] - 1s 106ms/step - loss: 0.0073
Epoch 70/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0073
Epoch 71/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0071
Epoch 72/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0071
Epoch 73/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0070
Epoch 74/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0069
Epoch 75/100
11/11 [==============================] - 1s 88ms/step - loss: 0.0070
Epoch 76/100
11/11 [==============================] - 1s 96ms/step - loss: 0.0073
Epoch 77/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0072
Epoch 78/100
11/11 [==============================] - 1s 93ms/step - loss: 0.0069
Epoch 79/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0072
Epoch 80/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0071
Epoch 81/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0073
Epoch 82/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0071
Epoch 83/100
11/11 [==============================] - 1s 83ms/step - loss: 0.0070
Epoch 84/100
11/11 [==============================] - 1s 99ms/step - loss: 0.0075
Epoch 85/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0071
Epoch 86/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0071
Epoch 87/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0070
Epoch 88/100
11/11 [==============================] - 1s 86ms/step - loss: 0.0070
Epoch 89/100
11/11 [==============================] - 1s 90ms/step - loss: 0.0070
```

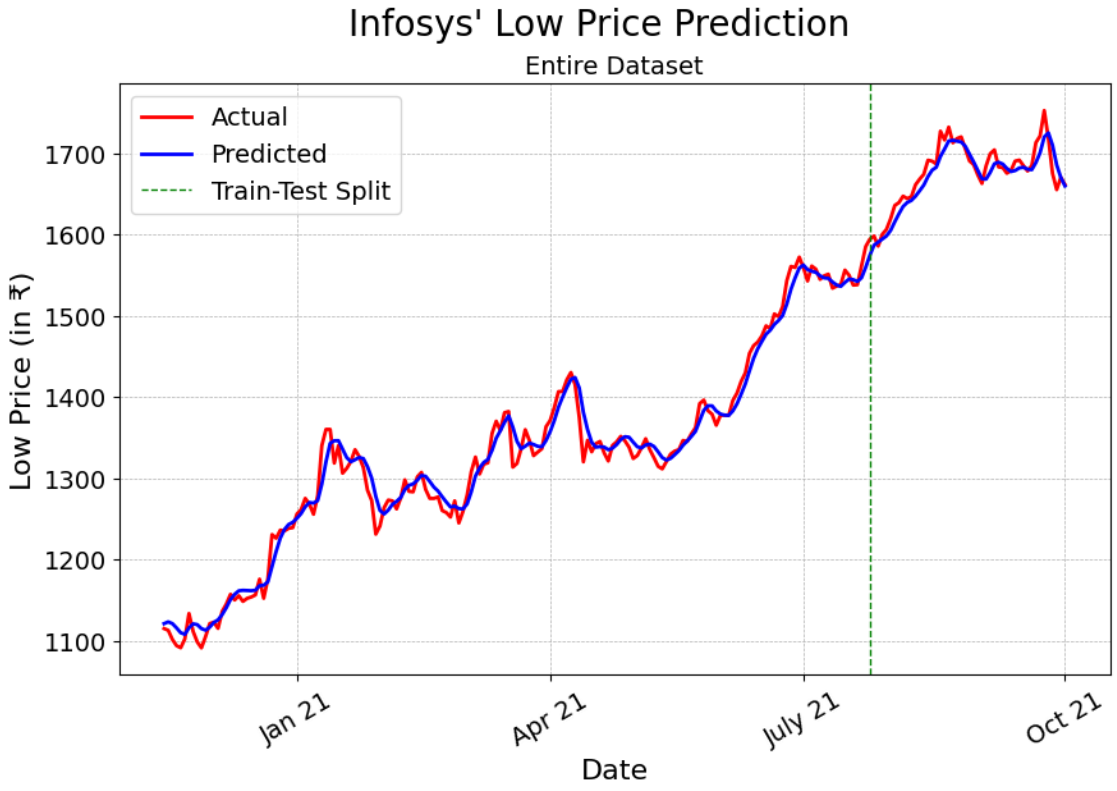
```
Epoch 90/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0070
Epoch 91/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0069
Epoch 92/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0070
Epoch 93/100
11/11 [==============================] - 1s 87ms/step - loss: 0.0071
Epoch 94/100
11/11 [==============================] - 1s 85ms/step - loss: 0.0069
Epoch 95/100
11/11 [==============================] - 1s 89ms/step - loss: 0.0071
Epoch 96/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0070
Epoch 97/100
11/11 [==============================] - 1s 84ms/step - loss: 0.0070
Epoch 98/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0070
Epoch 99/100
11/11 [==============================] - 1s 113ms/step - loss: 0.0068
Epoch 100/100
11/11 [==============================] - 1s 94ms/step - loss: 0.0069
Time required for fitting model: 109.1299 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 4s 49ms/step
MAE is 2371308.82 units.
MSE is 12475226406667.50 sq. units.
RMSE is 3532028.65 units.
MAPE is 29.16%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 46ms/step
MAE is 1269109.21 units.
MSE is 3141295154408.10 sq. units.
RMSE is 1772369.93 units.
MAPE is 28.59%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 41ms/step
2/2 [==============================] - 0s 46ms/step
```

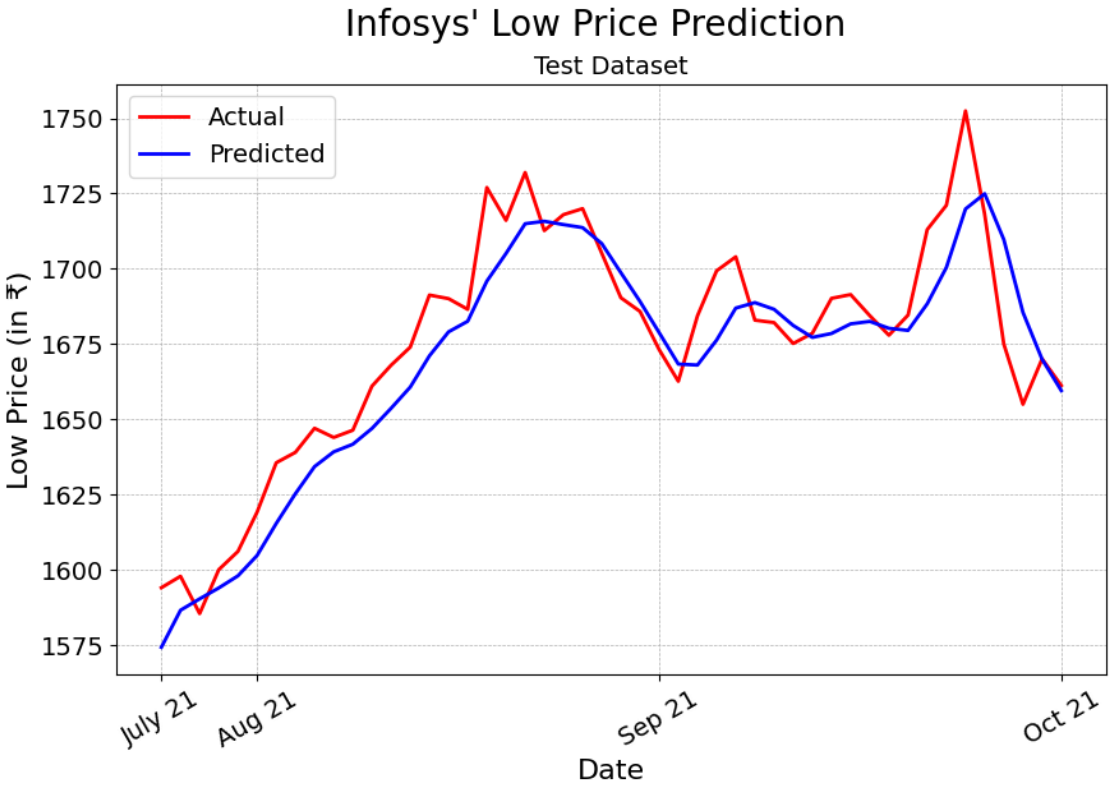

Infosys' Opening Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Opening Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date

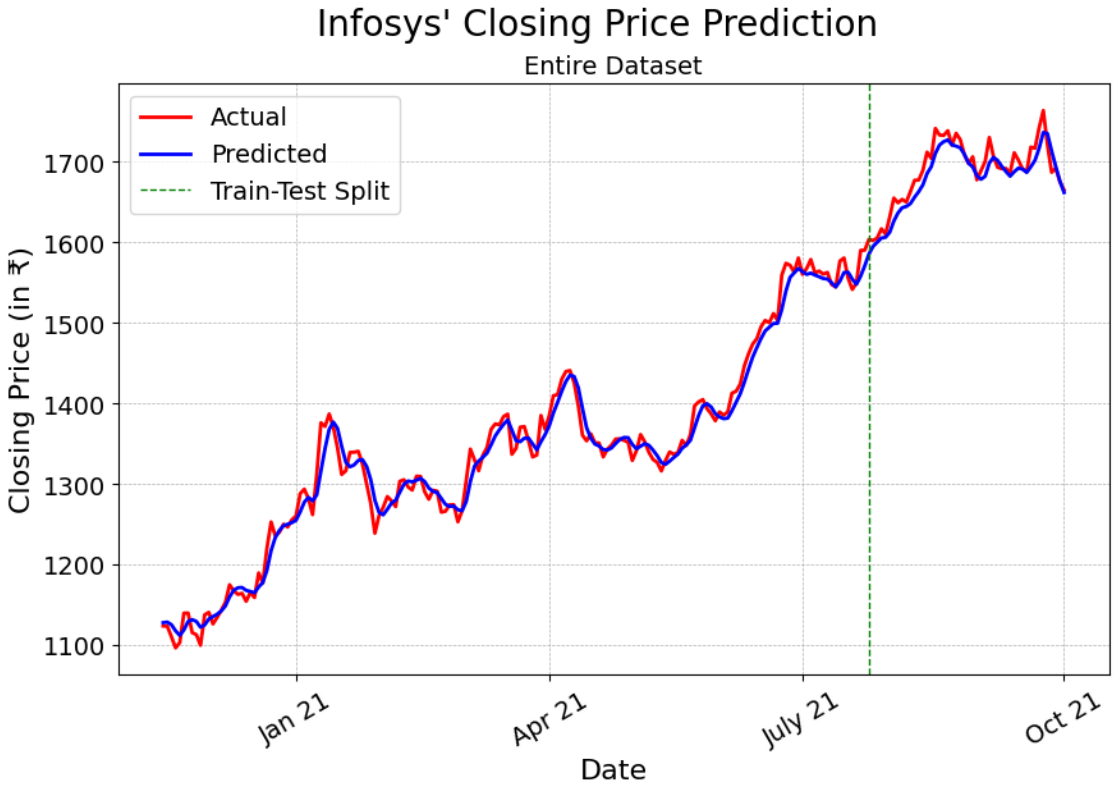

Infosys' Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
1775
1750
1725
1700
1675
1650
1625
1600
1575
July 21
Aug 21
Sep 21
Oct 21
Date

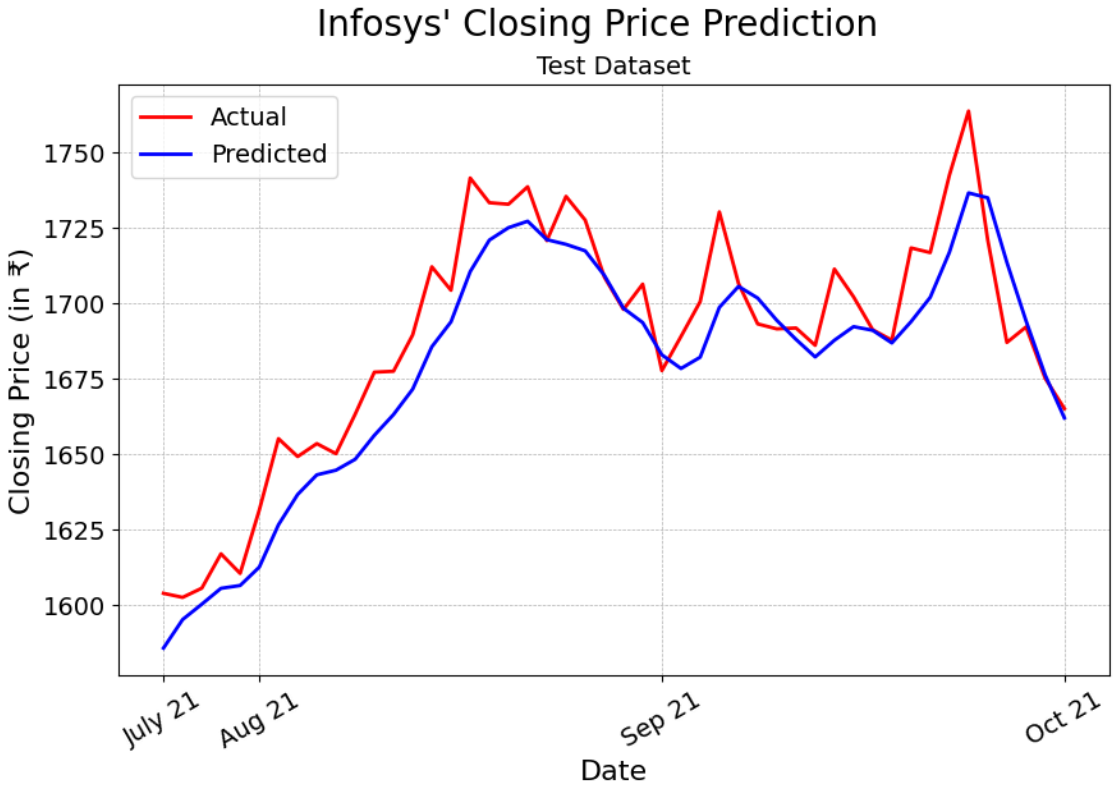

Infosys' High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date

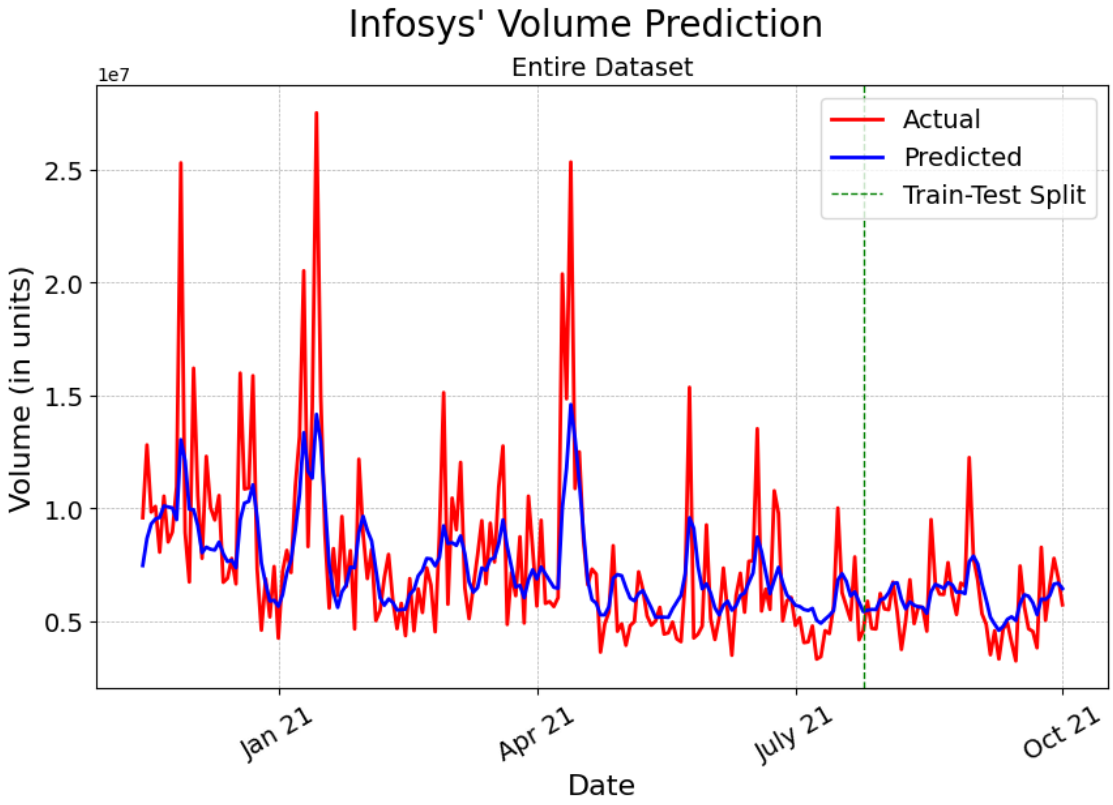

Infosys' High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
1750
1700
1650
1600
July 21
Aug 21
Sep 21
Oct 21
Date

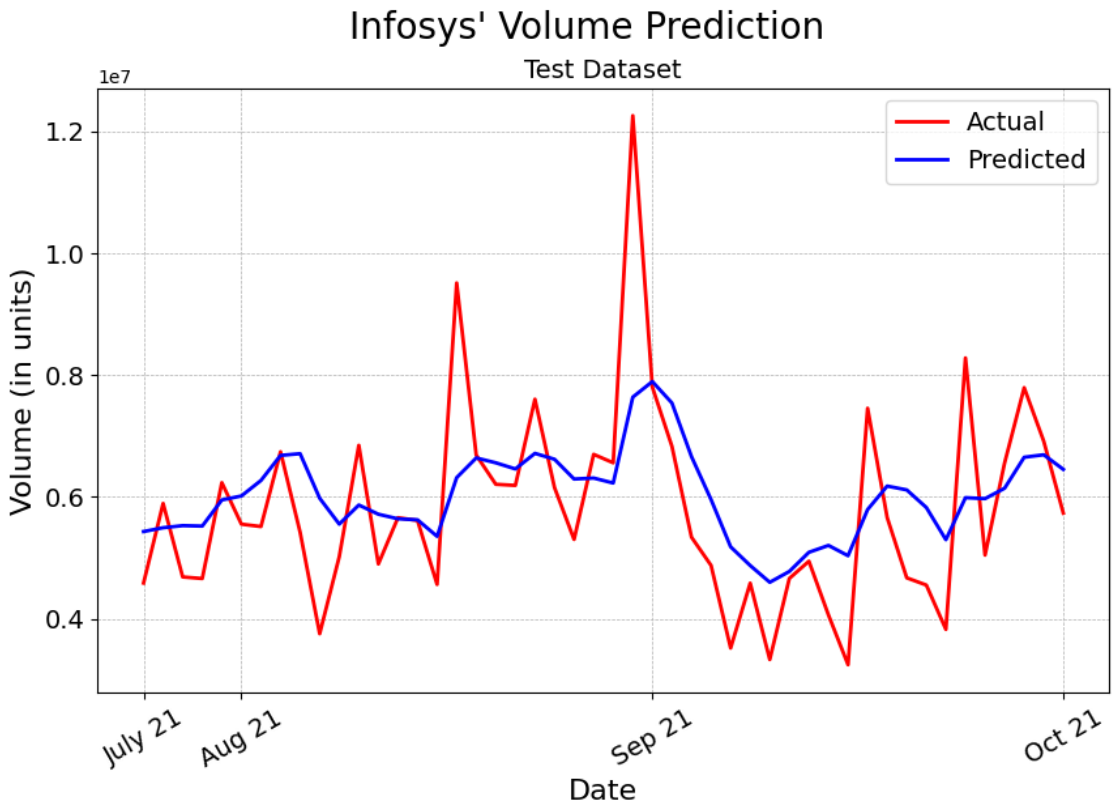

Infosys' Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
1750
1725
1700
1675
1650
1625
1600
1575
July 21
Aug 21
Sep 21
Oct 21
Date


Infosys' Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
1750
1725
1700
1675
1650
1625
1600
July 21
Aug 21
Sep 21
Oct 21
Date


Infosys' Volume Prediction
Entire Dataset
1e7
2.5
2.0
1.5
1.0
0.5
Volume (in units)
Actual
Predicted
Train-Test Split
Jan 21
Apr 21
July 21
Oct 21
Date



[30]:
```
generate_predictions('SBI', save_fig = True)
```

```
Fitting LSTM Model for Open Column of SBI Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Open Column of SBI Dataset
Epoch 1/50
31/31 [==============================] - 22s 138ms/step - loss: 0.0281
Epoch 2/50
31/31 [==============================] - 4s 133ms/step - loss: 0.0056
Epoch 3/50
31/31 [==============================] - 5s 145ms/step - loss: 0.0044
Epoch 4/50
31/31 [==============================] - 5s 155ms/step - loss: 0.0039
Epoch 5/50
31/31 [==============================] - 4s 140ms/step - loss: 0.0040
Epoch 6/50
31/31 [==============================] - 4s 129ms/step - loss: 0.0031
Epoch 7/50
31/31 [==============================] - 4s 138ms/step - loss: 0.0029
Epoch 8/50
```

```
31/31 [==============================] - 4s 143ms/step - loss: 0.0031
Epoch 9/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0030
Epoch 10/50
31/31 [==============================] - 4s 130ms/step - loss: 0.0027
Epoch 11/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0028
Epoch 12/50
31/31 [==============================] - 4s 128ms/step - loss: 0.0025
Epoch 13/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0024
Epoch 14/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0031
Epoch 15/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0024
Epoch 16/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0021
Epoch 17/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0025
Epoch 18/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0022
Epoch 19/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0019
Epoch 20/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0019
Epoch 21/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0022
Epoch 22/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0018
Epoch 23/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0020
Epoch 24/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0021
Epoch 25/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0018
Epoch 26/50
31/31 [==============================] - 4s 124ms/step - loss: 0.0018
Epoch 27/50
31/31 [==============================] - 4s 137ms/step - loss: 0.0018
Epoch 28/50
31/31 [==============================] - 4s 126ms/step - loss: 0.0017
Epoch 29/50
31/31 [==============================] - 4s 124ms/step - loss: 0.0018
Epoch 30/50
31/31 [==============================] - 4s 124ms/step - loss: 0.0017
Epoch 31/50
31/31 [==============================] - 4s 123ms/step - loss: 0.0015
Epoch 32/50
```

```
31/31 [==============================] - 4s 122ms/step - loss: 0.0016
Epoch 33/50
31/31 [==============================] - 4s 122ms/step - loss: 0.0016
Epoch 34/50
31/31 [==============================] - 4s 129ms/step - loss: 0.0015
Epoch 35/50
31/31 [==============================] - 4s 137ms/step - loss: 0.0016
Epoch 36/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0015
Epoch 37/50
31/31 [==============================] - 4s 128ms/step - loss: 0.0018
Epoch 38/50
31/31 [==============================] - 4s 136ms/step - loss: 0.0017
Epoch 39/50
31/31 [==============================] - 4s 142ms/step - loss: 0.0014
Epoch 40/50
31/31 [==============================] - 4s 130ms/step - loss: 0.0016
Epoch 41/50
31/31 [==============================] - 4s 131ms/step - loss: 0.0013
Epoch 42/50
31/31 [==============================] - 4s 134ms/step - loss: 0.0013
Epoch 43/50
31/31 [==============================] - 4s 127ms/step - loss: 0.0015
Epoch 44/50
31/31 [==============================] - 7s 232ms/step - loss: 0.0014
Epoch 45/50
31/31 [==============================] - 4s 125ms/step - loss: 0.0013
Epoch 46/50
31/31 [==============================] - 3s 112ms/step - loss: 0.0013
Epoch 47/50
31/31 [==============================] - 3s 108ms/step - loss: 0.0017
Epoch 48/50
31/31 [==============================] - 3s 99ms/step - loss: 0.0013
Epoch 49/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0012
Epoch 50/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0014
Time required for fitting model: 218.4243 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 48ms/step
MAE is  6.87.
MSE is sq.  88.72.
RMSE is  9.42.
MAPE is 2.68%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 43ms/step
MAE is  6.51.
```

```
MSE is sq.  74.69.
RMSE is  8.64.
MAPE is 1.61%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 57ms/step
5/5 [==============================] - 0s 50ms/step

Fitting LSTM Model for High Column of SBI Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for High Column of SBI Dataset
Epoch 1/50
31/31 [==============================] - 8s 89ms/step - loss: 0.0199
Epoch 2/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0061
Epoch 3/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0045
Epoch 4/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0040
Epoch 5/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0038
Epoch 6/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0030
Epoch 7/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0032
Epoch 8/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0032
Epoch 9/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0032
Epoch 10/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0025
Epoch 11/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0027
Epoch 12/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0027
Epoch 13/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0025
Epoch 14/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0025
Epoch 15/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0022
Epoch 16/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0022
Epoch 17/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0024
Epoch 18/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0020
```

```
Epoch 19/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 20/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0017
Epoch 21/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0019
Epoch 22/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0016
Epoch 23/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0019
Epoch 24/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0018
Epoch 25/50
31/31 [==============================] - 3s 85ms/step - loss: 0.0017
Epoch 26/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0017
Epoch 27/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0015
Epoch 28/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0015
Epoch 29/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0016
Epoch 30/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0015
Epoch 31/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0013
Epoch 32/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0014
Epoch 33/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0014
Epoch 34/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0013
Epoch 35/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0015
Epoch 36/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0013
Epoch 37/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0017
Epoch 38/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0015
Epoch 39/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0012
Epoch 40/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0014
Epoch 41/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0012
Epoch 42/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0011
```

```
Epoch 43/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0013
Epoch 44/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0013
Epoch 45/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0012
Epoch 46/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0012
Epoch 47/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0015
Epoch 48/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0011
Epoch 49/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0010
Epoch 50/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0014
Time required for fitting model: 142.4958 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 46ms/step
MAE is  6.46.
MSE is sq.  76.86.
RMSE is  8.77.
MAPE is 2.44%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 45ms/step
MAE is  6.06.
MSE is sq.  64.69.
RMSE is  8.04.
MAPE is 1.47%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 47ms/step
5/5 [==============================] - 0s 42ms/step

Fitting LSTM Model for Low Column of SBI Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Low Column of SBI Dataset
Epoch 1/50
31/31 [==============================] - 8s 90ms/step - loss: 0.0302
Epoch 2/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0064
Epoch 3/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0046
Epoch 4/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0042
Epoch 5/50
```

```
31/31 [==============================] - 3s 88ms/step - loss: 0.0038
Epoch 6/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0032
Epoch 7/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0031
Epoch 8/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0033
Epoch 9/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0031
Epoch 10/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 11/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0031
Epoch 12/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0023
Epoch 13/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0026
Epoch 14/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0030
Epoch 15/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0025
Epoch 16/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0025
Epoch 17/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 18/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0024
Epoch 19/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0021
Epoch 20/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0021
Epoch 21/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 22/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0019
Epoch 23/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0020
Epoch 24/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 25/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 26/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0018
Epoch 27/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 28/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 29/50
```

```
31/31 [==============================] - 3s 102ms/step - loss: 0.0018
Epoch 30/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0018
Epoch 31/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0016
Epoch 32/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 33/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0017
Epoch 34/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0016
Epoch 35/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 36/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0015
Epoch 37/50
31/31 [==============================] - 4s 117ms/step - loss: 0.0019
Epoch 38/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0016
Epoch 39/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0014
Epoch 40/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0018
Epoch 41/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0014
Epoch 42/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0013
Epoch 43/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0015
Epoch 44/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0015
Epoch 45/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0014
Epoch 46/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0014
Epoch 47/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0017
Epoch 48/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0013
Epoch 49/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0013
Epoch 50/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0017
Time required for fitting model: 147.8959 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 49ms/step
MAE is  7.24.
```

```
MSE is sq.  93.35.
RMSE is  9.66.
MAPE is 2.89%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 48ms/step
MAE is  7.12.
MSE is sq.  73.68.
RMSE is  8.58.
MAPE is 1.80%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 51ms/step
5/5 [==============================] - 0s 52ms/step

Fitting LSTM Model for Close Column of SBI Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Close Column of SBI Dataset
Epoch 1/50
31/31 [==============================] - 9s 100ms/step - loss: 0.0289
Epoch 2/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0063
Epoch 3/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0045
Epoch 4/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0040
Epoch 5/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0038
Epoch 6/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0035
Epoch 7/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0034
Epoch 8/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0031
Epoch 9/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0032
Epoch 10/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0025
Epoch 11/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0029
Epoch 12/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0025
Epoch 13/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0024
Epoch 14/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0030
Epoch 15/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0025
```

```
Epoch 16/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0022
Epoch 17/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 18/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0023
Epoch 19/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0018
Epoch 20/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0019
Epoch 21/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0021
Epoch 22/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0018
Epoch 23/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0019
Epoch 24/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0020
Epoch 25/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0018
Epoch 26/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0017
Epoch 27/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0017
Epoch 28/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0016
Epoch 29/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 30/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 31/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0015
Epoch 32/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0015
Epoch 33/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0015
Epoch 34/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0016
Epoch 35/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 36/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0015
Epoch 37/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0017
Epoch 38/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0015
Epoch 39/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0015
```

```
Epoch 40/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0016
Epoch 41/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0013
Epoch 42/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0013
Epoch 43/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0013
Epoch 44/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0014
Epoch 45/50
31/31 [==============================] - 3s 100ms/step - loss: 0.0015
Epoch 46/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0014
Epoch 47/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0015
Epoch 48/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0012
Epoch 49/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0012
Epoch 50/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0015
Time required for fitting model: 143.8103 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 46ms/step
MAE is  7.17.
MSE is sq.  91.09.
RMSE is  9.54.
MAPE is 2.78%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 41ms/step
MAE is  6.91.
MSE is sq.  75.51.
RMSE is  8.69.
MAPE is 1.71%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 46ms/step
5/5 [==============================] - 0s 44ms/step

Fitting LSTM Model for Volume Column of SBI Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Volume Column of SBI Dataset
Epoch 1/100
31/31 [==============================] - 8s 89ms/step - loss: 0.0188
Epoch 2/100
```

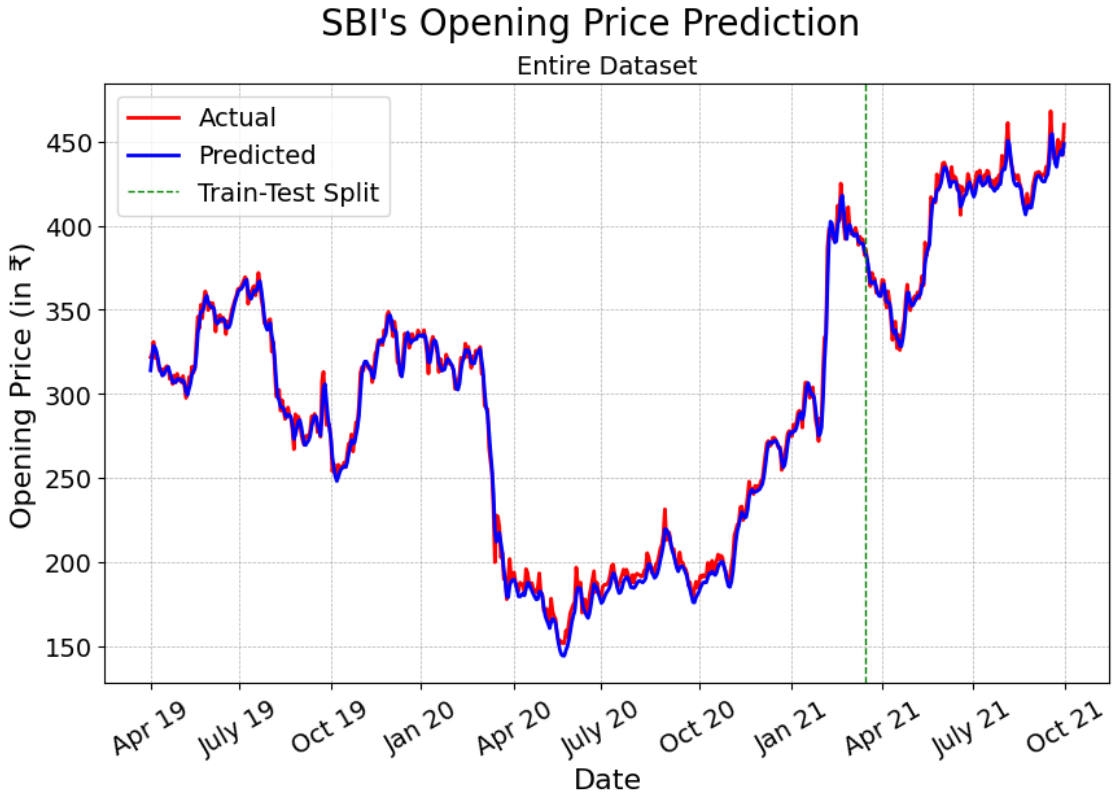
```
31/31 [==============================] - 3s 85ms/step - loss: 0.0132
Epoch 3/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0128
Epoch 4/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0125
Epoch 5/100
31/31 [==============================] - 3s 96ms/step - loss: 0.0124
Epoch 6/100
31/31 [==============================] - 3s 107ms/step - loss: 0.0129
Epoch 7/100
31/31 [==============================] - 3s 106ms/step - loss: 0.0128
Epoch 8/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0117
Epoch 9/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0113
Epoch 10/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0117
Epoch 11/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0112
Epoch 12/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0110
Epoch 13/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0111
Epoch 14/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0107
Epoch 15/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0109
Epoch 16/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0111
Epoch 17/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0109
Epoch 18/100
31/31 [==============================] - 3s 100ms/step - loss: 0.0104
Epoch 19/100
31/31 [==============================] - 3s 97ms/step - loss: 0.0105
Epoch 20/100
31/31 [==============================] - 3s 108ms/step - loss: 0.0108
Epoch 21/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0104
Epoch 22/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0103
Epoch 23/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0106
Epoch 24/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0105
Epoch 25/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0104
Epoch 26/100
```

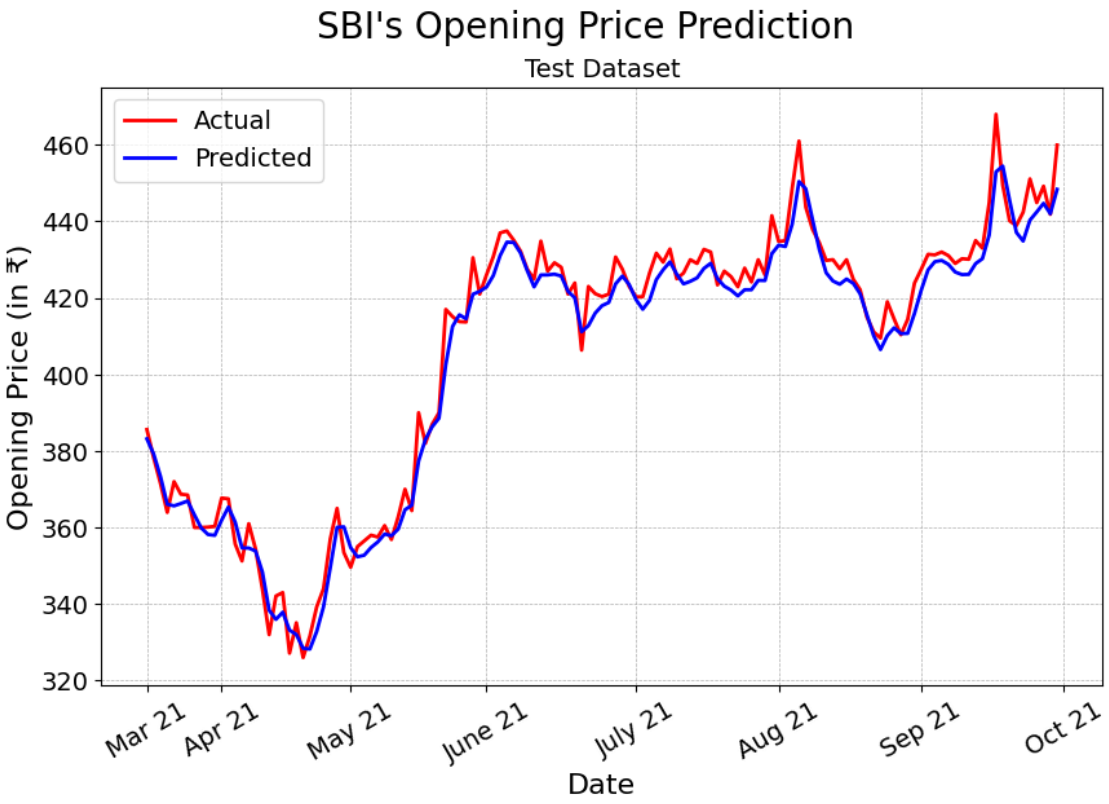
```
31/31 [==============================] - 3s 88ms/step - loss: 0.0104
Epoch 27/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0103
Epoch 28/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0105
Epoch 29/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0109
Epoch 30/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0102
Epoch 31/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0104
Epoch 32/100
31/31 [==============================] - 3s 85ms/step - loss: 0.0103
Epoch 33/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0102
Epoch 34/100
31/31 [==============================] - 3s 100ms/step - loss: 0.0101
Epoch 35/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0101
Epoch 36/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0100
Epoch 37/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0101
Epoch 38/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0101
Epoch 39/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0101
Epoch 40/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0102
Epoch 41/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0101
Epoch 42/100
31/31 [==============================] - 3s 97ms/step - loss: 0.0100
Epoch 43/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0105
Epoch 44/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0102
Epoch 45/100
31/31 [==============================] - 4s 128ms/step - loss: 0.0100
Epoch 46/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0105
Epoch 47/100
31/31 [==============================] - 3s 99ms/step - loss: 0.0102
Epoch 48/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0103
Epoch 49/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0100
Epoch 50/100
```

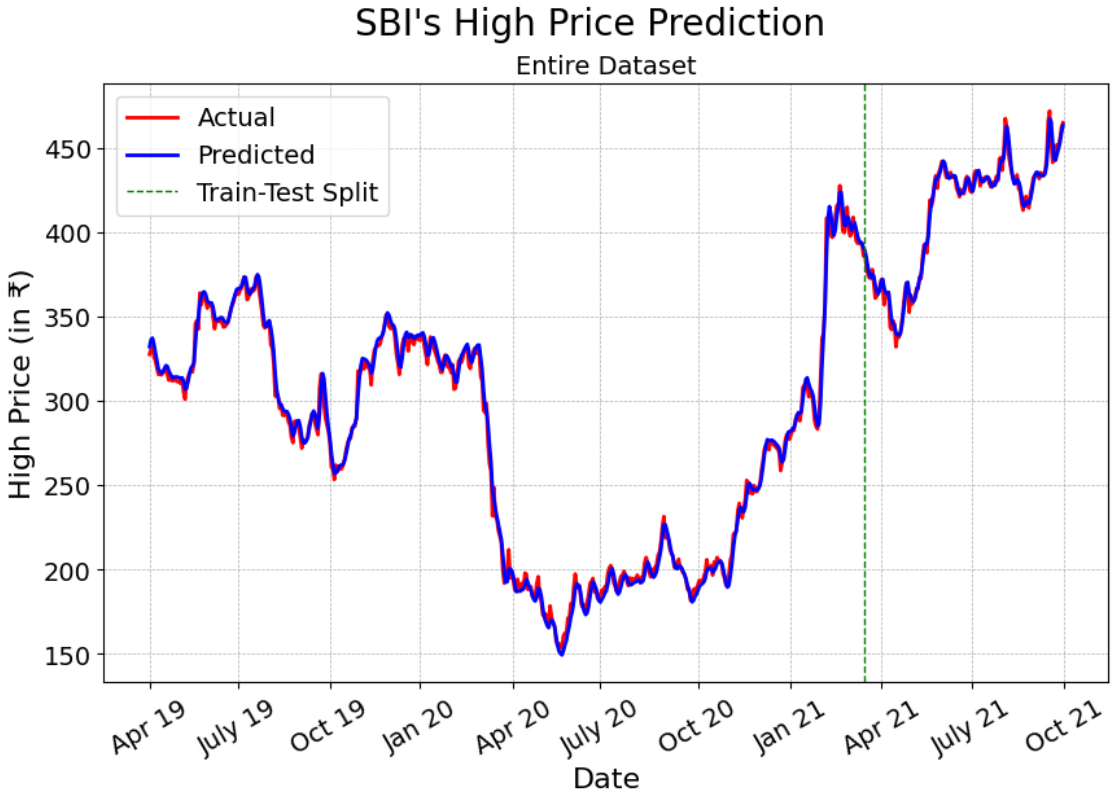
```
31/31 [==============================] - 3s 96ms/step - loss: 0.0106
Epoch 51/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0099
Epoch 52/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0102
Epoch 53/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0102
Epoch 54/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0103
Epoch 55/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0105
Epoch 56/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0102
Epoch 57/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0103
Epoch 58/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0101
Epoch 59/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0100
Epoch 60/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0101
Epoch 61/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0099
Epoch 62/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0101
Epoch 63/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0101
Epoch 64/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0101
Epoch 65/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0099
Epoch 66/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0100
Epoch 67/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0101
Epoch 68/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0103
Epoch 69/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0101
Epoch 70/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0101
Epoch 71/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0102
Epoch 72/100
31/31 [==============================] - 3s 97ms/step - loss: 0.0100
Epoch 73/100
31/31 [==============================] - 3s 99ms/step - loss: 0.0100
Epoch 74/100
```

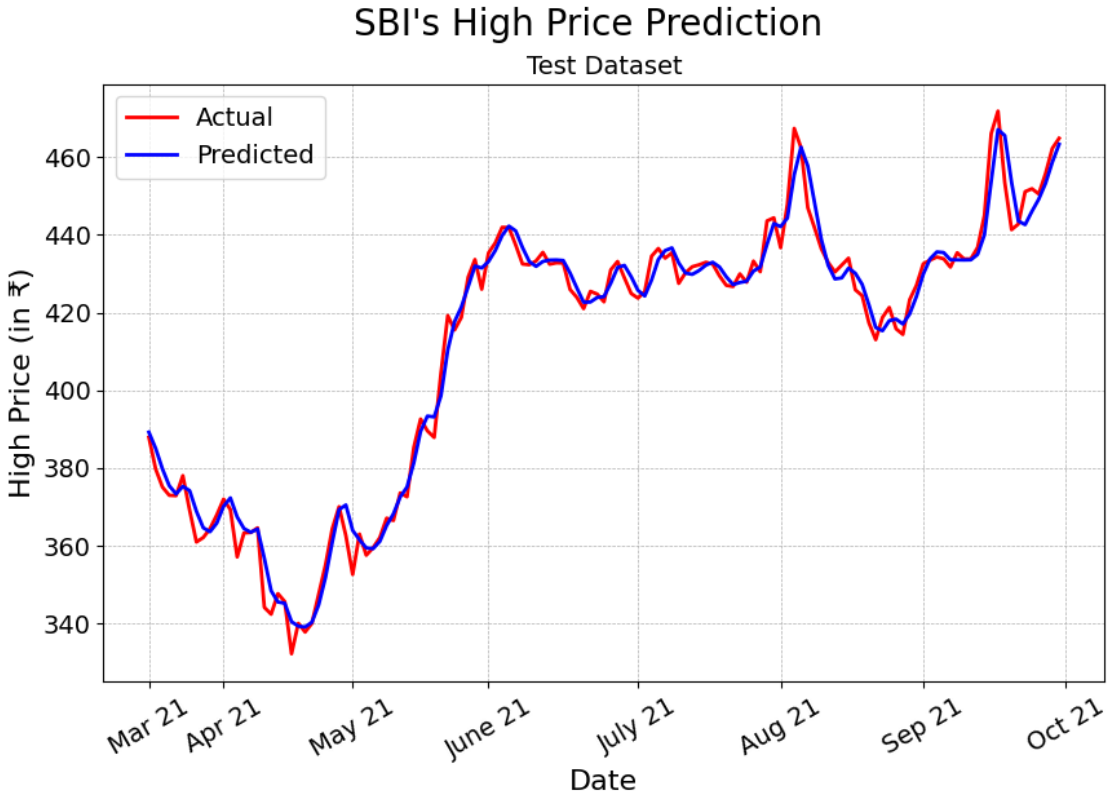
```
31/31 [==============================] - 3s 102ms/step - loss: 0.0099
Epoch 75/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0099
Epoch 76/100
31/31 [==============================] - 3s 101ms/step - loss: 0.0101
Epoch 77/100
31/31 [==============================] - 4s 113ms/step - loss: 0.0104
Epoch 78/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0101
Epoch 79/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0103
Epoch 80/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0104
Epoch 81/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0102
Epoch 82/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0101
Epoch 83/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0100
Epoch 84/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0102
Epoch 85/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0099
Epoch 86/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0099
Epoch 87/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0099
Epoch 88/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0099
Epoch 89/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0101
Epoch 90/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0102
Epoch 91/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0099
Epoch 92/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0099
Epoch 93/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0099
Epoch 94/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0100
Epoch 95/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0100
Epoch 96/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0099
Epoch 97/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0100
Epoch 98/100
```

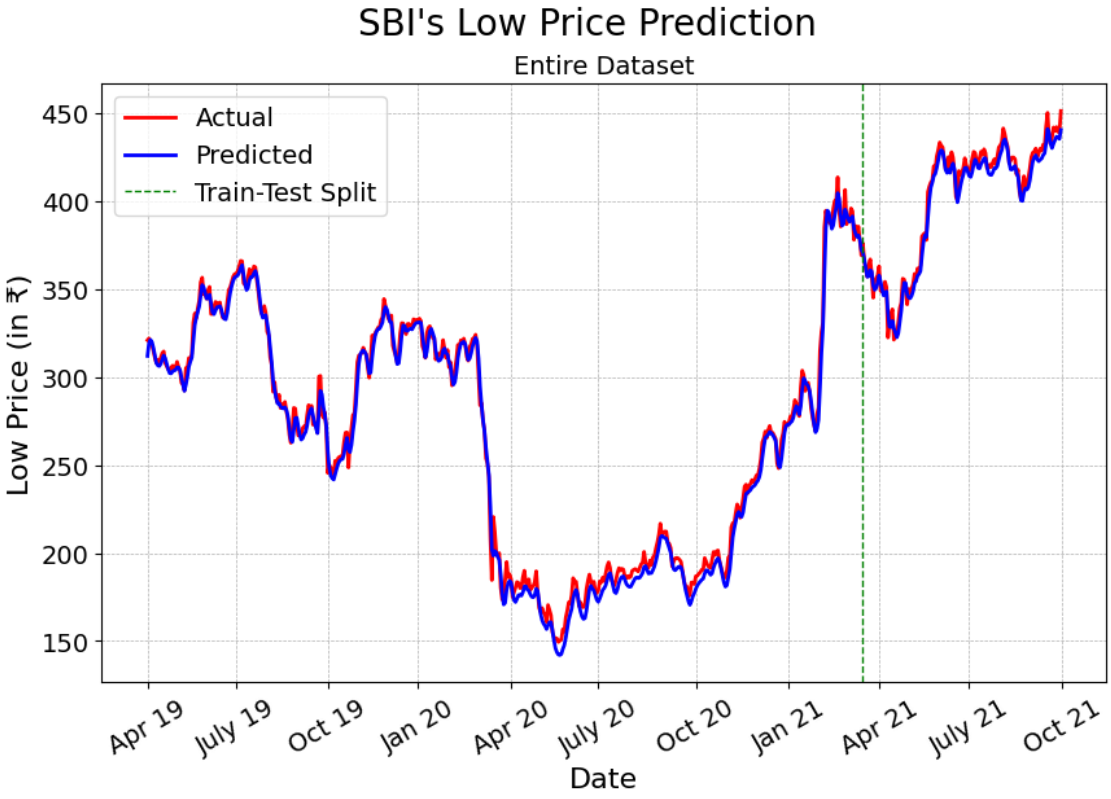
```
31/31 [==============================] - 3s 88ms/step - loss: 0.0102
Epoch 99/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0099
Epoch 100/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0098
Time required for fitting model: 287.5585 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 51ms/step
MAE is 14281772.60 units.
MSE is 418190972801201.94 sq. units.
RMSE is 20449718.16 units.
MAPE is 33.01%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 44ms/step
MAE is 12335319.62 units.
MSE is 379433522456699.12 sq. units.
RMSE is 19479053.43 units.
MAPE is 41.49%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 51ms/step
5/5 [==============================] - 0s 46ms/step
```

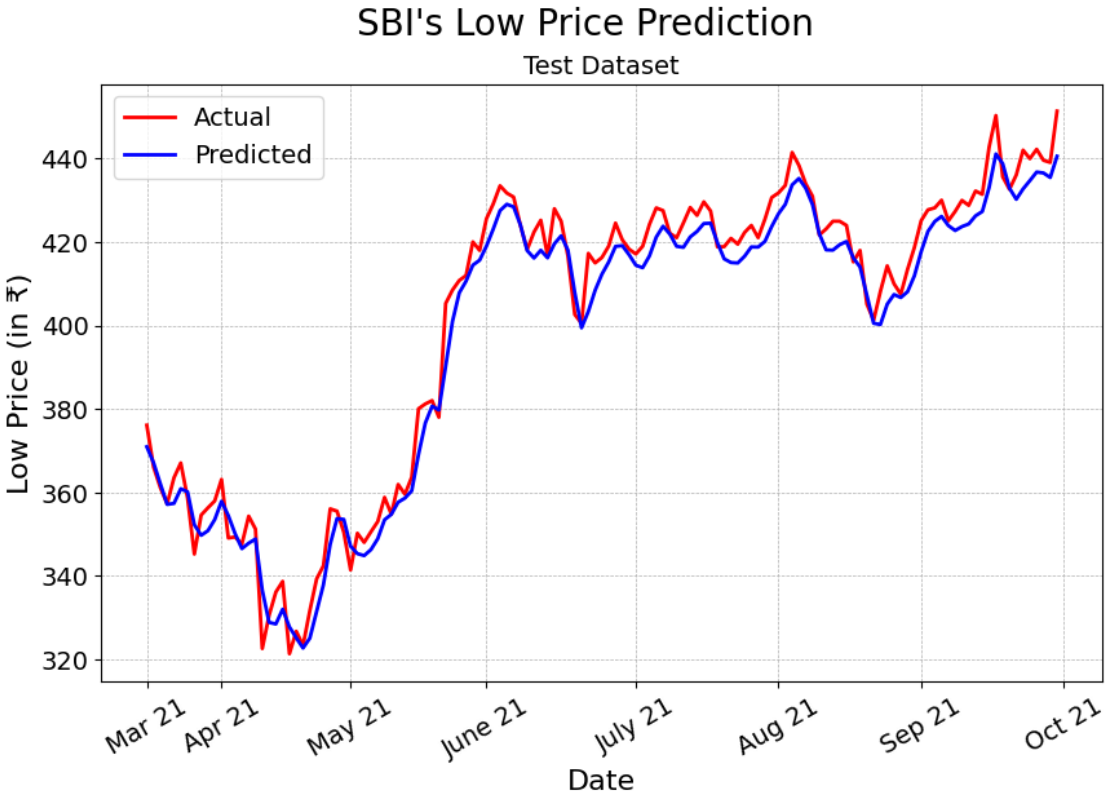


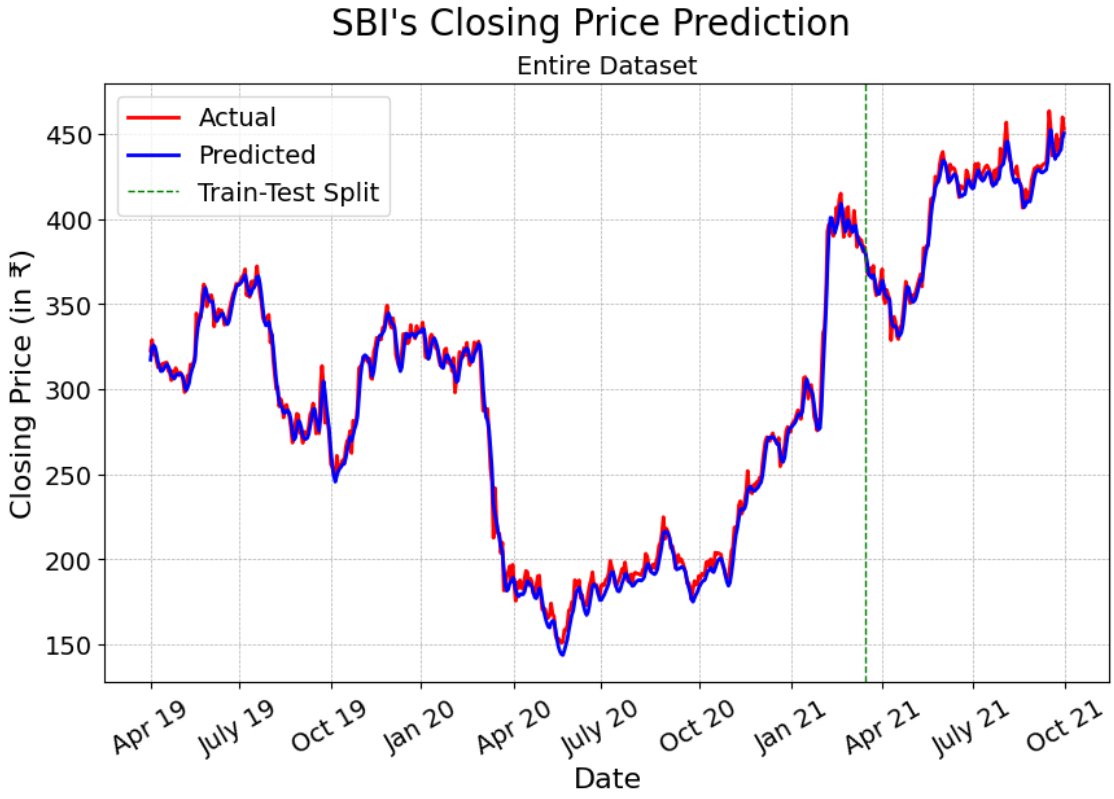

SBI's Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
460
440
420
400
380
360
340
320
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

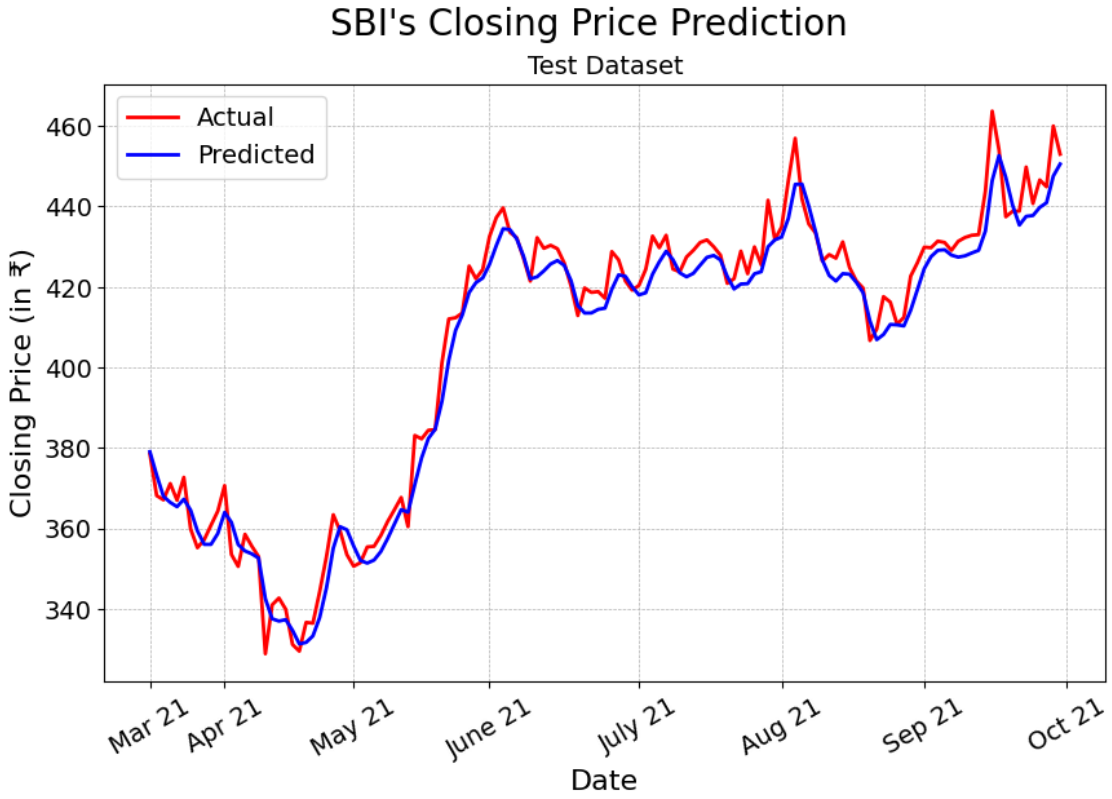

SBI's High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
450
400
350
300
250
200
150
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

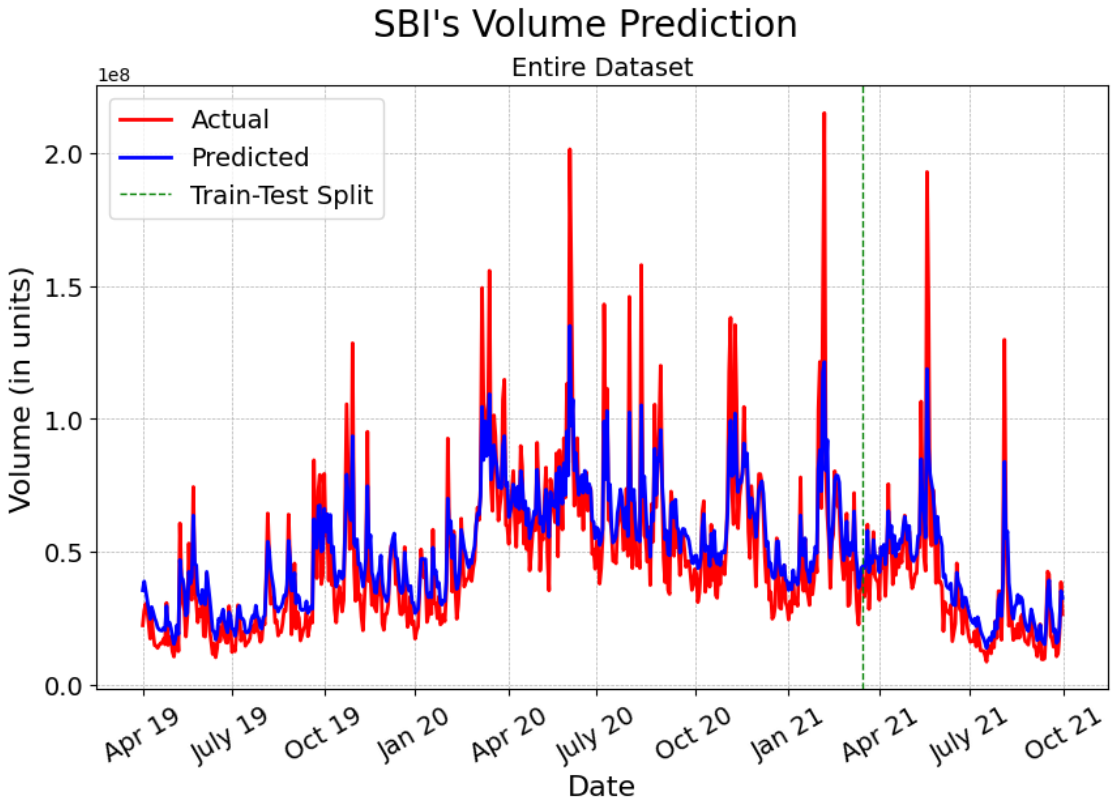

SBI's High Price Prediction
Test Dataset
Actual
Predicted
460
440
420
400
380
360
340
High Price (in ₹)
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

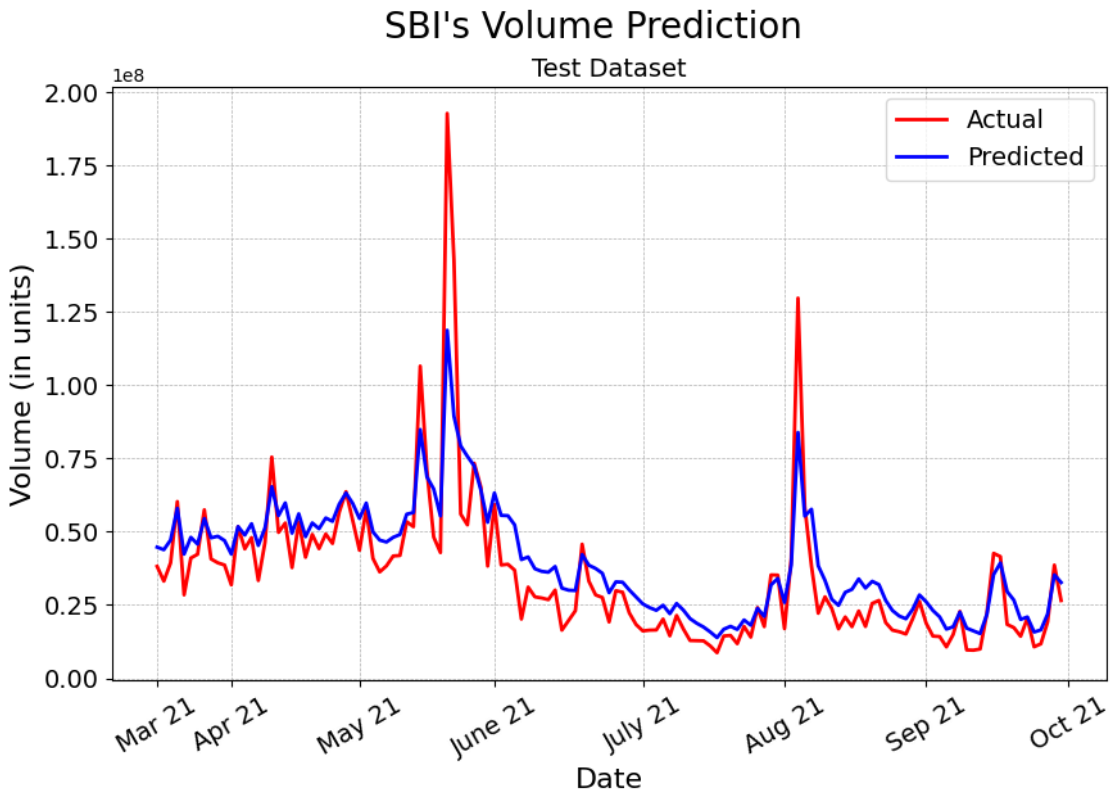

SBI's Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
450
400
350
300
250
200
150
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


SBI's Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
440
420
400
380
360
340
320
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


SBI's Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
450
400
350
300
250
200
150
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


SBI's Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
460
440
420
400
380
360
340
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


SBI's Volume Prediction
Entire Dataset
1e8
Actual
Predicted
Train-Test Split
Volume (in units)
2.0
1.5
1.0
0.5
0.0
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date



[31]:
```
generate_predictions('USD-INR Exchange Rate', save_fig = True)
```

```
Fitting LSTM Model for Open Column of USD-INR Exchange Rate Dataset
Shape of X_train: (516, 60)
Shape of Y_train: (516,)
Fitting the LSTM Model on the Train Set for Open Column of USD-INR Exchange Rate
Dataset
Epoch 1/50
33/33 [==============================] - 8s 84ms/step - loss: 0.0278
Epoch 2/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0067
Epoch 3/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0048
Epoch 4/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0046
Epoch 5/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0044
Epoch 6/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0040
Epoch 7/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0037
```

```
Epoch 8/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0041
Epoch 9/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0039
Epoch 10/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0035
Epoch 11/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0045
Epoch 12/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 13/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0033
Epoch 14/50
33/33 [==============================] - 4s 108ms/step - loss: 0.0039
Epoch 15/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0034
Epoch 16/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0032
Epoch 17/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0033
Epoch 18/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0029
Epoch 19/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0031
Epoch 20/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0035
Epoch 21/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0030
Epoch 22/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0033
Epoch 23/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0029
Epoch 24/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0029
Epoch 25/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0026
Epoch 26/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0027
Epoch 27/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0025
Epoch 28/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0030
Epoch 29/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0026
Epoch 30/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0028
Epoch 31/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0029
```

```
Epoch 32/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0028
Epoch 33/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0027
Epoch 34/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 35/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0027
Epoch 36/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0025
Epoch 37/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0024
Epoch 38/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0023
Epoch 39/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0024
Epoch 40/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0025
Epoch 41/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 42/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0025
Epoch 43/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0026
Epoch 44/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0023
Epoch 45/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0022
Epoch 46/50
33/33 [==============================] - 3s 85ms/step - loss: 0.0022
Epoch 47/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0020
Epoch 48/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0022
Epoch 49/50
33/33 [==============================] - 3s 83ms/step - loss: 0.0023
Epoch 50/50
33/33 [==============================] - 3s 84ms/step - loss: 0.0022
Time required for fitting model: 148.6499 seconds.

The Performance of Model on Train Set is as follows:-
17/17 [==============================] - 2s 44ms/step
MAE is  0.27.
MSE is sq.  0.14.
RMSE is  0.38.
MAPE is 0.38%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 44ms/step
```

```
MAE is  0.24.
MSE is sq.  0.10.
RMSE is  0.31.
MAPE is 0.32%.
Shape of X: (660, 60)
Shape of Y: (660,)
21/21 [==============================] - 1s 44ms/step
5/5 [==============================] - 0s 41ms/step

Fitting LSTM Model for High Column of USD-INR Exchange Rate Dataset
Shape of X_train: (516, 60)
Shape of Y_train: (516,)
Fitting the LSTM Model on the Train Set for High Column of USD-INR Exchange Rate
Dataset
Epoch 1/50
33/33 [==============================] - 8s 88ms/step - loss: 0.0324
Epoch 2/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0063
Epoch 3/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0053
Epoch 4/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0045
Epoch 5/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0040
Epoch 6/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0041
Epoch 7/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0036
Epoch 8/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0044
Epoch 9/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0042
Epoch 10/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0037
Epoch 11/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0046
Epoch 12/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0037
Epoch 13/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0034
Epoch 14/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0031
Epoch 15/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0035
Epoch 16/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0027
Epoch 17/50
33/33 [==============================] - 3s 86ms/step - loss: 0.0032
```

```
Epoch 18/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0029
Epoch 19/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0029
Epoch 20/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0031
Epoch 21/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0031
Epoch 22/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0030
Epoch 23/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 24/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0028
Epoch 25/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0024
Epoch 26/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0026
Epoch 27/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 28/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0025
Epoch 29/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0023
Epoch 30/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0025
Epoch 31/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0026
Epoch 32/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0025
Epoch 33/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0027
Epoch 34/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0023
Epoch 35/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0022
Epoch 36/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0023
Epoch 37/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0022
Epoch 38/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0019
Epoch 39/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0023
Epoch 40/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0020
Epoch 41/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0023
```

```
Epoch 42/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0021
Epoch 43/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0019
Epoch 44/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0019
Epoch 45/50
33/33 [==============================] - 3s 104ms/step - loss: 0.0020
Epoch 46/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0018
Epoch 47/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0019
Epoch 48/50
33/33 [==============================] - 3s 96ms/step - loss: 0.0020
Epoch 49/50
33/33 [==============================] - 4s 106ms/step - loss: 0.0018
Epoch 50/50
33/33 [==============================] - 3s 105ms/step - loss: 0.0017
Time required for fitting model: 153.6520 seconds.

The Performance of Model on Train Set is as follows:-
17/17 [==============================] - 2s 46ms/step
MAE is  0.24.
MSE is sq.  0.12.
RMSE is  0.34.
MAPE is 0.33%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 53ms/step
MAE is  0.24.
MSE is sq.  0.10.
RMSE is  0.32.
MAPE is 0.32%.
Shape of X: (660, 60)
Shape of Y: (660,)
21/21 [==============================] - 1s 48ms/step
5/5 [==============================] - 0s 47ms/step

Fitting LSTM Model for Low Column of USD-INR Exchange Rate Dataset
Shape of X_train: (516, 60)
Shape of Y_train: (516,)
Fitting the LSTM Model on the Train Set for Low Column of USD-INR Exchange Rate
Dataset
Epoch 1/50
33/33 [==============================] - 8s 89ms/step - loss: 0.0347
Epoch 2/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0064
Epoch 3/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0053
```

```
Epoch 4/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0046
Epoch 5/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0047
Epoch 6/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0042
Epoch 7/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0039
Epoch 8/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0045
Epoch 9/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0036
Epoch 10/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0040
Epoch 11/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0045
Epoch 12/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0037
Epoch 13/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0034
Epoch 14/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0033
Epoch 15/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0033
Epoch 16/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0029
Epoch 17/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 18/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0030
Epoch 19/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0029
Epoch 20/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0033
Epoch 21/50
33/33 [==============================] - 4s 108ms/step - loss: 0.0029
Epoch 22/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0028
Epoch 23/50
33/33 [==============================] - 3s 101ms/step - loss: 0.0030
Epoch 24/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0031
Epoch 25/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0028
Epoch 26/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0024
Epoch 27/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0026
```

```
Epoch 28/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0026
Epoch 29/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0024
Epoch 30/50
33/33 [==============================] - 3s 102ms/step - loss: 0.0026
Epoch 31/50
33/33 [==============================] - 3s 105ms/step - loss: 0.0025
Epoch 32/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0022
Epoch 33/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0022
Epoch 34/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 35/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0023
Epoch 36/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0022
Epoch 37/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0022
Epoch 38/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0018
Epoch 39/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0022
Epoch 40/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0020
Epoch 41/50
33/33 [==============================] - 3s 101ms/step - loss: 0.0021
Epoch 42/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0021
Epoch 43/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0021
Epoch 44/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0020
Epoch 45/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0021
Epoch 46/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0020
Epoch 47/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0018
Epoch 48/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0017
Epoch 49/50
33/33 [==============================] - 3s 97ms/step - loss: 0.0019
Epoch 50/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0020
Time required for fitting model: 158.1918 seconds.
```

```
The Performance of Model on Train Set is as follows:-
17/17 [==============================] - 2s 51ms/step
MAE is  0.21.
MSE is sq.  0.09.
RMSE is  0.29.
MAPE is 0.29%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 51ms/step
MAE is  0.20.
MSE is sq.  0.07.
RMSE is  0.27.
MAPE is 0.27%.
Shape of X: (660, 60)
Shape of Y: (660,)
21/21 [==============================] - 1s 52ms/step
5/5 [==============================] - 0s 51ms/step

Fitting LSTM Model for Close Column of USD-INR Exchange Rate Dataset
Shape of X_train: (516, 60)
Shape of Y_train: (516,)
Fitting the LSTM Model on the Train Set for Close Column of USD-INR Exchange
Rate Dataset
Epoch 1/50
33/33 [==============================] - 10s 95ms/step - loss: 0.0283
Epoch 2/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0065
Epoch 3/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0049
Epoch 4/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0046
Epoch 5/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0050
Epoch 6/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0044
Epoch 7/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0038
Epoch 8/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0040
Epoch 9/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0038
Epoch 10/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0039
Epoch 11/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0046
Epoch 12/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0036
Epoch 13/50
33/33 [==============================] - 3s 97ms/step - loss: 0.0032
```

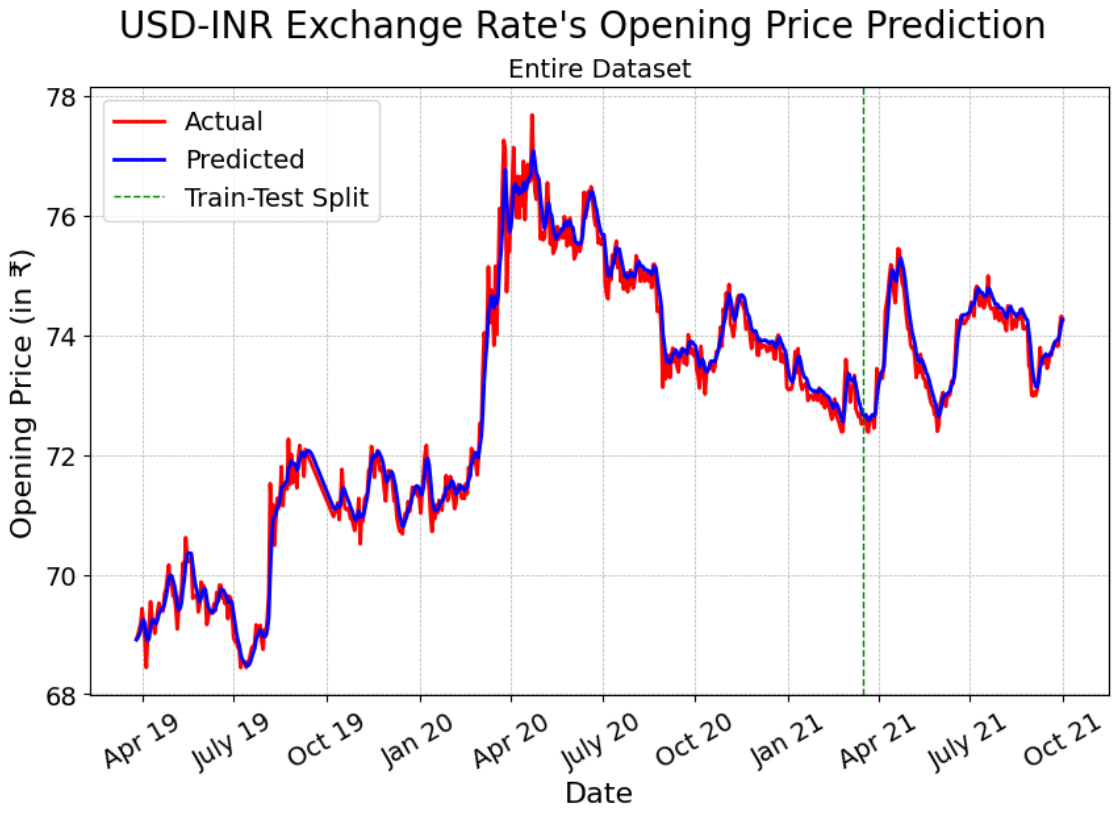
```
Epoch 14/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0039
Epoch 15/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0036
Epoch 16/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0029
Epoch 17/50
33/33 [==============================] - 3s 97ms/step - loss: 0.0032
Epoch 18/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0033
Epoch 19/50
33/33 [==============================] - 3s 100ms/step - loss: 0.0031
Epoch 20/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0033
Epoch 21/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0029
Epoch 22/50
33/33 [==============================] - 3s 97ms/step - loss: 0.0030
Epoch 23/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0033
Epoch 24/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0030
Epoch 25/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0027
Epoch 26/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0027
Epoch 27/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0026
Epoch 28/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0030
Epoch 29/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0026
Epoch 30/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0029
Epoch 31/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 32/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0027
Epoch 33/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0027
Epoch 34/50
33/33 [==============================] - 3s 99ms/step - loss: 0.0026
Epoch 35/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0030
Epoch 36/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0025
Epoch 37/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0024
```

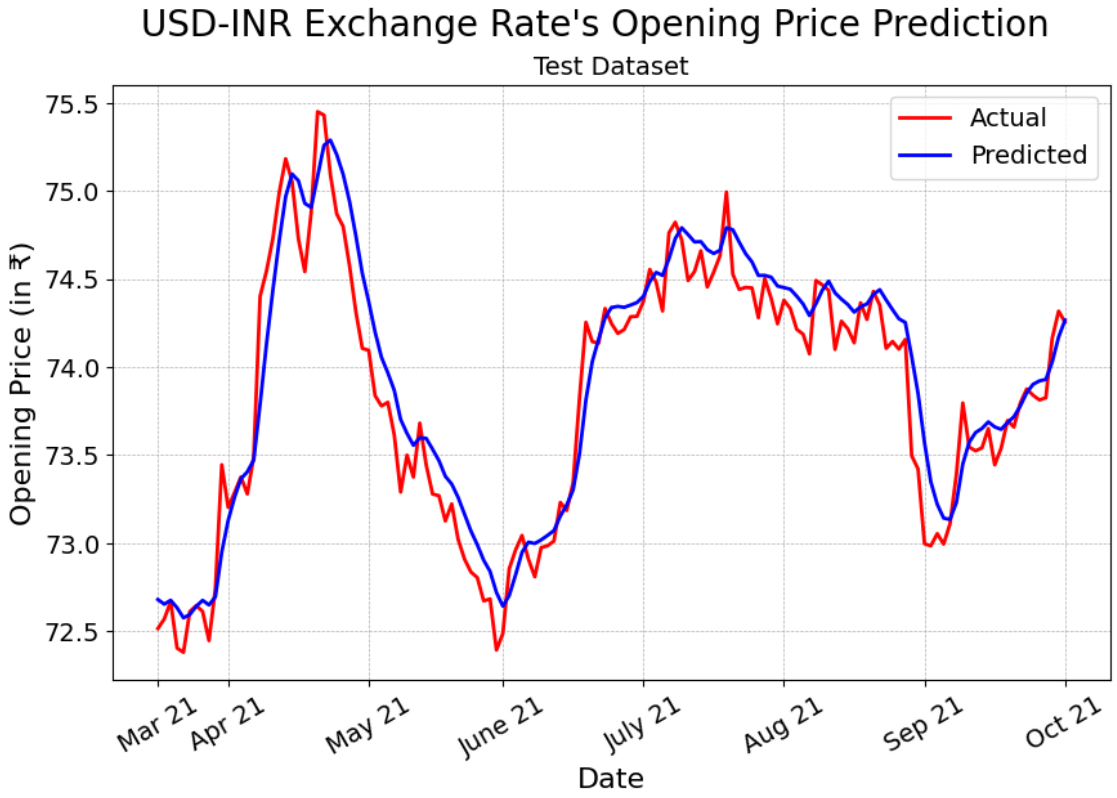
```
Epoch 38/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0023
Epoch 39/50
33/33 [==============================] - 3s 97ms/step - loss: 0.0027
Epoch 40/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0024
Epoch 41/50
33/33 [==============================] - 3s 96ms/step - loss: 0.0027
Epoch 42/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0024
Epoch 43/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0025
Epoch 44/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0022
Epoch 45/50
33/33 [==============================] - 3s 96ms/step - loss: 0.0024
Epoch 46/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0023
Epoch 47/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0022
Epoch 48/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 49/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0027
Epoch 50/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0026
Time required for fitting model: 162.6785 seconds.

The Performance of Model on Train Set is as follows:-
17/17 [==============================] - 2s 48ms/step
MAE is  0.28.
MSE is sq.  0.15.
RMSE is  0.39.
MAPE is 0.39%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 52ms/step
MAE is  0.24.
MSE is sq.  0.10.
RMSE is  0.31.
MAPE is 0.33%.
Shape of X: (660, 60)
Shape of Y: (660,)
21/21 [==============================] - 1s 52ms/step
5/5 [==============================] - 0s 45ms/step

Fitting LSTM Model for Adj Close Column of USD-INR Exchange Rate Dataset
Shape of X_train: (516, 60)
Shape of Y_train: (516,)
```

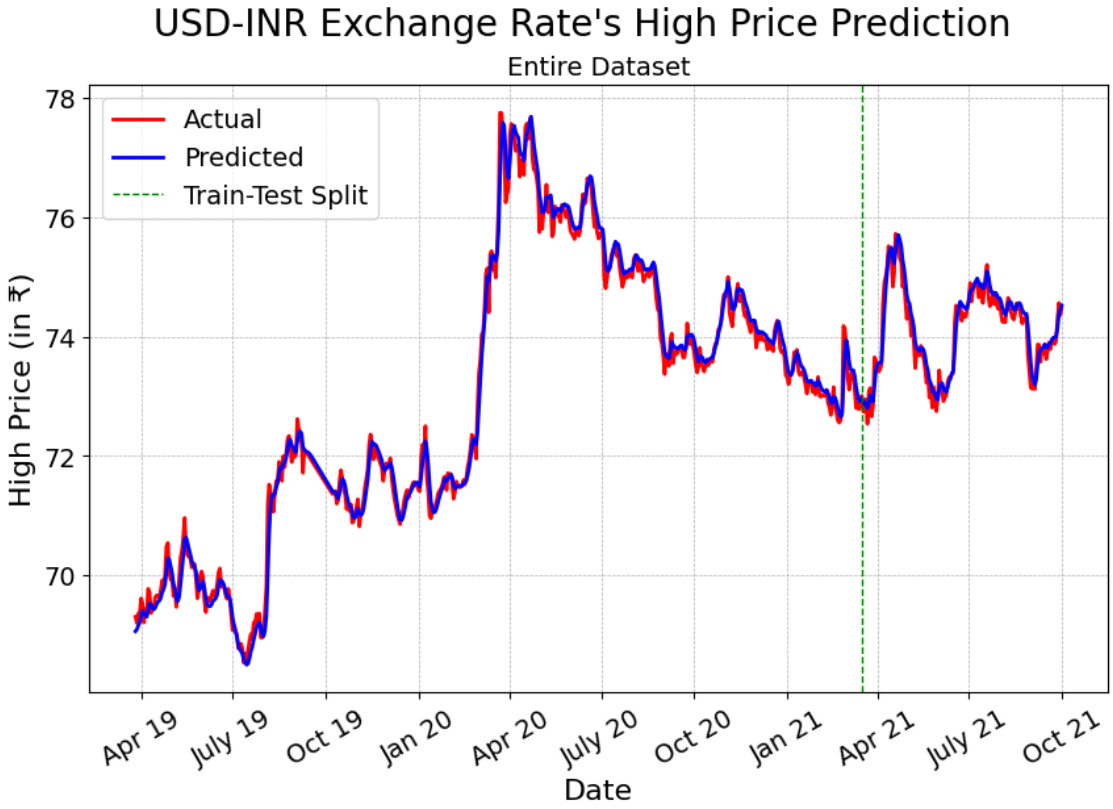
```
Fitting the LSTM Model on the Train Set for Adj Close Column of USD-INR Exchange
Rate Dataset
Epoch 1/50
33/33 [==============================] - 9s 92ms/step - loss: 0.0425
Epoch 2/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0066
Epoch 3/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0051
Epoch 4/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0052
Epoch 5/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0048
Epoch 6/50
33/33 [==============================] - 3s 92ms/step - loss: 0.0042
Epoch 7/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0040
Epoch 8/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0040
Epoch 9/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0037
Epoch 10/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0041
Epoch 11/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0056
Epoch 12/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0036
Epoch 13/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0035
Epoch 14/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0039
Epoch 15/50
33/33 [==============================] - 3s 87ms/step - loss: 0.0033
Epoch 16/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 17/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0034
Epoch 18/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0033
Epoch 19/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0030
Epoch 20/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0035
Epoch 21/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0033
Epoch 22/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0031
Epoch 23/50
33/33 [==============================] - 4s 109ms/step - loss: 0.0028
```

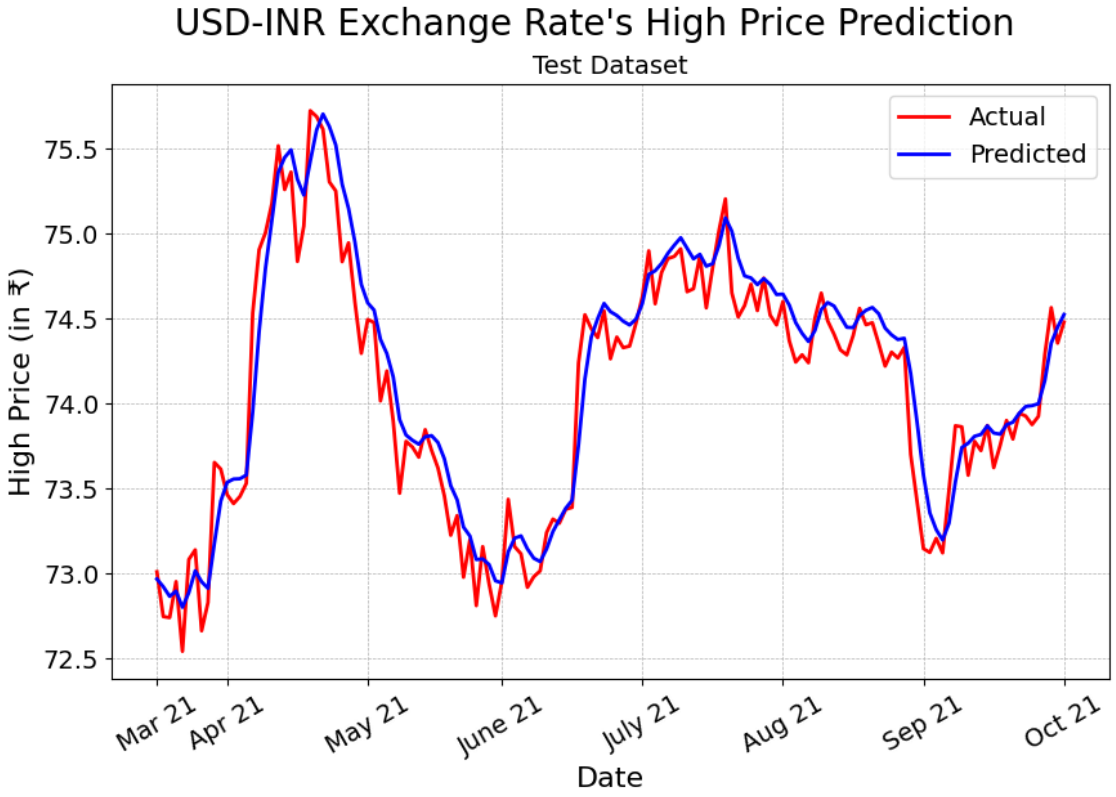
```
Epoch 24/50
33/33 [==============================] - 4s 111ms/step - loss: 0.0030
Epoch 25/50
33/33 [==============================] - 3s 103ms/step - loss: 0.0027
Epoch 26/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0028
Epoch 27/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 28/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0030
Epoch 29/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0027
Epoch 30/50
33/33 [==============================] - 3s 93ms/step - loss: 0.0029
Epoch 31/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0029
Epoch 32/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0028
Epoch 33/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0028
Epoch 34/50
33/33 [==============================] - 3s 91ms/step - loss: 0.0028
Epoch 35/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0027
Epoch 36/50
33/33 [==============================] - 3s 88ms/step - loss: 0.0024
Epoch 37/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0023
Epoch 38/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0023
Epoch 39/50
33/33 [==============================] - 3s 104ms/step - loss: 0.0027
Epoch 40/50
33/33 [==============================] - 4s 126ms/step - loss: 0.0026
Epoch 41/50
33/33 [==============================] - 4s 111ms/step - loss: 0.0027
Epoch 42/50
33/33 [==============================] - 3s 101ms/step - loss: 0.0025
Epoch 43/50
33/33 [==============================] - 3s 102ms/step - loss: 0.0025
Epoch 44/50
33/33 [==============================] - 3s 94ms/step - loss: 0.0021
Epoch 45/50
33/33 [==============================] - 3s 98ms/step - loss: 0.0025
Epoch 46/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0023
Epoch 47/50
33/33 [==============================] - 3s 90ms/step - loss: 0.0023
```

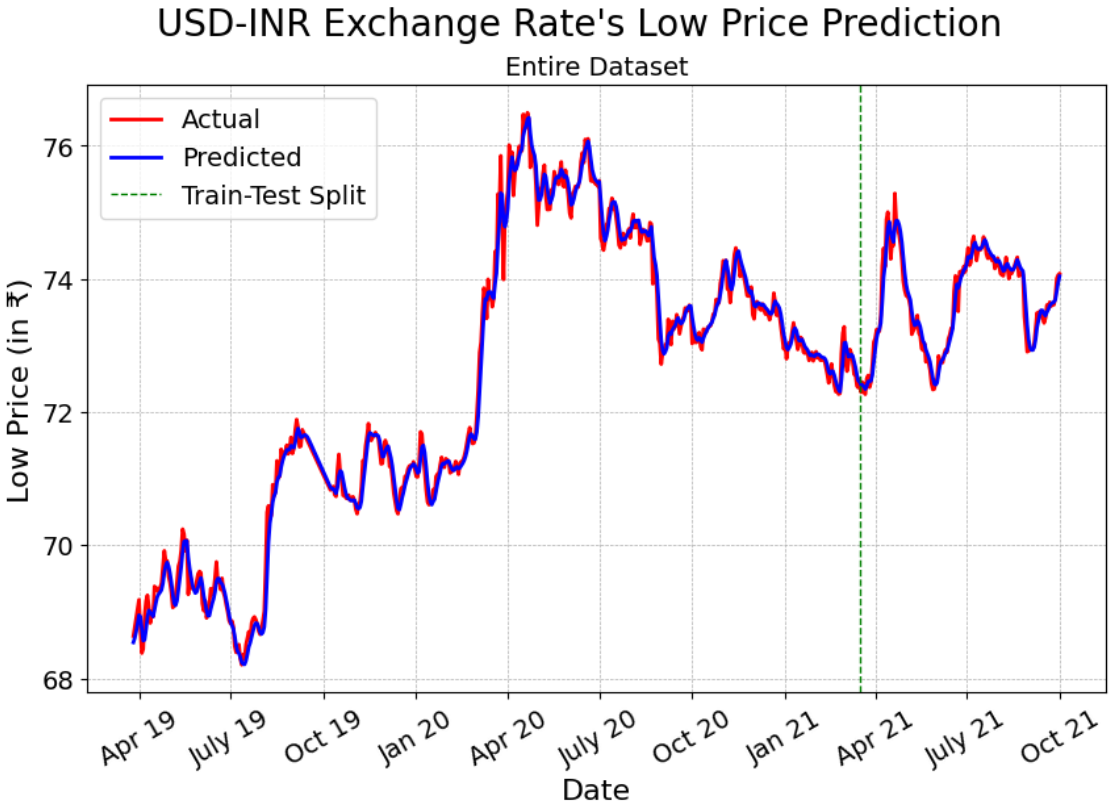
```
Epoch 48/50
33/33 [==============================] - 3s 89ms/step - loss: 0.0025
Epoch 49/50
33/33 [==============================] - 3s 95ms/step - loss: 0.0027
Epoch 50/50
33/33 [==============================] - 3s 103ms/step - loss: 0.0023
Time required for fitting model: 160.0566 seconds.

The Performance of Model on Train Set is as follows:-
17/17 [==============================] - 2s 48ms/step
MAE is  0.28.
MSE is sq.  0.15.
RMSE is  0.38.
MAPE is 0.38%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 52ms/step
MAE is  0.24.
MSE is sq.  0.10.
RMSE is  0.31.
MAPE is 0.32%.
Shape of X: (660, 60)
Shape of Y: (660,)
21/21 [==============================] - 1s 50ms/step
5/5 [==============================] - 0s 52ms/step
```

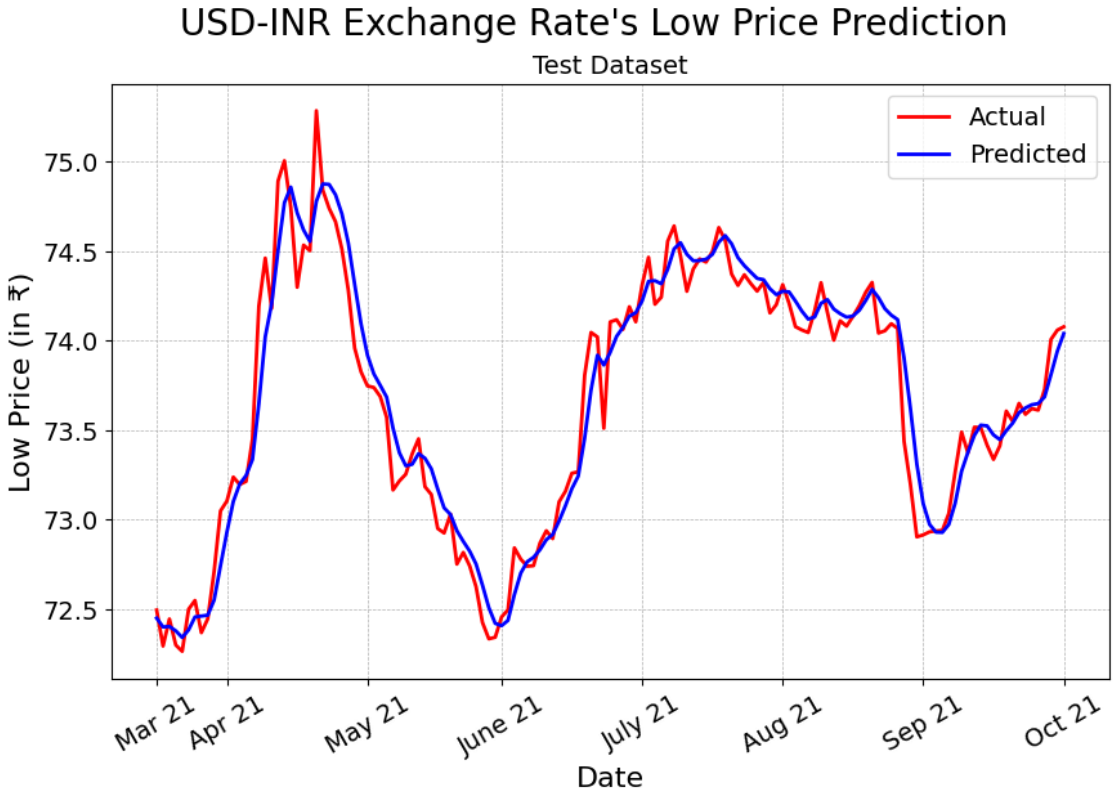


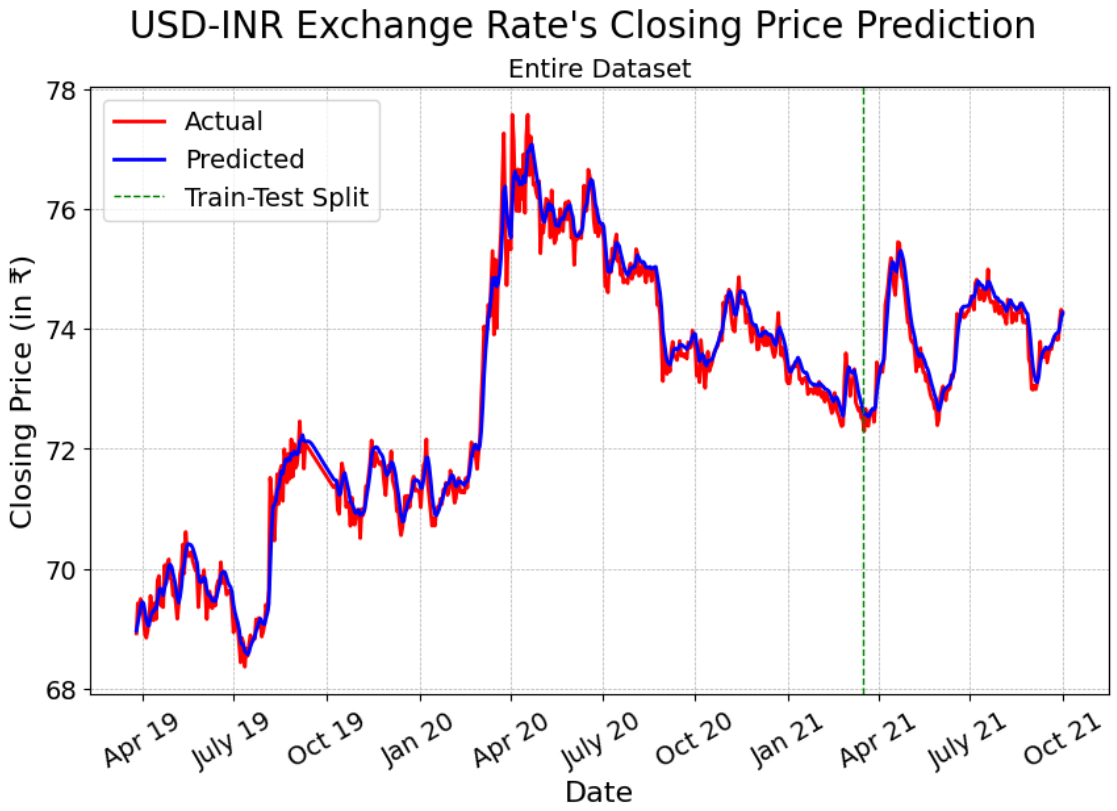

USD-INR Exchange Rate's Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
75.5
75.0
74.5
74.0
73.5
73.0
72.5
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

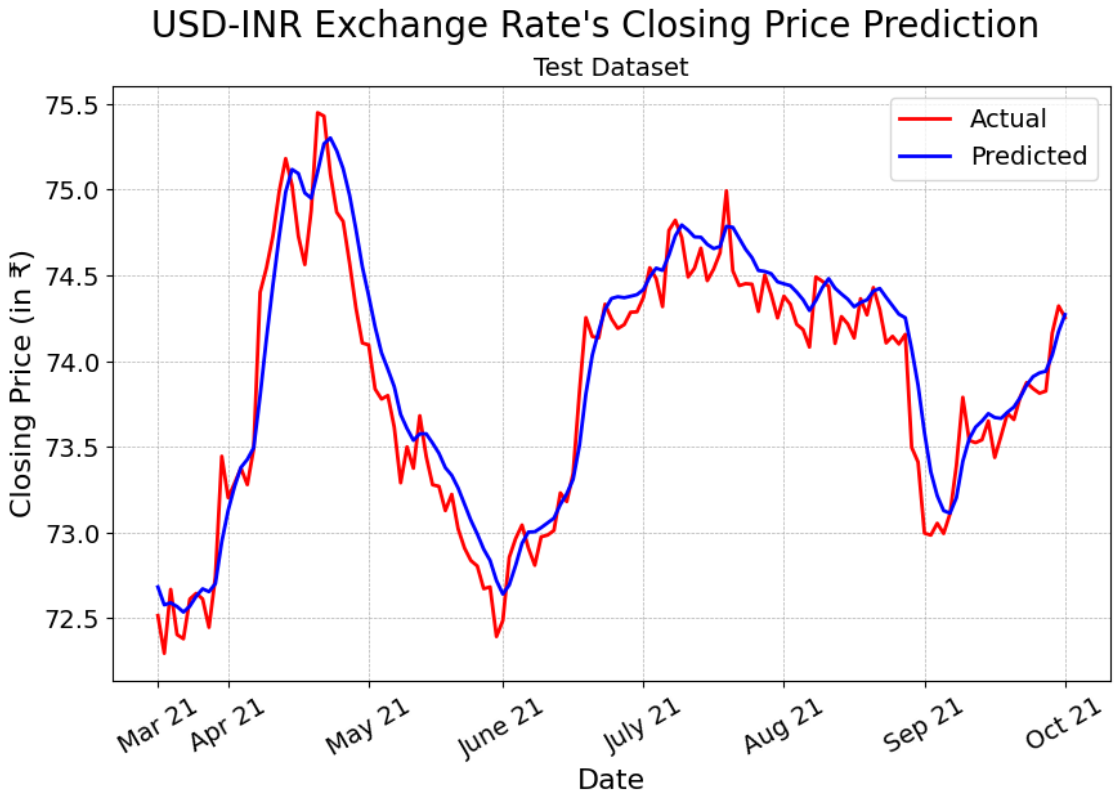

USD-INR Exchange Rate's High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
78
76
74
72
70
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

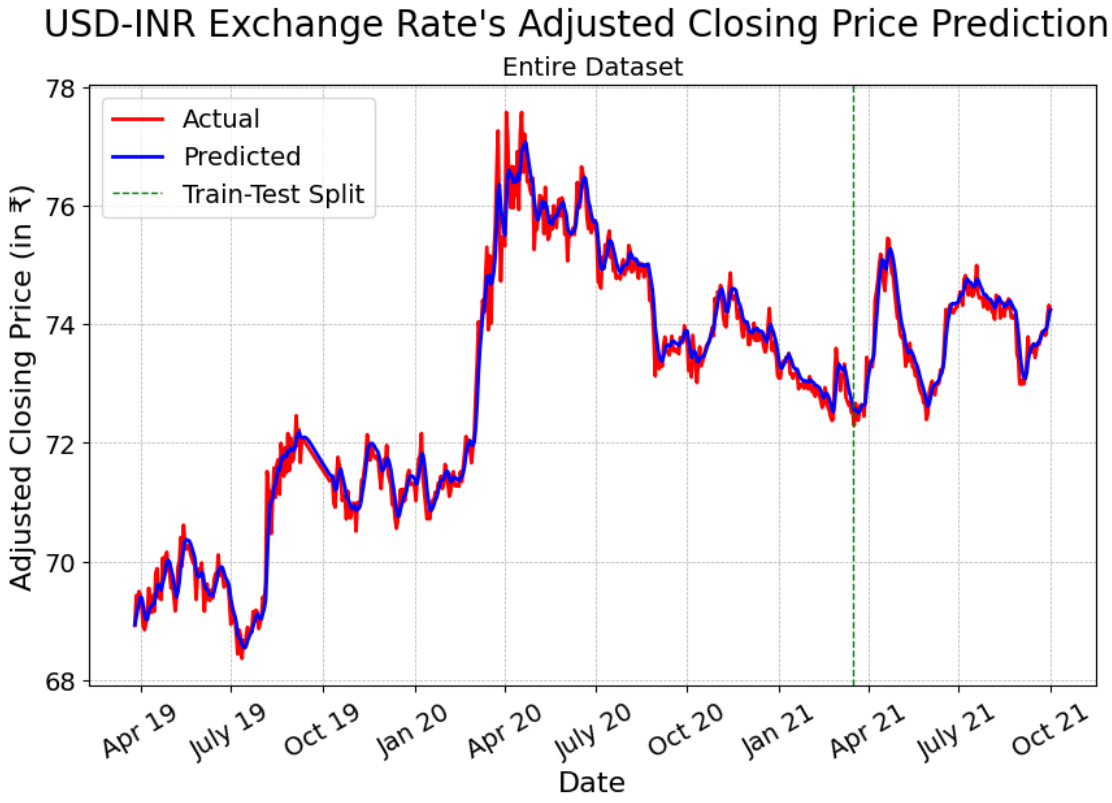

USD-INR Exchange Rate's High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
75.5
75.0
74.5
74.0
73.5
73.0
72.5
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

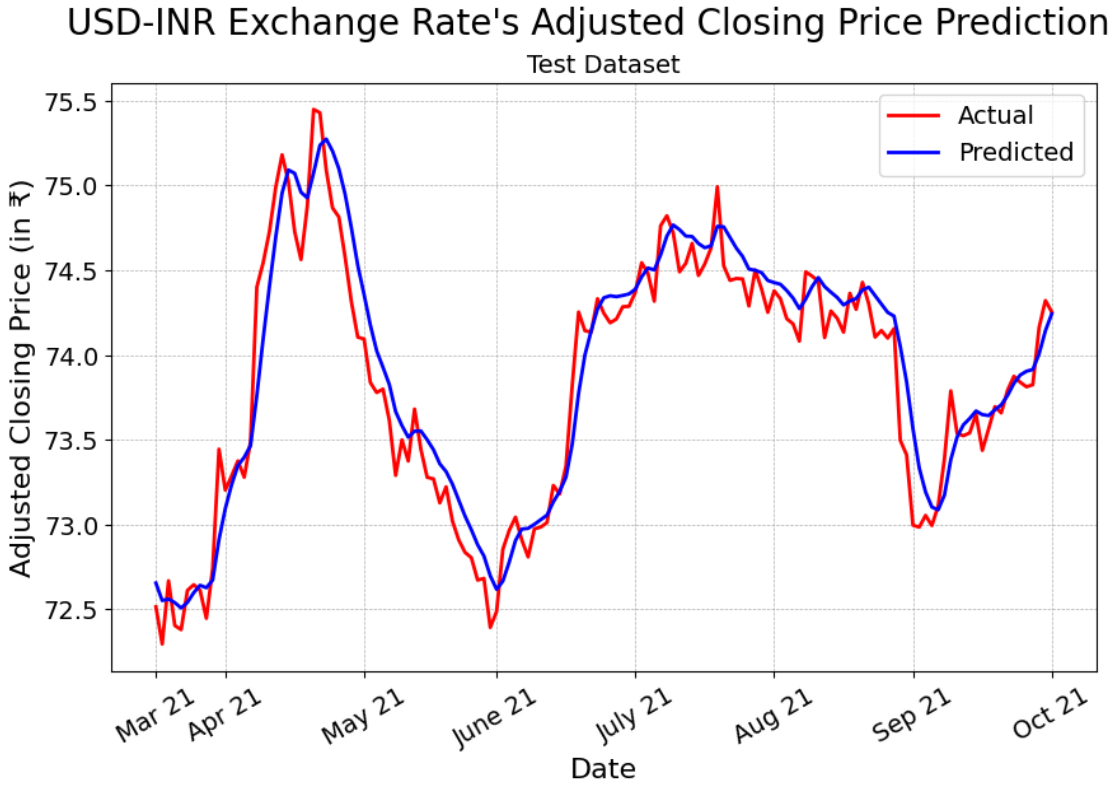

USD-INR Exchange Rate's Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
76
74
72
70
68
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
75.0
74.5
74.0
73.5
73.0
72.5
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


USD-INR Exchange Rate's Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
78
76
74
72
70
68
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
75.5
75.0
74.5
74.0
73.5
73.0
72.5
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


USD-INR Exchange Rate's Adjusted Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Adjusted Closing Price (in ₹)
78
76
74
72
70
68
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


USD-INR Exchange Rate's Adjusted Closing Price Prediction
Test Dataset
Actual
Predicted
Adjusted Closing Price (in ₹)
75.5
75.0
74.5
74.0
73.5
73.0
72.5
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

[32]:
```
generate_predictions('HDFC Bank', save_fig = True)
```

```
Fitting LSTM Model for Open Column of HDFC Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Open Column of HDFC Bank Dataset
Epoch 1/50
31/31 [==============================] - 9s 91ms/step - loss: 0.0410
Epoch 2/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0079
Epoch 3/50
31/31 [==============================] - 3s 97ms/step - loss: 0.0061
Epoch 4/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0054
Epoch 5/50
31/31 [==============================] - 3s 99ms/step - loss: 0.0052
Epoch 6/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0045
Epoch 7/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0046
Epoch 8/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0047
Epoch 9/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0039
Epoch 10/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0036
Epoch 11/50
31/31 [==============================] - 3s 97ms/step - loss: 0.0040
Epoch 12/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0038
Epoch 13/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0038
Epoch 14/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0039
Epoch 15/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0033
Epoch 16/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0034
Epoch 17/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0035
Epoch 18/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0035
Epoch 19/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0030
```

```
Epoch 20/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0028
Epoch 21/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0029
Epoch 22/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0027
Epoch 23/50
31/31 [==============================] - 4s 115ms/step - loss: 0.0033
Epoch 24/50
31/31 [==============================] - 3s 113ms/step - loss: 0.0027
Epoch 25/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0026
Epoch 26/50
31/31 [==============================] - 3s 109ms/step - loss: 0.0029
Epoch 27/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0027
Epoch 28/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0024
Epoch 29/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0023
Epoch 30/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 31/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0023
Epoch 32/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 33/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0023
Epoch 34/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0020
Epoch 35/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0022
Epoch 36/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0023
Epoch 37/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0025
Epoch 38/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0021
Epoch 39/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0019
Epoch 40/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0020
Epoch 41/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 42/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 43/50
31/31 [==============================] - 3s 105ms/step - loss: 0.0019
```

```
Epoch 44/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 45/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 46/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 47/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0021
Epoch 48/50
31/31 [==============================] - 3s 100ms/step - loss: 0.0019
Epoch 49/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 50/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Time required for fitting model: 151.7449 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 47ms/step
MAE is  21.44.
MSE is sq.  956.83.
RMSE is  30.93.
MAPE is 1.86%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 48ms/step
MAE is  19.94.
MSE is sq.  645.54.
RMSE is  25.41.
MAPE is 1.34%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 47ms/step
5/5 [==============================] - 0s 43ms/step

Fitting LSTM Model for High Column of HDFC Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for High Column of HDFC Bank Dataset
Epoch 1/50
31/31 [==============================] - 8s 92ms/step - loss: 0.0449
Epoch 2/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0077
Epoch 3/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0057
Epoch 4/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0049
Epoch 5/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0051
Epoch 6/50
```

```
31/31 [==============================] - 3s 86ms/step - loss: 0.0040
Epoch 7/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0042
Epoch 8/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0044
Epoch 9/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0040
Epoch 10/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0036
Epoch 11/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0035
Epoch 12/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0036
Epoch 13/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0038
Epoch 14/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0034
Epoch 15/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0035
Epoch 16/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0030
Epoch 17/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0031
Epoch 18/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0036
Epoch 19/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0031
Epoch 20/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0027
Epoch 21/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0033
Epoch 22/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0026
Epoch 23/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0028
Epoch 24/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0024
Epoch 25/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0025
Epoch 26/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0025
Epoch 27/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0024
Epoch 28/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0024
Epoch 29/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0023
Epoch 30/50
```

```
31/31 [==============================] - 3s 87ms/step - loss: 0.0021
Epoch 31/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0021
Epoch 32/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0022
Epoch 33/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0021
Epoch 34/50
31/31 [==============================] - 3s 86ms/step - loss: 0.0021
Epoch 35/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0021
Epoch 36/50
31/31 [==============================] - 3s 99ms/step - loss: 0.0020
Epoch 37/50
31/31 [==============================] - 4s 114ms/step - loss: 0.0023
Epoch 38/50
31/31 [==============================] - 3s 98ms/step - loss: 0.0019
Epoch 39/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0019
Epoch 40/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0019
Epoch 41/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0019
Epoch 42/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0018
Epoch 43/50
31/31 [==============================] - 3s 97ms/step - loss: 0.0018
Epoch 44/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0019
Epoch 45/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0018
Epoch 46/50
31/31 [==============================] - 3s 87ms/step - loss: 0.0019
Epoch 47/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0020
Epoch 48/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0017
Epoch 49/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0018
Epoch 50/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0018
Time required for fitting model: 146.0801 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 47ms/step
MAE is  19.18.
MSE is sq.  777.48.
RMSE is  27.88.
```

```
MAPE is 1.66%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 41ms/step
MAE is  18.53.
MSE is sq.  559.29.
RMSE is  23.65.
MAPE is 1.23%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 47ms/step
5/5 [==============================] - 0s 69ms/step

Fitting LSTM Model for Low Column of HDFC Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Low Column of HDFC Bank Dataset
Epoch 1/50
31/31 [==============================] - 9s 89ms/step - loss: 0.0245
Epoch 2/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0077
Epoch 3/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0051
Epoch 4/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0053
Epoch 5/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0047
Epoch 6/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0047
Epoch 7/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0038
Epoch 8/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0045
Epoch 9/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0037
Epoch 10/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0033
Epoch 11/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0035
Epoch 12/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0032
Epoch 13/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0035
Epoch 14/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 15/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0036
Epoch 16/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0028
```

```
Epoch 17/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0029
Epoch 18/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0032
Epoch 19/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0027
Epoch 20/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0025
Epoch 21/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0028
Epoch 22/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0022
Epoch 23/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0027
Epoch 24/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 25/50
31/31 [==============================] - 3s 95ms/step - loss: 0.0022
Epoch 26/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0023
Epoch 27/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0024
Epoch 28/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 29/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0020
Epoch 30/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 31/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 32/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 33/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 34/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 35/50
31/31 [==============================] - 4s 118ms/step - loss: 0.0017
Epoch 36/50
31/31 [==============================] - 3s 106ms/step - loss: 0.0019
Epoch 37/50
31/31 [==============================] - 3s 99ms/step - loss: 0.0020
Epoch 38/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0019
Epoch 39/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Epoch 40/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
```

```
Epoch 41/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0016
Epoch 42/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0015
Epoch 43/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0016
Epoch 44/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0015
Epoch 45/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0016
Epoch 46/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0016
Epoch 47/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 48/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0016
Epoch 49/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0015
Epoch 50/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0016
Time required for fitting model: 147.6167 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 47ms/step
MAE is  20.20.
MSE is sq.  812.11.
RMSE is  28.50.
MAPE is 1.78%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 47ms/step
MAE is  18.38.
MSE is sq.  585.96.
RMSE is  24.21.
MAPE is 1.25%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 48ms/step
5/5 [==============================] - 0s 45ms/step

Fitting LSTM Model for Close Column of HDFC Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Close Column of HDFC Bank Dataset
Epoch 1/50
31/31 [==============================] - 8s 90ms/step - loss: 0.0273
Epoch 2/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0074
Epoch 3/50
```

```
31/31 [==============================] - 3s 89ms/step - loss: 0.0053
Epoch 4/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0045
Epoch 5/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0047
Epoch 6/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0039
Epoch 7/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0039
Epoch 8/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0040
Epoch 9/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0039
Epoch 10/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0031
Epoch 11/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 12/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0031
Epoch 13/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0038
Epoch 14/50
31/31 [==============================] - 3s 103ms/step - loss: 0.0032
Epoch 15/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0032
Epoch 16/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0030
Epoch 17/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 18/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0032
Epoch 19/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0026
Epoch 20/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0030
Epoch 21/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0029
Epoch 22/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0025
Epoch 23/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 24/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0024
Epoch 25/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0025
Epoch 26/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0024
Epoch 27/50
```

```
31/31 [==============================] - 3s 89ms/step - loss: 0.0022
Epoch 28/50
31/31 [==============================] - 3s 91ms/step - loss: 0.0022
Epoch 29/50
31/31 [==============================] - 3s 94ms/step - loss: 0.0021
Epoch 30/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 31/50
31/31 [==============================] - 3s 100ms/step - loss: 0.0020
Epoch 32/50
31/31 [==============================] - 3s 96ms/step - loss: 0.0021
Epoch 33/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0019
Epoch 34/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0020
Epoch 35/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0024
Epoch 36/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0019
Epoch 37/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0019
Epoch 38/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0020
Epoch 39/50
31/31 [==============================] - 3s 93ms/step - loss: 0.0019
Epoch 40/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 41/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0018
Epoch 42/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 43/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0017
Epoch 44/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0018
Epoch 45/50
31/31 [==============================] - 3s 88ms/step - loss: 0.0017
Epoch 46/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0018
Epoch 47/50
31/31 [==============================] - 3s 92ms/step - loss: 0.0018
Epoch 48/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0017
Epoch 49/50
31/31 [==============================] - 3s 89ms/step - loss: 0.0015
Epoch 50/50
31/31 [==============================] - 3s 90ms/step - loss: 0.0018
Time required for fitting model: 146.1759 seconds.
```

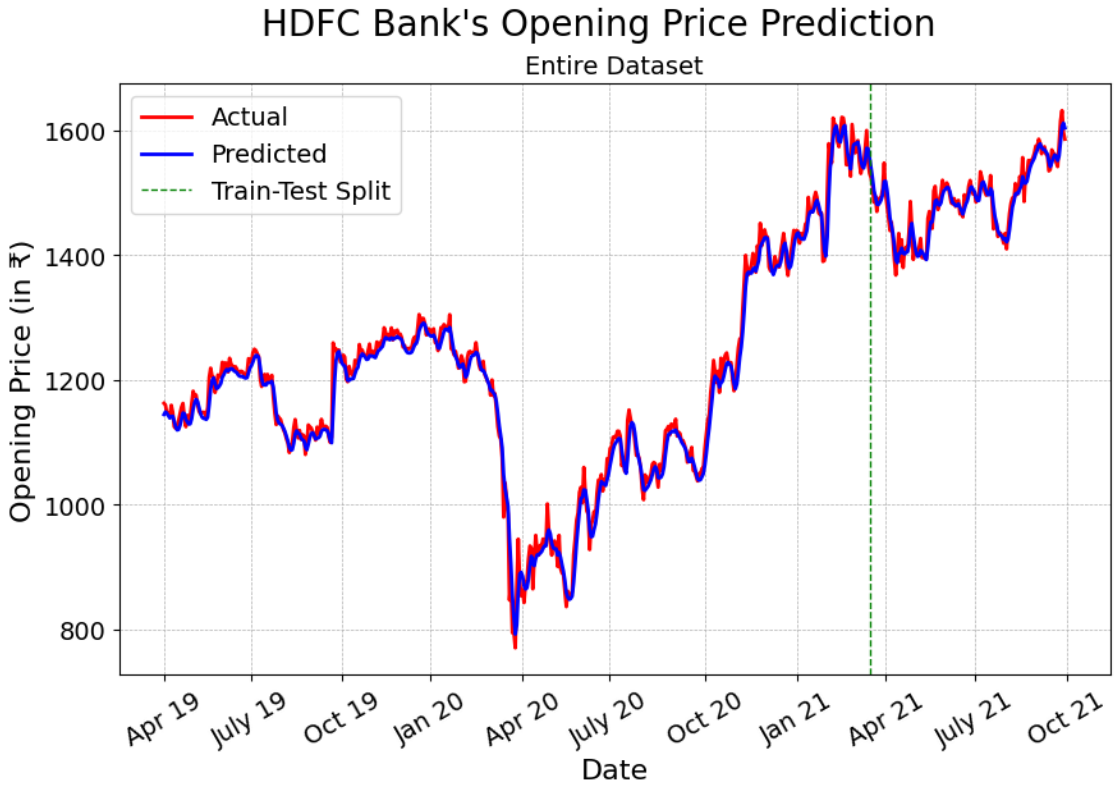
```
The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 50ms/step
MAE is  20.30.
MSE is sq.  835.29.
RMSE is  28.90.
MAPE is 1.78%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 48ms/step
MAE is  19.71.
MSE is sq.  671.92.
RMSE is  25.92.
MAPE is 1.32%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 54ms/step
5/5 [==============================] - 0s 44ms/step

Fitting LSTM Model for Volume Column of HDFC Bank Dataset
Shape of X_train: (484, 60)
Shape of Y_train: (484,)
Fitting the LSTM Model on the Train Set for Volume Column of HDFC Bank Dataset
Epoch 1/100
31/31 [==============================] - 8s 92ms/step - loss: 0.0140
Epoch 2/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0096
Epoch 3/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0091
Epoch 4/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0091
Epoch 5/100
31/31 [==============================] - 3s 95ms/step - loss: 0.0095
Epoch 6/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0088
Epoch 7/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0089
Epoch 8/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0096
Epoch 9/100
31/31 [==============================] - 4s 114ms/step - loss: 0.0089
Epoch 10/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0087
Epoch 11/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0092
Epoch 12/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0087
Epoch 13/100
31/31 [==============================] - 3s 95ms/step - loss: 0.0088
```

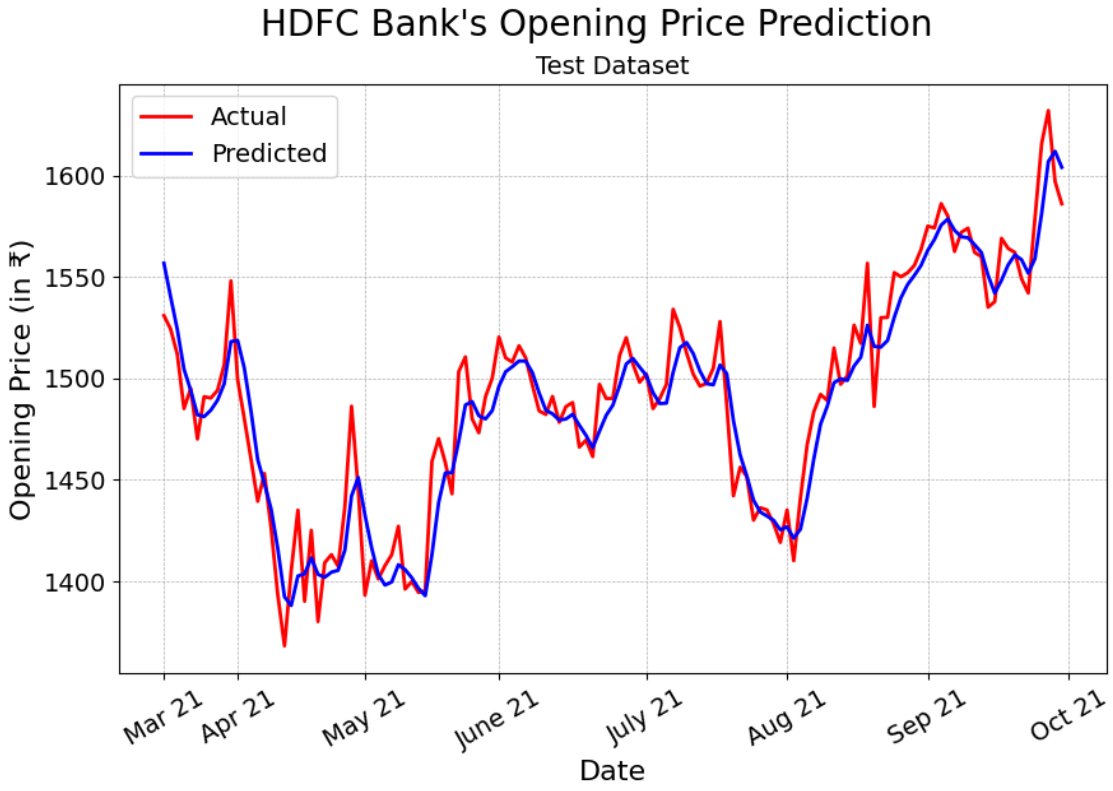
```
Epoch 14/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0086
Epoch 15/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0085
Epoch 16/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0087
Epoch 17/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0086
Epoch 18/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0087
Epoch 19/100
31/31 [==============================] - 3s 86ms/step - loss: 0.0085
Epoch 20/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0087
Epoch 21/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0087
Epoch 22/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0085
Epoch 23/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0085
Epoch 24/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0085
Epoch 25/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0084
Epoch 26/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0086
Epoch 27/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0085
Epoch 28/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0082
Epoch 29/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0083
Epoch 30/100
31/31 [==============================] - 3s 99ms/step - loss: 0.0082
Epoch 31/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0085
Epoch 32/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0087
Epoch 33/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0084
Epoch 34/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0085
Epoch 35/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0082
Epoch 36/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0081
Epoch 37/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0081
```

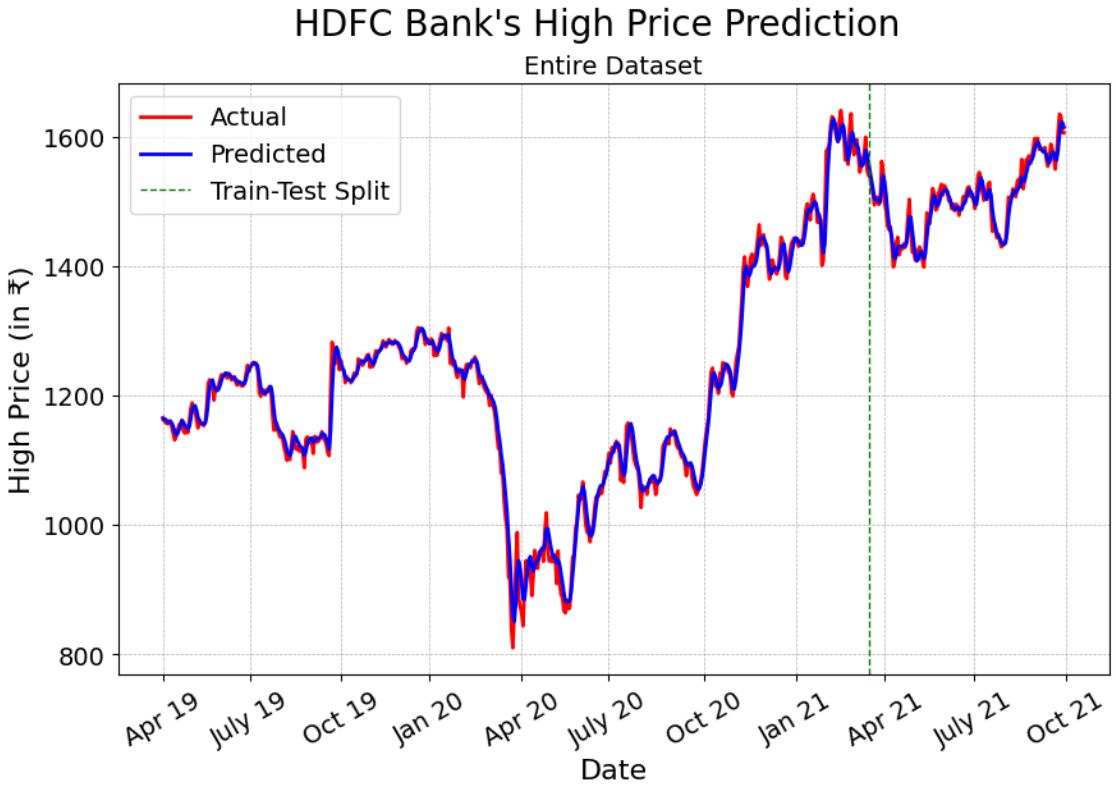
```
Epoch 38/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0082
Epoch 39/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0081
Epoch 40/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0084
Epoch 41/100
31/31 [==============================] - 4s 123ms/step - loss: 0.0085
Epoch 42/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0081
Epoch 43/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0083
Epoch 44/100
31/31 [==============================] - 3s 98ms/step - loss: 0.0080
Epoch 45/100
31/31 [==============================] - 3s 99ms/step - loss: 0.0085
Epoch 46/100
31/31 [==============================] - 3s 109ms/step - loss: 0.0080
Epoch 47/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0085
Epoch 48/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0080
Epoch 49/100
31/31 [==============================] - 3s 99ms/step - loss: 0.0082
Epoch 50/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0079
Epoch 51/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0080
Epoch 52/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0079
Epoch 53/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0084
Epoch 54/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0081
Epoch 55/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0080
Epoch 56/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0079
Epoch 57/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0081
Epoch 58/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0081
Epoch 59/100
31/31 [==============================] - 3s 87ms/step - loss: 0.0083
Epoch 60/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0079
Epoch 61/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0081
```

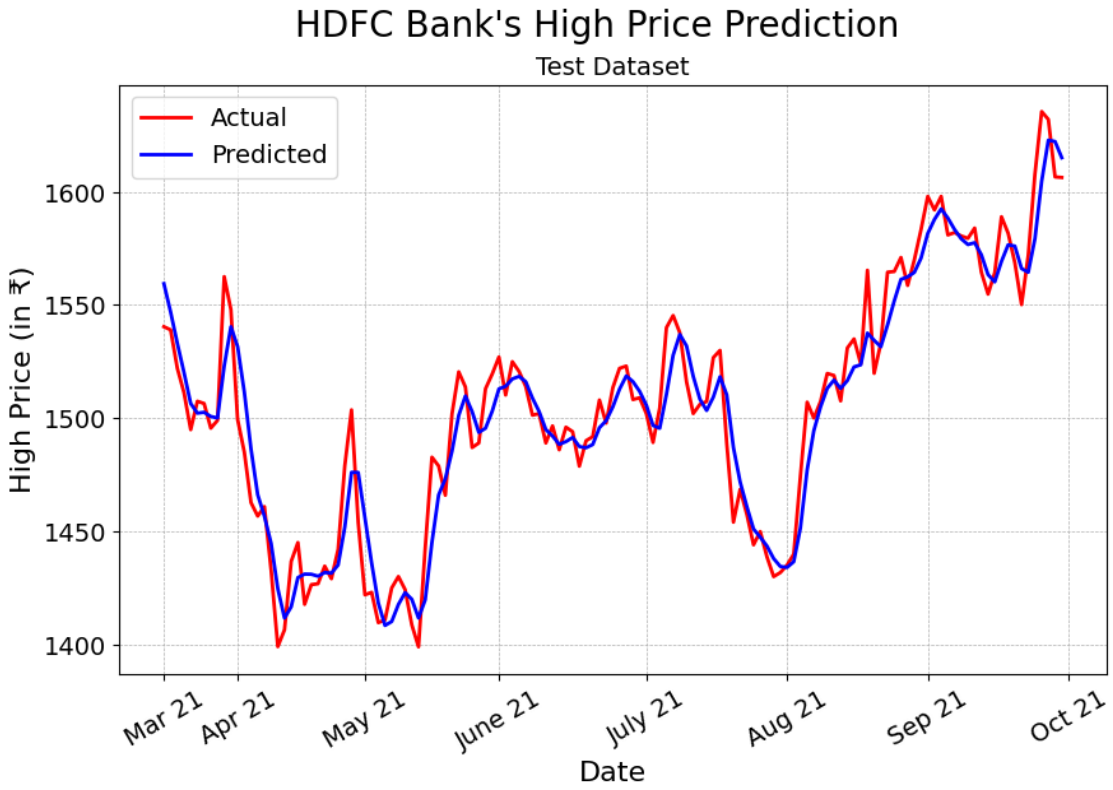
```
Epoch 62/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0080
Epoch 63/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0082
Epoch 64/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0080
Epoch 65/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0082
Epoch 66/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0084
Epoch 67/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0082
Epoch 68/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0081
Epoch 69/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0080
Epoch 70/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0079
Epoch 71/100
31/31 [==============================] - 3s 109ms/step - loss: 0.0079
Epoch 72/100
31/31 [==============================] - 3s 101ms/step - loss: 0.0078
Epoch 73/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0077
Epoch 74/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0078
Epoch 75/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0083
Epoch 76/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0081
Epoch 77/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0078
Epoch 78/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0078
Epoch 79/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0079
Epoch 80/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0077
Epoch 81/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0079
Epoch 82/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0079
Epoch 83/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0079
Epoch 84/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0078
Epoch 85/100
31/31 [==============================] - 3s 94ms/step - loss: 0.0077
```

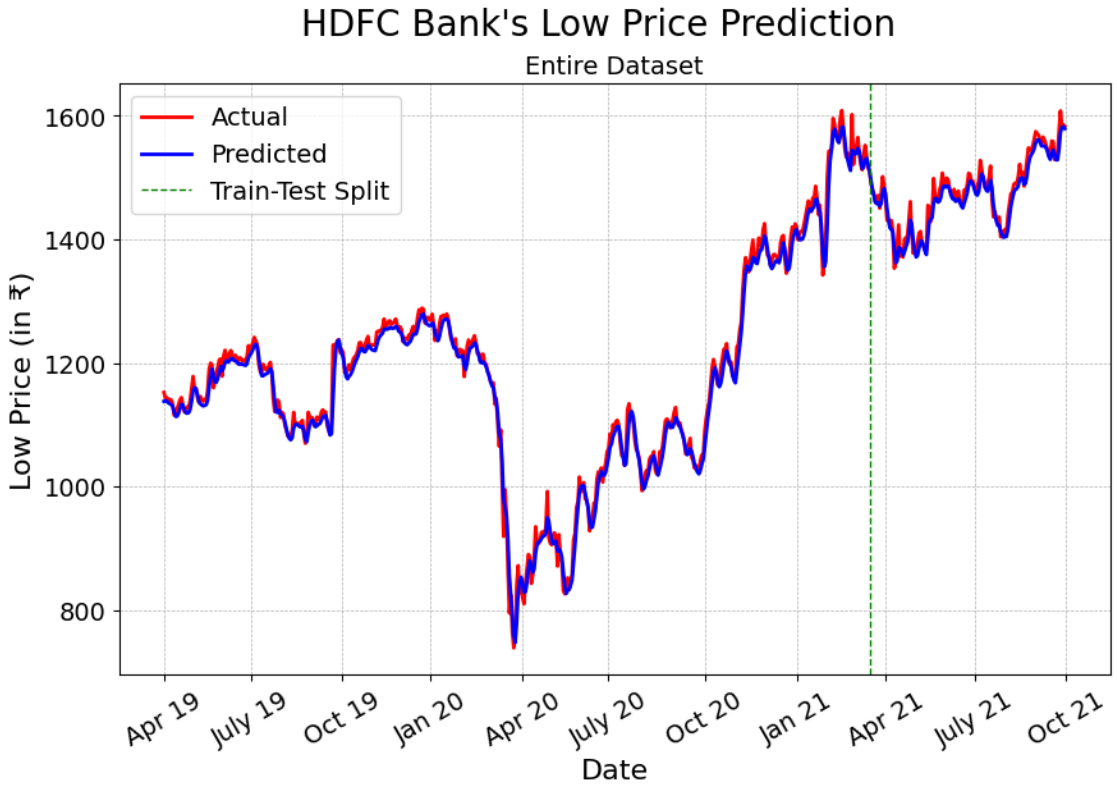
```
Epoch 86/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0079
Epoch 87/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0083
Epoch 88/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0078
Epoch 89/100
31/31 [==============================] - 3s 107ms/step - loss: 0.0077
Epoch 90/100
31/31 [==============================] - 3s 100ms/step - loss: 0.0077
Epoch 91/100
31/31 [==============================] - 3s 96ms/step - loss: 0.0078
Epoch 92/100
31/31 [==============================] - 3s 95ms/step - loss: 0.0076
Epoch 93/100
31/31 [==============================] - 3s 91ms/step - loss: 0.0079
Epoch 94/100
31/31 [==============================] - 3s 92ms/step - loss: 0.0084
Epoch 95/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0077
Epoch 96/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0079
Epoch 97/100
31/31 [==============================] - 3s 88ms/step - loss: 0.0078
Epoch 98/100
31/31 [==============================] - 3s 90ms/step - loss: 0.0077
Epoch 99/100
31/31 [==============================] - 3s 93ms/step - loss: 0.0078
Epoch 100/100
31/31 [==============================] - 3s 89ms/step - loss: 0.0077
Time required for fitting model: 290.4576 seconds.

The Performance of Model on Train Set is as follows:-
16/16 [==============================] - 2s 50ms/step
MAE is 2822645.63 units.
MSE is 20628298241471.37 sq. units.
RMSE is 4541838.64 units.
MAPE is 27.81%.
The Performance of Model on Test Set is as follows:-
5/5 [==============================] - 0s 42ms/step
MAE is 2251914.99 units.
MSE is 7661425091478.60 sq. units.
RMSE is 2767927.94 units.
MAPE is 33.69%.
Shape of X: (620, 60)
Shape of Y: (620,)
20/20 [==============================] - 1s 52ms/step
5/5 [==============================] - 0s 46ms/step
```

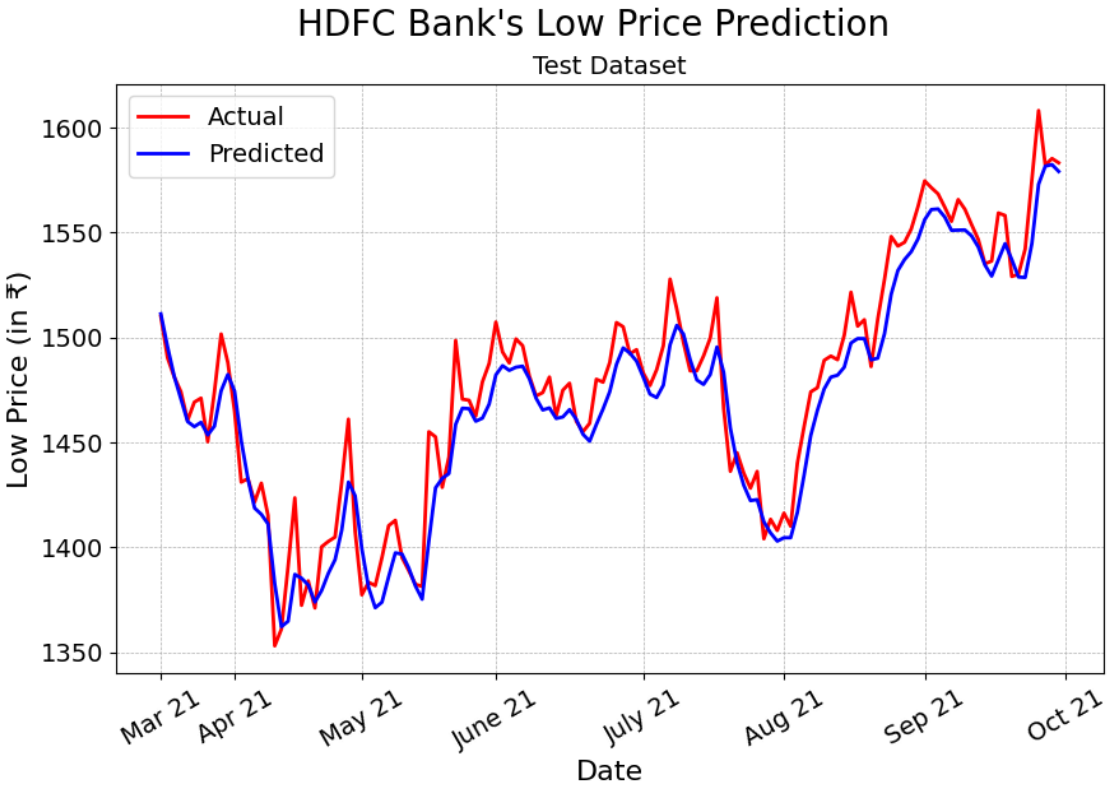

HDFC Bank's Opening Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Opening Price (in ₹)
1600
1400
1200
1000
800
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

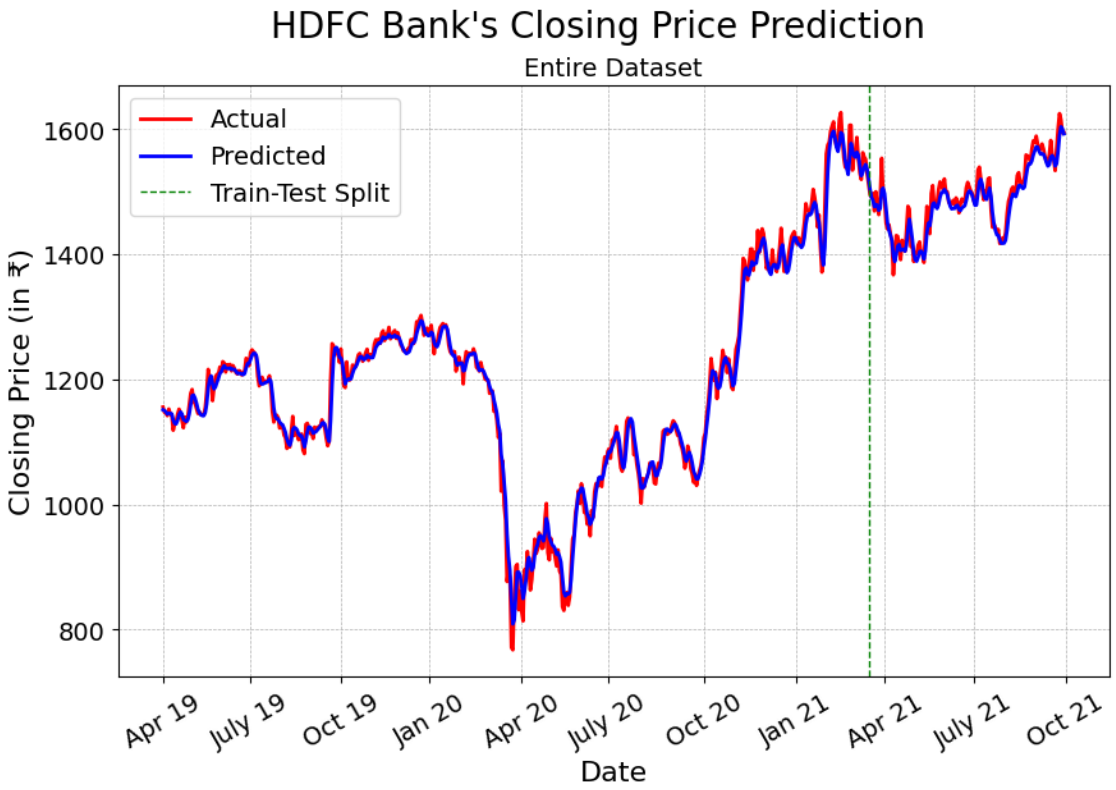

HDFC Bank's Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
1600
1550
1500
1450
1400
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

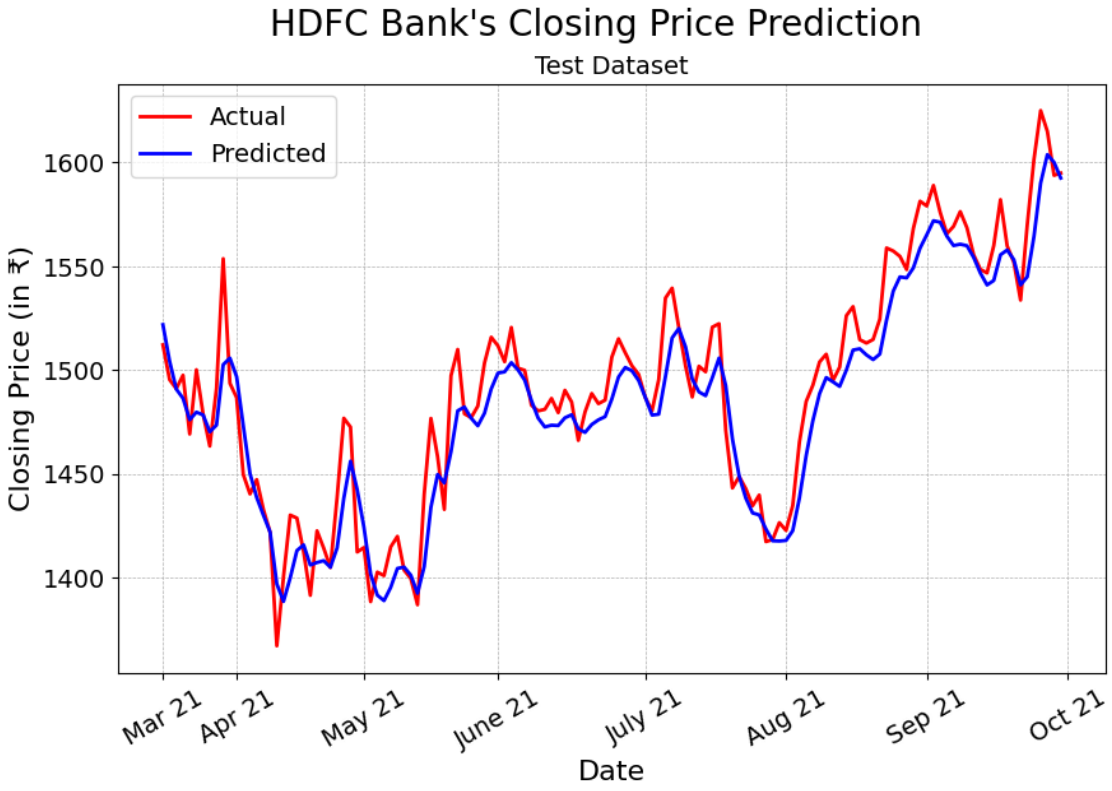

HDFC Bank's High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
1600
1400
1200
1000
800
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date

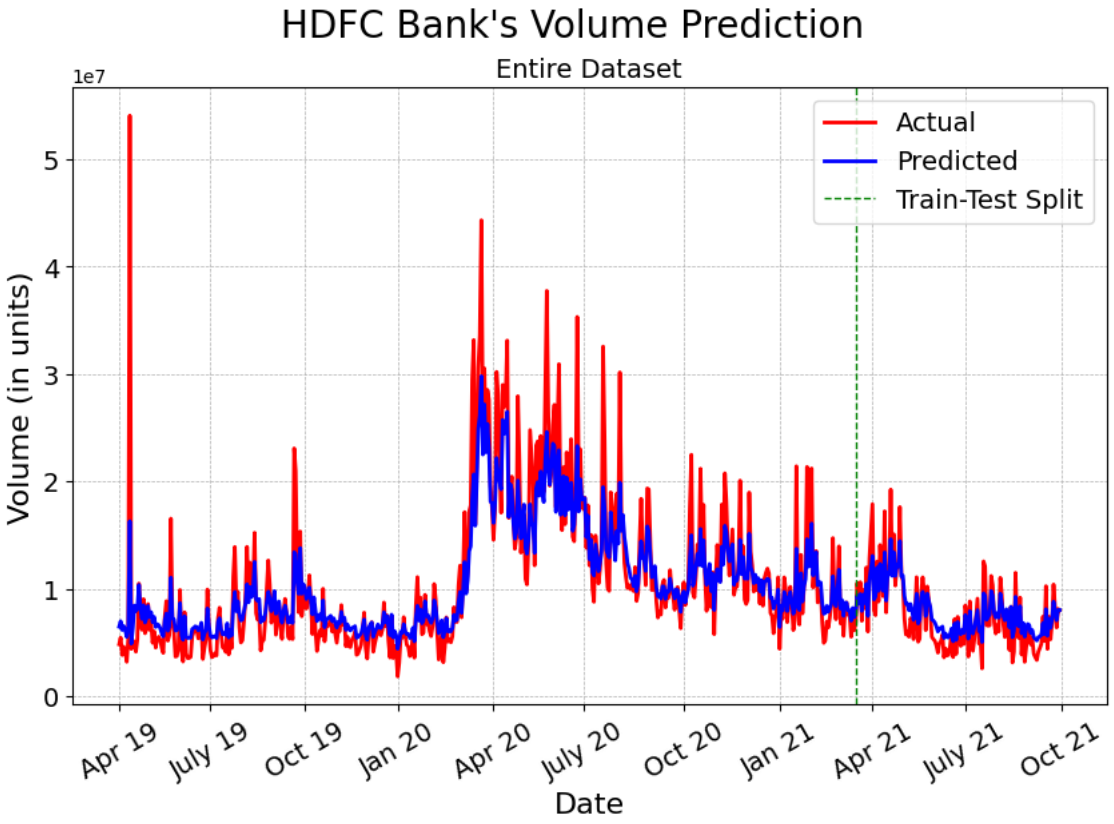

HDFC Bank's High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
1600
1550
1500
1450
1400
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date

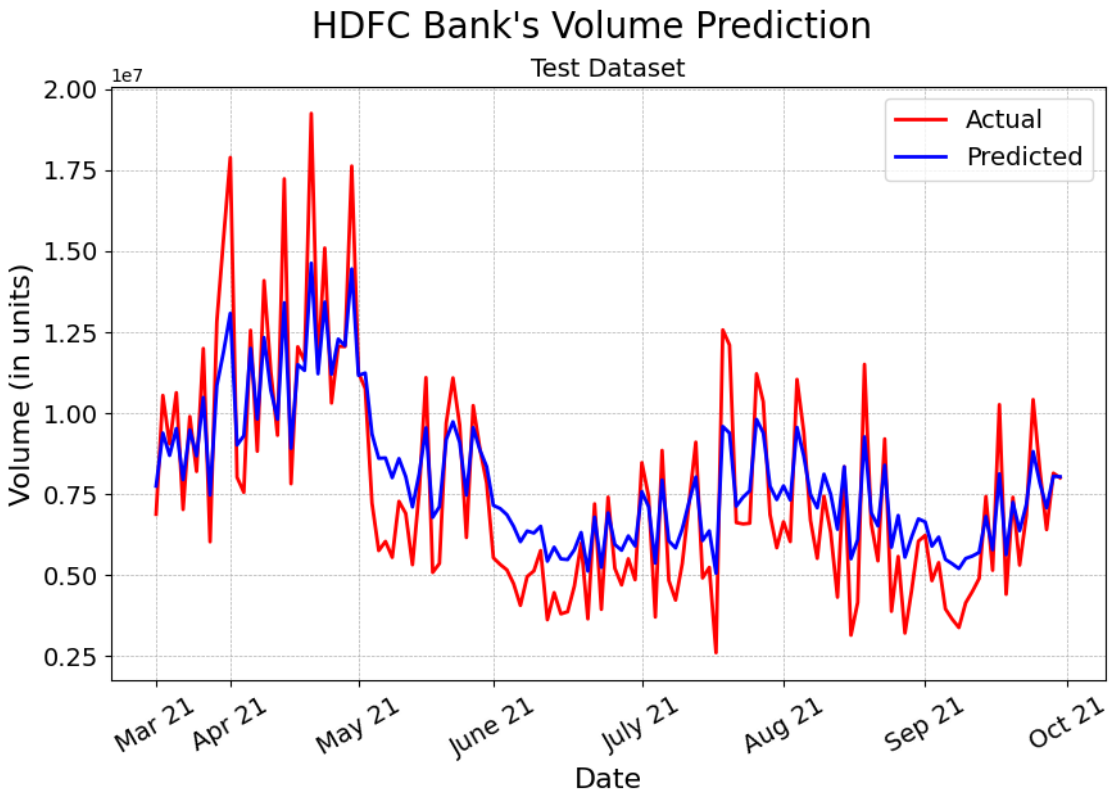

HDFC Bank's Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
1600
1400
1200
1000
800
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


HDFC Bank's Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
1600
1550
1500
1450
1400
1350
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


HDFC Bank's Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
1600
1400
1200
1000
800
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date


HDFC Bank's Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
1600
1550
1500
1450
1400
Mar 21
Apr 21
May 21
June 21
July 21
Aug 21
Sep 21
Oct 21
Date


HDFC Bank's Volume Prediction
Entire Dataset
1e7
Actual
Predicted
Train-Test Split
Volume (in units)
0
1
2
3
4
5
Apr 19
July 19
Oct 19
Jan 20
Apr 20
July 20
Oct 20
Jan 21
Apr 21
July 21
Oct 21
Date



[39]:
```
generate_predictions('Infosys', interval=30, n_epochs=100, save_fig = True)
```

```
Fitting LSTM Model for Open Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Open Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 7s 59ms/step - loss: 0.0403
Epoch 2/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0096
Epoch 3/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0060
Epoch 4/100
11/11 [==============================] - 1s 61ms/step - loss: 0.0044
Epoch 5/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0039
Epoch 6/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0038
Epoch 7/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0046
Epoch 8/100
```

```
11/11 [==============================] - 1s 47ms/step - loss: 0.0041
Epoch 9/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0035
Epoch 10/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0037
Epoch 11/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0036
Epoch 12/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0036
Epoch 13/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0033
Epoch 14/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0037
Epoch 15/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0035
Epoch 16/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0029
Epoch 17/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0039
Epoch 18/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0027
Epoch 19/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0030
Epoch 20/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0028
Epoch 21/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0027
Epoch 22/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0029
Epoch 23/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0027
Epoch 24/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0033
Epoch 25/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0043
Epoch 26/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0042
Epoch 27/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0036
Epoch 28/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0022
Epoch 29/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0025
Epoch 30/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0024
Epoch 31/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0021
Epoch 32/100
```

```
11/11 [==============================] - 1s 48ms/step - loss: 0.0025
Epoch 33/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0026
Epoch 34/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0023
Epoch 35/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0023
Epoch 36/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0024
Epoch 37/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0025
Epoch 38/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0025
Epoch 39/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0027
Epoch 40/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0026
Epoch 41/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0025
Epoch 42/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0026
Epoch 43/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0024
Epoch 44/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0018
Epoch 46/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0020
Epoch 47/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0028
Epoch 48/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0031
Epoch 49/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0022
Epoch 50/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0024
Epoch 51/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0027
Epoch 52/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0021
Epoch 53/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0022
Epoch 54/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0018
Epoch 55/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0022
Epoch 56/100
```

```
11/11 [==============================] - 0s 44ms/step - loss: 0.0023
Epoch 57/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0020
Epoch 58/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0027
Epoch 59/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0020
Epoch 60/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0018
Epoch 61/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0020
Epoch 62/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0025
Epoch 63/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0017
Epoch 64/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 65/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0018
Epoch 66/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0019
Epoch 67/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0019
Epoch 68/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0021
Epoch 69/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0019
Epoch 70/100
11/11 [==============================] - 0s 44ms/step - loss: 0.0018
Epoch 71/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0019
Epoch 72/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0017
Epoch 73/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0016
Epoch 74/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0018
Epoch 75/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0015
Epoch 76/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0014
Epoch 77/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0015
Epoch 78/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0014
Epoch 79/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0016
Epoch 80/100
```

```
11/11 [==============================] - 1s 50ms/step - loss: 0.0018
Epoch 81/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0017
Epoch 82/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0016
Epoch 83/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0015
Epoch 84/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0015
Epoch 85/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0018
Epoch 86/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0015
Epoch 87/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0015
Epoch 88/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0016
Epoch 89/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0014
Epoch 90/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0015
Epoch 91/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0013
Epoch 92/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0016
Epoch 93/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0015
Epoch 94/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0017
Epoch 95/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0014
Epoch 96/100
11/11 [==============================] - 1s 47ms/step - loss: 0.0012
Epoch 97/100
11/11 [==============================] - 1s 48ms/step - loss: 0.0014
Epoch 98/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0014
Epoch 99/100
11/11 [==============================] - 1s 46ms/step - loss: 0.0017
Epoch 100/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0014
Time required for fitting model: 62.1470 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 26ms/step
MAE is  18.11.
MSE is sq.  594.23.
RMSE is  24.38.
```

```
MAPE is 1.35%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 20ms/step
MAE is  23.15.
MSE is sq.  786.88.
RMSE is  28.05.
MAPE is 1.37%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 28ms/step
2/2 [==============================] - 0s 24ms/step

Fitting LSTM Model for High Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for High Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 6s 62ms/step - loss: 0.0456
Epoch 2/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0096
Epoch 3/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0057
Epoch 4/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0047
Epoch 5/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0037
Epoch 6/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0041
Epoch 7/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0049
Epoch 8/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0036
Epoch 9/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0032
Epoch 10/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0039
Epoch 11/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0039
Epoch 12/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0033
Epoch 13/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0033
Epoch 14/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0033
Epoch 15/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0030
Epoch 16/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0029
```

```
Epoch 17/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0035
Epoch 18/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0026
Epoch 19/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0033
Epoch 20/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0031
Epoch 21/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0027
Epoch 22/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0032
Epoch 23/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0028
Epoch 24/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0027
Epoch 25/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0037
Epoch 26/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0039
Epoch 27/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0041
Epoch 28/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0028
Epoch 29/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 30/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0025
Epoch 31/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0022
Epoch 32/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 33/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0024
Epoch 34/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0027
Epoch 35/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0025
Epoch 36/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 37/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0023
Epoch 38/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0023
Epoch 39/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0024
Epoch 40/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0025
```

```
Epoch 41/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 42/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0024
Epoch 43/100
11/11 [==============================] - 1s 65ms/step - loss: 0.0020
Epoch 44/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0021
Epoch 46/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0021
Epoch 47/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0026
Epoch 48/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0029
Epoch 49/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0021
Epoch 50/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0022
Epoch 51/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0026
Epoch 52/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0022
Epoch 53/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0023
Epoch 54/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0019
Epoch 55/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0022
Epoch 56/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0021
Epoch 57/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0021
Epoch 58/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0028
Epoch 59/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0020
Epoch 60/100
11/11 [==============================] - 1s 49ms/step - loss: 0.0018
Epoch 61/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0019
Epoch 62/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0024
Epoch 63/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0017
Epoch 64/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0016
```

```
Epoch 65/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 66/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0021
Epoch 67/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0019
Epoch 68/100
11/11 [==============================] - 1s 66ms/step - loss: 0.0019
Epoch 69/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0020
Epoch 70/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0017
Epoch 71/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0016
Epoch 72/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 73/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0014
Epoch 74/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0017
Epoch 75/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0015
Epoch 76/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 77/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0014
Epoch 78/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0014
Epoch 79/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 80/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0018
Epoch 81/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0016
Epoch 82/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0018
Epoch 83/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0017
Epoch 84/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 85/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0018
Epoch 86/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 87/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0015
Epoch 88/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0016
```

```
Epoch 89/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0014
Epoch 90/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0014
Epoch 91/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 92/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0014
Epoch 93/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 94/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 95/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0014
Epoch 96/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0013
Epoch 97/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0014
Epoch 98/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0013
Epoch 99/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0017
Epoch 100/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0015
Time required for fitting model: 64.6648 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 26ms/step
MAE is  17.88.
MSE is sq.  545.46.
RMSE is  23.36.
MAPE is 1.32%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 19ms/step
MAE is  21.62.
MSE is sq.  706.12.
RMSE is  26.57.
MAPE is 1.27%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 26ms/step
2/2 [==============================] - 0s 25ms/step

Fitting LSTM Model for Low Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Low Column of Infosys Dataset
Epoch 1/100
```

```
11/11 [==============================] - 6s 53ms/step - loss: 0.0446
Epoch 2/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0108
Epoch 3/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0067
Epoch 4/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0047
Epoch 5/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0039
Epoch 6/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0040
Epoch 7/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0043
Epoch 8/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0035
Epoch 9/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0035
Epoch 10/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0041
Epoch 11/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0039
Epoch 12/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0044
Epoch 13/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0034
Epoch 14/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0039
Epoch 15/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0029
Epoch 16/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0031
Epoch 17/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0038
Epoch 18/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0029
Epoch 19/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0035
Epoch 20/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0033
Epoch 21/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0029
Epoch 22/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0034
Epoch 23/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0026
Epoch 24/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0029
Epoch 25/100
```

```
11/11 [==============================] - 1s 54ms/step - loss: 0.0040
Epoch 26/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0040
Epoch 27/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0034
Epoch 28/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0028
Epoch 29/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0025
Epoch 30/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0023
Epoch 31/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0024
Epoch 32/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0024
Epoch 33/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 34/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0022
Epoch 35/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0024
Epoch 36/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0025
Epoch 37/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0025
Epoch 38/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0022
Epoch 39/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0025
Epoch 40/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0027
Epoch 41/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0022
Epoch 42/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0023
Epoch 43/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0021
Epoch 44/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0024
Epoch 45/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0020
Epoch 46/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0021
Epoch 47/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0025
Epoch 48/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0026
Epoch 49/100
```

```
11/11 [==============================] - 1s 50ms/step - loss: 0.0023
Epoch 50/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0022
Epoch 51/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0030
Epoch 52/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0024
Epoch 53/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0024
Epoch 54/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0018
Epoch 55/100
11/11 [==============================] - 1s 64ms/step - loss: 0.0020
Epoch 56/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0021
Epoch 57/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0019
Epoch 58/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0026
Epoch 59/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0020
Epoch 60/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0020
Epoch 61/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0020
Epoch 62/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0020
Epoch 63/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0019
Epoch 64/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0017
Epoch 65/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0017
Epoch 66/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0019
Epoch 67/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0020
Epoch 68/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0024
Epoch 69/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0020
Epoch 70/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0018
Epoch 71/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0019
Epoch 72/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Epoch 73/100
```

```
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 74/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0017
Epoch 75/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 76/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 77/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0013
Epoch 78/100
11/11 [==============================] - 1s 64ms/step - loss: 0.0015
Epoch 79/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 80/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0018
Epoch 81/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0016
Epoch 82/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0018
Epoch 83/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0015
Epoch 84/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0016
Epoch 85/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0018
Epoch 86/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0015
Epoch 87/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0014
Epoch 88/100
11/11 [==============================] - 1s 63ms/step - loss: 0.0017
Epoch 89/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 90/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0014
Epoch 91/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0013
Epoch 92/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0012
Epoch 93/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0014
Epoch 94/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Epoch 95/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0015
Epoch 96/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0013
Epoch 97/100
```

```
11/11 [==============================] - 1s 55ms/step - loss: 0.0013
Epoch 98/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0015
Epoch 99/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0016
Epoch 100/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0012
Time required for fitting model: 65.7765 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 29ms/step
MAE is  17.59.
MSE is sq.  543.24.
RMSE is  23.31.
MAPE is 1.33%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 22ms/step
MAE is  17.98.
MSE is sq.  504.88.
RMSE is  22.47.
MAPE is 1.07%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 29ms/step
2/2 [==============================] - 0s 28ms/step

Fitting LSTM Model for Close Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Close Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 6s 57ms/step - loss: 0.0430
Epoch 2/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0106
Epoch 3/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0066
Epoch 4/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0052
Epoch 5/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0049
Epoch 6/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0041
Epoch 7/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0056
Epoch 8/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0042
Epoch 9/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0038
```

```
Epoch 10/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0035
Epoch 11/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0036
Epoch 12/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0035
Epoch 13/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0032
Epoch 14/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0036
Epoch 15/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0038
Epoch 16/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0033
Epoch 17/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0036
Epoch 18/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0030
Epoch 19/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0037
Epoch 20/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0034
Epoch 21/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0030
Epoch 22/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0032
Epoch 23/100
11/11 [==============================] - 1s 64ms/step - loss: 0.0028
Epoch 24/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0040
Epoch 25/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0048
Epoch 26/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0040
Epoch 27/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0032
Epoch 28/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0029
Epoch 29/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0027
Epoch 30/100
11/11 [==============================] - 1s 59ms/step - loss: 0.0027
Epoch 31/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0024
Epoch 32/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0026
Epoch 33/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0021
```

```
Epoch 34/100
11/11 [==============================] - 1s 70ms/step - loss: 0.0024
Epoch 35/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0024
Epoch 36/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0025
Epoch 37/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0026
Epoch 38/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0024
Epoch 39/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0024
Epoch 40/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0025
Epoch 41/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0029
Epoch 42/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0022
Epoch 43/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0021
Epoch 44/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0025
Epoch 45/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0025
Epoch 46/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0022
Epoch 47/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0023
Epoch 48/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0025
Epoch 49/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0021
Epoch 50/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0021
Epoch 51/100
11/11 [==============================] - 1s 71ms/step - loss: 0.0026
Epoch 52/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0021
Epoch 53/100
11/11 [==============================] - 1s 69ms/step - loss: 0.0024
Epoch 54/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0019
Epoch 55/100
11/11 [==============================] - 1s 66ms/step - loss: 0.0020
Epoch 56/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0022
Epoch 57/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0022
```

```
Epoch 58/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0025
Epoch 59/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0021
Epoch 60/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0020
Epoch 61/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0020
Epoch 62/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0023
Epoch 63/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0018
Epoch 64/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0017
Epoch 65/100
11/11 [==============================] - 1s 67ms/step - loss: 0.0015
Epoch 66/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0019
Epoch 67/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0025
Epoch 68/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0023
Epoch 69/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0024
Epoch 70/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0019
Epoch 71/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0021
Epoch 72/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Epoch 73/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 74/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0019
Epoch 75/100
11/11 [==============================] - 1s 71ms/step - loss: 0.0016
Epoch 76/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 77/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0015
Epoch 78/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Epoch 79/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0016
Epoch 80/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0020
Epoch 81/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0018
```

```
Epoch 82/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0017
Epoch 83/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0017
Epoch 84/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0019
Epoch 85/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0021
Epoch 86/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0015
Epoch 87/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0015
Epoch 88/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0019
Epoch 89/100
11/11 [==============================] - 1s 57ms/step - loss: 0.0017
Epoch 90/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0016
Epoch 91/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0014
Epoch 92/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0013
Epoch 93/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Epoch 94/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0015
Epoch 95/100
11/11 [==============================] - 1s 65ms/step - loss: 0.0015
Epoch 96/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0015
Epoch 97/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0016
Epoch 98/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0015
Epoch 99/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0017
Epoch 100/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0015
Time required for fitting model: 69.0192 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 1s 26ms/step
MAE is  19.03.
MSE is sq.  614.79.
RMSE is  24.79.
MAPE is 1.41%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 20ms/step
```

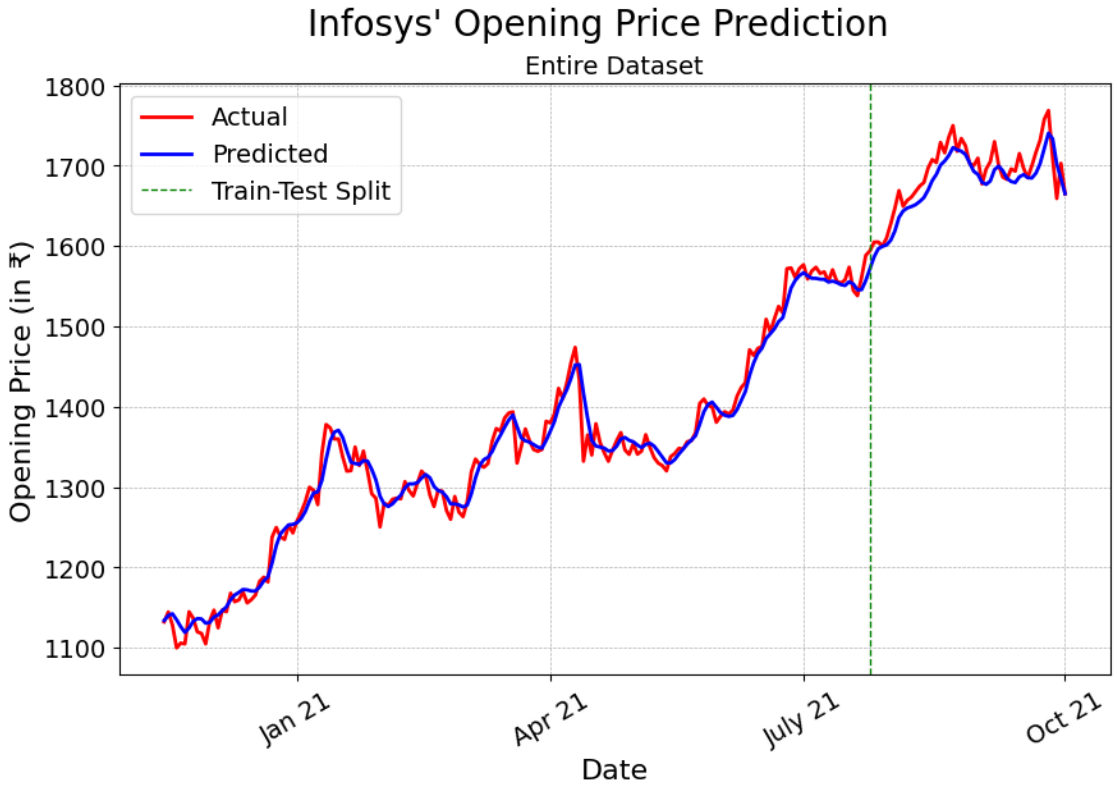
```
MAE is  21.83.
MSE is sq.  694.12.
RMSE is  26.35.
MAPE is 1.29%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 28ms/step
2/2 [==============================] - 0s 19ms/step

Fitting LSTM Model for Volume Column of Infosys Dataset
Shape of X_train: (170, 30)
Shape of Y_train: (170,)
Fitting the LSTM Model on the Train Set for Volume Column of Infosys Dataset
Epoch 1/100
11/11 [==============================] - 6s 59ms/step - loss: 0.0158
Epoch 2/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0105
Epoch 3/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0089
Epoch 4/100
11/11 [==============================] - 1s 61ms/step - loss: 0.0084
Epoch 5/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0083
Epoch 6/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0082
Epoch 7/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0080
Epoch 8/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0081
Epoch 9/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0081
Epoch 10/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0080
Epoch 11/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0080
Epoch 12/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0079
Epoch 13/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0079
Epoch 14/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0080
Epoch 15/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0079
Epoch 16/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0077
Epoch 17/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0076
Epoch 18/100
```

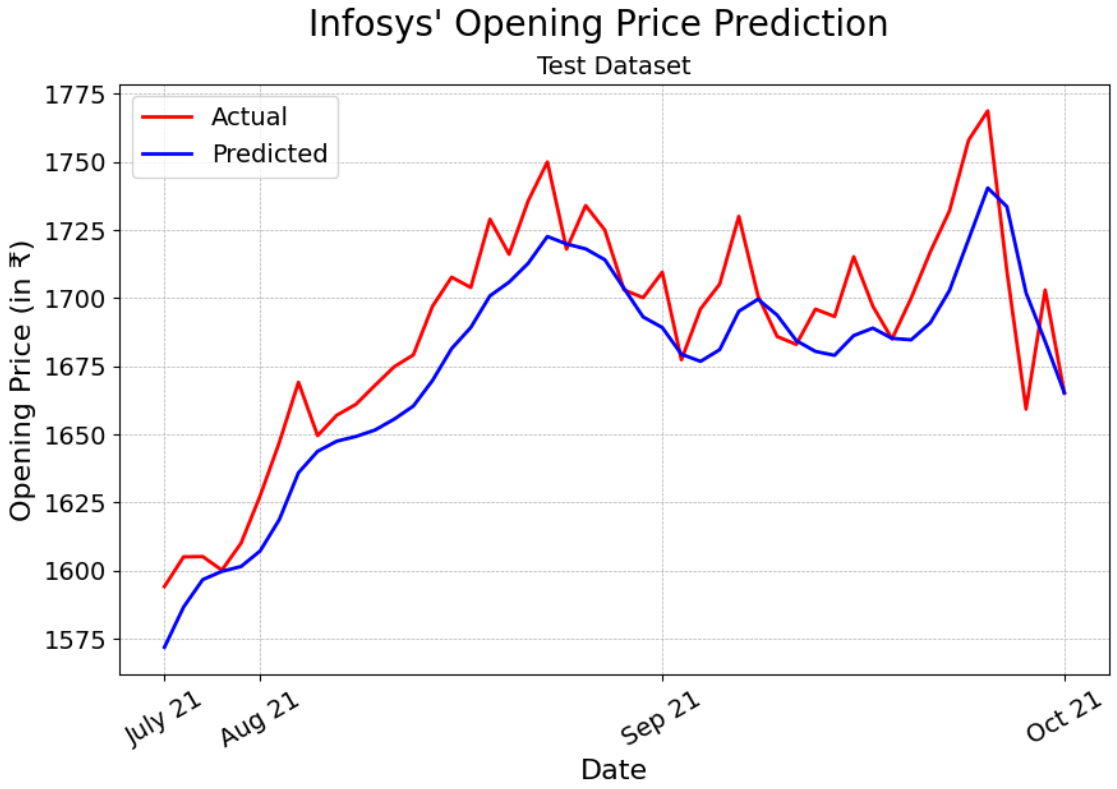
```
11/11 [==============================] - 1s 53ms/step - loss: 0.0076
Epoch 19/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0076
Epoch 20/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0075
Epoch 21/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0077
Epoch 22/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0077
Epoch 23/100
11/11 [==============================] - 1s 60ms/step - loss: 0.0074
Epoch 24/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0076
Epoch 25/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0073
Epoch 26/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0072
Epoch 27/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0073
Epoch 28/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0073
Epoch 29/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0073
Epoch 30/100
11/11 [==============================] - 1s 61ms/step - loss: 0.0072
Epoch 31/100
11/11 [==============================] - 1s 68ms/step - loss: 0.0073
Epoch 32/100
11/11 [==============================] - 1s 61ms/step - loss: 0.0072
Epoch 33/100
11/11 [==============================] - 1s 56ms/step - loss: 0.0071
Epoch 34/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0072
Epoch 35/100
11/11 [==============================] - 1s 55ms/step - loss: 0.0072
Epoch 36/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0073
Epoch 37/100
11/11 [==============================] - 1s 64ms/step - loss: 0.0073
Epoch 38/100
11/11 [==============================] - 1s 65ms/step - loss: 0.0074
Epoch 39/100
11/11 [==============================] - 1s 91ms/step - loss: 0.0071
Epoch 40/100
11/11 [==============================] - 0s 44ms/step - loss: 0.0071
Epoch 41/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0073
Epoch 42/100
```

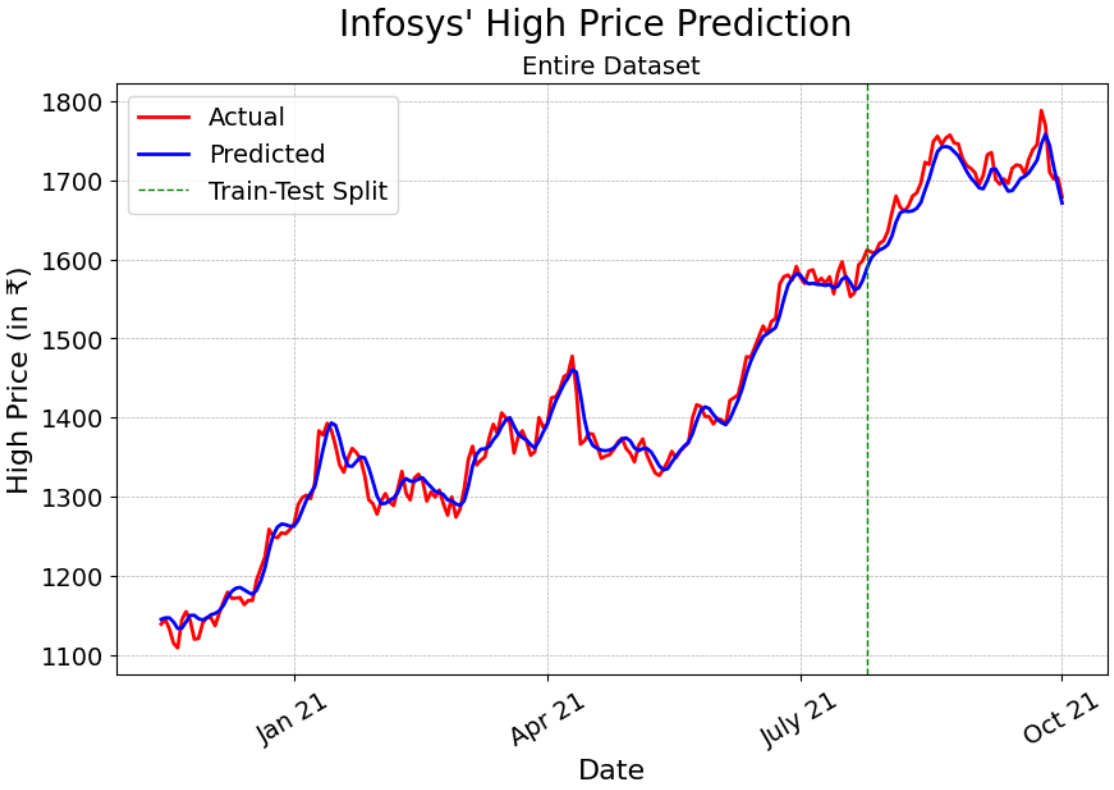
```
11/11 [==============================] - 1s 59ms/step - loss: 0.0073
Epoch 43/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0076
Epoch 44/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0078
Epoch 45/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0072
Epoch 46/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0072
Epoch 47/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0072
Epoch 48/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0077
Epoch 49/100
11/11 [==============================] - 1s 53ms/step - loss: 0.0072
Epoch 50/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0076
Epoch 51/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0077
Epoch 52/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0071
Epoch 53/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0071
Epoch 54/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0070
Epoch 55/100
11/11 [==============================] - 1s 58ms/step - loss: 0.0072
Epoch 56/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0076
Epoch 57/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0079
Epoch 58/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0076
Epoch 59/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0074
Epoch 60/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0070
Epoch 61/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0073
Epoch 62/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0076
Epoch 63/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0072
Epoch 64/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0071
Epoch 65/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0072
Epoch 66/100
```

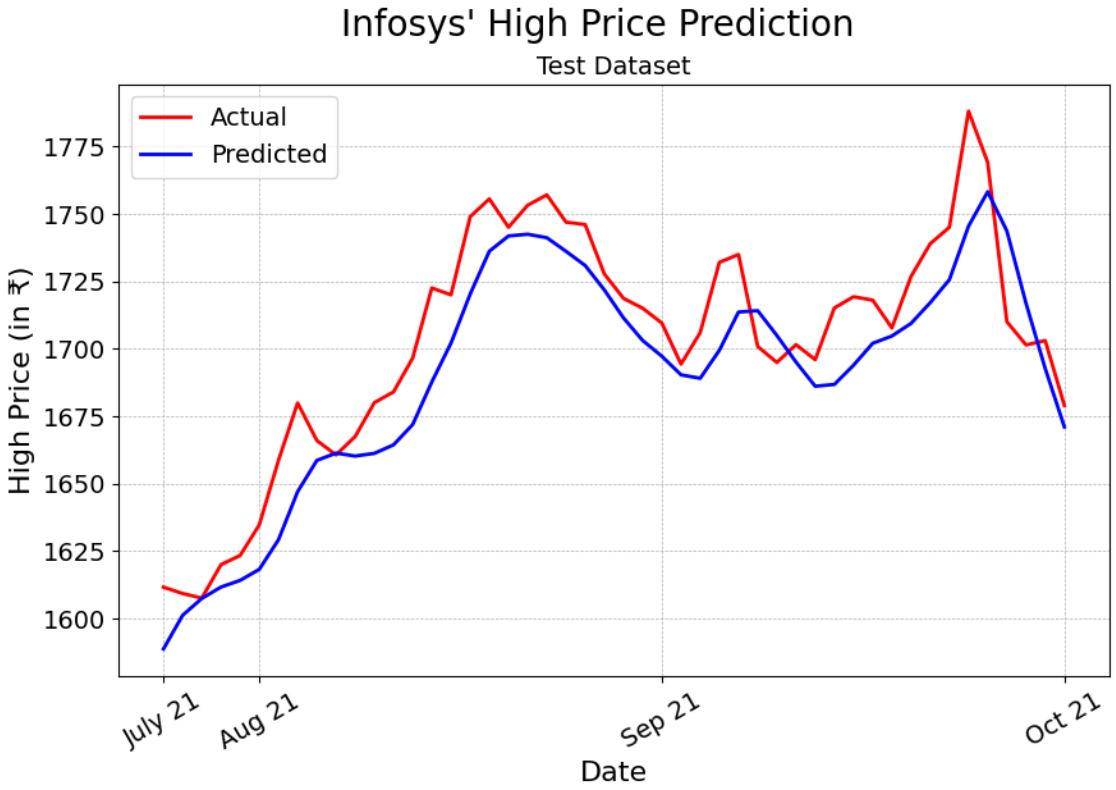
```
11/11 [==============================] - 1s 50ms/step - loss: 0.0074
Epoch 67/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0074
Epoch 68/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0077
Epoch 69/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0074
Epoch 70/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0073
Epoch 71/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0071
Epoch 72/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0071
Epoch 73/100
11/11 [==============================] - 1s 54ms/step - loss: 0.0070
Epoch 74/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0070
Epoch 75/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0071
Epoch 76/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0073
Epoch 77/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0072
Epoch 78/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0069
Epoch 79/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0072
Epoch 80/100
11/11 [==============================] - 1s 65ms/step - loss: 0.0071
Epoch 81/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0073
Epoch 82/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0071
Epoch 83/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0071
Epoch 84/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0076
Epoch 85/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0071
Epoch 86/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0072
Epoch 87/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0071
Epoch 88/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0070
Epoch 89/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0070
Epoch 90/100
```

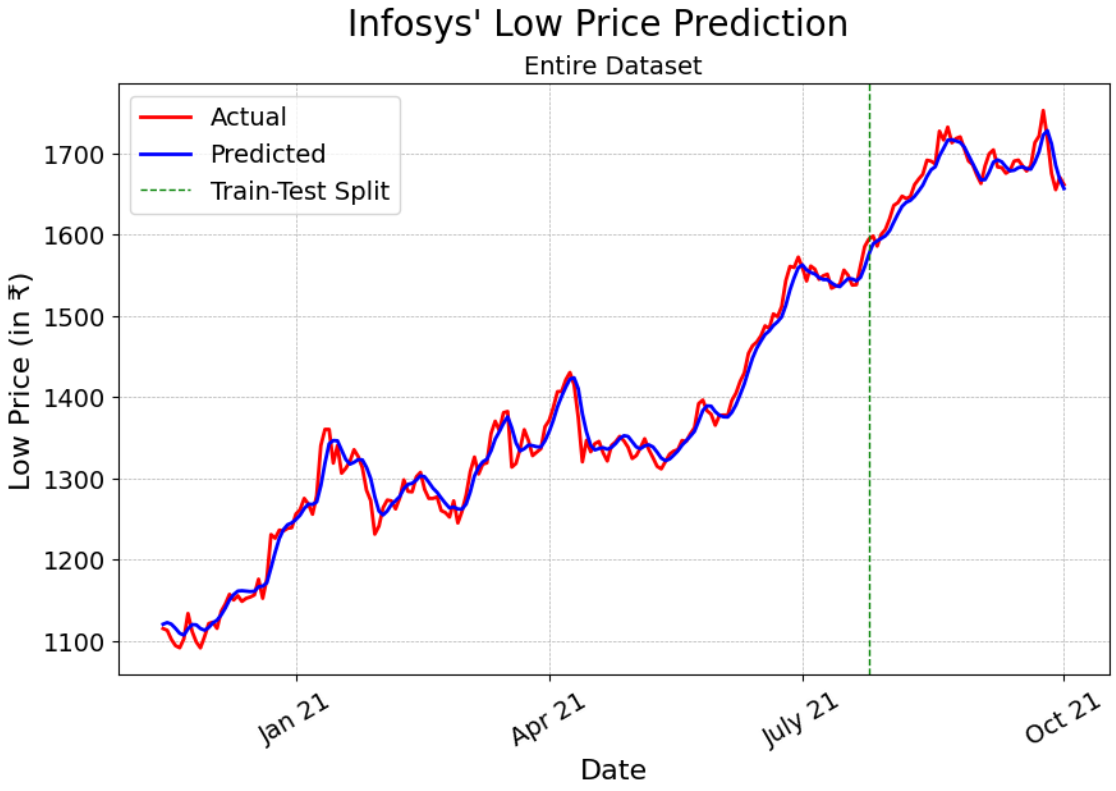
```
11/11 [==============================] - 1s 50ms/step - loss: 0.0070
Epoch 91/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0070
Epoch 92/100
11/11 [==============================] - 1s 62ms/step - loss: 0.0070
Epoch 93/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0071
Epoch 94/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0070
Epoch 95/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0071
Epoch 96/100
11/11 [==============================] - 1s 51ms/step - loss: 0.0071
Epoch 97/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0071
Epoch 98/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0071
Epoch 99/100
11/11 [==============================] - 1s 50ms/step - loss: 0.0069
Epoch 100/100
11/11 [==============================] - 1s 52ms/step - loss: 0.0069
Time required for fitting model: 64.9275 seconds.

The Performance of Model on Train Set is as follows:-
6/6 [==============================] - 2s 26ms/step
MAE is 2381149.31 units.
MSE is 12749633608294.54 sq. units.
RMSE is 3570662.91 units.
MAPE is 28.66%.
The Performance of Model on Test Set is as follows:-
2/2 [==============================] - 0s 27ms/step
MAE is 1251459.53 units.
MSE is 3090907191151.25 sq. units.
RMSE is 1758097.61 units.
MAPE is 27.64%.
Shape of X: (219, 30)
Shape of Y: (219,)
7/7 [==============================] - 0s 27ms/step
2/2 [==============================] - 0s 27ms/step
```

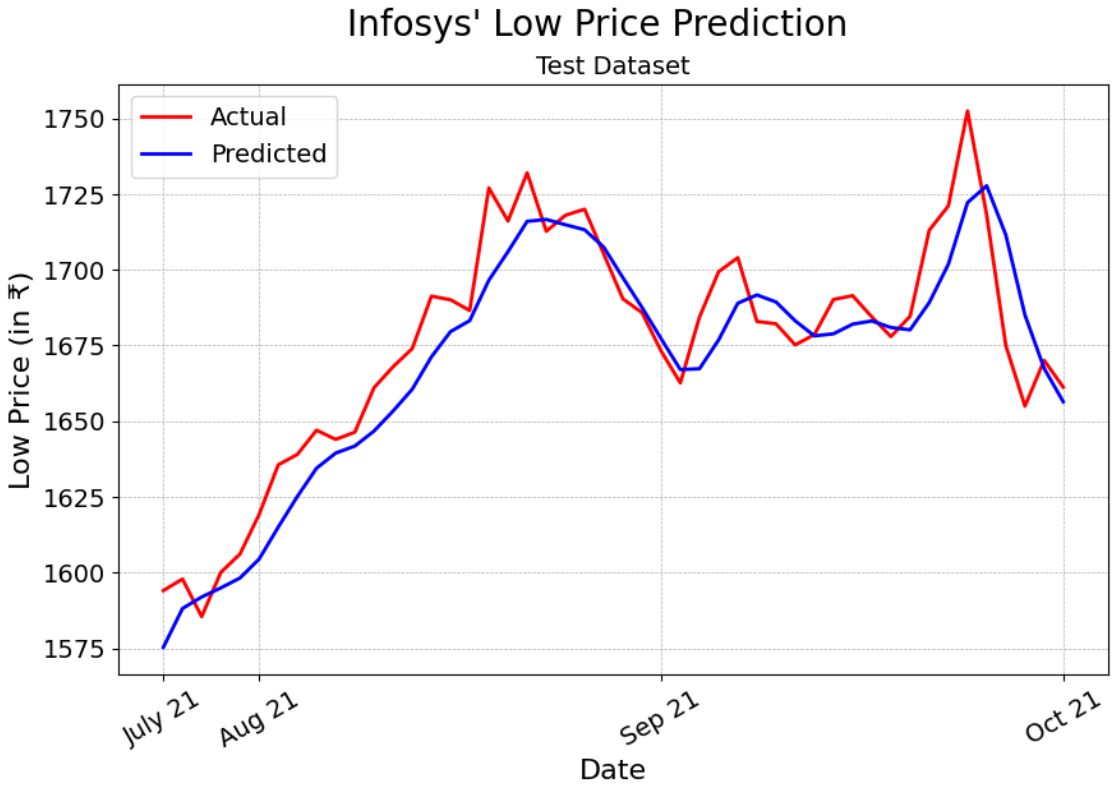

Infosys' Opening Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Opening Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date

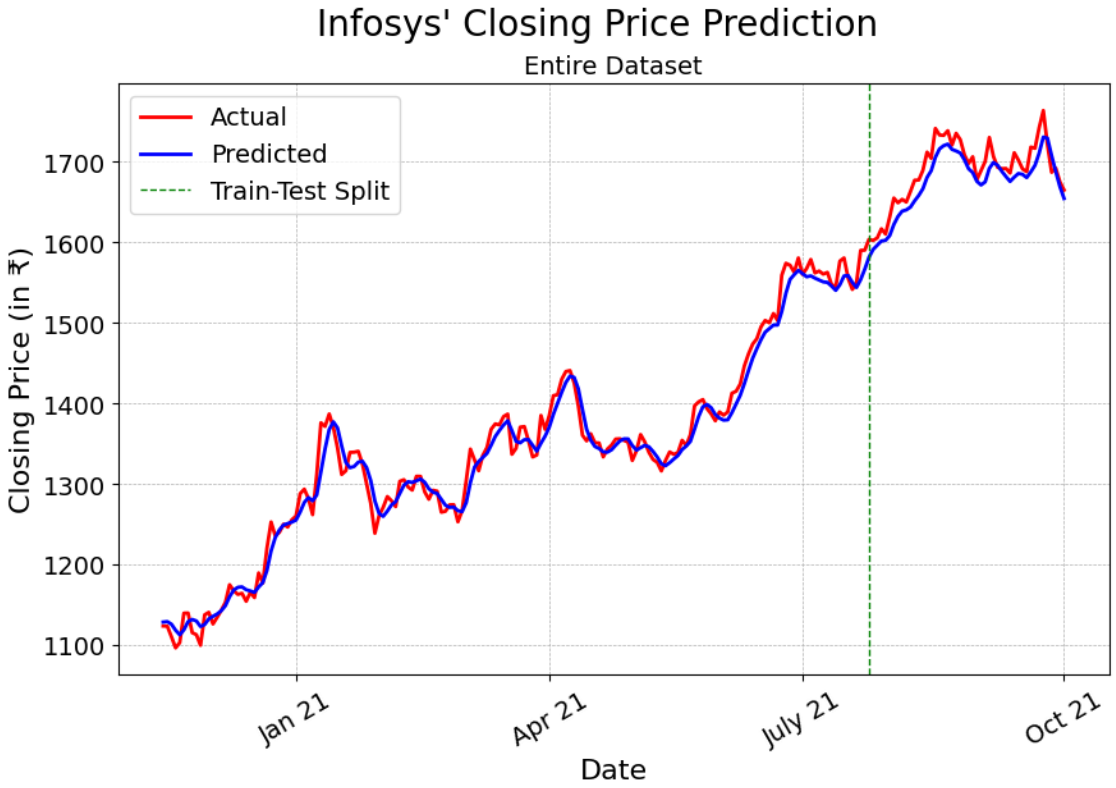

Infosys' Opening Price Prediction
Test Dataset
Actual
Predicted
Opening Price (in ₹)
1775
1750
1725
1700
1675
1650
1625
1600
1575
July 21
Aug 21
Sep 21
Oct 21
Date

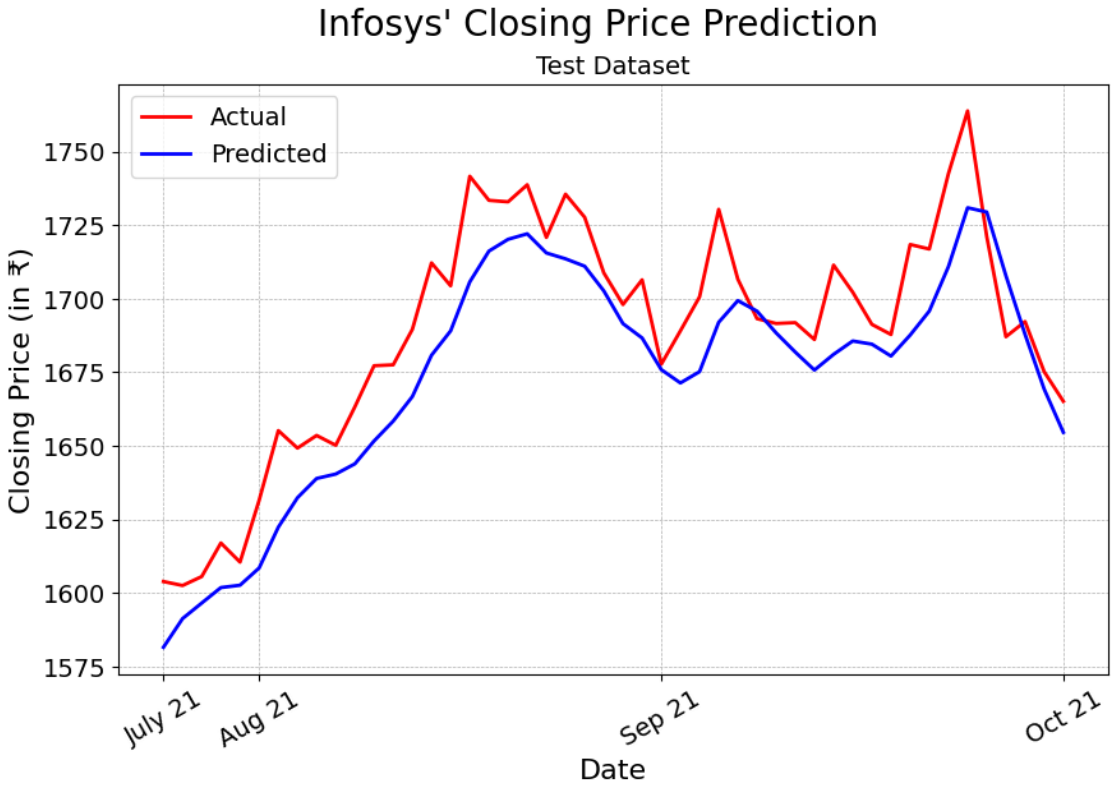

Infosys' High Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
High Price (in ₹)
1800
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date

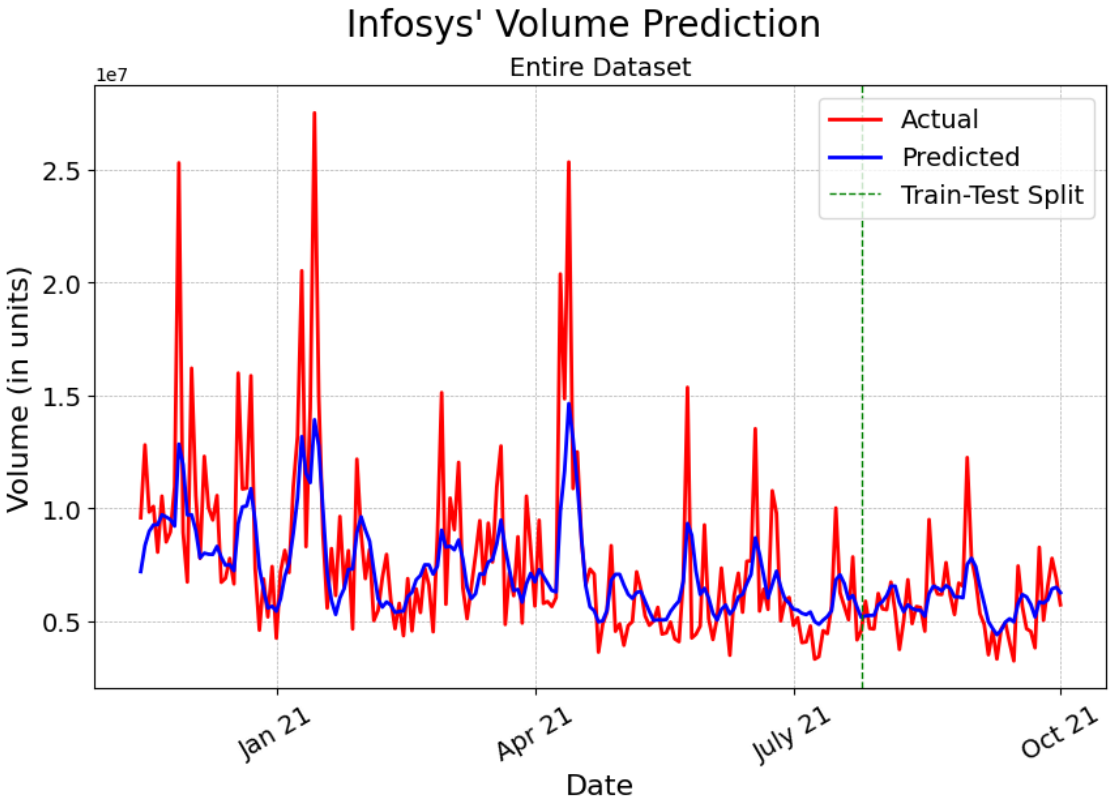

Infosys' High Price Prediction
Test Dataset
Actual
Predicted
High Price (in ₹)
1775
1750
1725
1700
1675
1650
1625
1600
July 21
Aug 21
Sep 21
Oct 21
Date

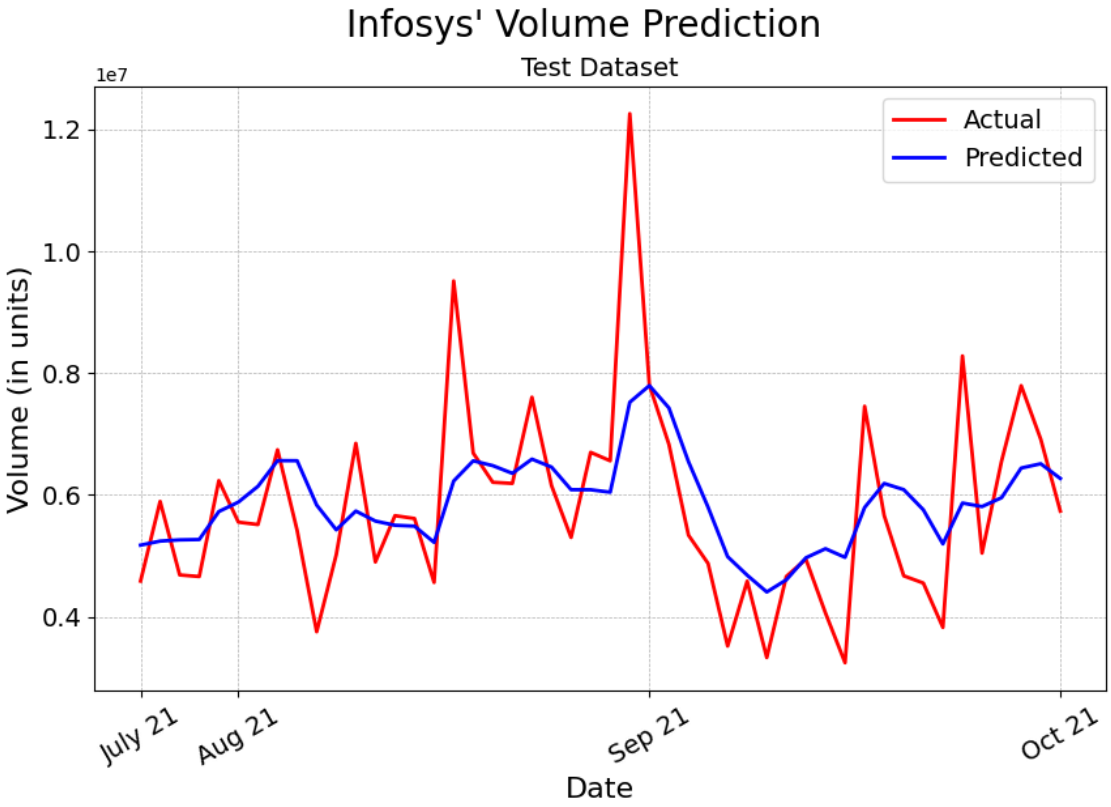

Infosys' Low Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Low Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' Low Price Prediction
Test Dataset
Actual
Predicted
Low Price (in ₹)
1750
1725
1700
1675
1650
1625
1600
1575
July 21
Aug 21
Sep 21
Oct 21
Date


Infosys' Closing Price Prediction
Entire Dataset
Actual
Predicted
Train-Test Split
Closing Price (in ₹)
1700
1600
1500
1400
1300
1200
1100
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' Closing Price Prediction
Test Dataset
Actual
Predicted
Closing Price (in ₹)
1750
1725
1700
1675
1650
1625
1600
1575
July 21
Aug 21
Sep 21
Oct 21
Date


Infosys' Volume Prediction
Entire Dataset
1e7
Actual
Predicted
Train-Test Split
Volume (in units)
2.5
2.0
1.5
1.0
0.5
Jan 21
Apr 21
July 21
Oct 21
Date


Infosys' Volume Prediction
Test Dataset
1e7
1.2
1.0
0.8
0.6
0.4
Volume (in units)
Actual
Predicted
July 21
Aug 21
Sep 21
Oct 21
Date