FMC - LAB-5

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Lab 5: LSTM to analyze historical stock.

In [ ]:

```
!pip install yfinance
```

In [ ]:

```
import yfinance as yf
```

In [ ]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline

sns.set_style('whitegrid')
plt.style.use("fivethirtyeight")

# For reading stock data from yahoo
import yfinance as yf
from datetime import datetime
from pandas_datareader import data as pdr
from pandas_datareader.data import DataReader
yf.pdr_override()
```

1. Import data from Yfinance.

2. Plot Historic Data for specific stock between given duration.

In [ ]:

```
# The tech stocks we'll use for this analysis
stock = 'TSLA'

# Set up End and Start times for data grab
end = datetime.now()
start = datetime(2000, 1, 1)
start = '2020-01-01'

df = yf.download(stock, start, end)
df.tail(10)
```

```
[**********************100%**********************]  1 of 1 completed
```

Out[ ]:

Date	Open	High	Low	Close	Adj Close	Volume
2023-03-31	197.529999	207.789993	197.199997	207.460007	207.460007	169638500
2023-04-03	199.910004	202.690002	192.199997	194.770004	194.770004	169545900
2023-04-04	197.320007	198.740005	190.320007	192.580002	192.580002	126463800

Date	Open	High	Low	Close	Adj Close	Volume
2023-04-05	190.520004	190.679993	183.759995	185.520004	185.520004	133882500
2023-04-06	183.080002	186.389999	179.740005	185.059998	185.059998	123857900
2023-04-10	179.940002	185.100006	176.110001	184.509995	184.509995	142154600
2023-04-11	186.690002	189.190002	185.649994	186.789993	186.789993	115770900
2023-04-12	190.740005	191.580002	180.309998	180.539993	180.539993	150256300
2023-04-13	182.960007	186.500000	180.940002	185.899994	185.899994	112933000
2023-04-14	183.949997	186.279999	182.009995	185.000000	185.000000	96306500

In [ ]:

```
# Summary Stats
df.describe()
```

Out[ ]:

	Open	High	Low	Close	Adj Close	Volume
count	827.000000	827.000000	827.000000	827.000000	827.000000	8.270000e+02
mean	203.901476	208.699398	198.613740	203.758959	203.758959	1.350576e+08
std	92.669967	94.573502	90.404644	92.445508	92.445508	9.696314e+07
min	24.980000	26.990667	23.367332	24.081333	24.081333	2.940180e+07
25%	139.648331	142.879997	135.945000	139.983337	139.983337	7.125075e+07
50%	217.843338	222.046661	210.139999	216.866669	216.866669	9.924120e+07
75%	271.750000	276.308334	264.368332	270.083328	270.083328	1.726955e+08
max	411.470001	414.496674	405.666656	409.970001	409.970001	9.140820e+08

In [ ]:

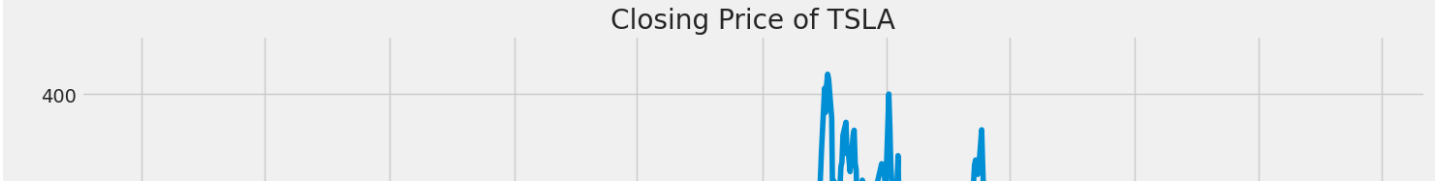
```
# General info
df.info()
```

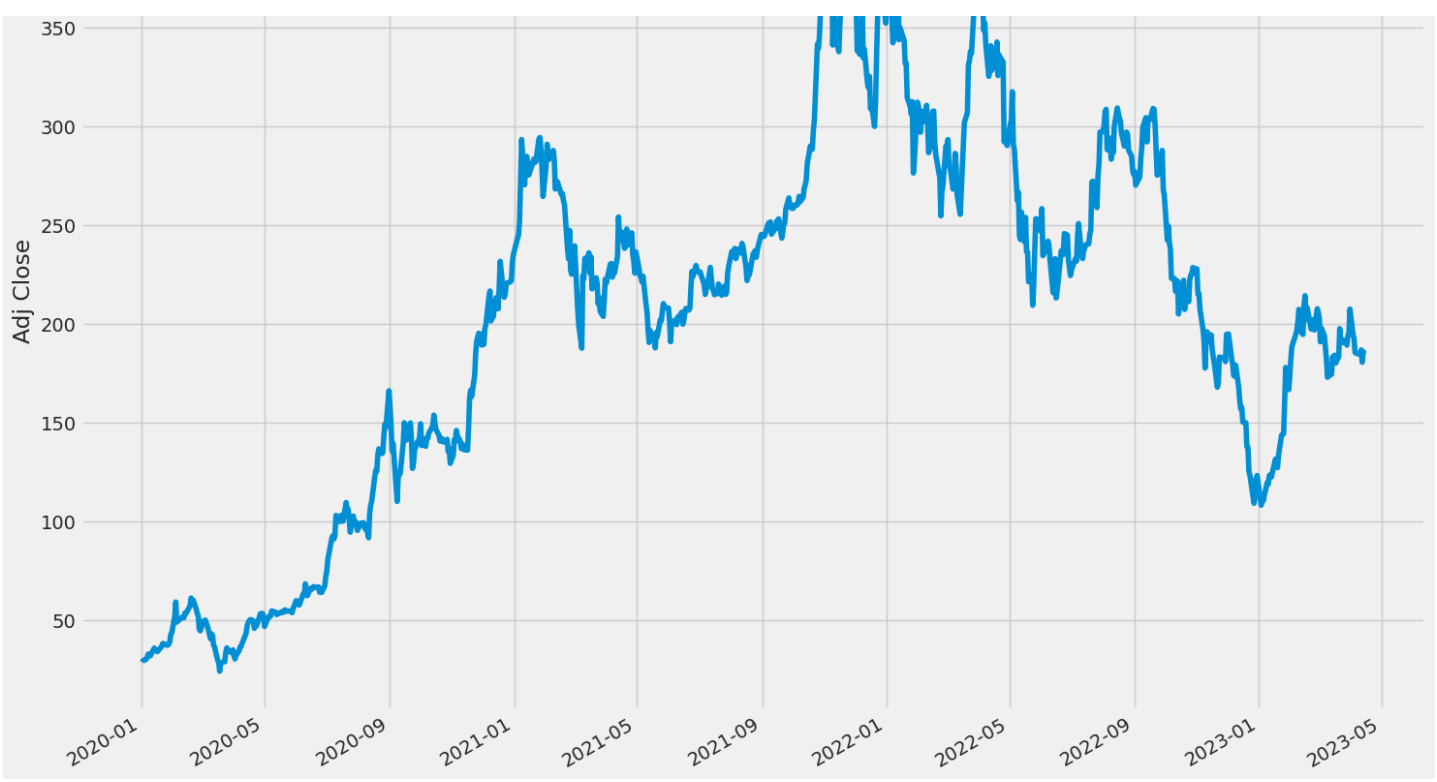
```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 827 entries, 2020-01-02 to 2023-04-14
Data columns (total 6 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   Open       827 non-null    float64
 1   High       827 non-null    float64
 2   Low        827 non-null    float64
 3   Close      827 non-null    float64
 4   Adj Close  827 non-null    float64
 5   Volume     827 non-null    int64  
dtypes: float64(5), int64(1)
memory usage: 45.2 KB
```

In [ ]:

```
# Let's see a historical view of the closing price
plt.figure(figsize=(15, 10))
df['Adj Close'].plot()
plt.ylabel('Adj Close')
plt.xlabel(None)
plt.title(f"Closing Price of {stock}")

plt.tight_layout()
plt.show()
```

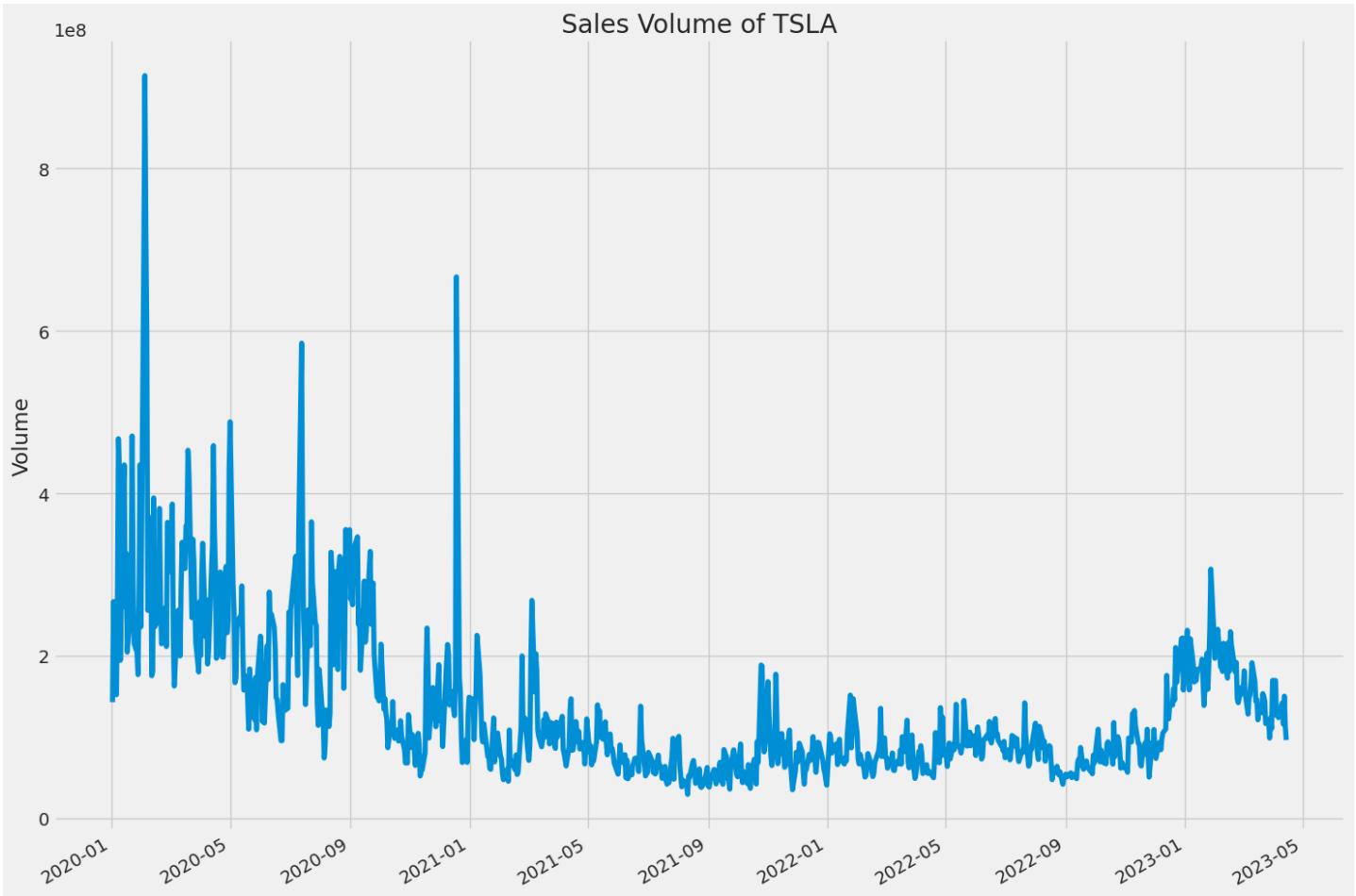




In [ ]:

```
# Now let's plot the total volume of stock being traded each day
plt.figure(figsize=(15, 10))
df['Volume'].plot()
plt.ylabel('Volume')
plt.xlabel(None)
plt.title(f"Sales Volume of {stock}")

plt.tight_layout()
plt.show()
```



In [ ]:

```
ma_day = [10, 20, 50]
```

```
ma_day = [10, 20, 50]

for ma in ma_day:
    column_name = f"MA for {ma} days"
    df[column_name] = df['Adj Close'].rolling(ma).mean()

fig, axes = plt.subplots(nrows=2, ncols=2)
fig.set_figheight(10)
fig.set_figwidth(15)

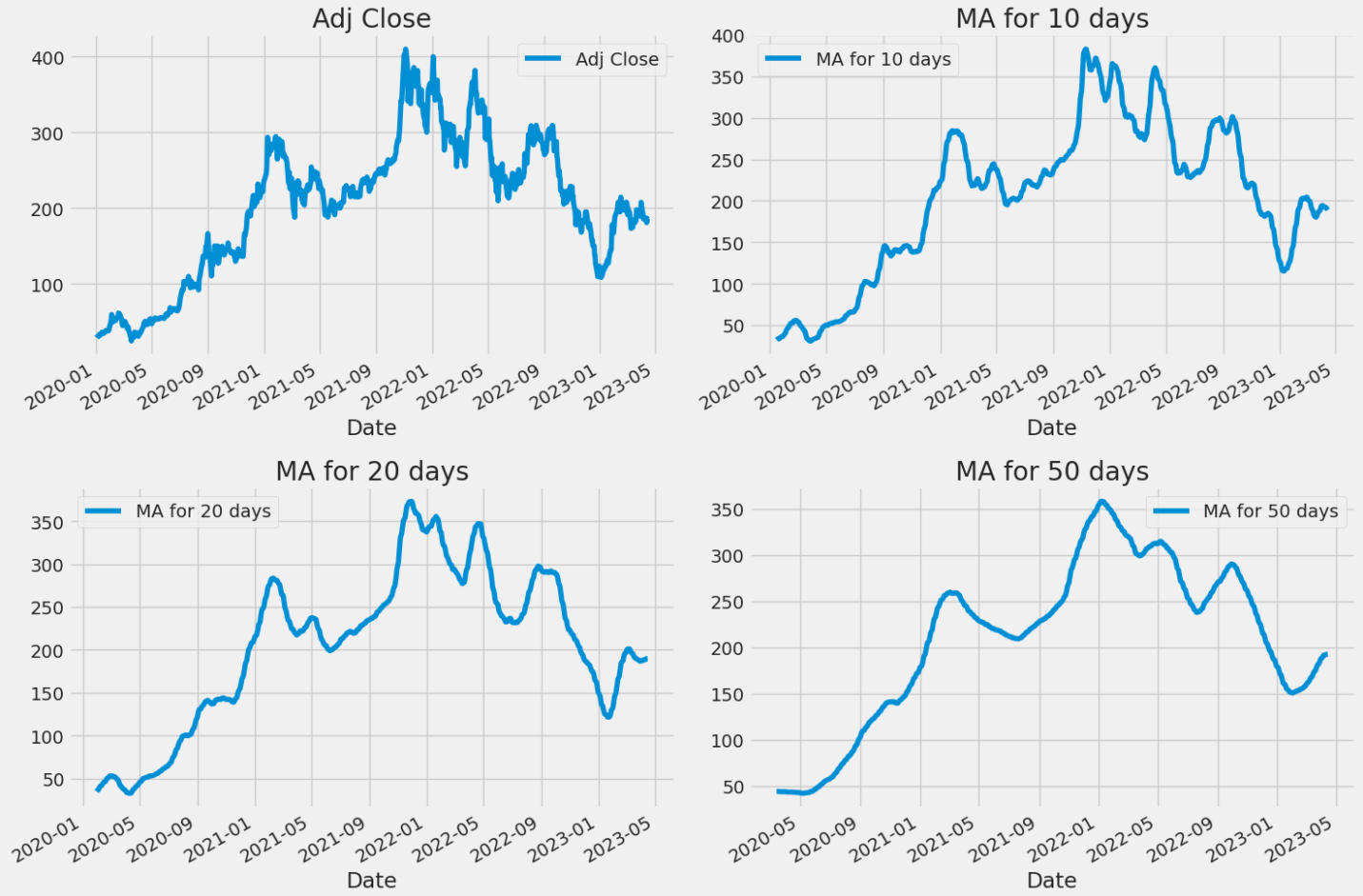
df[['Adj Close']].plot(ax=axes[0,0])
axes[0,0].set_title('Adj Close')

df[['MA for 10 days']].plot(ax=axes[0,1])
axes[0,1].set_title('MA for 10 days')

df[['MA for 20 days']].plot(ax=axes[1,0])
axes[1,0].set_title('MA for 20 days')

df[['MA for 50 days']].plot(ax=axes[1,1])
axes[1,1].set_title('MA for 50 days')

fig.tight_layout()
plt.figure(figsize=(15, 10))
plt.show()
```

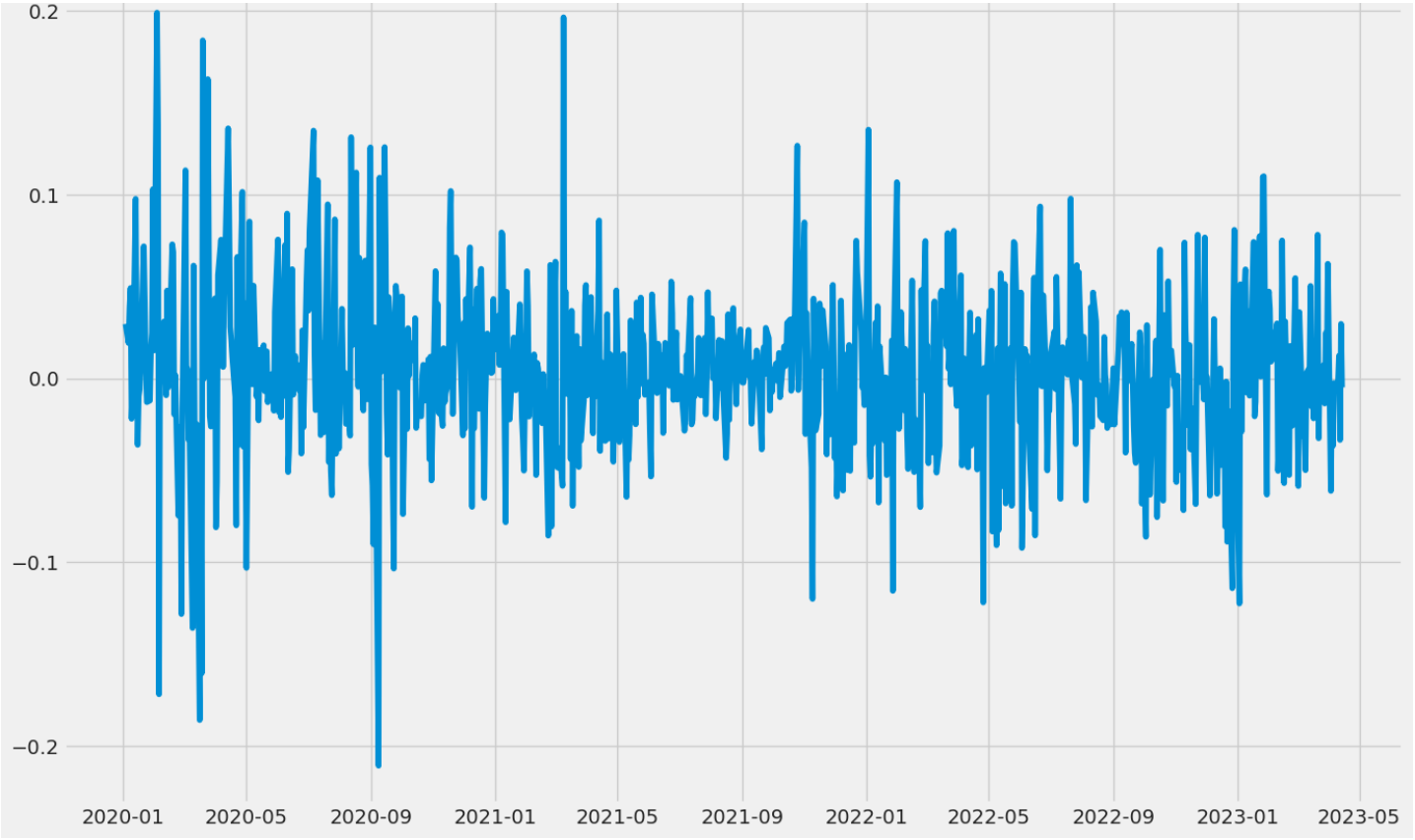



```
<Figure size 1500x1000 with 0 Axes>
```

In [ ]:

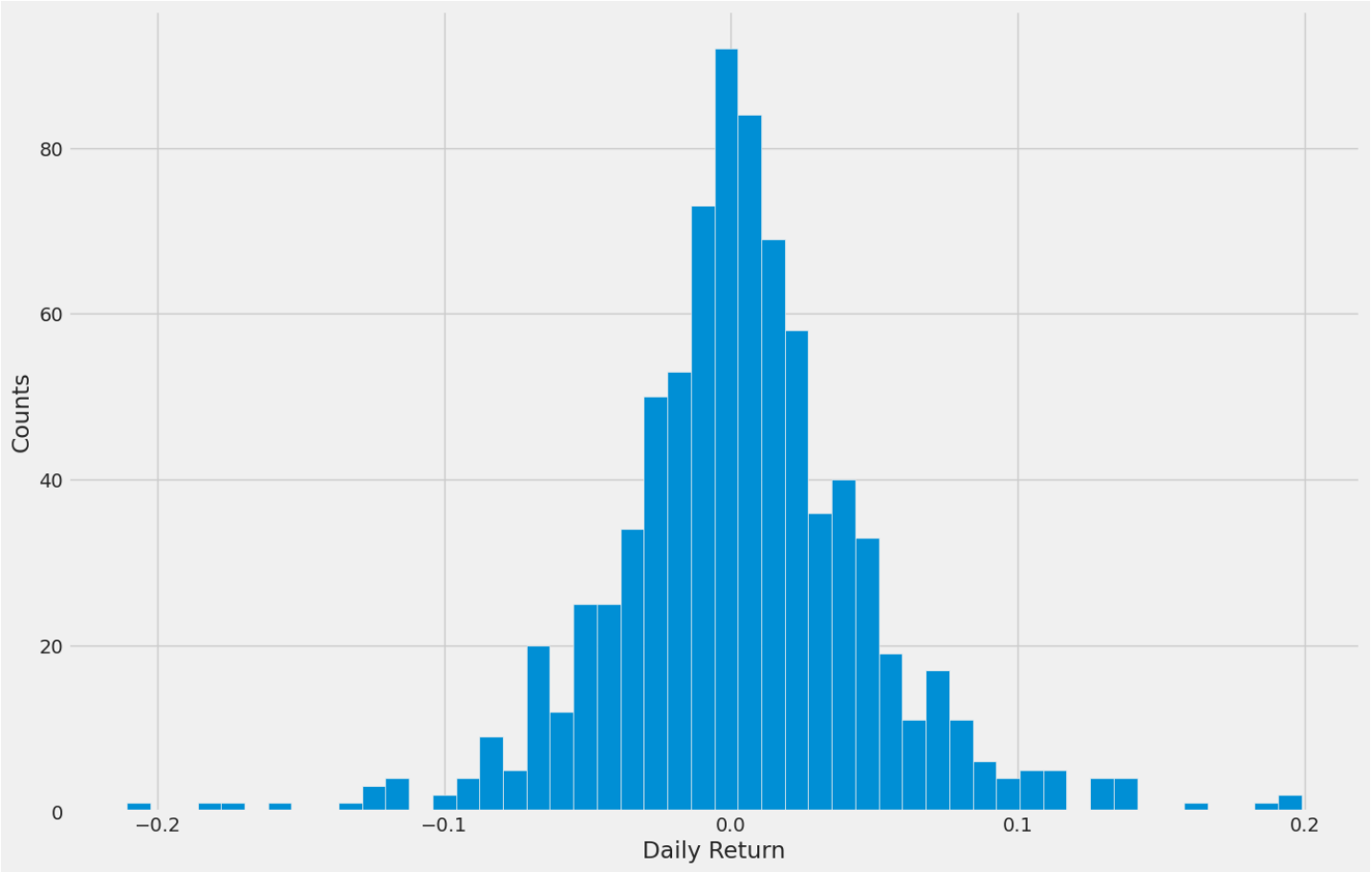
```
# We'll use pct_change to find the percent change for each day
df['Daily Return'] = df['Adj Close'].pct_change()

# Then we'll plot the daily return percentage
plt.figure(figsize=(15, 10))
plt.plot(df['Daily Return'])
plt.title('Daily Returns')
plt.show()
```



In [ ]:

```
fig = plt.figure(figsize=(15, 10))
df['Daily Return'].hist(bins=50)
plt.xlabel('Daily Return')
plt.ylabel('Counts')
plt.show()
```



In [ ]:

```
# Get the stock quote
df = pdr.get_data_yahoo('AAPL', start=start, end=datetime.now())
```

```
# Show teh data
df.head()
```

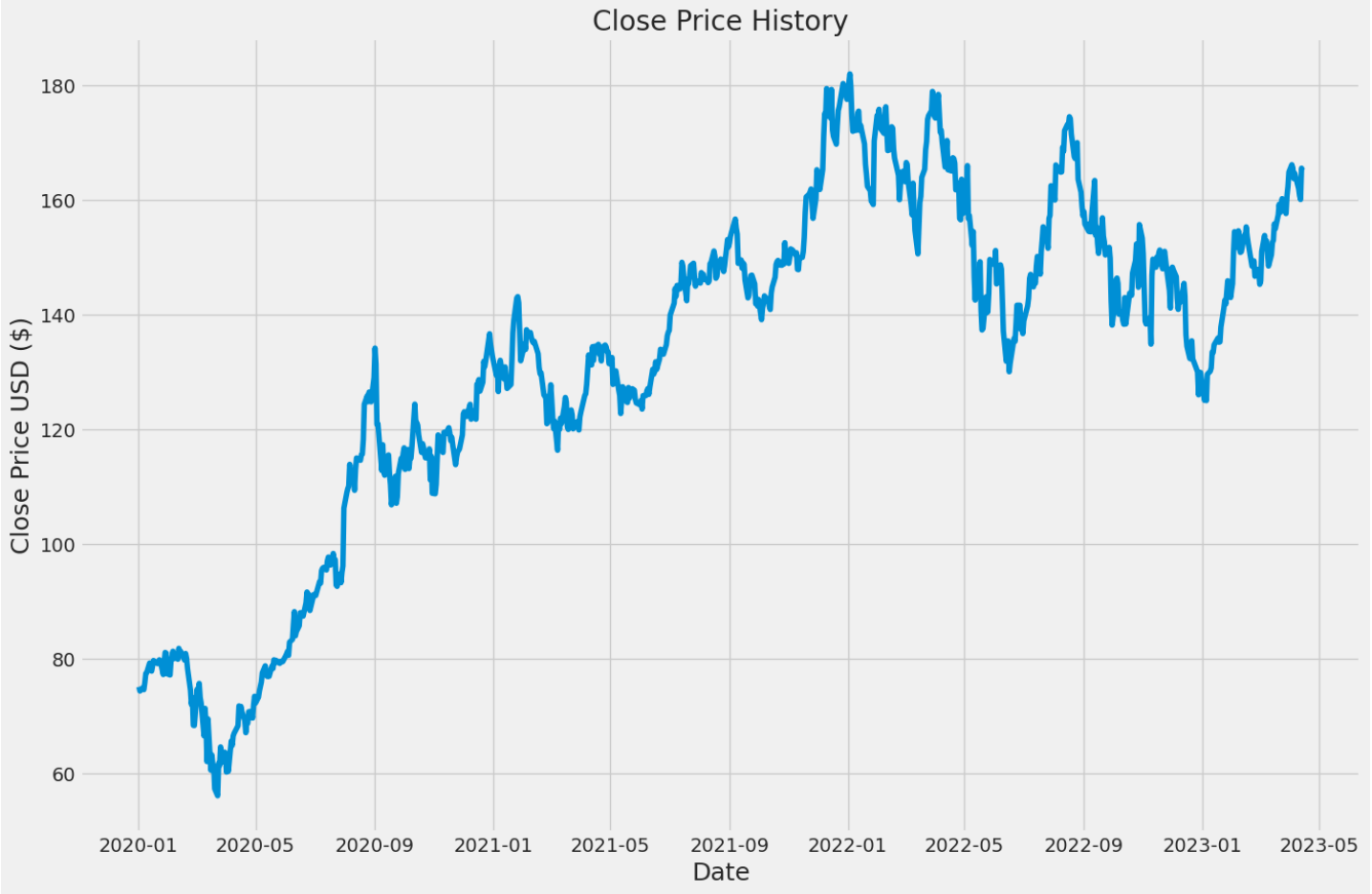
```
[**********100%**********]  1 of 1 completed
```

Out[ ]:

Date	Open	High	Low	Close	Adj Close	Volume
2020-01-02	74.059998	75.150002	73.797501	75.087502	73.449402	135480400
2020-01-03	74.287498	75.144997	74.125000	74.357498	72.735313	146322800
2020-01-06	73.447502	74.989998	73.187500	74.949997	73.314873	118387200
2020-01-07	74.959999	75.224998	74.370003	74.597504	72.970093	108872000
2020-01-08	74.290001	76.110001	74.290001	75.797501	74.143890	132079200

In [ ]:

```
plt.figure(figsize=(15,10))
plt.title('Close Price History')
plt.plot(df['Close'])
plt.xlabel('Date', fontsize=18)
plt.ylabel('Close Price USD ($)', fontsize=18)
plt.show()
```



In [ ]:

```
# Create a new dataframe with only the 'Close' column
data = df.filter(['Close'])
# Convert the dataframe to a numpy array
dataset = data.values
# Get the number of rows to train the model on
training_data_len = int(np.ceil( len(dataset) * .95 ))

training_data_len
```

Out[ ]:

786

In [ ]:

```
# Scale the data
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler(feature_range=(0,1))
scaled_data = scaler.fit_transform(dataset)

scaled_data
```

Out[ ]:

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```

3. Create the training dataset.

4. Create the scaled training dataset.

In [ ]:

```
# Create the training data set
# Create the scaled training data set
train_data = scaled_data[0:int(training_data_len), :]
# Split the data into x_train and y_train data sets
x_train = []
y_train = []

for i in range(60, len(train_data)):
    x_train.append(train_data[i-60:i, 0])
    y_train.append(train_data[i, 0])

# Convert the x_train and y_train to numpy arrays
x_train, y_train = np.array(x_train), np.array(y_train)

# Reshape the data
```

```
x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))
# x_train.shape
```

5. Build the LSTM model for prediction.

In [ ]:

```
from keras.models import Sequential
from keras.layers import Dense, LSTM

# Build the LSTM model
model = Sequential()
model.add(LSTM(128, return_sequences=True, input_shape= (x_train.shape[1], 1)))
model.add(LSTM(64, return_sequences=False))
model.add(Dense(25))
model.add(Dense(1))

# Compile the model
model.compile(optimizer='adam', loss='mean_squared_error')

# Train the model
model.fit(x_train, y_train, epochs=1)
```

```
23/23 [==============================] - 12s 283ms/step - loss: 0.0436
```

Out[ ]:

```
<keras.callbacks.History at 0x7f05788da790>
```

6. Create the testing dataset.

In [ ]:

```
# Create the testing data set
# Create a new array containing scaled values from index 1543 to 2002
test_data = scaled_data[training_data_len - 60: , :]
# Create the data sets x_test and y_test
x_test = []
y_test = dataset[training_data_len:, :]
for i in range(60, len(test_data)):
    x_test.append(test_data[i-60:i, 0])

# Convert the data to a numpy array
x_test = np.array(x_test)

# Reshape the data
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1 ))

# Get the models predicted price values
predictions = model.predict(x_test)
predictions = scaler.inverse_transform(predictions)

# Get the root mean squared error (RMSE)
rmse = np.sqrt(np.mean(((predictions - y_test) ** 2)))
rmse
```

```
2/2 [==============================] - 2s 38ms/step
```

Out[ ]:

```
4.108398997713889
```

7. Plot and Visualise the data.

In [ ]:

```
# Plot the data
train = data.iloc[5300:training_data_len, :]
valid = data.iloc[training_data_len:, :]
valid['Predictions'] = predictions
```

```
# Visualize the data
plt.figure(figsize=(15, 10))

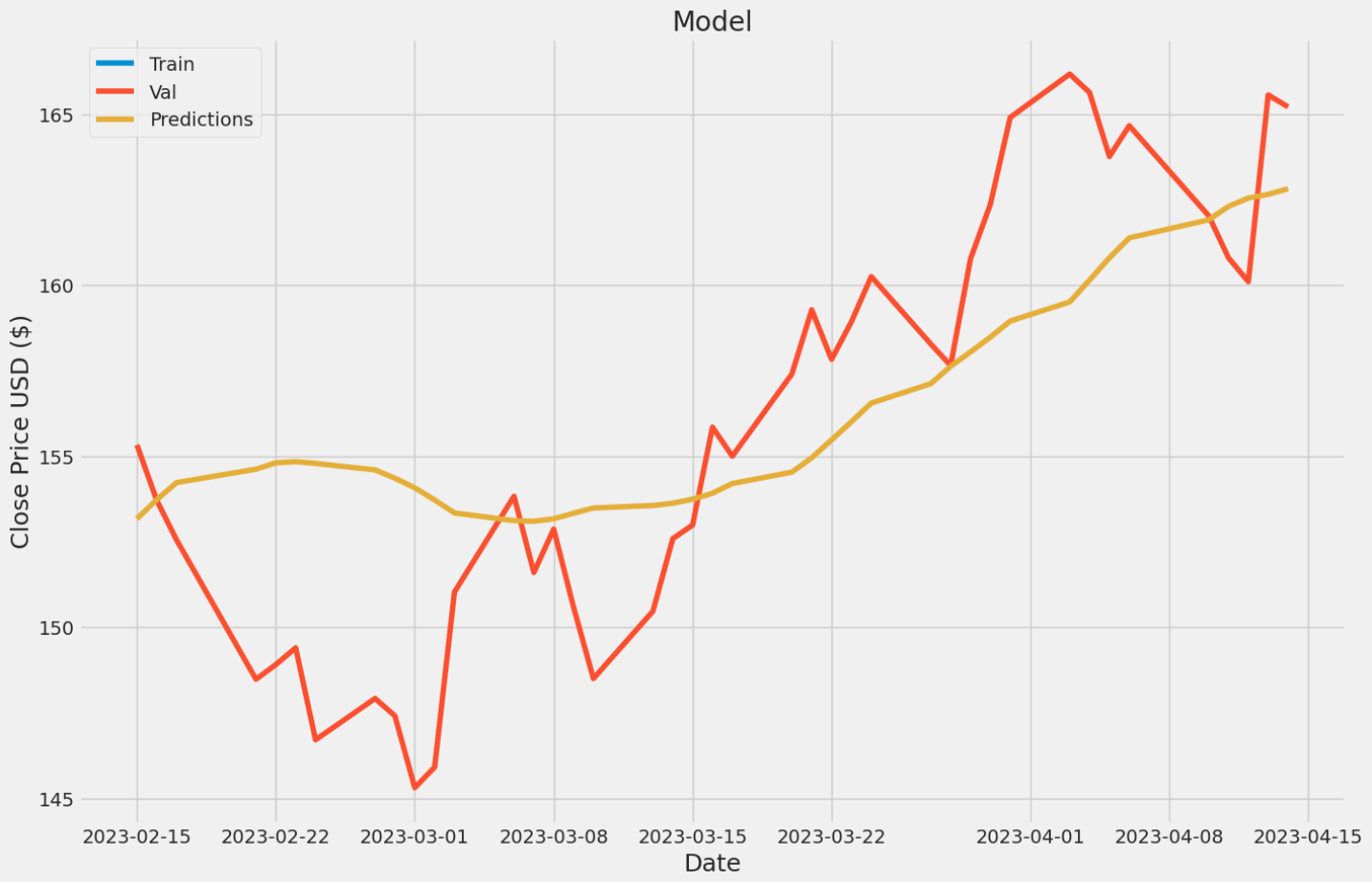
plt.title('Model')
plt.xlabel('Date', fontsize=18)
plt.ylabel('Close Price USD ($)', fontsize=18)

plt.plot(train['Close'])
plt.plot(valid[['Close', 'Predictions']])
plt.legend(['Train', 'Val', 'Predictions'], loc='best')

plt.show()
```

```
<ipython-input-60-44a072488fb9>:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  valid['Predictions'] = predictions
```



In [ ]:

```
!jupyter nbconvert --to html "/content/60009200040_FMC_K2_Lab5.ipynb"
```

```
[NbConvertApp] Converting notebook /content/60009200040_FMC_K2_Lab5.ipynb to html
[NbConvertApp] Writing 1569609 bytes to /content/60009200040_FMC_K2_Lab5.html
```