# Data Project - Stock Market Analysis

In [1]:
```
import pandas as pd
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style('whitegrid')
plt.style.use("fivethirtyeight")
%matplotlib inline
```

In [2]:
```
df = pd.read_csv(r"C:\Users\HP\stocks.csv")
df
```

Out[2]:

| | date | open | high | low | close | volume | Name |
|---|---|---|---|---|---|---|---|
| **0** | 2013-02-08 | 15.07 | 15.12 | 14.63 | 14.75 | 8407500 | AAL |
| **1** | 2013-02-11 | 14.89 | 15.01 | 14.26 | 14.46 | 8882000 | AAL |
| **2** | 2013-02-12 | 14.45 | 14.51 | 14.10 | 14.27 | 8126000 | AAL |
| **3** | 2013-02-13 | 14.30 | 14.94 | 14.25 | 14.66 | 10259500 | AAL |
| **4** | 2013-02-14 | 14.94 | 14.96 | 13.16 | 13.99 | 31879900 | AAL |
| **...** | ... | ... | ... | ... | ... | ... | ... |
| **619035** | 2018-02-01 | 76.84 | 78.27 | 76.69 | 77.82 | 2982259 | ZTS |
| **619036** | 2018-02-02 | 77.53 | 78.12 | 76.73 | 76.78 | 2595187 | ZTS |
| **619037** | 2018-02-05 | 76.64 | 76.92 | 73.18 | 73.83 | 2962031 | ZTS |
| **619038** | 2018-02-06 | 72.74 | 74.56 | 72.13 | 73.27 | 4924323 | ZTS |
| **619039** | 2018-02-07 | 72.70 | 75.00 | 72.69 | 73.86 | 4534912 | ZTS |

619040 rows × 7 columns

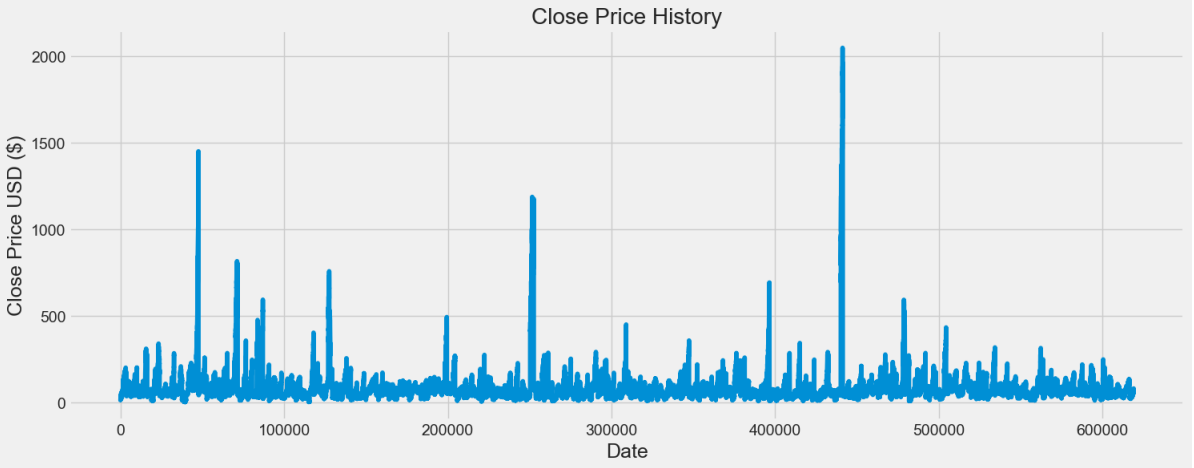
In [3]:
```
print(df.head())
```

```
         date   open   high    low  close    volume Name
0  2013-02-08  15.07  15.12  14.63  14.75   8407500  AAL
1  2013-02-11  14.89  15.01  14.26  14.46   8882000  AAL
2  2013-02-12  14.45  14.51  14.10  14.27   8126000  AAL
3  2013-02-13  14.30  14.94  14.25  14.66  10259500  AAL
4  2013-02-14  14.94  14.96  13.16  13.99  31879900  AAL
```

In [4]:
```
print(df.columns)
```

```
Index(['date', 'open', 'high', 'low', 'close', 'volume', 'Name'], dtype='object')
```

In [5]:
```
plt.figure(figsize=(16,6))
plt.title('Close Price History')
plt.plot(df['close'])
plt.xlabel('Date', fontsize=18)
plt.ylabel('Close Price USD ($)', fontsize=18)
plt.show()
```




In [6]:
```
# 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[6]:
```
588088
```

In [7]:
```
# Scale the data
from sklearn.preprocessing import MinMaxScaler

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

scaled_data
```

Out[7]:
```
array([[0.00642763],
       [0.00628599],
       [0.00619319],
       ...,
       [0.0352836 ],
       [0.03501009],
       [0.03529825]])
```

In [8]:
```
# 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])
    if i<= 61:
        print(x_train)
        print(y_train)
        print()

# 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
```

```
[array([0.00642763, 0.00628599, 0.00619319, 0.00638367, 0.00605643,
       0.00630553, 0.00618831, 0.00573407, 0.00575361, 0.0058513 ,
       0.00558266, 0.00569988, 0.00577315, 0.00578292, 0.00587083,
       0.00601247, 0.00608574, 0.00633972, 0.00646182, 0.00651066,
       0.00661323, 0.00679395, 0.0069942 , 0.00716027, 0.00702839,
       0.0071798 , 0.00741913, 0.00763892, 0.00752658, 0.0074582 ,
       0.00733121, 0.00728726, 0.00735563, 0.00751193, 0.0073654 ,
       0.00691117, 0.0068086 , 0.00688675, 0.0069014 , 0.00696001,
       0.00689163, 0.00693071, 0.00713096, 0.00710654, 0.00683791,
       0.00721888, 0.00729214, 0.007087  , 0.00704793, 0.00680372,
       0.00718469, 0.00725795, 0.00714561, 0.00732633, 0.00743378,
       0.00747774, 0.00733121, 0.00749728, 0.00753635, 0.00752658])]
[0.007516813925886851]

[array([0.00642763, 0.00628599, 0.00619319, 0.00638367, 0.00605643,
       0.00630553, 0.00618831, 0.00573407, 0.00575361, 0.0058513 ,
       0.00558266, 0.00569988, 0.00577315, 0.00578292, 0.00587083,
       0.00601247, 0.00608574, 0.00633972, 0.00646182, 0.00651066,
       0.00661323, 0.00679395, 0.0069942 , 0.00716027, 0.00702839,
       0.0071798 , 0.00741913, 0.00763892, 0.00752658, 0.0074582 ,
       0.00733121, 0.00728726, 0.00735563, 0.00751193, 0.0073654 ,
       0.00691117, 0.0068086 , 0.00688675, 0.0069014 , 0.00696001,
       0.00689163, 0.00693071, 0.00713096, 0.00710654, 0.00683791,
       0.00721888, 0.00729214, 0.007087  , 0.00704793, 0.00680372,
       0.00718469, 0.00725795, 0.00714561, 0.00732633, 0.00743378,
       0.00747774, 0.00733121, 0.00749728, 0.00753635, 0.00752658]), array([0.006285
99, 0.00619319, 0.00638367, 0.00605643, 0.00630553,
       0.00618831, 0.00573407, 0.00575361, 0.0058513 , 0.00558266,
       0.00569988, 0.00577315, 0.00578292, 0.00587083, 0.00601247,
       0.00608574, 0.00633972, 0.00646182, 0.00651066, 0.00661323,
       0.00679395, 0.0069942 , 0.00716027, 0.00702839, 0.0071798 ,
       0.00741913, 0.00763892, 0.00752658, 0.0074582 , 0.00733121,
       0.00728726, 0.00735563, 0.00751193, 0.0073654 , 0.00691117,
       0.0068086 , 0.00688675, 0.0069014 , 0.00696001, 0.00689163,
       0.00693071, 0.00713096, 0.00710654, 0.00683791, 0.00721888,
       0.00729214, 0.007087  , 0.00704793, 0.00680372, 0.00718469,
       0.00725795, 0.00714561, 0.00732633, 0.00743378, 0.00747774,
       0.00733121, 0.00749728, 0.00753635, 0.00752658, 0.00751681])]
[0.007516813925886851, 0.00769264583058596]
```

In [9]:

```
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, batch_size=100, epochs=5)
```

```
Epoch 1/5
5881/5881 [==============================] - 1645s 278ms/step - loss: 2.1789e-05
Epoch 2/5
5881/5881 [==============================] - 1302s 221ms/step - loss: 9.4617e-06
Epoch 3/5
5881/5881 [==============================] - 1422s 242ms/step - loss: 8.9023e-06
Epoch 4/5
5881/5881 [==============================] - 1335s 227ms/step - loss: 8.9060e-06
Epoch 5/5
5881/5881 [==============================] - 2126s 362ms/step - loss: 8.2106e-06
```

Out[9]:
```
<keras.src.callbacks.History at 0x232a08ba990>
```

In [10]:
```
# 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
```

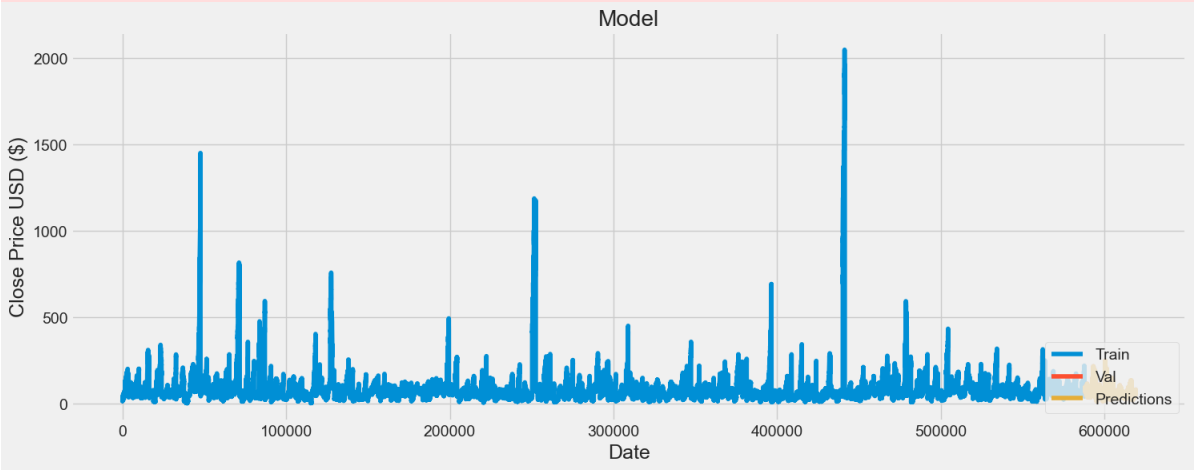
```
968/968 [==============================] - 63s 50ms/step
```

Out[10]:
```
2.103550450280048
```

In [11]:
```
# Plot the data
train = data[:training_data_len]
valid = data[training_data_len:]
valid['Predictions'] = predictions
# Visualize the data
plt.figure(figsize=(16,6))
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='lower right')
plt.show()
```

```
C:\Users\HP\AppData\Local\Temp\ipykernel_5396\2269485014.py:4: SettingWithCopyWarnin
g:
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/u
ser_guide/indexing.html#returning-a-view-versus-a-copy
  valid['Predictions'] = predictions
```




In [12]:
```
# Show the valid and predicted prices
valid
```

Out[12]:

| | close | Predictions |
|---|---|---|
| **588088** | 68.47 | 67.932472 |
| **588089** | 68.61 | 68.589119 |
| **588090** | 67.77 | 68.735733 |
| **588091** | 66.75 | 67.926224 |
| **588092** | 67.38 | 66.906975 |
| **...** | ... | ... |
| **619035** | 77.82 | 76.845627 |
| **619036** | 76.78 | 77.870880 |
| **619037** | 73.83 | 76.809448 |
| **619038** | 73.27 | 73.946838 |
| **619039** | 73.86 | 73.352760 |

30952 rows × 2 columns

# Summary

In this notebook, you discovered and explored stock data.

Specifically, you learned:

How to load stock market data from the YAHOO Finance website using yfinance. How to explore and visualize time-series data using Pandas, Matplotlib, and Seaborn. How to measure the correlation between stocks. How to measure the risk of investing in a particular

stock. Do you have any questions? Ask your questions in the comments below and I will do my best to answer.

References: https://www.investopedia.com/terms/c/correlation.asp Jose Portilla Udemy Course: Learning Python for Data Analysis and Visualization