In [1]:
```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.layers import LSTM
from tensorflow.keras.layers import Dropout
from tensorflow.keras.layers import *
from tensorflow.keras.callbacks import EarlyStopping
from sklearn.preprocessing import MinMaxScaler,StandardScaler
from sklearn.metrics import mean_squared_error
from sklearn.metrics import mean_absolute_percentage_error
from sklearn.model_selection import train_test_split
from sklearn.model_selection import TimeSeriesSplit
from sklearn.metrics import mean_squared_error
```

In [2]:
```
stock_data=pd.read_csv('./Stock_Price_data_set.csv',index_col='Date')
stock_data.head()
```

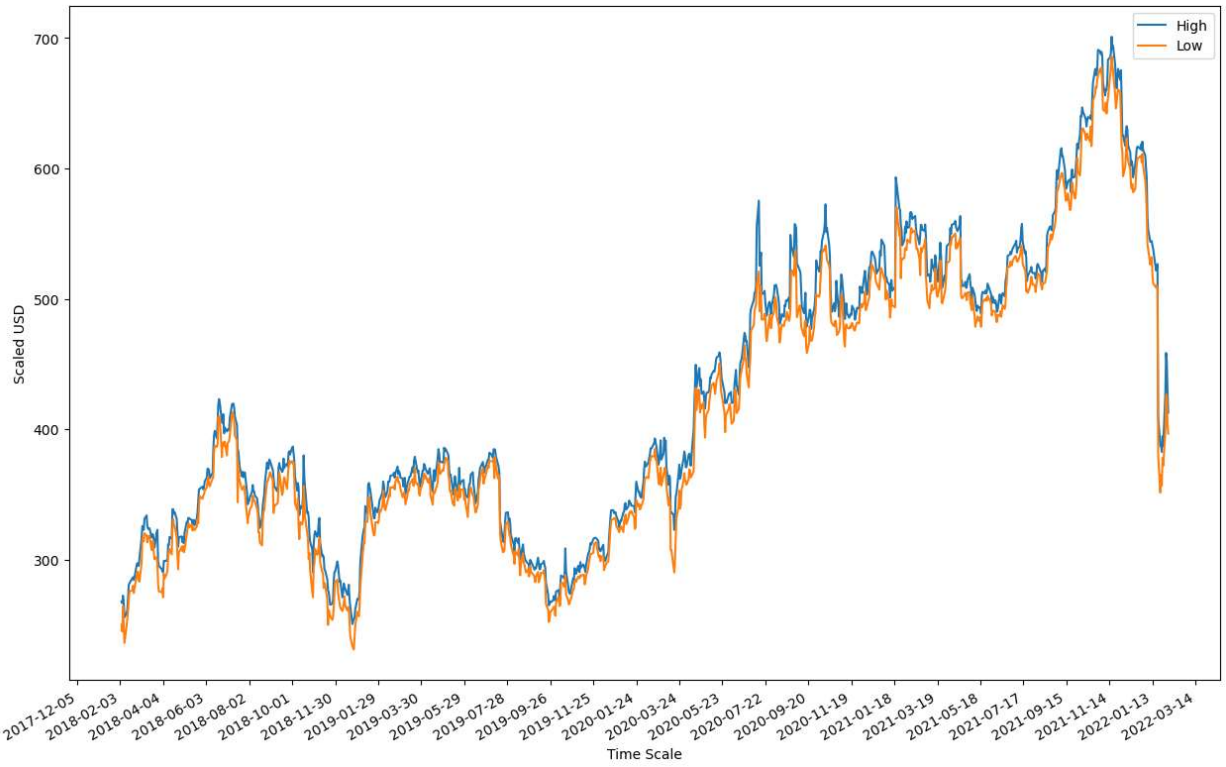
Out[2]:

Date	Open	High	Low	Close	Adj Close	Volume
2018-02-05	262.000000	267.899994	250.029999	254.259995	254.259995	11896100
2018-02-06	247.699997	266.700012	245.000000	265.720001	265.720001	12595800
2018-02-07	266.579987	272.450012	264.329987	264.559998	264.559998	8981500
2018-02-08	267.079987	267.619995	250.000000	250.100006	250.100006	9306700
2018-02-09	253.850006	255.800003	236.110001	249.470001	249.470001	16906900

In [3]:
```
import matplotlib.dates as mdates
import matplotlib.pyplot as plt
import datetime as dt

plt.figure(figsize=(15,10))
plt.gca().xaxis.set_major_formatter(mdates.DateFormatter('%Y-%m-%d'))
plt.gca().xaxis.set_major_locator(mdates.DayLocator(interval=60))
x_dates=[dt.datetime.strptime(d,'%Y-%m-%d').date() for d in stock_data.index.values]

plt.plot(x_dates, stock_data['High'],label='High')
plt.plot(x_dates, stock_data['Low'],label='Low')
plt.xlabel('Time Scale')
plt.ylabel('Scaled USD')
plt.legend()
plt.gcf().autofmt_xdate()
plt.show()
```



In [4]:
```
target_y=stock_data['Close']
X_feat=stock_data.iloc[:,0:3]
```

In [5]:
```
sc=StandardScaler()
X_ft=sc.fit_transform(X_feat.values)
X_ft=pd.DataFrame(columns=X_feat.columns,data=X_ft,index=X_feat.index)
```

In [6]:
```
def lstm_split(data,n_steps):
    X,y=[],[]
    for i in range(len(data)-n_steps+1):
        X.append(data[i:i+n_steps,:-1])
        y.append(data[i+n_steps-1,-1])

    return np.array(X),np.array(y)
```

In [7]:
```
n_steps=10
X1,y1=lstm_split(stock_data.values,n_steps=n_steps)

train_split=0.8
split_idx=int(np.ceil(len(X1)*train_split))
date_index=stock_data.index

X_train,X_test=X1[:split_idx],X1[split_idx:]
y_train,y_test=y1[:split_idx],y1[split_idx:]
X_train_date,X_test_date=date_index[:split_idx],date_index[split_idx:]
print(X1.shape,X_train.shape,X_test.shape,y_test.shape)
```

```
(1000, 10, 5) (800, 10, 5) (200, 10, 5) (200,)
```

In [8]:
```
lstm = Sequential()
lstm.add(LSTM(50, input_shape=(X_train.shape[1], X_train.shape[2]),
              activation='relu', return_sequences=True))
lstm.add(LSTM(50, activation='relu'))
lstm.add(Dense(1))
```

```
lstm.compile(loss='mean_squared_error', optimizer='adam')
lstm.summary()

history = lstm.fit(X_train, y_train, epochs=100, batch_size=4, verbose=2, shuffle=Fals

y_pred = lstm.predict(X_test)

rmse = mean_squared_error(y_test, y_pred, squared=False)
mape = mean_absolute_percentage_error(y_test, y_pred)
print("RSME: ", rmse)
print("MAPE: ", mape)
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 10, 50)            11200

 lstm_1 (LSTM)               (None, 50)                20200

 dense (Dense)               (None, 1)                 51

=================================================================
Total params: 31,451
Trainable params: 31,451
Non-trainable params: 0
_________________________________________________________________
Epoch 1/100
200/200 - 4s - loss: 85358683357184.0000 - 4s/epoch - 19ms/step
Epoch 2/100
200/200 - 0s - loss: 32246895476736.0000 - 489ms/epoch - 2ms/step
Epoch 3/100
200/200 - 0s - loss: 32185081921536.0000 - 459ms/epoch - 2ms/step
Epoch 4/100
200/200 - 0s - loss: 32477278109696.0000 - 469ms/epoch - 2ms/step
Epoch 5/100
200/200 - 0s - loss: 32917245919232.0000 - 488ms/epoch - 2ms/step
Epoch 6/100
200/200 - 0s - loss: 33189072470016.0000 - 493ms/epoch - 2ms/step
Epoch 7/100
200/200 - 0s - loss: 33532535635968.0000 - 461ms/epoch - 2ms/step
Epoch 8/100
200/200 - 0s - loss: 33846930178048.0000 - 478ms/epoch - 2ms/step
Epoch 9/100
200/200 - 0s - loss: 34130741952512.0000 - 484ms/epoch - 2ms/step
Epoch 10/100
200/200 - 0s - loss: 34366264705024.0000 - 485ms/epoch - 2ms/step
Epoch 11/100
200/200 - 0s - loss: 34574633533440.0000 - 480ms/epoch - 2ms/step
Epoch 12/100
200/200 - 0s - loss: 34773428862976.0000 - 480ms/epoch - 2ms/step
Epoch 13/100
200/200 - 0s - loss: 34910374985728.0000 - 457ms/epoch - 2ms/step
Epoch 14/100
200/200 - 0s - loss: 35074418409472.0000 - 478ms/epoch - 2ms/step
Epoch 15/100
200/200 - 0s - loss: 35199018598400.0000 - 473ms/epoch - 2ms/step
Epoch 16/100
200/200 - 0s - loss: 32359013416960.0000 - 459ms/epoch - 2ms/step
Epoch 17/100
200/200 - 0s - loss: 34392026120192.0000 - 492ms/epoch - 2ms/step
Epoch 18/100
200/200 - 0s - loss: 34838597861376.0000 - 484ms/epoch - 2ms/step
Epoch 19/100
200/200 - 0s - loss: 35057563598848.0000 - 467ms/epoch - 2ms/step
Epoch 20/100
200/200 - 0s - loss: 35199110873088.0000 - 473ms/epoch - 2ms/step
Epoch 21/100
200/200 - 0s - loss: 35288667652096.0000 - 469ms/epoch - 2ms/step
Epoch 22/100
200/200 - 1s - loss: 35244832980992.0000 - 557ms/epoch - 3ms/step
Epoch 23/100
```

```
200/200 - 1s - loss: 35442246287360.0000 - 515ms/epoch - 3ms/step
Epoch 24/100
200/200 - 0s - loss: 35556071309312.0000 - 495ms/epoch - 2ms/step
Epoch 25/100
200/200 - 1s - loss: 35564296339456.0000 - 522ms/epoch - 3ms/step
Epoch 26/100
200/200 - 0s - loss: 35695045378048.0000 - 496ms/epoch - 2ms/step
Epoch 27/100
200/200 - 1s - loss: 35664263380992.0000 - 532ms/epoch - 3ms/step
Epoch 28/100
200/200 - 0s - loss: 35810246131712.0000 - 496ms/epoch - 2ms/step
Epoch 29/100
200/200 - 0s - loss: 35724766216192.0000 - 497ms/epoch - 2ms/step
Epoch 30/100
200/200 - 0s - loss: 36661702426624.0000 - 488ms/epoch - 2ms/step
Epoch 31/100
200/200 - 0s - loss: 36562188369920.0000 - 482ms/epoch - 2ms/step
Epoch 32/100
200/200 - 0s - loss: 36575316541440.0000 - 464ms/epoch - 2ms/step
Epoch 33/100
200/200 - 0s - loss: 36549433491456.0000 - 488ms/epoch - 2ms/step
Epoch 34/100
200/200 - 0s - loss: 36509306585088.0000 - 500ms/epoch - 2ms/step
Epoch 35/100
200/200 - 0s - loss: 36469020295168.0000 - 459ms/epoch - 2ms/step
Epoch 36/100
200/200 - 0s - loss: 36432253026304.0000 - 469ms/epoch - 2ms/step
Epoch 37/100
200/200 - 0s - loss: 36397985562624.0000 - 474ms/epoch - 2ms/step
Epoch 38/100
200/200 - 1s - loss: 36367757213696.0000 - 527ms/epoch - 3ms/step
Epoch 39/100
200/200 - 0s - loss: 36340670398464.0000 - 486ms/epoch - 2ms/step
Epoch 40/100
200/200 - 1s - loss: 36316993552384.0000 - 540ms/epoch - 3ms/step
Epoch 41/100
200/200 - 1s - loss: 36297204826112.0000 - 501ms/epoch - 3ms/step
Epoch 42/100
200/200 - 0s - loss: 35474064277504.0000 - 474ms/epoch - 2ms/step
Epoch 43/100
200/200 - 0s - loss: 35478933864448.0000 - 487ms/epoch - 2ms/step
Epoch 44/100
200/200 - 0s - loss: 35774124785664.0000 - 489ms/epoch - 2ms/step
Epoch 45/100
200/200 - 0s - loss: 35887211610112.0000 - 497ms/epoch - 2ms/step
Epoch 46/100
200/200 - 0s - loss: 35947286626304.0000 - 484ms/epoch - 2ms/step
Epoch 47/100
200/200 - 0s - loss: 35983374417920.0000 - 459ms/epoch - 2ms/step
Epoch 48/100
200/200 - 0s - loss: 36007978205184.0000 - 481ms/epoch - 2ms/step
Epoch 49/100
200/200 - 0s - loss: 36026613497856.0000 - 481ms/epoch - 2ms/step
Epoch 50/100
200/200 - 0s - loss: 36042937729024.0000 - 475ms/epoch - 2ms/step
Epoch 51/100
200/200 - 0s - loss: 36057852674048.0000 - 480ms/epoch - 2ms/step
Epoch 52/100
200/200 - 0s - loss: 36074558586880.0000 - 472ms/epoch - 2ms/step
Epoch 53/100
```

```
200/200 - 0s - loss: 36090769571840.0000 - 488ms/epoch - 2ms/step
Epoch 54/100
200/200 - 0s - loss: 36092204023808.0000 - 470ms/epoch - 2ms/step
Epoch 55/100
200/200 - 0s - loss: 36128656719872.0000 - 474ms/epoch - 2ms/step
Epoch 56/100
200/200 - 0s - loss: 36145782063104.0000 - 469ms/epoch - 2ms/step
Epoch 57/100
200/200 - 0s - loss: 36164278943744.0000 - 482ms/epoch - 2ms/step
Epoch 58/100
200/200 - 0s - loss: 36364171083776.0000 - 470ms/epoch - 2ms/step
Epoch 59/100
200/200 - 0s - loss: 33587642499072.0000 - 471ms/epoch - 2ms/step
Epoch 60/100
200/200 - 1s - loss: 35388697608192.0000 - 587ms/epoch - 3ms/step
Epoch 61/100
200/200 - 0s - loss: 34542505164800.0000 - 493ms/epoch - 2ms/step
Epoch 62/100
200/200 - 0s - loss: 35592402370560.0000 - 472ms/epoch - 2ms/step
Epoch 63/100
200/200 - 1s - loss: 35785185165312.0000 - 630ms/epoch - 3ms/step
Epoch 64/100
200/200 - 1s - loss: 35887375187968.0000 - 532ms/epoch - 3ms/step
Epoch 65/100
200/200 - 0s - loss: 35957948547072.0000 - 486ms/epoch - 2ms/step
Epoch 66/100
200/200 - 0s - loss: 36015758639104.0000 - 484ms/epoch - 2ms/step
Epoch 67/100
200/200 - 0s - loss: 36061434609664.0000 - 487ms/epoch - 2ms/step
Epoch 68/100
200/200 - 1s - loss: 34494293737472.0000 - 578ms/epoch - 3ms/step
Epoch 69/100
200/200 - 1s - loss: 36003460939776.0000 - 585ms/epoch - 3ms/step
Epoch 70/100
200/200 - 1s - loss: 36069483479040.0000 - 556ms/epoch - 3ms/step
Epoch 71/100
200/200 - 0s - loss: 36115209781248.0000 - 494ms/epoch - 2ms/step
Epoch 72/100
200/200 - 1s - loss: 36152304205824.0000 - 531ms/epoch - 3ms/step
Epoch 73/100
200/200 - 0s - loss: 36185363709952.0000 - 470ms/epoch - 2ms/step
Epoch 74/100
200/200 - 0s - loss: 34982231801856.0000 - 486ms/epoch - 2ms/step
Epoch 75/100
200/200 - 0s - loss: 34576726491136.0000 - 486ms/epoch - 2ms/step
Epoch 76/100
200/200 - 0s - loss: 36207346057216.0000 - 484ms/epoch - 2ms/step
Epoch 77/100
200/200 - 1s - loss: 36408391630848.0000 - 501ms/epoch - 3ms/step
Epoch 78/100
200/200 - 1s - loss: 36412325888000.0000 - 550ms/epoch - 3ms/step
Epoch 79/100
200/200 - 1s - loss: 36412325888000.0000 - 704ms/epoch - 4ms/step
Epoch 80/100
200/200 - 1s - loss: 36430772436992.0000 - 541ms/epoch - 3ms/step
Epoch 81/100
200/200 - 0s - loss: 36446312333312.0000 - 493ms/epoch - 2ms/step
Epoch 82/100
200/200 - 1s - loss: 36465425776640.0000 - 518ms/epoch - 3ms/step
Epoch 83/100
```

```
200/200 - 1s - loss: 36485206114304.0000 - 551ms/epoch - 3ms/step
Epoch 84/100
200/200 - 1s - loss: 36507532394496.0000 - 626ms/epoch - 3ms/step
Epoch 85/100
200/200 - 1s - loss: 36529699291136.0000 - 548ms/epoch - 3ms/step
Epoch 86/100
200/200 - 1s - loss: 36554881892352.0000 - 517ms/epoch - 3ms/step
Epoch 87/100
200/200 - 1s - loss: 36580970463232.0000 - 517ms/epoch - 3ms/step
Epoch 88/100
200/200 - 0s - loss: 36608753532928.0000 - 484ms/epoch - 2ms/step
Epoch 89/100
200/200 - 0s - loss: 36641703985152.0000 - 486ms/epoch - 2ms/step
Epoch 90/100
200/200 - 0s - loss: 36674046263296.0000 - 486ms/epoch - 2ms/step
Epoch 91/100
200/200 - 0s - loss: 36697509199872.0000 - 469ms/epoch - 2ms/step
Epoch 92/100
200/200 - 0s - loss: 36724600209408.0000 - 486ms/epoch - 2ms/step
Epoch 93/100
200/200 - 1s - loss: 36745202630656.0000 - 523ms/epoch - 3ms/step
Epoch 94/100
200/200 - 1s - loss: 36762890010624.0000 - 501ms/epoch - 3ms/step
Epoch 95/100
200/200 - 1s - loss: 36787187613696.0000 - 548ms/epoch - 3ms/step
Epoch 96/100
200/200 - 1s - loss: 36799254626304.0000 - 531ms/epoch - 3ms/step
Epoch 97/100
200/200 - 1s - loss: 36816908451840.0000 - 559ms/epoch - 3ms/step
Epoch 98/100
200/200 - 1s - loss: 36828455370752.0000 - 672ms/epoch - 3ms/step
Epoch 99/100
200/200 - 1s - loss: 36839465418752.0000 - 501ms/epoch - 3ms/step
Epoch 100/100
200/200 - 0s - loss: 36844238536704.0000 - 484ms/epoch - 2ms/step
7/7 [==============================] - 0s 3ms/step
RSME:  5684041.344119098
MAPE:  0.9812833147674315
```

In [ ]: