Stock Market Prediction

```
import pandas as pd

df= pd.read_csv(r'C:/Users/hp/Desktop/AAPL.csv' , encoding=
'unicode_escape')

df.head()
```

```
   Unnamed: 0.1  Unnamed: 0 symbol                          date    close
\
0             0           0   AAPL  2015-05-27 00:00:00+00:00  132.045

1             1           1   AAPL  2015-05-28 00:00:00+00:00  131.780

2             2           2   AAPL  2015-05-29 00:00:00+00:00  130.280

3             3           3   AAPL  2015-06-01 00:00:00+00:00  130.535

4             4           4   AAPL  2015-06-02 00:00:00+00:00  129.960


      high     low    open    volume    adjClose     adjHigh
adjLow  \
0  132.260  130.05  130.34  45833246  121.682558  121.880685
119.844118
1  131.950  131.10  131.86  30733309  121.438354  121.595013
120.811718
2  131.450  129.90  131.23  50884452  120.056069  121.134251
119.705890
3  131.390  130.05  131.20  32112797  120.291057  121.078960
119.844118
4  130.655  129.32  129.86  33667627  119.761181  120.401640
119.171406

      adjOpen  adjVolume  divCash  splitFactor
0  120.111360   45833246      0.0            1
1  121.512076   30733309      0.0            1
2  120.931516   50884452      0.0            1
3  120.903870   32112797      0.0            1
4  119.669029   33667627      0.0            1
```

```
df.tail()
```

```
      Unnamed: 0.1  Unnamed: 0 symbol                          date
close  \
1253          1253        1253   AAPL  2020-05-18 00:00:00+00:00
314.96
1254          1254        1254   AAPL  2020-05-19 00:00:00+00:00
313.14
1255          1255        1255   AAPL  2020-05-20 00:00:00+00:00
```

```
319.23
1256          1256        1256   AAPL  2020-05-21 00:00:00+00:00
316.85
1257          1257        1257   AAPL  2020-05-22 00:00:00+00:00
318.89

        high       low    open    volume  adjClose  adjHigh    adjLow
\
1253  316.50  310.3241  313.17  33843125    314.96   316.50  310.3241

1254  318.52  313.0100  315.03  25432385    313.14   318.52  313.0100

1255  319.52  316.2000  316.68  27876215    319.23   319.52  316.2000

1256  320.89  315.8700  318.66  25672211    316.85   320.89  315.8700

1257  319.23  315.3500  315.77  20450754    318.89   319.23  315.3500


      adjOpen  adjVolume  divCash  splitFactor
1253   313.17   33843125      0.0            1
1254   315.03   25432385      0.0            1
1255   316.68   27876215      0.0            1
1256   318.66   25672211      0.0            1
1257   315.77   20450754      0.0            1
```

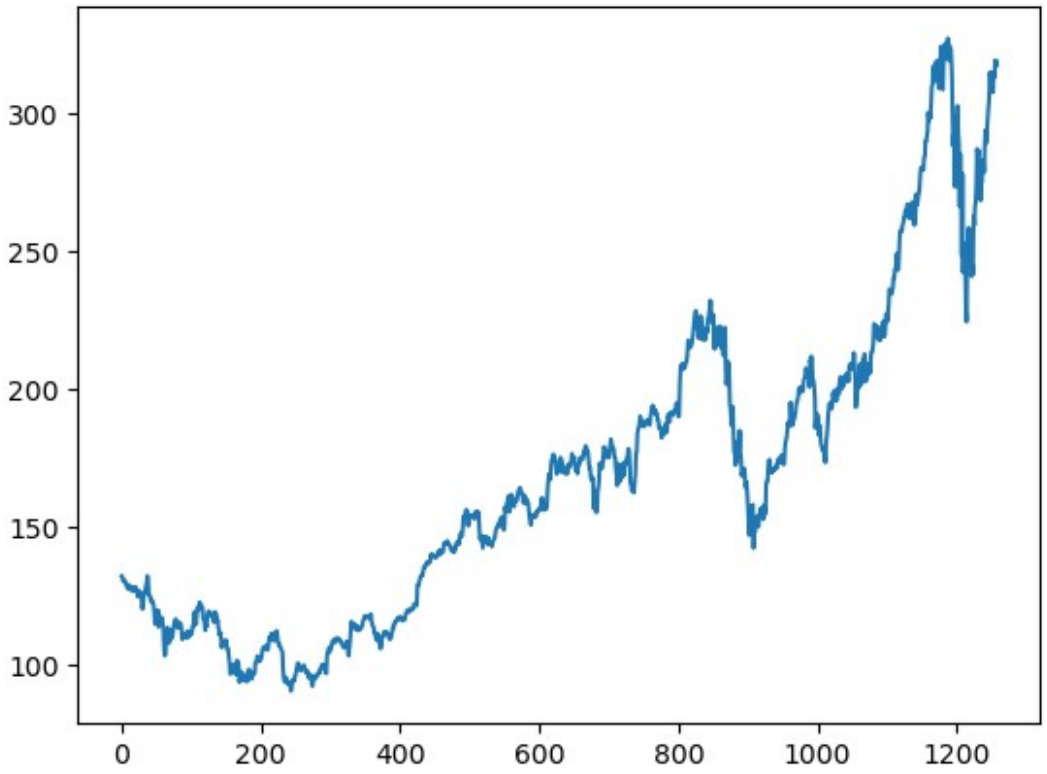
```
df1=df.reset_index()['close']
```

```
df1
```

```
0       132.045
1       131.780
2       130.280
3       130.535
4       129.960
         ...
1253    314.960
1254    313.140
1255    319.230
1256    316.850
1257    318.890
Name: close, Length: 1258, dtype: float64
```

```
import matplotlib.pyplot as plt
plt.plot(df1)
```

```
[<matplotlib.lines.Line2D at 0x1481647ee50>]
```




```
### LSTM are sensitive to the scale of the data. so we apply MinMax scaler

import numpy as np

df1
```

```
0       132.045
1       131.780
2       130.280
3       130.535
4       129.960
         ...
1253    314.960
1254    313.140
1255    319.230
1256    316.850
1257    318.890
Name: close, Length: 1258, dtype: float64
```

```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler(feature_range=(0,1))
df1=scaler.fit_transform(np.array(df1).reshape(-1,1))

print(df1)
```

```
[[0.17607447]
 [0.17495567]
 [0.16862282]
 ...
 [0.96635143]
 [0.9563033 ]
 [0.96491598]]
```

```
##splitting dataset into train and test split
training_size=int(len(df1)*0.65)
test_size=len(df1)-training_size
train_data,test_data=df1[0:training_size,:],df1[training_size:len(df1)
,:1]
```

```
training_size,test_size
```

```
(817, 441)
```

```
train_data
```

```
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```

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```

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```

```
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```

```
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       [0.53719497],
```

```
       [0.52824453],
       [0.52647133]])
```

```
import numpy
# convert an array of values into a dataset matrix
def create_dataset(dataset, time_step=1):
     dataX, dataY = [], []
     for i in range(len(dataset)-time_step-1):
          a = dataset[i:(i+time_step), 0]   ###i=0, 0,1,2,3-----99
100
          dataX.append(a)
          dataY.append(dataset[i + time_step, 0])
     return numpy.array(dataX), numpy.array(dataY)

# reshape into X=t,t+1,t+2,t+3 and Y=t+4
time_step = 100
X_train, y_train = create_dataset(train_data, time_step)
X_test, ytest = create_dataset(test_data, time_step)

print(X_train.shape), print(y_train.shape)
```

```
(716, 100)
(716,)
```

```
(None, None)
```

```
print(X_test.shape), print(ytest.shape)
```

```
(340, 100)
(340,)
```

```
(None, None)
```

```
# reshape input to be [samples, time steps, features] which is
required for LSTM
X_train =X_train.reshape(X_train.shape[0],X_train.shape[1] , 1)
X_test = X_test.reshape(X_test.shape[0],X_test.shape[1] , 1)

### Create the Stacked LSTM model
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.layers import LSTM

model=Sequential()
model.add(LSTM(50,return_sequences=True,input_shape=(100,1)))
model.add(LSTM(50,return_sequences=True))
model.add(LSTM(50))
model.add(Dense(1))
model.compile(loss='mean_squared_error',optimizer='adam')

model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 100, 50)           10400

 lstm_1 (LSTM)               (None, 100, 50)           20200

 lstm_2 (LSTM)               (None, 50)                20200

 dense (Dense)               (None, 1)                 51

=================================================================
Total params: 50851 (198.64 KB)
Trainable params: 50851 (198.64 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 100, 50)           10400

 lstm_1 (LSTM)               (None, 100, 50)           20200

 lstm_2 (LSTM)               (None, 50)                20200

 dense (Dense)               (None, 1)                 51

=================================================================
Total params: 50851 (198.64 KB)
Trainable params: 50851 (198.64 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

```
model.fit(X_train,y_train,validation_data=(X_test,ytest),epochs=100,ba
tch_size=64,verbose=1)
```

```
Epoch 1/100
12/12 [==============================] - 16s 458ms/step - loss: 0.0179
- val_loss: 0.0539
Epoch 2/100
12/12 [==============================] - 3s 278ms/step - loss: 0.0033
- val_loss: 0.0040
Epoch 3/100
```

```
12/12 [==============================] - 3s 257ms/step - loss: 0.0010
- val_loss: 0.0072
Epoch 4/100
12/12 [==============================] - 3s 273ms/step - loss:
9.0199e-04 - val_loss: 0.0041
Epoch 5/100
12/12 [==============================] - 3s 245ms/step - loss:
6.2359e-04 - val_loss: 0.0046
Epoch 6/100
12/12 [==============================] - 3s 221ms/step - loss:
5.8402e-04 - val_loss: 0.0036
Epoch 7/100
12/12 [==============================] - 3s 231ms/step - loss:
5.8540e-04 - val_loss: 0.0035
Epoch 8/100
12/12 [==============================] - 3s 239ms/step - loss:
6.1281e-04 - val_loss: 0.0035
Epoch 9/100
12/12 [==============================] - 3s 241ms/step - loss:
6.4264e-04 - val_loss: 0.0034
Epoch 10/100
12/12 [==============================] - 3s 236ms/step - loss:
5.8780e-04 - val_loss: 0.0036
Epoch 11/100
12/12 [==============================] - 3s 223ms/step - loss:
6.0043e-04 - val_loss: 0.0035
Epoch 12/100
12/12 [==============================] - 3s 235ms/step - loss:
5.8679e-04 - val_loss: 0.0041
Epoch 13/100
12/12 [==============================] - 3s 234ms/step - loss:
5.7078e-04 - val_loss: 0.0046
Epoch 14/100
12/12 [==============================] - 3s 238ms/step - loss:
5.9570e-04 - val_loss: 0.0036
Epoch 15/100
12/12 [==============================] - 3s 236ms/step - loss:
5.3442e-04 - val_loss: 0.0032
Epoch 16/100
12/12 [==============================] - 3s 231ms/step - loss:
5.2215e-04 - val_loss: 0.0029
Epoch 17/100
12/12 [==============================] - 3s 224ms/step - loss:
5.1835e-04 - val_loss: 0.0032
Epoch 18/100
12/12 [==============================] - 3s 224ms/step - loss:
5.1133e-04 - val_loss: 0.0028
Epoch 19/100
12/12 [==============================] - 3s 238ms/step - loss:
```

```
4.8972e-04 - val_loss: 0.0031
Epoch 20/100
12/12 [==============================] - 3s 241ms/step - loss:
5.0359e-04 - val_loss: 0.0034
Epoch 21/100
12/12 [==============================] - 3s 242ms/step - loss:
5.7657e-04 - val_loss: 0.0026
Epoch 22/100
12/12 [==============================] - 3s 230ms/step - loss:
5.4125e-04 - val_loss: 0.0025
Epoch 23/100
12/12 [==============================] - 3s 235ms/step - loss:
5.0906e-04 - val_loss: 0.0028
Epoch 24/100
12/12 [==============================] - 3s 242ms/step - loss:
4.7249e-04 - val_loss: 0.0024
Epoch 25/100
12/12 [==============================] - 3s 257ms/step - loss:
4.5941e-04 - val_loss: 0.0023
Epoch 26/100
12/12 [==============================] - 3s 255ms/step - loss:
4.4308e-04 - val_loss: 0.0027
Epoch 27/100
12/12 [==============================] - 3s 237ms/step - loss:
4.4933e-04 - val_loss: 0.0022
Epoch 28/100
12/12 [==============================] - 3s 226ms/step - loss:
4.2114e-04 - val_loss: 0.0021
Epoch 29/100
12/12 [==============================] - 3s 223ms/step - loss:
4.1742e-04 - val_loss: 0.0020
Epoch 30/100
12/12 [==============================] - 3s 230ms/step - loss:
4.1149e-04 - val_loss: 0.0021
Epoch 31/100
12/12 [==============================] - 3s 242ms/step - loss:
4.5039e-04 - val_loss: 0.0023
Epoch 32/100
12/12 [==============================] - 3s 236ms/step - loss:
4.0957e-04 - val_loss: 0.0020
Epoch 33/100
12/12 [==============================] - 3s 230ms/step - loss:
4.1596e-04 - val_loss: 0.0033
Epoch 34/100
12/12 [==============================] - 3s 233ms/step - loss:
5.2193e-04 - val_loss: 0.0025
Epoch 35/100
12/12 [==============================] - 3s 221ms/step - loss:
4.1750e-04 - val_loss: 0.0024
```

```
Epoch 36/100
12/12 [==============================] - 3s 236ms/step - loss:
4.0452e-04 - val_loss: 0.0019
Epoch 37/100
12/12 [==============================] - 3s 237ms/step - loss:
3.8493e-04 - val_loss: 0.0018
Epoch 38/100
12/12 [==============================] - 3s 242ms/step - loss:
4.0272e-04 - val_loss: 0.0016
Epoch 39/100
12/12 [==============================] - 3s 232ms/step - loss:
4.4289e-04 - val_loss: 0.0016
Epoch 40/100
12/12 [==============================] - 3s 224ms/step - loss:
4.1878e-04 - val_loss: 0.0016
Epoch 41/100
12/12 [==============================] - 3s 223ms/step - loss:
3.6170e-04 - val_loss: 0.0017
Epoch 42/100
12/12 [==============================] - 3s 251ms/step - loss:
3.7705e-04 - val_loss: 0.0016
Epoch 43/100
12/12 [==============================] - 3s 238ms/step - loss:
3.4725e-04 - val_loss: 0.0016
Epoch 44/100
12/12 [==============================] - 3s 236ms/step - loss:
3.3530e-04 - val_loss: 0.0014
Epoch 45/100
12/12 [==============================] - 3s 226ms/step - loss:
3.4635e-04 - val_loss: 0.0019
Epoch 46/100
12/12 [==============================] - 3s 237ms/step - loss:
3.5692e-04 - val_loss: 0.0014
Epoch 47/100
12/12 [==============================] - 3s 256ms/step - loss:
3.3433e-04 - val_loss: 0.0015
Epoch 48/100
12/12 [==============================] - 3s 238ms/step - loss:
3.2681e-04 - val_loss: 0.0014
Epoch 49/100
12/12 [==============================] - 3s 244ms/step - loss:
3.5239e-04 - val_loss: 0.0014
Epoch 50/100
12/12 [==============================] - 3s 232ms/step - loss:
3.1635e-04 - val_loss: 0.0013
Epoch 51/100
12/12 [==============================] - 3s 221ms/step - loss:
3.0588e-04 - val_loss: 0.0018
Epoch 52/100
```

```
12/12 [==============================] - 3s 224ms/step - loss:
3.7449e-04 - val_loss: 0.0013
Epoch 53/100
12/12 [==============================] - 3s 230ms/step - loss:
3.9706e-04 - val_loss: 0.0013
Epoch 54/100
12/12 [==============================] - 3s 239ms/step - loss:
2.9269e-04 - val_loss: 0.0016
Epoch 55/100
12/12 [==============================] - 3s 241ms/step - loss:
2.8518e-04 - val_loss: 0.0014
Epoch 56/100
12/12 [==============================] - 3s 233ms/step - loss:
2.9348e-04 - val_loss: 0.0014
Epoch 57/100
12/12 [==============================] - 3s 223ms/step - loss:
2.9027e-04 - val_loss: 0.0014
Epoch 58/100
12/12 [==============================] - 3s 220ms/step - loss:
3.0347e-04 - val_loss: 0.0013
Epoch 59/100
12/12 [==============================] - 3s 232ms/step - loss:
2.9653e-04 - val_loss: 0.0013
Epoch 60/100
12/12 [==============================] - 3s 233ms/step - loss:
2.9471e-04 - val_loss: 0.0013
Epoch 61/100
12/12 [==============================] - 3s 236ms/step - loss:
2.6676e-04 - val_loss: 0.0013
Epoch 62/100
12/12 [==============================] - 3s 258ms/step - loss:
2.6791e-04 - val_loss: 0.0013
Epoch 63/100
12/12 [==============================] - 3s 241ms/step - loss:
2.5830e-04 - val_loss: 0.0014
Epoch 64/100
12/12 [==============================] - 3s 234ms/step - loss:
2.5963e-04 - val_loss: 0.0018
Epoch 65/100
12/12 [==============================] - 3s 236ms/step - loss:
2.8236e-04 - val_loss: 0.0013
Epoch 66/100
12/12 [==============================] - 3s 237ms/step - loss:
2.8963e-04 - val_loss: 0.0013
Epoch 67/100
12/12 [==============================] - 3s 249ms/step - loss:
2.5305e-04 - val_loss: 0.0015
Epoch 68/100
12/12 [==============================] - 3s 253ms/step - loss:
```

```
2.5984e-04 - val_loss: 0.0012
Epoch 69/100
12/12 [==============================] - 3s 226ms/step - loss:
2.4009e-04 - val_loss: 0.0012
Epoch 70/100
12/12 [==============================] - 3s 232ms/step - loss:
2.3543e-04 - val_loss: 0.0015
Epoch 71/100
12/12 [==============================] - 3s 235ms/step - loss:
2.6768e-04 - val_loss: 0.0012
Epoch 72/100
12/12 [==============================] - 3s 236ms/step - loss:
2.4553e-04 - val_loss: 0.0012
Epoch 73/100
12/12 [==============================] - 3s 234ms/step - loss:
2.3304e-04 - val_loss: 0.0012
Epoch 74/100
12/12 [==============================] - 3s 222ms/step - loss:
2.4133e-04 - val_loss: 0.0012
Epoch 75/100
12/12 [==============================] - 3s 220ms/step - loss:
2.1976e-04 - val_loss: 0.0015
Epoch 76/100
12/12 [==============================] - 3s 242ms/step - loss:
2.3779e-04 - val_loss: 0.0011
Epoch 77/100
12/12 [==============================] - 3s 241ms/step - loss:
2.3830e-04 - val_loss: 0.0012
Epoch 78/100

12/12 [==============================] - 3s 235ms/step - loss:
2.2949e-04 - val_loss: 0.0013
Epoch 79/100
12/12 [==============================] - 3s 233ms/step - loss:
2.2559e-04 - val_loss: 0.0012
Epoch 80/100
12/12 [==============================] - 3s 220ms/step - loss:
2.4459e-04 - val_loss: 0.0011
Epoch 81/100
12/12 [==============================] - 3s 218ms/step - loss:
2.2708e-04 - val_loss: 0.0011
Epoch 82/100
12/12 [==============================] - 3s 231ms/step - loss:
2.0078e-04 - val_loss: 0.0012
Epoch 83/100
12/12 [==============================] - 3s 242ms/step - loss:
1.9358e-04 - val_loss: 0.0012
Epoch 84/100
12/12 [==============================] - 3s 240ms/step - loss:
2.2956e-04 - val_loss: 0.0010
```

```
Epoch 85/100
12/12 [==============================] - 3s 241ms/step - loss:
1.9340e-04 - val_loss: 0.0011
Epoch 86/100
12/12 [==============================] - 3s 218ms/step - loss:
1.9325e-04 - val_loss: 0.0012
Epoch 87/100
12/12 [==============================] - 3s 218ms/step - loss:
1.9798e-04 - val_loss: 0.0010
Epoch 88/100
12/12 [==============================] - 3s 243ms/step - loss:
1.7442e-04 - val_loss: 0.0010
Epoch 89/100
12/12 [==============================] - 3s 241ms/step - loss:
1.7388e-04 - val_loss: 0.0012
Epoch 90/100
12/12 [==============================] - 3s 269ms/step - loss:
1.8648e-04 - val_loss: 0.0013
Epoch 91/100
12/12 [==============================] - 3s 224ms/step - loss:
1.9368e-04 - val_loss: 0.0011
Epoch 92/100
12/12 [==============================] - 3s 220ms/step - loss:
1.9000e-04 - val_loss: 9.7194e-04
Epoch 93/100
12/12 [==============================] - 3s 227ms/step - loss:
1.6553e-04 - val_loss: 9.5727e-04
Epoch 94/100
12/12 [==============================] - 3s 236ms/step - loss:
1.6200e-04 - val_loss: 9.6427e-04
Epoch 95/100
12/12 [==============================] - 3s 234ms/step - loss:
1.5779e-04 - val_loss: 0.0012
Epoch 96/100
12/12 [==============================] - 3s 230ms/step - loss:
1.6530e-04 - val_loss: 0.0010
Epoch 97/100
12/12 [==============================] - 3s 220ms/step - loss:
1.6316e-04 - val_loss: 0.0018
Epoch 98/100
12/12 [==============================] - 3s 226ms/step - loss:
2.1360e-04 - val_loss: 0.0014
Epoch 99/100
12/12 [==============================] - 3s 228ms/step - loss:
1.8715e-04 - val_loss: 9.7609e-04
Epoch 100/100
12/12 [==============================] - 3s 235ms/step - loss:
1.6941e-04 - val_loss: 9.5443e-04

<keras.src.callbacks.History at 0x14819ccca10>
```

```
import tensorflow as tf
```

```
tf.__version__
```

```
'2.14.0'
```

```
### Lets Do the prediction and check performance metrics
train_predict=model.predict(X_train)
test_predict=model.predict(X_test)
```

```
23/23 [==============================] - 3s 51ms/step
11/11 [==============================] - 1s 54ms/step
```

```
##Transformback to original form
train_predict=scaler.inverse_transform(train_predict)
test_predict=scaler.inverse_transform(test_predict)
```

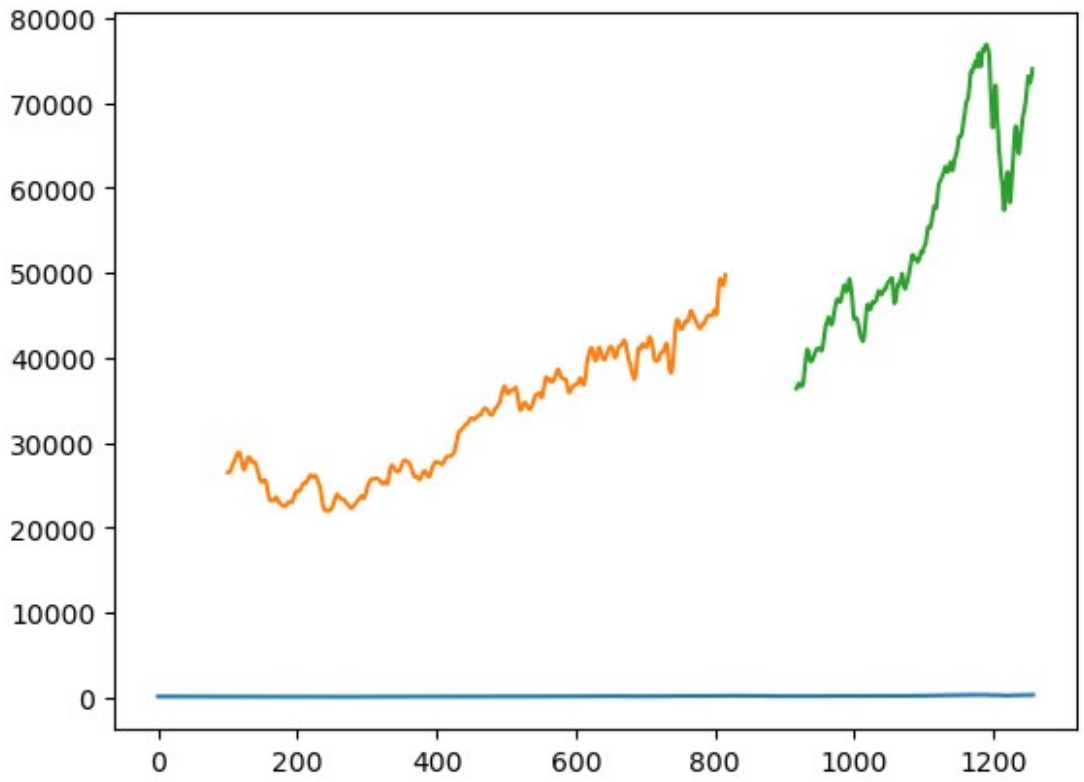
```
### Calculate RMSE performance metrics
import math
from sklearn.metrics import mean_squared_error
math.sqrt(mean_squared_error(y_train,train_predict))
```

```
33512.1193517794
```

```
### Test Data RMSE
math.sqrt(mean_squared_error(ytest,test_predict))
```

```
56181.832017641646
```

```
### Plotting
# shift train predictions for plotting
look_back=100
trainPredictPlot = numpy.empty_like(df1)
trainPredictPlot[:, :] = np.nan
trainPredictPlot[look_back:len(train_predict)+look_back, :] =
train_predict
# shift test predictions for plotting
testPredictPlot = numpy.empty_like(df1)
testPredictPlot[:, :] = numpy.nan
testPredictPlot[len(train_predict)+(look_back*2)+1:len(df1)-1, :] =
test_predict
# plot baseline and predictions
plt.plot(scaler.inverse_transform(df1))
plt.plot(trainPredictPlot)
plt.plot(testPredictPlot)
plt.show()
```




```
len(test_data)
```

```
441
```

```
x_input=test_data[341:].reshape(1,-1)
x_input.shape
```

```
(1, 100)
```

```
temp_input=list(x_input)
temp_input=temp_input[0].tolist()

temp_input
```

```
[0.8583551465000423,
 0.8866418981676942,
 0.8743139407244789,
 0.8843198513890065,
 0.8783669678290975,
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 0.933040614709111,
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0.9905007177235499,
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0.6600101325677616,
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0.5658616904500551,
0.660896732246897,
0.6551549438486872,
0.7097019336316812,
```

```
 0.664527569028118,
 0.6943764248923416,
 0.692181035210673,
 0.6356919699400492,
 0.6526640209406402,
 0.637802921557038,
 0.7267162036646122,
 0.7138816178333194,
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 0.8289706999915563,
 0.8125474964113824,
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 0.7797433082833742,
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 0.8562864139153934,
 0.8748627881448958,
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 0.9485349995778098,
 0.9333361479354896,
 0.9174617917757326,
 0.925441188887951,
 0.9177151059697712,
 0.9483239044161109,
 0.9406400405302711,
 0.9663514312251966,
 0.9563033015283293,
 0.964915984125644]

# demonstrate prediction for next 10 days
from numpy import array

lst_output=[]
n_steps=100
i=0
while(i<30):

    if(len(temp_input)>100):
```

```
        #print(temp_input)
        x_input=np.array(temp_input[1:])
        print("{} day input {}".format(i,x_input))
        x_input=x_input.reshape(1,-1)
        x_input = x_input.reshape((1, n_steps, 1))
        #print(x_input)
        yhat = model.predict(x_input, verbose=0)
        print("{} day output {}".format(i,yhat))
        temp_input.extend(yhat[0].tolist())
        temp_input=temp_input[1:]
        #print(temp_input)
        lst_output.extend(yhat.tolist())
        i=i+1
    else:
        x_input = x_input.reshape((1, n_steps,1))
        yhat = model.predict(x_input, verbose=0)
        print(yhat[0])
        temp_input.extend(yhat[0].tolist())
        print(len(temp_input))
        lst_output.extend(yhat.tolist())
        i=i+1


print(lst_output)
```

```
[0.9521544]
101
1 day input [0.8866419  0.87431394 0.88431985 0.87836697 0.8986321
0.92582116
 0.92877649 0.95676771 0.93869797 0.93304061 0.94950604 0.96424048
 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.9521544 ]
1 day output [[0.95207864]]
2 day input [0.87431394 0.88431985 0.87836697 0.8986321  0.92582116
0.92877649
 0.95676771 0.93869797 0.93304061 0.94950604 0.96424048 0.95512117
 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
```

```
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.9521544  0.95207864]
2 day output [[0.9488468]]
3 day input [0.88431985 0.87836697 0.8986321  0.92582116 0.92877649
0.95676771
 0.93869797 0.93304061 0.94950604 0.96424048 0.95512117 0.95989192
 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.9521544  0.95207864 0.94884682]
3 day output [[0.9449774]]
4 day input [0.87836697 0.8986321  0.92582116 0.92877649 0.95676771
0.93869797
 0.93304061 0.94950604 0.96424048 0.95512117 0.95989192 0.96635143
 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
```

```
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.9521544  0.95207864 0.94884682 0.9449774 ]
4 day output [[0.9414997]]
5 day input [0.8986321  0.92582116 0.92877649 0.95676771 0.93869797
0.93304061
 0.94950604 0.96424048 0.95512117 0.95989192 0.96635143 0.96246728
 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.9521544
 0.95207864 0.94884682 0.9449774  0.94149971]
5 day output [[0.93878686]]
6 day input [0.92582116 0.92877649 0.95676771 0.93869797 0.93304061
0.94950604
 0.96424048 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027
 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864
 0.94884682 0.9449774  0.94149971 0.93878686]
6 day output [[0.9369701]]
7 day input [0.92877649 0.95676771 0.93869797 0.93304061 0.94950604
0.96424048
 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
```

```
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682
 0.9449774  0.94149971 0.93878686 0.93697011]
7 day output [[0.9360571]]
8 day input [0.95676771 0.93869797 0.93304061 0.94950604 0.96424048
0.95512117
 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682 0.9449774
 0.94149971 0.93878686 0.93697011 0.93605709]
8 day output [[0.9359636]]
9 day input [0.93869797 0.93304061 0.94950604 0.96424048 0.95512117
0.95989192
 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971
 0.93878686 0.93697011 0.93605709 0.93596357]
```

```
9 day output [[0.9365412]]
10 day input [0.93304061 0.94950604 0.96424048 0.95512117 0.95989192
0.96635143
 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971 0.93878686
 0.93697011 0.93605709 0.93596357 0.9365412 ]

10 day output [[0.9376085]]
11 day input [0.94950604 0.96424048 0.95512117 0.95989192 0.96635143
0.96246728
 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.9521544
 0.95207864 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011
 0.93605709 0.93596357 0.9365412  0.93760848]
11 day output [[0.93898064]]
12 day input [0.96424048 0.95512117 0.95989192 0.96635143 0.96246728
0.92295027
 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
```

```
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864
 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709
 0.93596357 0.9365412  0.93760848 0.93898064]
12 day output [[0.9404933]]
13 day input [0.95512117 0.95989192 0.96635143 0.96246728 0.92295027
0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682
 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709 0.93596357
 0.9365412  0.93760848 0.93898064 0.94049329]
13 day output [[0.9420158]]
14 day input [0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
0.98792536
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682 0.9449774
 0.94149971 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412
 0.93760848 0.93898064 0.94049329 0.94201583]
14 day output [[0.94346094]]
15 day input [0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
0.98594106
```

```
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971
 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848
 0.93898064 0.94049329 0.94201583 0.94346094]
15 day output [[0.94478154]]
16 day input [0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971 0.93878686
 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064
 0.94049329 0.94201583 0.94346094 0.94478154]
16 day output [[0.94596714]]
17 day input [0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
```

```
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.9521544
 0.95207864 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011
 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064 0.94049329
 0.94201583 0.94346094 0.94478154 0.94596714]
17 day output [[0.9470347]]
18 day input [0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864
 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709
 0.93596357 0.9365412  0.93760848 0.93898064 0.94049329 0.94201583
 0.94346094 0.94478154 0.94596714 0.94703472]
18 day output [[0.94801867]]
19 day input [0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682
 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709 0.93596357
 0.9365412  0.93760848 0.93898064 0.94049329 0.94201583 0.94346094
 0.94478154 0.94596714 0.94703472 0.94801867]

19 day output [[0.94896144]]
20 day input [0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
```

```
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682 0.9449774
 0.94149971 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412
 0.93760848 0.93898064 0.94049329 0.94201583 0.94346094 0.94478154
 0.94596714 0.94703472 0.94801867 0.94896144]
20 day output [[0.9499045]]
21 day input [0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971
 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848
 0.93898064 0.94049329 0.94201583 0.94346094 0.94478154 0.94596714
 0.94703472 0.94801867 0.94896144 0.9499045 ]
21 day output [[0.95088387]]
22 day input [0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971 0.93878686
 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064
```

```
 0.94049329 0.94201583 0.94346094 0.94478154 0.94596714 0.94703472
 0.94801867 0.94896144 0.9499045  0.95088387]
22 day output [[0.9519246]]
23 day input [0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.9521544
 0.95207864 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011
 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064 0.94049329
 0.94201583 0.94346094 0.94478154 0.94596714 0.94703472 0.94801867
 0.94896144 0.9499045  0.95088387 0.95192462]
23 day output [[0.95304054]]
24 day input [0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864
 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709
 0.93596357 0.9365412  0.93760848 0.93898064 0.94049329 0.94201583
 0.94346094 0.94478154 0.94596714 0.94703472 0.94801867 0.94896144
 0.9499045  0.95088387 0.95192462 0.95304054]
24 day output [[0.95423466]]
25 day input [0.99159841 0.96972895 0.97614625 0.96795575 1.
0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
```

```
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682
 0.9449774  0.94149971 0.93878686 0.93697011 0.93605709 0.93596357
 0.9365412  0.93760848 0.93898064 0.94049329 0.94201583 0.94346094
 0.94478154 0.94596714 0.94703472 0.94801867 0.94896144 0.9499045
 0.95088387 0.95192462 0.95304054 0.95423466]
25 day output [[0.95549977]]
26 day input [0.96972895 0.97614625 0.96795575 1.         0.99016297
0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.9521544  0.95207864 0.94884682 0.9449774
 0.94149971 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412
 0.93760848 0.93898064 0.94049329 0.94201583 0.94346094 0.94478154
 0.94596714 0.94703472 0.94801867 0.94896144 0.9499045  0.95088387
 0.95192462 0.95304054 0.95423466 0.95549977]
26 day output [[0.9568228]]
27 day input [0.97614625 0.96795575 1.         0.99016297 0.99050072
0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971
 0.93878686 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848
 0.93898064 0.94049329 0.94201583 0.94346094 0.94478154 0.94596714
 0.94703472 0.94801867 0.94896144 0.9499045  0.95088387 0.95192462
 0.95304054 0.95423466 0.95549977 0.95682281]
27 day output [[0.9581866]]
```

```
28 day input [0.96795575 1.         0.99016297 0.99050072 0.96538039
0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.9521544  0.95207864 0.94884682 0.9449774  0.94149971 0.93878686
 0.93697011 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064
 0.94049329 0.94201583 0.94346094 0.94478154 0.94596714 0.94703472
 0.94801867 0.94896144 0.9499045  0.95088387 0.95192462 0.95304054
 0.95423466 0.95549977 0.95682281 0.95818663]
28 day output [[0.9595736]]
29 day input [1.         0.99016297 0.99050072 0.96538039 0.98488559
0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.9521544
 0.95207864 0.94884682 0.9449774  0.94149971 0.93878686 0.93697011
 0.93605709 0.93596357 0.9365412  0.93760848 0.93898064 0.94049329
 0.94201583 0.94346094 0.94478154 0.94596714 0.94703472 0.94801867
 0.94896144 0.9499045  0.95088387 0.95192462 0.95304054 0.95423466
 0.95549977 0.95682281 0.95818663 0.95957363]

29 day output [[0.96096665]]
[[0.9521543979644775], [0.952078640460968], [0.9488468170166016],
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[0.9542346596717834], [0.9554997682571411], [0.9568228125572205],
[0.9581866264343262], [0.9595736265182495], [0.9609666466712952]]
```
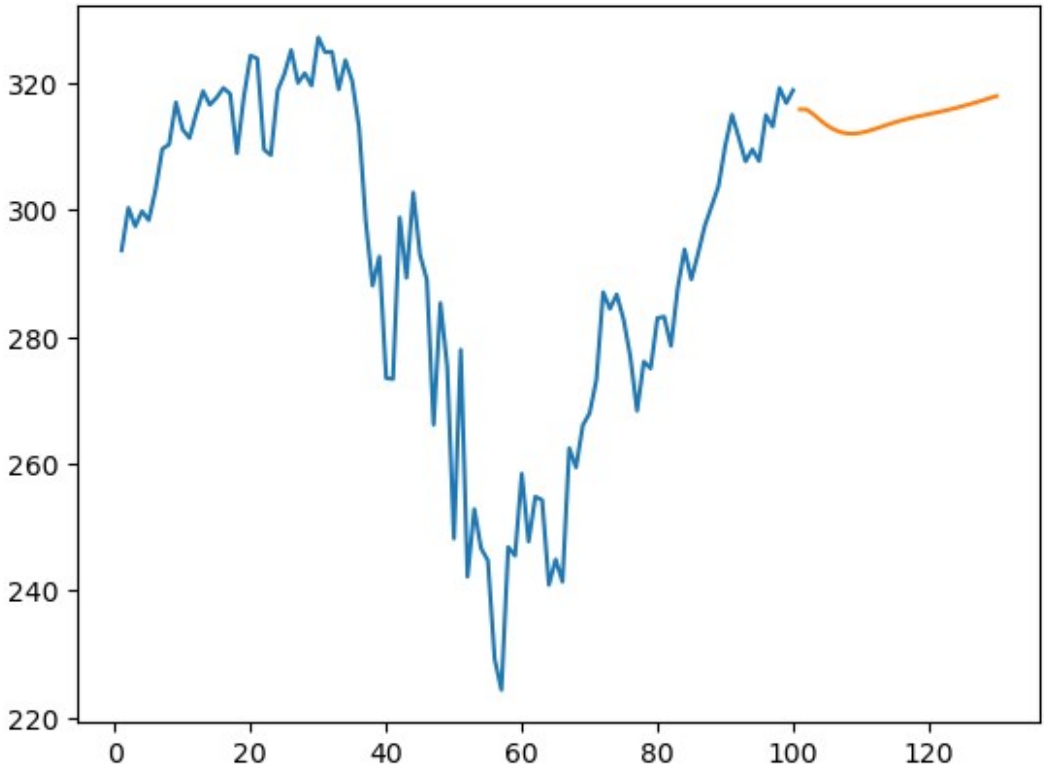

```
day_new=np.arange(1,101)
day_pred=np.arange(101,131)

import matplotlib.pyplot as plt

len(df1)
```

```
1258
```

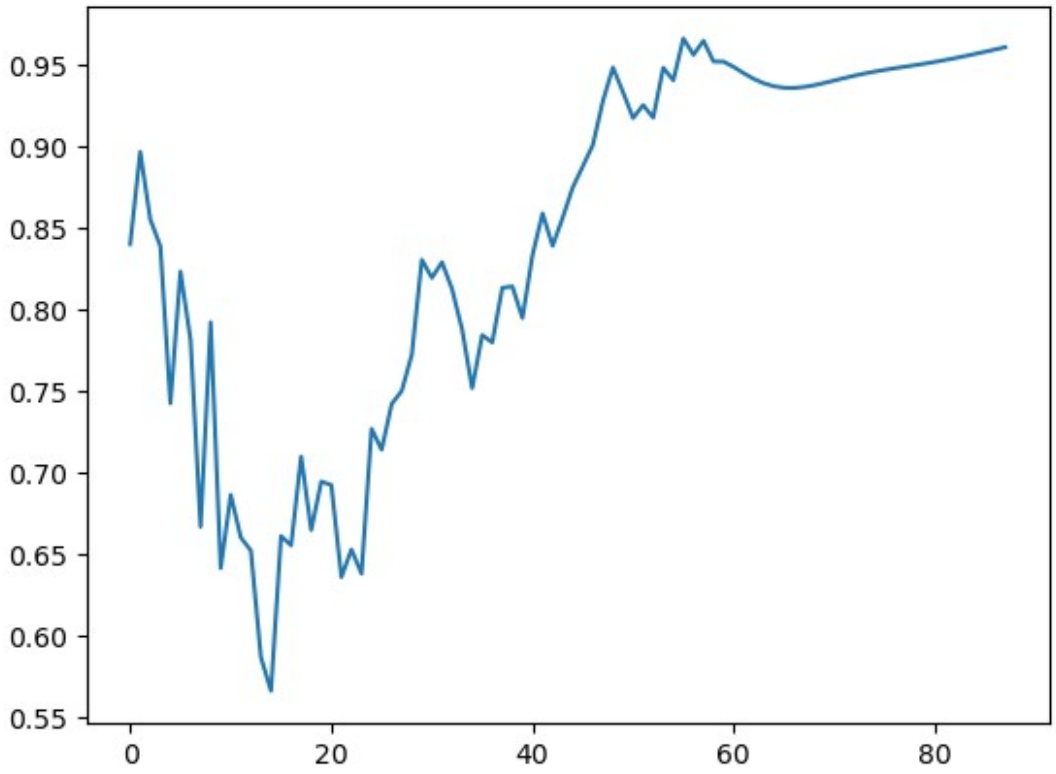
```
plt.plot(day_new,scaler.inverse_transform(df1[1158:]))
plt.plot(day_pred,scaler.inverse_transform(lst_output))
```

```
[<matplotlib.lines.Line2D at 0x148234b1990>]
```

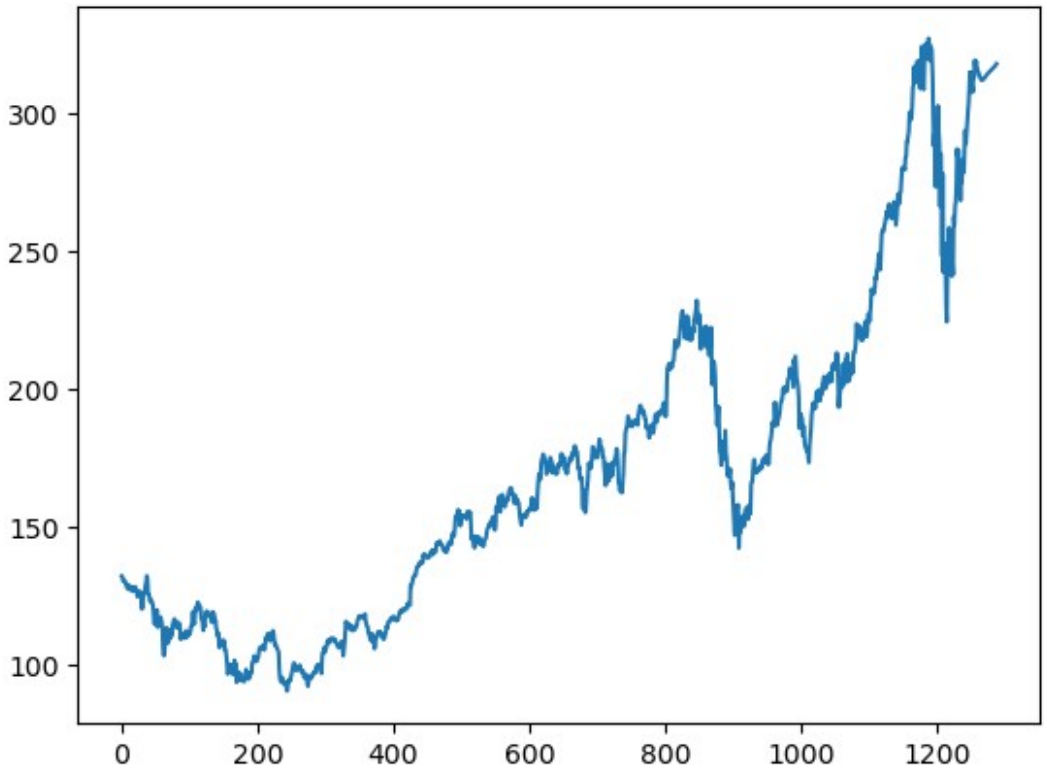



```
df3=df1.tolist()
df3.extend(lst_output)
plt.plot(df3[1200:])
```

```
[<matplotlib.lines.Line2D at 0x148234ec410>]
```




```
df3=scaler.inverse_transform(df3).tolist()

plt.plot(df3)

[<matplotlib.lines.Line2D at 0x148235e8590>]
```



Thank you