stock1

July 4, 2023

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import datetime
```

[2]:
```
from google.colab import files
upload =files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving 1729258-1613615-Stock_Price_data_set_(1).csv to
1729258-1613615-Stock_Price_data_set_(1).csv
```

[3]:
```
df = pd.read_csv('1729258-1613615-Stock_Price_data_set_(1).csv')
```

[4]:
```
df.head(6)
```

[4]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	2018-02-05	262.000000	267.899994	250.029999	254.259995	254.259995	11896100
1	2018-02-06	247.699997	266.700012	245.000000	265.720001	265.720001	12595800
2	2018-02-07	266.579987	272.450012	264.329987	264.559998	264.559998	8981500
3	2018-02-08	267.079987	267.619995	250.000000	250.100006	250.100006	9306700
4	2018-02-09	253.850006	255.800003	236.110001	249.470001	249.470001	16906900
5	2018-02-12	252.139999	259.149994	249.000000	257.950012	257.950012	8534900

[5]:
```
df.shape
```

[5]: (1009, 7)

[6]:
```
df.isna().any()
```

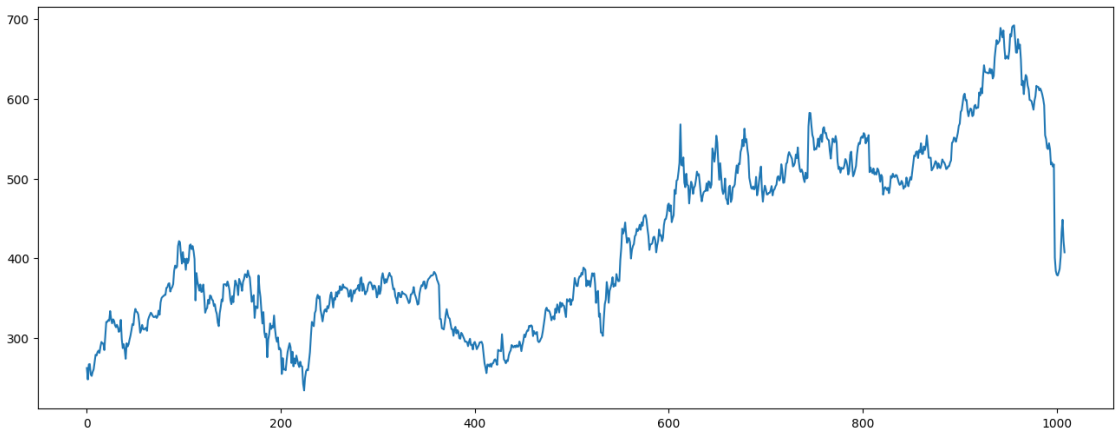
[6]:
```
Date          False
Open          False
High          False
Low           False
Close         False
Adj Close     False
Volume        False
dtype: bool
```

[7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1009 entries, 0 to 1008
Data columns (total 7 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Date       1009 non-null   object
 1   Open       1009 non-null   float64
 2   High       1009 non-null   float64
 3   Low        1009 non-null   float64
 4   Close      1009 non-null   float64
 5   Adj Close  1009 non-null   float64
 6   Volume     1009 non-null   int64
dtypes: float64(5), int64(1), object(1)
memory usage: 55.3+ KB
```

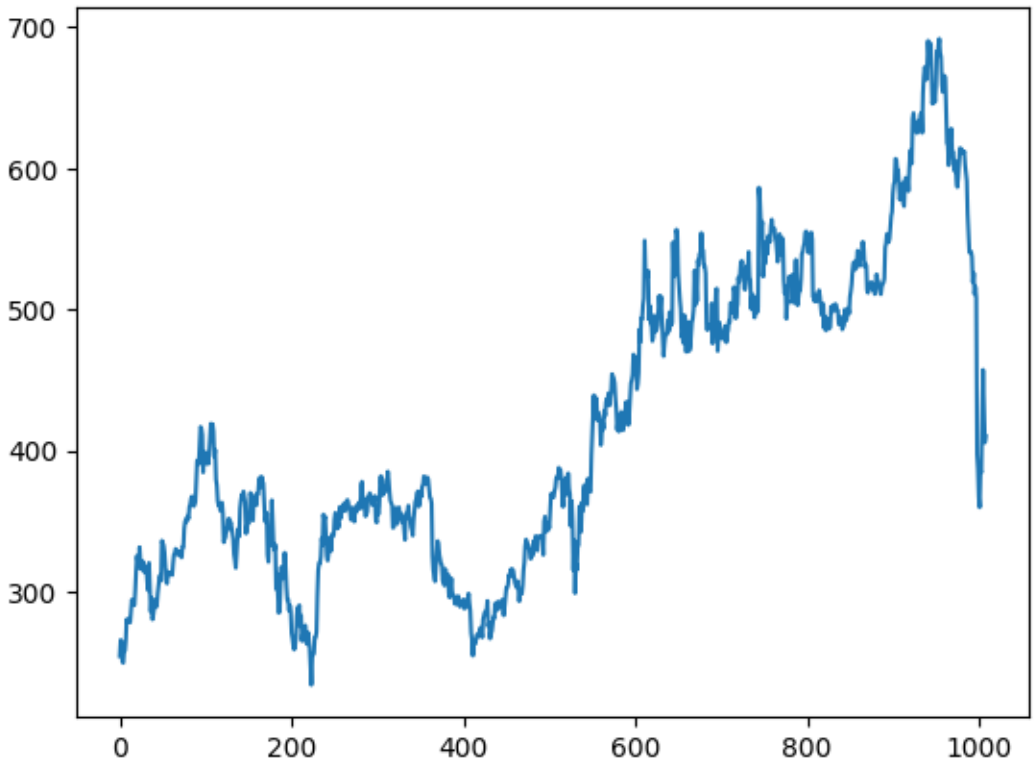
[8]:
```
df['Open'].plot(figsize=(16,6))
```

[8]:
```
<Axes: >
```



[9]:
```
df['Close'].plot()
```

[9]: <Axes: >



[10]:
```
len(df)
```

[10]: 1009

[11]:
```
airtel_close=df['Close']
```

[12]:
```
airtel_close.reset_index(drop=True,inplace=True)
airtel_close.shape
```

[12]: (1009,)

[13]:
```
airtel_close= pd.DataFrame(airtel_close)
```

[14]:
```
train = airtel_close.iloc[:480]
test = airtel_close.iloc[:480]
```

[15]:
```
from sklearn.preprocessing import MinMaxScaler
```

[16]:
```
scaler = MinMaxScaler()
```

[17]:
```
scaler.fit(train)
```

[17]:
```
MinMaxScaler()
```

[18]:
```
scaled_train = scaler.transform(train)
scaled_test = scaler.transform(test)
```

[19]:
```
from tensorflow.keras.preprocessing.sequence import TimeseriesGenerator
```

[20]:
```
test.shape
```

[20]:
```
(480, 1)
```

[21]:
```
help(TimeseriesGenerator)
```

```
Help on class TimeseriesGenerator in module keras.preprocessing.sequence:

class TimeseriesGenerator(keras.utils.data_utils.Sequence)
 |  TimeseriesGenerator(data, targets, length, sampling_rate=1, stride=1,
start_index=0, end_index=None, shuffle=False, reverse=False, batch_size=128)
 |
 |  Utility class for generating batches of temporal data.
 |
 |  Deprecated: `tf.keras.preprocessing.sequence.TimeseriesGenerator` does not
 |  operate on tensors and is not recommended for new code. Prefer using a
 |  `tf.data.Dataset` which provides a more efficient and flexible mechanism for
 |  batching, shuffling, and windowing input. See the
 |  [tf.data guide](https://www.tensorflow.org/guide/data) for more details.
 |
 |  This class takes in a sequence of data-points gathered at
 |  equal intervals, along with time series parameters such as
 |  stride, length of history, etc., to produce batches for
 |  training/validation.
 |
 |  Arguments:
 |      data: Indexable generator (such as list or Numpy array)
 |          containing consecutive data points (timesteps).
 |          The data should be at 2D, and axis 0 is expected
 |          to be the time dimension.
 |      targets: Targets corresponding to timesteps in `data`.
 |          It should have same length as `data`.
 |      length: Length of the output sequences (in number of timesteps).
 |      sampling_rate: Period between successive individual timesteps
 |          within sequences. For rate `r`, timesteps
 |          `data[i]`, `data[i-r]`, … `data[i - length]`
 |          are used for create a sample sequence.
 |      stride: Period between successive output sequences.
```

```
|          For stride `s`, consecutive output samples would
|          be centered around `data[i]`, `data[i+s]`, `data[i+2*s]`, etc.
|      start_index: Data points earlier than `start_index` will not be used
|          in the output sequences. This is useful to reserve part of the
|          data for test or validation.
|      end_index: Data points later than `end_index` will not be used
|          in the output sequences. This is useful to reserve part of the
|          data for test or validation.
|      shuffle: Whether to shuffle output samples,
|          or instead draw them in chronological order.
|      reverse: Boolean: if `true`, timesteps in each output sample will be
|          in reverse chronological order.
|      batch_size: Number of timeseries samples in each batch
|          (except maybe the last one).
|
|  Returns:
|      A [Sequence](
|      https://www.tensorflow.org/api_docs/python/tf/keras/utils/Sequence)
|      instance.
|
|  Examples:
|      ```python
|      from keras.preprocessing.sequence import TimeseriesGenerator
|      import numpy as np
|      data = np.array([[i] for i in range(50)])
|      targets = np.array([[i] for i in range(50)])
|      data_gen = TimeseriesGenerator(data, targets,
|                                     length=10, sampling_rate=2,
|                                     batch_size=2)
|      assert len(data_gen) == 20
|      batch_0 = data_gen[0]
|      x, y = batch_0
|      assert np.array_equal(x,
|                            np.array([[[0], [2], [4], [6], [8]],
|                                      [[1], [3], [5], [7], [9]]]))
|      assert np.array_equal(y,
|                            np.array([[10], [11]]))
|      ```
|
|  Method resolution order:
|      TimeseriesGenerator
|      keras.utils.data_utils.Sequence
|      builtins.object
|
|  Methods defined here:
|
|  __getitem__(self, index)
|      Gets batch at position `index`.
```

```
 |
 |      Args:
 |          index: position of the batch in the Sequence.
 |
 |      Returns:
 |          A batch
 |
 |  __init__(self, data, targets, length, sampling_rate=1, stride=1,
start_index=0, end_index=None, shuffle=False, reverse=False, batch_size=128)
 |      Initialize self.  See help(type(self)) for accurate signature.
 |
 |  __len__(self)
 |      Number of batch in the Sequence.
 |
 |      Returns:
 |          The number of batches in the Sequence.
 |
 |  get_config(self)
 |      Returns the TimeseriesGenerator configuration as Python dictionary.
 |
 |      Returns:
 |          A Python dictionary with the TimeseriesGenerator configuration.
 |
 |  to_json(self, **kwargs)
 |      Returns a JSON string containing the generator's configuration.
 |
 |      Args:
 |          **kwargs: Additional keyword arguments to be passed
 |              to `json.dumps()`.
 |
 |      Returns:
 |          A JSON string containing the tokenizer configuration.
 |
 |  ----------------------------------------------------------------------
 |  Methods inherited from keras.utils.data_utils.Sequence:
 |
 |  __iter__(self)
 |      Create a generator that iterate over the Sequence.
 |
 |  on_epoch_end(self)
 |      Method called at the end of every epoch.
 |
 |  ----------------------------------------------------------------------
 |  Data descriptors inherited from keras.utils.data_utils.Sequence:
 |
 |  __dict__
 |      dictionary for instance variables (if defined)
 |
```

```
|  __weakref__
|      list of weak references to the object (if defined)
```

[22]:
```
length =16
batch_size =32

generator =TimeseriesGenerator(scaled_train,scaled_train,
                               length = length, batch_size=batch_size )
```

[23]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,SimpleRNN,LSTM, Dropout
```

[24]:
```
n_features = 1
```

[25]:
```
model = Sequential()
model.add(SimpleRNN(30,input_shape=(length,n_features)))
model.add(Dropout(rate=0.2))
model.add(Dense(1))
model.compile(optimizer='adam',loss='mse')
```

[26]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 simple_rnn (SimpleRNN)      (None, 30)                960

 dropout (Dropout)           (None, 30)                0

 dense (Dense)               (None, 1)                 31

=================================================================
Total params: 991
Trainable params: 991
Non-trainable params: 0
_________________________________________________________________
```

[27]:
```
model.fit_generator(generator,epochs=10,shuffle=False)
```

```
Epoch 1/10
```

```
<ipython-input-27-b5005ef83afd>:1: UserWarning: `Model.fit_generator` is
deprecated and will be removed in a future version. Please use `Model.fit`,
which supports generators.
  model.fit_generator(generator,epochs=10,shuffle=False)
```

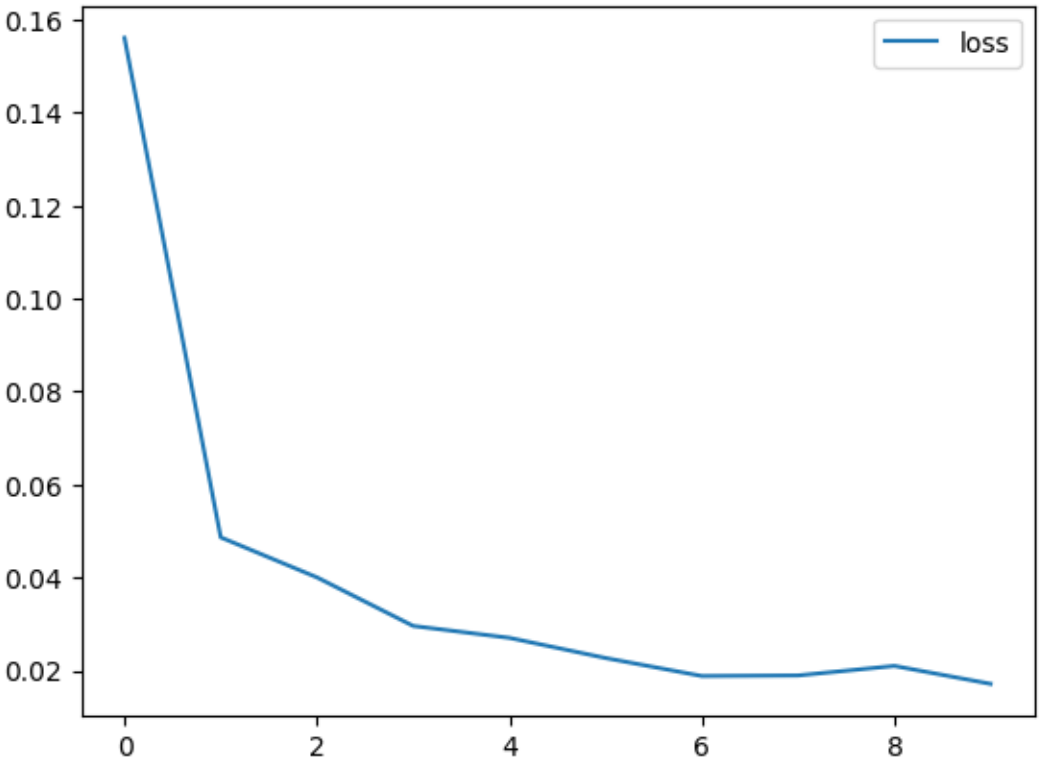
```
15/15 [==============================] - 1s 3ms/step - loss: 0.1560
Epoch 2/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0487
Epoch 3/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0401
Epoch 4/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0296
Epoch 5/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0271
Epoch 6/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0227
Epoch 7/10
15/15 [==============================] - 0s 4ms/step - loss: 0.0189
Epoch 8/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0190
Epoch 9/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0210
Epoch 10/10
15/15 [==============================] - 0s 3ms/step - loss: 0.0172
```

[27]:
```
<keras.callbacks.History at 0x7fdeca22b820>
```

[28]:
```
losses = pd.DataFrame(model.history.history)
```

[29]:
```
losses.plot()
```

[29]:
```
<Axes: >
```



[30]:
```
first_eval_batch =scaled_train[-length:]
```

[31]:
```
first_eval_batch
```

[31]:
```
array([[0.37073854],
       [0.32006046],
       [0.35145059],
       [0.34880328],
       [0.34912743],
       [0.37997724],
       [0.44086665],
       [0.4696093 ],
       [0.53130908],
       [0.55659404],
       [0.53606355],
       [0.53660386],
       [0.53352424],
       [0.51439836],
       [0.48317032],
       [0.48457509]])
```

[32]:
```
first_eval_batch = first_eval_batch.reshape((1,length,1))
```

[33]:
```
first_eval_batch
```

[33]:
```
array([[[0.37073854],
        [0.32006046],
        [0.35145059],
        [0.34880328],
        [0.34912743],
        [0.37997724],
        [0.44086665],
        [0.4696093 ],
        [0.53130908],
        [0.55659404],
        [0.53606355],
        [0.53660386],
        [0.53352424],
        [0.51439836],
        [0.48317032],
        [0.48457509]]])
```

[34]:
```
model.predict(first_eval_batch)
```

```
1/1 [==============================] - 0s 132ms/step
```

[34]:
```
array([[0.4777103]], dtype=float32)
```

[35]:
```
scaled_test[0]
```

[35]:
```
array([0.11010854])
```

[36]:
```
test_prediction = []

first_eval_batch = scaled_train[-length:]
current_batch = first_eval_batch.reshape((1,length,n_features))

for i in range(len(test)):

  current_pred = model.predict(current_batch)[0]
  test_prediction.append(current_pred)
  current_batch = np.append(current_batch[:,1:,:],[[current_pred]],axis=1)
```

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[38]:
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true_prediction = scaler.inverse_transform(test_prediction)
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[39]:
```
true_prediction
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[39]:
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[40]:
```
test['pediction'] = true_prediction
```

```
<ipython-input-40-7faa8537788c>:1: 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
  test['pediction'] = true_prediction
```

[41]:
```
test
```

[41]:

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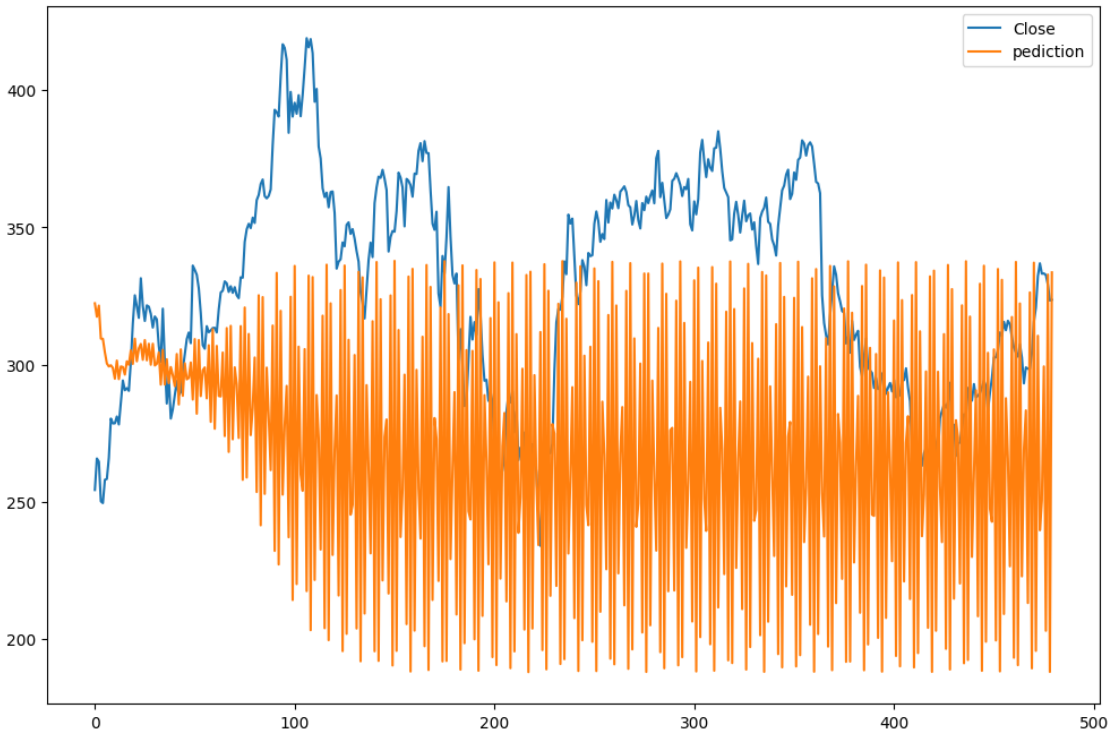
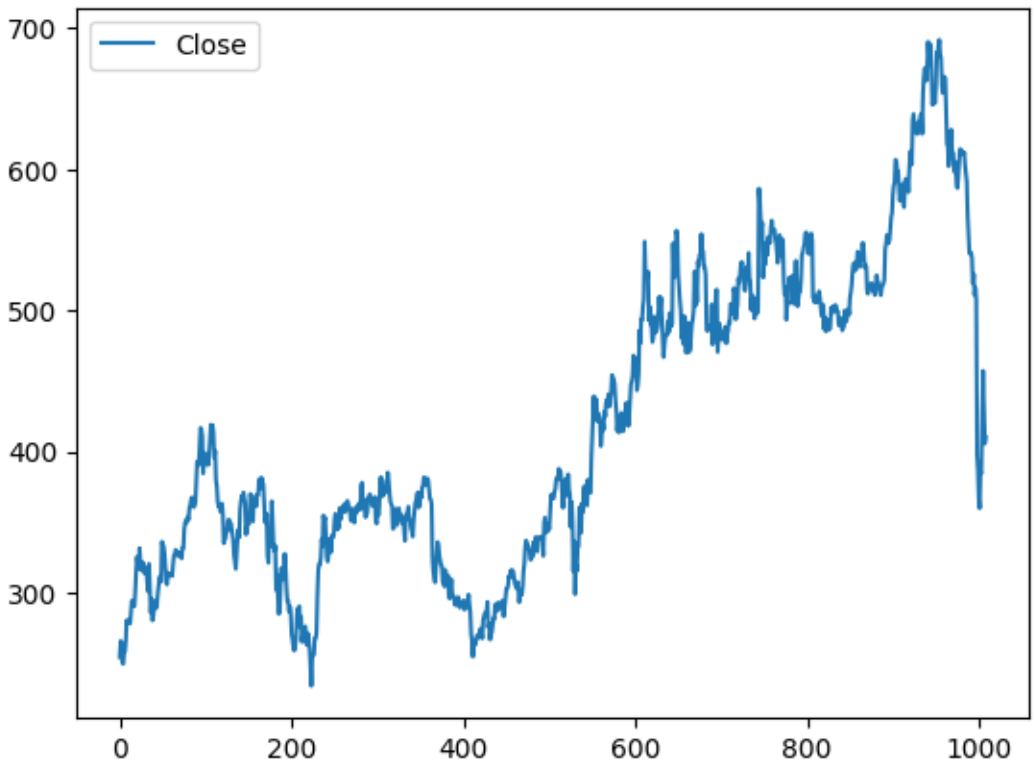
3	250.100006	309.426432
4	249.470001	309.350078
..	…	…
475	333.200012	299.287747
476	332.630005	202.911343
477	329.089996	332.781903
478	323.309998	187.902516
479	323.570007	333.573509

```
[480 rows x 2 columns]
```

[42]:
```
test.plot(figsize=(12,8))
airtel_close.plot()
```

[42]: <Axes: >





[43]:
```
full_scaler = MinMaxScaler()
scaled_full_data = full_scaler.fit_transform(airtel_close)
```

[44]:
```
generator = TimeseriesGenerator(scaled_full_data,scaled_full_data,
                                length=length, batch_size=32)
```

[45]:
```
model = Sequential()
model.add(SimpleRNN(30,input_shape=(length,n_features)))
model.add(Dropout(rate=0.2))
model.add(Dense(1))
model.compile(optimizer='adam',loss='mse')
```

[46]:
```
model.fit_generator(generator,epochs=10,shuffle=False)
```

```
Epoch 1/10
```

```
<ipython-input-46-b5005ef83afd>:1: UserWarning: `Model.fit_generator` is
deprecated and will be removed in a future version. Please use `Model.fit`,
which supports generators.
  model.fit_generator(generator,epochs=10,shuffle=False)
```

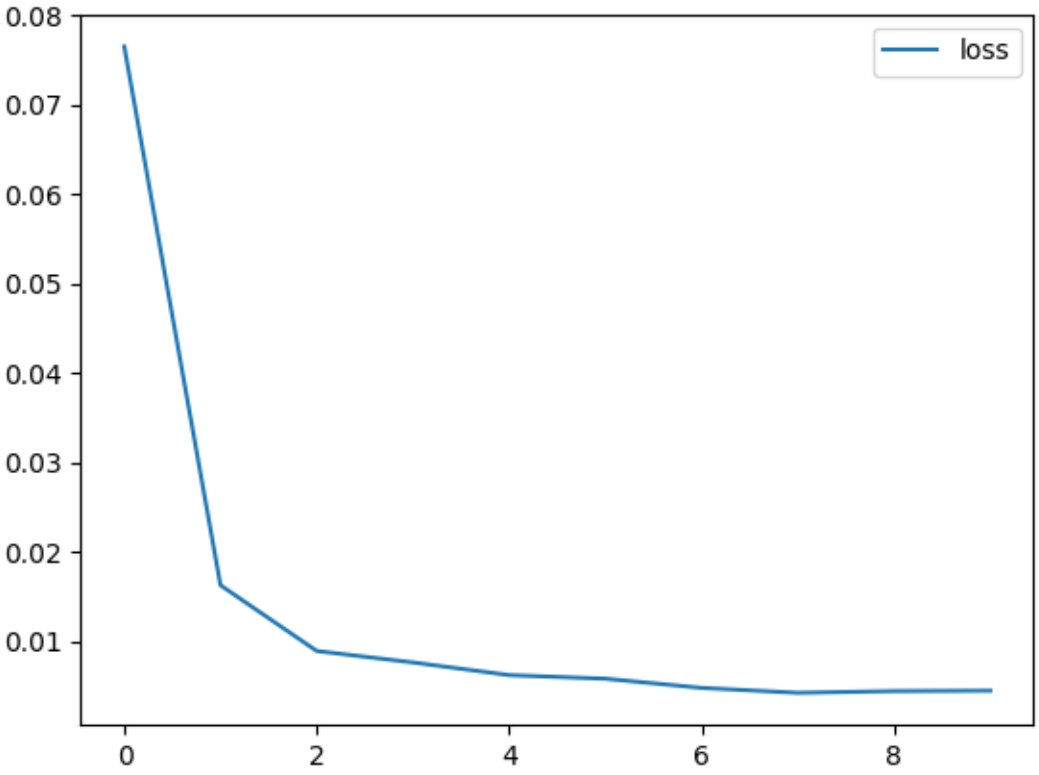
```
32/32 [==============================] - 1s 3ms/step - loss: 0.0765
Epoch 2/10
```

```
32/32 [==============================] - 0s 3ms/step - loss: 0.0163
Epoch 3/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0089
Epoch 4/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0076
Epoch 5/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0062
Epoch 6/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0058
Epoch 7/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0048
Epoch 8/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0043
Epoch 9/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0044
Epoch 10/10
32/32 [==============================] - 0s 3ms/step - loss: 0.0045
```

[46]:
```
<keras.callbacks.History at 0x7fdec37d3850>
```

[47]:
```
full_model_losses = pd.DataFrame(model.history.history)
full_model_losses.plot()
```

[47]:
```
<Axes: >
```



[48]:
```
forecast = []

first_eval_batch = scaled_train[-length:]
current_batch = first_eval_batch.reshape((1,length,n_features))

for i in range(20):

  current_pred = model.predict(current_batch)[0]
  forecast.append(current_pred)
  current_batch = np.append(current_batch[:,1:,:],[[current_pred]],axis=1)
```

```
1/1 [==============================] - 0s 114ms/step
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```

[49]:
```
forecast = scaler.inverse_transform(forecast)
```

[50]:
```
forecast
```

[50]:
```
array([[332.99180163],
       [332.07535483],
       [332.55755125],
       [332.54219439],
       [329.87504405],
       [327.98738649],
       [327.38248967],
       [326.79778183],
       [330.07452871],
```

```
       [332.13047182],
       [331.01449622],
       [333.78788687],
       [336.10750012],
       [335.18335282],
       [333.28746522],
       [334.0304634 ],
       [335.94960693],
       [336.62793423],
       [338.04775932],
       [339.62636018]])
```

[51]:
```
forecast.flatten()
```

[51]:
```
array([332.99180163, 332.07535483, 332.55755125, 332.54219439,
       329.87504405, 327.98738649, 327.38248967, 326.79778183,
       330.07452871, 332.13047182, 331.01449622, 333.78788687,
       336.10750012, 335.18335282, 333.28746522, 334.0304634 ,
       335.94960693, 336.62793423, 338.04775932, 339.62636018])
```

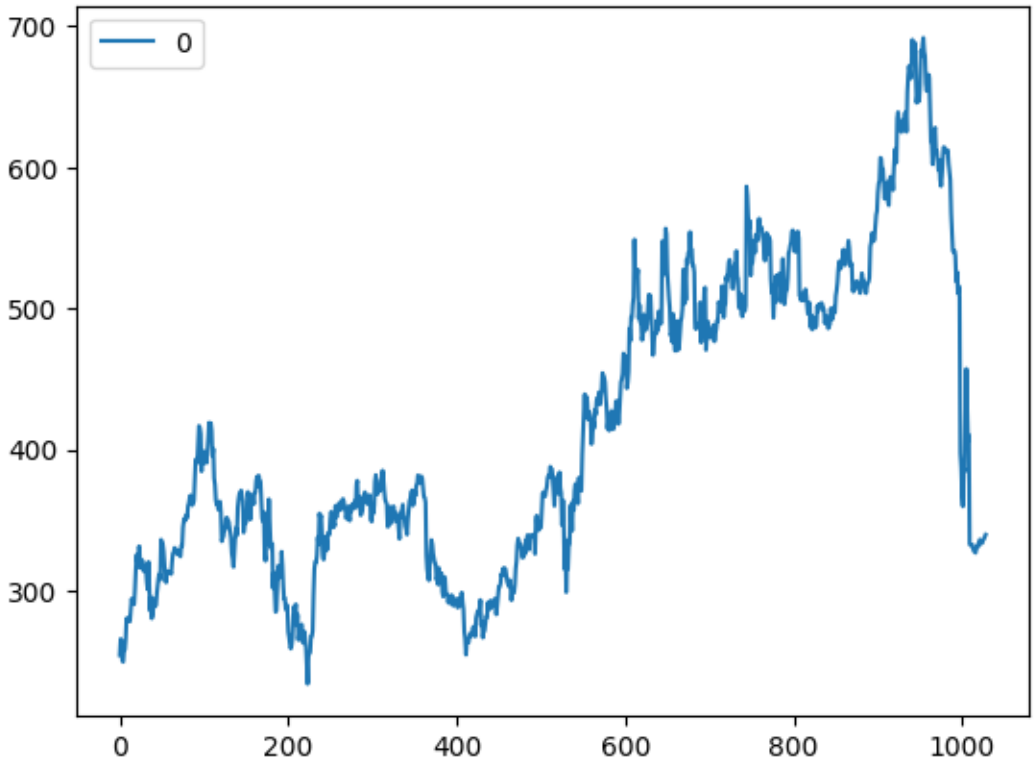
[52]:
```
df_array =np.array(airtel_close)
df_array
```

[52]:
```
array([[254.259995],
       [265.720001],
       [264.559998],
       …,
       [429.480011],
       [405.600006],
       [410.170013]])
```

[53]:
```
full_data = pd.DataFrame(np.concatenate((df_array.flatten(),forecast.
 ↪flatten())))
```

[54]:
```
full_data.plot()
```

[54]:
```
<Axes: >
```



[55]:
```
from tensorflow.keras.callbacks import EarlyStopping
early_stop = EarlyStopping(monitor='val_loss',patience=2)
```

[56]:
```
length
```

[56]:
```
16
```

[57]:
```
scaled_test.shape
```

[57]:
```
(480, 1)
```

[58]:
```
length=15
generator = TimeseriesGenerator(scaled_train,scaled_train,
                                length=length,batch_size=32)

validation_generator = TimeseriesGenerator(scaled_test,scaled_test,
                                           length=length,batch_size=32)
```

[59]:
```
model = Sequential()
model.add(LSTM(30,input_shape=(length,n_features)))
model.add (Dropout(rate=0.2))
model.add (Dense(1))
```

```
model.compile(optimizer='adam',loss='mse')
```

[60]:
```
from numpy.random.mtrand import shuffle
model.fit_generator(generator,epochs=20,
                    validation_data = validation_generator,
                    callbacks=[early_stop],shuffle=False)
```

```
Epoch 1/20

<ipython-input-60-85d0b10a4abe>:2: UserWarning: `Model.fit_generator` is
deprecated and will be removed in a future version. Please use `Model.fit`,
which supports generators.
  model.fit_generator(generator,epochs=20,

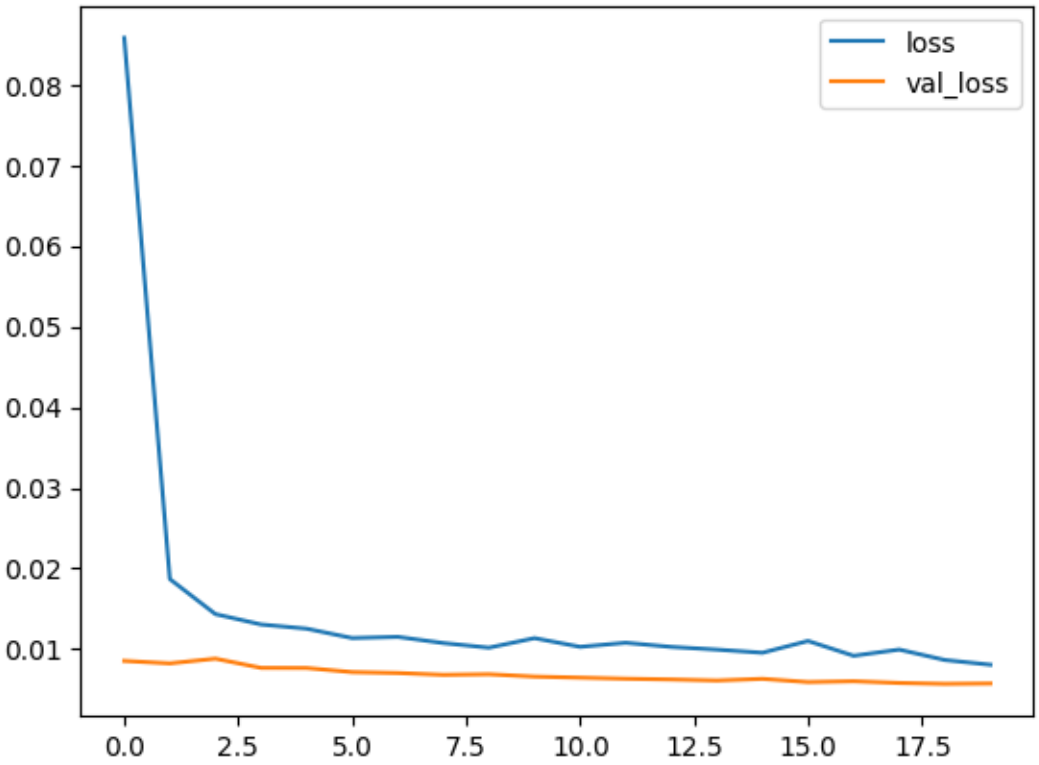
15/15 [==============================] - 2s 38ms/step - loss: 0.0858 - val_loss:
0.0086
Epoch 2/20
15/15 [==============================] - 0s 12ms/step - loss: 0.0187 - val_loss:
0.0082
Epoch 3/20
15/15 [==============================] - 0s 12ms/step - loss: 0.0144 - val_loss:
0.0088
Epoch 4/20
15/15 [==============================] - 0s 13ms/step - loss: 0.0131 - val_loss:
0.0077
Epoch 5/20
15/15 [==============================] - 0s 12ms/step - loss: 0.0125 - val_loss:
0.0077
Epoch 6/20
15/15 [==============================] - 0s 13ms/step - loss: 0.0114 - val_loss:
0.0072
Epoch 7/20
15/15 [==============================] - 0s 12ms/step - loss: 0.0115 - val_loss:
0.0071
Epoch 8/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0108 - val_loss:
0.0068
Epoch 9/20
15/15 [==============================] - 0s 8ms/step - loss: 0.0102 - val_loss:
0.0069
Epoch 10/20
15/15 [==============================] - 0s 10ms/step - loss: 0.0114 - val_loss:
0.0066
Epoch 11/20
15/15 [==============================] - 0s 8ms/step - loss: 0.0103 - val_loss:
0.0065
Epoch 12/20
15/15 [==============================] - 0s 10ms/step - loss: 0.0108 - val_loss:
```

```
0.0063
Epoch 13/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0103 - val_loss:
0.0063
Epoch 14/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0100 - val_loss:
0.0061
Epoch 15/20
15/15 [==============================] - 0s 10ms/step - loss: 0.0096 - val_loss:
0.0063
Epoch 16/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0110 - val_loss:
0.0059
Epoch 17/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0092 - val_loss:
0.0060
Epoch 18/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0100 - val_loss:
0.0058
Epoch 19/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0087 - val_loss:
0.0057
Epoch 20/20
15/15 [==============================] - 0s 9ms/step - loss: 0.0081 - val_loss:
0.0058
```

[60]: `<keras.callbacks.History at 0x7fdec35405b0>`

[61]:
```
losses = pd.DataFrame(model.history.history)
losses.plot()
```

[61]: `<Axes: >`



[62]:
```
test_prediction = []

first_eval_batch = scaled_train[-length:]
current_batch = first_eval_batch.reshape((1,length,n_features))

for i in range(len(test)):

  current_pred = model.predict(current_batch)[0]
  test_prediction.append(current_pred)
  current_batch = np.append(current_batch[:,1:,:],[[current_pred]],axis=1)
```

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[63]:
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from IPython.core.pylabtools import figsize
true_prediction =scaler.inverse_transform(test_prediction)
test['LSTM_prediction'] = true_prediction
test.plot(figsize=(12,8))
```

```
<ipython-input-63-1e22b084f314>:3: 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
  test['LSTM_prediction'] = true_prediction
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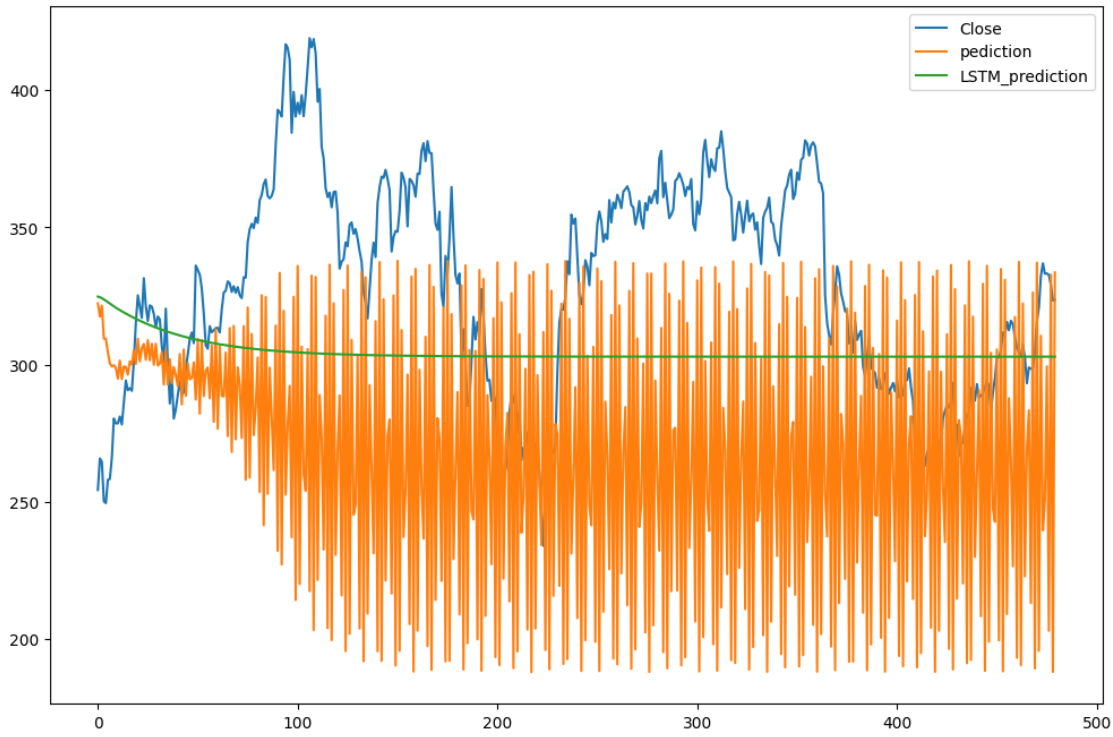
[63]: <Axes: >



[64]:
```
forecast = []

first_eval_batch = scaled_train[-length:]
current_batch = first_eval_batch.reshape((1,length,n_features))

for i in range(len(test)):

  current_pred = model.predict(current_batch)[0]
  forecast.append(current_pred)
  current_batch = np.append(current_batch[:,1:,:],[[current_pred]],axis=1)
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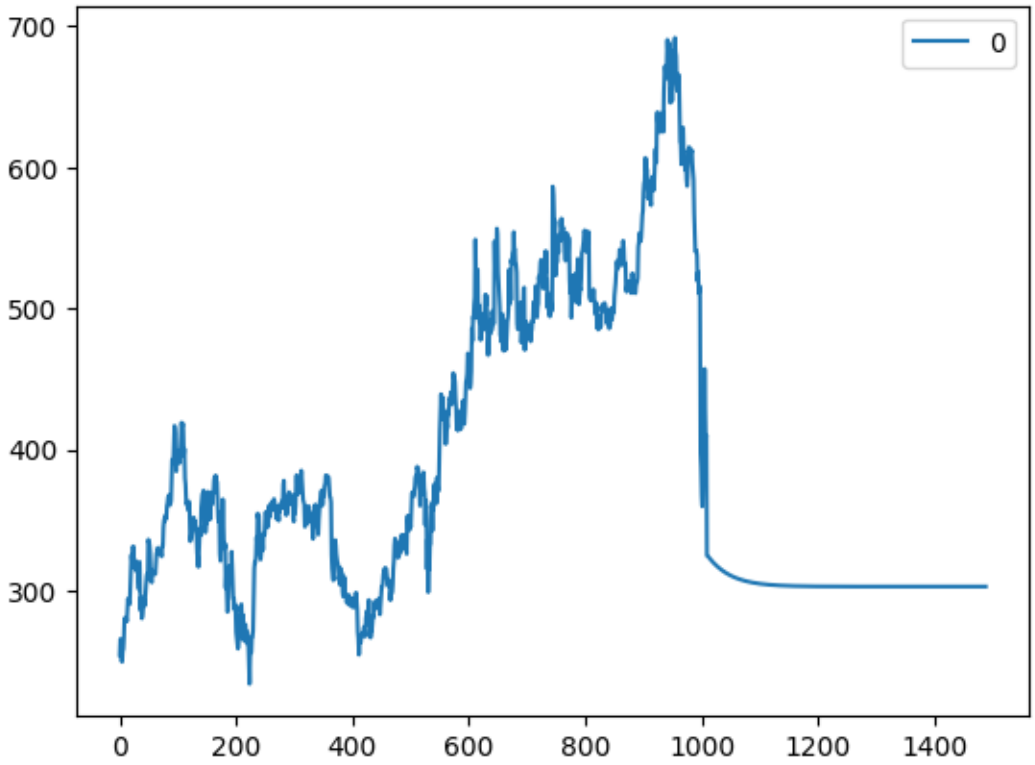
[65]:
```
forecast = scaler.inverse_transform(forecast)
```

[66]:
```
full_data = pd.DataFrame(np.concatenate((df_array.flatten(),forecast.
↪flatten())))
```

[67]:
```
full_data.plot();
```



[68]:
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[69]:
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full_data.tail(30)
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[69]:

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1488  302.839858
```

[70]:
```
data = df[['Date','Close']]
```

[71]:
```
data.head()
```

[71]:
```
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2  2018-02-07  264.559998
3  2018-02-08  250.100006
4  2018-02-09  249.470001
```

[72]:
```
data = data.rename(columns ={"date":"ds","Close":"y"})
```

[73]:
```
data.head()
```

[73]:
```
         Date           y
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1  2018-02-06  265.720001
2  2018-02-07  264.559998
3  2018-02-08  250.100006
4  2018-02-09  249.470001
```

[ ]:
```
from prophet import Prophet
m = prophet(changepoint_prior_scale=0.15, daily_seasonlity = True)
m.fit(data)
```

[ ]:
```
future = m.make_future_dataframe(periods=21)
prediction = m.predict(future)
m.plot(prediction)
plt.title("Prediction of Stock Price using the Prophet")
plt.xlabel("date")
plt.ylabel("Close Stock Price")
polt.show()
```

[ ]:
```
m.plot_components(prediction)
plt.show()
```