Name: Atharva Suryakant Mali | Class: TY BCA | Roll No.: 04 | DS LAB

Experiment 8

Create a time series forecasting model using linear regression for dataset climate, gold price and vegetable selling (use average selling price).

1. Time series forecasting model for climate data set.

In [406]:

```
import pandas as pd
import matplotlib.pyplot as pt
```

In [407]:

```
df = pd.read_csv("delhi_climate.csv",index_col="date",parse_dates=True)
```

In [408]:

```
df
```

Out[408]:

	humidity
date	
2013-01-01	84.500000
2013-01-02	92.000000
2013-01-03	87.000000
2013-01-04	71.333333
2013-01-05	86.833333
...	...
2016-12-28	68.043478
2016-12-29	87.857143
2016-12-30	89.666667
2016-12-31	87.000000
2017-01-01	100.000000

1462 rows × 1 columns

In [409]:

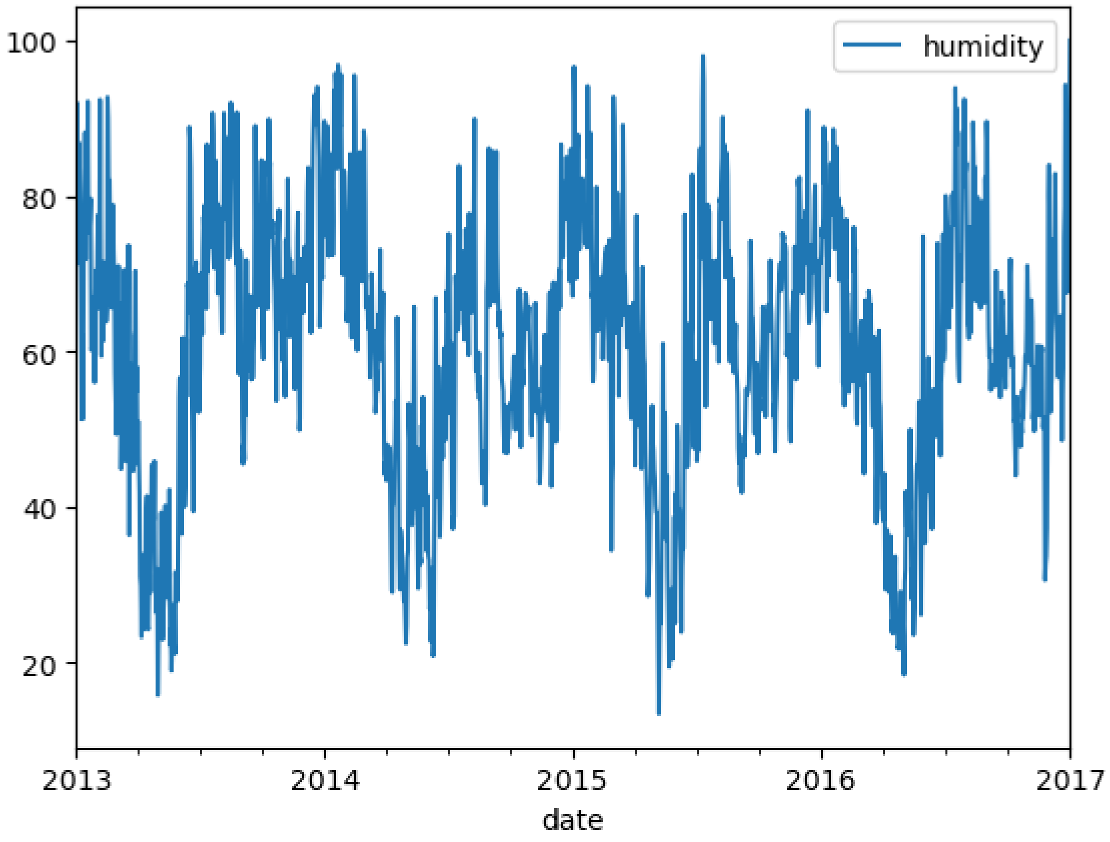
```
df.columns = ['humidity']
```

In [410]:

```
df.plot()
```

Out[410]:

```
<Axes: xlabel='date'>
```



In [411]:

```
df['humidity_lastmonth']=df['humidity'].shift(+1)
df['humidity_2monthback']=df['humidity'].shift(+2)
df['humidity_3monthback']=df['humidity'].shift(+3)
```

In [412]:

```
df
```

Out[412]:

	humidity	humidity_lastmonth	humidity_2monthback	humidity_3monthback
date				
2013-01-01	84.500000	NaN	NaN	NaN
2013-01-02	92.000000	84.500000	NaN	NaN
2013-01-03	87.000000	92.000000	84.500000	NaN
2013-01-04	71.333333	87.000000	92.000000	84.500000
2013-01-05	86.833333	71.333333	87.000000	92.000000
...	...	...	...	...
2016-12-28	68.043478	67.550000	74.857143	94.300000
2016-12-29	87.857143	68.043478	67.550000	74.857143
2016-12-30	89.666667	87.857143	68.043478	67.550000
2016-12-31	87.000000	89.666667	87.857143	68.043478
2017-01-01	100.000000	87.000000	89.666667	87.857143

1462 rows × 4 columns

In [413]:

```
df=df.dropna()
df
```

Out[413]:

	humidity	humidity_lastmonth	humidity_2monthback	humidity_3monthback
date				
2013-01-04	71.333333	87.000000	92.000000	84.500000
2013-01-05	86.833333	71.333333	87.000000	92.000000
2013-01-06	82.800000	86.833333	71.333333	87.000000
2013-01-07	78.600000	82.800000	86.833333	71.333333
2013-01-08	63.714286	78.600000	82.800000	86.833333
...	...	...	...	...
2016-12-28	68.043478	67.550000	74.857143	94.300000
2016-12-29	87.857143	68.043478	67.550000	74.857143
2016-12-30	89.666667	87.857143	68.043478	67.550000
2016-12-31	87.000000	89.666667	87.857143	68.043478
2017-01-01	100.000000	87.000000	89.666667	87.857143

1459 rows × 4 columns

In [414]:

```
from sklearn.linear_model import LinearRegression
linear_model = LinearRegression()
```

In [415]:

```
import numpy as np
```

In [416]:

```
x1,x2,x3,y = df['humidity_lastmonth'],df['humidity_2monthback'],df['humidity_3monthback']
x1,x2,x3,y = np.array(x1), np.array(x2), np.array(x3), np.array(y)
```

In [417]:

```
x1, x2, x3, y = x1.reshape(-1,1),x2.reshape(-1,1),x3.reshape(-1,1),y.reshape(-1,1)
```

In [418]:

```
final_x = np.concatenate((x1,x2,x3),axis=1)
print(final_x)
```

```
[[87.         92.         84.5       ]
 [71.33333333 87.         92.        ]
 [86.83333333 71.33333333 87.        ]
 ...
 [87.85714286 68.04347826 67.55      ]
 [89.66666667 87.85714286 68.04347826]
 [87.         89.66666667 87.85714286]]
```

In [419]:

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = final_x[:-200],final_x[-200:],y[:-200],y[-200:]
```

In [420]:

```
len(x_train)
```

Out[420]:

```
1259
```

In [421]:

```
linear_model.fit(x_train, y_train)
```

Out[421]:

```
LinearRegression()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [422]:

```
prediction = linear_model.predict(x_test)
linear_model.predict([[23,12,11]])
```

Out[422]:

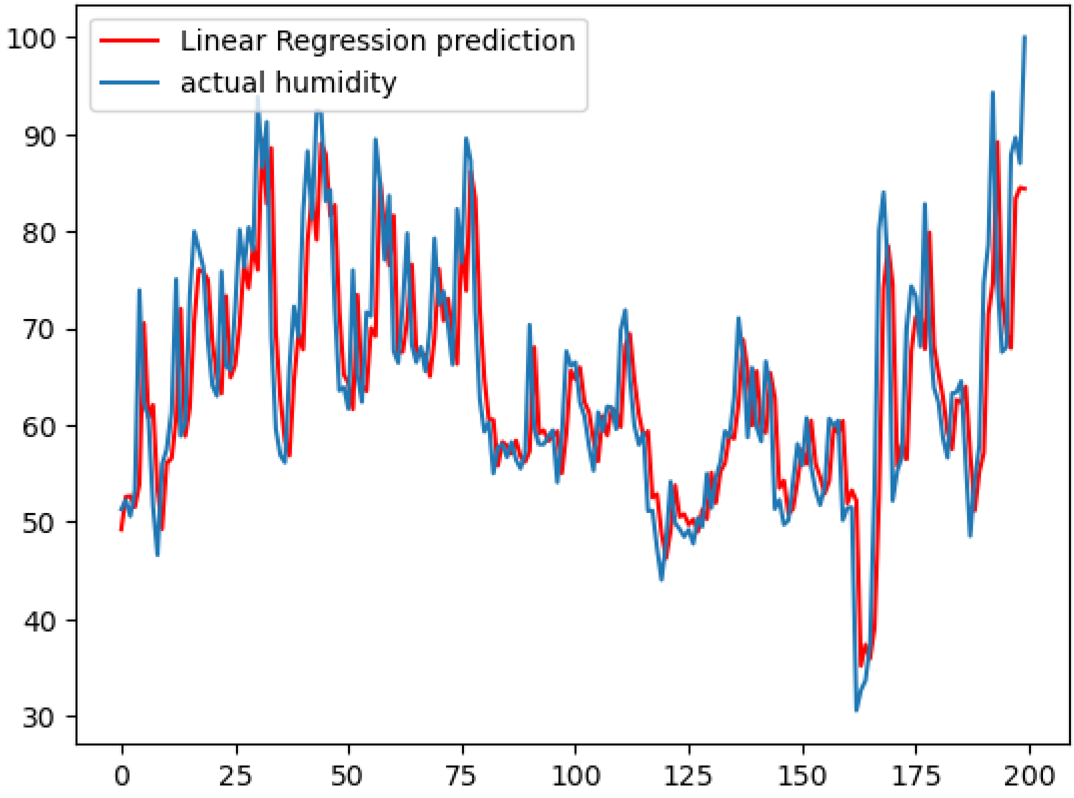
```
array([[25.57282704]])
```

In [423]:

```
pt.plot(prediction, label='Linear Regression prediction',color='red')
pt.plot(y_test,label='actual humidity')
pt.legend(loc='upper left')
```

Out[423]:

```
<matplotlib.legend.Legend at 0x1ea576ce350>
```



2. Time series forecasting model for gold price data set.

In [424]:

```
import pandas as pd
import matplotlib.pyplot as pt
```

In [425]:

```
df = pd.read_csv("gold_price_data.csv",index_col="Date",parse_dates=True)
```

In [426]:

```
df
```

Out[426]:

```
              Value
      Date
1970-01-01    35.20
1970-04-01    35.10
1970-07-01    35.40
1970-10-01    36.20
1971-01-01    37.40
       ...      ...
2020-03-09  1672.50
2020-03-10  1655.70
2020-03-11  1653.75
2020-03-12  1570.70
2020-03-13  1562.80

10787 rows × 1 columns
```

In [427]:

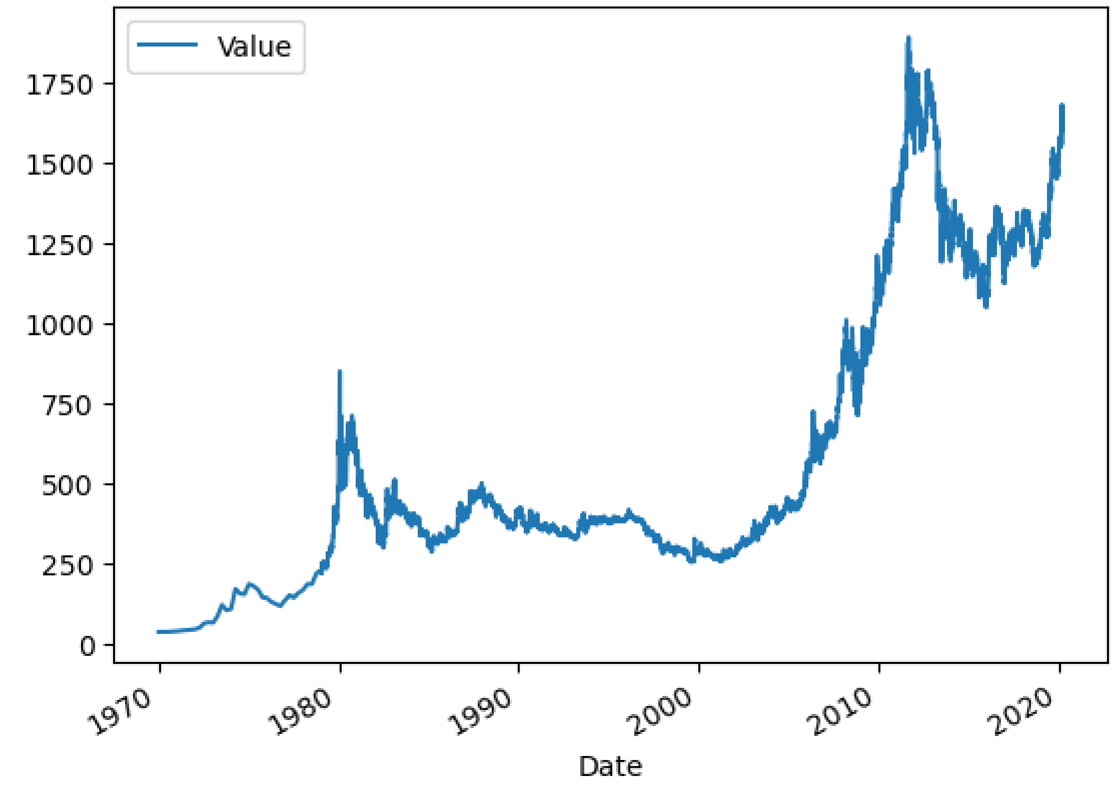
```
df.columns = ['Value']
```

In [428]:

```
df.plot()
```

Out[428]:

```
<Axes: xlabel='Date'>
```



In [429]:

```
df['Value_lastmonth']=df['Value'].shift(+1)
df['Value_2monthback']=df['Value'].shift(+2)
df['Value_3monthback']=df['Value'].shift(+3)
```

In [430]:

```
df
```

Out[430]:

	Value	Value_lastmonth	Value_2monthback	Value_3monthback
Date				
1970-01-01	35.20	NaN	NaN	NaN
1970-04-01	35.10	35.20	NaN	NaN
1970-07-01	35.40	35.10	35.20	NaN
1970-10-01	36.20	35.40	35.10	35.20
1971-01-01	37.40	36.20	35.40	35.10
...	...	...	...	...
2020-03-09	1672.50	1683.65	1659.60	1641.85
2020-03-10	1655.70	1672.50	1683.65	1659.60
2020-03-11	1653.75	1655.70	1672.50	1683.65
2020-03-12	1570.70	1653.75	1655.70	1672.50
2020-03-13	1562.80	1570.70	1653.75	1655.70

10787 rows × 4 columns

In [431]:

```
df=df.dropna()
df
```

Out[431]:

	Value	Value_lastmonth	Value_2monthback	Value_3monthback
Date				
1970-10-01	36.20	35.40	35.10	35.20
1971-01-01	37.40	36.20	35.40	35.10
1971-04-01	38.90	37.40	36.20	35.40
1971-07-01	40.10	38.90	37.40	36.20
1971-10-01	42.00	40.10	38.90	37.40
...	...	...	...	...
2020-03-09	1672.50	1683.65	1659.60	1641.85
2020-03-10	1655.70	1672.50	1683.65	1659.60
2020-03-11	1653.75	1655.70	1672.50	1683.65
2020-03-12	1570.70	1653.75	1655.70	1672.50
2020-03-13	1562.80	1570.70	1653.75	1655.70

10784 rows × 4 columns

In [432]:

```
from sklearn.linear_model import LinearRegression
linear_model = LinearRegression()
```

In [433]:

```
import numpy as np
```

In [434]:

```
x1,x2,x3,y = df['Value_lastmonth'],df['Value_2monthback'],df['Value_3monthback'],df['Valu
x1,x2,x3,y = np.array(x1), np.array(x2), np.array(x3), np.array(y)
```

In [435]:

```
x1, x2, x3, y = x1.reshape(-1,1),x2.reshape(-1,1),x3.reshape(-1,1),y.reshape(-1,1)
```

In [436]:

```
final_x = np.concatenate((x1,x2,x3),axis=1)
print(final_x)
```

```
[[  35.4    35.1    35.2 ]
 [  36.2    35.4    35.1 ]
 [  37.4    36.2    35.4 ]
 ...
 [1655.7  1672.5  1683.65]
 [1653.75 1655.7  1672.5 ]
 [1570.7  1653.75 1655.7 ]]
```

In [437]:

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = final_x[:-200],final_x[-200:],y[:-200],y[-200:]
```

In [438]:

```
len(x_train)
```

Out[438]:

```
10584
```

In [439]:

```
linear_model.fit(x_train, y_train)
```

Out[439]:

```
LinearRegression()
```

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In [440]:

```
prediction = linear_model.predict(x_test)
linear_model.predict([[35.40,35.10,35.20]])
```

Out[440]:

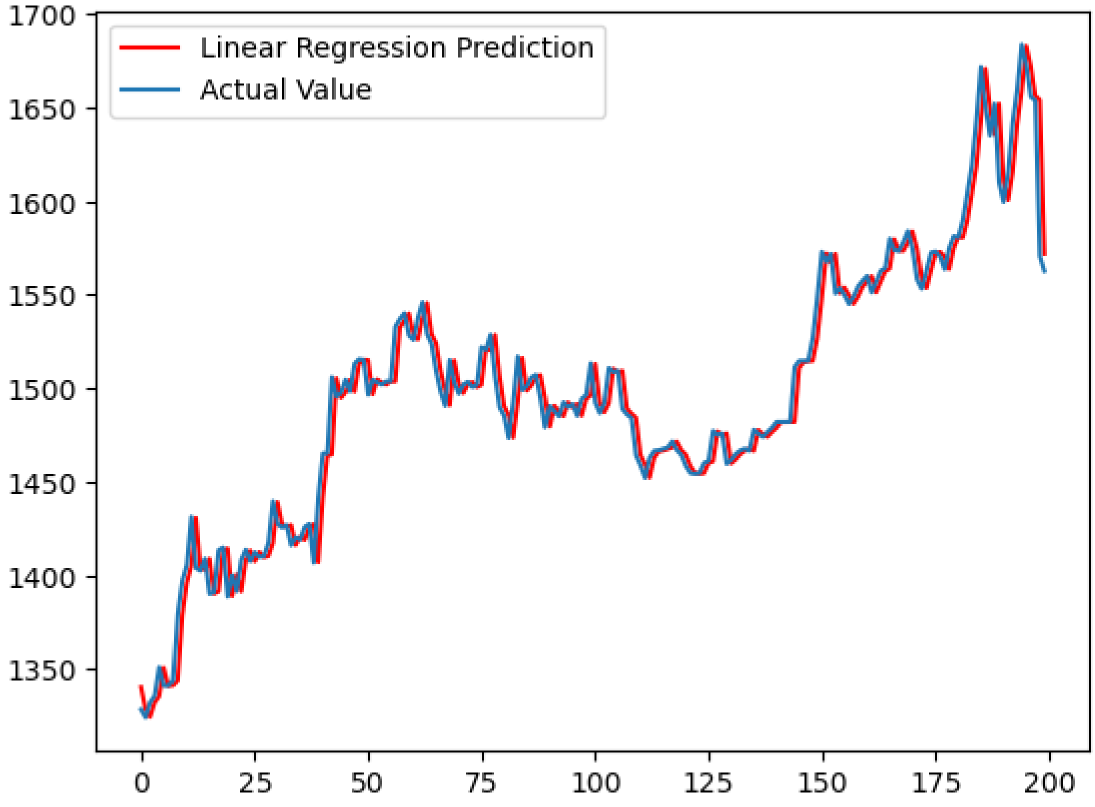
```
array([[35.63331644]])
```

In [441]:

```
pt.plot(prediction, label='Linear Regression Prediction',color='red')
pt.plot(y_test,label='Actual Value')
pt.legend(loc='upper left')
```

Out[441]:

```
<matplotlib.legend.Legend at 0x1ea3d7aa6e0>
```



3. Time series forecasting model for vegetable selling data set.

In [442]:

```
import pandas as pd
import matplotlib.pyplot as pt
```

In [443]:

```
df = pd.read_csv("vegetable_selling_data.csv",index_col="Date",usecols=['Date','Average']
```

In [444]:

```
df
```

Out[444]:

```
             Average
      Date
2013-06-16      37.5
2013-06-16      29.0
2013-06-16      20.5
2013-06-16      15.5
2013-06-16      29.0
       ...       ...
2021-05-13     110.0
2021-05-13     275.0
2021-05-13     230.0
2021-05-13     225.0
2021-05-13     245.0
```

197161 rows × 1 columns

In [445]:

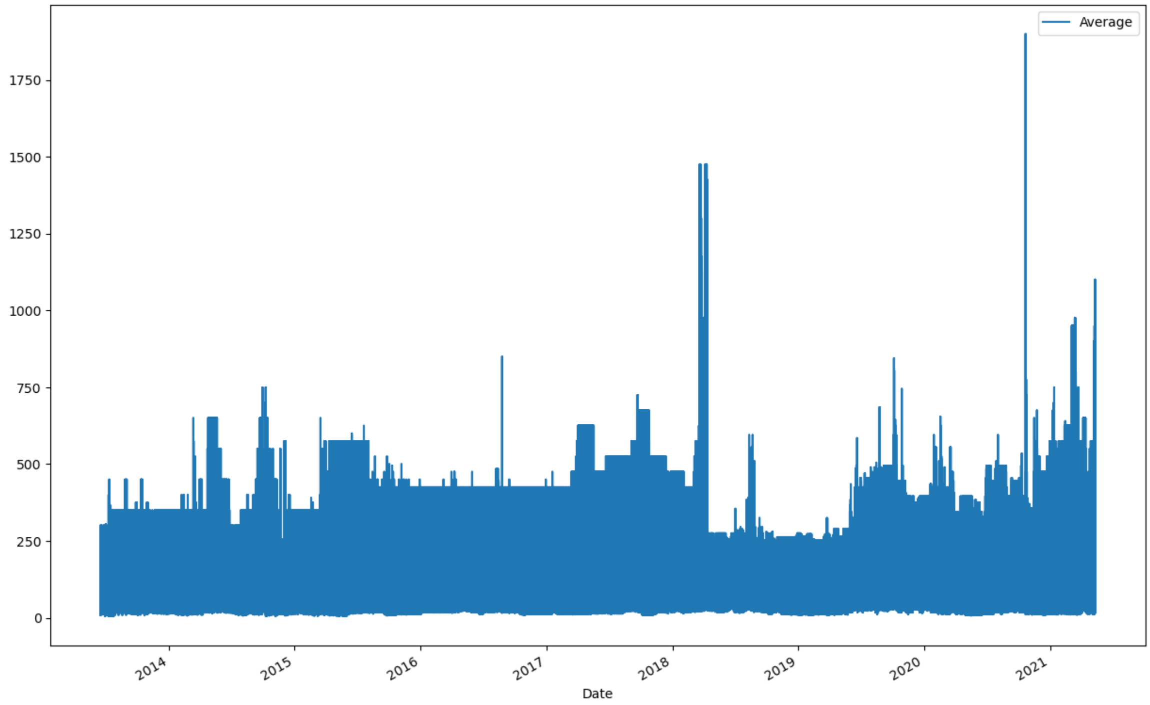
```
df.columns = ['Average']
```

In [446]:

```
df.plot(figsize=(15, 10))
```

Out[446]:

```
<Axes: xlabel='Date'>
```



In [447]:

```
df['Average_lastmonth']=df['Average'].shift(+1)
df['Average_2monthback']=df['Average'].shift(+2)
df['Average_3monthback']=df['Average'].shift(+3)
```

In [448]:

```
df
```

Out[448]:

	Average	Average_lastmonth	Average_2monthback	Average_3monthback
Date				
2013-06-16	37.5	NaN	NaN	NaN
2013-06-16	29.0	37.5	NaN	NaN
2013-06-16	20.5	29.0	37.5	NaN
2013-06-16	15.5	20.5	29.0	37.5
2013-06-16	29.0	15.5	20.5	29.0
...	...	...	...	...
2021-05-13	110.0	245.0	85.0	55.0
2021-05-13	275.0	110.0	245.0	85.0
2021-05-13	230.0	275.0	110.0	245.0
2021-05-13	225.0	230.0	275.0	110.0
2021-05-13	245.0	225.0	230.0	275.0

197161 rows × 4 columns

In [449]:

```
df=df.dropna()
df
```

Out[449]:

	Average	Average_lastmonth	Average_2monthback	Average_3monthback
Date				
2013-06-16	15.5	20.5	29.0	37.5
2013-06-16	29.0	15.5	20.5	29.0
2013-06-16	32.5	29.0	15.5	20.5
2013-06-16	8.0	32.5	29.0	15.5
2013-06-16	32.5	8.0	32.5	29.0
...	...	...	...	...
2021-05-13	110.0	245.0	85.0	55.0
2021-05-13	275.0	110.0	245.0	85.0
2021-05-13	230.0	275.0	110.0	245.0
2021-05-13	225.0	230.0	275.0	110.0
2021-05-13	245.0	225.0	230.0	275.0

197158 rows × 4 columns

In [450]:

```
from sklearn.linear_model import LinearRegression
linear_model = LinearRegression()
```

In [451]:

```
import numpy as np
```

In [452]:

```
x1,x2,x3,y = df['Average_lastmonth'],df['Average_2monthback'],df['Average_3monthback'],df
x1,x2,x3,y = np.array(x1), np.array(x2), np.array(x3), np.array(y)
```

In [453]:

```
x1, x2, x3, y = x1.reshape(-1,1),x2.reshape(-1,1),x3.reshape(-1,1),y.reshape(-1,1)
```

In [454]:

```
final_x = np.concatenate((x1,x2,x3),axis=1)
print(final_x)
```

```
[[ 20.5  29.   37.5]
 [ 15.5  20.5  29. ]
 [ 29.   15.5  20.5]
 ...
 [275.  110.  245. ]
 [230.  275.  110. ]
 [225.  230.  275. ]]
```

In [455]:

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = final_x[:-200],final_x[-200:],y[:-200],y[-200:]
```

In [456]:

```
len(x_train)
```

Out[456]:

```
196958
```

In [457]:

```
linear_model.fit(x_train, y_train)
```

Out[457]:

```
LinearRegression()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [458]:

```
prediction = linear_model.predict(x_test)
linear_model.predict([[20.5,29.0,37.5]])
```

Out[458]:

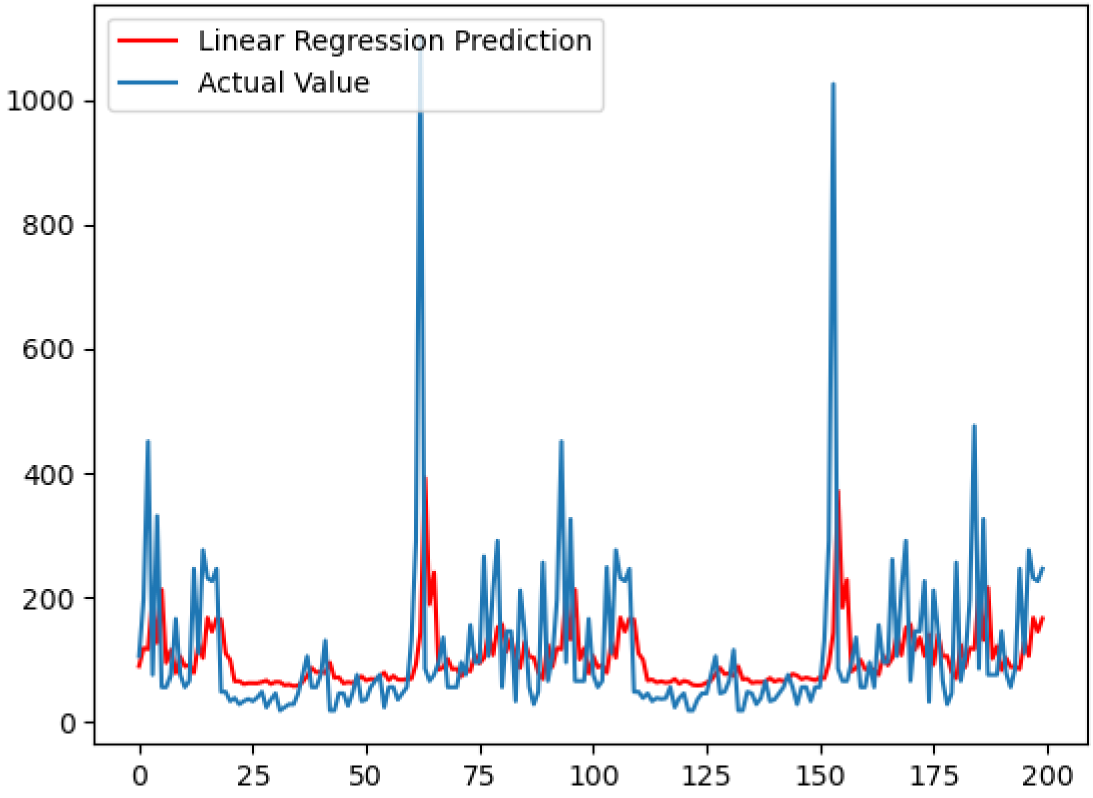
```
array([[58.23433563]])
```

In [459]:

```
pt.plot(prediction, label='Linear Regression Prediction',color='red')
pt.plot(y_test,label='Actual Value')
pt.legend(loc='upper left')
```

Out[459]:

```
<matplotlib.legend.Legend at 0x1ea5f9c6530>
```


Linear Regression Prediction
Actual Value