Linear_Regression

September 29, 2021

1 Linear Regression Indicator

https://commodity.com/technical-analysis/lin-reg-line/

https://www.fidelity.com/learning-center/trading-investing/technical-analysis/technical-indicator-guide/linear-regression

[1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")

# fix_yahoo_finance is used to fetch data
import fix_yahoo_finance as yf
yf.pdr_override()
```

[2]:

```
# input
symbol1 = 'AAPL'
symbol2 = 'QQQ'
start = '2018-08-01'
end = '2019-01-01'

# Read data
df1 = yf.download(symbol1,start,end)
df2 = yf.download(symbol2,start,end)
```

```
[*********************100%***********************]  1 of 1 downloaded
[*********************100%***********************]  1 of 1 downloaded
```

[3]:

```
# View Columns
df1.head()
```

[3]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  198.478760
2018-08-02  200.580002  208.380005  200.350006  207.389999  204.280457
```

```
2018-08-03  207.029999  208.740005  205.479996  207.990005  204.871445
2018-08-06  208.000000  209.250000  207.070007  209.070007  205.935257
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.004639

              Volume
Date
2018-08-01  67935700
2018-08-02  62404000
2018-08-03  33447400
2018-08-06  25425400
2018-08-07  25587400
```

[4]:

```
df2.head()
```

[4]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  176.860001  177.649994  176.100006  177.119995  175.977173
2018-08-02  175.869995  179.740005  175.789993  179.529999  178.371628
2018-08-03  179.869995  180.089996  179.080002  180.080002  178.918091
2018-08-06  179.960007  181.190002  179.740005  181.139999  179.971237
2018-08-07  181.649994  182.139999  181.259995  181.800003  180.626999

              Volume
Date
2018-08-01  37101900
2018-08-02  47178200
2018-08-03  28934400
2018-08-06  24808800
2018-08-07  29895700
```

[5]:

```
avg1 = df1['Adj Close'].mean()
avg2 = df2['Adj Close'].mean()
df1['AVGS1_S1'] = avg1 - df1['Adj Close']
df1['AVGS2_S2'] = avg2 - df2['Adj Close']
df1['Average_SQ'] = df1['AVGS1_S1']**2
df1['AVG_AVG'] = df1['AVGS1_S1']*df1['AVGS2_S2']
```

[6]:

```
df1.head(20)
```

[6]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  198.478760
2018-08-02  200.580002  208.380005  200.350006  207.389999  204.280457
2018-08-03  207.029999  208.740005  205.479996  207.990005  204.871445
2018-08-06  208.000000  209.250000  207.070007  209.070007  205.935257
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.004639
2018-08-08  206.050003  207.809998  204.520004  207.250000  204.142532
```

```
2018-08-09  207.279999  209.779999  207.199997  208.880005  205.748108
2018-08-10  207.360001  209.100006  206.669998  207.529999  205.135254
2018-08-13  207.699997  210.949997  207.699997  208.869995  206.459793
2018-08-14  210.160004  210.559998  208.259995  209.750000  207.329651
2018-08-15  209.220001  210.740005  208.330002  210.240005  207.813995
2018-08-16  211.750000  213.809998  211.470001  213.320007  210.858459
2018-08-17  213.440002  217.949997  213.160004  217.580002  215.069290
2018-08-20  218.100006  219.179993  215.110001  215.460007  212.973755
2018-08-21  216.800003  217.190002  214.029999  215.039993  212.558609
2018-08-22  214.100006  216.360001  213.839996  215.050003  212.568481
2018-08-23  214.649994  217.050003  214.600006  215.490005  213.003418
2018-08-24  216.600006  216.899994  215.110001  216.160004  213.665680
2018-08-27  217.149994  218.740005  216.330002  217.940002  215.425140
2018-08-28  219.009995  220.539993  218.919998  219.699997  217.164825

              Volume   AVGS1_S1   AVGS2_S2  Average_SQ     AVG_AVG
Date
2018-08-01  67935700   2.593095  -3.527169    6.724141   -9.146283
2018-08-02  62404000  -3.208602  -5.921624   10.295127   19.000134
2018-08-03  33447400  -3.799590  -6.468087   14.436884   24.576078
2018-08-06  25425400  -4.863402  -7.521233   23.652679   36.578778
2018-08-07  25587400  -2.932784  -8.176995    8.601222   23.981359
2018-08-08  22525500  -3.070677  -8.395562    9.429057   25.780058
2018-08-09  23469200  -4.676253  -8.286278   21.867342   38.748731
2018-08-10  24611200  -4.063399  -6.905236   16.511212   28.058728
2018-08-13  25869100  -5.387938  -6.706536   29.029876   36.134399
2018-08-14  20748000  -6.257796  -7.829247   39.160011   48.993829
2018-08-15  28807600  -6.742140  -5.623559   45.456452   37.914820
2018-08-16  28500400  -9.786604  -6.209771   95.777619   60.772567
2018-08-17  35427000 -13.997435  -6.249505  195.928188   87.477036
2018-08-20  30287700 -11.901900  -6.090523  141.655225   72.488792
2018-08-21  26159800 -11.486754  -6.746270  131.945518   77.492740
2018-08-22  19018100 -11.496626  -7.441765  132.172410   85.555186
2018-08-23  18883200 -11.931563  -7.183434  142.362197   85.709592
2018-08-24  18476400 -12.593825  -8.852593  158.604429  111.488003
2018-08-27  20525100 -14.353285 -10.700585  206.016791  153.588542
2018-08-28  22776800 -16.092970 -10.968850  258.983685  176.521369
```

[7]:

```
sum_sq = df1['Average_SQ'].sum()
sum_avg = df1['AVG_AVG'].sum()
slope = sum_avg/sum_sq
intercept = avg2-(slope*avg1)
```

[8]:

```
df1['Linear_Regression'] = intercept + slope*(df1['Adj Close'])
```

[9]:

```
df1 = df1.drop(['AVGS1_S1', 'AVGS2_S2', 'Average_SQ', 'AVG_AVG'], axis=1)
df1.head()
```

[9]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  198.478760
2018-08-02  200.580002  208.380005  200.350006  207.389999  204.280457
2018-08-03  207.029999  208.740005  205.479996  207.990005  204.871445
2018-08-06  208.000000  209.250000  207.070007  209.070007  205.935257
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.004639

              Volume  Linear_Regression
Date
2018-08-01  67935700         171.415488
2018-08-02  62404000         173.730078
2018-08-03  33447400         173.965852
2018-08-06  25425400         174.390261
2018-08-07  25587400         173.620040
```

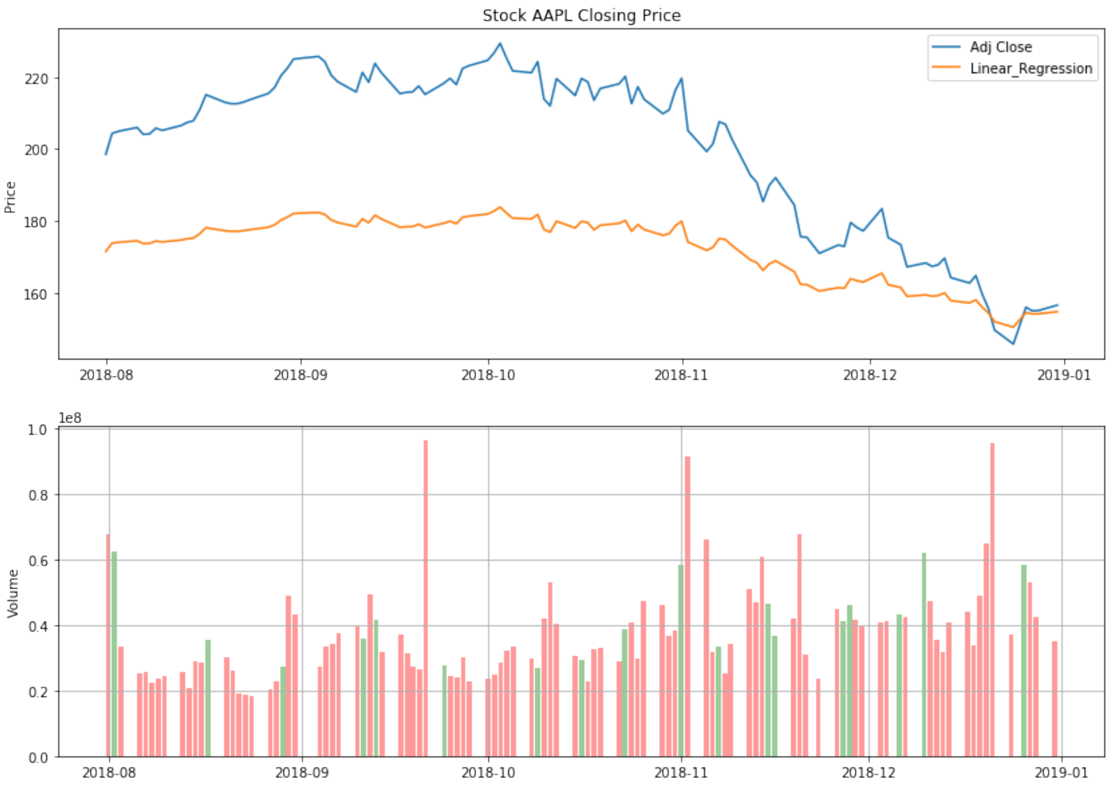
[10]:

```python
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
ax1.plot(df1['Adj Close'])
ax1.plot(df1['Linear_Regression'], label='Linear_Regression')
ax1.set_title('Stock '+ symbol1 +' Closing Price')
ax1.set_ylabel('Price')
ax1.legend(loc='best')

ax2 = plt.subplot(2, 1, 2)
df1['VolumePositive'] = df1['Open'] < df1['Adj Close']
colors = df1.VolumePositive.map({True: 'g', False: 'r'})
ax2.bar(df1.index, df1['Volume'], color=colors, alpha=0.4)
ax2.grid()
ax2.set_ylabel('Volume')
```

[10]:

```
Text(0,0.5,'Volume')
```



1.1 Candlestick with Linear Regression

[11]:

```
from matplotlib import dates as mdates
import datetime as dt

dfc = df1.copy()
dfc['VolumePositive'] = dfc['Open'] < dfc['Adj Close']
#dfc = dfc.dropna()
dfc = dfc.reset_index()
dfc['Date'] = mdates.date2num(dfc['Date'].astype(dt.date))
dfc.head()
```

[11]:

```
       Date        Open        High         Low       Close   Adj Close  \
0  736907.0  199.130005  201.759995  197.309998  201.500000  198.478760
1  736908.0  200.580002  208.380005  200.350006  207.389999  204.280457
2  736909.0  207.029999  208.740005  205.479996  207.990005  204.871445
3  736912.0  208.000000  209.250000  207.070007  209.070007  205.935257
4  736913.0  209.320007  209.500000  206.759995  207.110001  204.004639

     Volume  Linear_Regression  VolumePositive
0  67935700         171.415488           False
1  62404000         173.730078            True
```

```
2  33447400         173.965852          False
3  25425400         174.390261          False
4  25587400         173.620040          False
```

[12]:

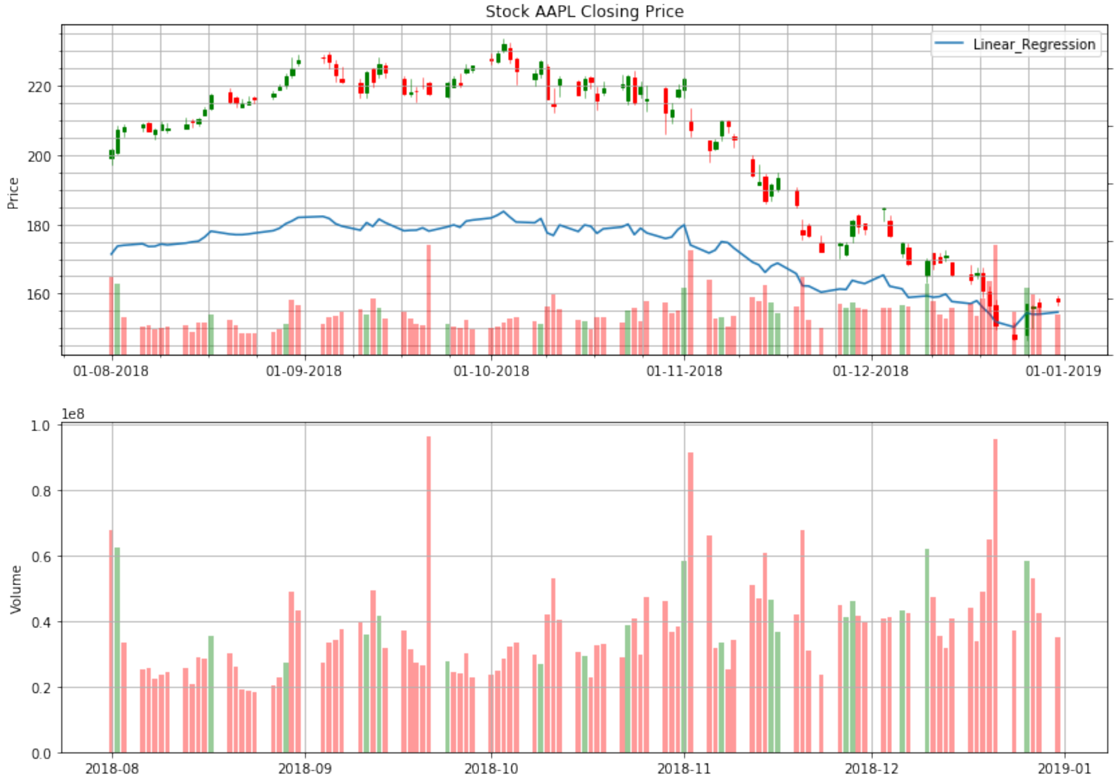
```
from mpl_finance import candlestick_ohlc

fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
candlestick_ohlc(ax1,dfc.values, width=0.5, colorup='g', colordown='r', alpha=1.
 ↪0)
ax1.plot(df1['Linear_Regression'], label='Linear_Regression')
ax1.xaxis_date()
ax1.xaxis.set_major_formatter(mdates.DateFormatter('%d-%m-%Y'))
ax1.grid(True, which='both')
ax1.minorticks_on()
ax1v = ax1.twinx()
colors = dfc.VolumePositive.map({True: 'g', False: 'r'})
ax1v.bar(dfc.Date, dfc['Volume'], color=colors, alpha=0.4)
ax1v.axes.yaxis.set_ticklabels([])
ax1v.set_ylim(0, 3*df1.Volume.max())
ax1.set_title('Stock '+ symbol1 +' Closing Price')
ax1.set_ylabel('Price')
ax1.legend(loc='best')

ax2 = plt.subplot(2, 1, 2)
df1['VolumePositive'] = df1['Open'] < df1['Adj Close']
colors = df1.VolumePositive.map({True: 'g', False: 'r'})
ax2.bar(df1.index, df1['Volume'], color=colors, alpha=0.4)
ax2.grid()
ax2.set_ylabel('Volume')
```

[12]:

```
Text(0,0.5,'Volume')
```


Stock AAPL Closing Price
Linear_Regression
Price
220
200
180
160
01-08-2018
01-09-2018
01-10-2018
01-11-2018
01-12-2018
01-01-2019
1e8
Volume
1.0
0.8
0.6
0.4
0.2
0.0
2018-08
2018-09
2018-10
2018-11
2018-12
2019-01