Moving_Linear_Regression

September 29, 2021

1 Moving Linear Regression

https://www.fmlabs.com/reference/default.htm

[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]:

Date	Open	High	Low	Close	Adj Close
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
```

Date	Volume	AVGS1_S1	AVGS2_S2	Average_SQ	AVG_AVG
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]:
```
n = 14 # number of periods
df1['Moving_Linear_Regression'] = df1['Linear_Regression'].rolling(n).mean()
```

[10]:
```
df1 = df1.drop(['AVGS1_S1', 'AVGS2_S2', 'Average_SQ', 'AVG_AVG'], axis=1)
df1.head()
```

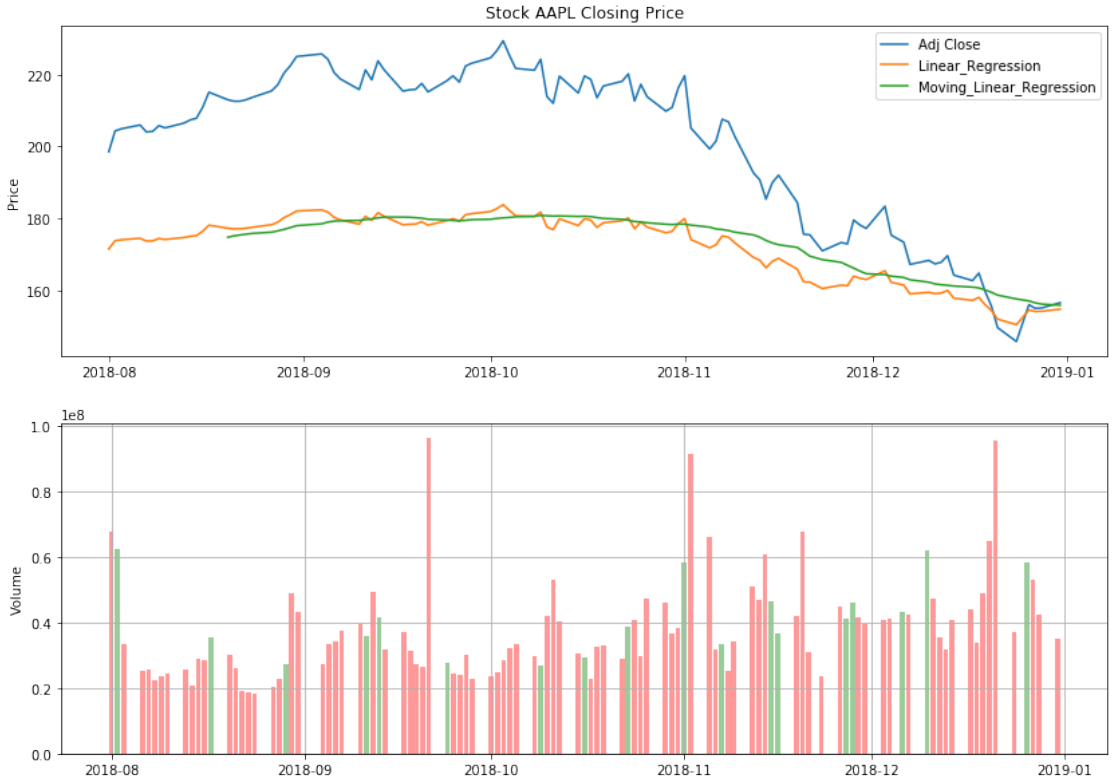
[10]:

Date	Open	High	Low	Close	Adj Close	Volume	Linear_Regression	Moving_Linear_Regression
2018-08-01	199.130005	201.759995	197.309998	201.500000	198.478760	67935700	171.415488	NaN
2018-08-02	200.580002	208.380005	200.350006	207.389999	204.280457	62404000	173.730078	NaN
2018-08-03	207.029999	208.740005	205.479996	207.990005	204.871445	33447400	173.965852	NaN
2018-08-06	208.000000	209.250000	207.070007	209.070007	205.935257	25425400	174.390261	NaN
2018-08-07	209.320007	209.500000	206.759995	207.110001	204.004639	25587400	173.620040	NaN

[11]:
```
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.plot(df1['Moving_Linear_Regression'], label='Moving_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')
```

[11]:
```
Text(0,0.5,'Volume')
```



1.1 Candlestick with Moving Linear Regression

[12]:
```
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()
```

[12]:

	Date	Open	High	Low	Close	Adj Close	Volume	Linear_Regression	Moving_Linear_Regression	VolumePositive
0	736907.0	199.130005	201.759995	197.309998	201.500000	198.478760	67935700	171.415488	NaN	False
1	736908.0	200.580002	208.380005	200.350006	207.389999	204.280457	62404000	173.730078	NaN	True
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				

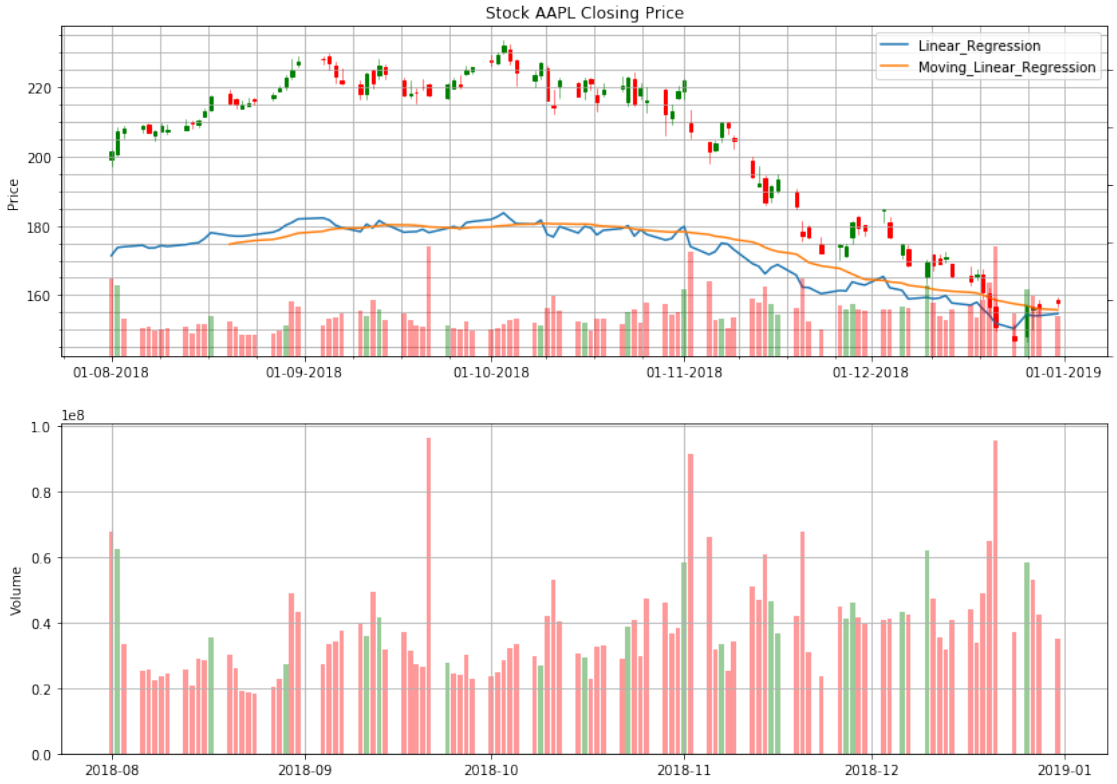
```
2   33447400        173.965852                      NaN         False
3   25425400        174.390261                      NaN         False
4   25587400        173.620040                      NaN         False
```

[13]:
```
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.plot(df1['Moving_Linear_Regression'], label='Moving_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')
```

[13]:
```
Text(0,0.5,'Volume')
```


Stock AAPL Closing Price
Linear_Regression
Moving_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
1.0
0.8
0.6
0.4
0.2
0.0
Volume
2018-08
2018-09
2018-10
2018-11
2018-12
2019-01