PMO

September 29, 2021

1 Decision Point Price Momentum Oscillator (PMO)

https://stockcharts.com/school/doku.php?id=chart_school:technical_indicators:dppmo

[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
symbol = 'AAPL'
start = '2017-01-01'
end = '2019-01-01'

# Read data
df = yf.download(symbol,start,end)

# View Columns
df.head()
```

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

[2]:
```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-03  115.800003  116.330002  114.760002  116.150002  112.140007
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950

              Volume
Date
```

```
2017-01-03  28781900
2017-01-04  21118100
2017-01-05  22193600
2017-01-06  31751900
2017-01-09  33561900
```

[3]:
```
df.tail()
```

[3]:
```
                  Open        High         Low       Close   Adj Close  \
Date
2018-12-24  148.149994  151.550003  146.589996  146.830002  146.202972
2018-12-26  148.300003  157.229996  146.720001  157.169998  156.498810
2018-12-27  155.839996  156.770004  150.070007  156.149994  155.483154
2018-12-28  157.500000  158.520004  154.550003  156.229996  155.562820
2018-12-31  158.529999  159.360001  156.479996  157.740005  157.066376

              Volume
Date
2018-12-24  37169200
2018-12-26  58582500
2018-12-27  53117100
2018-12-28  42291400
2018-12-31  35003500
```

[4]:
```
df['ROC'] = ((df['Adj Close'] - df['Adj Close'].shift(1))/df['Adj Close'].
 ↪shift(1)) * 100
df = df.dropna()
df.head()
```

[4]:
```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818

              Volume       ROC
Date
2017-01-04  21118100 -0.111917
2017-01-05  22193600  0.508529
2017-01-06  31751900  1.114829
2017-01-09  33561900  0.915942
2017-01-10  24462100  0.100858
```

[5]:
```
df['35_Custom_EMA_ROC'] = df['ROC'].
 ↪ewm(ignore_na=False,span=35,min_periods=0,adjust=True).mean()
```

```
df.head()
```

[5]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818

              Volume       ROC  35_Custom_EMA_ROC
Date
2017-01-04  21118100 -0.111917          -0.111917
2017-01-05  22193600  0.508529           0.207169
2017-01-06  31751900  1.114829           0.527171
2017-01-09  33561900  0.915942           0.632848
2017-01-10  24462100  0.100858           0.513954
```

[6]:

```
df['35_Custom_EMA_ROC_10'] = df['35_Custom_EMA_ROC']*10
df.head()
```

[6]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818

              Volume       ROC  35_Custom_EMA_ROC  35_Custom_EMA_ROC_10
Date
2017-01-04  21118100 -0.111917          -0.111917             -1.119172
2017-01-05  22193600  0.508529           0.207169              2.071693
2017-01-06  31751900  1.114829           0.527171              5.271710
2017-01-09  33561900  0.915942           0.632848              6.328485
2017-01-10  24462100  0.100858           0.513954              5.139537
```

[7]:

```
df = df.dropna()
df.head(20)
```

[7]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818
```

```
2017-01-11  118.739998  119.930000  118.599998  119.750000  115.615723
2017-01-12  118.900002  119.300003  118.209999  119.250000  115.132988
2017-01-13  119.110001  119.620003  118.809998  119.040001  114.930237
2017-01-17  118.339996  120.239998  118.220001  120.000000  115.857086
2017-01-18  120.000000  120.500000  119.709999  119.989998  115.847435
2017-01-19  119.400002  120.089996  119.370003  119.779999  115.644691
2017-01-20  120.449997  120.449997  119.730003  120.000000  115.857086
2017-01-23  120.000000  120.809998  119.769997  120.080002  115.934326
2017-01-24  119.550003  120.099998  119.500000  119.970001  115.828125
2017-01-25  120.419998  122.099998  120.279999  121.879997  117.672188
2017-01-26  121.669998  122.440002  121.599998  121.940002  117.730118
2017-01-27  122.139999  122.349998  121.599998  121.949997  117.739769
2017-01-30  120.930000  121.629997  120.660004  121.629997  117.430817
2017-01-31  121.150002  121.389999  120.620003  121.349998  117.160492
2017-02-01  127.029999  130.490005  127.010002  128.750000  124.305000

               Volume       ROC  35_Custom_EMA_ROC  35_Custom_EMA_ROC_10
Date
2017-01-04   21118100 -0.111917          -0.111917             -1.119172
2017-01-05   22193600  0.508529           0.207169              2.071693
2017-01-06   31751900  1.114829           0.527171              5.271710
2017-01-09   33561900  0.915942           0.632848              6.328485
2017-01-10   24462100  0.100858           0.513954              5.139537
2017-01-11   27588600  0.537319           0.518425              5.184247
2017-01-12   27086200 -0.417534           0.360738              3.607379
2017-01-13   26111900 -0.176102           0.279470              2.794700
2017-01-17   34439800  0.806445           0.352269              3.522685
2017-01-18   23713000 -0.008330           0.306254              3.062542
2017-01-19   25597300 -0.175009           0.248970              2.489696
2017-01-20   32597900  0.183662           0.241660              2.416600
2017-01-23   22050200  0.066668           0.223119              2.231192
2017-01-24   23211000 -0.091604           0.191373              1.913733
2017-01-25   32377600  1.592068           0.326535              3.265355
2017-01-26   26337600  0.049230           0.300829              3.008289
2017-01-27   20562900  0.008198           0.274673              2.746732
2017-01-30   30377500 -0.262402           0.228239              2.282395
2017-01-31   49201000 -0.230199           0.189792              1.897924
2017-02-01  111985000  6.098052           0.671648              6.716483
```

[8]:
```
df['PMO_Line'] = df['35_Custom_EMA_ROC_10'].
 ↪ewm(ignore_na=False,span=20,min_periods=0,adjust=True).mean()
df.head()
```

[8]:
```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
```

```
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818

              Volume       ROC  35_Custom_EMA_ROC  35_Custom_EMA_ROC_10  \
Date
2017-01-04  21118100 -0.111917          -0.111917             -1.119172
2017-01-05  22193600  0.508529           0.207169              2.071693
2017-01-06  31751900  1.114829           0.527171              5.271710
2017-01-09  33561900  0.915942           0.632848              6.328485
2017-01-10  24462100  0.100858           0.513954              5.139537

            PMO_Line
Date
2017-01-04 -1.119172
2017-01-05  0.556032
2017-01-06  2.287601
2017-01-09  3.454141
2017-01-10  3.861824
```

[9]:
```
df['PMO_Signal_Line'] = df['PMO_Line'].
↪ewm(ignore_na=False,span=10,min_periods=0,adjust=True).mean()
```

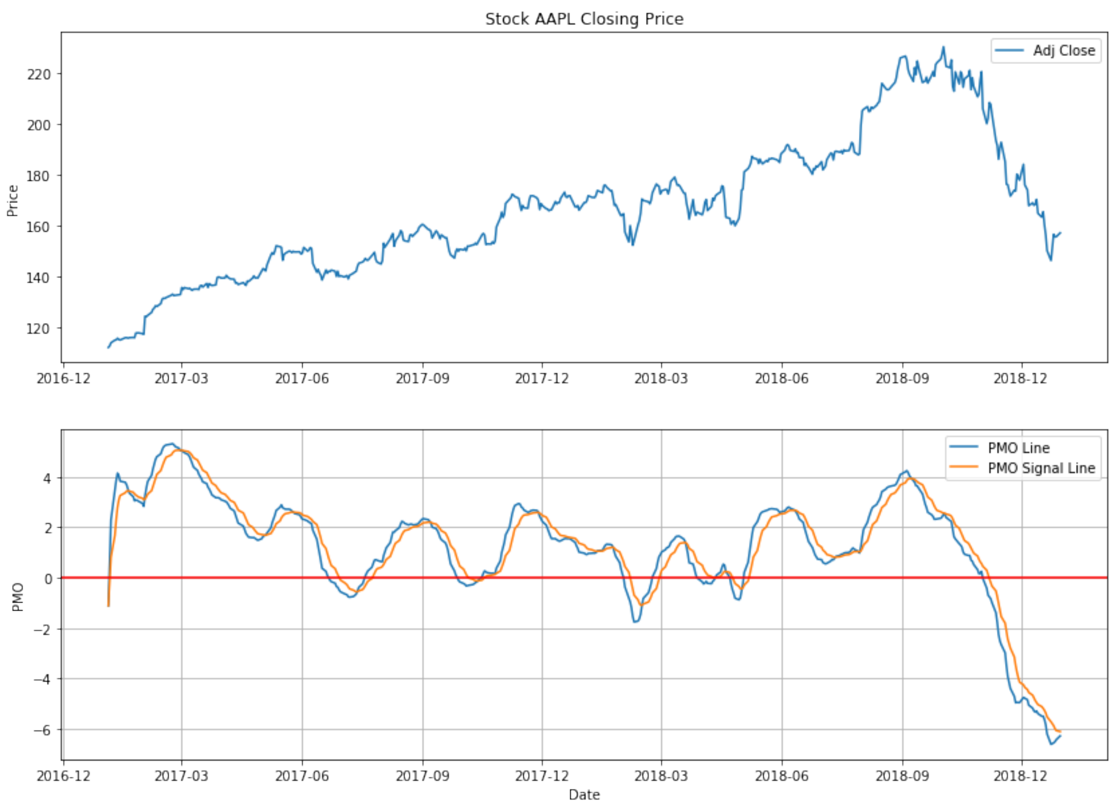
[10]:
```
df = df.dropna()
df.head()
```

[10]:
```
                  Open        High         Low       Close   Adj Close  \
Date
2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950
2017-01-10  118.769997  119.379997  118.300003  119.110001  114.997818

              Volume       ROC  35_Custom_EMA_ROC  35_Custom_EMA_ROC_10  \
Date
2017-01-04  21118100 -0.111917          -0.111917             -1.119172
2017-01-05  22193600  0.508529           0.207169              2.071693
2017-01-06  31751900  1.114829           0.527171              5.271710
2017-01-09  33561900  0.915942           0.632848              6.328485
2017-01-10  24462100  0.100858           0.513954              5.139537

            PMO_Line  PMO_Signal_Line
Date
2017-01-04 -1.119172        -1.119172
2017-01-05  0.556032        -0.197810
2017-01-06  2.287601         0.801309
```

```
2017-01-09  3.454141         1.675299
2017-01-10  3.861824         2.302991
```

[11]:
```
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
ax1.plot(df['Adj Close'])
ax1.set_title('Stock '+ symbol +' Closing Price')
ax1.set_ylabel('Price')
ax1.legend(loc='best')

ax2 = plt.subplot(2, 1, 2)
ax2.plot(df['PMO_Line'], label='PMO Line')
ax2.plot(df['PMO_Signal_Line'], label='PMO Signal Line')
ax2.axhline(y=0, color='red')
ax2.grid()
ax2.legend(loc='best')
ax2.set_ylabel('PMO')
ax2.set_xlabel('Date')
```

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



1.1 Candlestick with PMO

[12]:
```
from matplotlib import dates as mdates
import datetime as dt

dfc = df.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  \
0  736333.0  115.849998  116.510002  115.750000  116.019997  112.014503
1  736334.0  115.919998  116.860001  115.809998  116.610001  112.584129
2  736335.0  116.779999  118.160004  116.470001  117.910004  113.839249
3  736338.0  117.949997  119.430000  117.940002  118.989998  114.881950
4  736339.0  118.769997  119.379997  118.300003  119.110001  114.997818

     Volume       ROC  35_Custom_EMA_ROC  35_Custom_EMA_ROC_10  PMO_Line  \
0  21118100 -0.111917          -0.111917             -1.119172 -1.119172
1  22193600  0.508529           0.207169              2.071693  0.556032
2  31751900  1.114829           0.527171              5.271710  2.287601
3  33561900  0.915942           0.632848              6.328485  3.454141
4  24462100  0.100858           0.513954              5.139537  3.861824

   PMO_Signal_Line  VolumePositive
0        -1.119172           False
1        -0.197810           False
2         0.801309           False
3         1.675299           False
4         2.302991           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.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*df.Volume.max())
ax1.set_title('Stock '+ symbol +' Closing Price')
ax1.set_ylabel('Price')

ax2 = plt.subplot(2, 1, 2)
ax2.plot(df['PMO_Line'], label='PMO_Line')
ax2.plot(df['PMO_Signal_Line'], label='PMO_Signal_Line')
ax2.axhline(y=0, color='red')
ax2.grid()
ax2.set_ylabel('PMO')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[13]: <matplotlib.legend.Legend at 0x204fa9711d0>