PGO

September 29, 2021

1 Pretty Good Oscillator (PGO)

https://library.tradingtechnologies.com/trade/chrt-ti-pretty-good-oscillator.html

[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]:

Date	Open	High	Low	Close	Adj Close	Volume
2017-01-03	115.800003	116.330002	114.760002	116.150002	111.709831	
2017-01-04	115.849998	116.510002	115.750000	116.019997	111.584778	
2017-01-05	115.919998	116.860001	115.809998	116.610001	112.152229	
2017-01-06	116.779999	118.160004	116.470001	117.910004	113.402542	
2017-01-09	117.949997	119.430000	117.940002	118.989998	114.441246	

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

[3]:
```
n = 14
df['SMA'] = df['Adj Close'].rolling(n).mean()
df['EMA'] = df['Adj Close'].
 ↪ewm(ignore_na=False,span=n,min_periods=n,adjust=True).mean()
```

[4]:
```
df['HL'] = df['High'] - df['Low']
df['HC'] = abs(df['High'] - df['Adj Close'].shift())
df['LC'] = abs(df['Low'] - df['Adj Close'].shift())
df['TR'] = df[['HL','HC','LC']].max(axis=1)
df['ATR'] = df['TR'].rolling(n).mean()
df = df.drop(['HL','HC','LC','TR'],axis=1)
```

[5]:
```
df['PGO'] = (df['Adj Close'] - df['SMA']) / df['ATR']
```

[6]:
```
df
```

[6]:

Date	Open	High	Low	Close	Adj Close	\
2017-01-03	115.800003	116.330002	114.760002	116.150002	111.709831	
2017-01-04	115.849998	116.510002	115.750000	116.019997	111.584778	
2017-01-05	115.919998	116.860001	115.809998	116.610001	112.152229	
2017-01-06	116.779999	118.160004	116.470001	117.910004	113.402542	
2017-01-09	117.949997	119.430000	117.940002	118.989998	114.441246	
2017-01-10	118.769997	119.379997	118.300003	119.110001	114.556656	
2017-01-11	118.739998	119.930000	118.599998	119.750000	115.172195	
2017-01-12	118.900002	119.300003	118.209999	119.250000	114.691307	
2017-01-13	119.110001	119.620003	118.809998	119.040001	114.489334	
2017-01-17	118.339996	120.239998	118.220001	120.000000	115.412643	
2017-01-18	120.000000	120.500000	119.709999	119.989998	115.403008	
2017-01-19	119.400002	120.089996	119.370003	119.779999	115.201050	
2017-01-20	120.449997	120.449997	119.730003	120.000000	115.412643	
2017-01-23	120.000000	120.809998	119.769997	120.080002	115.489578	
2017-01-24	119.550003	120.099998	119.500000	119.970001	115.383789	
2017-01-25	120.419998	122.099998	120.279999	121.879997	117.220779	
2017-01-26	121.669998	122.440002	121.599998	121.940002	117.278488	
2017-01-27	122.139999	122.349998	121.599998	121.949997	117.288101	
2017-01-30	120.930000	121.629997	120.660004	121.629997	116.980324	
2017-01-31	121.150002	121.389999	120.620003	121.349998	116.711029	
2017-02-01	127.029999	130.490005	127.010002	128.750000	123.828148	
2017-02-02	127.980003	129.389999	127.779999	128.529999	123.616562	
2017-02-03	128.309998	129.190002	128.160004	129.080002	124.145538	

2017-02-06	129.130005	130.500000	128.899994	130.289993	125.309273
2017-02-07	130.539993	132.089996	130.449997	131.529999	126.501862
2017-02-08	131.350006	132.220001	131.220001	132.039993	126.992355
2017-02-09	131.649994	132.449997	131.119995	132.419998	127.909996
2017-02-10	132.460007	132.940002	132.050003	132.119995	127.620224
2017-02-13	133.080002	133.820007	132.750000	133.289993	128.750366
2017-02-14	133.470001	135.089996	133.250000	135.020004	130.421463
…	…	…	…	…	…
2018-11-15	188.389999	191.970001	186.899994	191.410004	189.861435
2018-11-16	190.500000	194.970001	189.460007	193.529999	191.964279
2018-11-19	190.000000	190.699997	184.990005	185.860001	184.356339
2018-11-20	178.369995	181.470001	175.509995	176.979996	175.548157
2018-11-21	179.729996	180.270004	176.550003	176.779999	175.349792
2018-11-23	174.940002	176.600006	172.100006	172.289993	170.896118
2018-11-26	174.240005	174.949997	170.259995	174.619995	173.207260
2018-11-27	171.509995	174.770004	170.880005	174.240005	172.830338
2018-11-28	176.729996	181.289993	174.929993	180.940002	179.476135
2018-11-29	182.660004	182.800003	177.699997	179.550003	178.097382
2018-11-30	180.289993	180.330002	177.029999	178.580002	177.135223
2018-12-03	184.460007	184.940002	181.210007	184.820007	183.324753
2018-12-04	180.949997	182.389999	176.270004	176.690002	175.260513
2018-12-06	171.759995	174.779999	170.419998	174.720001	173.306473
2018-12-07	173.490005	174.490005	168.300003	168.490005	167.126862
2018-12-10	165.000000	170.089996	163.330002	169.600006	168.227890
2018-12-11	171.660004	171.789993	167.000000	168.630005	167.265732
2018-12-12	170.399994	171.919998	169.020004	169.100006	167.731934
2018-12-13	170.490005	172.570007	169.550003	170.949997	169.566956
2018-12-14	169.000000	169.080002	165.279999	165.479996	164.141220
2018-12-17	165.449997	168.350006	162.729996	163.940002	162.613678
2018-12-18	165.380005	167.529999	164.389999	166.070007	164.726440
2018-12-19	166.000000	167.449997	159.089996	160.889999	159.588348
2018-12-20	160.399994	162.110001	155.300003	156.830002	155.561188
2018-12-21	156.860001	158.160004	149.630005	150.729996	149.510544
2018-12-24	148.149994	151.550003	146.589996	146.830002	145.642090
2018-12-26	148.300003	157.229996	146.720001	157.169998	155.898438
2018-12-27	155.839996	156.770004	150.070007	156.149994	154.886688
2018-12-28	157.500000	158.520004	154.550003	156.229996	154.966034
2018-12-31	158.529999	159.360001	156.479996	157.740005	156.463837

Date	Volume	SMA	EMA	ATR	PGO
2017-01-03	28781900	NaN	NaN	NaN	NaN
2017-01-04	21118100	NaN	NaN	NaN	NaN
2017-01-05	22193600	NaN	NaN	NaN	NaN
2017-01-06	31751900	NaN	NaN	NaN	NaN
2017-01-09	33561900	NaN	NaN	NaN	NaN
2017-01-10	24462100	NaN	NaN	NaN	NaN

2017-01-11	27588600	NaN	NaN	NaN	NaN
2017-01-12	27086200	NaN	NaN	NaN	NaN
2017-01-13	26111900	NaN	NaN	NaN	NaN
2017-01-17	34439800	NaN	NaN	NaN	NaN
2017-01-18	23713000	NaN	NaN	NaN	NaN
2017-01-19	25597300	NaN	NaN	NaN	NaN
2017-01-20	32597900	NaN	NaN	NaN	NaN
2017-01-23	22050200	114.222789	114.812533	4.944324	0.256211
2017-01-24	23211000	114.485214	114.898782	5.161497	0.174092
2017-01-25	32377600	114.887786	115.243282	5.298357	0.440324
2017-01-26	26337600	115.253947	115.540761	5.294357	0.382396
2017-01-27	20562900	115.531487	115.792927	5.227481	0.336035
2017-01-30	30377500	115.712850	115.962424	5.107083	0.248180
2017-01-31	49201000	115.866733	116.068289	5.069292	0.166551
2017-02-01	111985000	116.485016	117.156857	5.669695	1.295155
2017-02-02	33710400	117.122534	118.056783	5.772126	1.125067
2017-02-03	24507300	117.812263	118.899988	5.818179	1.088532
2017-02-06	26845900	118.519165	119.783033	5.861308	1.158463
2017-02-07	38183800	119.311940	120.704631	5.982262	1.201873
2017-02-08	23004100	120.154176	121.563802	6.055916	1.129173
2017-02-09	28349900	121.046844	122.428103	6.070823	1.130514
2017-02-10	20065500	121.913319	123.133212	6.044584	0.944135
2017-02-13	23035400	122.868075	123.894163	6.158110	0.955211
2017-02-14	33226200	123.810981	124.776526	6.131211	1.078169
…	…	…	…	…	…
2018-11-15	46478800	202.711329	200.529118	7.735443	-1.661171
2018-11-16	36928300	201.437997	199.387140	7.157585	-1.323591
2018-11-19	41925300	199.546401	197.383033	7.233606	-2.099929
2018-11-20	67825200	196.633089	194.471716	7.178965	-2.937043
2018-11-21	31124200	193.468377	191.922126	7.085848	-2.557010
2018-11-23	23624000	191.026255	189.118659	6.391150	-3.149689
2018-11-26	44998500	189.165073	186.997139	6.232162	-2.560558
2018-11-27	41387400	187.123050	185.108232	6.120292	-2.335299
2018-11-28	46062500	185.119393	184.357286	6.107314	-0.924016
2018-11-29	41770000	183.068974	183.522632	6.230886	-0.797895
2018-11-30	39531500	181.234650	182.670977	6.141368	-0.667510
2018-12-03	40802500	180.572196	182.758147	6.054154	0.454656
2018-12-04	41344300	179.471176	181.758463	6.148780	-0.684797
2018-12-06	43098400	178.615300	180.631531	5.883816	-0.902276
2018-12-07	42281600	176.991402	178.830908	5.848726	-1.686613
2018-12-10	62026000	175.295945	177.417173	5.938012	-1.190307
2018-12-11	47281700	174.075188	176.063647	5.781992	-1.177701
2018-12-12	35627700	173.516886	174.952752	5.482558	-1.055156
2018-12-13	31898600	173.103826	174.234646	5.490860	-0.644138
2018-12-14	40703700	172.621334	172.888856	5.475642	-1.548698
2018-12-17	44287900	171.864649	171.518832	5.542071	-1.669226
2018-12-18	33841500	171.285799	170.613180	5.615380	-1.168106

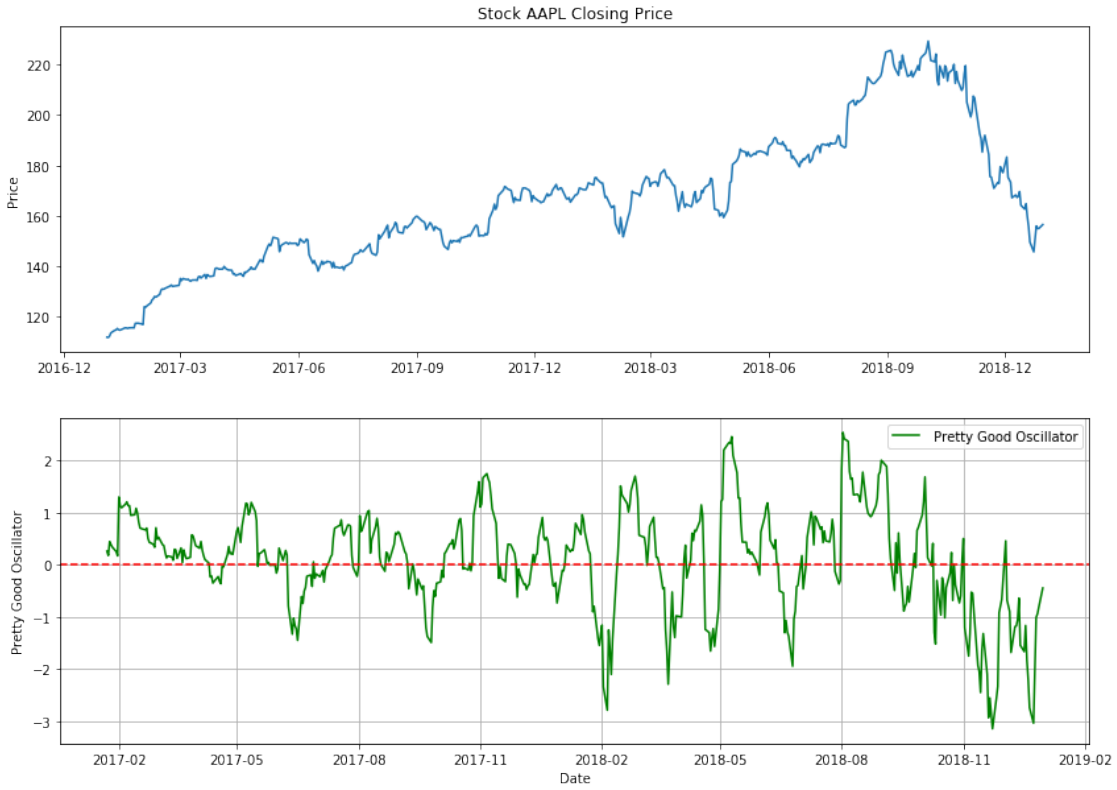
```
2018-12-19   49047300  169.865243  169.143202  5.608262 -1.832456
2018-12-20   64773000  168.255515  167.332267  5.730404 -2.215259
2018-12-21   95744600  166.282324  164.956037  6.103975 -2.747681
2018-12-24   37169200  163.590705  162.380844  5.900777 -3.041737
2018-12-26   58582500  162.207699  161.516523  6.224574 -1.013605
2018-12-27   53117100  160.892001  160.632545  6.357395 -0.944619
2018-12-28   42291400  160.023370  159.877011  6.198823 -0.815854
2018-12-31   35003500  159.183080  159.421921  6.029821 -0.450966

[502 rows x 10 columns]
```

[7]:
```
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')

ax2 = plt.subplot(2, 1, 2)
ax2.plot(df['PGO'], label=' Pretty Good Oscillator', color='green')
ax2.axhline(y=0, color='red', linestyle='--')
ax2.grid()
ax2.set_ylabel('Pretty Good Oscillator')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[7]:
```
<matplotlib.legend.Legend at 0x12f07f69ac8>
```



1.1 Candlestick with Pretty Good Oscillator (PGO)

[8]:
```
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()
```

[8]:

	Date	Open	High	Low	Close	Adj Close	\
0	736332.0	115.800003	116.330002	114.760002	116.150002	111.709831	
1	736333.0	115.849998	116.510002	115.750000	116.019997	111.584778	
2	736334.0	115.919998	116.860001	115.809998	116.610001	112.152229	
3	736335.0	116.779999	118.160004	116.470001	117.910004	113.402542	
4	736338.0	117.949997	119.430000	117.940002	118.989998	114.441246	

	Volume	SMA	EMA	ATR	PGO	VolumePositive
0	28781900	NaN	NaN	NaN	NaN	False

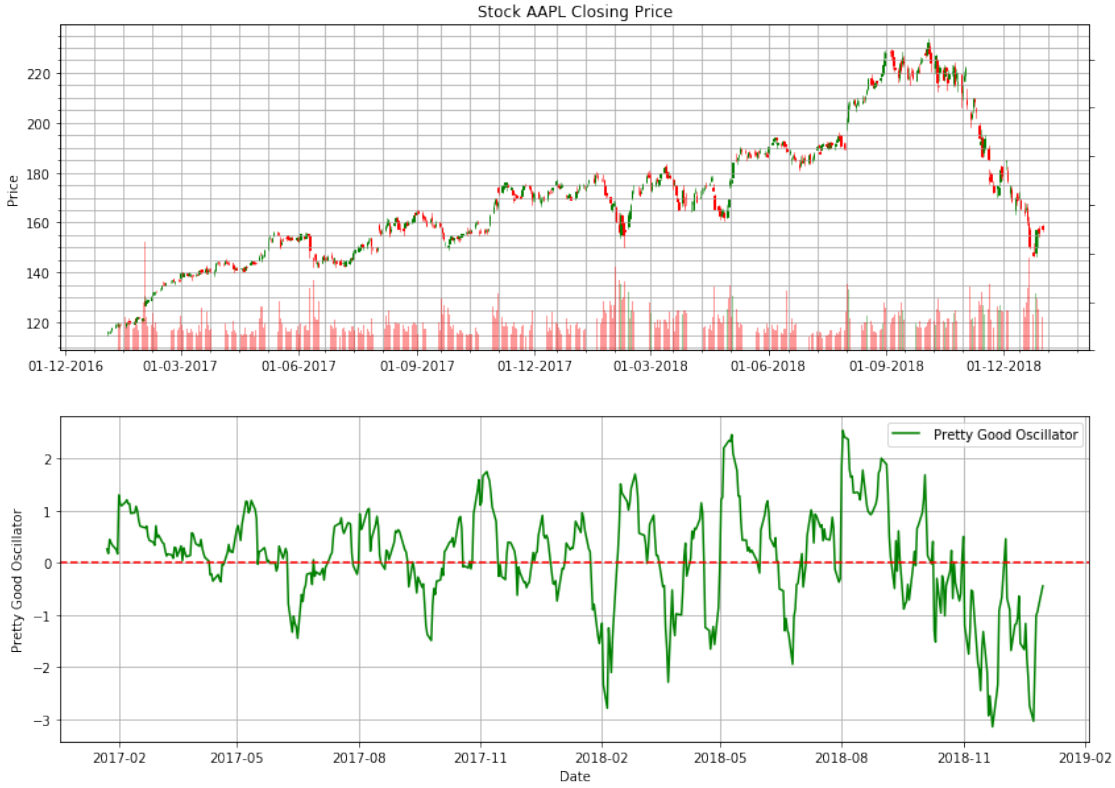
```
1  21118100  NaN  NaN  NaN  NaN          False
2  22193600  NaN  NaN  NaN  NaN          False
3  31751900  NaN  NaN  NaN  NaN          False
4  33561900  NaN  NaN  NaN  NaN          False
```

[9]:
```
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['PGO'], label=' Pretty Good Oscillator', color='green')
ax2.axhline(y=0, color='red', linestyle='--')
ax2.grid()
ax2.set_ylabel('Pretty Good Oscillator')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[9]:
```
<matplotlib.legend.Legend at 0x12f09e097f0>
```


Stock AAPL Closing Price
Price
220
200
180
160
140
120
01-12-2016
01-03-2017
01-06-2017
01-09-2017
01-12-2017
01-03-2018
01-06-2018
01-09-2018
01-12-2018
Pretty Good Oscillator
Pretty Good Oscillator
2
1
0
−1
−2
−3
2017-02
2017-05
2017-08
2017-11
2018-02
2018-05
2018-08
2018-11
2019-02
Date