VAO

September 29, 2021

1 Volume Accumulation Oscillator (VAO)

Volume Accumulation Oscillator (VAO) use for volume times the difference of the current price and the midpoint price. As a result, is used as a divergence indicator with the high and low price.

https://www.marketvolume.com/technicalanalysis/vao.asp

[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 = '2018-08-01'
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
2018-08-01  199.130005  201.759995  197.309998  201.500000  199.243088
2018-08-02  200.580002  208.380005  200.350006  207.389999  205.067123
2018-08-03  207.029999  208.740005  205.479996  207.990005  205.660416
2018-08-06  208.000000  209.250000  207.070007  209.070007  206.728317
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.790268
```

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

[3]:

```
# Create Volume Accumulation Oscillator (VAO) indicator
df['VAO'] = df['Volume'] * (df['Adj Close'] - (df['High']+df['Low'])/2)
df.head()
```

[3]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  199.243088
2018-08-02  200.580002  208.380005  200.350006  207.389999  205.067123
2018-08-03  207.029999  208.740005  205.479996  207.990005  205.660416
2018-08-06  208.000000  209.250000  207.070007  209.070007  206.728317
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.790268

              Volume           VAO
Date
2018-08-01  67935700 -1.983101e+07
2018-08-02  62404000  4.381494e+07
2018-08-03  33447400 -4.848483e+07
2018-08-06  25425400 -3.640120e+07
2018-08-07  25587400 -8.545499e+07
```

[4]:

```
df['Positive'] = df['VAO'] > 0
```

[5]:

```
df['VolumePositive'] = df['Open'] < df['Adj Close']
```

[6]:

```
df.head()
```

[6]:

```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  199.243088
2018-08-02  200.580002  208.380005  200.350006  207.389999  205.067123
2018-08-03  207.029999  208.740005  205.479996  207.990005  205.660416
2018-08-06  208.000000  209.250000  207.070007  209.070007  206.728317
2018-08-07  209.320007  209.500000  206.759995  207.110001  204.790268

              Volume           VAO  Positive  VolumePositive
Date
2018-08-01  67935700 -1.983101e+07     False            True
2018-08-02  62404000  4.381494e+07      True            True
```

```
2018-08-03  33447400 -4.848483e+07     False            False
2018-08-06  25425400 -3.640120e+07     False            False
2018-08-07  25587400 -8.545499e+07     False            False
```

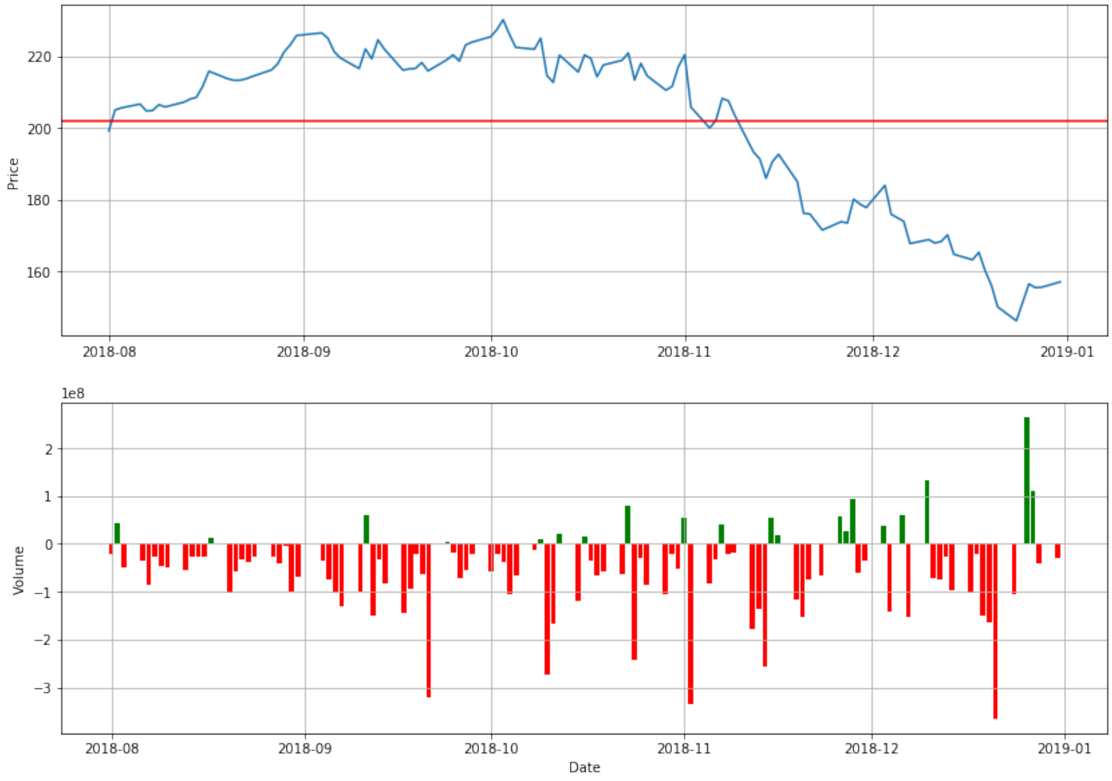
[12]:

```
# Line Chart
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
ax1.plot(df.index, df['Adj Close'])
ax1.axhline(y=df['Adj Close'].mean(),color='r')
ax1.grid()
ax1.set_ylabel('Price')

ax2 = plt.subplot(2, 1, 2)
ax2.bar(df.index, df['VAO'], color=df.Positive.map({True: 'g', False: 'r'}))
ax2.grid()
ax2.set_ylabel('VAO')
ax2.set_xlabel('Date')
```

[12]:

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



[8]:

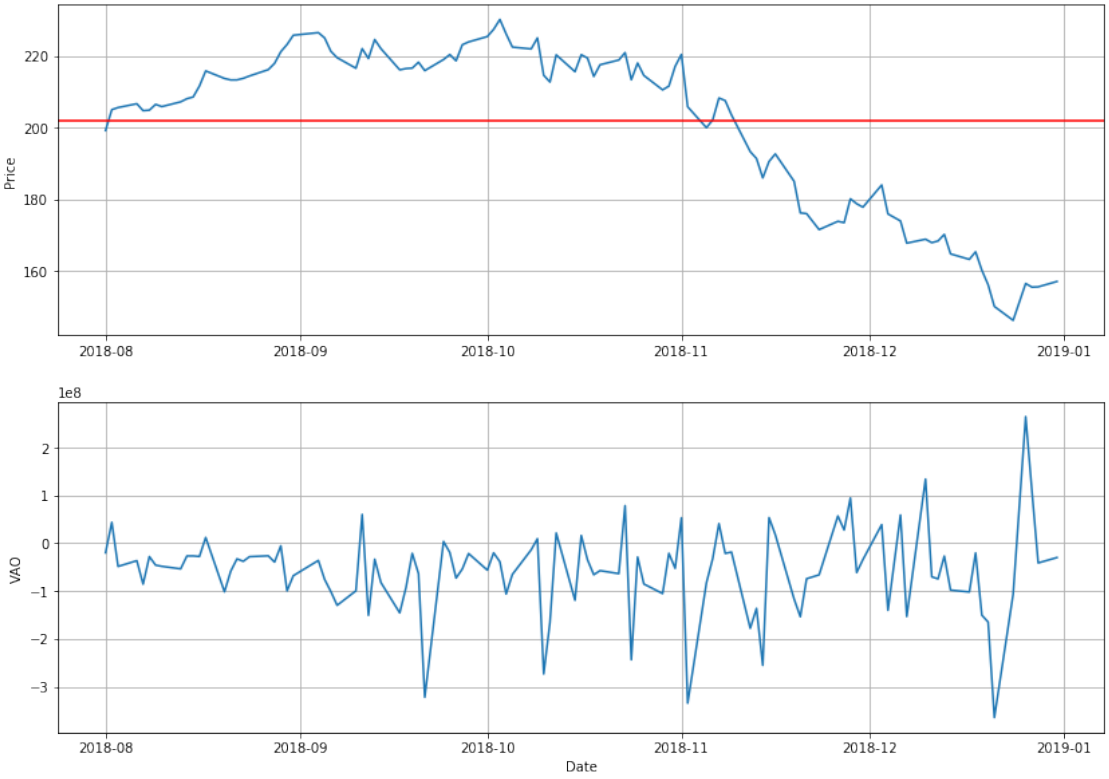
```
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
```

```
ax1.plot(df.index, df['Adj Close'])
ax1.axhline(y=df['Adj Close'].mean(),color='r')
ax1.grid()
ax1.set_ylabel('Price')

ax2 = plt.subplot(2, 1, 2)
ax2.plot(df.index, df['VAO'])
ax2.grid()
ax2.set_ylabel('VAO')
ax2.set_xlabel('Date')
```

[8]:

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



1.1 Candlestick with VAO

[9]:

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

dfc = df.copy()
dfc['VAO'] = dfc['Volume'] * (dfc['Adj Close'] - (dfc['High']+dfc['Low'])/2)
dfc['Positive'] = dfc['VAO'] > 0
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()
```

[9]:

```
       Date        Open        High         Low       Close   Adj Close  \
0  736907.0  199.130005  201.759995  197.309998  201.500000  199.243088
1  736908.0  200.580002  208.380005  200.350006  207.389999  205.067123
2  736909.0  207.029999  208.740005  205.479996  207.990005  205.660416
3  736912.0  208.000000  209.250000  207.070007  209.070007  206.728317
4  736913.0  209.320007  209.500000  206.759995  207.110001  204.790268

     Volume           VAO  Positive  VolumePositive
0  67935700 -1.983101e+07     False            True
1  62404000  4.381494e+07      True            True
2  33447400 -4.848483e+07     False           False
3  25425400 -3.640120e+07     False           False
4  25587400 -8.545499e+07     False           False
```

[13]:

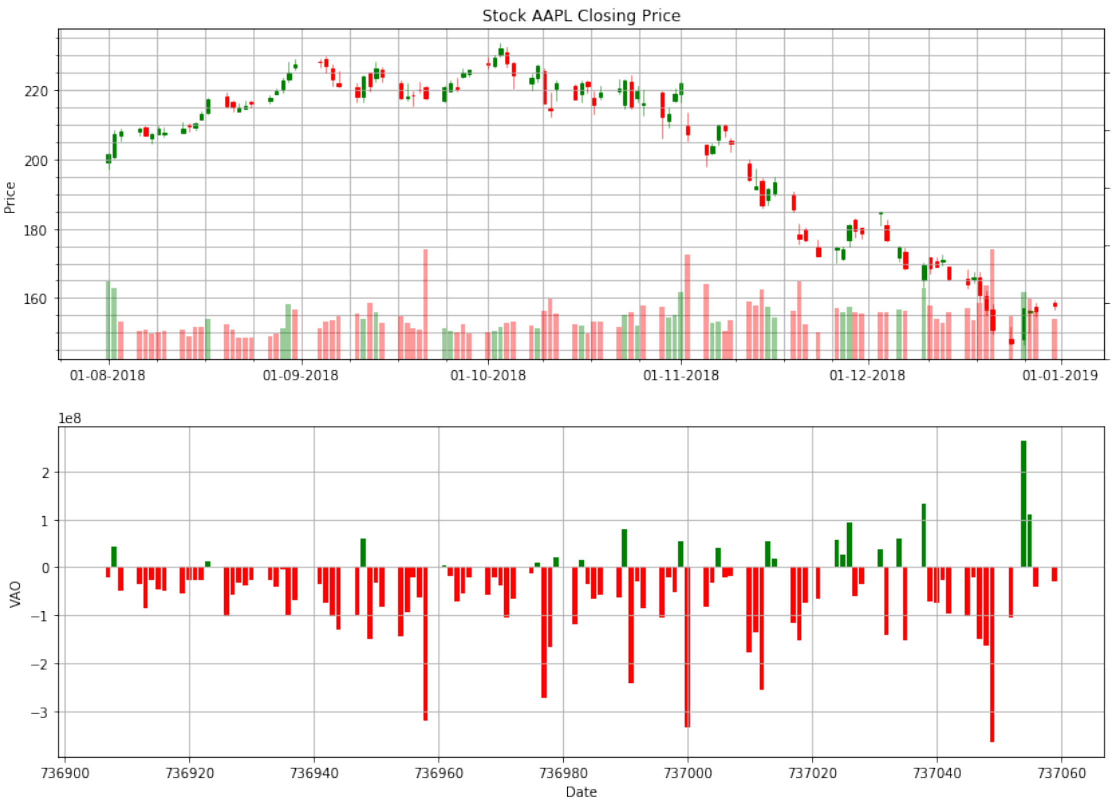
```
from mpl_finance import candlestick_ohlc

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.bar(dfc.Date, dfc['VAO'], color=dfc.Positive.map({True: 'g', False: 'r'}))
ax2.grid()
ax2.set_ylabel('VAO')
ax2.set_xlabel('Date')
```

[13]:

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



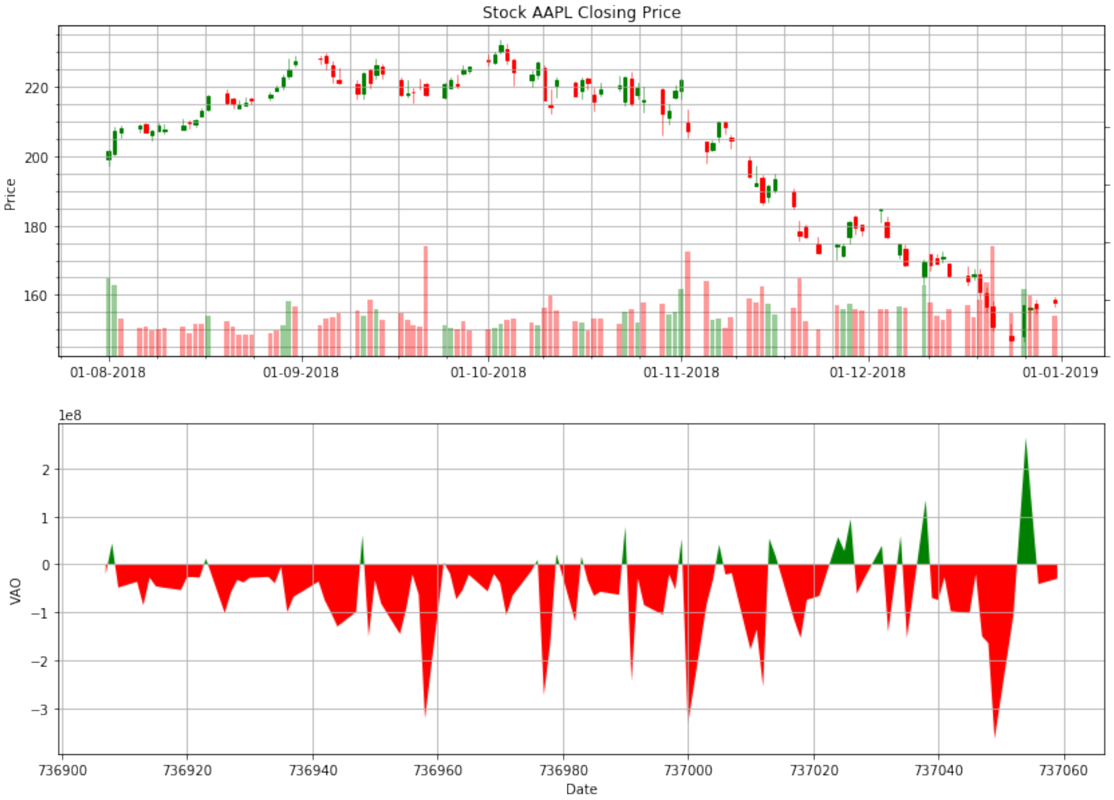
[17]:

```
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.fill_between(dfc.Date, dfc['VAO'],where= dfc['VAO'] >= 0,
                 facecolor='green', interpolate=True)
ax2.fill_between(dfc.Date, dfc['VAO'],where= dfc['VAO'] <= 0,
                 facecolor='red', interpolate=True)
```

```
ax2.grid()
ax2.set_ylabel('VAO')
ax2.set_xlabel('Date')
```

[17]: Text(0.5,0,'Date')


Stock AAPL Closing Price
Price
1e8
VAO
Date