# PVI

September 29, 2021

## 1 Positive Volume Index (PVI)

https://www.investopedia.com/terms/p/pvi.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]:

| Date | Open | High | Low | Close | Adj Close | Volume |
|---|---|---|---|---|---|---|
| 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 | |

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

[3]:
```
returns = df['Adj Close'].pct_change()
vol_increase = (df['Volume'].shift(1) < df['Volume'])

pvi = pd.Series(data=np.nan, index=df['Adj Close'].index, dtype='float64')

pvi.iloc[0] = 1000
for i in range(1,len(pvi)):
    if vol_increase.iloc[i]:
        pvi.iloc[i] = pvi.iloc[i - 1] * (1.0 + returns.iloc[i])
    else:
        pvi.iloc[i] = pvi.iloc[i - 1]

pvi = pvi.replace([np.inf, -np.inf], np.nan).fillna(1000)

df['PVI'] = pd.Series(pvi)
```

[4]:
```
df.head()
```

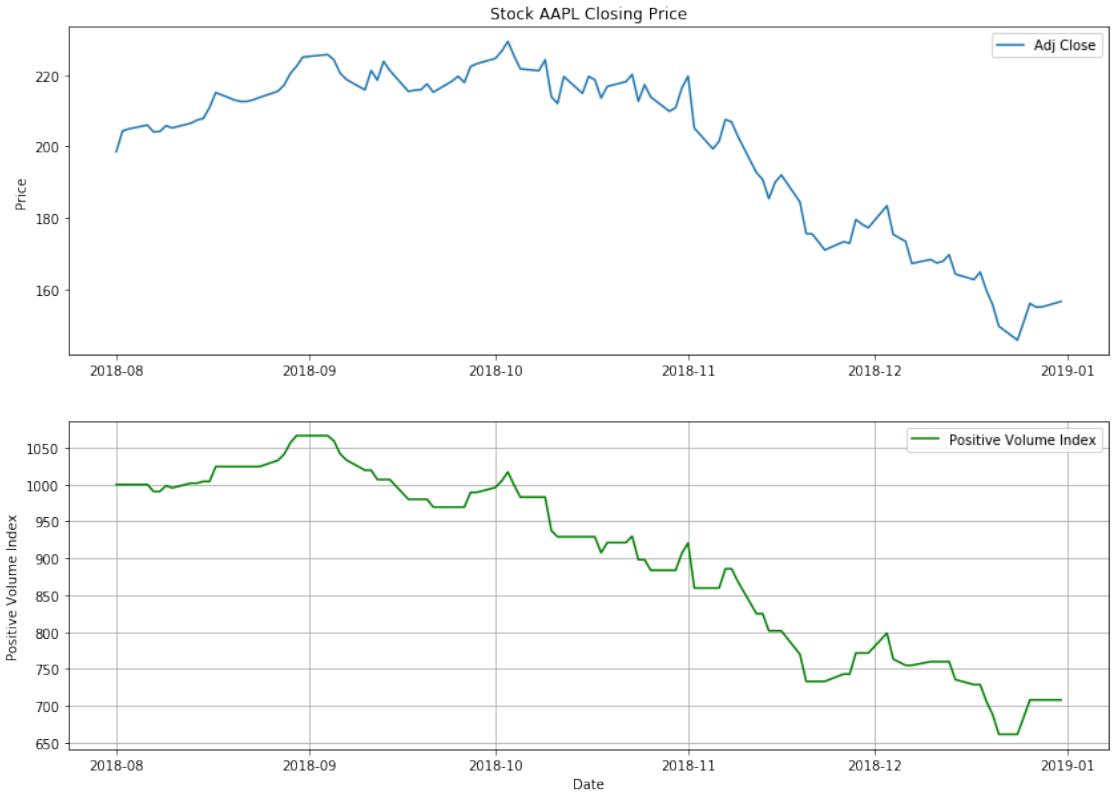
[4]:

| Date | Open | High | Low | Close | Adj Close | Volume | PVI |
|---|---|---|---|---|---|---|---|
| 2018-08-01 | 199.130005 | 201.759995 | 197.309998 | 201.500000 | 198.478760 | 67935700 | 1000.000000 |
| 2018-08-02 | 200.580002 | 208.380005 | 200.350006 | 207.389999 | 204.280457 | 62404000 | 1000.000000 |
| 2018-08-03 | 207.029999 | 208.740005 | 205.479996 | 207.990005 | 204.871445 | 33447400 | 1000.000000 |
| 2018-08-06 | 208.000000 | 209.250000 | 207.070007 | 209.070007 | 205.935257 | 25425400 | 1000.000000 |
| 2018-08-07 | 209.320007 | 209.500000 | 206.759995 | 207.110001 | 204.004639 | 25587400 | 990.625122 |

[5]:
```
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['PVI'], label='Positive Volume Index', color='green')
ax2.grid()
ax2.legend(loc='best')
ax2.set_ylabel('Positive Volume Index')
ax2.set_xlabel('Date')
```

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




## 1.1 Candlestick with Postive Volume Index

[6]:
```
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()
```

[6]:

| | 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 | |

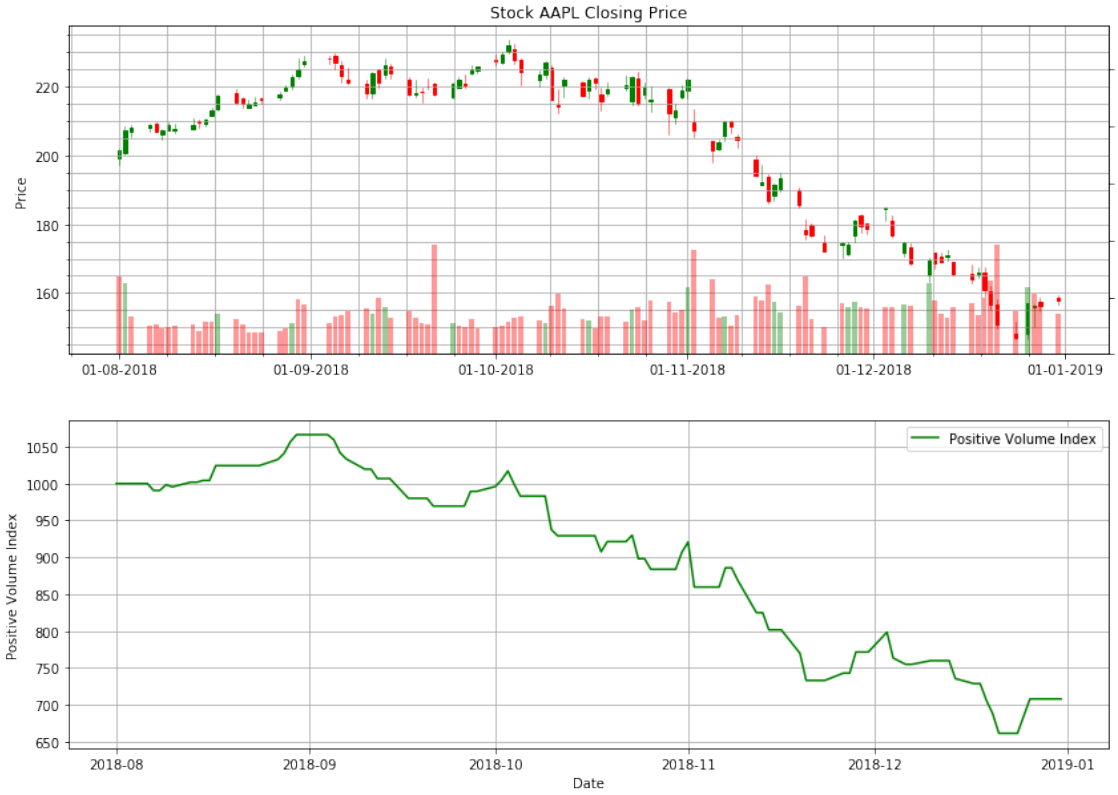
| | Volume | PVI | VolumePositive |
|---|---|---|---|
| 0 | 67935700 | 1000.000000 | False |
| 1 | 62404000 | 1000.000000 | True |
| 2 | 33447400 | 1000.000000 | False |
| 3 | 25425400 | 1000.000000 | False |
| 4 | 25587400 | 990.625122 | False |

[7]:
```
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['PVI'], label='Positive Volume Index', color='green')
ax2.grid()
ax2.legend(loc='best')
ax2.set_ylabel('Positive Volume Index')
ax2.set_xlabel('Date')
```

[7]:
```
Text(0.5,0,'Date')
```


Stock AAPL Closing Price
Price
220
200
180
160
01-08-2018
01-09-2018
01-10-2018
01-11-2018
01-12-2018
01-01-2019
Positive Volume Index
Positive Volume Index
1050
1000
950
900
850
800
750
700
650
2018-08
2018-09
2018-10
2018-11
2018-12
2019-01
Date