WMA

September 29, 2021

1 Weighted Moving Average (WMA)

[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
```

https://www.investopedia.com/ask/answers/071414/whats-difference-between-moving-average-and-weighted-moving-average.asp

https://www.thebalance.com/simple-exponential-and-weighted-moving-averages-1031196

[3]:

```
def WMA(data, n):

    ws = np.zeros(data.shape[0])
    t_sum = sum(range(1, n+1))

    for i in range(n-1, data.shape[0]):
        ws[i] = sum(data[i-n+1 : i+1] * np.linspace(1, n, n))/ t_sum

    return ws
```

[4]:

```
df['WMA'] = WMA(df['Adj Close'], 5)
df.head()
```

[4]:

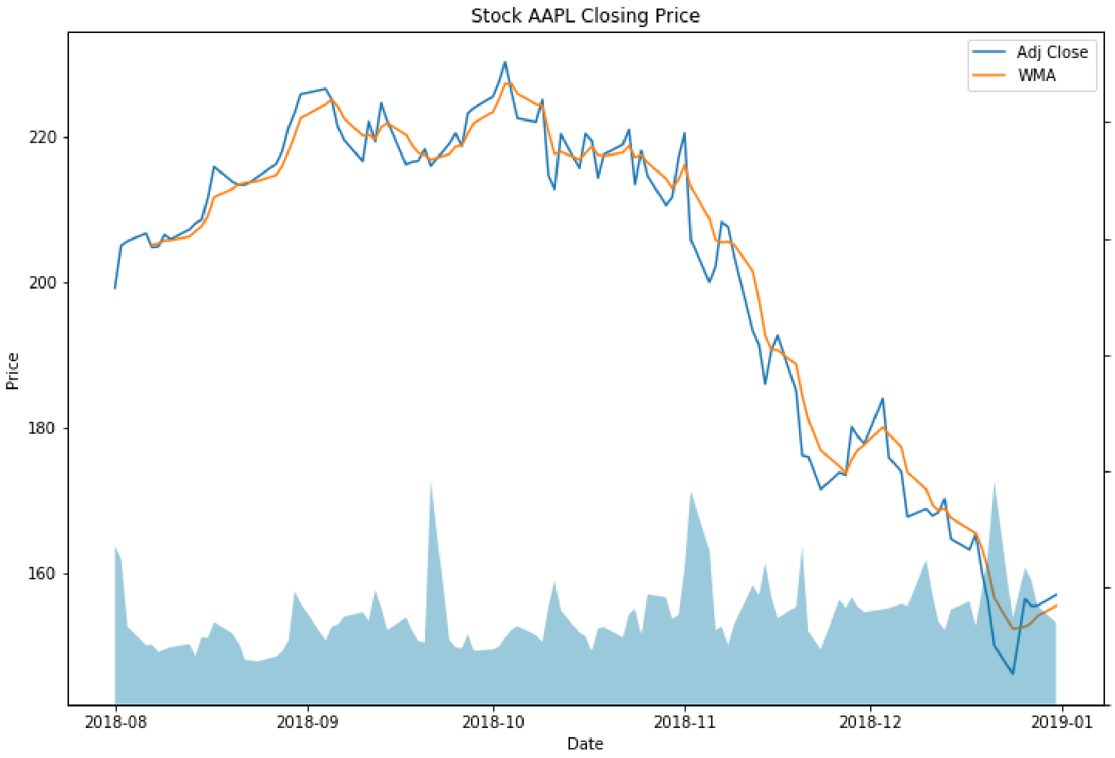
```
                  Open        High         Low       Close   Adj Close  \
Date
2018-08-01  199.130005  201.759995  197.309998  201.500000  199.243088
2018-08-02  200.580002  208.380005  200.350006  207.389999  205.067123
2018-08-03  207.029999  208.740005  205.479996  207.990005  205.660416
2018-08-06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

              Volume         WMA
Date
2018-08-01  67935700    0.000000
2018-08-02  62404000    0.000000
2018-08-03  33447400    0.000000
2018-08-06  25425400    0.000000
2018-08-07  25587400  205.148213
```

[5]:

```
# Line Chart
fig = plt.figure(figsize=(12,8))
ax1 = plt.subplot(111)
ax1.plot(df.index, df['Adj Close'])
ax1.plot(df.index[4:], df['WMA'][4:])
ax1v = ax1.twinx()
ax1v.fill_between(df.index[0:],0, df.Volume[0:], facecolor='#0079a3', 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')
ax1.set_xlabel('Date')
ax1.legend(loc='best')
```

```
[5]: <matplotlib.legend.Legend at 0x246d782ba58>
```



2 Candlestick with WMA

```
[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  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         WMA  VolumePositive
0  67935700    0.000000            True
1  62404000    0.000000            True
2  33447400    0.000000           False
3  25425400    0.000000           False
4  25587400  205.148213           False
```

[7]:

```
dfc = dfc.iloc[4:]
dfc.head()
```

[7]:

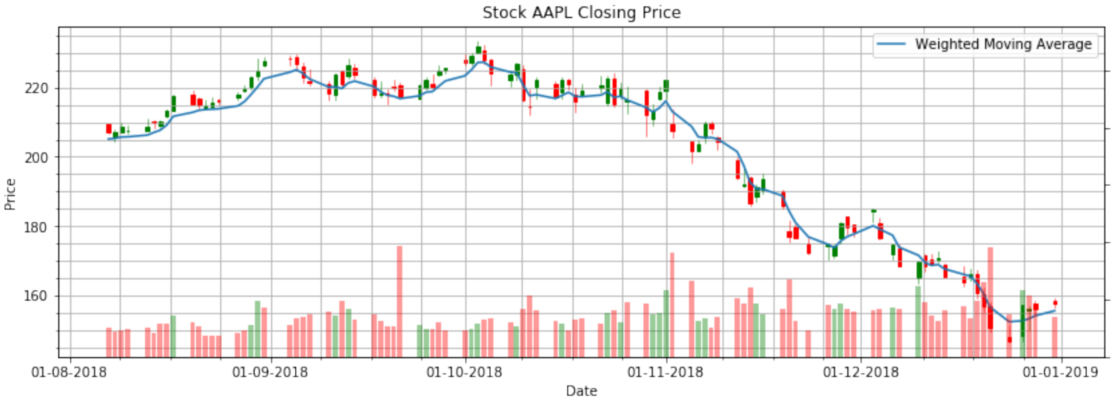
```
       Date        Open        High         Low       Close   Adj Close  \
4  736913.0  209.320007  209.500000  206.759995  207.110001  204.790268
5  736914.0  206.050003  207.809998  204.520004  207.250000  204.928696
6  736915.0  207.279999  209.779999  207.199997  208.880005  206.540436
7  736916.0  207.360001  209.100006  206.669998  207.529999  205.925232
8  736919.0  207.699997  210.949997  207.699997  208.869995  207.254883

     Volume         WMA  VolumePositive
4  25587400  205.148213           False
5  22525500  205.358497           False
6  23469200  205.726988           False
7  24611200  205.792190           False
8  25869100  206.282954           False
```

[8]:

```
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(dfc.Date, dfc['WMA'], label='Weighted Moving Average')
ax1.set_title('Stock '+ symbol +' Closing Price')
ax1.set_ylabel('Price')
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*dfc.Volume.max())
ax1.set_title('Stock '+ symbol +' Closing Price')
```

```
ax1.set_ylabel('Price')
ax1.set_xlabel('Date')
ax1.legend(loc='best')
```

```
[8]: <matplotlib.legend.Legend at 0x246d7bfd128>
```


Stock AAPL Closing Price
Weighted Moving Average
Price
Date