# EWMA_Triple

September 29, 2021

## 1 Triple Exponential Weighted Moving Average

[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 = '2018-01-01'
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 |
|---|---|---|---|---|---|---|
| 2018-01-02 | 170.160004 | 172.300003 | 169.259995 | 172.259995 | 168.339050 | 25555900 |
| 2018-01-03 | 172.529999 | 174.550003 | 171.960007 | 172.229996 | 168.309738 | |
| 2018-01-04 | 172.539993 | 173.470001 | 172.080002 | 173.029999 | 169.091522 | |
| 2018-01-05 | 173.440002 | 175.369995 | 173.050003 | 175.000000 | 171.016678 | |
| 2018-01-08 | 174.350006 | 175.610001 | 173.929993 | 174.350006 | 170.381485 | |

```
2018-01-03  29517900
2018-01-04  22434600
2018-01-05  23660000
2018-01-08  20567800
```

[3]:
```
n = 7
ewma = df['Adj Close'].ewm(ignore_na=False, min_periods=n - 1,
span=n).mean()
triple_ema = 3 * ewma
ema_ema_ema = ewma.ewm(ignore_na=False, span=n).mean().ewm(ignore_na=False,␣
 ↪span=n).mean()
```

[4]:
```
df['TEWMA'] = triple_ema - 3 * ewma.ewm(ignore_na=False,min_periods=n -␣
 ↪1,span=n).mean() + ema_ema_ema
```

[5]:
```
df.head(20)
```

[5]:

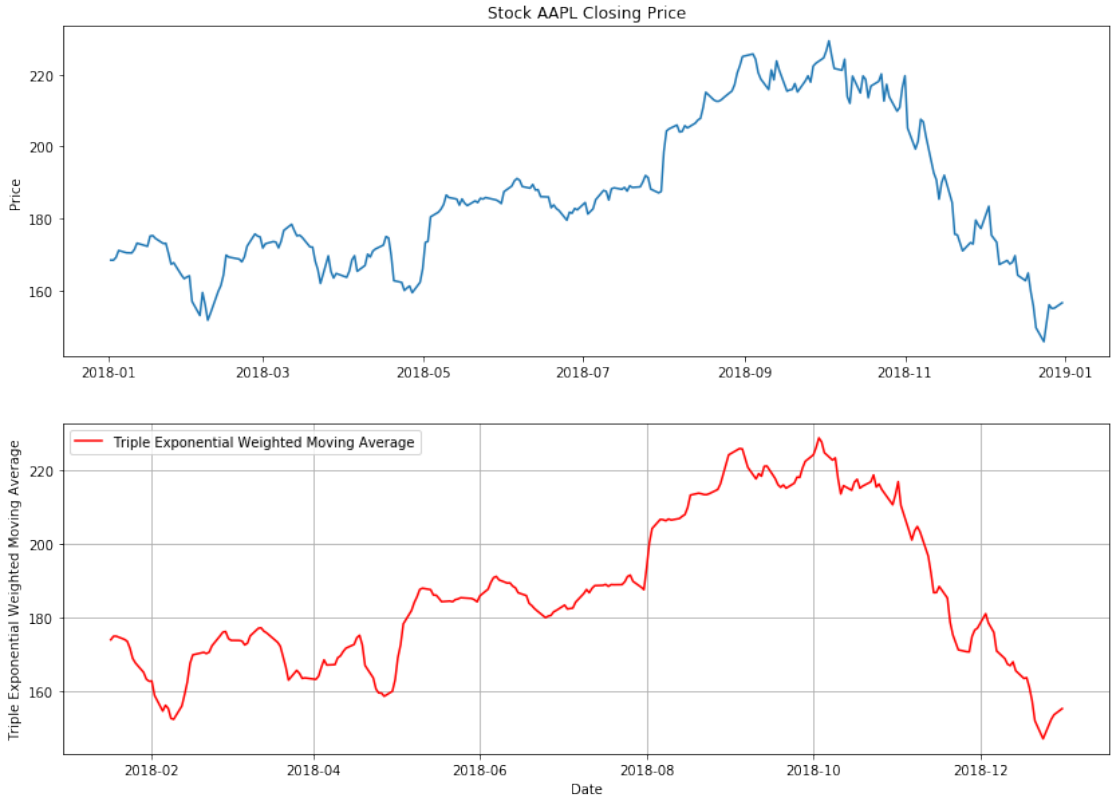
| Date | Open | High | Low | Close | Adj Close | Volume | TEWMA |
|---|---|---|---|---|---|---|---|
| 2018-01-02 | 170.160004 | 172.300003 | 169.259995 | 172.259995 | 168.339050 | 25555900 | NaN |
| 2018-01-03 | 172.529999 | 174.550003 | 171.960007 | 172.229996 | 168.309738 | 29517900 | NaN |
| 2018-01-04 | 172.539993 | 173.470001 | 172.080002 | 173.029999 | 169.091522 | 22434600 | NaN |
| 2018-01-05 | 173.440002 | 175.369995 | 173.050003 | 175.000000 | 171.016678 | 23660000 | NaN |
| 2018-01-08 | 174.350006 | 175.610001 | 173.929993 | 174.350006 | 170.381485 | 20567800 | NaN |
| 2018-01-09 | 174.550003 | 175.059998 | 173.410004 | 174.330002 | 170.361954 | | |
| 2018-01-10 | 173.160004 | 174.300003 | 173.000000 | 174.289993 | 170.322845 | | |
| 2018-01-11 | 174.589996 | 175.490005 | 174.490005 | 175.279999 | 171.290329 | | |
| 2018-01-12 | 176.179993 | 177.360001 | 175.649994 | 177.089996 | 173.059113 | | |
| 2018-01-16 | 177.899994 | 179.389999 | 176.139999 | 176.190002 | 172.179611 | | |
| 2018-01-17 | 176.149994 | 179.250000 | 175.070007 | 179.100006 | 175.023361 | | |
| 2018-01-18 | 179.369995 | 180.100006 | 178.250000 | 179.259995 | 175.179718 | | |
| 2018-01-19 | 178.610001 | 179.580002 | 177.410004 | 178.460007 | 174.397949 | | |
| 2018-01-22 | 177.300003 | 177.779999 | 176.600006 | 177.000000 | 172.971176 | | |
| 2018-01-23 | 177.300003 | 179.440002 | 176.820007 | 177.039993 | 173.010254 | | |
| 2018-01-24 | 177.250000 | 177.300003 | 173.199997 | 174.220001 | 170.254440 | | |
| 2018-01-25 | 174.509995 | 174.949997 | 170.529999 | 171.110001 | 167.215210 | | |
| 2018-01-26 | 172.000000 | 172.000000 | 170.059998 | 171.509995 | 167.606140 | | |
| 2018-01-29 | 170.160004 | 170.160004 | 167.070007 | 167.960007 | 164.136932 | | |
| 2018-01-30 | 165.529999 | 167.369995 | 164.699997 | 166.970001 | 163.169464 | | |

```
2018-01-09  21584000         NaN
2018-01-10  23959900         NaN
2018-01-11  18667700         NaN
2018-01-12  25418100         NaN
2018-01-16  29565900         NaN
2018-01-17  34386800  173.888189
2018-01-18  31193400  174.846128
2018-01-19  32425100  174.856371
2018-01-22  27108600  173.980375
2018-01-23  32689100  173.482252
2018-01-24  51105100  171.601153
2018-01-25  41529000  168.823052
2018-01-26  39143000  167.583818
2018-01-29  50640400  165.010548
2018-01-30  46048200  163.169467
```

[6]:
```
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['TEWMA'], label='Triple Exponential Weighted Moving Average',␣
↪color='red')
#ax2.axhline(y=0, color='blue', linestyle='--')
#ax2.axhline(y=0.5, color='darkblue')
#ax2.axhline(y=-0.5, color='darkblue')
ax2.grid()
ax2.set_ylabel('Triple Exponential Weighted Moving Average')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[6]:
```
<matplotlib.legend.Legend at 0x2177e8f1518>
```




### 1.1 Candlestick with Triple Exponential Weighted Moving Average

[7]:
```
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'] = pd.to_datetime(dfc['Date'])
dfc['Date'] = dfc['Date'].apply(mdates.date2num)
dfc.head()
```

[7]:

| | Date | Open | High | Low | Close | Adj Close | \ |
|---|---|---|---|---|---|---|---|
| 0 | 736696.0 | 170.160004 | 172.300003 | 169.259995 | 172.259995 | 168.339050 | |
| 1 | 736697.0 | 172.529999 | 174.550003 | 171.960007 | 172.229996 | 168.309738 | |
| 2 | 736698.0 | 172.539993 | 173.470001 | 172.080002 | 173.029999 | 169.091522 | |
| 3 | 736699.0 | 173.440002 | 175.369995 | 173.050003 | 175.000000 | 171.016678 | |
| 4 | 736702.0 | 174.350006 | 175.610001 | 173.929993 | 174.350006 | 170.381485 | |

| | Volume | TEWMA | VolumePositive |
|---|---|---|---|

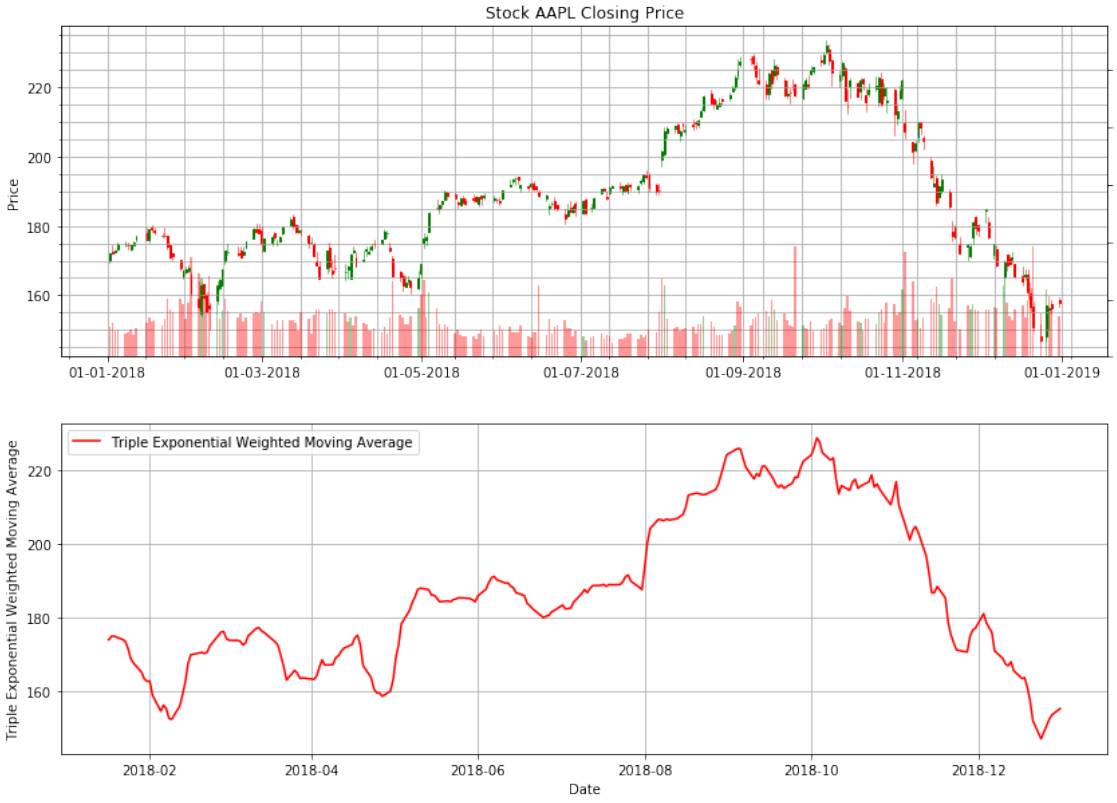
```
0  25555900    NaN           False
1  29517900    NaN           False
2  22434600    NaN           False
3  23660000    NaN           False
4  20567800    NaN           False
```

[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.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['TEWMA'], label='Triple Exponential Weighted Moving Average',␣
↪color='red')
#ax2.axhline(y=0, color='blue', linestyle='--')
#ax2.axhline(y=0.5, color='darkblue')
#ax2.axhline(y=-0.5, color='darkblue')
ax2.grid()
ax2.set_ylabel('Triple Exponential Weighted Moving Average')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[8]:
```
<matplotlib.legend.Legend at 0x21700127e10>
```


Stock AAPL Closing Price
Price
220
200
180
160
01-01-2018
01-03-2018
01-05-2018
01-07-2018
01-09-2018
01-11-2018
01-01-2019
Triple Exponential Weighted Moving Average
Triple Exponential Weighted Moving Average
220
200
180
160
2018-02
2018-04
2018-06
2018-08
2018-10
2018-12
Date