EMA

September 29, 2021

1 Exponential Moving Average (EMA)

https://www.investopedia.com/terms/e/ema.asp

```python
[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()
```

```python
[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]:                  Open        High         Low       Close    Adj Close  \
     Date
     2017-01-03  115.800003  116.330002  114.760002  116.150002  112.140007
     2017-01-04  115.849998  116.510002  115.750000  116.019997  112.014503
     2017-01-05  115.919998  116.860001  115.809998  116.610001  112.584129
     2017-01-06  116.779999  118.160004  116.470001  117.910004  113.839249
     2017-01-09  117.949997  119.430000  117.940002  118.989998  114.881950

                     Volume
     Date
```

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

[3]:
```python
n = 15
df['EMA'] = df['Adj Close'].
 ↪ewm(ignore_na=False,span=n,min_periods=n,adjust=True).mean()
```
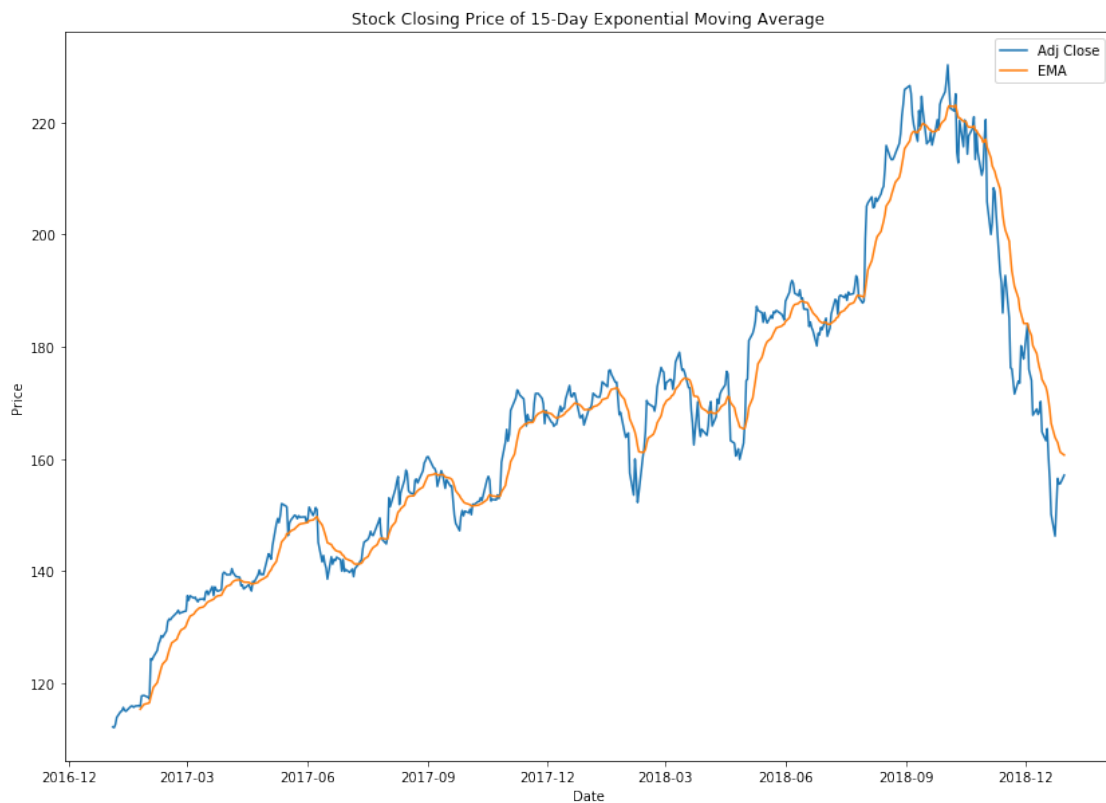
[4]:
```python
plt.figure(figsize=(14,10))
plt.plot(df['Adj Close'])
plt.plot(df['EMA'])
plt.ylabel('Price')
plt.xlabel('Date')
plt.title('Stock Closing Price of ' + str(n) + '-Day Exponential Moving␣
 ↪Average')
plt.legend(loc='best')
```

[4]: <matplotlib.legend.Legend at 0x1b47a023278>

1.1 Candlestick with EMA

```
[5]: 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()
```

```
[5]:        Date        Open        High         Low       Close    Adj Close  \
     0  736332.0  115.800003  116.330002  114.760002  116.150002  112.140007
     1  736333.0  115.849998  116.510002  115.750000  116.019997  112.014503
     2  736334.0  115.919998  116.860001  115.809998  116.610001  112.584129
     3  736335.0  116.779999  118.160004  116.470001  117.910004  113.839249
     4  736338.0  117.949997  119.430000  117.940002  118.989998  114.881950

          Volume  EMA  VolumePositive
     0  28781900  NaN           False
     1  21118100  NaN           False
     2  22193600  NaN           False
     3  31751900  NaN           False
     4  33561900  NaN           False
```

```
[6]: 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(df['EMA'], label='EMA')
     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.legend(loc='best')
     ax1.set_ylabel('Price')
     ax1.set_xlabel('Date')
```

Stock AAPL Closing Price