MACD

September 29, 2021

1 Moving Average Convergence Divergence (MACD)

Moving Average Convergence Divergence (MACD) is a trend indicator. MACD fast line is usually 12-period moving average while MACD slow line is usually 26-period moving average. The difference between the MACD fast and slow lines is the signal line.

[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 = '2016-01-01'
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
2016-01-04	102.610001	105.370003	102.000000	105.349998	99.499107
2016-01-05	105.750000	105.849998	102.410004	102.709999	97.005730
2016-01-06	100.559998	102.370003	99.870003	100.699997	95.107361
2016-01-07	98.680000	100.129997	96.430000	96.449997	91.093399
2016-01-08	98.550003	99.110001	96.760002	96.959999	91.575073

```
               Volume
Date
2016-01-04  67649400
2016-01-05  55791000
2016-01-06  68457400
2016-01-07  81094400
2016-01-08  70798000
```

[3]:
```
import talib as ta
```

[4]:
```
df['macd'], df['macdsignal'], df['macdhist'] = ta.MACD(df['Adj Close'],␣
↪fastperiod=12, slowperiod=26, signalperiod=9)
```

[5]:
```
df.tail()
```

[5]:
```
                 Open        High         Low       Close   Adj Close  \
Date
2018-12-24  148.149994  151.550003  146.589996  146.830002  146.202972
2018-12-26  148.300003  157.229996  146.720001  157.169998  156.498810
2018-12-27  155.839996  156.770004  150.070007  156.149994  155.483154
2018-12-28  157.500000  158.520004  154.550003  156.229996  155.562820
2018-12-31  158.529999  159.360001  156.479996  157.740005  157.066376

               Volume       macd  macdsignal  macdhist
Date
2018-12-24  37169200 -10.368121   -9.225511 -1.142611
2018-12-26  58582500  -9.986672   -9.377743 -0.608929
2018-12-27  53117100  -9.655028   -9.433200 -0.221828
2018-12-28  42291400  -9.278809   -9.402322  0.123513
2018-12-31  35003500  -8.758367   -9.273531  0.515163
```

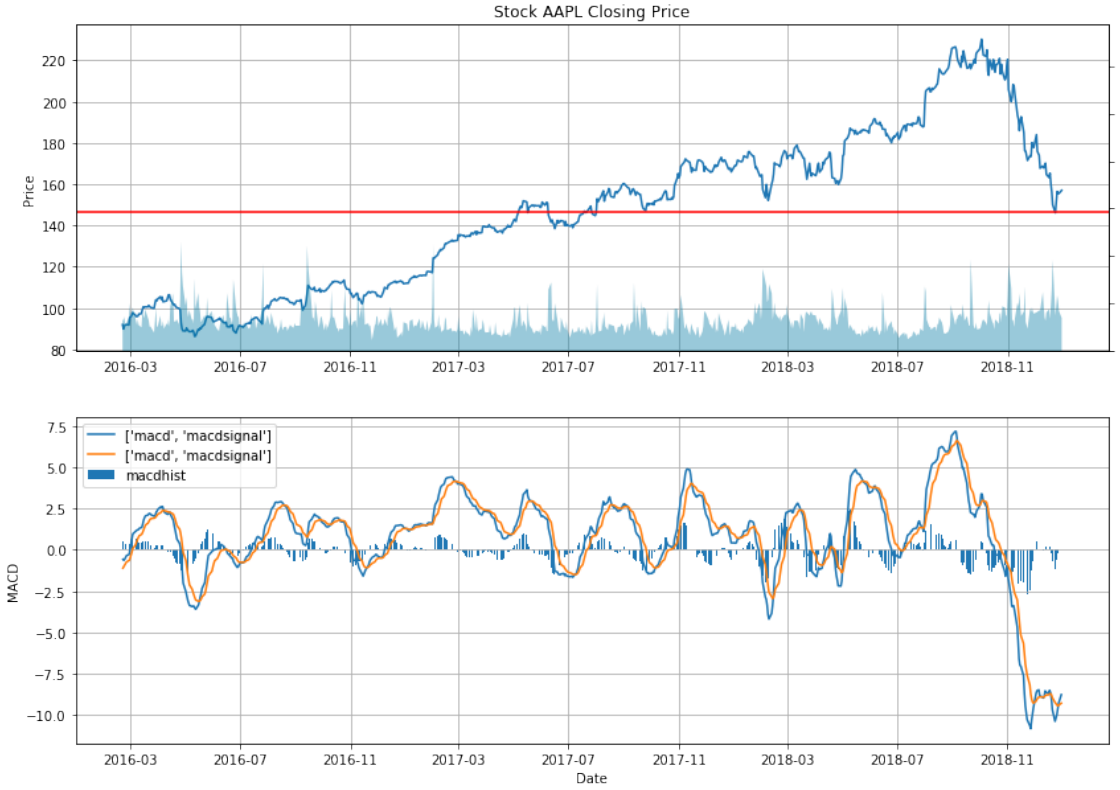
[6]:
```
df = df.dropna()
```

[7]:
```
# 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.grid(True, which='both')
#ax1.grid(which='minor', linestyle='-', linewidth='0.5', color='black')
#ax1.grid(which='major', linestyle='-', linewidth='0.5', color='red')
#ax1.minorticks_on()
#ax1.legend(loc='best')
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')

labels = ['macd','macdsignal']
ax2 = plt.subplot(2, 1, 2)
ax2.plot(df[['macd','macdsignal']], label=labels)
ax2.bar(df.index, df['macdhist'], label='macdhist')
ax2.grid()
ax2.set_ylabel('MACD')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[7]: <matplotlib.legend.Legend at 0x1f40a70eda0>

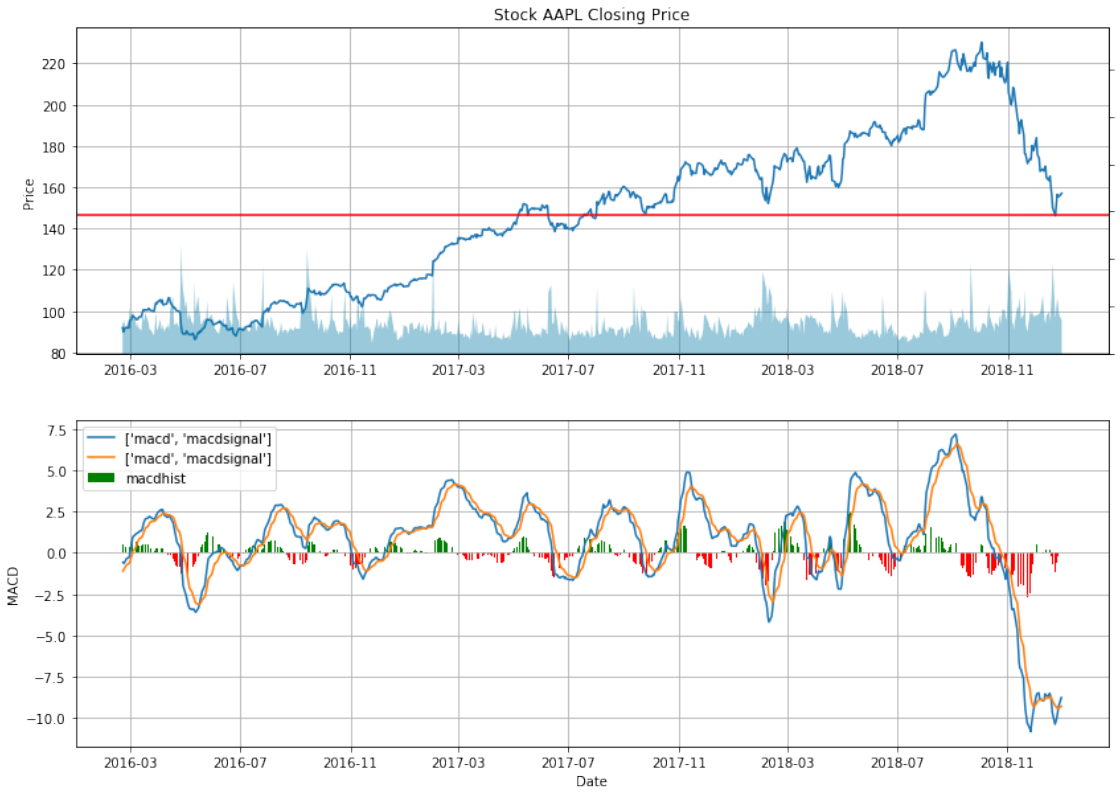


[8]:
```
# Line Chart
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(2, 1, 1)
ax1.plot(df.index, df['Adj Close'])
ax1.axhline(y=df['Adj Close'].mean(),color='r')
ax1.grid()
#ax1.grid(True, which='both')
```

```
#ax1.grid(which='minor', linestyle='-', linewidth='0.5', color='black')
#ax1.grid(which='major', linestyle='-', linewidth='0.5', color='red')
#ax1.minorticks_on()
#ax1.legend(loc='best')
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')

labels = ['macd','macdsignal']
ax2 = plt.subplot(2, 1, 2)
df['positive'] = df['macdhist'] > 0
ax2.plot(df[['macd','macdsignal']], label=labels)
ax2.bar(df.index, df['macdhist'], color=df.positive.map({True: 'g', False:␣
↪'r'}), label='macdhist')
ax2.grid()
ax2.set_ylabel('MACD')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[8]: <matplotlib.legend.Legend at 0x1f40c42cef0>



1.1 Candlestick with MACD

[9]:
```
from matplotlib import dates as mdates
import datetime as dt

dfc = df.copy()
dfc['macd'], dfc['macdsignal'], dfc['macdhist'] = ta.MACD(dfc['Adj Close'],␣
↪fastperiod=12, slowperiod=26, signalperiod=9)
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	736062.0	108.910004	109.769997	108.169998	108.660004	103.182144	
1	736065.0	108.970001	110.610001	108.830002	109.019997	103.523987	
2	736066.0	109.339996	110.500000	108.660004	110.440002	104.872406	
3	736067.0	110.800003	112.339996	110.800003	112.040001	106.391754	
4	736068.0	111.620003	112.389999	111.330002	112.099998	106.448715	

	Volume	macd	macdsignal	macdhist	positive	VolumePositive
0	23581700	2.784154	3.152633	-0.368478	False	False
1	29407500	2.618614	3.045829	-0.427215	False	False
2	27232300	2.566642	2.949992	-0.383349	False	False
3	33257300	2.617876	2.883568	-0.265693	False	False
4	25473900	2.632726	2.833400	-0.200674	False	False

[10]:
```
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()
ax1v.fill_between(dfc.Date, 0, dfc.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')
```

```
labels = ['macd','macdsignal']
ax2 = plt.subplot(2, 1, 2)
ax2.plot(df[['macd','macdsignal']], label=labels)
ax2.bar(df.index, df['macdhist'], label='macdhist')
ax2.grid()
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[10]:
```
<matplotlib.legend.Legend at 0x1f40e046eb8>
```

[ ]:
```
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')

labels = ['macd','macdsignal']
ax2 = plt.subplot(2, 1, 2)
df['positive'] = df['macdhist'] > 0
ax2.plot(df[['macd','macdsignal']], label=labels)
ax2.bar(df.index, df['macdhist'], color=df.positive.map({True: 'g', False:␣
↪'r'}), label='macdhist')
ax2.grid()
ax2.set_ylabel('MACD')
ax2.set_xlabel('Date')
ax2.legend(loc='best')
```

[ ]:
```
fig = plt.figure(figsize=(14,10))
ax1 = plt.subplot(3, 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')

labels = ['macd','macdsignal']
ax2 = plt.subplot(3, 1, 2)
df['positive'] = df['macdhist'] > 0
ax2.plot(df[['macd','macdsignal']], label=labels)
ax2.bar(df.index, df['macdhist'], color=df.positive.map({True: 'g', False:␣
 ↪'r'}), label='macdhist')
ax2.grid()
ax2.set_ylabel('MACD')
ax2.set_xlabel('Date')
ax2.legend(loc='best')

ax3 = plt.subplot(3, 1, 3)
ax3.bar(dfc.Date, dfc['Volume'], color=dfc.VolumePositive.map({True: 'g', False:
 ↪ 'r'}))
ax3.grid()
ax3.set_ylabel('Volume')
ax3.set_xlabel('Date')
```