MACD_AND_SYGNAL_IS_READY

March 28, 2022

1 MACD Implementation

1.1 Celem projektu jest zaipmlementowanie wskaźnika giełdowego MACD

1.2 i opracowanie algorytmu , który na podstawie MACD będzie

1.3 podejmował za nas decyzje o sprzedaży i zakupie

1.3.1 Importing libraries

[4]:
```
import numpy as np
import math
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.dates as mdates
%matplotlib inline
import mpld3
mpld3.enable_notebook()
```

1.3.2 Parsowanie danych wejściowych z pliku (txt/csv)

[5]:
```
data = pd.read_csv('TSLA.csv')
#data = pd.read_csv('MSFT.csv')
start_date = '2016-01-01'
end_date = '2021-01-01'
prices_with_date =  data.loc[(data['Date'] > start_date) & (data['Date'] <␣
 ↪end_date)]
prices_with_date
```

[5]:

	Date	Open	High	Low	Close	Adj Close	\
1245	2016-01-04	46.144001	46.276001	43.799999	44.681999	44.681999	
1246	2016-01-05	45.271999	45.377998	44.000000	44.686001	44.686001	
1247	2016-01-06	44.000000	44.009998	43.195999	43.807999	43.807999	
1248	2016-01-07	42.838001	43.688000	42.734001	43.130001	43.130001	
1249	2016-01-08	43.571999	44.088001	42.153999	42.200001	42.200001	
…	…	…	…	…	…	…	
2499	2020-12-24	642.989990	666.090027	641.000000	661.770020	661.770020	
2500	2020-12-28	674.510010	681.400024	660.799988	663.690002	663.690002	
2501	2020-12-29	661.000000	669.900024	655.000000	665.989990	665.989990	

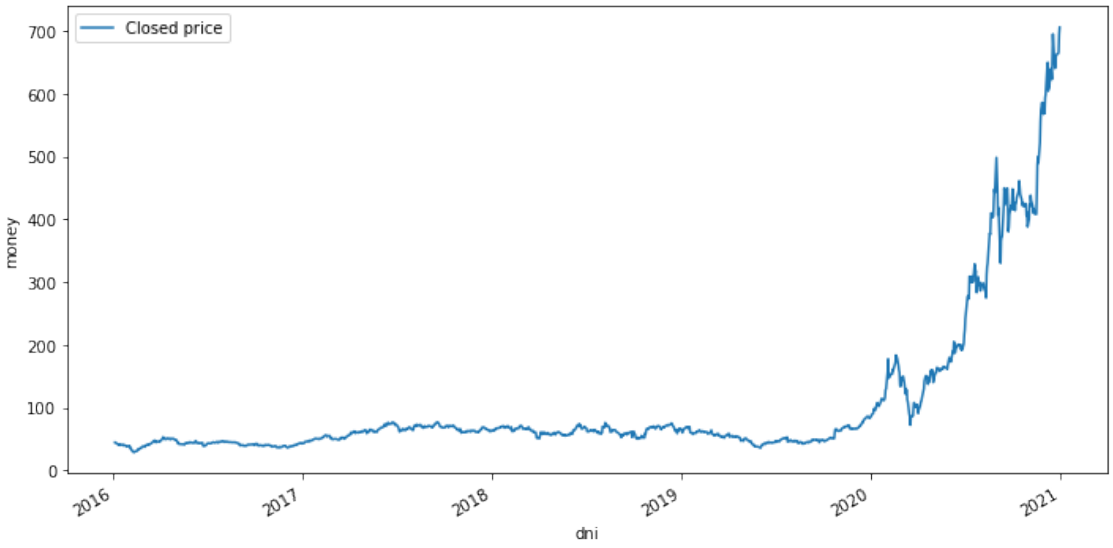
```
2502  2020-12-30  672.000000  696.599976  668.359985  694.780029  694.780029
2503  2020-12-31  699.989990  718.719971  691.119995  705.669983  705.669983

         Volume
1245   34135500
1246   15934000
1247   18895500
1248   17771500
1249   18140500
...         ...
2499   22865600
2500   32278600
2501   22910800
2502   42846000
2503   49649900

[1259 rows x 7 columns]
```

1.3.3 Wizualizacja danych wejściowych

[6]:
```
price_array = prices_with_date['Close']
date_array = pd.to_datetime(prices_with_date['Date'])
plt.figure(figsize=(10, 5))
plt.xlabel("dni")
plt.ylabel("money")
plt.plot( date_array, price_array,label = "Closed price")
plt.gcf().autofmt_xdate()
plt.tight_layout()
plt.legend()
plt.show()
```



1.3.4 EMA formula

Function that compute Exponential Moving Average

where n is period

prices is an array of price with length n;

[8]:
```
def EMA(prices,n):
    a = 2/(n+1)
    wagi = (1-a)**np.arange(n,-1,-1)
    return (wagi*prices).sum()/wagi.sum()
```

1.3.5 Calculating EMA1 with period 12 and EMA2 with period 26

And EMA1 - EMA2

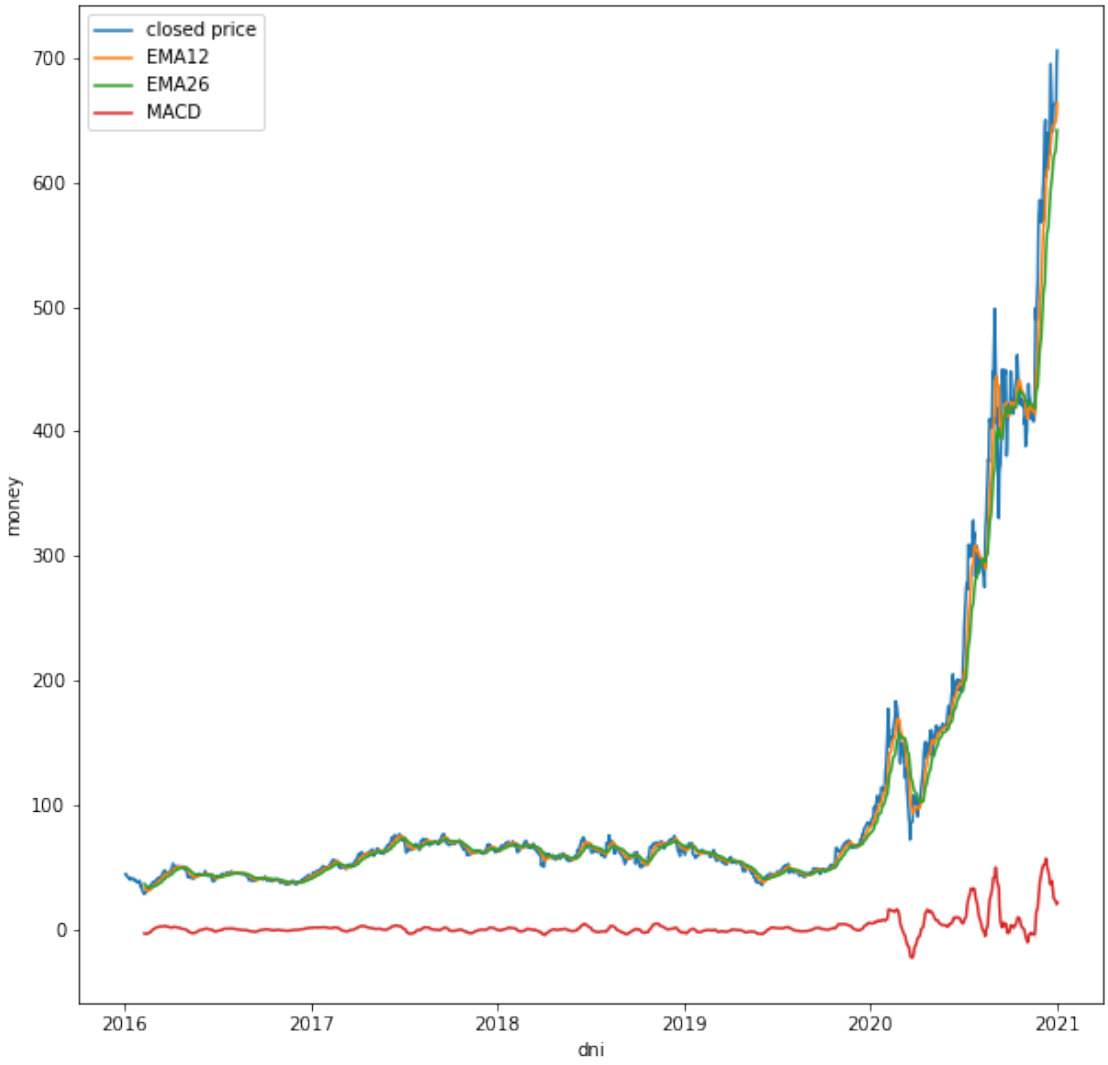
Calculating Exponensial moving average starting with 26 day because it's impossible to calculate EMA__2(26) before this day

[9]:
```
price_array
period_1 = 12
period_2 = 26
EMA1 = []
EMA2 = []
MACD = []
for i in range(period_2,price_array.size):
    ema_elem1 = EMA(price_array[i-period_1:i], period_1-1)
    EMA1.append(ema_elem1)
    ema_elem2 = EMA(price_array[i-period_2:i],period_2-1)
    EMA2.append(ema_elem2)
    MACD.append(ema_elem1 - ema_elem2)
```

start drawing plot starting 26 day.

[10]:
```
plt.figure(figsize=(10, 10))
plt.xlabel("dni")
plt.ylabel("money")
plt.plot(date_array,price_array, label = "closed price")
plt.plot(date_array[period_2:],EMA1, label= "EMA12")
plt.plot(date_array[period_2:],EMA2, label= "EMA26")
plt.plot(date_array[period_2:],MACD, label= "MACD")
plt.legend()
```

[10]:
```
<matplotlib.legend.Legend at 0x2282ecb5388>
```



1.3.6 Implementacja wskaźnika MACD

Linii Sygnal i MACD

invest dates starting with period 2 + period 3 = 26 + 9 = 35 day

invest points shows where exactly crossing of two lines happend

invest dicision True - sell , False - buy

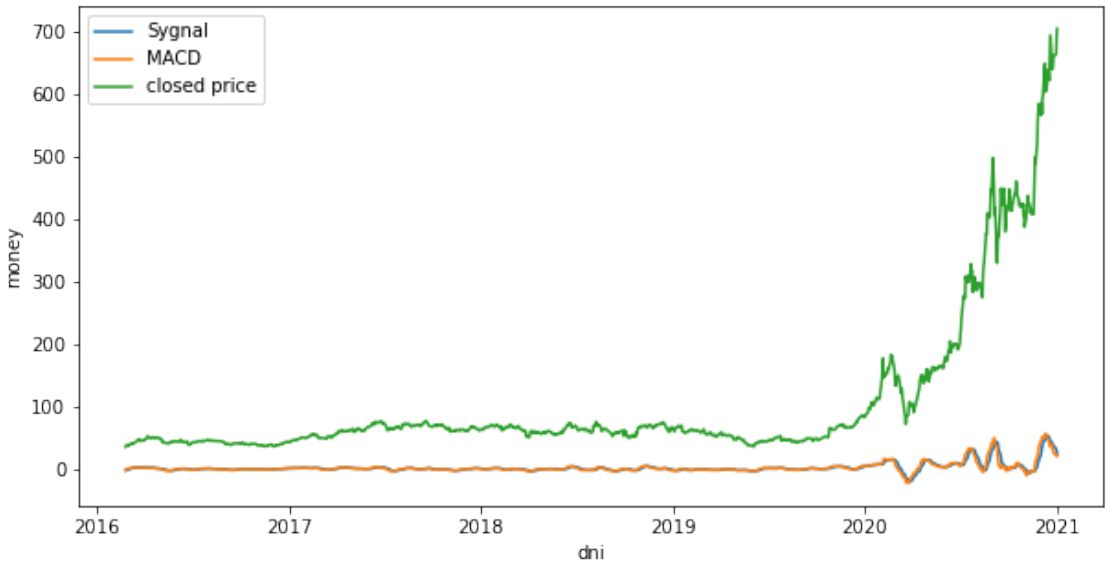
[11]:
```
period_3 = 9
Sygnal = []
for i in range(period_3,len(MACD)):
    Sygnal.append(EMA(MACD[i-period_3:i],period_3-1))
```

```
MACD_is_higher = MACD[0] > Sygnal[0]
invest_dates = []
invest_price = []
invest_decision = []
change_cnt = 0
```

1.3.7 Ploting

[12]:
```
plt.figure(figsize=(10, 5))
plt.xlabel("dni")
plt.ylabel("money")
plt.plot(date_array[period_2+period_3:], Sygnal,label="Sygnal")
plt.plot(date_array[period_2+period_3:], MACD[period_3:],label="MACD")
plt.plot(date_array[period_2+period_3:],price_array[period_2+period_3:],label =␣
↪"closed price")
difference = np.array(MACD[period_3:]) - np.array(Sygnal)
plt.legend()
```

[12]:
```
<matplotlib.legend.Legend at 0x2282ef35808>
```



[13]:
```
# True - buy
MACD_bigger = difference[0] > 0
invest = []
for i in range(0,len(difference)):
    is_change = False
    if difference[i] > 0 and MACD_bigger == False:
```

```
        MACD_bigger = True
        invest.append((True, np.array(price_array)[period_2+period_3+i]))
    elif difference[i] < 0 and MACD_bigger == True:
        MACD_bigger = False
        invest.append((False, np.array(price_array)[period_2+period_3+i]))
```

1.4 Analiza i omówienie wyników, wniosków

1.5 Analiza automatycznego zarabiania przez algorytm

[14]:
```
gotowka = 0
stock = 1000
price_begin = np.array(price_array)[period_2+period_3]
print("price_begin:" + str(price_begin))
print("Stock begin:" + str(stock))
print("Gotowka:" + str(gotowka))
money_begin = stock * price_begin + gotowka

for decision, price in invest:
    if decision: # BUY
        amount =  math.floor(gotowka/price)
        stock += amount
        gotowka -= price * amount
    else:# SELL
        amount = stock
        gotowka += amount * price
        stock -= amount
price_end = np.array(price_array)[-1]
money_end = stock * price_end + gotowka
print("price_end:" + str(price_end))
print("Stock end:" + str(stock))
print("Gotowka:" + str(gotowka))
print("Money end/ Money Begin " + str(money_end/ money_begin))
print("Algorytm Save and Keep " + str(price_end/price_begin))
```

```
price_begin:35.799999
Stock begin:1000
Gotowka:0
price_end:705.669983
Stock end:0
Gotowka:277770.50837699993
Money end/ Money Begin 7.758952964691423
Algorytm Save and Keep 19.71145258970538
```

Algorytm sprzedawania wszystkich akcji (dla Microsoft i Tesla)daje wynik gorszy niż zachowanie tych akcji.

Z tego wynika ze wykorzystanie MACD nie jest skuteczne(przynajmniej dla tych kompanij i algorytmu w którym sprzedajemy wszytko i kupujemy ile się da).

[30]:
```
gotowka = 0
stock = 1000
price_begin = np.array(price_array)[period_2+period_3]
print("price_begin:" + str(price_begin))
print("Stock begin:" + str(stock))
print("Gotowka:" + str(gotowka))
money_begin = stock * price_begin + gotowka
amount = 100
for decision, price in invest:
    if decision: # BUY
        stock += amount
        gotowka -= price * amount
    else:# SELL
        gotowka += amount * price
        stock -= amount
price_end = np.array(price_array)[-1]
money_end = stock * price_end + gotowka
print("price_end:" + str(price_end))
print("Stock end:" + str(stock))
print("Gotowka:" + str(gotowka))
print("Money end/ Money Begin " + str(money_end/ money_begin))
print("Algorytm Save and Keep " + str(price_end/price_begin))
```

```
price_begin:35.799999
Stock begin:1000
Gotowka:0
price_end:705.669983
Stock end:900
Gotowka:45929.9952
Money end/ Money Begin 19.023268126348274
Algorytm Save and Keep 19.71145258970538
```

1.5.1 Wyniki lepsze gdy sprzedajemy część akcji

Im bliżej liczba sprzedanych/ kupowanych do 0 tym bardziej strategia podobna do przechowywania akcji.

2 Podsumowanie:

2.0.1 Myśle że nie odkryłem pełnego potencjalu MACD. Mój algorytm pozwala zarobić, ale mniej niż to możliwe.