



Gies College of Business

# Volume Profile Trading Strategies

FIN580. Data Science and Python for Finance

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# Agenda



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# Code Explanation

# Code Explanation --- First Part



## The Process of Coding Volume Trading Strategies

### First Step

- Retrieving MSFT data from Yahoo Finance.
- Computing log returns, dropping NaN, and creating a column of cumulative log returns.

### Second Step

- Computing moving averages of volume by day, week and month.
- Long the stock if the average of shorter period is more than the one of longer period.
- Short if the opposite situation happens.

### Third Step

- Organizing cumulative log returns from 3 strategies.
- Plotting the cumulative log returns from 3 strategies and the original log returns (Buy & Hold)

# Code Explanation --- First Part

```
In [1]: import pandas_datareader as pdr  
import pandas as pd  
import numpy as np  
import matplotlib.pyplot as plt
```

```
In [2]: #Retrieve data  
l1=['MSFT']  
l2=['Adj Close','Volume']  
df1=pdr.get_data_yahoo(l1, start = '01-01-2015',end ='31-03-2021')[l2]  
df1
```

Out[2]:

	Attributes	Adj Close	Volume
Symbols	MSFT	MSFT	
Date			
2015-01-02	41.443684	27913900.0	
2015-01-05	41.062580	39673900.0	
2015-01-06	40.459892	36447900.0	
2015-01-07	40.973934	29114100.0	
2015-01-08	42.179317	29645200.0	
...	...	...	
2021-03-25	232.339996	34061900.0	
2021-03-26	236.479996	25471700.0	
2021-03-29	235.240005	25227500.0	
2021-03-30	231.850006	24792000.0	
2021-03-31	235.770004	43623500.0	

1572 rows x 2 columns

# Code Explanation --- First Part

```
In [3]: df1['log return']=np.log(df1['Adj Close']/df1['Adj Close'].shift(1))
df1
```

Out[3]:

	Attributes	Adj Close	Volume	log return
Symbols	MSFT	MSFT		
Date				
2015-01-02	41.443684	27913900.0	NaN	
2015-01-05	41.062580	39673900.0	-0.009238	
2015-01-06	40.459892	36447900.0	-0.014786	
2015-01-07	40.973934	29114100.0	0.012625	
2015-01-08	42.179317	29645200.0	0.028994	
...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	
2021-03-26	236.479996	25471700.0	0.017662	
2021-03-29	235.240005	25227500.0	-0.005257	
2021-03-30	231.850006	24792000.0	-0.014516	
2021-03-31	235.770004	43623500.0	0.016766	

1572 rows × 3 columns

```
In [4]: df1.dropna(inplace=True)
df1
```

Out[4]:

	Attributes	Adj Close	Volume	log return
Symbols	MSFT	MSFT		
Date				
2015-01-05	41.062580	39673900.0	-0.009238	
2015-01-06	40.459892	36447900.0	-0.014786	

# Code Explanation --- Second Part



## The Process of Coding Volume Trading Strategies

### First Step

- Retrieving MSFT data from Yahoo Finance.
- Computing log returns, dropping NaN, and creating a column of cumulative log returns.

### Second Step

- Computing moving averages of volume by day, week and month.
- Long the stock if the average of shorter period is more than the one of longer period.
- Short if the opposite situation happens.

### Third Step

- Organizing cumulative log returns from 3 strategies.
- Plotting the cumulative log returns from 3 strategies and the original log returns (Buy & Hold)

# Code Explanation --- Second Part

```
In [5]: df1['daily']=df1['Volume'].rolling(1).mean()
df1['weekly']=df1['Volume'].rolling(5).mean()
df1['monthly']=df1['Volume'].rolling(21).mean()
df1
```

Out[5]:

	Attributes	Adj Close	Volume	log return	daily	weekly	monthly
Symbols	MSFT	MSFT					
Date							
2015-01-05	41.062580	39673900.0	-0.009238	39673900.0	NaN	NaN	NaN
2015-01-06	40.459892	36447900.0	-0.014786	36447900.0	NaN	NaN	NaN
2015-01-07	40.973934	29114100.0	0.012625	29114100.0	NaN	NaN	NaN
2015-01-08	42.179317	29645200.0	0.028994	29645200.0	NaN	NaN	NaN
2015-01-09	41.824806	23944200.0	-0.008440	23944200.0	31765060.0	NaN	NaN
...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	

1571 rows × 6 columns

```
In [6]: df1.dropna(inplace=True)
df1
```

Out[6]:

	Attributes	Adj Close	Volume	log return	daily	weekly	monthly
Symbols	MSFT	MSFT					
Date							
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	

# Code Explanation --- Second Part

```
In [7]: df1['return_cum']=np.exp(df1['log return'].cumsum())-1  
df1
```

Out[7]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum
Symbols	MSFT	MSFT					
Date							
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163
...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139

1551 rows x 7 columns

# Code Explanation --- Second Part (Strategy 1)

```
In [8]: #Strategy 1
```

```
In [9]: df1['position1']=np.where(df1['daily']>df1['weekly'], 1 , -1)
df1
```

Out[9]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1
Symbols	MSFT	MSFT						
Date								
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1
...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1

1551 rows x 8 columns



# Code Explanation --- Second Part (Strategy 1)

```
In [10]: df1['strategy1'] = df1['position1'].shift(1) * df1['log return']  
df1
```

Out[10]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1
Symbols	MSFT	MSFT							
Date									
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179
...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766

1551 rows × 9 columns



# Code Explanation --- Second Part (Strategy 2)

```
In [11]: #Strategy 2
```

```
In [12]: df1['position2']=np.where(df1['daily']>df1['monthly'], 1 , -1)
df1
```

Out[12]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1	position2
Symbols	MSFT	MSFT								
Date										
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN	1
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753	-1
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474	-1
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943	-1
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179	-1
...	...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339	1
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662	-1
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257	-1
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516	-1
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766	1

1551 rows × 10 columns



# Code Explanation --- Second Part (Strategy 2)

```
In [13]: df1['strategy2'] = df1['position2'].shift(1) * df1['log return']  
df1
```

Out[13]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1	position2	strategy2
Symbols	MSFT	MSFT									
Date											
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN	1	NaN
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753	-1	0.005753
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474	-1	-0.014474
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943	-1	0.000943
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179	-1	0.001179
...	...	...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339	1	0.013339
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662	-1	0.017662
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257	-1	0.005257
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516	-1	0.014516
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766	1	-0.016766

1551 rows × 11 columns



# Code Explanation --- Second Part (Strategy 3)

```
In [14]: #Strategy 3
```

```
In [15]: df1['position3']=np.where(df1['weekly']>df1['monthly'], 1 , -1)  
df1
```

Out[15]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1	position2	strategy2	position3
Symbols	MSFT	MSFT										
Date												
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN	1	NaN	1
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753	-1	0.005753	1
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474	-1	-0.014474	1
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943	-1	0.000943	-1
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179	-1	0.001179	-1
...	...	...	...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339	1	0.013339	1
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662	-1	0.017662	-1
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257	-1	0.005257	-1
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516	-1	0.014516	-1
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766	1	-0.016766	-1

1551 rows x 12 columns

# Code Explanation --- Second Part (Strategy 3)

```
In [16]: df1['strategy3'] = df1['position3'].shift(1) * df1['log return']
df1
```

Out[16]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1	position2	strategy2	position3	strategy3
Symbols	MSFT	MSFT											
Date													
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN	1	NaN	1	NaN
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753	-1	0.005753	1	0.005753
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474	-1	-0.014474	1	0.014474
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943	-1	0.000943	-1	-0.000943
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179	-1	0.001179	-1	0.001179
...	...	...	...	...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339	1	0.013339	1	-0.013339
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662	-1	0.017662	-1	0.017662
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257	-1	0.005257	-1	0.005257
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516	-1	0.014516	-1	0.014516
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766	1	-0.016766	-1	-0.016766

1551 rows × 13 columns

# Code Explanation --- Third Part



## The Process of Coding Volume Trading Strategies

### First Step

- Retrieving MSFT data from Yahoo Finance.
- Computing log returns, dropping NaN, and creating a column of cumulative log returns.

### Second Step

- Computing moving averages of volume by day, week and month.
- Long the stock if the average of shorter period is more than the one of longer period.
- Short if the opposite situation happens.

### Third Step

- Organizing cumulative log returns from 3 strategies.
- Plotting the cumulative log returns from 3 strategies and the original log returns (Buy & Hold)

# Code Explanation --- Third Part

```
In [17]: df1['strategy1_cum']=np.exp(df1['strategy1'].cumsum())-1
df1['strategy2_cum']=np.exp(df1['strategy2'].cumsum())-1
df1['strategy3_cum']=np.exp(df1['strategy3'].cumsum())-1
df1
```

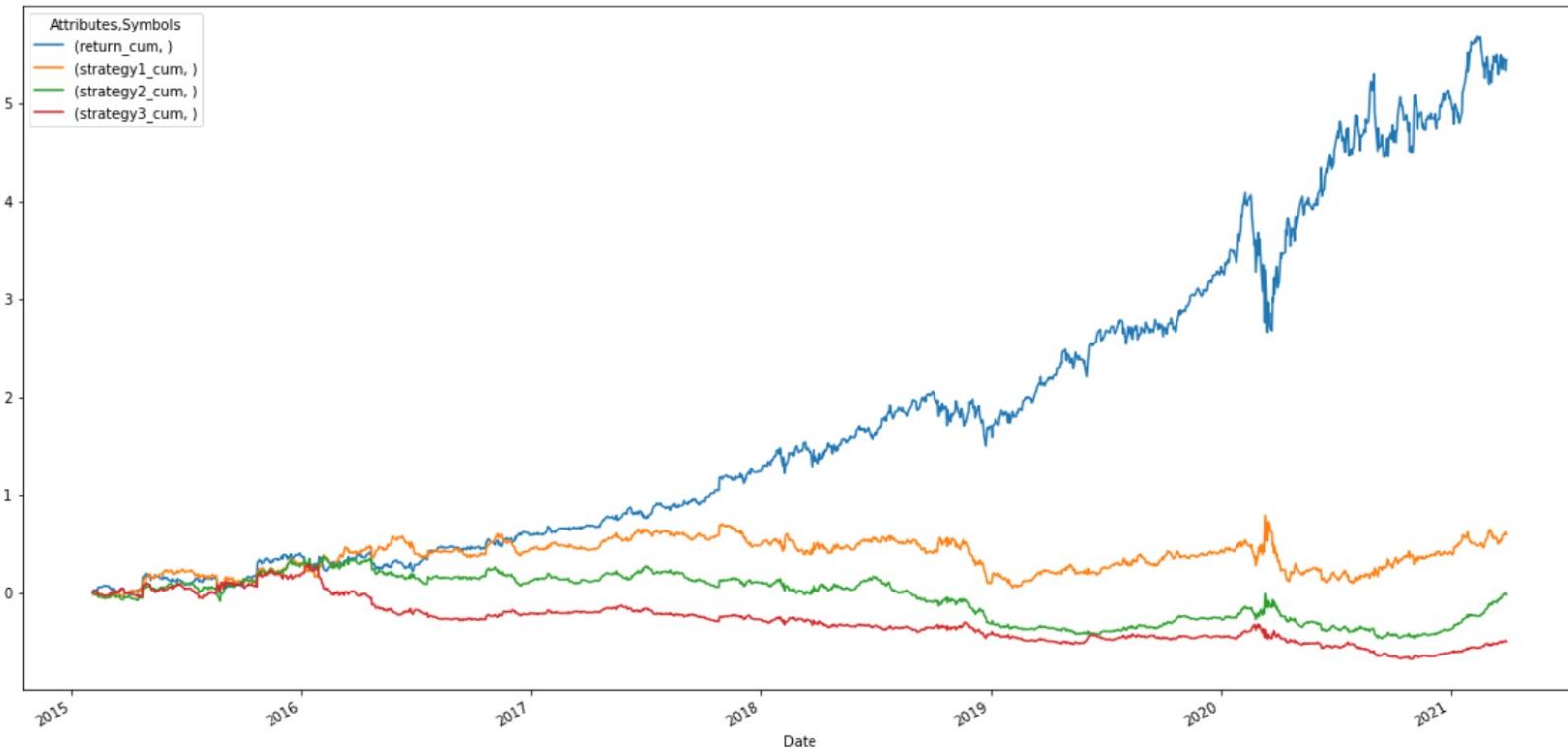
Out[17]:

Attributes	Adj Close	Volume	log return	daily	weekly	monthly	return_cum	position1	strategy1	position2	strategy2	position3	strategy3	position4	strategy4
Symbols	MSFT		MSFT												
Date															
2015-02-03	36.870346	52082400.0	0.007722	52082400.0	65706440.0	4.730894e+07	0.007752	-1	NaN	1	NaN	1	NaN	1	NaN
2015-02-04	37.083065	41614800.0	0.005753	41614800.0	57127980.0	4.740137e+07	0.013566	-1	-0.005753	-1	0.005753	1	0.005753	1	0.005753
2015-02-05	37.623703	36548200.0	0.014474	36548200.0	51720560.0	4.740614e+07	0.028343	-1	-0.014474	-1	-0.014474	1	0.014474	1	0.014474
2015-02-06	37.588245	34616600.0	-0.000943	34616600.0	43042900.0	4.766817e+07	0.027374	-1	0.000943	-1	0.000943	-1	-0.000943	-1	-0.000943
2015-02-09	37.543945	31381100.0	-0.001179	31381100.0	39248620.0	4.775083e+07	0.026163	-1	0.001179	-1	0.001179	-1	0.001179	-1	0.001179
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2021-03-25	232.339996	34061900.0	-0.013339	34061900.0	33571620.0	3.249242e+07	5.350389	1	0.013339	1	0.013339	1	-0.013339	1	-0.013339
2021-03-26	236.479996	25471700.0	0.017662	25471700.0	29383820.0	3.182240e+07	5.463545	-1	0.017662	-1	0.017662	-1	0.017662	-1	0.017662
2021-03-29	235.240005	25227500.0	-0.005257	25227500.0	28403920.0	3.122317e+07	5.429653	-1	0.005257	-1	0.005257	-1	0.005257	-1	0.005257
2021-03-30	231.850006	24792000.0	-0.014516	24792000.0	27034640.0	3.119784e+07	5.336996	-1	0.014516	-1	0.014516	-1	0.014516	-1	0.014516
2021-03-31	235.770004	43623500.0	0.016766	43623500.0	30635320.0	3.219012e+07	5.444139	1	-0.016766	1	-0.016766	-1	-0.016766	-1	-0.016766

1551 rows × 16 columns

# Code Explanation --- Third Part

```
In [18]: df1[['return_cum', 'strategy1_cum','strategy2_cum','strategy3_cum']].plot(figsize=(20, 10))  
plt.show()
```



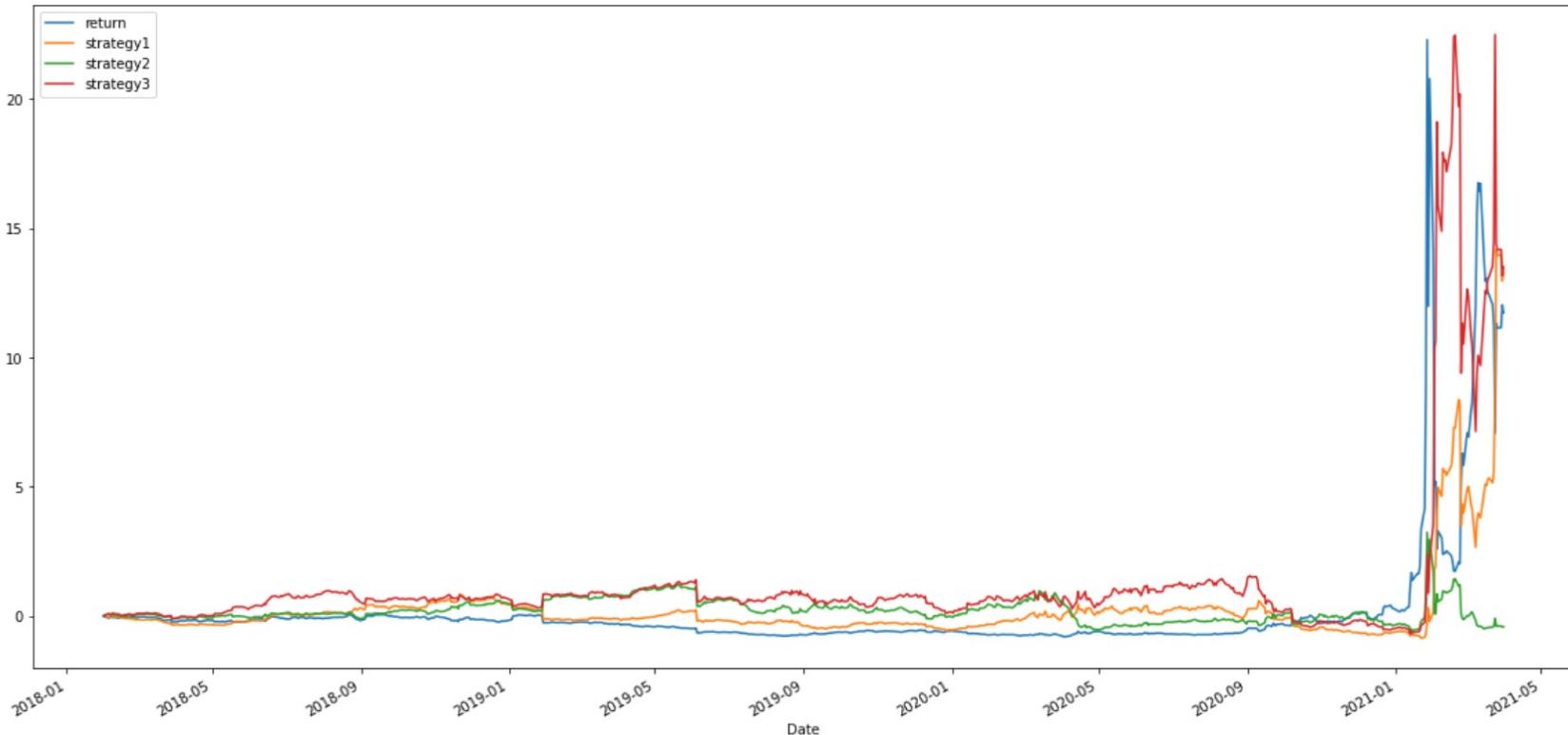
# Strategy Performance

# Wrapping code into a function

```
def strategy(ticker,n1,n2,n3):
    df = pdr.get_data_yahoo(ticker, start='2018-01-01',end='2021-03-31')[['Adj Close','Volume']]
    df['return'] = np.log(df['Adj Close'] / df['Adj Close'].shift(1))
    df['mv1'] = df['Volume'].rolling(n1).mean()
    df['mv2'] = df['Volume'].rolling(n2).mean()
    df['mv3'] = df['Volume'].rolling(n3).mean()
    df.dropna(inplace=True)
    df['position'] = np.where(df['mv1'] > df['mv2'], 1, -1)
    df['position1'] = np.where(df['mv2'] > df['mv3'], 1, -1)
    df['position2'] = np.where(df['mv1'] > df['mv3'], 1, -1)
    df['strategy1'] = df['position'].shift(1) * df['return']
    df['strategy2'] = df['position1'].shift(1) * df['return']
    df['strategy3'] = df['position2'].shift(1) * df['return']
    df[['return','strategy1','strategy2','strategy3']].cumsum().apply(np.exp).sub(1).plot(figsize=(20, 10))
    plt.show()
```

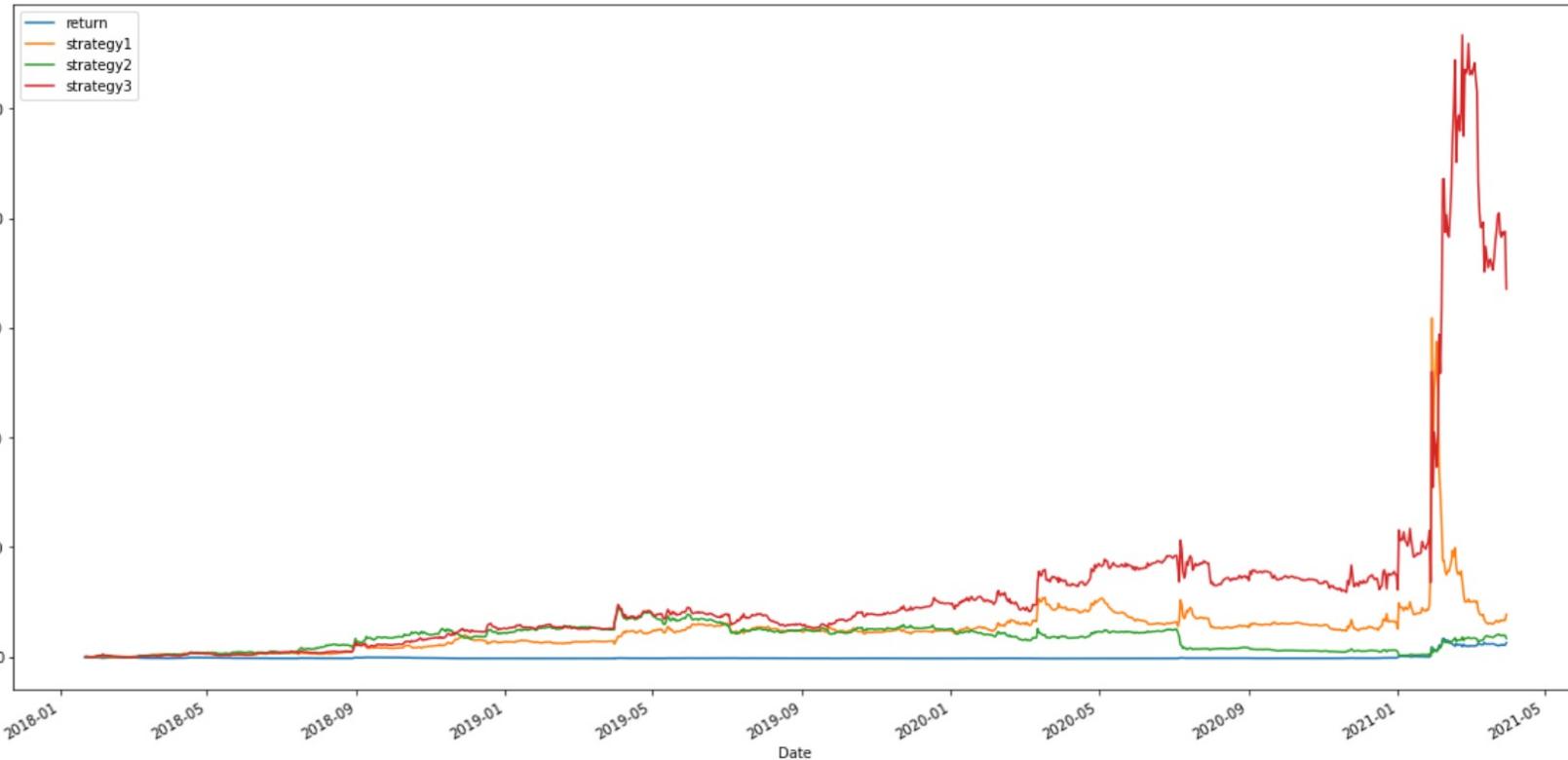
# Strategy performance on GME

```
In [21]: strategy('GME', 1, 5, 21)
```



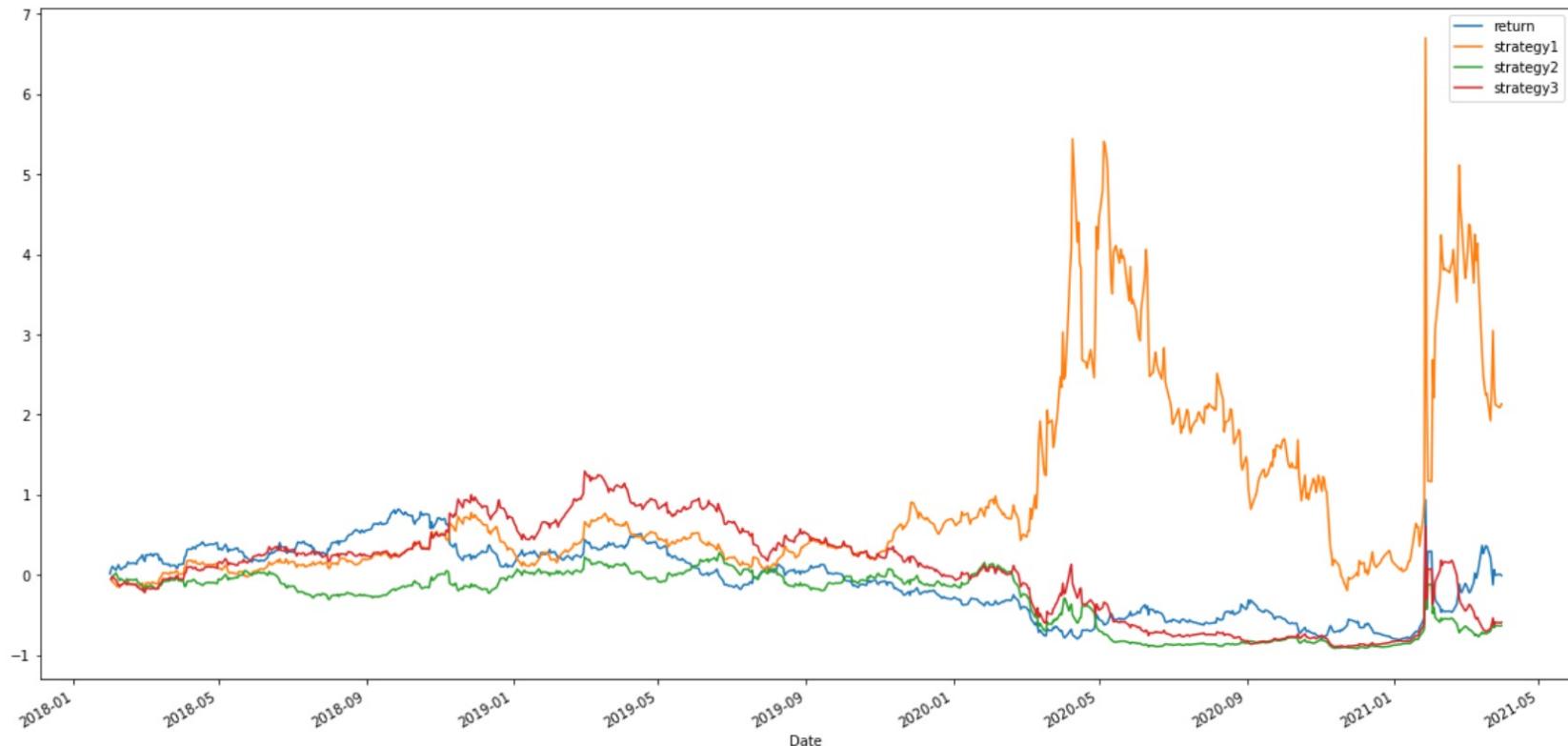
# Strategy performance on DOGE

```
In [22]: strategy('DOGE-USD', 1, 5, 21)
```



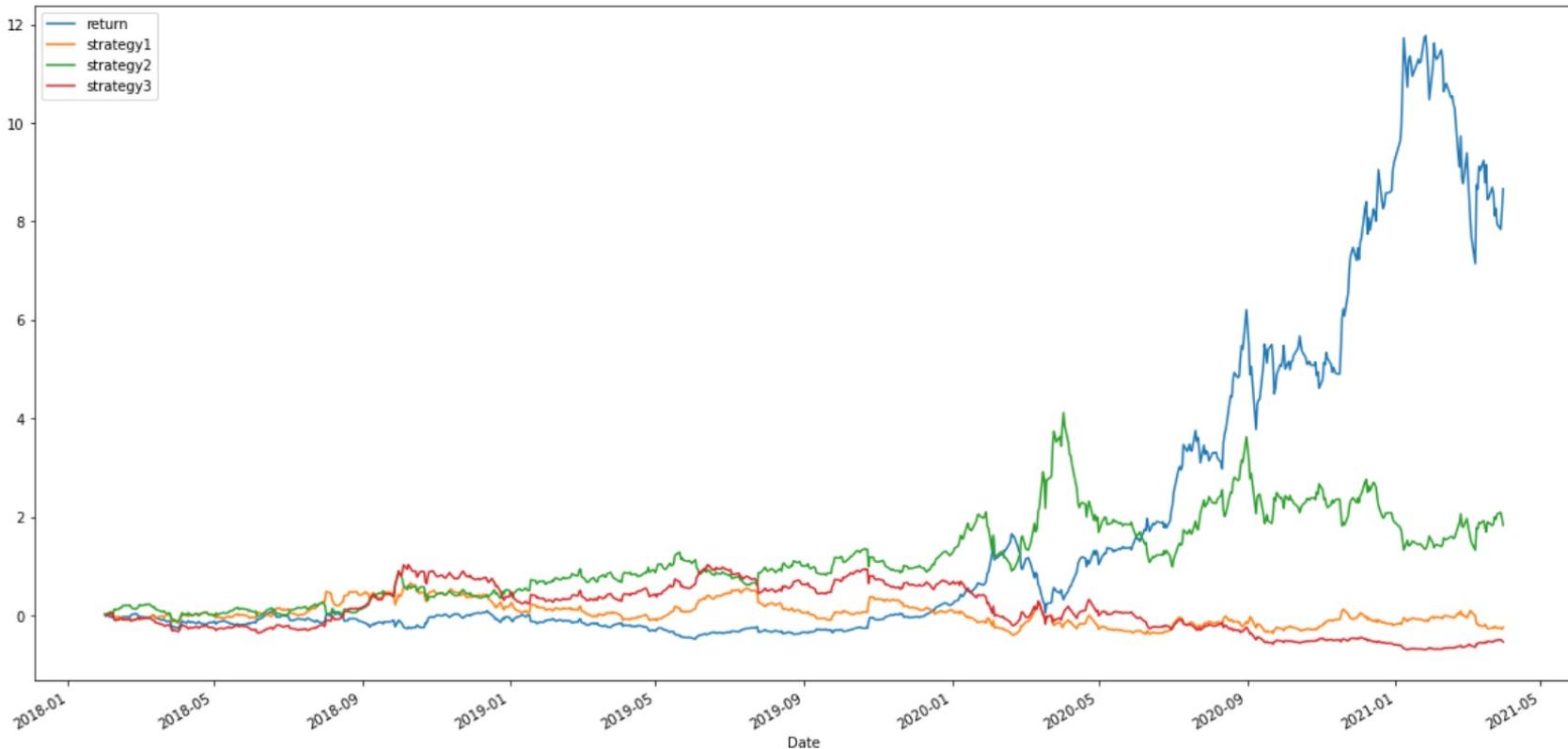
# Strategy performance on AMC

```
In [23]: strategy('AMC', 1, 5, 21)
```



# Strategy performance on TSLA

```
In [24]: strategy('TSLA', 1, 5, 21)
```



# Conclusion

Companies based on fundamentals like MSFT abide by the efficient market hypothesis, while there are lot of ad hoc companies, whose returns are derived by external factors (one being volume and market euphoria), thus proving that the efficient market hypothesis does not hold always.