In [ ]:
```python
import pandas as pd
import numpy as np
import datetime
import yfinance as yf
import matplotlib.pyplot as plt
import pandas_datareader.data as web
from datetime import date, datetime, time, timezone
```

In [ ]:
```python
import pandas as pd

def get_stock_data(ticker, start, end):
    data = yf.download(ticker, start=start, end=end)
    data.insert(0, 'Ticker', ticker)
    return data
```

In [ ]:
```python
ticker = 'DIS'
start_date = '2023-01-01'
end_date = '2023-07-31'
```

In [ ]:
```python
stock_data = get_stock_data(ticker, start_date, end_date)
stock_data.head()
```

[**********************100%***********************] 1 of 1 completed

Out[ ]:

Date	Ticker	Open	High	Low	Close	Adj Close	Volume
2023-01-03	DIS	88.980003	89.970001	87.830002	88.970001	88.970001	14997100
2023-01-04	DIS	90.000000	92.750000	89.360001	91.980003	91.980003	14957200
2023-01-05	DIS	91.660004	92.480003	90.510002	91.919998	91.919998	11622600
2023-01-06	DIS	92.660004	94.690002	91.320000	93.919998	93.919998	9828100
2023-01-09	DIS	94.430000	95.699997	93.449997	94.769997	94.769997	11675800

In [ ]:
```python
stock_data = stock_data.pivot(index = None, columns = "Ticker", values = "Close"
stock_data.head()
```

Out[ ]:

Ticker	DIS
Date	
2023-01-03	88.970001
2023-01-04	91.980003
2023-01-05	91.919998
2023-01-06	93.919998
2023-01-09	94.769997

In [ ]:
```python
SPY = get_stock_data("SPY",start,end)
IYW = get_stock_data("IYW",start,end)
VT = get_stock_data("VT",start,end)
DBA = get_stock_data("DBA",start,end)
TLT = get_stock_data("TLT",start,end)
PDBC = get_stock_data("PDBC",start,end)
IAU = get_stock_data("IAU",start,end)
```

```
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
[*********************100%***********************]  1 of 1 completed
```

In [ ]:
```python
SPY.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 143 entries, 2023-01-03 to 2023-07-28
Data columns (total 7 columns):
 #   Column     Non-Null Count   Dtype
---  ------     --------------   -----
 0   Ticker     143 non-null     object
 1   Open       143 non-null     float64
 2   High       143 non-null     float64
 3   Low        143 non-null     float64
 4   Close      143 non-null     float64
 5   Adj Close  143 non-null     float64
 6   Volume     143 non-null     int64
dtypes: float64(5), int64(1), object(1)
memory usage: 8.9+ KB
```

In [ ]:
```python
SPY = SPY.pivot(index=None,columns="Ticker",values="Close")
IYW = IYW.pivot(index=None,columns="Ticker",values="Close")
VT = VT.pivot(index=None,columns="Ticker",values="Close")
DBA = DBA.pivot(index=None,columns="Ticker",values="Close")
TLT = TLT.pivot(index=None,columns="Ticker",values="Close")
PDBC = PDBC.pivot(index=None,columns="Ticker",values="Close")
IAU = IAU.pivot(index=None,columns="Ticker",values="Close")
```

In [ ]:
```python
stock = pd.concat([SPY,IYW,VT,DBA,TLT,PDBC,IAU],axis = 1,join='outer')
stock.head()
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Date							
2023-01-03	380.820007	73.949997	86.239998	19.930000	101.459999	14.41	34.880001
2023-01-04	383.760010	74.180000	87.300003	19.690001	102.849998	14.12	35.209999
2023-01-05	379.380005	72.540001	86.400002	19.639999	103.279999	14.06	34.790001
2023-01-06	388.079987	74.470001	88.379997	19.559999	105.180000	14.15	35.430000
2023-01-09	387.859985	75.480003	88.589996	19.629999	105.739998	14.35	35.500000

In [ ]:
```python
plt.style.use('ggplot')
stock.plot(figsize=(20,10))
plt.show()
```
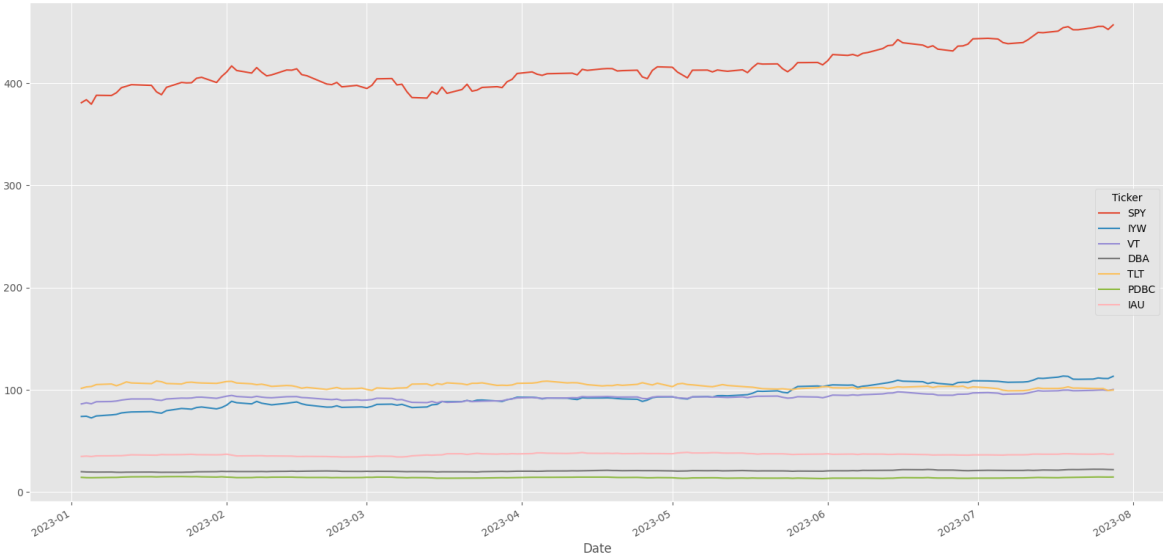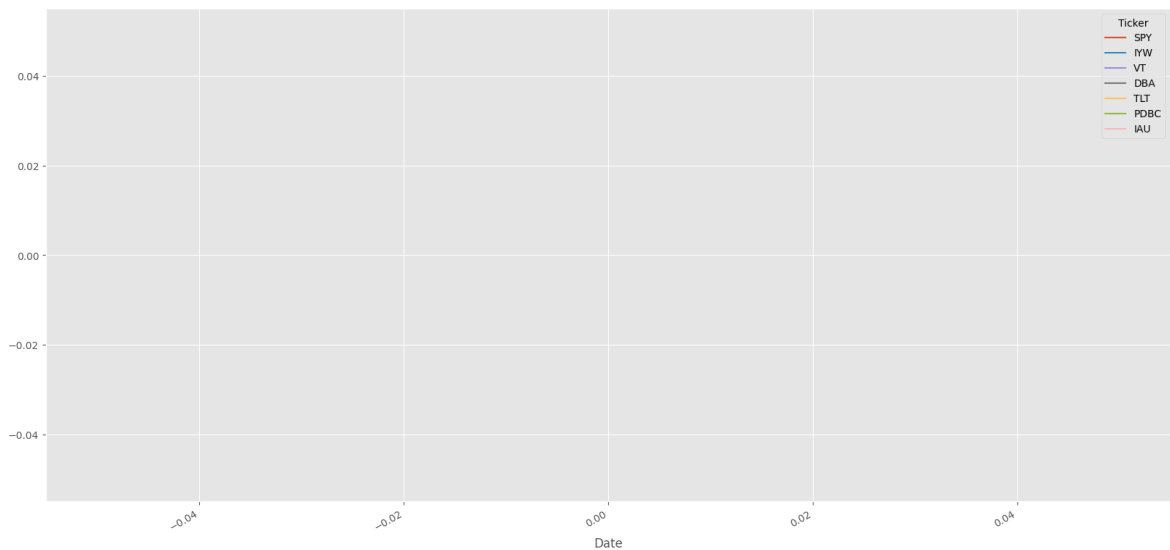

In [ ]:
```python
covid = stock['2020-2-1':'2020-7-31']
```

In [ ]:
```python
plt.style.use('ggplot')
covid.plot(figsize=(20,10))
plt.show()
```
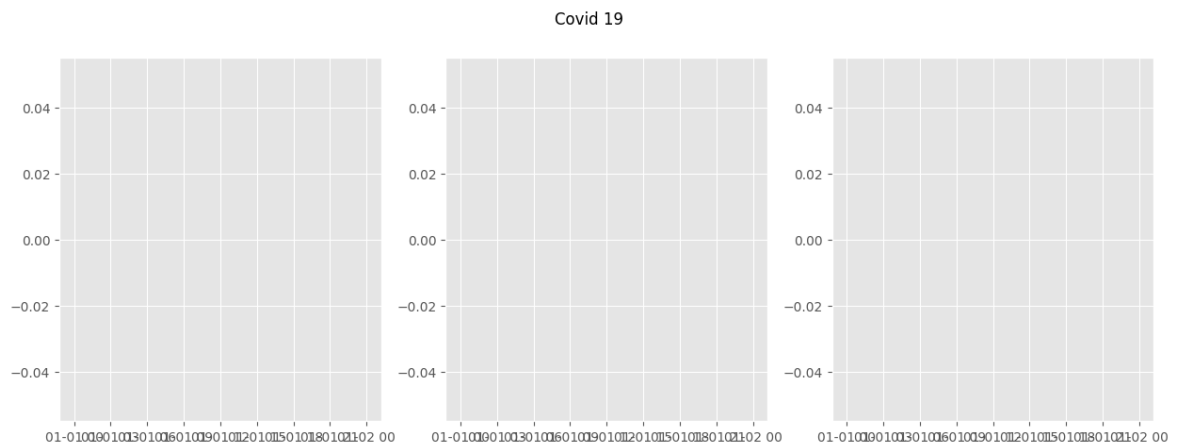
```
In [ ]:  x = covid.index
         s_y = covid[['SPY']]
         i_y = covid[['IAU']]
         d_y = covid[['DBA']]
         t_y = covid[['TLT']]
```

```
In [ ]:  import matplotlib.pyplot as plt

         fig,axs = plt.subplots(1,3,figsize = (15,5))
         axs[0].plot(x, s_y)
         axs[1].plot(x, i_y)
         axs[2].plot(x, t_y)

         fig.suptitle("Covid 19")
```

```
Out[ ]:  Text(0.5, 0.98, 'Covid 19')
```



```
In [ ]:  ticker = 'PDBC'
```

```
In [ ]:  stock_data = get_stock_data(ticker, start_date, end_date)
         stock_data.head()
```

```
[************************100%************************]  1 of 1 completed
```

Out[ ]:

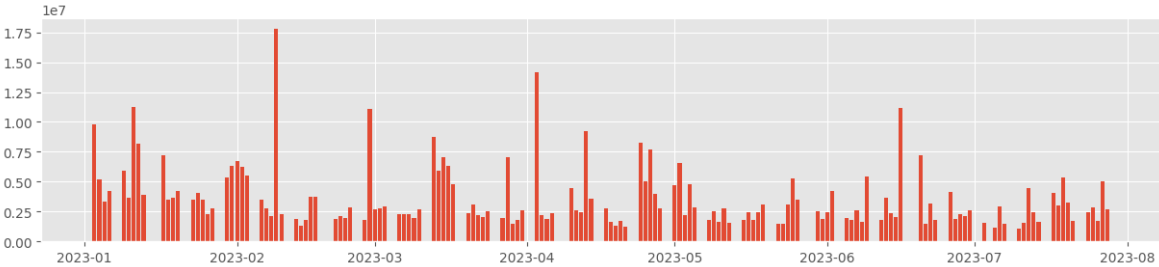| Date	Ticker	Open	High	Low	Close	Adj Close	Volume
2023-01-03	PDBC	14.60	14.69	14.350	14.41	14.41	9766300
2023-01-04	PDBC	14.18	14.23	14.060	14.12	14.12	5159500
2023-01-05	PDBC	14.08	14.15	14.000	14.06	14.06	3305800
2023-01-06	PDBC	14.18	14.24	14.080	14.15	14.15	4234800
2023-01-09	PDBC	14.38	14.50	14.323	14.35	14.35	5908000

In [ ]:
```python
stock_data.drop(['Ticker','Open','High','Low','Close','Adj Close'],axis = 1,inpl
stock_data.head()
```

Out[ ]:

Date	Volume
2023-01-03	9766300
2023-01-04	5159500
2023-01-05	3305800
2023-01-06	4234800
2023-01-09	5908000

In [ ]:
```python
x = stock_data.index
y = stock_data["Volume"]
plt.figure(figsize=(15,3))
plt.bar(x,y)
plt.show()
```


In [ ]:
```python
stock_data = get_stock_data(ticker, start_date, end_date)
stock_data.head()
```

[*********************100%***********************] 1 of 1 completed

Out[ ]:

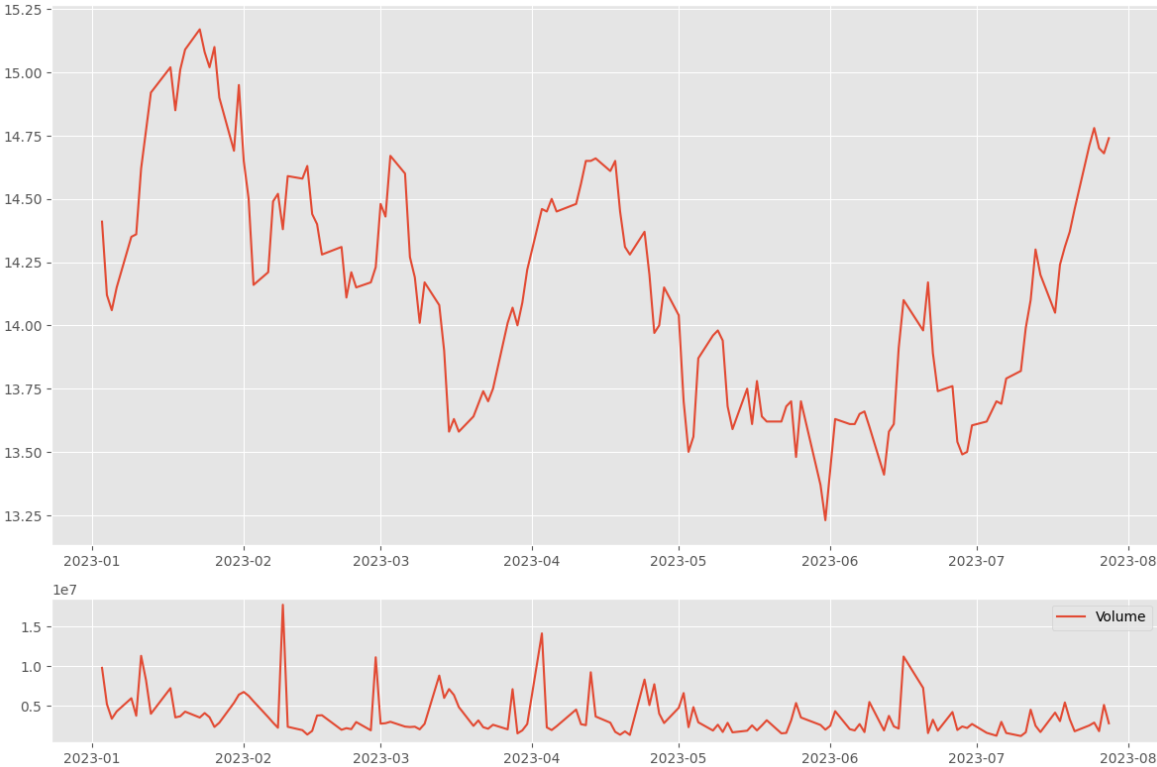| Date	Ticker	Open	High	Low	Close	Adj Close	Volume
2023-01-03	PDBC	14.60	14.69	14.350	14.41	14.41	9766300
2023-01-04	PDBC	14.18	14.23	14.060	14.12	14.12	5159500
2023-01-05	PDBC	14.08	14.15	14.000	14.06	14.06	3305800
2023-01-06	PDBC	14.18	14.24	14.080	14.15	14.15	4234800
2023-01-09	PDBC	14.38	14.50	14.323	14.35	14.35	5908000

```python
fig = plt.figure(figsize=(12,8))

top_grid = plt.subplot2grid((4,4),(0,0),rowspan=3,colspan=4)
bottom_grid = plt.subplot2grid((4,4),(3,0),rowspan=1,colspan=4)

top_grid.plot(stock_data.index,stock_data['Close'],label = "Close" )
bottom_grid.plot(stock_data.index,stock_data['Volume'],label = "Volume")

plt.tight_layout()

plt.legend()
plt.show()
```



```python
stock.head()
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Date							
2023-01-03	380.820007	73.949997	86.239998	19.930000	101.459999	14.41	34.880001
2023-01-04	383.760010	74.180000	87.300003	19.690001	102.849998	14.12	35.209999
2023-01-05	379.380005	72.540001	86.400002	19.639999	103.279999	14.06	34.790001
2023-01-06	388.079987	74.470001	88.379997	19.559999	105.180000	14.15	35.430000
2023-01-09	387.859985	75.480003	88.589996	19.629999	105.739998	14.35	35.500000

In [ ]:
```python
stock['SPY']
```

Out[ ]:
```
Date
2023-01-03    380.820007
2023-01-04    383.760010
2023-01-05    379.380005
2023-01-06    388.079987
2023-01-09    387.859985
                 ...
2023-07-24    454.200012
2023-07-25    455.440002
2023-07-26    455.510010
2023-07-27    452.489990
2023-07-28    456.920013
Name: SPY, Length: 143, dtype: float64
```

In [ ]:
```python
stock['SPY'].shift(1)
```

Out[ ]:
```
Date
2023-01-03           NaN
2023-01-04    380.820007
2023-01-05    383.760010
2023-01-06    379.380005
2023-01-09    388.079987
                 ...
2023-07-24    452.179993
2023-07-25    454.200012
2023-07-26    455.440002
2023-07-27    455.510010
2023-07-28    452.489990
Name: SPY, Length: 143, dtype: float64
```
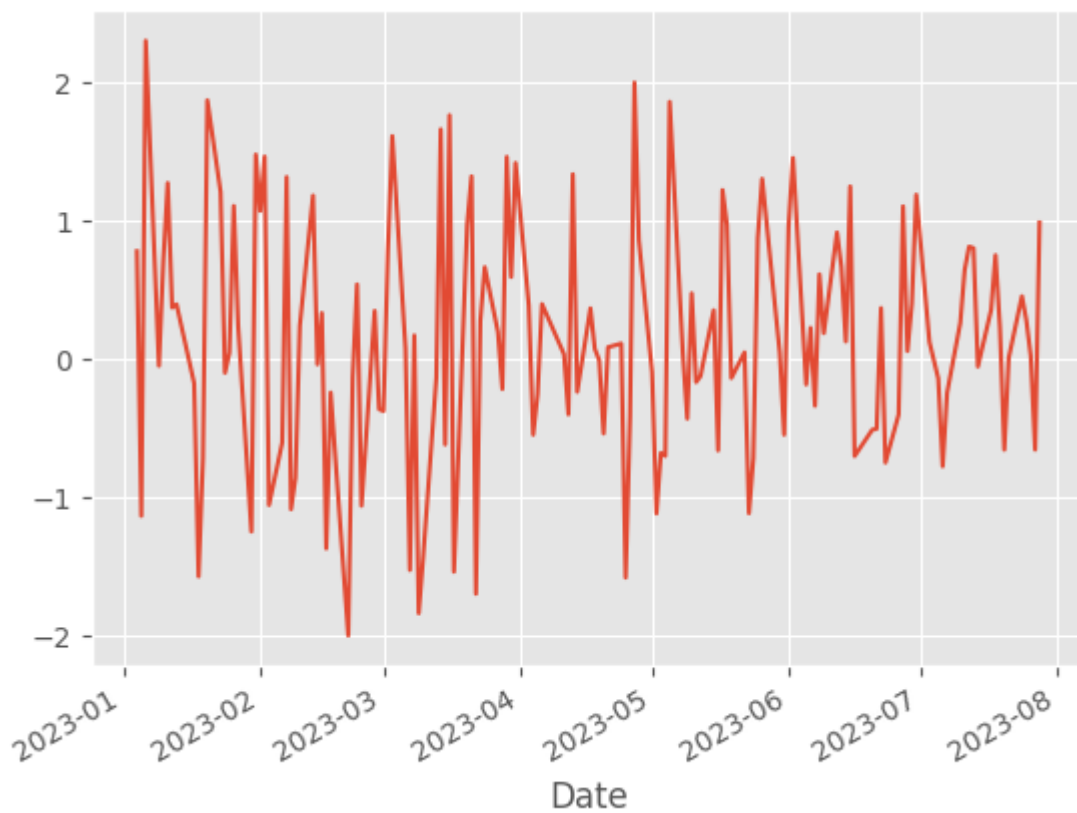
In [ ]:
```python
spy_dayily_pc = (stock['SPY']/stock['SPY'].shift(1)-1)*100
spy_dayily_pc
```

```
Out[ ]:  Date
         2023-01-03         NaN
         2023-01-04    0.772019
         2023-01-05   -1.141340
         2023-01-06    2.293210
         2023-01-09   -0.056690
                           ...
         2023-07-24    0.446729
         2023-07-25    0.273005
         2023-07-26    0.015371
         2023-07-27   -0.662997
         2023-07-28    0.979032
         Name: SPY, Length: 143, dtype: float64
```
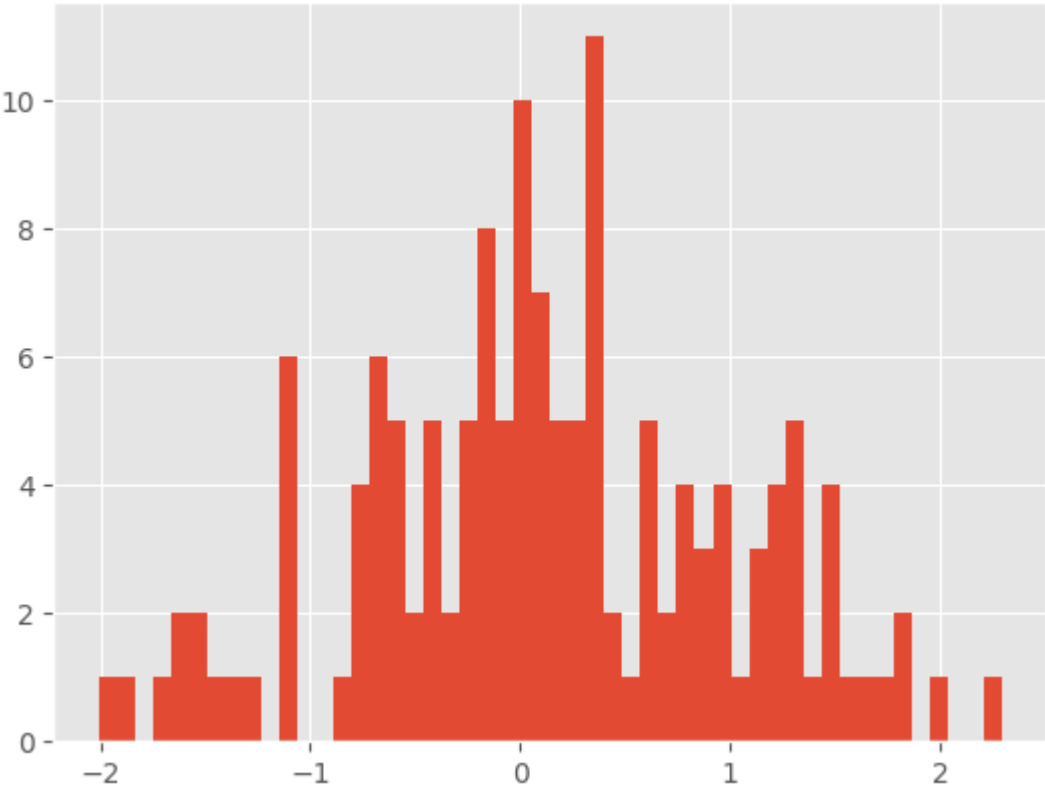
In [ ]:
```python
spy_dayily_pc.plot()
```

Out[ ]: <Axes: xlabel='Date'>

In [ ]:
```python
spy_dayily_pc = (stock['SPY']-stock['SPY'].shift(1))/stock['SPY'].shift(1)*100
spy_dayily_pc.iloc[0] = 0
```

In [ ]:
```python
plt.hist(spy_dayily_pc,bins = 50)
plt.show
```

Out[ ]: <function matplotlib.pyplot.show(close=None, block=None)>

In [ ]:
```python
stock_dayily_pc = (stock-stock.shift(1))/stock.shift(1)*100
stock_dayily_pc.head()
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Date							
2023-01-03	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-04	0.772019	0.311026	1.229134	-1.204214	1.369997	-2.012491	0.946095
2023-01-05	-1.141340	-2.210838	-1.030930	-0.253942	0.418085	-0.424925	-1.192838
2023-01-06	2.293210	2.660601	2.291662	-0.407332	1.839661	0.640108	1.839607
2023-01-09	-0.056690	1.356254	0.237609	0.357872	0.532418	1.413433	0.197572

In [ ]:
```python
stock_d_cr = stock_dayily_pc.cumsum()
stock_d_cr
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Date							
2023-01-03	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-04	0.772019	0.311026	1.229134	-1.204214	1.369997	-2.012491	0.946095
2023-01-05	-0.369321	-1.899812	0.198205	-1.458155	1.788082	-2.437416	-0.246743
2023-01-06	1.923890	0.760789	2.489866	-1.865487	3.627743	-1.797308	1.592865
2023-01-09	1.867200	2.117043	2.727475	-1.507615	4.160161	-0.383875	1.790437
...	...	...	...	...	...	...	...
2023-07-24	18.167673	41.521474	14.811073	11.841544	0.693326	2.867262	6.508759
2023-07-25	18.440678	42.534953	15.112523	11.886288	0.505873	3.343127	7.049009
2023-07-26	18.456049	42.122878	15.292848	11.662669	0.604715	2.801855	7.586347
2023-07-27	17.793052	42.050915	14.632845	10.766215	-1.340574	2.665804	6.036378
2023-07-28	18.772084	44.004291	15.669694	10.223471	-0.826984	3.074520	6.796419

143 rows × 7 columns

In [ ]:
```python
stock_d_cr.plot(figsize=(20,10))
```

Out[ ]: `<Axes: xlabel='Date'>`
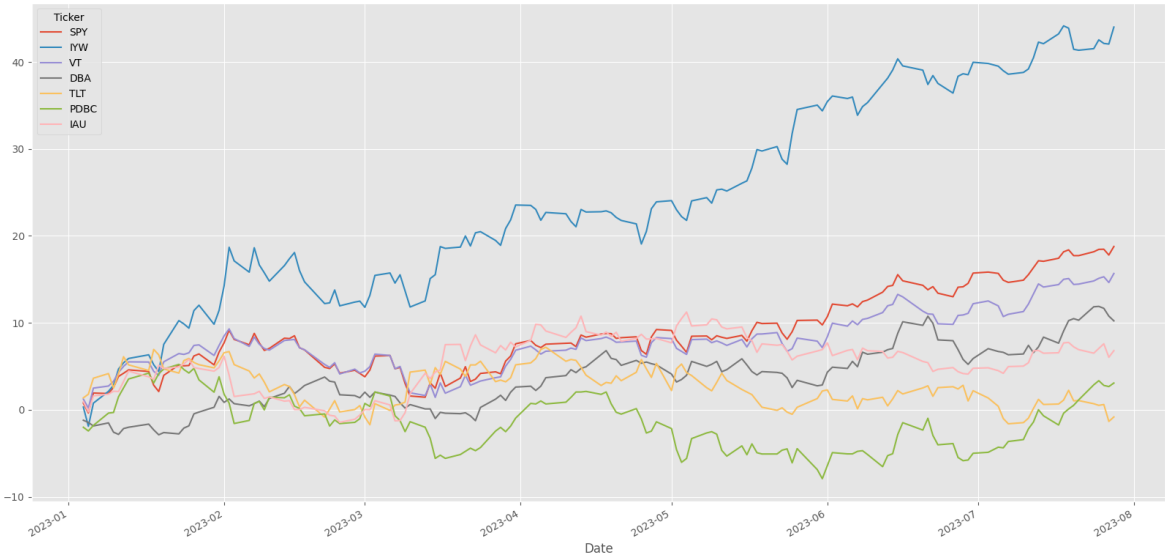
In [ ]:
```python
df_corr = stock_dayily_pc.corr()
df_corr
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Ticker							
SPY	1.000000	0.861755	0.950274	0.220478	-0.027286	0.331629	-0.079354
IYW	0.861755	1.000000	0.800055	0.066309	0.048336	0.123772	-0.032007
VT	0.950274	0.800055	1.000000	0.289654	-0.016303	0.422287	0.030049
DBA	0.220478	0.066309	0.289654	1.000000	0.027704	0.557974	0.032718
TLT	-0.027286	0.048336	-0.016303	0.027704	1.000000	-0.045833	0.462083
PDBC	0.331629	0.123772	0.422287	0.557974	-0.045833	1.000000	0.158478
IAU	-0.079354	-0.032007	0.030049	0.032718	0.462083	0.158478	1.000000

In [ ]:
```python
plt.imshow(df_corr,cmap='hot',interpolation='none')
plt.colorbar()
plt.xticks(range(len(df_corr)),df_corr.columns)
plt.yticks(range(len(df_corr)),df_corr.columns)

plt.gcf().set_size_inches(10,10)
```
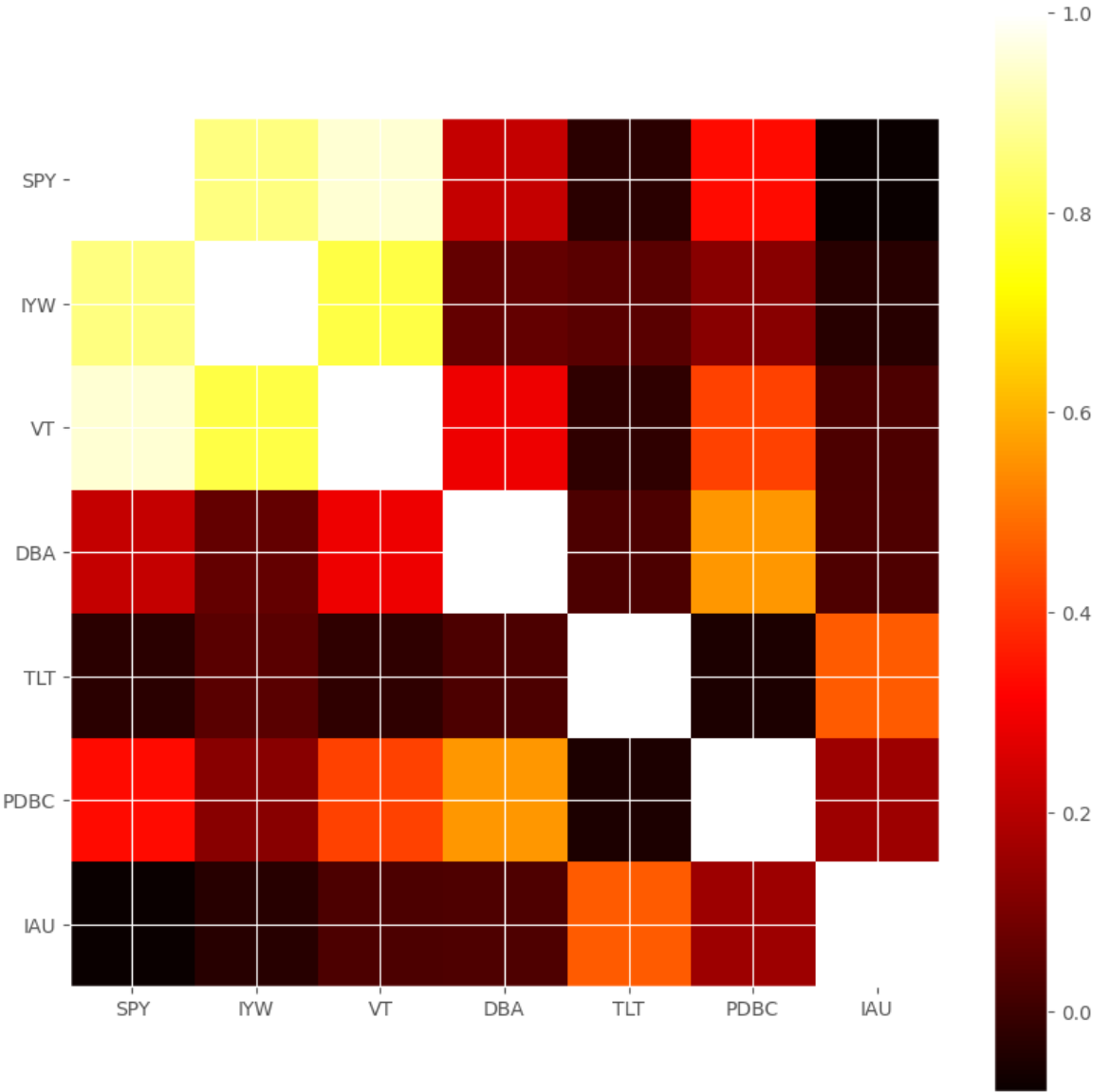
In [ ]:
```python
plt.scatter(df_corr.SPY,df_corr.VT)
plt.show()
```
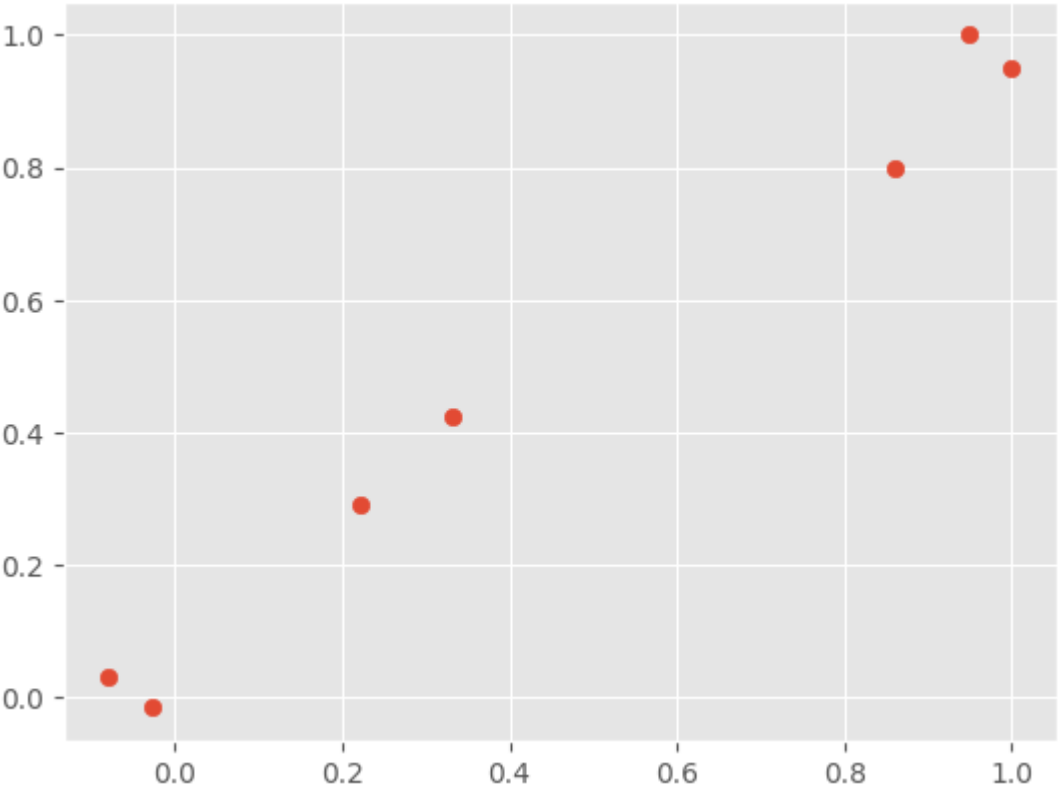

In [ ]:
```python
periods = 75
vol = stock_dayily_pc.rolling(window=periods).std()
vol
```

Out[ ]:

Ticker	SPY	IYW	VT	DBA	TLT	PDBC	IAU
Date							
2023-01-03	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-04	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-05	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-06	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2023-01-09	NaN	NaN	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...
2023-07-24	0.707558	1.166506	0.734429	0.809015	0.963432	1.064412	0.732151
2023-07-25	0.706113	1.156585	0.731453	0.807949	0.954634	1.065039	0.735241
2023-07-26	0.705720	1.156957	0.731077	0.802649	0.954034	1.066217	0.733968
2023-07-27	0.711860	1.156609	0.736521	0.810772	0.961963	1.066175	0.750537
2023-07-28	0.718360	1.164933	0.744222	0.811101	0.963905	1.065341	0.752773

143 rows × 7 columns

```
In [ ]:  vol['SPY'].plot()
         vol['TLT'].plot()
         vol['DBA'].plot()
```

Out[ ]: <Axes: xlabel='Date'>