SpaceX_Portfolio

September 29, 2021

1 SpaceX Portfolio

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import math

import warnings
warnings.filterwarnings("ignore")

# yahoo finance data
import yfinance as yf
yf.pdr_override()
```

[2]:
```
# input
# SpaceX
title = "SpaceX"
symbols = ['BA', 'TSLA', 'SPCE','LMT','NOC','LDOS']
start = '2019-12-01'
end = '2020-06-01'
```

[3]:
```
df = pd.DataFrame()
for s in symbols:
    df[s] = yf.download(s,start,end)['Adj Close']
```

```
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```

[4]:
```
from datetime import datetime
from dateutil import relativedelta

d1 = datetime.strptime(start, "%Y-%m-%d")
```

```python
d2 = datetime.strptime(end, "%Y-%m-%d")
delta = relativedelta.relativedelta(d2,d1)
print('How many years of investing?')
print('%s years' % delta.years)
```

```
How many years of investing?
0 years
```

[5]:
```python
number_of_years = delta.years
```

[6]:
```python
days = (df.index[-1] - df.index[0]).days
days
```

[6]: 179

[7]:
```python
df.head()
```

[7]:

Date	BA	TSLA	SPCE	LMT	NOC	LDOS
2019-12-02	353.079285	334.869995	7.44	378.929810	339.047699	89.160278
2019-12-03	349.997620	336.200012	7.46	376.954254	340.456543	88.971741
2019-12-04	346.776764	333.029999	7.22	379.878082	340.516052	89.051117
2019-12-05	343.635468	330.369995	7.22	381.221436	341.706635	89.259506
2019-12-06	351.995728	335.890015	7.26	382.130188	342.053925	89.983910

[8]:
```python
df.tail()
```

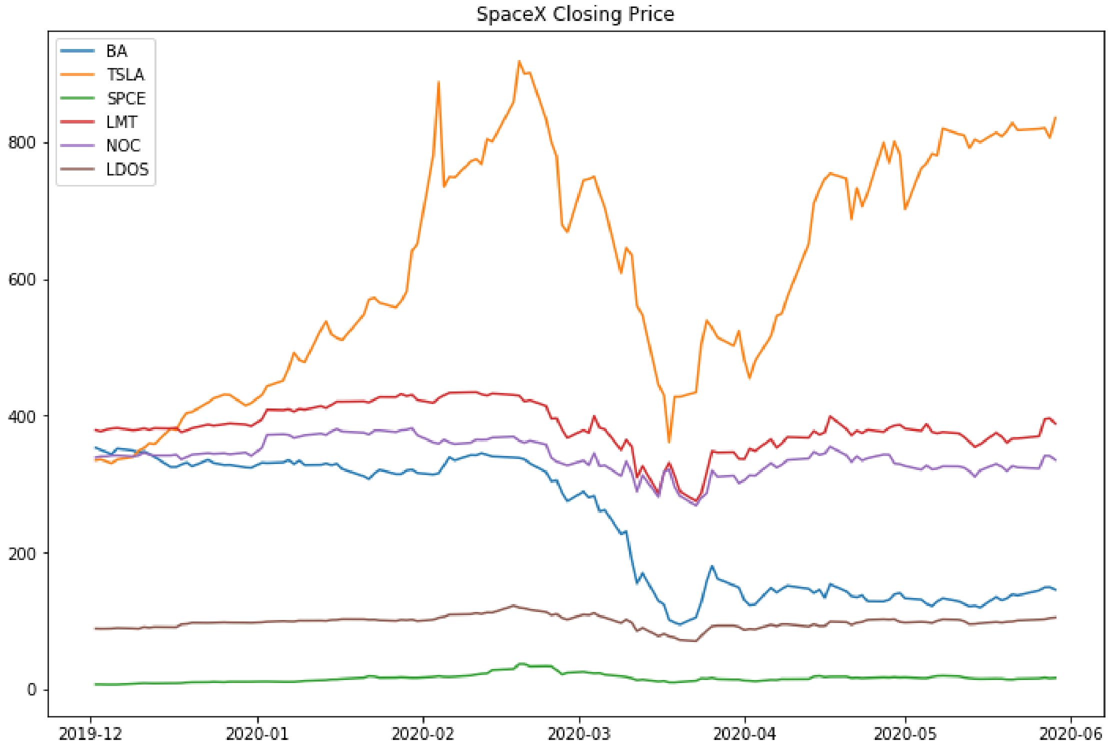
[8]:

Date	BA	TSLA	SPCE	LMT	NOC \
2020-05-22	137.529999	816.880005	15.740000	366.777344	324.531158
2020-05-26	144.729996	818.869995	16.330000	369.958069	322.818451
2020-05-27	149.520004	820.229980	17.520000	394.727966	341.528961
2020-05-28	149.820007	805.809998	16.469999	396.040009	341.279999
2020-05-29	145.850006	835.000000	17.040001	388.440002	335.200012

Date	LDOS
2020-05-22	100.959999
2020-05-26	102.250000
2020-05-27	102.760002
2020-05-28	104.360001
2020-05-29	105.290001

[9]:
```python
plt.figure(figsize=(12,8))
plt.plot(df)
plt.title(title + ' Closing Price')
plt.legend(labels=df.columns)
```

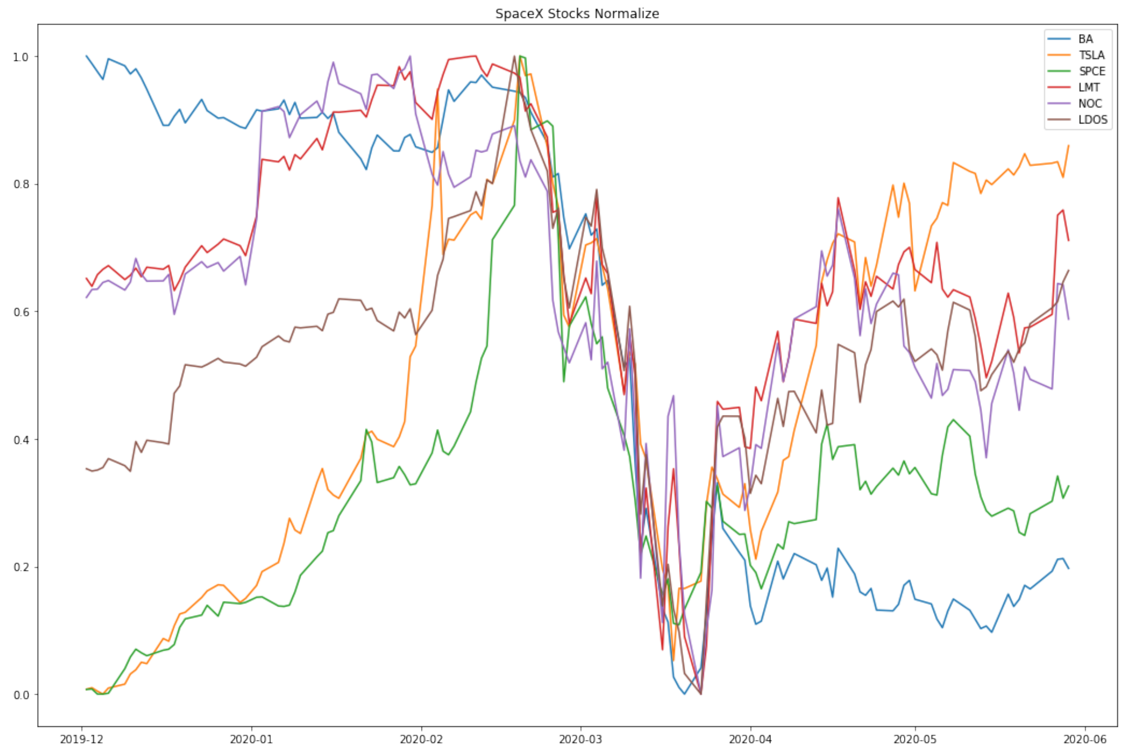
[9]: <matplotlib.legend.Legend at 0x25dd1b6d780>



[10]:
```
# Normalize the data
normalize = (df - df.min())/ (df.max() - df.min())
```

[11]:
```
plt.figure(figsize=(18,12))
plt.plot(normalize)
plt.title(title + ' Stocks Normalize')
plt.legend(labels=normalize.columns)
```

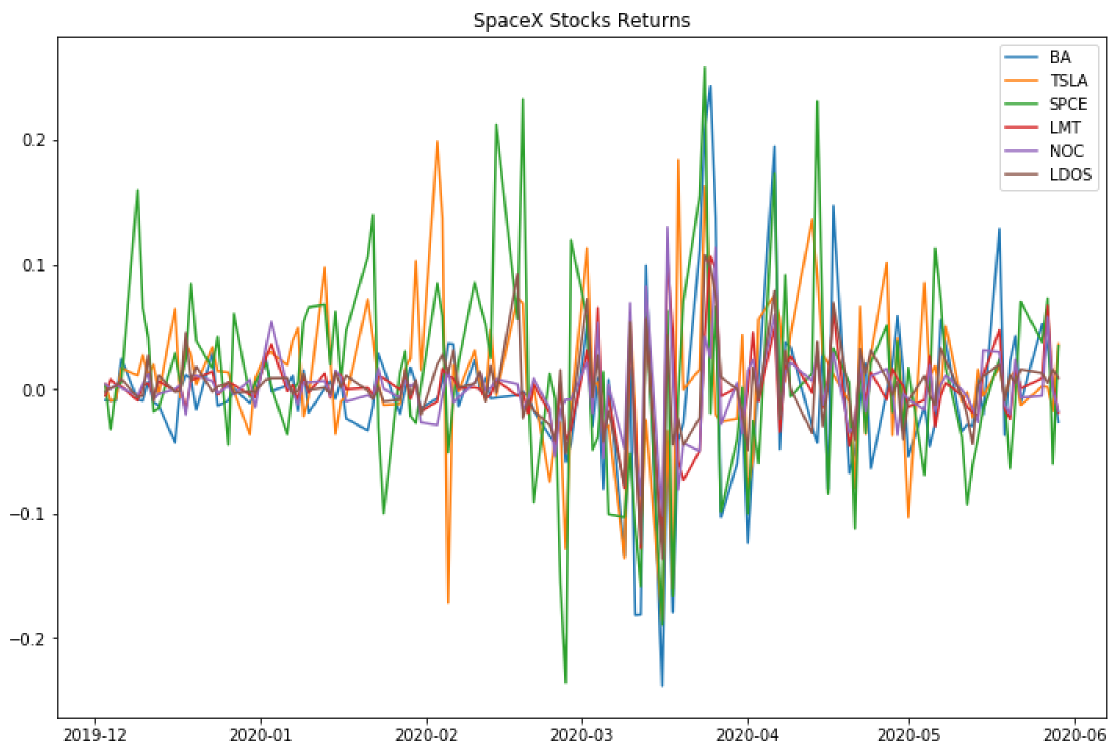
[11]: <matplotlib.legend.Legend at 0x25dd1deeba8>



[12]:
```
stock_rets = df.pct_change().dropna()
```

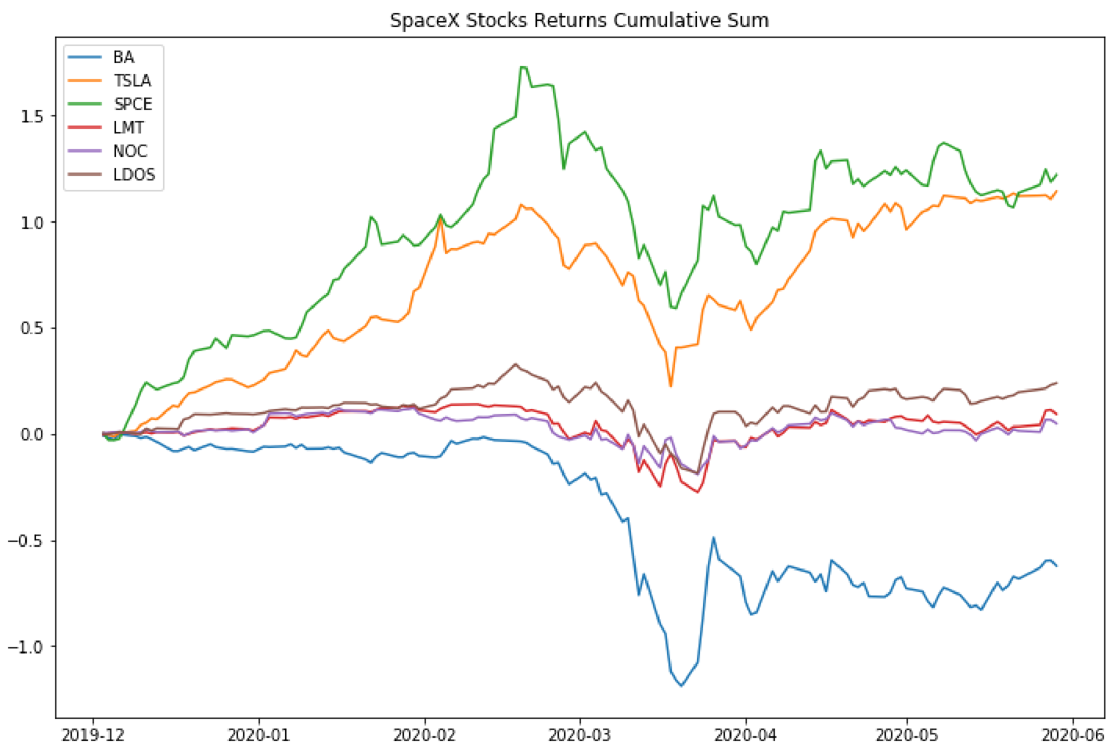
[13]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title(title + ' Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[13]: <matplotlib.legend.Legend at 0x25dd1bcd550>

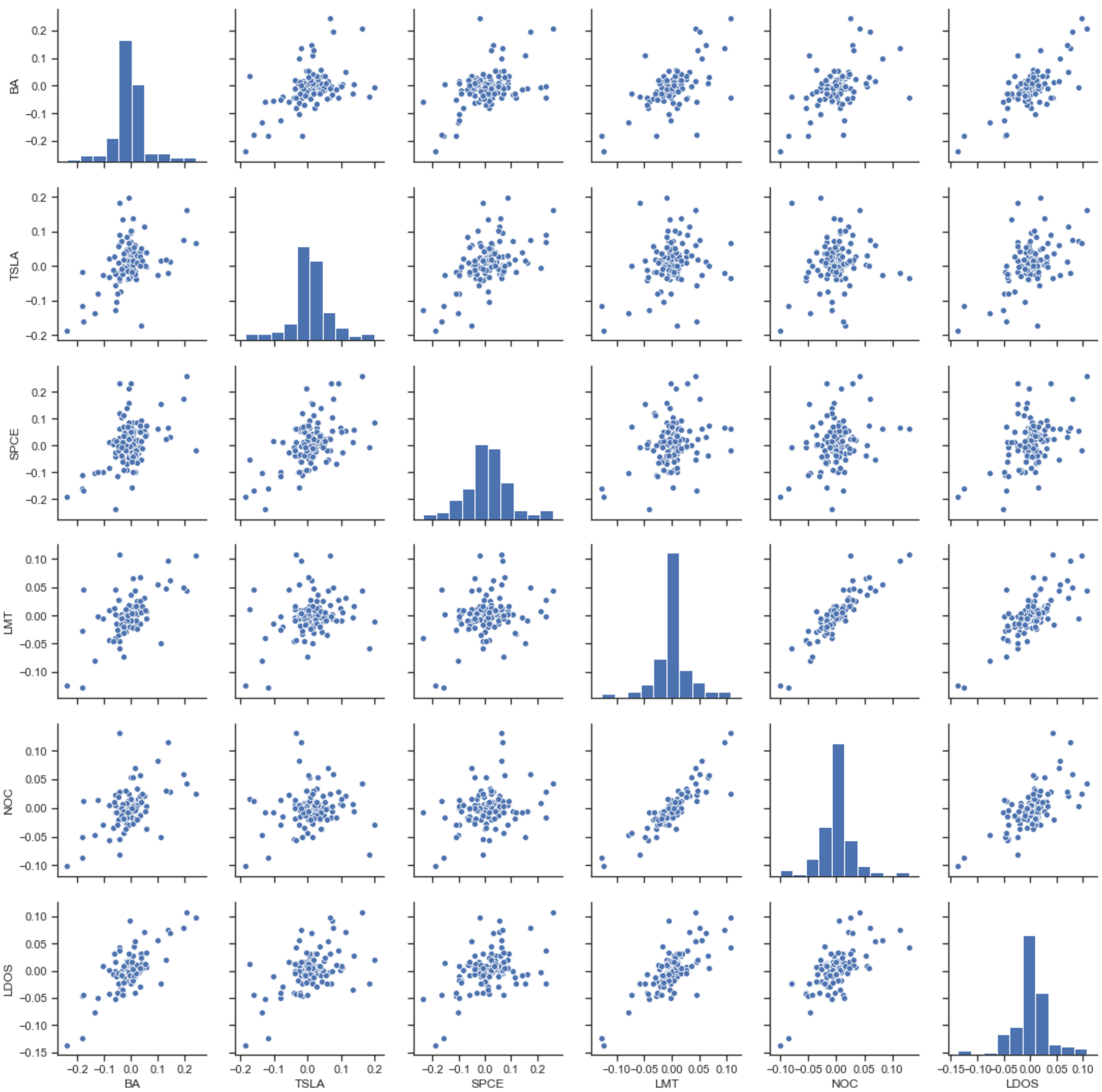


[14]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title(title + ' Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

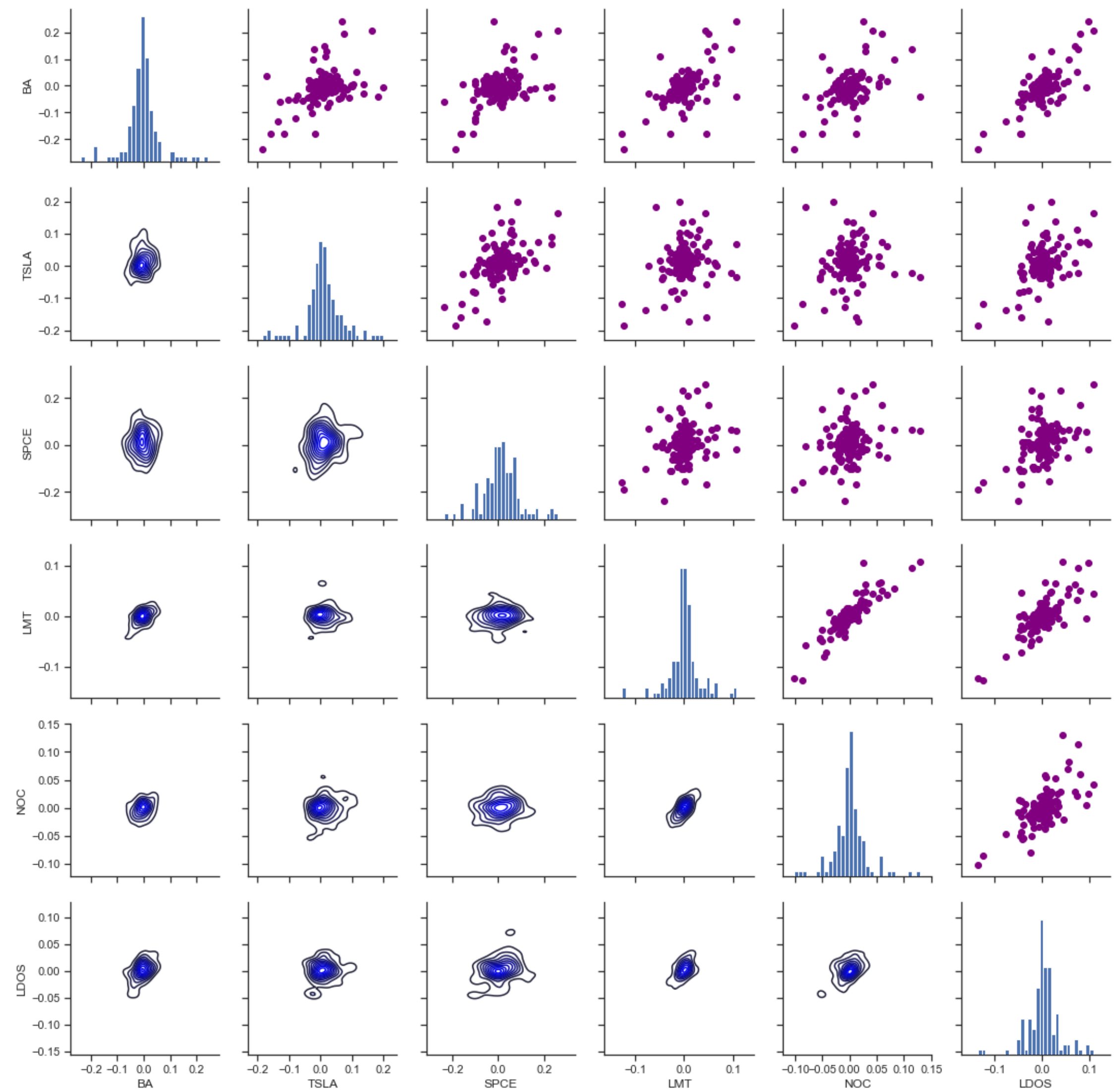
[14]: <matplotlib.legend.Legend at 0x25dd1c2add8>



[15]:
```
sns.set(style='ticks')
ax = sns.pairplot(stock_rets, diag_kind='hist')

nplot = len(stock_rets.columns)
for i in range(nplot) :
    for j in range(nplot) :
        ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)
```

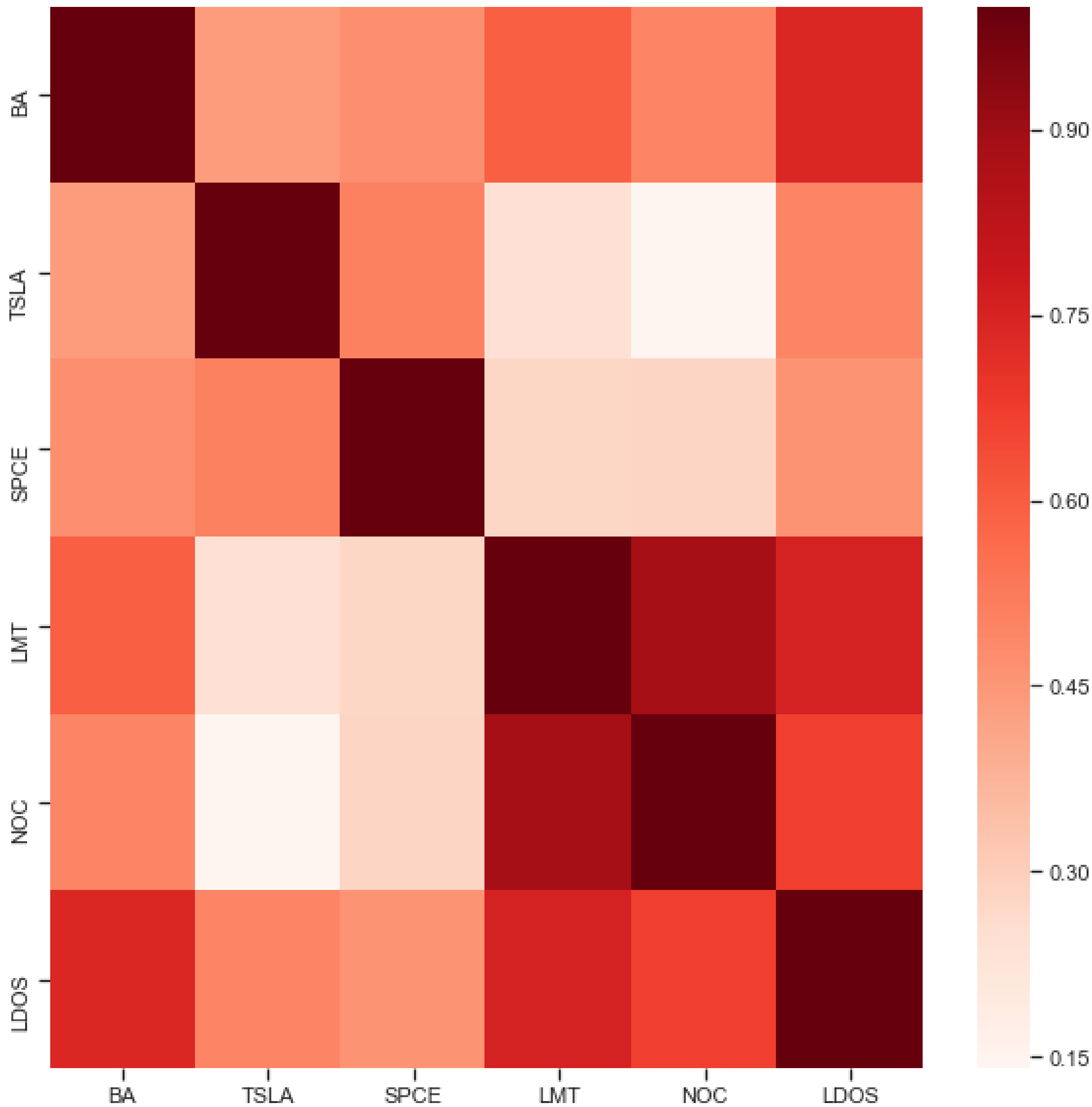


[16]:
```python
ax = sns.PairGrid(stock_rets)
ax.map_upper(plt.scatter, color='purple')
ax.map_lower(sns.kdeplot, color='blue')
ax.map_diag(plt.hist, bins=30)
for i in range(nplot) :
    for j in range(nplot) :
        ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)
```



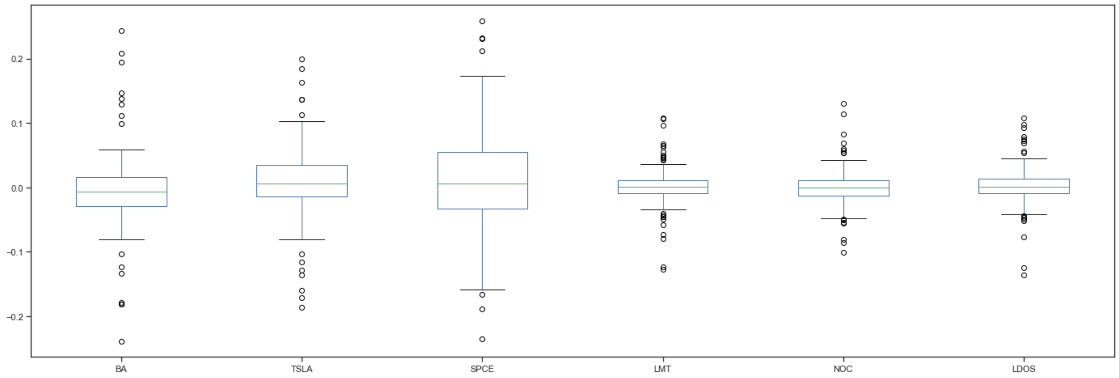
[17]:
```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

# plot the heatmap
sns.heatmap(corr,
        xticklabels=corr.columns,
        yticklabels=corr.columns,
            cmap="Reds")
```

[17]: <matplotlib.axes._subplots.AxesSubplot at 0x25dd3e4fb38>

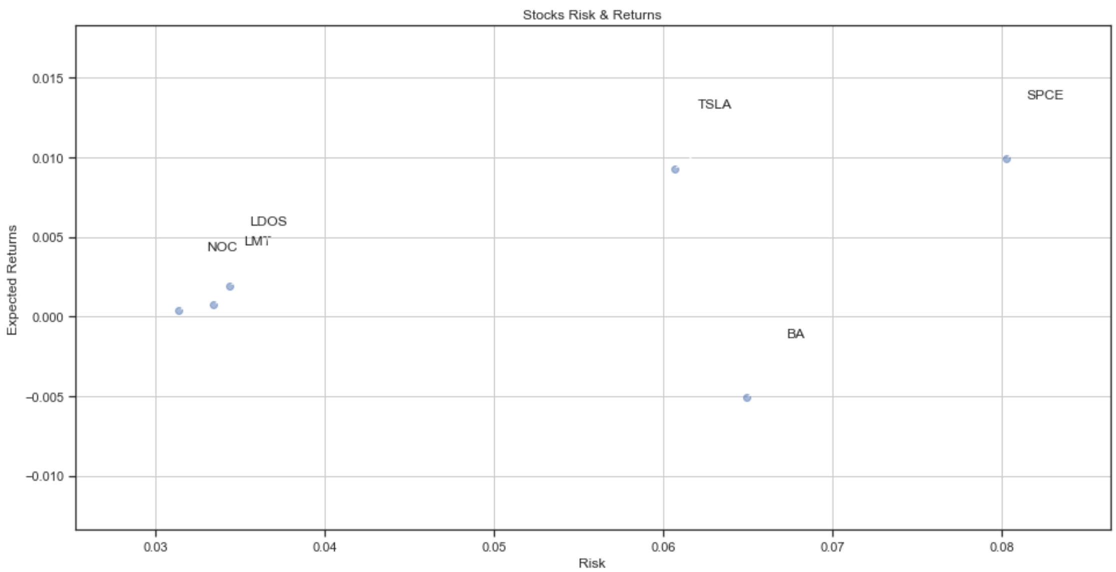


[18]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(24,8))
```

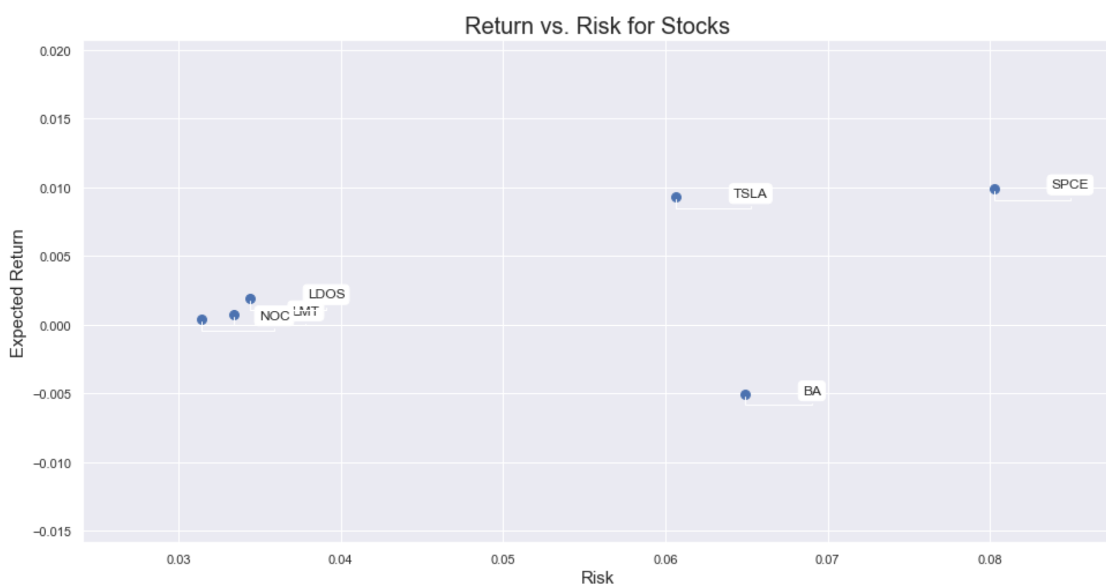
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x25dd33718d0>



[19]:
```python
rets = stock_rets.dropna()

plt.figure(figsize=(16,8))
plt.scatter(rets.std(), rets.mean(),alpha = 0.5)

plt.title('Stocks Risk & Returns')
plt.xlabel('Risk')
plt.ylabel('Expected Returns')
plt.grid(which='major')

for label, x, y in zip(rets.columns, rets.std(), rets.mean()):
    plt.annotate(
        label,
        xy = (x, y), xytext = (50, 50),
        textcoords = 'offset points', ha = 'right', va = 'bottom',
        arrowprops = dict(arrowstyle = '-', connectionstyle = 'arc3,rad=-0.3'))
```



[20]:
```
rets = stock_rets.dropna()
area = np.pi*20.0

sns.set(style='darkgrid')
plt.figure(figsize=(16,8))
plt.scatter(rets.std(), rets.mean(), s=area)
plt.xlabel("Risk", fontsize=15)
plt.ylabel("Expected Return", fontsize=15)
plt.title("Return vs. Risk for Stocks", fontsize=20)

for label, x, y in zip(rets.columns, rets.std(), rets.mean()) :
    plt.annotate(label, xy=(x,y), xytext=(50, 0), textcoords='offset points',
                 arrowprops=dict(arrowstyle='-',␣
 ↪connectionstyle='bar,angle=180,fraction=-0.2'),
                 bbox=dict(boxstyle="round", fc="w"))
```



[21]:
```
rest_rets = rets.corr()
pair_value = rest_rets.abs().unstack()
pair_value.sort_values(ascending = False)
```

[21]:
```
LDOS  LDOS    1.000000
NOC   NOC     1.000000
TSLA  TSLA    1.000000
SPCE  SPCE    1.000000
LMT   LMT     1.000000
```

```
BA    BA      1.000000
NOC   LMT     0.886977
LMT   NOC     0.886977
      LDOS    0.758027
LDOS  LMT     0.758027
      BA      0.738257
BA    LDOS    0.738257
NOC   LDOS    0.668499
LDOS  NOC     0.668499
BA    LMT     0.596671
LMT   BA      0.596671
SPCE  TSLA    0.509609
TSLA  SPCE    0.509609
BA    NOC     0.498895
NOC   BA      0.498895
TSLA  LDOS    0.498308
LDOS  TSLA    0.498308
BA    SPCE    0.471701
SPCE  BA      0.471701
LDOS  SPCE    0.458546
SPCE  LDOS    0.458546
TSLA  BA      0.438817
BA    TSLA    0.438817
SPCE  NOC     0.280334
NOC   SPCE    0.280334
SPCE  LMT     0.275388
LMT   SPCE    0.275388
TSLA  LMT     0.243270
LMT   TSLA    0.243270
TSLA  NOC     0.140325
NOC   TSLA    0.140325
dtype: float64
```

[22]:
```
# Normalized Returns Data
Normalized_Value = ((rets[:] - rets[:].min()) /(rets[:].max() - rets[:].min()))
Normalized_Value.head()
```

[22]:

	BA	TSLA	SPCE	LMT	NOC	LDOS
Date						
2019-12-03	0.476999	0.493207	0.482711	0.521094	0.456284	0.549904
2019-12-04	0.476014	0.458375	0.412161	0.576310	0.439087	0.562225
2019-12-05	0.476313	0.462122	0.477270	0.558344	0.453437	0.568159
2019-12-06	0.545629	0.526313	0.488483	0.553437	0.442723	0.591826
2019-12-09	0.478233	0.511051	0.800636	0.504553	0.416904	0.532359

[23]:
```
Normalized_Value.corr()
```

[23]:

```
           BA      TSLA      SPCE       LMT       NOC      LDOS
BA    1.000000  0.438817  0.471701  0.596671  0.498895  0.738257
TSLA  0.438817  1.000000  0.509609  0.243270  0.140325  0.498308
SPCE  0.471701  0.509609  1.000000  0.275388  0.280334  0.458546
LMT   0.596671  0.243270  0.275388  1.000000  0.886977  0.758027
NOC   0.498895  0.140325  0.280334  0.886977  1.000000  0.668499
LDOS  0.738257  0.498308  0.458546  0.758027  0.668499  1.000000
```

[24]:

```python
normalized_rets = Normalized_Value.corr()
normalized_pair_value = normalized_rets.abs().unstack()
normalized_pair_value.sort_values(ascending = False)
```

[24]:

```
LDOS  LDOS    1.000000
NOC   NOC     1.000000
TSLA  TSLA    1.000000
SPCE  SPCE    1.000000
LMT   LMT     1.000000
BA    BA      1.000000
NOC   LMT     0.886977
LMT   NOC     0.886977
      LDOS    0.758027
LDOS  LMT     0.758027
      BA      0.738257
BA    LDOS    0.738257
NOC   LDOS    0.668499
LDOS  NOC     0.668499
BA    LMT     0.596671
LMT   BA      0.596671
SPCE  TSLA    0.509609
TSLA  SPCE    0.509609
BA    NOC     0.498895
NOC   BA      0.498895
TSLA  LDOS    0.498308
LDOS  TSLA    0.498308
BA    SPCE    0.471701
SPCE  BA      0.471701
LDOS  SPCE    0.458546
SPCE  LDOS    0.458546
TSLA  BA      0.438817
BA    TSLA    0.438817
SPCE  NOC     0.280334
NOC   SPCE    0.280334
SPCE  LMT     0.275388
LMT   SPCE    0.275388
TSLA  LMT     0.243270
LMT   TSLA    0.243270
TSLA  NOC     0.140325
```

```
NOC   TSLA    0.140325
dtype: float64
```

[25]:
```
print("Stock returns: ")
print(rets.mean())
print('-' * 50)
print("Stock risks:")
print(rets.std())
```

```
Stock returns:
BA      -0.005059
TSLA     0.009290
SPCE     0.009929
LMT      0.000760
NOC      0.000391
LDOS     0.001944
dtype: float64
--------------------------------------------------
Stock risks:
BA       0.064907
TSLA     0.060640
SPCE     0.080244
LMT      0.033435
NOC      0.031387
LDOS     0.034377
dtype: float64
```

[26]:
```
table = pd.DataFrame()
table['Returns'] = rets.mean()
table['Risk'] = rets.std()
table.sort_values(by='Returns')
```

[26]:

	Returns	Risk
BA	-0.005059	0.064907
NOC	0.000391	0.031387
LMT	0.000760	0.033435
LDOS	0.001944	0.034377
TSLA	0.009290	0.060640
SPCE	0.009929	0.080244

[27]:
```
table.sort_values(by='Risk')
```

[27]:

	Returns	Risk
NOC	0.000391	0.031387
LMT	0.000760	0.033435
LDOS	0.001944	0.034377
TSLA	0.009290	0.060640

```
BA    -0.005059  0.064907
SPCE   0.009929  0.080244
```

[28]:
```python
rf = 0.01
table['Sharpe Ratio'] = (table['Returns'] - rf) / table['Risk']
table
```

[28]:
```
       Returns      Risk  Sharpe Ratio
BA   -0.005059  0.064907     -0.232014
TSLA  0.009290  0.060640     -0.011711
SPCE  0.009929  0.080244     -0.000889
LMT   0.000760  0.033435     -0.276350
NOC   0.000391  0.031387     -0.306140
LDOS  0.001944  0.034377     -0.234349
```

[29]:
```python
table['Max Returns'] = rets.max()
```

[30]:
```python
table['Min Returns'] = rets.min()
```

[31]:
```python
table['Median Returns'] = rets.median()
```

[32]:
```python
total_return = stock_rets[-1:].transpose()
table['Total Return'] = 100 * total_return
table
```

[32]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
BA   -0.005059  0.064907     -0.232014     0.243186    -0.238484
TSLA  0.009290  0.060640     -0.011711     0.198949    -0.185778
SPCE  0.009929  0.080244     -0.000889     0.258288    -0.235826
LMT   0.000760  0.033435     -0.276350     0.107279    -0.127616
NOC   0.000391  0.031387     -0.306140     0.130012    -0.101463
LDOS  0.001944  0.034377     -0.234349     0.107723    -0.136308

      Median Returns  Total Return
BA         -0.007132     -2.649847
TSLA        0.006215      3.622442
SPCE        0.005540      3.460848
LMT         0.000488     -1.919000
NOC         0.000175     -1.781524
LDOS        0.001364      0.891146
```

[33]:
```python
table['Average Return Days'] = (1 + total_return)**(1 / days) - 1
table
```

[33]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
BA   -0.005059  0.064907     -0.232014     0.243186    -0.238484
TSLA  0.009290  0.060640     -0.011711     0.198949    -0.185778
```

```
SPCE  0.009929  0.080244     -0.000889     0.258288    -0.235826
LMT   0.000760  0.033435     -0.276350     0.107279    -0.127616
NOC   0.000391  0.031387     -0.306140     0.130012    -0.101463
LDOS  0.001944  0.034377     -0.234349     0.107723    -0.136308

      Median Returns  Total Return  Average Return Days
BA         -0.007132     -2.649847            -0.000150
TSLA        0.006215      3.622442             0.000199
SPCE        0.005540      3.460848             0.000190
LMT         0.000488     -1.919000            -0.000108
NOC         0.000175     -1.781524            -0.000100
LDOS        0.001364      0.891146             0.000050
```

[34]:
```python
initial_value = df.iloc[0]
ending_value = df.iloc[-1]
table['CAGR'] = ((ending_value / initial_value) ** (252.0 / days)) -1
table
```

[34]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
BA   -0.005059  0.064907     -0.232014     0.243186    -0.238484
TSLA  0.009290  0.060640     -0.011711     0.198949    -0.185778
SPCE  0.009929  0.080244     -0.000889     0.258288    -0.235826
LMT   0.000760  0.033435     -0.276350     0.107279    -0.127616
NOC   0.000391  0.031387     -0.306140     0.130012    -0.101463
LDOS  0.001944  0.034377     -0.234349     0.107723    -0.136308

      Median Returns  Total Return  Average Return Days      CAGR
BA         -0.007132     -2.649847            -0.000150 -0.711965
TSLA        0.006215      3.622442             0.000199  2.619411
SPCE        0.005540      3.460848             0.000190  2.211221
LMT         0.000488     -1.919000            -0.000108  0.035513
NOC         0.000175     -1.781524            -0.000100 -0.015940
LDOS        0.001364      0.891146             0.000050  0.263766
```

[35]:
```python
table.sort_values(by='Average Return Days')
```

[35]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
BA   -0.005059  0.064907     -0.232014     0.243186    -0.238484
LMT   0.000760  0.033435     -0.276350     0.107279    -0.127616
NOC   0.000391  0.031387     -0.306140     0.130012    -0.101463
LDOS  0.001944  0.034377     -0.234349     0.107723    -0.136308
SPCE  0.009929  0.080244     -0.000889     0.258288    -0.235826
TSLA  0.009290  0.060640     -0.011711     0.198949    -0.185778

      Median Returns  Total Return  Average Return Days      CAGR
BA         -0.007132     -2.649847            -0.000150 -0.711965
LMT         0.000488     -1.919000            -0.000108  0.035513
```

NOC	0.000175	-1.781524	-0.000100	-0.015940
LDOS	0.001364	0.891146	0.000050	0.263766
SPCE	0.005540	3.460848	0.000190	2.211221
TSLA	0.006215	3.622442	0.000199	2.619411