Space_Stock_Portfolio

September 29, 2021

1 Space Stock Portfolio Risk and Returns

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

import warnings
warnings.filterwarnings("ignore")

# yahoo finance is used to fetch data
import yfinance as yf
yf.pdr_override()
```

[2]:
```
# input
# Space Stock
title = 'Space'
symbols = ['LORL','SRAC','SRACU','NPA', 'NPAUU', 'SPCE']
start = '2020-02-01'
end = '2021-01-14'
```

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

```
[*********************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
```

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

```
d1 = datetime.strptime(start, "%Y-%m-%d")
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]:
```
number_of_years = delta.years
```

[6]:
```
months = (d2.year - d1.year) * 12 + (d2.month - d1.month)
months
```

[6]: 11

[7]:
```
days = (df.index[-1] - df.index[0]).days
days
```

[7]: 345

[8]:
```
df.head()
```

[8]:

Date	LORL	SRAC	SRACU	NPA	NPAUU	SPCE
2020-02-03	23.481482	9.94	10.26	10.01	10.40	18.610001
2020-02-04	24.179167	9.94	10.21	10.00	10.38	19.690001
2020-02-05	24.346319	9.94	10.21	10.00	10.38	18.690001
2020-02-06	24.942261	9.90	10.22	10.00	10.42	18.520000
2020-02-07	25.145750	9.91	10.25	10.00	10.42	18.930000

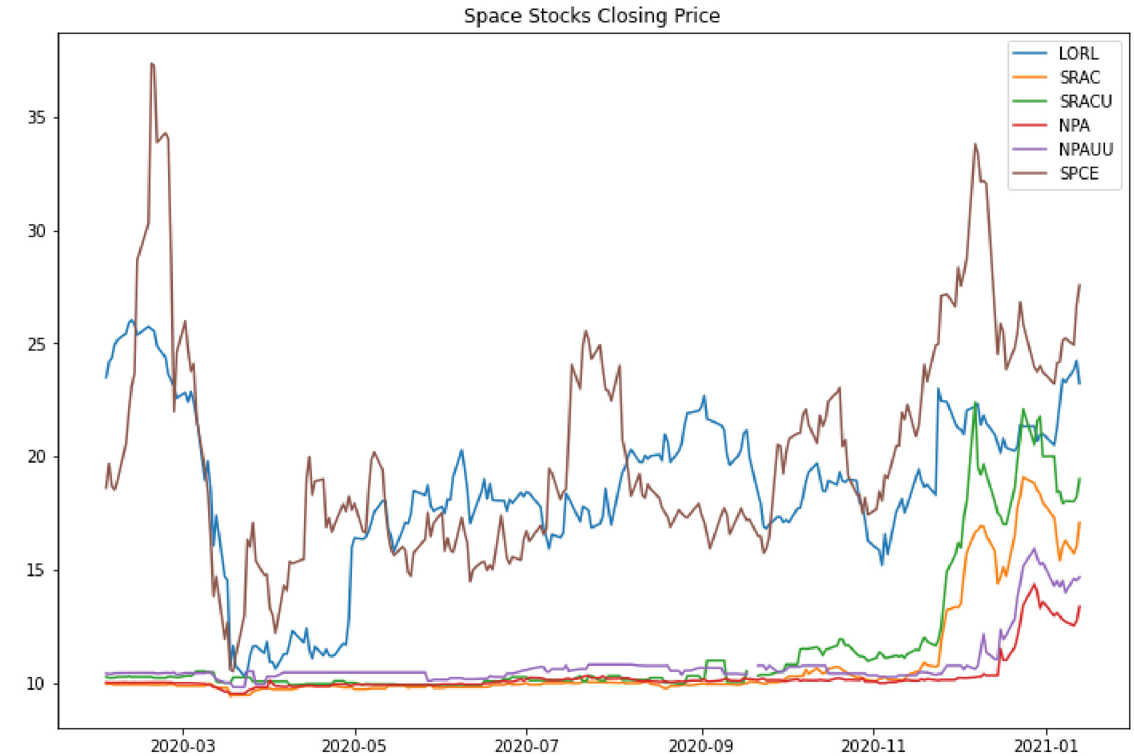
[9]:
```
df.tail()
```

[9]:

Date	LORL	SRAC	SRACU	NPA	NPAUU	SPCE
2021-01-07	23.410000	16.049999	17.920000	12.78	14.4999	25.129999
2021-01-08	23.270000	16.280001	18.020000	12.69	13.9800	25.219999
2021-01-11	23.830000	15.700000	18.000000	12.52	14.6000	24.920000
2021-01-12	24.230000	16.000000	18.200001	12.70	14.5155	26.660000
2021-01-13	23.219999	17.070000	19.000000	13.35	14.6700	27.559999

[10]:
```
plt.figure(figsize=(12,8))
plt.plot(df)
plt.title(title + ' Stocks Closing Price')
plt.legend(labels=df.columns)
```

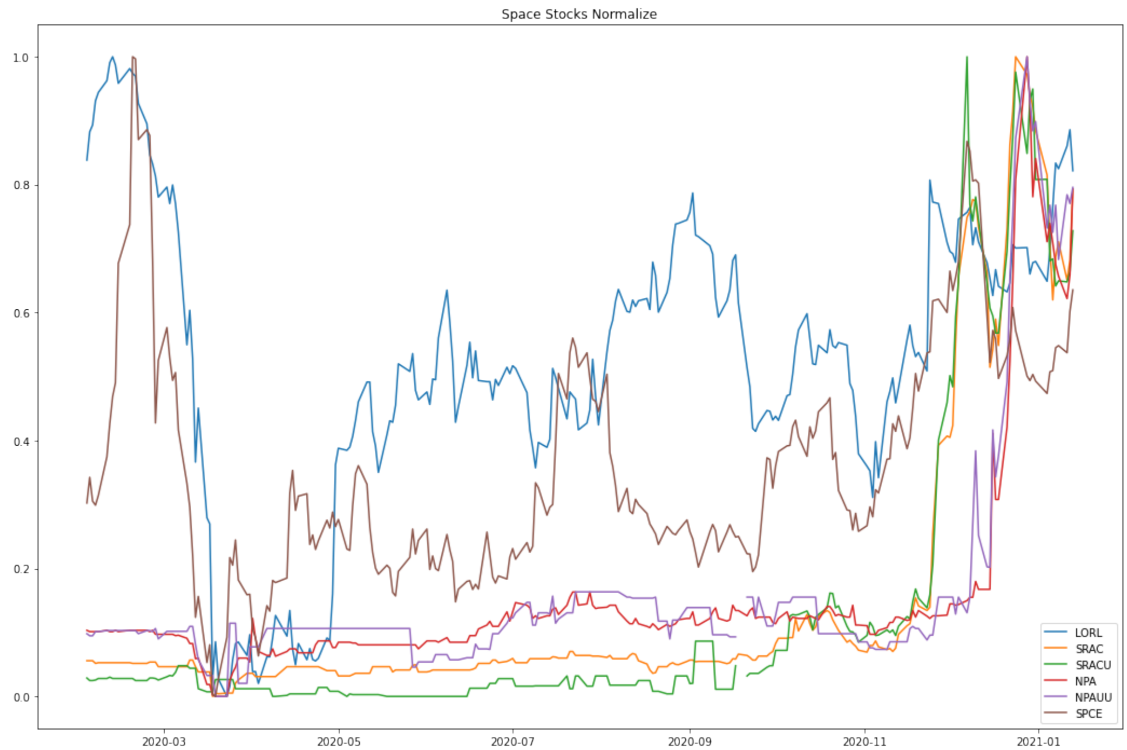
[10]: <matplotlib.legend.Legend at 0x156535d6710>



[11]:
```
# Normalize the data
normalize = (df - df.min())/ (df.max() - df.min())
```

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

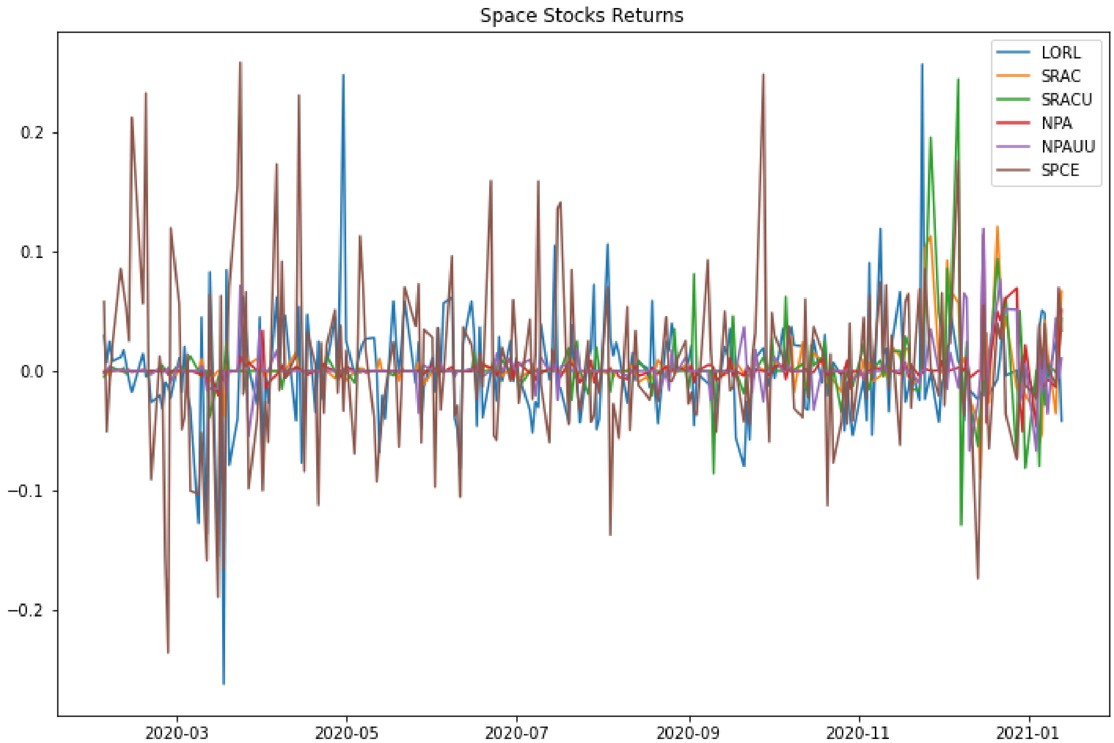
[12]: <matplotlib.legend.Legend at 0x156536d5c18>



[13]:
```
stock_rets = df.pct_change().dropna()
```

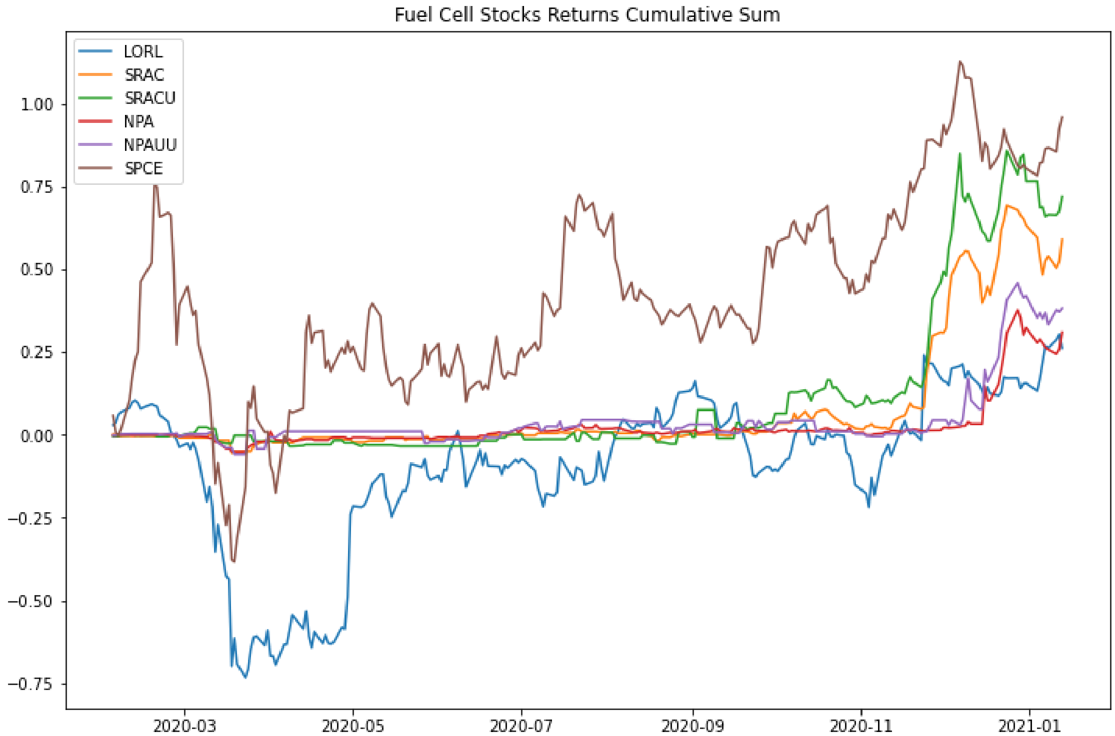
[14]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title(title +' Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[14]: <matplotlib.legend.Legend at 0x1565376ccf8>

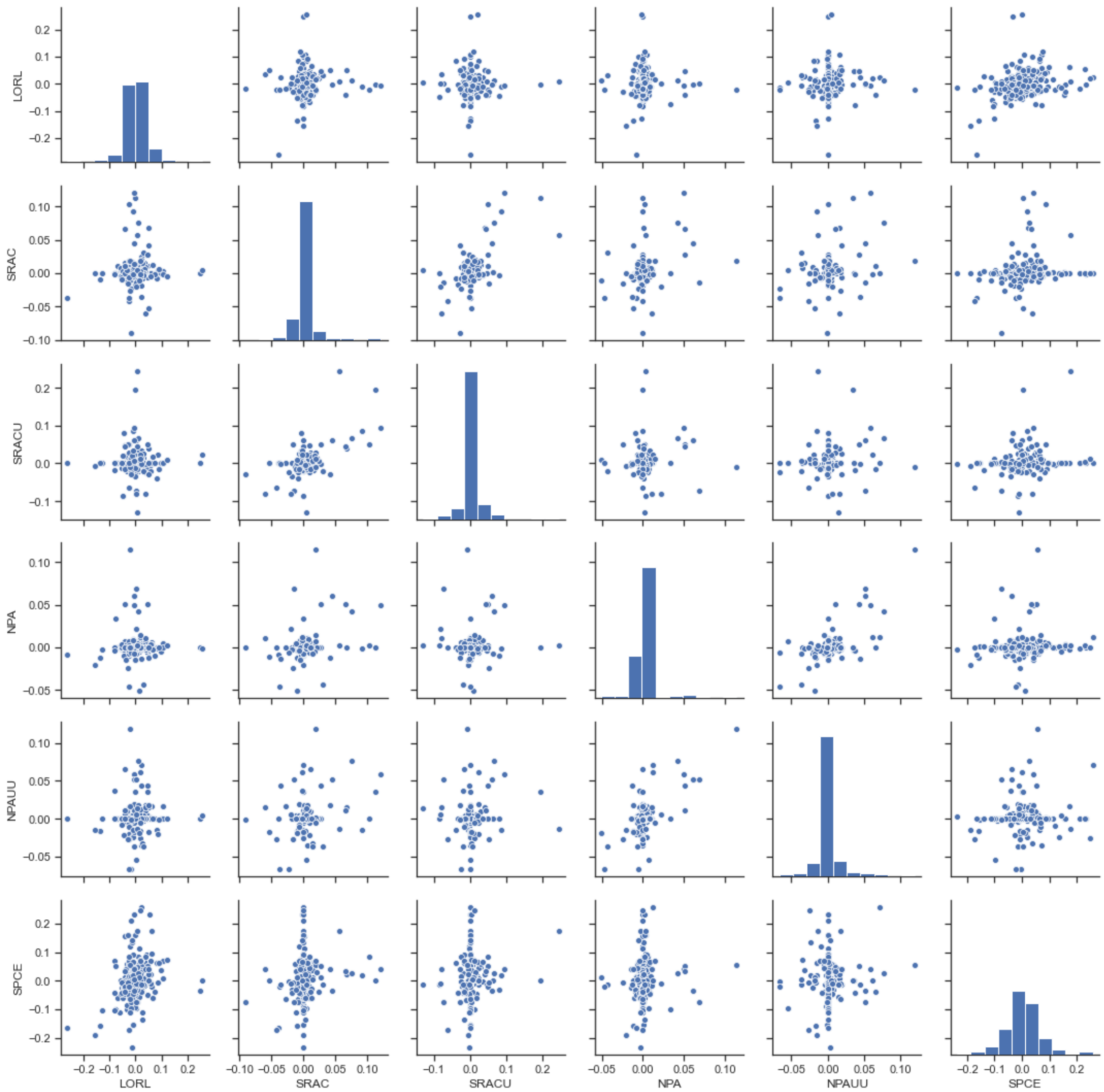


[15]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title('Fuel Cell Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

[15]: <matplotlib.legend.Legend at 0x15653860dd8>

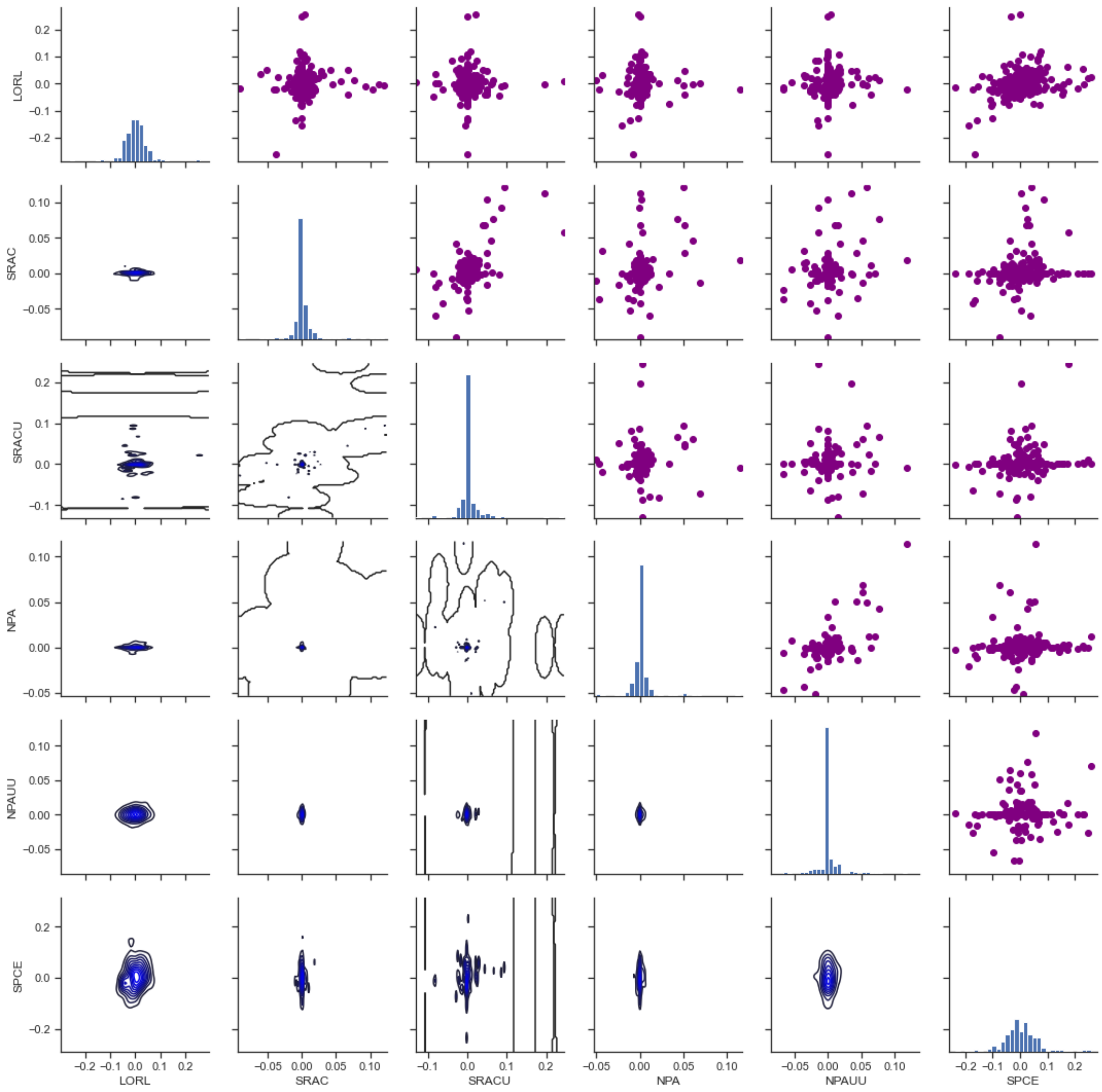


[16]:
```
sns.set(style='ticks')
ax = sns.pairplot(stock_rets, diag_kind='hist')

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)
```



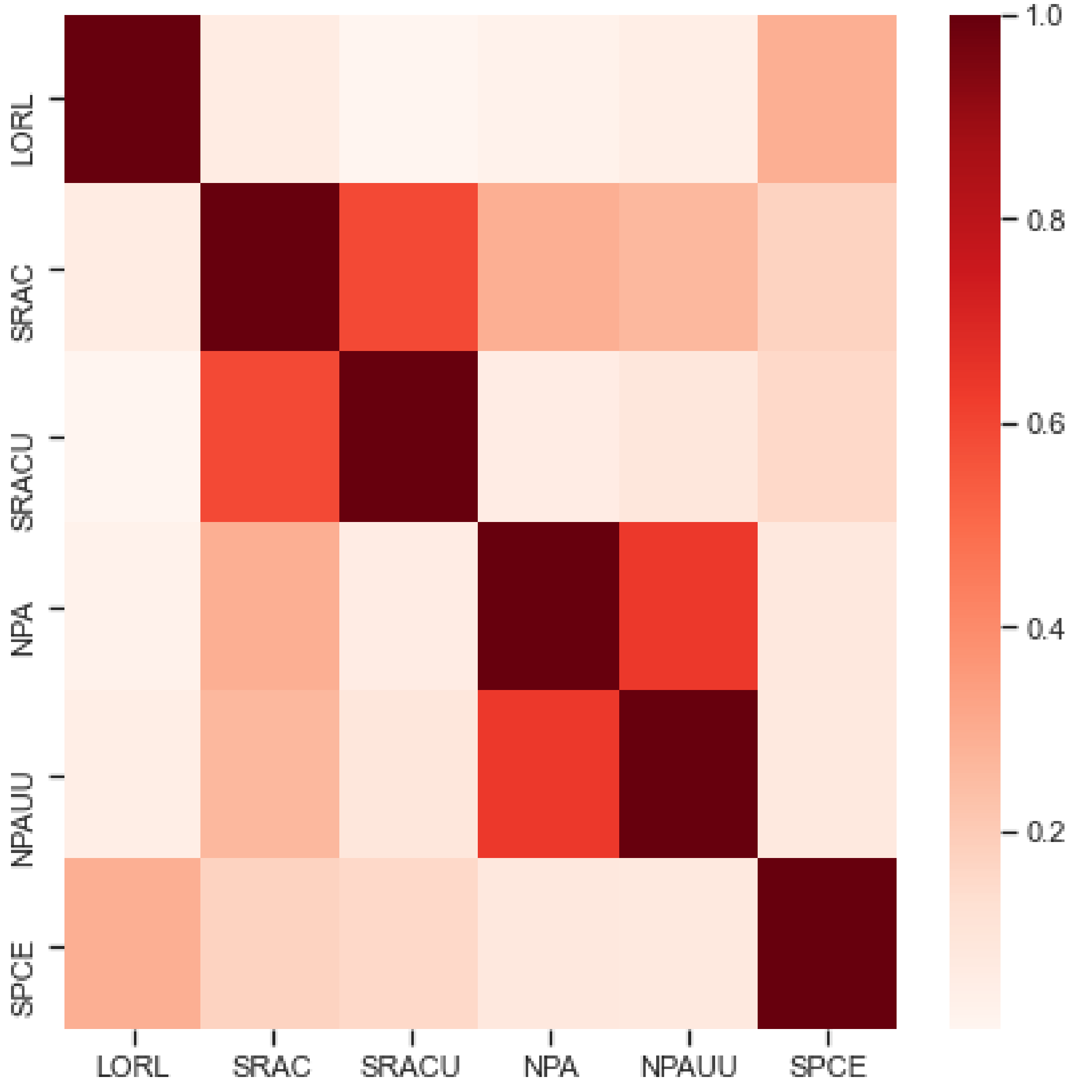
[17]:

```
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)
```



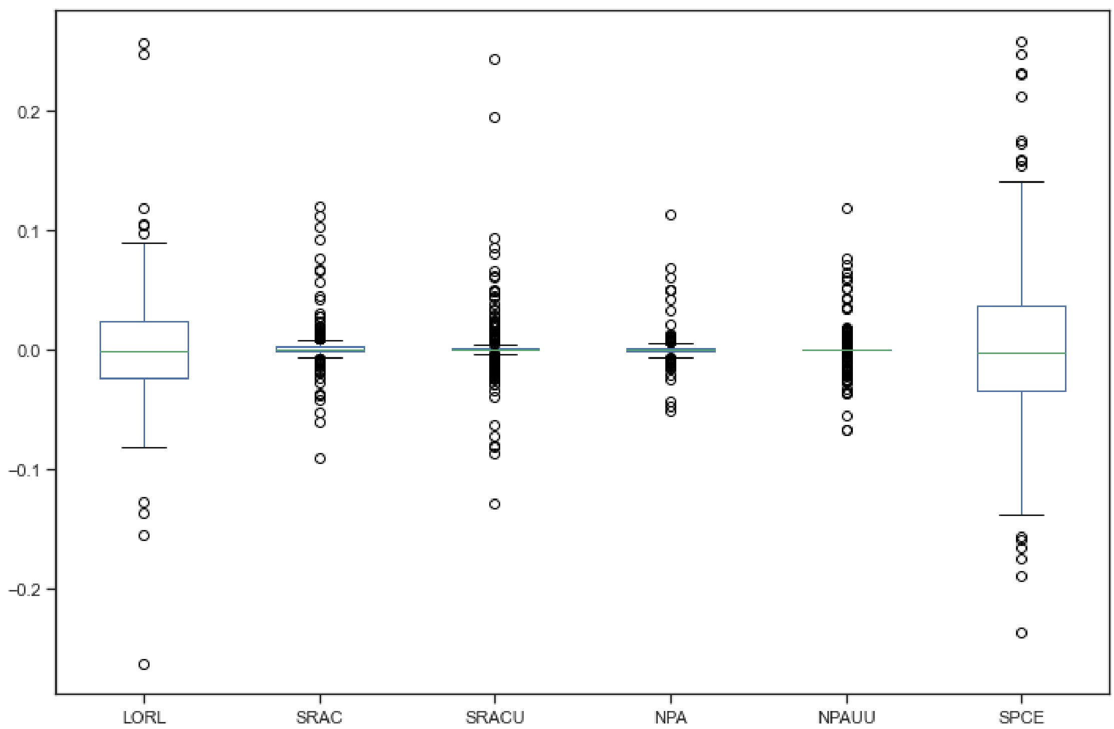
[18]:
```
plt.figure(figsize=(7,7))
corr = stock_rets.corr()

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

[18]: <AxesSubplot:>



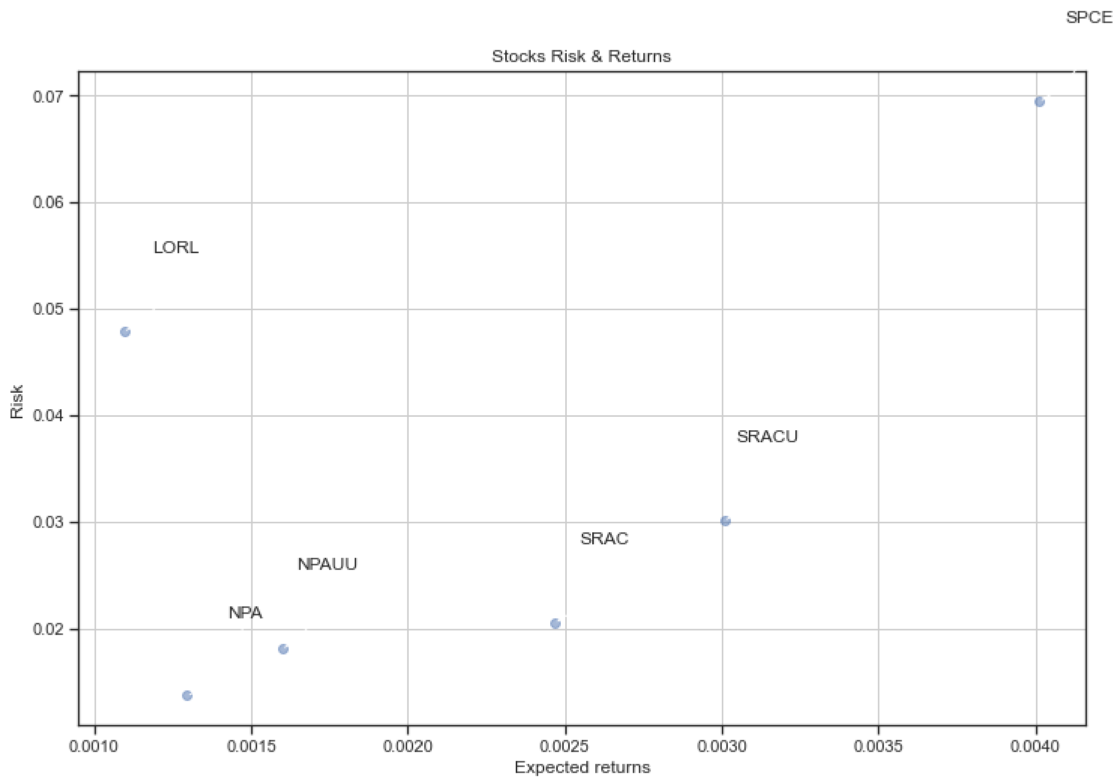
[19]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(12,8))
```

[19]: <AxesSubplot:>



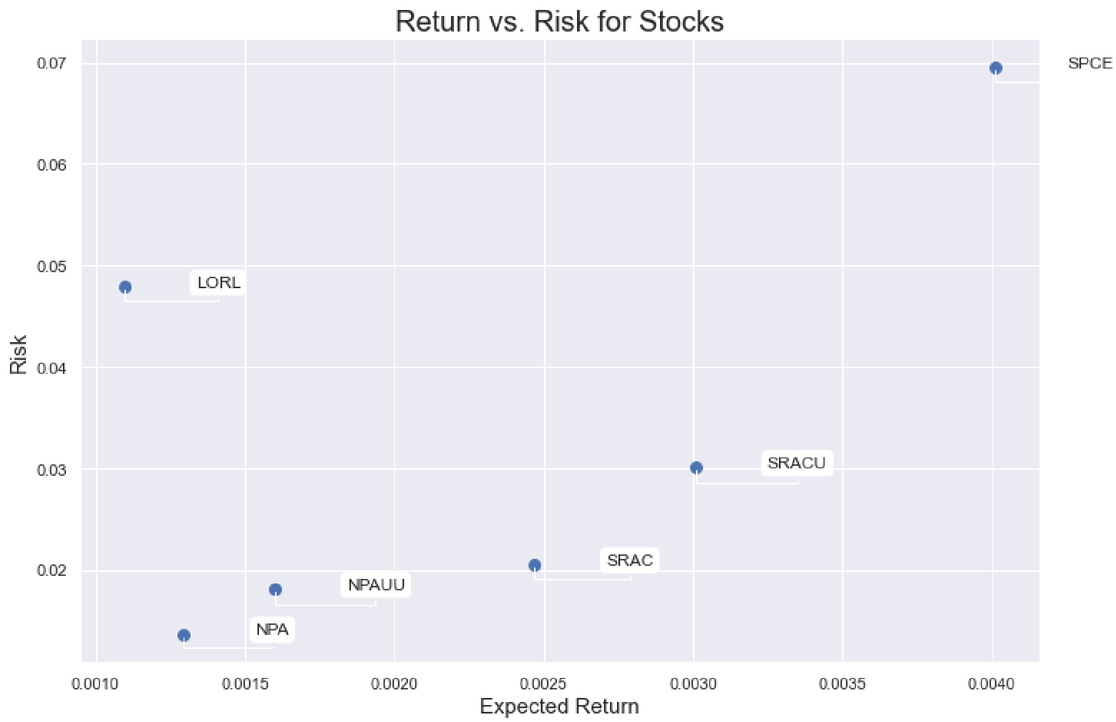
[20]:

```
rets = stock_rets.dropna()

plt.figure(figsize=(12,8))
plt.scatter(rets.mean(), rets.std(),alpha = 0.5)

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

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



[21]:

```
rets = stock_rets.dropna()
area = np.pi*20.0

sns.set(style='darkgrid')
plt.figure(figsize=(12,8))
plt.scatter(rets.mean(), rets.std(), s=area)
plt.xlabel("Expected Return", fontsize=15)
plt.ylabel("Risk", fontsize=15)
plt.title("Return vs. Risk for Stocks", fontsize=20)

for label, x, y in zip(rets.columns, rets.mean(), rets.std()) :
    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"))
```



[22]:
```
rest_rets = rets.corr()
pair_value = rest_rets.abs().unstack()
pair_value.sort_values(ascending = False)
```

[22]:
```
SPCE   SPCE     1.000000
NPAUU  NPAUU    1.000000
SRAC   SRAC     1.000000
SRACU  SRACU    1.000000
NPA    NPA      1.000000
LORL   LORL     1.000000
NPAUU  NPA      0.635902
NPA    NPAUU    0.635902
SRAC   SRACU    0.589331
SRACU  SRAC     0.589331
SRAC   NPA      0.292574
NPA    SRAC     0.292574
SPCE   LORL     0.292469
LORL   SPCE     0.292469
NPAUU  SRAC     0.264501
SRAC   NPAUU    0.264501
SPCE   SRAC     0.176258
SRAC   SPCE     0.176258
SPCE   SRACU    0.156968
SRACU  SPCE     0.156968
```

```
       NPAUU    0.091144
NPAUU  SRACU    0.091144
NPA    SPCE     0.081423
SPCE   NPA      0.081423
       NPAUU    0.078507
NPAUU  SPCE     0.078507
SRAC   LORL     0.061132
LORL   SRAC     0.061132
SRACU  NPA      0.056923
NPA    SRACU    0.056923
NPAUU  LORL     0.051822
LORL   NPAUU    0.051822
NPA    LORL     0.028718
LORL   NPA      0.028718
SRACU  LORL     0.005697
LORL   SRACU    0.005697
dtype: float64
```

[23]:
```
# Normalized Returns Data
Normalized_Value = ((rets[:] - rets[:].min()) /(rets[:].max() - rets[:].min()))
Normalized_Value.head()
```

[23]:

	LORL	SRAC	SRACU	NPA	NPAUU	SPCE
Date						
2020-02-04	0.562322	0.427746	0.332415	0.301203	0.348397	0.594719
2020-02-05	0.518373	0.427746	0.345464	0.307256	0.358745	0.374486
2020-02-06	0.552232	0.408715	0.348087	0.307256	0.379482	0.458862
2020-02-07	0.520774	0.432523	0.353324	0.307256	0.358745	0.522074
2020-02-10	0.527332	0.427746	0.345464	0.313315	0.363910	0.650466

[24]:
```
Normalized_Value.corr()
```

[24]:

	LORL	SRAC	SRACU	NPA	NPAUU	SPCE
LORL	1.000000	0.061132	0.005697	0.028718	0.051822	0.292469
SRAC	0.061132	1.000000	0.589331	0.292574	0.264501	0.176258
SRACU	0.005697	0.589331	1.000000	0.056923	0.091144	0.156968
NPA	0.028718	0.292574	0.056923	1.000000	0.635902	0.081423
NPAUU	0.051822	0.264501	0.091144	0.635902	1.000000	0.078507
SPCE	0.292469	0.176258	0.156968	0.081423	0.078507	1.000000

[25]:
```
normalized_rets = Normalized_Value.corr()
normalized_pair_value = normalized_rets.abs().unstack()
normalized_pair_value.sort_values(ascending = False)
```

[25]:
```
SPCE   SPCE     1.000000
NPAUU  NPAUU    1.000000
SRAC   SRAC     1.000000
```

```
SRACU  SRACU    1.000000
NPA    NPA      1.000000
LORL   LORL     1.000000
NPAUU  NPA      0.635902
NPA    NPAUU    0.635902
SRAC   SRACU    0.589331
SRACU  SRAC     0.589331
SRAC   NPA      0.292574
NPA    SRAC     0.292574
SPCE   LORL     0.292469
LORL   SPCE     0.292469
NPAUU  SRAC     0.264501
SRAC   NPAUU    0.264501
SPCE   SRAC     0.176258
SRAC   SPCE     0.176258
SPCE   SRACU    0.156968
SRACU  SPCE     0.156968
       NPAUU    0.091144
NPAUU  SRACU    0.091144
NPA    SPCE     0.081423
SPCE   NPA      0.081423
       NPAUU    0.078507
NPAUU  SPCE     0.078507
SRAC   LORL     0.061132
LORL   SRAC     0.061132
SRACU  NPA      0.056923
NPA    SRACU    0.056923
NPAUU  LORL     0.051822
LORL   NPAUU    0.051822
NPA    LORL     0.028718
LORL   NPA      0.028718
SRACU  LORL     0.005697
LORL   SRACU    0.005697
dtype: float64
```

[26]:

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

```
Stock returns:
LORL     0.001095
SRAC     0.002469
SRACU    0.003009
NPA      0.001295
NPAUU    0.001600
```

```
SPCE     0.004013
dtype: float64
--------------------------------------------------
Stock risks:
LORL     0.047869
SRAC     0.020524
SRACU    0.030071
NPA      0.013651
NPAUU    0.018064
SPCE     0.069482
dtype: float64
```

[27]:
```python
table = pd.DataFrame()
table['Returns'] = rets.mean()
table['Risk'] = rets.std()
table.sort_values(by='Returns')
```

[27]:

	Returns	Risk
LORL	0.001095	0.047869
NPA	0.001295	0.013651
NPAUU	0.001600	0.018064
SRAC	0.002469	0.020524
SRACU	0.003009	0.030071
SPCE	0.004013	0.069482

[28]:
```python
table.sort_values(by='Risk')
```

[28]:

	Returns	Risk
NPA	0.001295	0.013651
NPAUU	0.001600	0.018064
SRAC	0.002469	0.020524
SRACU	0.003009	0.030071
LORL	0.001095	0.047869
SPCE	0.004013	0.069482

[29]:
```python
rf = 0.001
table['Sharpe Ratio'] = (table['Returns'] - rf) / table['Risk']
table
```

[29]:

	Returns	Risk	Sharpe Ratio
LORL	0.001095	0.047869	0.001988
SRAC	0.002469	0.020524	0.071561
SRACU	0.003009	0.030071	0.066798
NPA	0.001295	0.013651	0.021647
NPAUU	0.001600	0.018064	0.033192
SPCE	0.004013	0.069482	0.043360

[30]:
```
table['Max Returns'] = rets.max()
```

[31]:
```
table['Min Returns'] = rets.min()
```

[32]:
```
table['Median Returns'] = rets.median()
```

[33]:
```
total_return = stock_rets[-1:].transpose()
table['Total Return'] = 100 * total_return
table
```

[33]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL   0.001095  0.047869      0.001988     0.256764    -0.262000
SRAC   0.002469  0.020524      0.071561     0.121006    -0.090449
SRACU  0.003009  0.030071      0.066798     0.244444    -0.129018
NPA    0.001295  0.013651      0.021647     0.114341    -0.050714
NPAUU  0.001600  0.018064      0.033192     0.119166    -0.066667
SPCE   0.004013  0.069482      0.043360     0.258288    -0.235826

       Median Returns  Total Return
LORL        -0.001011     -4.168387
SRAC         0.000000      6.687498
SRACU        0.000000      4.395600
NPA          0.000000      5.118115
NPAUU        0.000000      1.064380
SPCE        -0.001637      3.375843
```

[34]:
```
table['Average Return Days'] = (1 + total_return)**(1 / days) - 1
table
```

[34]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL   0.001095  0.047869      0.001988     0.256764    -0.262000
SRAC   0.002469  0.020524      0.071561     0.121006    -0.090449
SRACU  0.003009  0.030071      0.066798     0.244444    -0.129018
NPA    0.001295  0.013651      0.021647     0.114341    -0.050714
NPAUU  0.001600  0.018064      0.033192     0.119166    -0.066667
SPCE   0.004013  0.069482      0.043360     0.258288    -0.235826

       Median Returns  Total Return  Average Return Days
LORL        -0.001011     -4.168387            -0.000123
SRAC         0.000000      6.687498             0.000188
SRACU        0.000000      4.395600             0.000125
NPA          0.000000      5.118115             0.000145
NPAUU        0.000000      1.064380             0.000031
SPCE        -0.001637      3.375843             0.000096
```

[35]:
```
initial_value = df.iloc[0]
ending_value = df.iloc[-1]
```

```
table['CAGR'] = ((ending_value / initial_value) ** (252.0 / days)) -1
table
```

[35]:

```
         Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL    0.001095  0.047869      0.001988     0.256764    -0.262000
SRAC    0.002469  0.020524      0.071561     0.121006    -0.090449
SRACU   0.003009  0.030071      0.066798     0.244444    -0.129018
NPA     0.001295  0.013651      0.021647     0.114341    -0.050714
NPAUU   0.001600  0.018064      0.033192     0.119166    -0.066667
SPCE    0.004013  0.069482      0.043360     0.258288    -0.235826

       Median Returns  Total Return  Average Return Days      CAGR
LORL        -0.001011     -4.168387            -0.000123 -0.008146
SRAC         0.000000      6.687498             0.000188  0.484364
SRACU        0.000000      4.395600             0.000125  0.568444
NPA          0.000000      5.118115             0.000145  0.234067
NPAUU        0.000000      1.064380             0.000031  0.285656
SPCE        -0.001637      3.375843             0.000096  0.332181
```

[36]:

```
table.sort_values(by='Average Return Days')
```

[36]:

```
         Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL    0.001095  0.047869      0.001988     0.256764    -0.262000
NPAUU   0.001600  0.018064      0.033192     0.119166    -0.066667
SPCE    0.004013  0.069482      0.043360     0.258288    -0.235826
SRACU   0.003009  0.030071      0.066798     0.244444    -0.129018
NPA     0.001295  0.013651      0.021647     0.114341    -0.050714
SRAC    0.002469  0.020524      0.071561     0.121006    -0.090449

       Median Returns  Total Return  Average Return Days      CAGR
LORL        -0.001011     -4.168387            -0.000123 -0.008146
NPAUU        0.000000      1.064380             0.000031  0.285656
SPCE        -0.001637      3.375843             0.000096  0.332181
SRACU        0.000000      4.395600             0.000125  0.568444
NPA          0.000000      5.118115             0.000145  0.234067
SRAC         0.000000      6.687498             0.000188  0.484364
```

[37]:

```
table['var_99'] = round((rets).quantile(0.01), 3)
table['var_95'] = round((rets).quantile(0.05), 3)
```

[38]:

```
table.sort_values(by='Returns')
```

[38]:

```
         Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL    0.001095  0.047869      0.001988     0.256764    -0.262000
NPA     0.001295  0.013651      0.021647     0.114341    -0.050714
NPAUU   0.001600  0.018064      0.033192     0.119166    -0.066667
SRAC    0.002469  0.020524      0.071561     0.121006    -0.090449
```

```
SRACU  0.003009  0.030071      0.066798     0.244444     -0.129018
SPCE   0.004013  0.069482      0.043360     0.258288     -0.235826

       Median Returns  Total Return  Average Return Days      CAGR  var_99  \
LORL        -0.001011     -4.168387            -0.000123 -0.008146  -0.133
NPA          0.000000      5.118115             0.000145  0.234067  -0.036
NPAUU        0.000000      1.064380             0.000031  0.285656  -0.048
SRAC         0.000000      6.687498             0.000188  0.484364  -0.048
SRACU        0.000000      4.395600             0.000125  0.568444  -0.081
SPCE        -0.001637      3.375843             0.000096  0.332181  -0.171

       var_95
LORL   -0.056
NPA    -0.010
NPAUU  -0.022
SRAC   -0.016
SRACU  -0.023
SPCE   -0.101
```

[39]:
```
# Pure Profit Score
df = df.dropna()
t = np.arange(0, df.shape[0]).reshape(-1, 1)
regression = LinearRegression().fit(t, df)
r_squared = regression.score(t, df)
table['PPS'] = table['CAGR'] * r_squared
```

[40]:
```
table
```

[40]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
LORL   0.001095  0.047869      0.001988     0.256764     -0.262000
SRAC   0.002469  0.020524      0.071561     0.121006     -0.090449
SRACU  0.003009  0.030071      0.066798     0.244444     -0.129018
NPA    0.001295  0.013651      0.021647     0.114341     -0.050714
NPAUU  0.001600  0.018064      0.033192     0.119166     -0.066667
SPCE   0.004013  0.069482      0.043360     0.258288     -0.235826

       Median Returns  Total Return  Average Return Days      CAGR  var_99  \
LORL        -0.001011     -4.168387            -0.000123 -0.008146  -0.133
SRAC         0.000000      6.687498             0.000188  0.484364  -0.048
SRACU        0.000000      4.395600             0.000125  0.568444  -0.081
NPA          0.000000      5.118115             0.000145  0.234067  -0.036
NPAUU        0.000000      1.064380             0.000031  0.285656  -0.048
SPCE        -0.001637      3.375843             0.000096  0.332181  -0.171

       var_95       PPS
LORL   -0.056 -0.002158
SRAC   -0.016  0.128287
```

SRACU	-0.023	0.150556
NPA	-0.010	0.061994
NPAUU	-0.022	0.075658
SPCE	-0.101	0.087980