Cruises_Portfolio

September 29, 2021

1 Cruises Portfolio Risk and Returns

[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")

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

[2]:
```
# input
# Airlines Stock
symbols = ['CCL','CUK','LIND','NCLH','RCL']
start = '2019-12-01'
end = '2020-04-14'
```

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

```
[*********************100%***********************]  1 of 1 completed
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[*********************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]:
```
days = (df.index[-1] - df.index[0]).days
days
```

[6]:
```
133
```

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

[7]:

Date	CCL	CUK	LIND	NCLH	RCL
2019-12-02	43.976734	41.633583	15.48	53.150002	117.257675
2019-12-03	43.037693	40.596443	15.04	52.860001	116.962440
2019-12-04	43.373772	40.932278	15.09	53.610001	118.192581
2019-12-05	43.690079	41.317505	15.17	54.250000	119.078293
2019-12-06	44.253506	42.028679	15.37	54.709999	120.131294

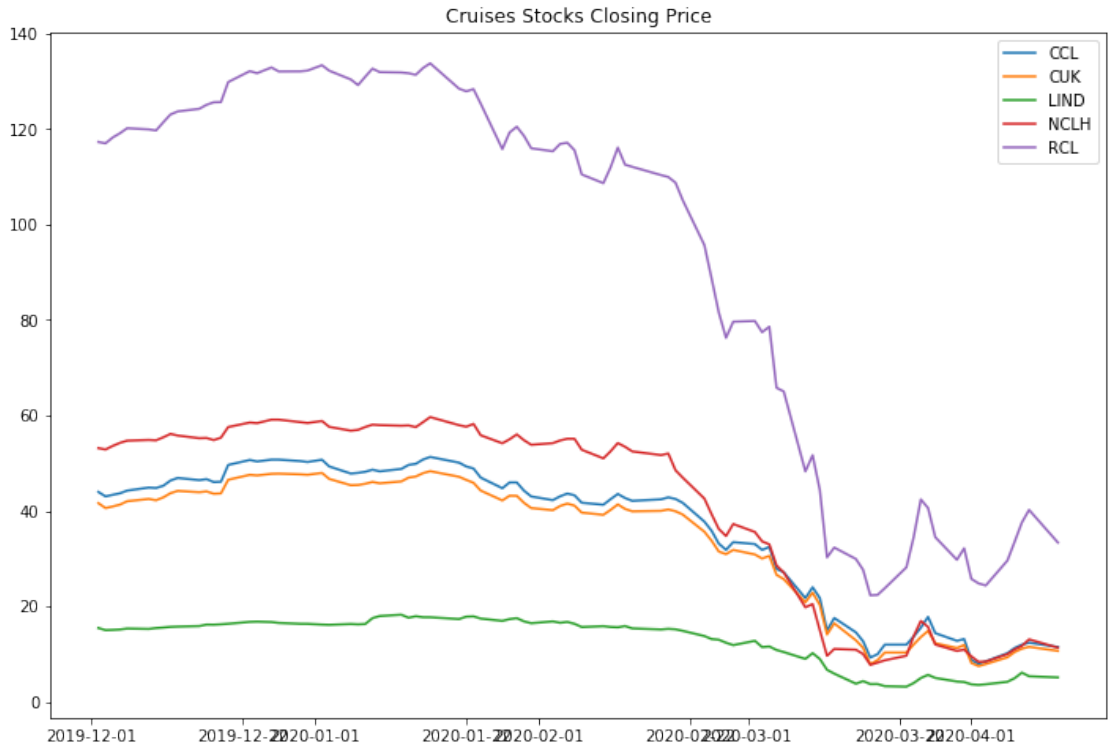
[8]:
```
df.tail()
```

[8]:

Date	CCL	CUK	LIND	NCLH	RCL
2020-04-06	10.21	9.34	4.22	10.01	29.610001
2020-04-07	11.30	10.45	4.97	11.01	33.549999
2020-04-08	11.99	11.15	6.14	11.72	37.560001
2020-04-09	12.42	11.54	5.38	13.11	40.220001
2020-04-13	11.50	10.69	5.13	11.36	33.369999

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

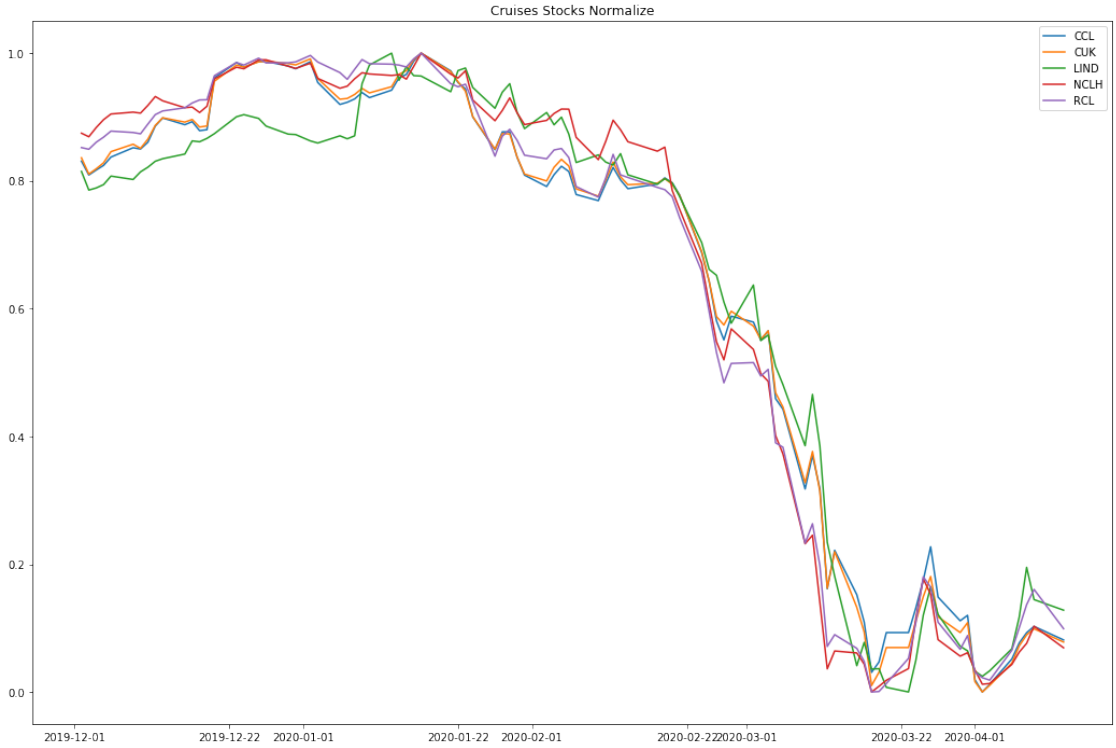
[9]:
```
<matplotlib.legend.Legend at 0x1d156911e80>
```



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

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

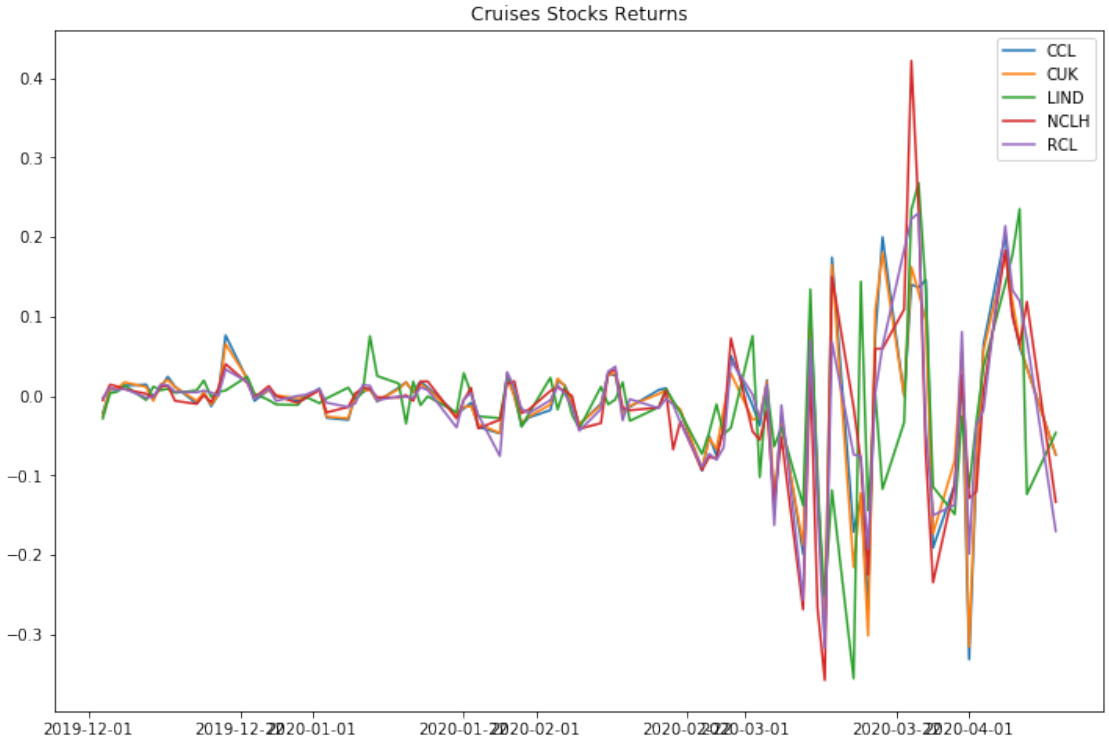
[11]: <matplotlib.legend.Legend at 0x1d156bb5588>



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

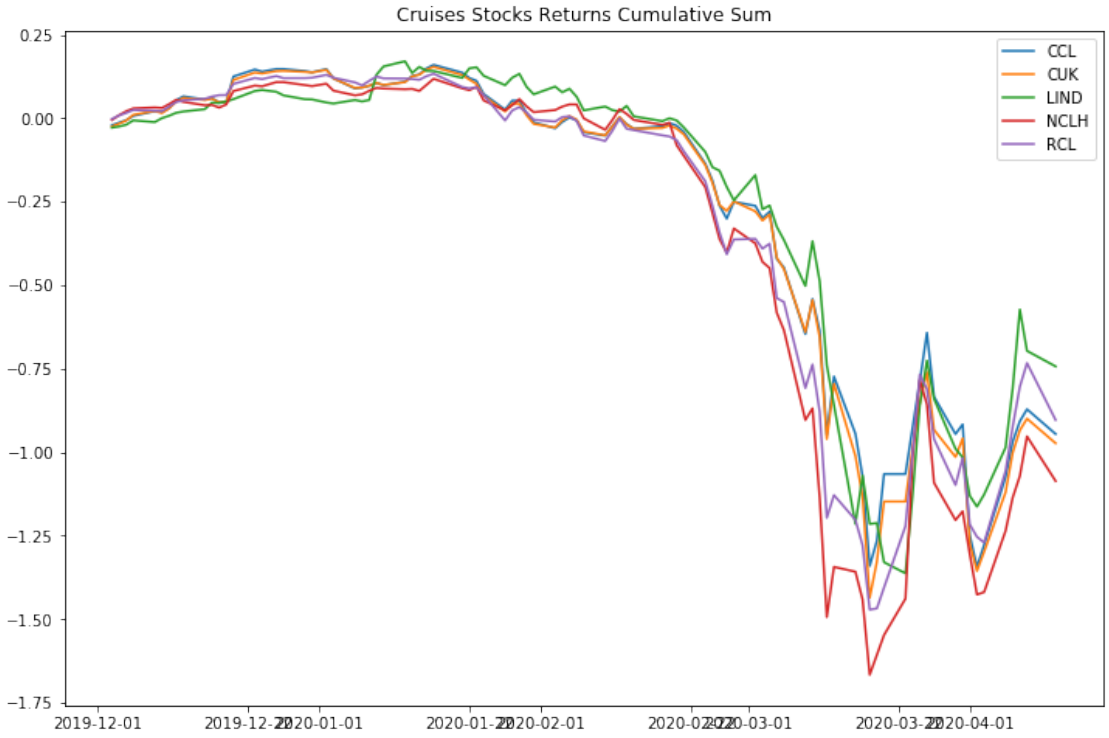
[13]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title('Cruises Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[13]: <matplotlib.legend.Legend at 0x1d15698d5f8>

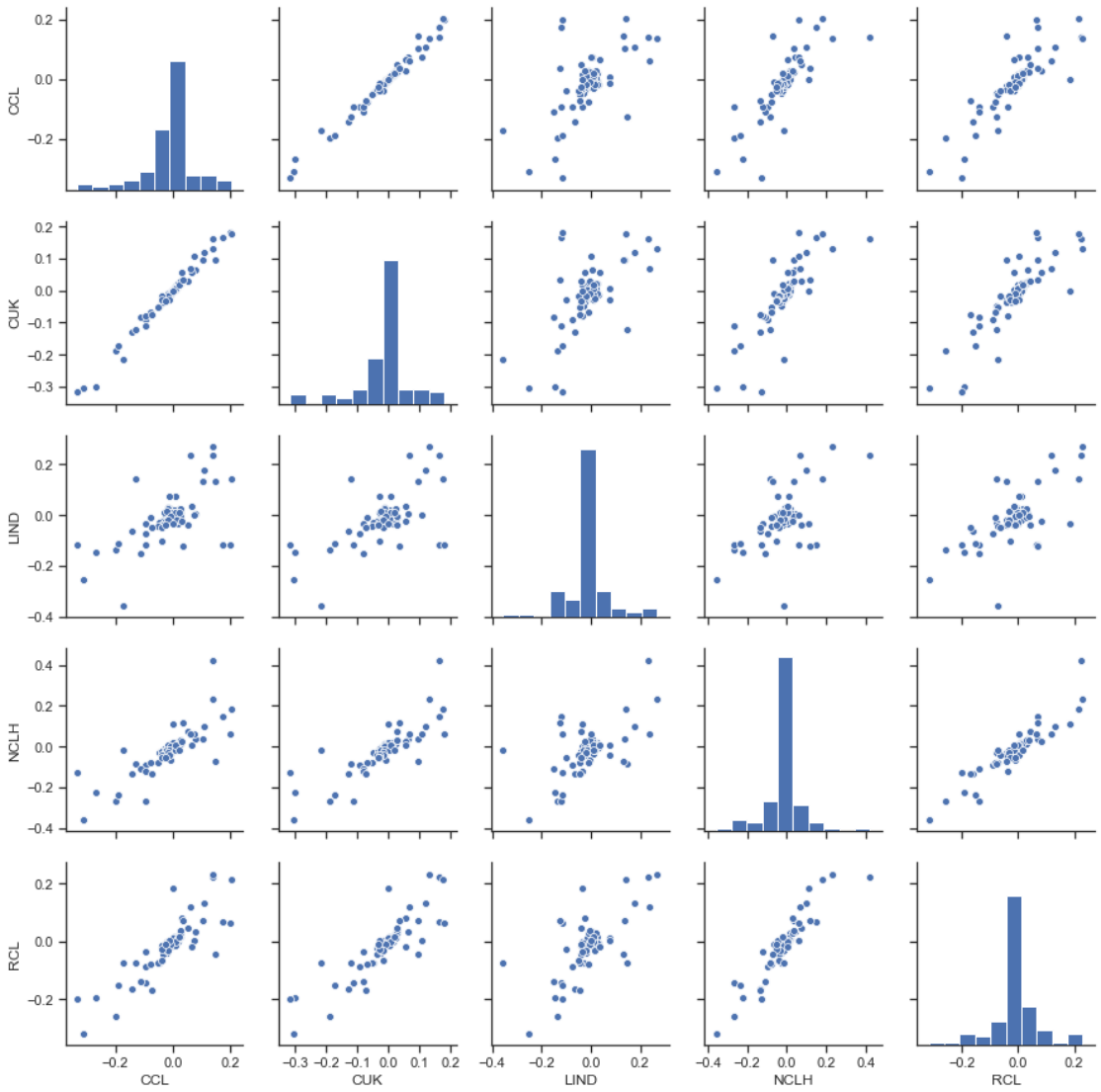


[14]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title('Cruises Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

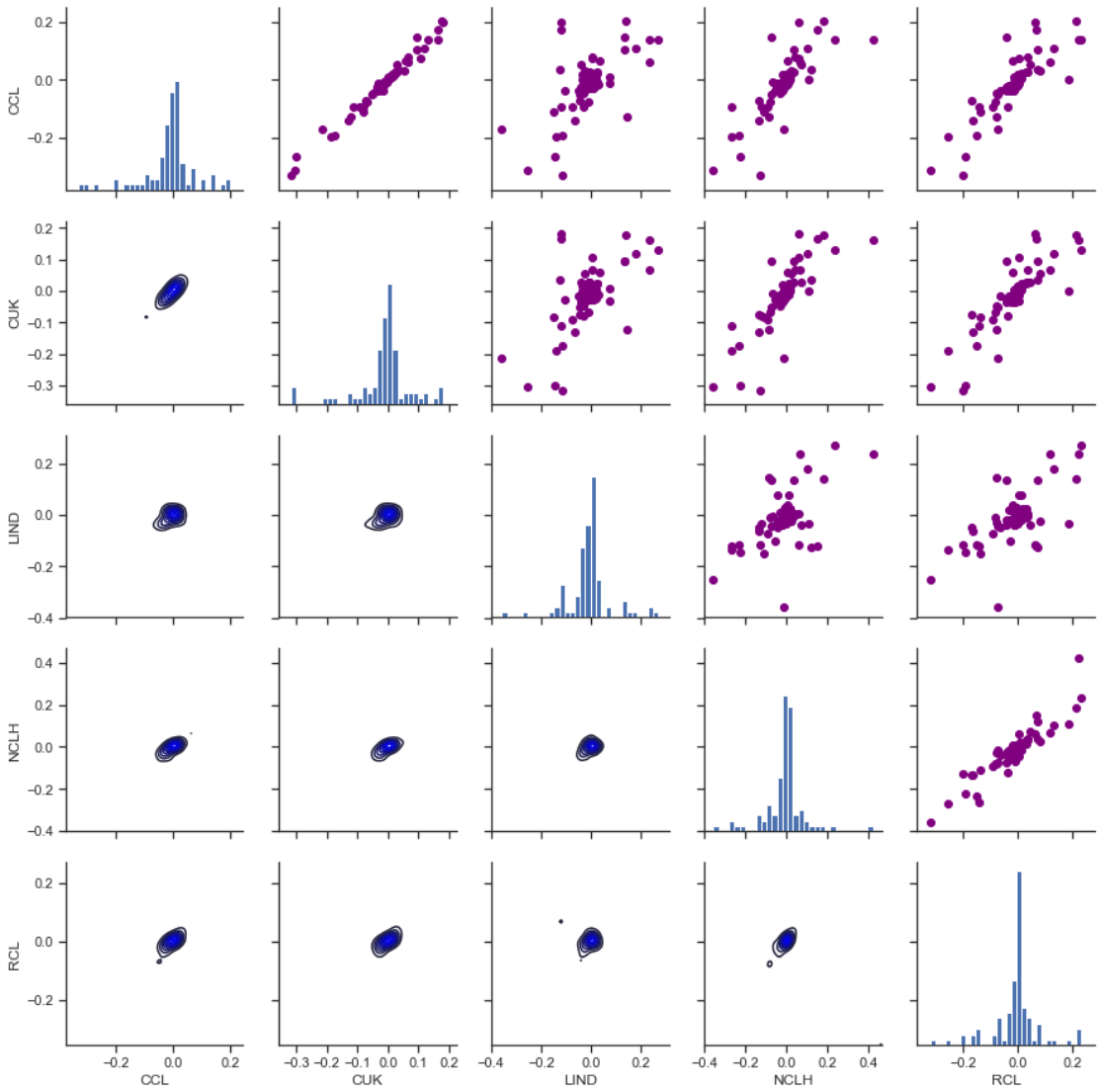
[14]: <matplotlib.legend.Legend at 0x1d1569e1e48>



[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)
```

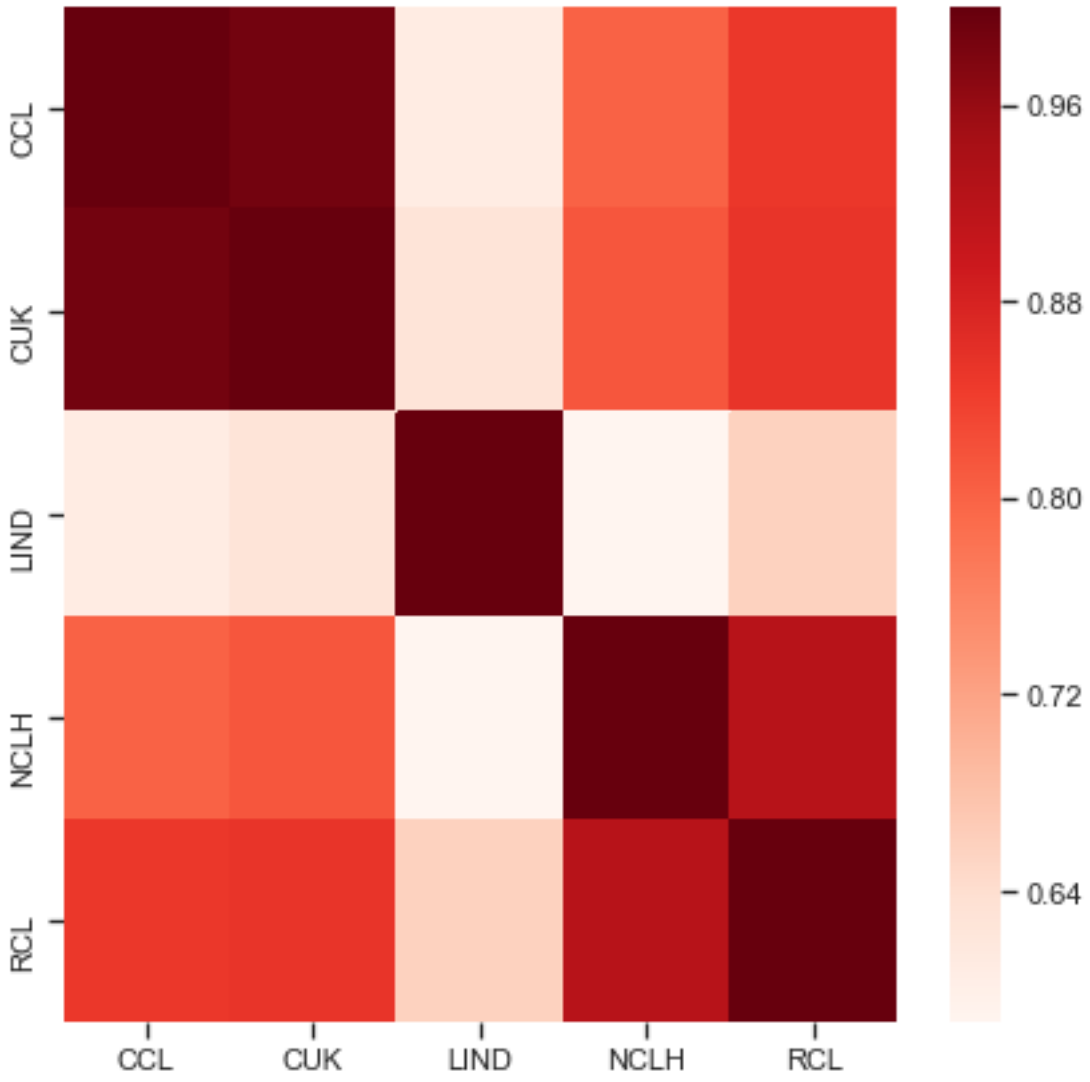


[16]:
```
ax = sns.PairGrid(stock_rets)
ax.map_upper(plt.scatter, color='purple')
ax.map_lower(sns.kdeplot, color='blue')
ax.map_diag(plt.hist, bins=30)
for i in range(nplot) :
    for j in range(nplot) :
        ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)
```



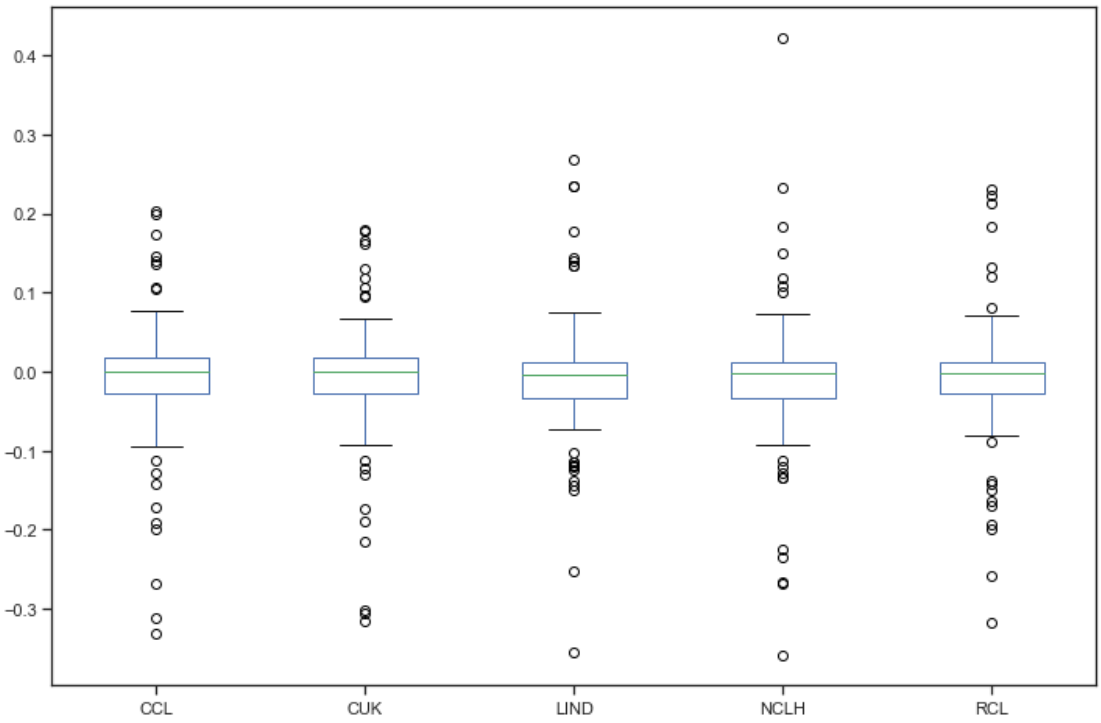
[17]:
```
plt.figure(figsize=(7,7))
corr = stock_rets.corr()

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

[17]: <matplotlib.axes._subplots.AxesSubplot at 0x1d15a5a5c88>

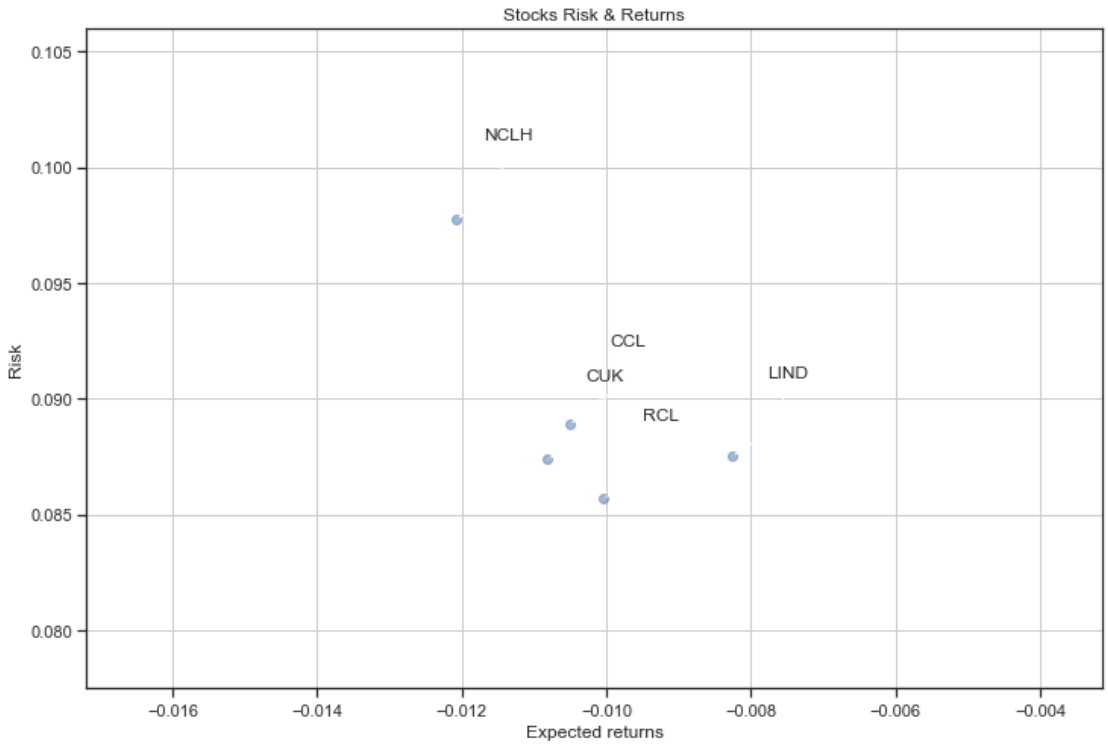


[18]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(12,8))
```

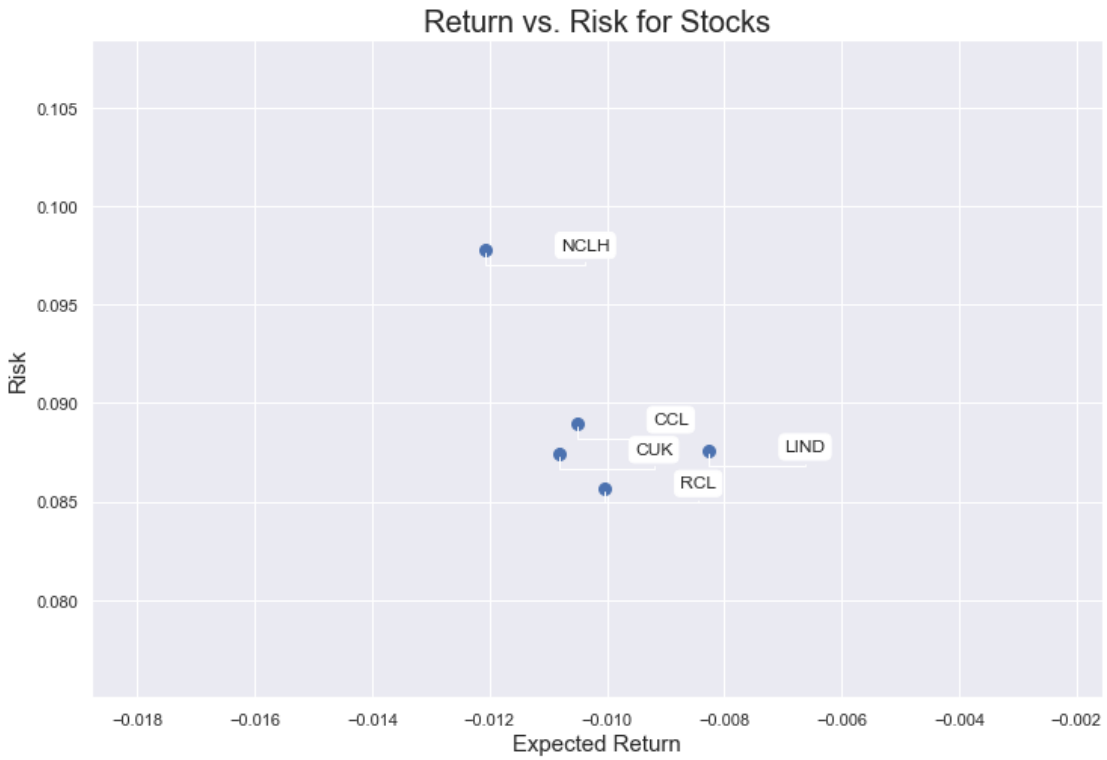
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x1d15aacf4e0>



[19]:
```
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'))
```



[20]:
```
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"))
```



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

[21]:
```
RCL   RCL     1.000000
NCLH  NCLH    1.000000
CUK   CUK     1.000000
LIND  LIND    1.000000
CCL   CCL     1.000000
      CUK     0.990227
CUK   CCL     0.990227
RCL   NCLH    0.923020
NCLH  RCL     0.923020
RCL   CUK     0.854708
CUK   RCL     0.854708
CCL   RCL     0.850806
RCL   CCL     0.850806
CUK   NCLH    0.814799
NCLH  CUK     0.814799
      CCL     0.802360
CCL   NCLH    0.802360
LIND  RCL     0.658584
RCL   LIND    0.658584
```

```
LIND  CUK     0.630125
CUK   LIND    0.630125
CCL   LIND    0.610575
LIND  CCL     0.610575
      NCLH    0.586554
NCLH  LIND    0.586554
dtype: float64
```

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

[22]:

Date	CCL	CUK	LIND	NCLH	RCL
2019-12-03	0.580947	0.586449	0.524525	0.451989	0.575166
2019-12-04	0.635516	0.653301	0.575390	0.477178	0.598948
2019-12-05	0.634550	0.655595	0.578557	0.474293	0.593431
2019-12-06	0.645035	0.671312	0.591186	0.469858	0.595893
2019-12-09	0.647654	0.659362	0.561725	0.462501	0.576023

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

[23]:

	CCL	CUK	LIND	NCLH	RCL
CCL	1.000000	0.990227	0.610575	0.802360	0.850806
CUK	0.990227	1.000000	0.630125	0.814799	0.854708
LIND	0.610575	0.630125	1.000000	0.586554	0.658584
NCLH	0.802360	0.814799	0.586554	1.000000	0.923020
RCL	0.850806	0.854708	0.658584	0.923020	1.000000

[24]:
```
normalized_rets = Normalized_Value.corr()
normalized_pair_value = normalized_rets.abs().unstack()
normalized_pair_value.sort_values(ascending = False)
```

[24]:
```
RCL   RCL     1.000000
NCLH  NCLH    1.000000
CUK   CUK     1.000000
LIND  LIND    1.000000
CCL   CCL     1.000000
      CUK     0.990227
CUK   CCL     0.990227
RCL   NCLH    0.923020
NCLH  RCL     0.923020
RCL   CUK     0.854708
CUK   RCL     0.854708
CCL   RCL     0.850806
RCL   CCL     0.850806
CUK   NCLH    0.814799
```

```
NCLH  CUK     0.814799
      CCL     0.802360
CCL   NCLH    0.802360
LIND  RCL     0.658584
RCL   LIND    0.658584
LIND  CUK     0.630125
CUK   LIND    0.630125
CCL   LIND    0.610575
LIND  CCL     0.610575
      NCLH    0.586554
NCLH  LIND    0.586554
dtype: float64
```

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

```
Stock returns:
CCL    -0.010504
CUK    -0.010812
LIND   -0.008256
NCLH   -0.012068
RCL    -0.010038
dtype: float64
--------------------------------------------------
Stock risks:
CCL     0.088926
CUK     0.087401
LIND    0.087545
NCLH    0.097778
RCL     0.085690
dtype: float64
```

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

[26]:

	Returns	Risk
NCLH	-0.012068	0.097778
CUK	-0.010812	0.087401
CCL	-0.010504	0.088926
RCL	-0.010038	0.085690
LIND	-0.008256	0.087545

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

[27]:
```
        Returns      Risk
RCL   -0.010038  0.085690
CUK   -0.010812  0.087401
LIND -0.008256  0.087545
CCL   -0.010504  0.088926
NCLH -0.012068  0.097778
```

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

[28]:
```
        Returns      Risk  Sharpe Ratio
CCL   -0.010504  0.088926     -0.230573
CUK   -0.010812  0.087401     -0.238126
LIND -0.008256  0.087545     -0.208537
NCLH -0.012068  0.097778     -0.225693
RCL   -0.010038  0.085690     -0.233842
```

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

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

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

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

[32]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
CCL   -0.010504  0.088926     -0.230573     0.202591    -0.331815
CUK   -0.010812  0.087401     -0.238126     0.180365    -0.316010
LIND -0.008256  0.087545     -0.208537     0.268354    -0.355818
NCLH -0.012068  0.097778     -0.225693     0.421923    -0.357951
RCL   -0.010038  0.085690     -0.233842     0.230345    -0.317782

      Median Returns  Total Return
CCL         0.000000     -7.407408
CUK        -0.000343     -7.365688
LIND       -0.004374     -4.646840
NCLH       -0.001896    -13.348589
RCL        -0.001968    -17.031333
```

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

[33]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
CCL  -0.010504  0.088926     -0.230573     0.202591    -0.331815
CUK  -0.010812  0.087401     -0.238126     0.180365    -0.316010
LIND -0.008256  0.087545     -0.208537     0.268354    -0.355818
NCLH -0.012068  0.097778     -0.225693     0.421923    -0.357951
RCL  -0.010038  0.085690     -0.233842     0.230345    -0.317782

      Median Returns  Total Return  Average Return Days
CCL         0.000000     -7.407408            -0.000578
CUK        -0.000343     -7.365688            -0.000575
LIND       -0.004374     -4.646840            -0.000358
NCLH       -0.001896    -13.348589            -0.001077
RCL        -0.001968    -17.031333            -0.001403
```

[34]:
```
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  \
CCL  -0.010504  0.088926     -0.230573     0.202591    -0.331815
CUK  -0.010812  0.087401     -0.238126     0.180365    -0.316010
LIND -0.008256  0.087545     -0.208537     0.268354    -0.355818
NCLH -0.012068  0.097778     -0.225693     0.421923    -0.357951
RCL  -0.010038  0.085690     -0.233842     0.230345    -0.317782

      Median Returns  Total Return  Average Return Days      CAGR
CCL         0.000000     -7.407408            -0.000578 -0.921247
CUK        -0.000343     -7.365688            -0.000575 -0.923928
LIND       -0.004374     -4.646840            -0.000358 -0.876638
NCLH       -0.001896    -13.348589            -0.001077 -0.946261
RCL        -0.001968    -17.031333            -0.001403 -0.907556
```

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

[35]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
RCL  -0.010038  0.085690     -0.233842     0.230345    -0.317782
NCLH -0.012068  0.097778     -0.225693     0.421923    -0.357951
CCL  -0.010504  0.088926     -0.230573     0.202591    -0.331815
CUK  -0.010812  0.087401     -0.238126     0.180365    -0.316010
LIND -0.008256  0.087545     -0.208537     0.268354    -0.355818

      Median Returns  Total Return  Average Return Days      CAGR
RCL        -0.001968    -17.031333            -0.001403 -0.907556
NCLH       -0.001896    -13.348589            -0.001077 -0.946261
CCL         0.000000     -7.407408            -0.000578 -0.921247
CUK        -0.000343     -7.365688            -0.000575 -0.923928
```

LIND	-0.004374	-4.646840	-0.000358	-0.876638