Healthcare_Portfolio_Growth

September 29, 2021

1 Healthcare Stocks Growth

[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
# Growth Stock
title = "Healthcare Stocks Growth"
symbols = ['UTHR', 'AXSM', 'CCXI']
start = '2020-04-01'
end = '2020-07-09'
```

[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
```

[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]:
```
98
```

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

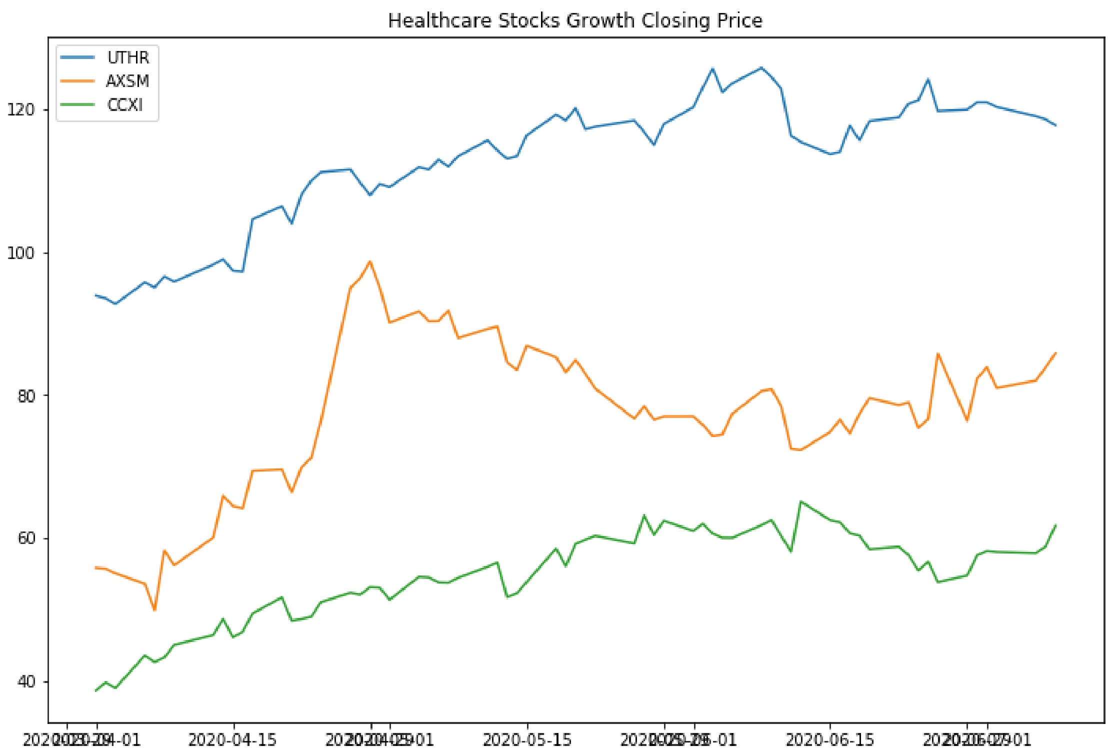
[7]:
```
                 UTHR       AXSM       CCXI
Date
2020-04-01  93.900002  55.790001  38.580002
2020-04-02  93.529999  55.660000  39.750000
2020-04-03  92.739998  55.020000  38.959999
2020-04-06  95.760002  53.549999  43.500000
2020-04-07  95.059998  49.869999  42.599998
```

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

[8]:
```
                  UTHR       AXSM       CCXI
Date
2020-07-01  121.000000  83.910004  58.150002
2020-07-02  120.330002  80.970001  58.009998
2020-07-06  119.040001  82.010002  57.840000
2020-07-07  118.599998  83.879997  58.799999
2020-07-08  117.779999  85.839996  61.689999
```

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

[9]:
```
<matplotlib.legend.Legend at 0x2704ed5c668>
```




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

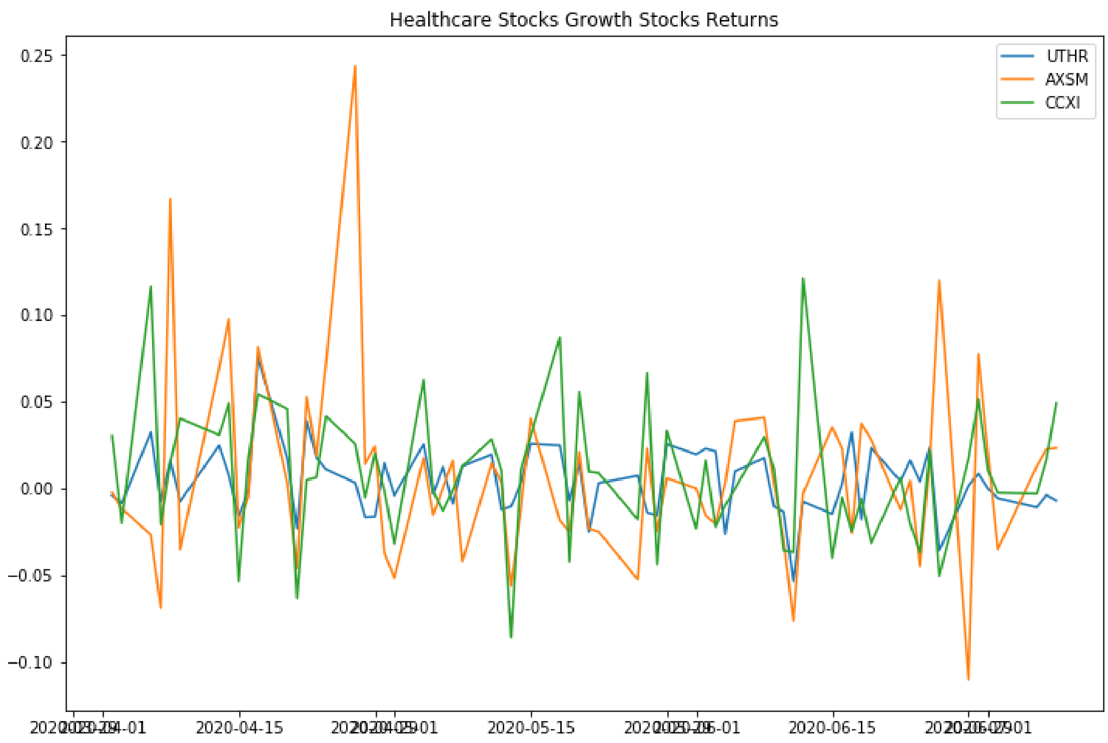
```
[11]: plt.figure(figsize=(18,12))
      plt.plot(normalize)
      plt.title(title + ' Stocks Normalize')
      plt.legend(labels=normalize.columns)
```

```
[11]: <matplotlib.legend.Legend at 0x2704efd15f8>
```

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

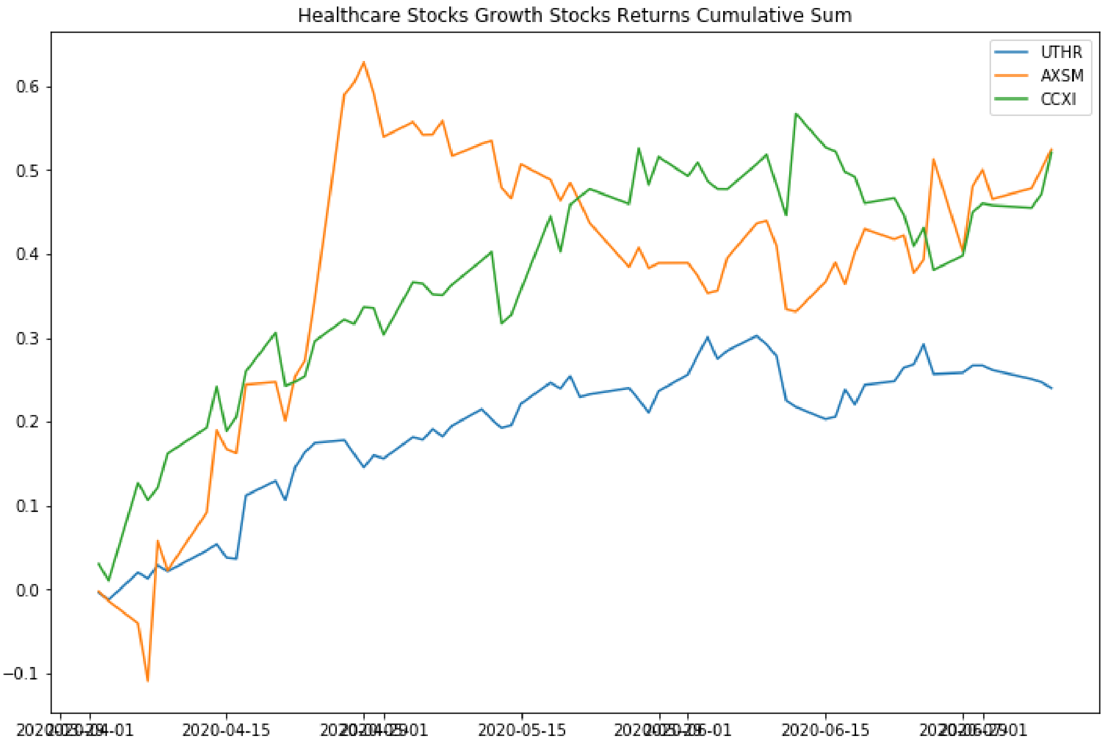
[13]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title(title + ' Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[13]: <matplotlib.legend.Legend at 0x2704edc9f28>

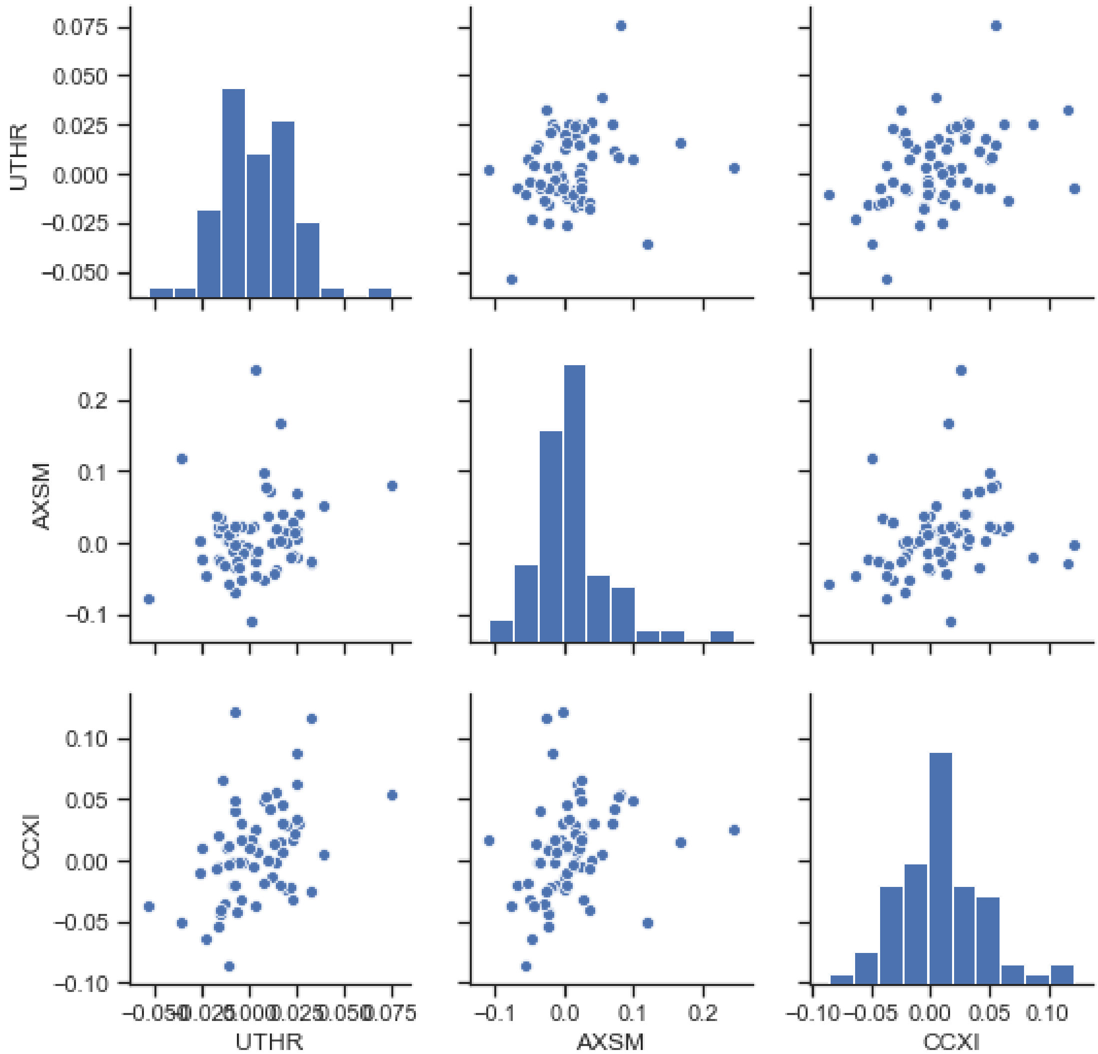



```
[14]: plt.figure(figsize=(12,8))
      plt.plot(stock_rets.cumsum())
      plt.title(title + ' Stocks Returns Cumulative Sum')
      plt.legend(labels=stock_rets.columns)
```

```
[14]: <matplotlib.legend.Legend at 0x2704edcde48>
```

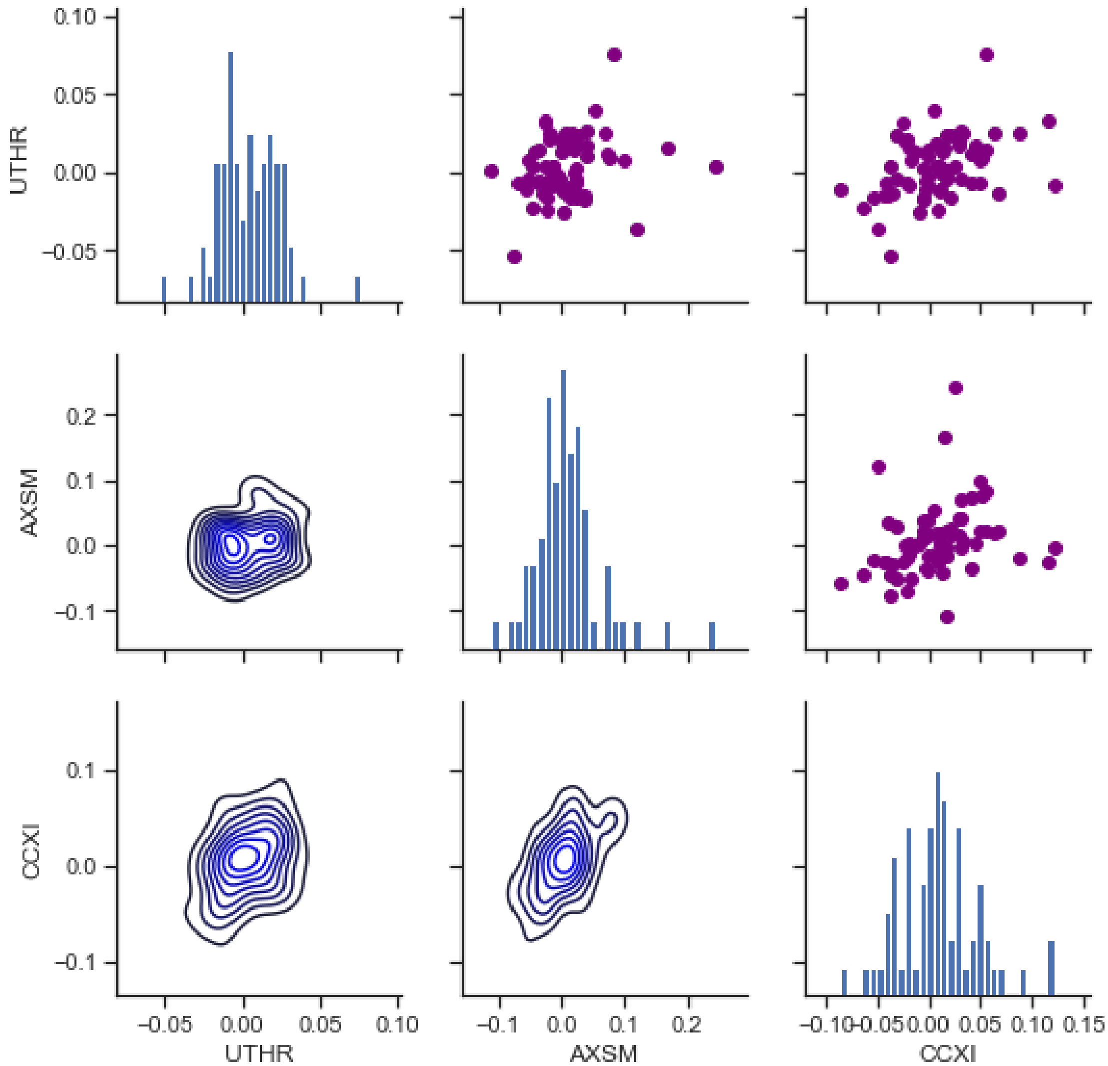


[15]:
```
sns.set(style='ticks')
ax = sns.pairplot(stock_rets, diag_kind='hist')

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)
```



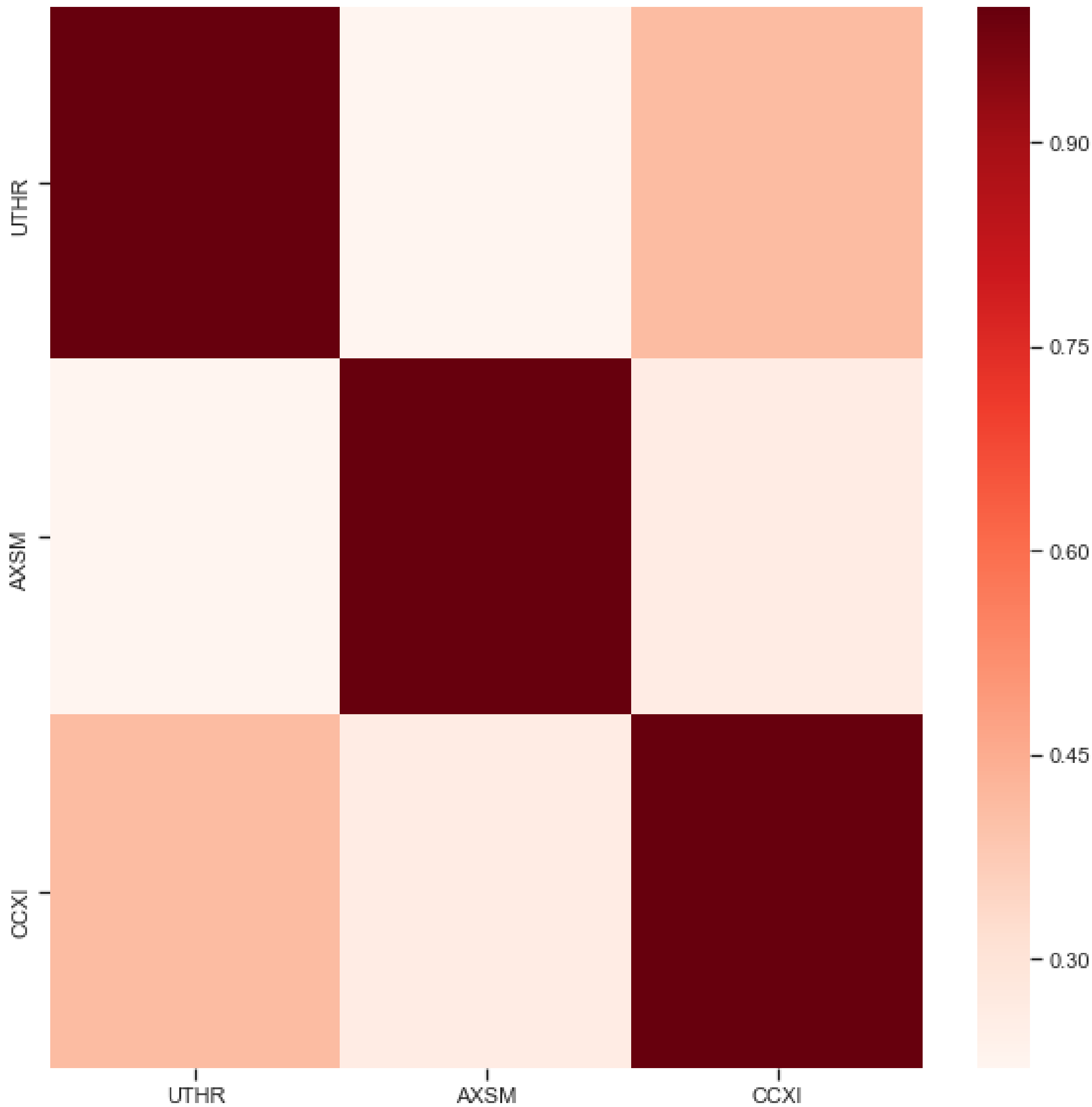
[16]:

```
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)
```



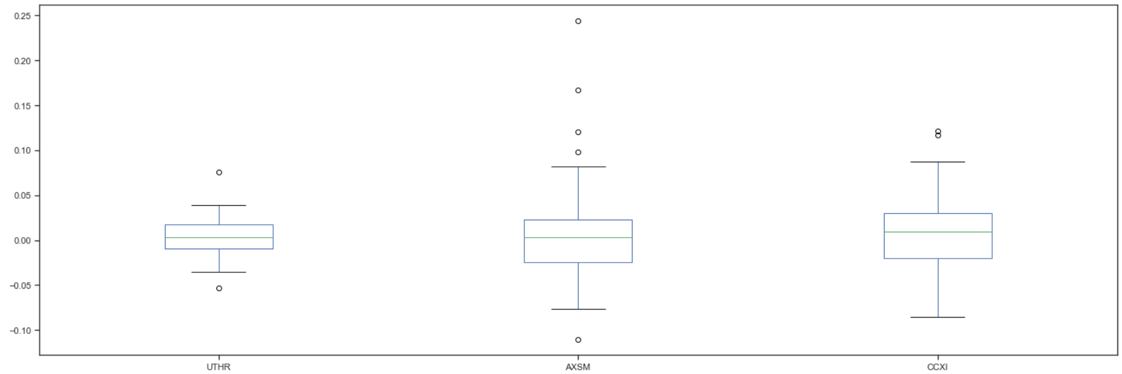
[17]:
```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

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

[17]: <matplotlib.axes._subplots.AxesSubplot at 0x27050dabeb8>

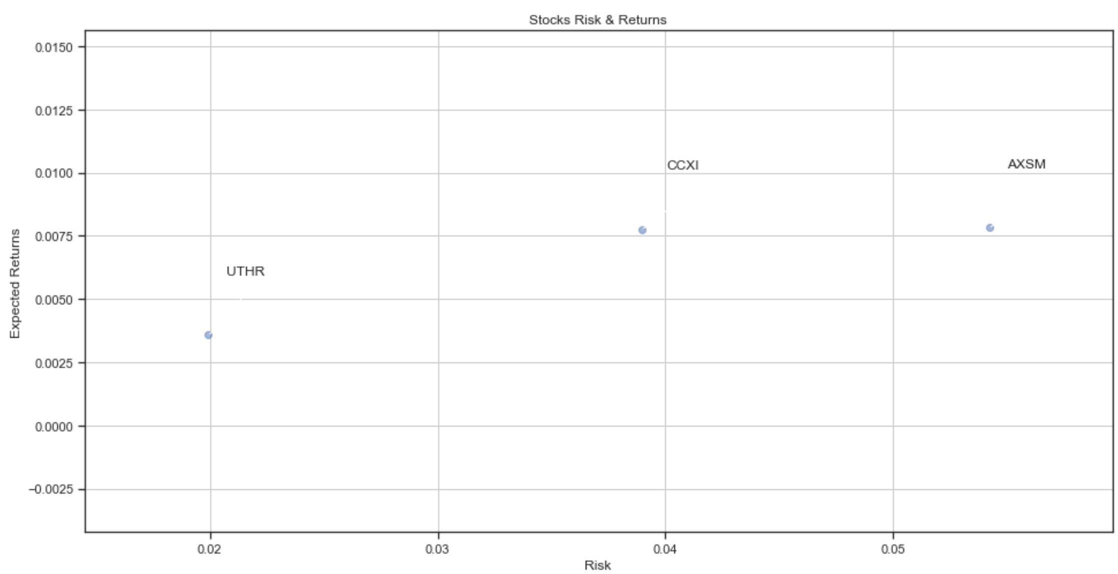


[18]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(24,8))
```

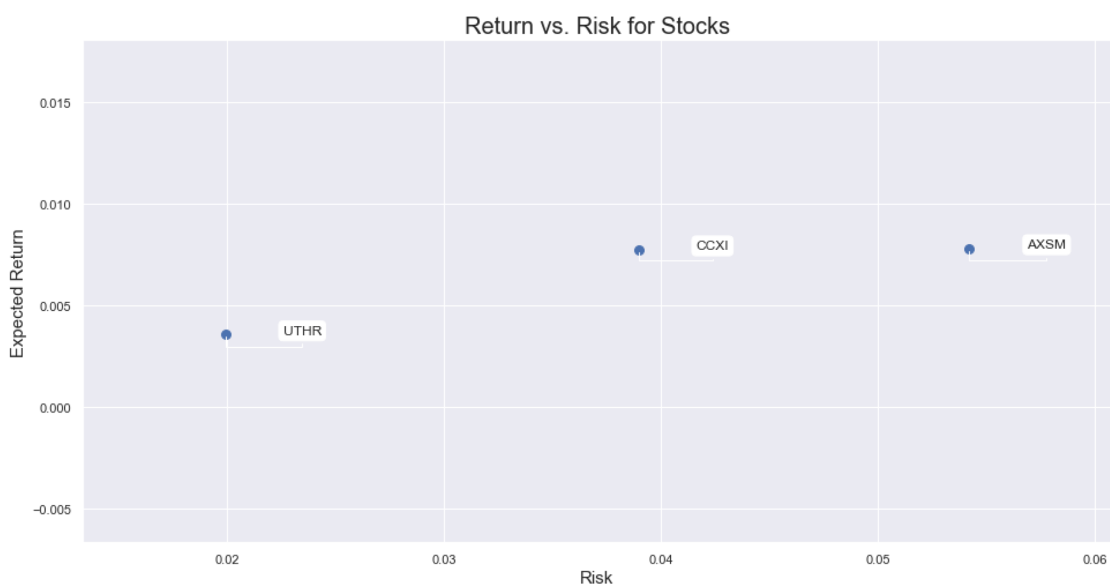
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x27050fee898>



[19]:
```
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]:
```
def annual_risk_return(stock_rets):
    tradeoff = stock_rets.agg(["mean", "std"]).T
    tradeoff.columns = ["Return", "Risk"]
    tradeoff.Return = tradeoff.Return*252
    tradeoff.Risk = tradeoff.Risk * np.sqrt(252)
    return tradeoff
```

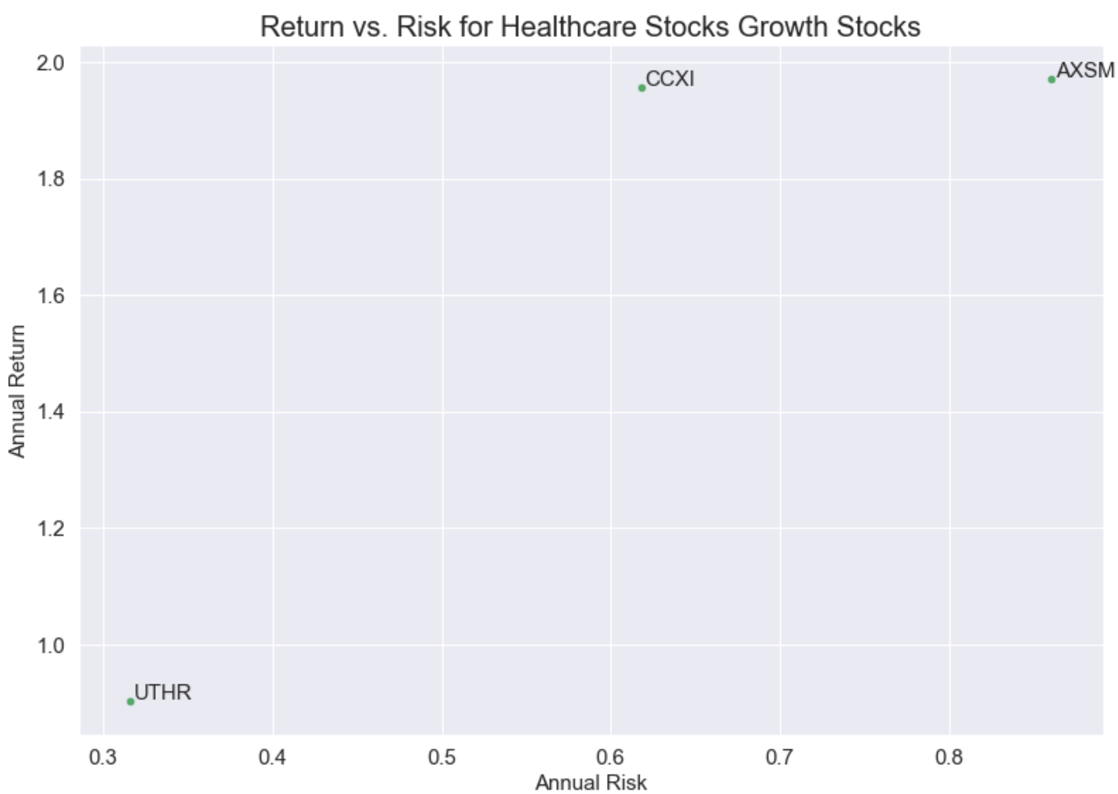
[22]:
```
tradeoff = annual_risk_return(stock_rets)
tradeoff
```

[22]:

	Return	Risk
UTHR	0.902482	0.315917
AXSM	1.971030	0.860686
CCXI	1.956847	0.618366

[23]:

```
import itertools

colors = itertools.cycle(["r", "b", "g"])

tradeoff.plot(x = "Risk", y = "Return", kind = "scatter", figsize = (13,9), s =␣
 ↪20, fontsize = 15, c='g')
for i in tradeoff.index:
    plt.annotate(i, xy=(tradeoff.loc[i, "Risk"]+0.002, tradeoff.loc[i,␣
 ↪"Return"]+0.002), size = 15)
plt.xlabel("Annual Risk", fontsize = 15)
plt.ylabel("Annual Return", fontsize = 15)
plt.title("Return vs. Risk for " + title + " Stocks", fontsize = 20)
plt.show()
```



[24]:

```
rest_rets = rets.corr()
pair_value = rest_rets.abs().unstack()
pair_value.sort_values(ascending = False)
```

[24]:
```
CCXI  CCXI    1.000000
AXSM  AXSM    1.000000
UTHR  UTHR    1.000000
CCXI  UTHR    0.414333
UTHR  CCXI    0.414333
CCXI  AXSM    0.260518
AXSM  CCXI    0.260518
      UTHR    0.219479
UTHR  AXSM    0.219479
dtype: float64
```

[25]:
```python
# Normalized Returns Data
Normalized_Value = ((rets[:] - rets[:].min()) /(rets[:].max() - rets[:].min()))
Normalized_Value.head()
```

[25]:
```
                UTHR      AXSM      CCXI
Date
2020-04-02  0.383490  0.304462  0.560852
2020-04-03  0.348547  0.278518  0.318051
2020-04-06  0.666565  0.235450  0.977783
2020-04-07  0.357360  0.116586  0.314107
2020-04-08  0.538855  0.783739  0.486838
```

[26]:
```python
Normalized_Value.corr()
```

[26]:
```
          UTHR      AXSM      CCXI
UTHR  1.000000  0.219479  0.414333
AXSM  0.219479  1.000000  0.260518
CCXI  0.414333  0.260518  1.000000
```

[27]:
```python
normalized_rets = Normalized_Value.corr()
normalized_pair_value = normalized_rets.abs().unstack()
normalized_pair_value.sort_values(ascending = False)
```

[27]:
```
CCXI  CCXI    1.000000
AXSM  AXSM    1.000000
UTHR  UTHR    1.000000
CCXI  UTHR    0.414333
UTHR  CCXI    0.414333
CCXI  AXSM    0.260518
AXSM  CCXI    0.260518
      UTHR    0.219479
UTHR  AXSM    0.219479
dtype: float64
```

[28]:
```python
print("Stock returns: ")
print(rets.mean())
```

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

```
Stock returns:
UTHR    0.003581
AXSM    0.007822
CCXI    0.007765
dtype: float64
--------------------------------------------------
Stock risks:
UTHR    0.019901
AXSM    0.054218
CCXI    0.038953
dtype: float64
```

[29]:
```
table = pd.DataFrame()
table['Returns'] = rets.mean()
table['Risk'] = rets.std()
table.sort_values(by='Returns')
```

[29]:

	Returns	Risk
UTHR	0.003581	0.019901
CCXI	0.007765	0.038953
AXSM	0.007822	0.054218

[30]:
```
table.sort_values(by='Risk')
```

[30]:

	Returns	Risk
UTHR	0.003581	0.019901
CCXI	0.007765	0.038953
AXSM	0.007822	0.054218

[31]:
```
rf = 0.01
table['Sharpe Ratio'] = (table['Returns'] - rf) / table['Risk']
table
```

[31]:

	Returns	Risk	Sharpe Ratio
UTHR	0.003581	0.019901	-0.322534
AXSM	0.007822	0.054218	-0.040179
CCXI	0.007765	0.038953	-0.057369

[32]:
```
table['Max Returns'] = rets.max()
```

[33]:
```
table['Min Returns'] = rets.min()
```

[34]:
```
table['Median Returns'] = rets.median()
```

[35]:
```python
total_return = stock_rets[-1:].transpose()
table['Total Return'] = 100 * total_return
table
```

[35]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
UTHR  0.003581  0.019901     -0.322534     0.075563    -0.053394
AXSM  0.007822  0.054218     -0.040179     0.243455    -0.109920
CCXI  0.007765  0.038953     -0.057369     0.121123    -0.085633

      Median Returns  Total Return
UTHR        0.003095     -0.691399
AXSM        0.003098      2.336670
CCXI        0.009041      4.914965
```

[36]:
```python
table['Average Return Days'] = (1 + total_return)**(1 / days) - 1
table
```

[36]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
UTHR  0.003581  0.019901     -0.322534     0.075563    -0.053394
AXSM  0.007822  0.054218     -0.040179     0.243455    -0.109920
CCXI  0.007765  0.038953     -0.057369     0.121123    -0.085633

      Median Returns  Total Return  Average Return Days
UTHR        0.003095     -0.691399            -0.000071
AXSM        0.003098      2.336670             0.000236
CCXI        0.009041      4.914965             0.000490
```

[37]:
```python
initial_value = df.iloc[0]
ending_value = df.iloc[-1]
table['CAGR'] = ((ending_value / initial_value) ** (252.0 / days)) -1
table
```

[37]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
UTHR  0.003581  0.019901     -0.322534     0.075563    -0.053394
AXSM  0.007822  0.054218     -0.040179     0.243455    -0.109920
CCXI  0.007765  0.038953     -0.057369     0.121123    -0.085633

      Median Returns  Total Return  Average Return Days      CAGR
UTHR        0.003095     -0.691399            -0.000071  0.790787
AXSM        0.003098      2.336670             0.000236  2.028307
CCXI        0.009041      4.914965             0.000490  2.343430
```

[38]:
```python
table.sort_values(by='Average Return Days')
```

[38]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
UTHR  0.003581  0.019901     -0.322534     0.075563    -0.053394
AXSM  0.007822  0.054218     -0.040179     0.243455    -0.109920
```

CCXI	0.007765	0.038953	-0.057369	0.121123	-0.085633

	Median Returns	Total Return	Average Return Days	CAGR
UTHR	0.003095	-0.691399	-0.000071	0.790787
AXSM	0.003098	2.336670	0.000236	2.028307
CCXI	0.009041	4.914965	0.000490	2.343430