Growth_Stock_Portfolio

September 29, 2021

1 Growth Stock 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
# Growth Stock
title = "Growth Stock for July"
symbols = ['STNE', 'CRWD', 'ZNGA']
start = '2020-04-01'
end = '2020-06-26'
```

[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]: 85
```

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

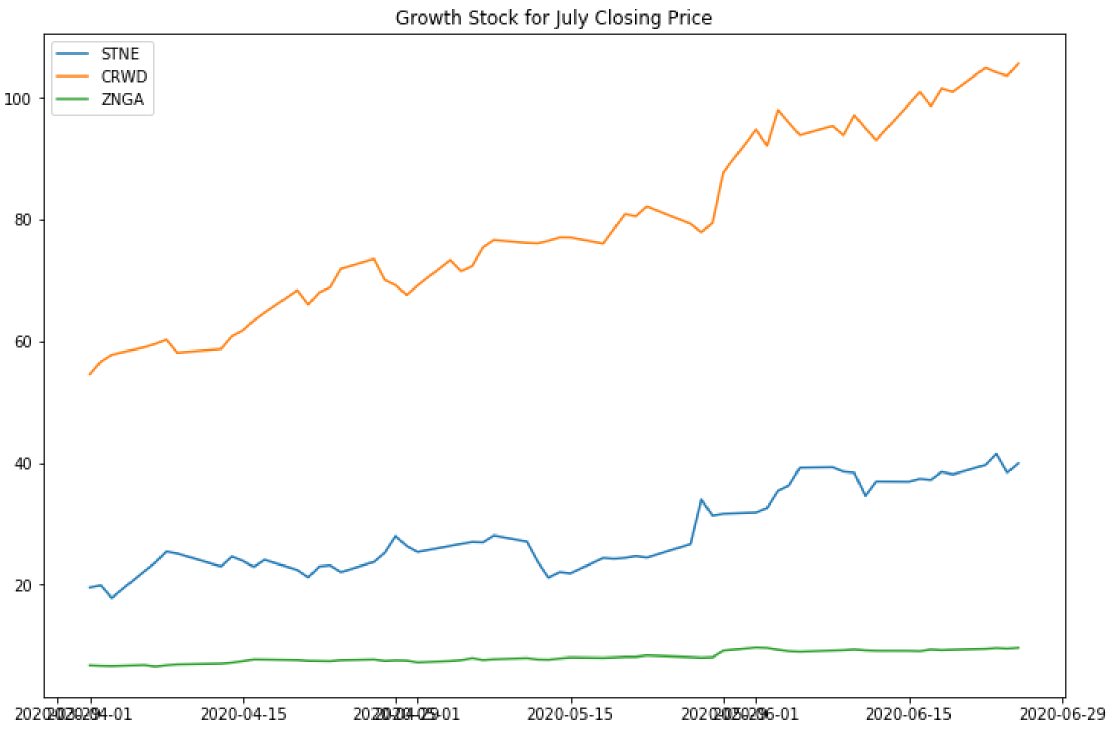
```
[7]:                  STNE       CRWD  ZNGA
     Date
     2020-04-01  19.530001  54.580002  6.76
     2020-04-02  19.879999  56.689999  6.68
     2020-04-03  17.820000  57.820000  6.64
     2020-04-06  22.240000  59.070000  6.81
     2020-04-07  23.639999  59.599998  6.56
```

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

```
[8]:                  STNE        CRWD  ZNGA
     Date
     2020-06-19  38.139999  101.080002  9.29
     2020-06-22  39.689999  105.019997  9.44
     2020-06-23  41.549999  104.269997  9.57
     2020-06-24  38.430000  103.699997  9.48
     2020-06-25  39.959999  105.709999  9.61
```

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

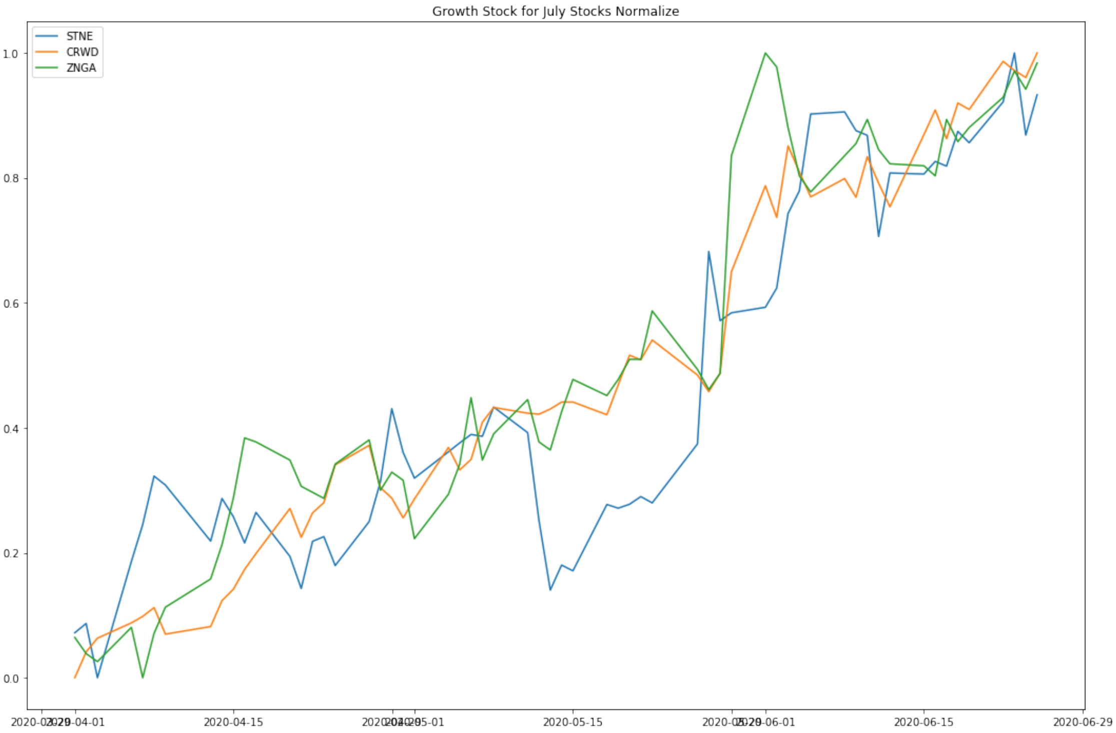
```
[9]: <matplotlib.legend.Legend at 0x1d5fce1a6a0>
```



[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)
```

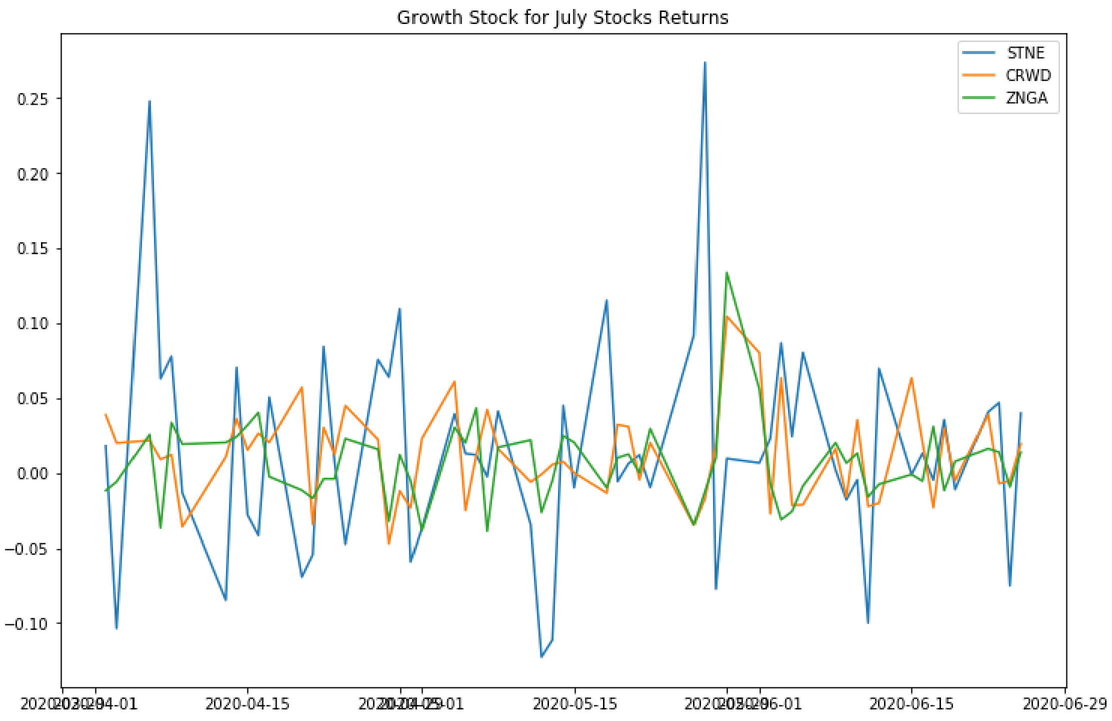
[11]:
```
<matplotlib.legend.Legend at 0x1d5fd1f8b38>
```



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

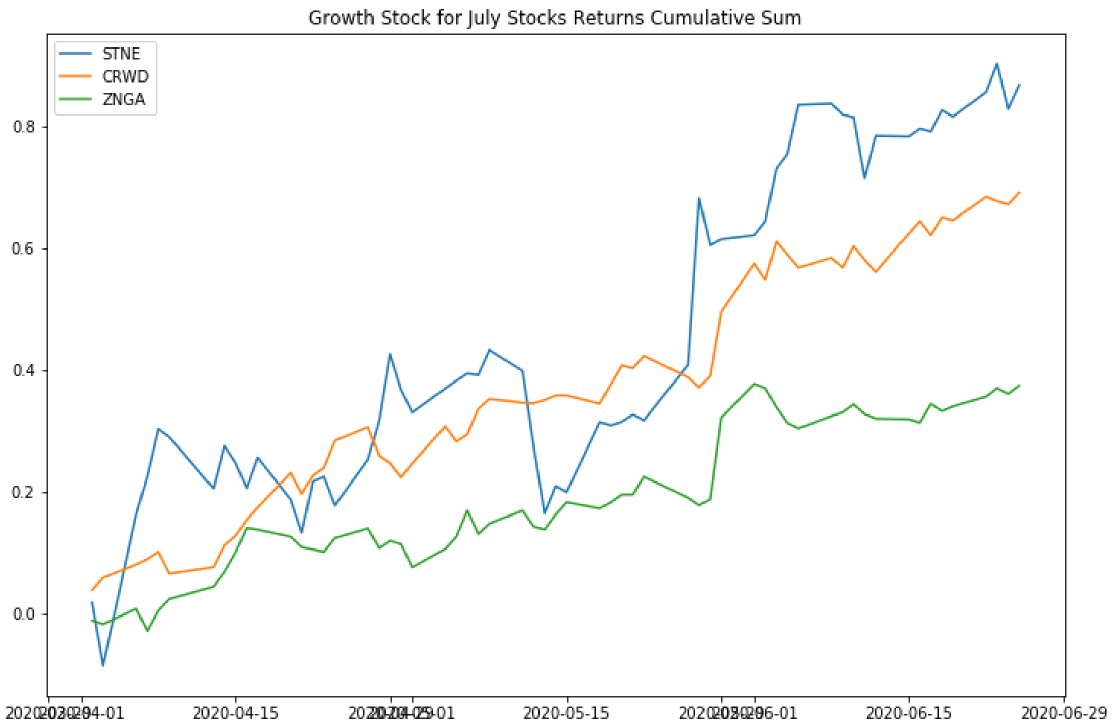
```
[13]: plt.figure(figsize=(12,8))
      plt.plot(stock_rets)
      plt.title(title + ' Stocks Returns')
      plt.legend(labels=stock_rets.columns)
```

```
[13]: <matplotlib.legend.Legend at 0x1d5fce84d30>
```

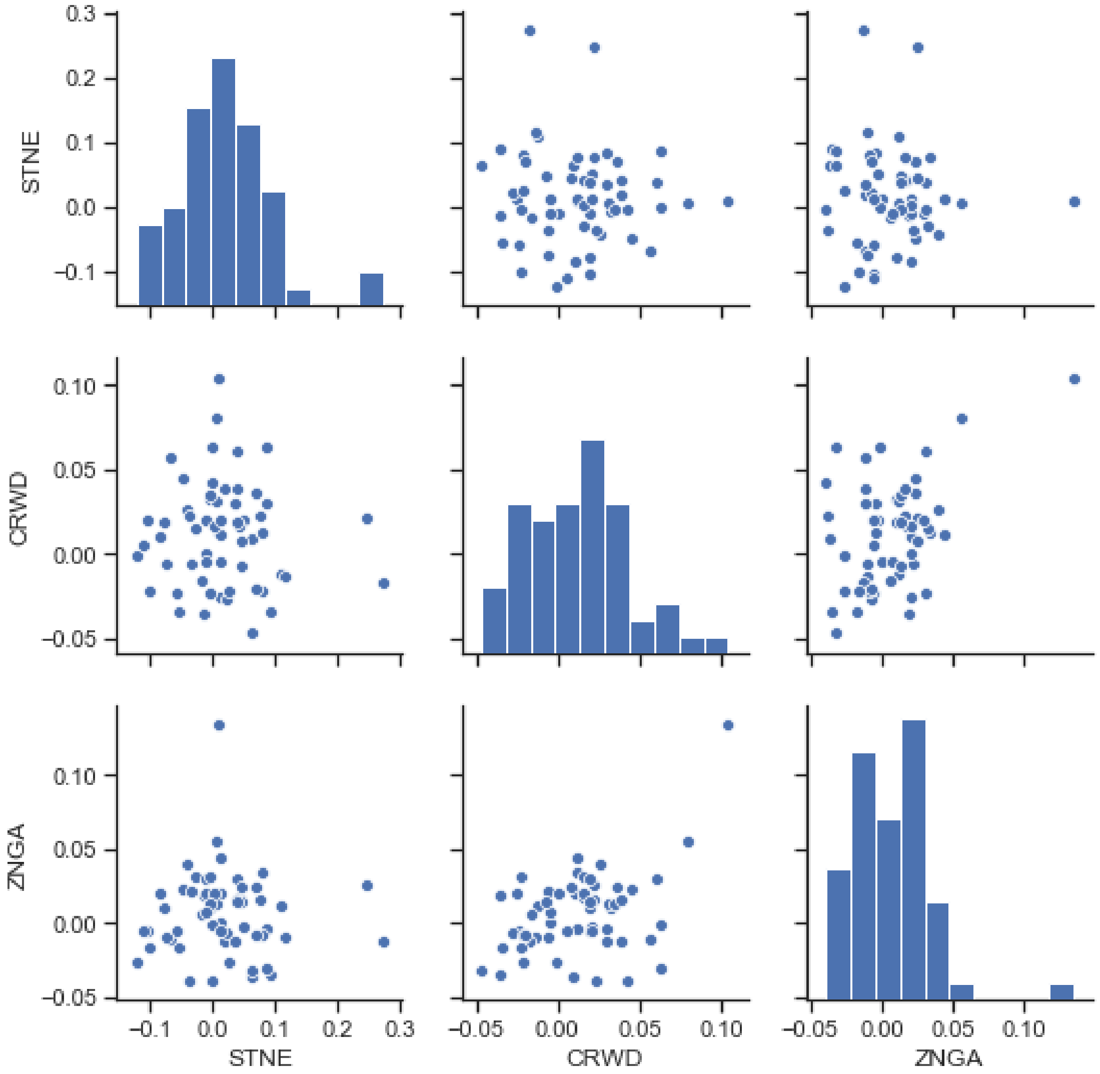


```
[14]: plt.figure(figsize=(12,8))
      plt.plot(stock_rets.cumsum())
      plt.title(title + ' Stocks Returns Cumulative Sum')
      plt.legend(labels=stock_rets.columns)
```

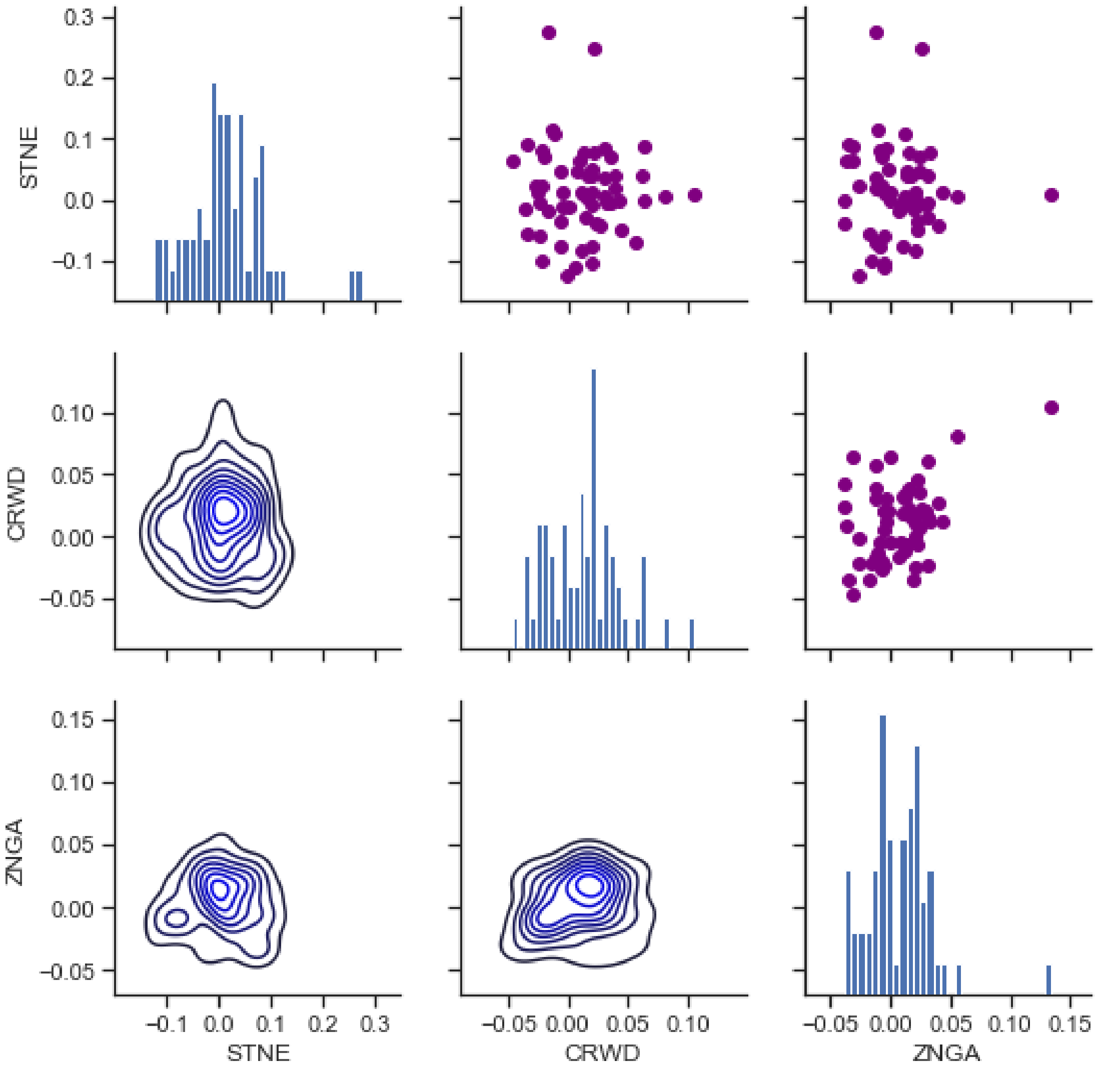
```
[14]: <matplotlib.legend.Legend at 0x1d5fd225940>
```



```
[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)
```

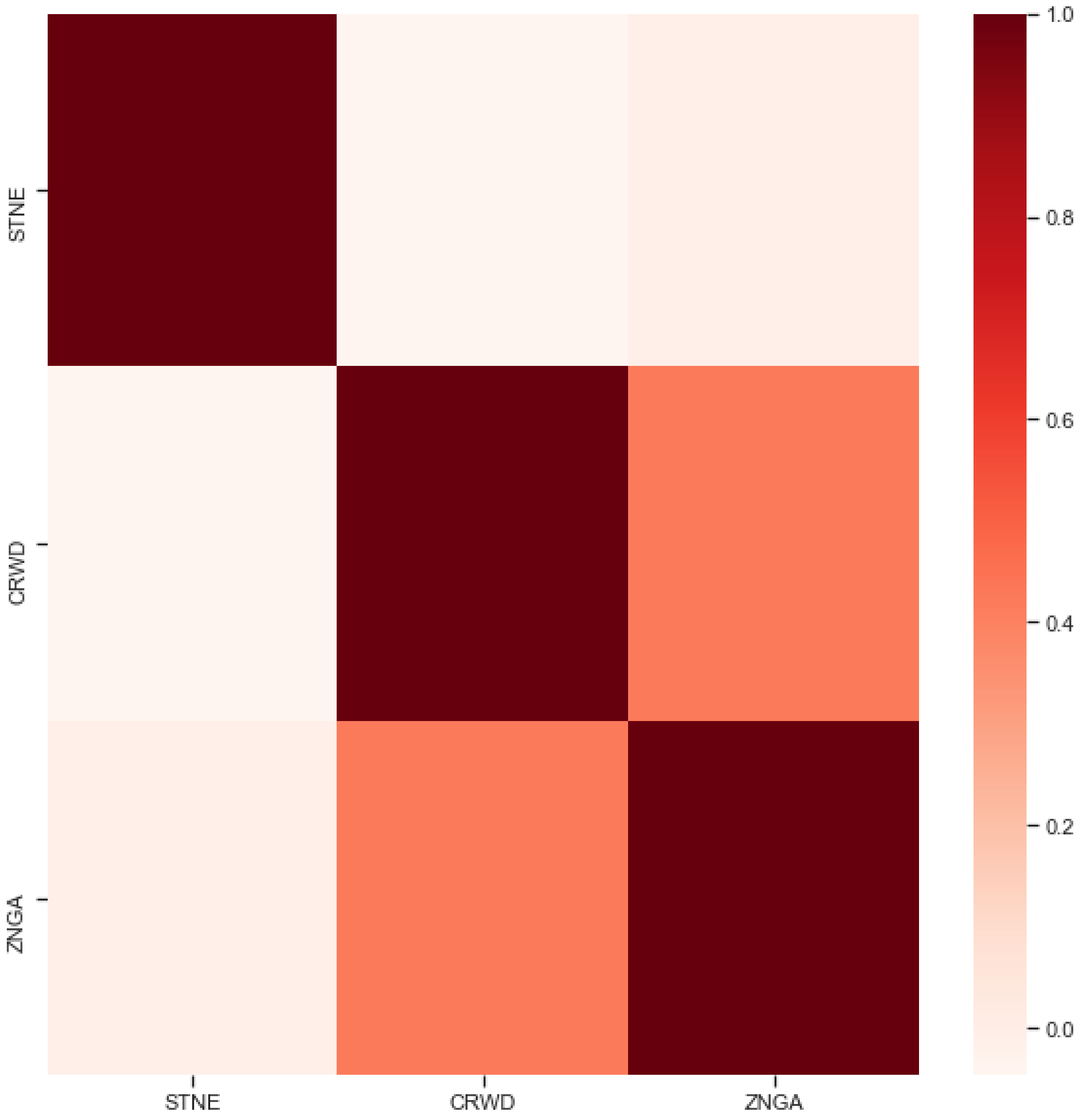


[17]:

```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

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

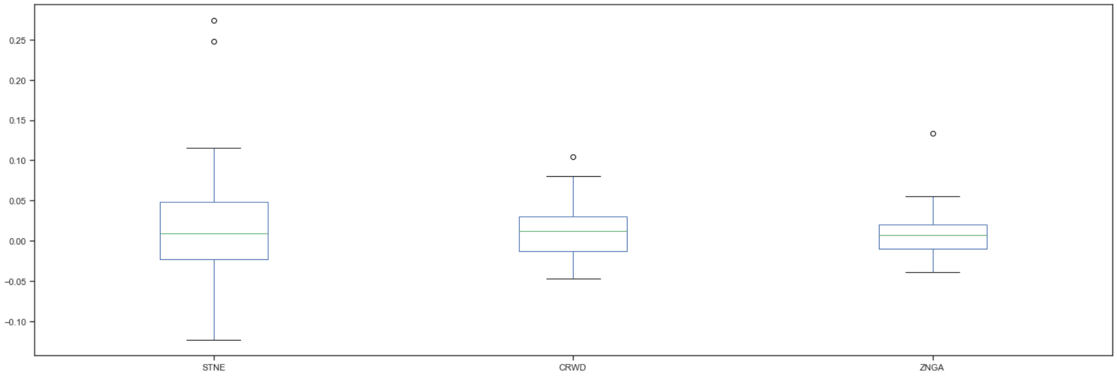
[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x1d5fce7b3c8>
```



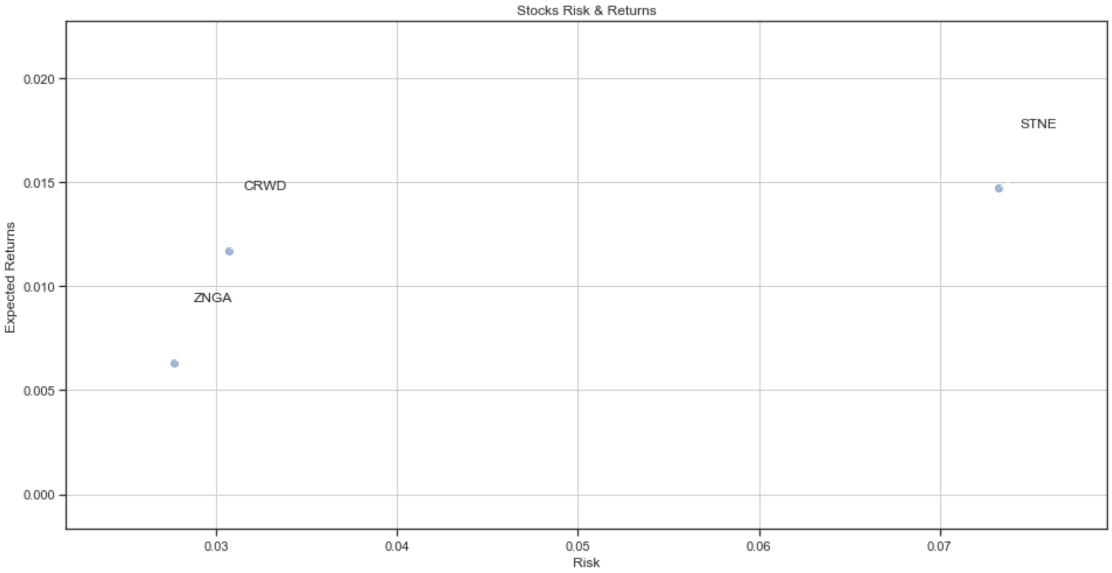
```
[18]: # Box plot
      stock_rets.plot(kind='box',figsize=(24,8))
```

```
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x1d5ff074a58>
```

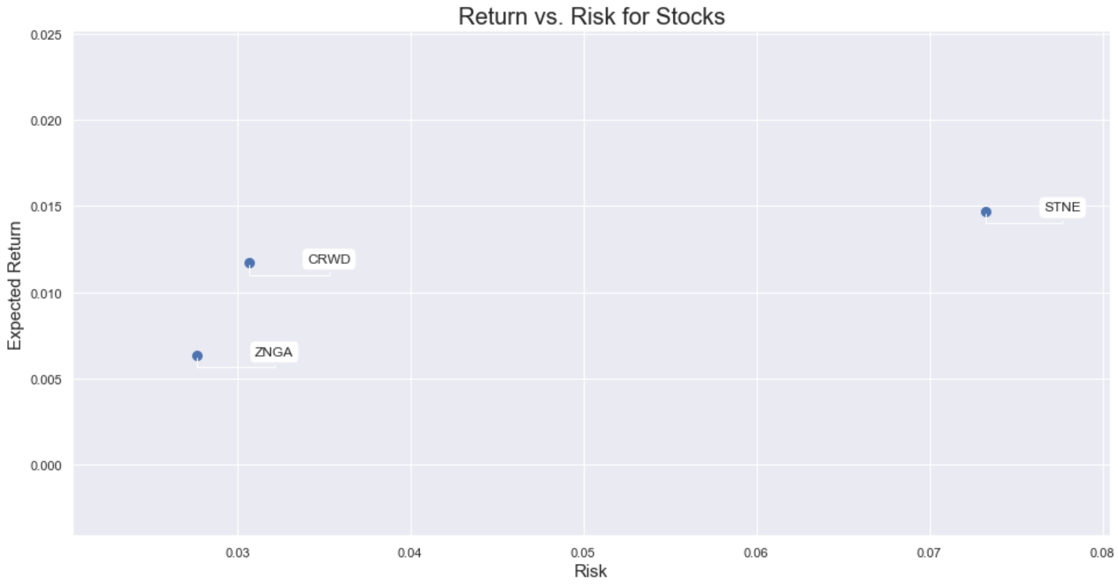


[19]:

```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"))
```

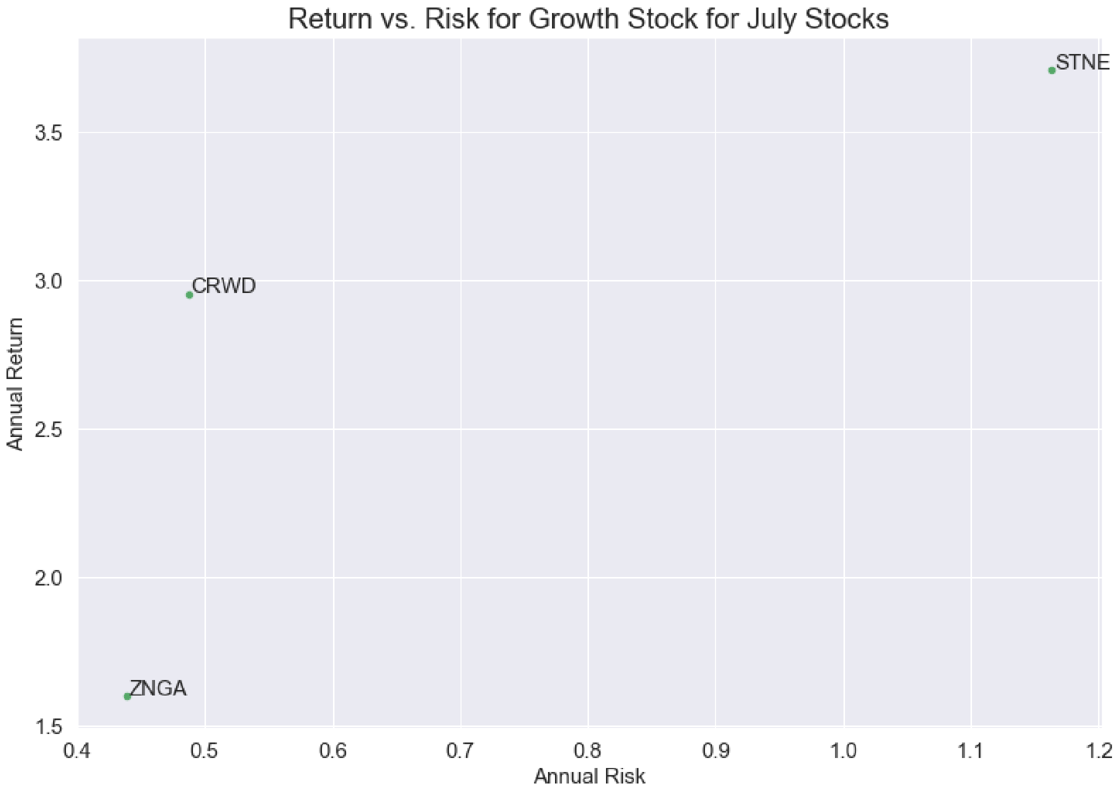


[21]:
```
def annual_risk_return(stock_rets):
    tradeoff = stock_rets.agg(["mean", "std"]).T
    tradeoff.columns = ["Return", "Risk"]
    tradeoff.Return = tradeoff.Return*252
    tradeoff.Risk = tradeoff.Risk * np.sqrt(252)
    return tradeoff
```

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

[22]:
```
          Return      Risk
STNE   3.708787   1.163257
CRWD   2.953634   0.487298
ZNGA   1.598953   0.439222
```

[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]:
```
ZNGA  ZNGA    1.000000
CRWD  CRWD    1.000000
STNE  STNE    1.000000
ZNGA  CRWD    0.427355
CRWD  ZNGA    0.427355
      STNE    0.046759
STNE  CRWD    0.046759
ZNGA  STNE    0.006471
STNE  ZNGA    0.006471
dtype: float64
```

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

[25]:
```
                STNE      CRWD      ZNGA
Date
2020-04-02  0.354740  0.565720  0.157151
2020-04-03  0.048221  0.442260  0.190980
2020-04-06  0.935069  0.453374  0.373771
2020-04-07  0.468298  0.369996  0.013210
2020-04-08  0.505836  0.390488  0.419681
```

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

[26]:
```
          STNE      CRWD      ZNGA
STNE  1.000000 -0.046759 -0.006471
CRWD -0.046759  1.000000  0.427355
ZNGA -0.006471  0.427355  1.000000
```

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

[27]:
```
ZNGA  ZNGA    1.000000
CRWD  CRWD    1.000000
STNE  STNE    1.000000
ZNGA  CRWD    0.427355
CRWD  ZNGA    0.427355
      STNE    0.046759
STNE  CRWD    0.046759
ZNGA  STNE    0.006471
STNE  ZNGA    0.006471
dtype: float64
```

[28]:
```
print("Stock returns: ")
print(rets.mean())
print('-' * 50)
print("Stock risks:")
print(rets.std())
```

```
Stock returns:
STNE    0.014717
CRWD    0.011721
ZNGA    0.006345
dtype: float64
--------------------------------------------------
Stock risks:
STNE    0.073278
CRWD    0.030697
ZNGA    0.027668
dtype: float64
```

[29]:

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

[29]:

```
       Returns      Risk
ZNGA  0.006345  0.027668
CRWD  0.011721  0.030697
STNE  0.014717  0.073278
```

[30]:

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

[30]:

```
       Returns      Risk
ZNGA  0.006345  0.027668
CRWD  0.011721  0.030697
STNE  0.014717  0.073278
```

[31]:

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

[31]:

```
       Returns      Risk  Sharpe Ratio
STNE  0.014717  0.073278      0.064377
CRWD  0.011721  0.030697      0.056057
ZNGA  0.006345  0.027668     -0.132098
```

[32]:

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

[33]:

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

[34]:

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

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

[35]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
STNE   0.014717  0.073278      0.064377     0.273783    -0.122742
CRWD   0.011721  0.030697      0.056057     0.104528    -0.047147
ZNGA   0.006345  0.027668     -0.132098     0.133829    -0.038994

      Median Returns  Total Return
STNE        0.009560      3.981261
CRWD        0.012340      1.938286
ZNGA        0.007592      1.371309
```

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

[36]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
STNE   0.014717  0.073278      0.064377     0.273783    -0.122742
CRWD   0.011721  0.030697      0.056057     0.104528    -0.047147
ZNGA   0.006345  0.027668     -0.132098     0.133829    -0.038994

      Median Returns  Total Return  Average Return Days
STNE        0.009560      3.981261             0.000459
CRWD        0.012340      1.938286             0.000226
ZNGA        0.007592      1.371309             0.000160
```

[37]:
```
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  \
STNE   0.014717  0.073278      0.064377     0.273783    -0.122742
CRWD   0.011721  0.030697      0.056057     0.104528    -0.047147
ZNGA   0.006345  0.027668     -0.132098     0.133829    -0.038994

      Median Returns  Total Return  Average Return Days      CAGR
STNE        0.009560      3.981261             0.000459  7.352104
CRWD        0.012340      1.938286             0.000226  6.097661
ZNGA        0.007592      1.371309             0.000160  1.837513
```

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

[38]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
ZNGA   0.006345  0.027668     -0.132098     0.133829    -0.038994
CRWD   0.011721  0.030697      0.056057     0.104528    -0.047147
```

```
STNE  0.014717  0.073278      0.064377     0.273783    -0.122742

      Median Returns  Total Return  Average Return Days      CAGR
ZNGA        0.007592      1.371309             0.000160  1.837513
CRWD        0.012340      1.938286             0.000226  6.097661
STNE        0.009560      3.981261             0.000459  7.352104
```