Guns_Portfolio

September 29, 2021

1 Gun Stocks 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
# Gun Stocks
title = "Gun Stocks"
symbols = ['SWBI', 'RGR', 'VSTO', 'OLN', 'SPWH', 'AAXN', 'BGFV']
start = '2020-01-01'
end = '2020-10-16'
```

[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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```

[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]: 287

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

[7]:

Date	SWBI	RGR	VSTO	OLN	SPWH	AAXN	BGFV
2020-01-02	7.027052	43.791065	7.09	16.290392	7.635	76.559998	2.916299
2020-01-03	7.141999	44.180981	7.08	15.956765	7.650	73.930000	2.916299
2020-01-06	7.348902	45.072208	7.23	16.023491	8.220	68.750000	3.108794
2020-01-07	7.264608	44.858685	7.10	16.042555	8.440	69.769997	3.022171
2020-01-08	7.295260	45.675652	7.02	15.909107	8.640	69.610001	3.060670

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

[8]:

Date	SWBI	RGR	VSTO	OLN	SPWH	AAXN \
2020-10-09	16.790001	65.589996	21.450001	15.370000	16.660000	98.989998
2020-10-12	16.500000	65.550003	20.629999	15.710000	16.430000	99.180000
2020-10-13	16.620001	65.559998	20.820000	16.190001	16.850000	101.750000
2020-10-14	16.440001	65.389999	20.620001	17.559999	17.040001	101.419998
2020-10-15	16.780001	66.989998	20.870001	17.200001	17.120001	105.860001

Date	BGFV
2020-10-09	8.10
2020-10-12	7.96
2020-10-13	8.30
2020-10-14	8.22
2020-10-15	8.69

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

[9]:
```
SWBI     4.559538
RGR     38.452953
```

```
VSTO     4.800000
OLN      9.013595
SPWH     4.300000
AAXN    52.610001
BGFV     0.698748
dtype: float64
```

[10]:
```python
df.max()
```

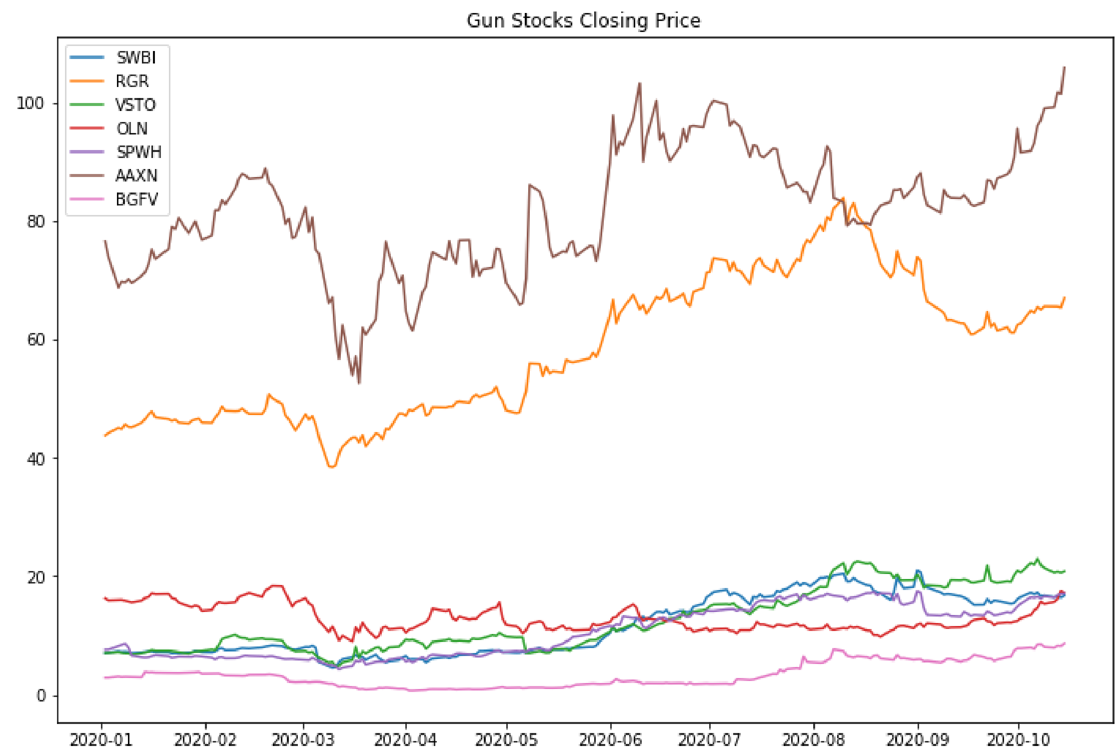
[10]:
```
SWBI     21.045992
RGR      83.916054
VSTO     23.000000
OLN      18.393909
SPWH     17.510000
AAXN    105.860001
BGFV      8.690000
dtype: float64
```

[11]:
```python
df.describe()
```

[11]:
```
             SWBI        RGR        VSTO         OLN        SPWH        AAXN  \
count  200.000000  200.000000  200.000000  200.000000  200.000000  200.000000
mean    11.667557   58.479674   12.556650   12.917141   10.716625   81.874200
std      5.034987   11.929120    5.315731    2.154348    4.336542   10.578901
min      4.559538   38.452953    4.800000    9.013595    4.300000   52.610001
25%      7.232040   47.449042    7.742500   11.256542    6.487500   74.634998
50%      8.283799   56.924280   10.110000   12.176005   10.480000   82.639999
75%     16.709366   67.831205   18.180000   14.709635   14.467500   89.570002
max     21.045992   83.916054   23.000000   18.393909   17.510000  105.860001

             BGFV
count  200.000000
mean     3.417705
std      2.209801
min      0.698748
25%      1.643534
50%      2.916299
75%      5.620000
max      8.690000
```

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

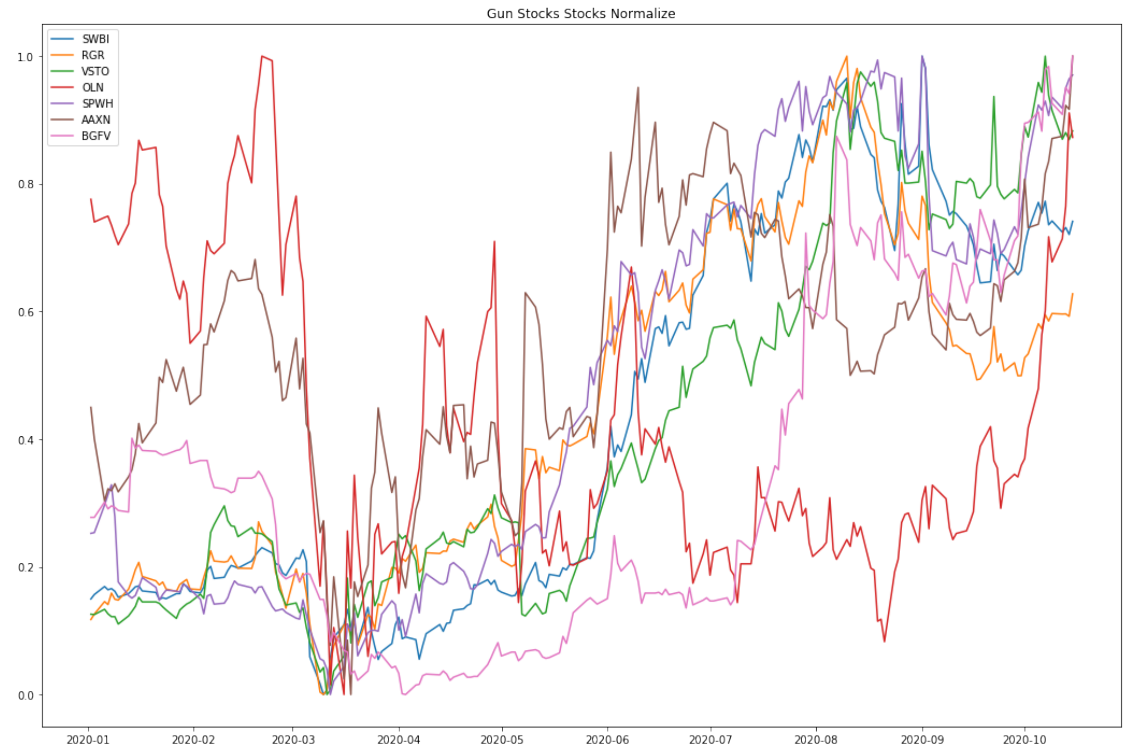
[12]:
```
<matplotlib.legend.Legend at 0x2458d4a6da0>
```



[13]:
```
# Normalize the data
normalize = (df - df.min())/ (df.max() - df.min())
```

[14]:
```
plt.figure(figsize=(18,12))
plt.plot(normalize)
plt.title(title + ' Stocks Normalize')
plt.legend(labels=normalize.columns)
```

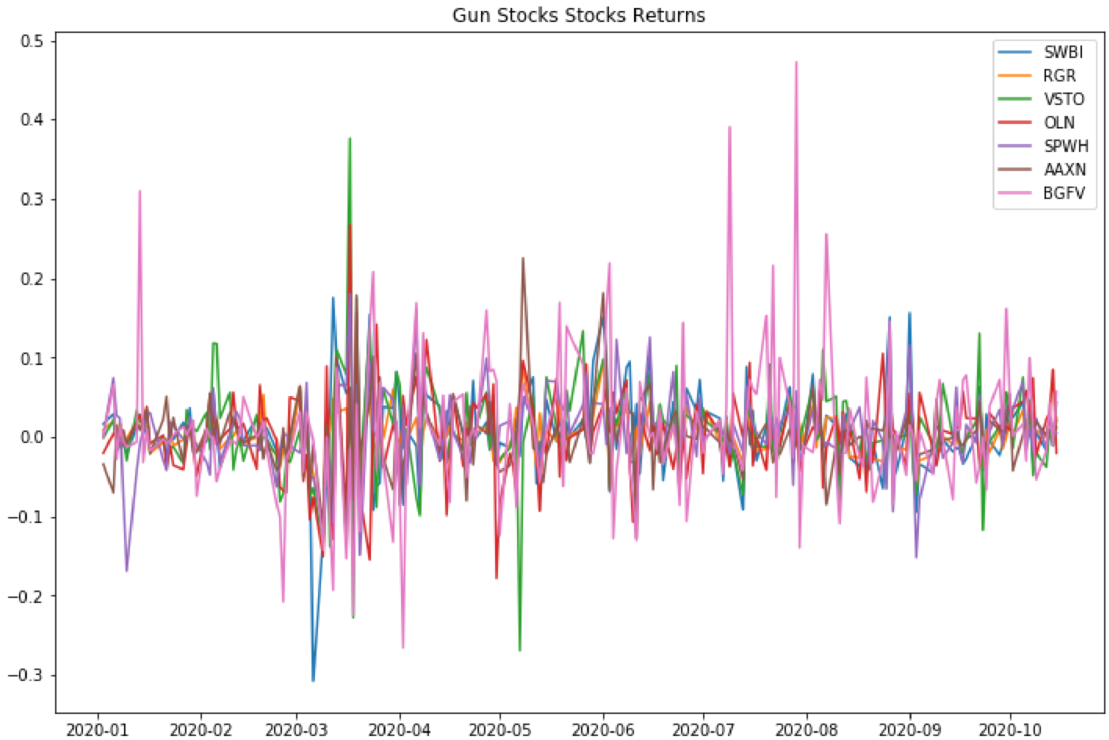
[14]: <matplotlib.legend.Legend at 0x2458d50a208>



[15]:
```
stock_rets = df.pct_change().dropna()
```

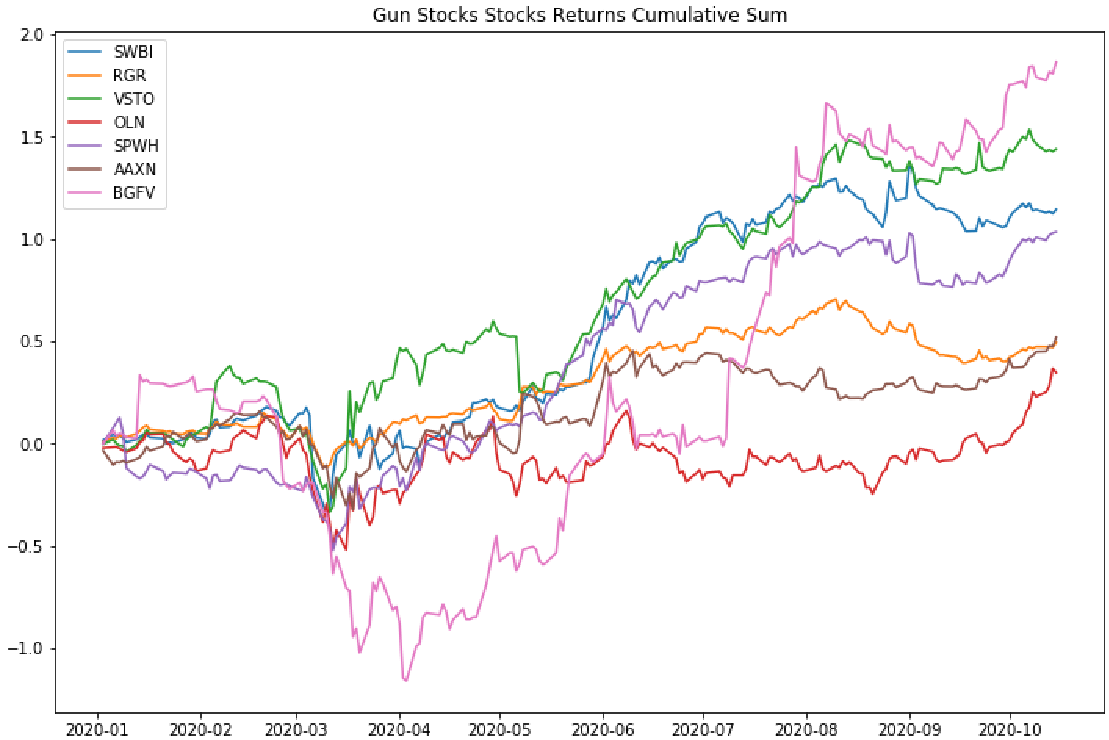
[16]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title(title + ' Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[16]: <matplotlib.legend.Legend at 0x2458d565e80>

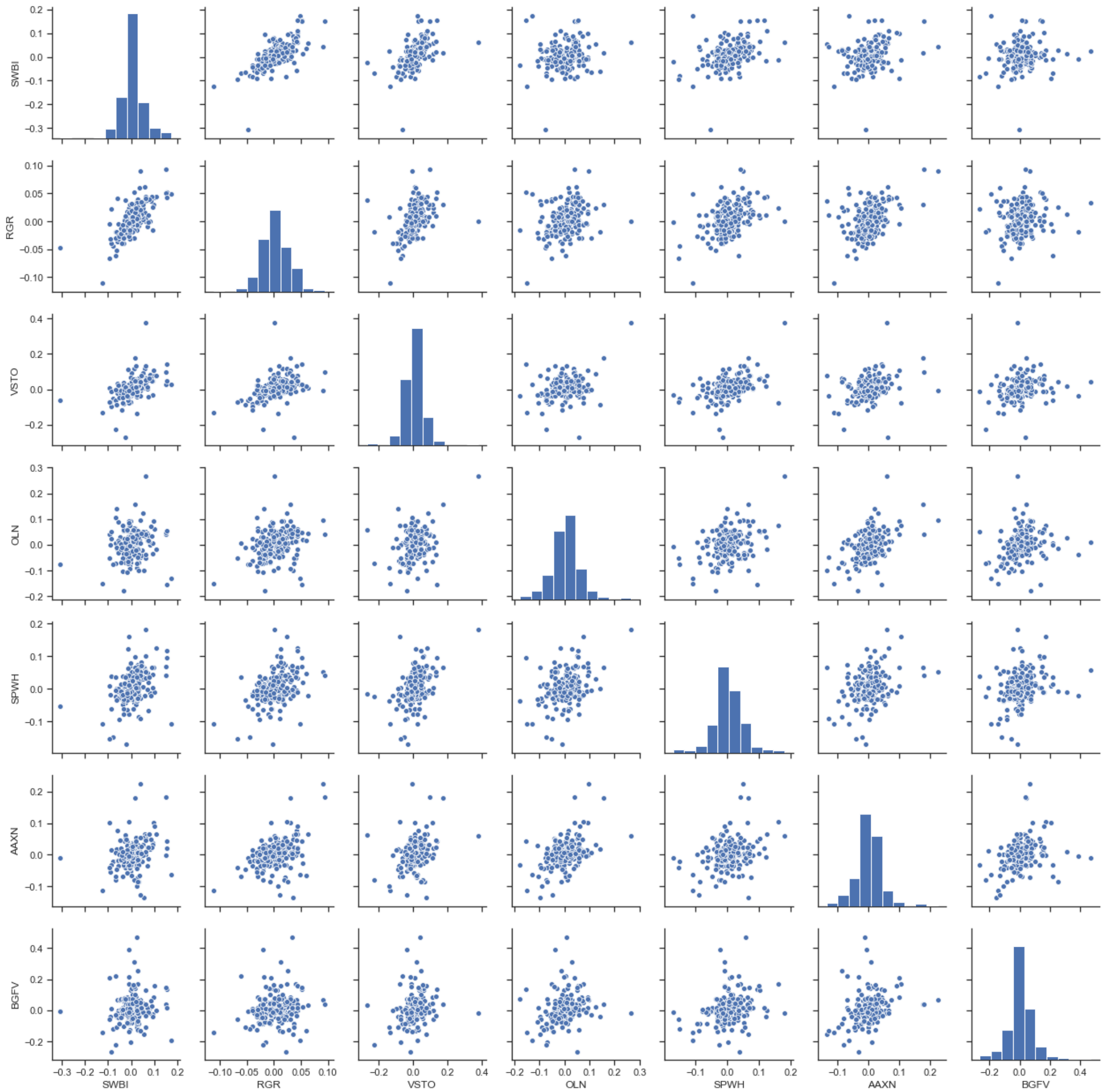


[17]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title(title + ' Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

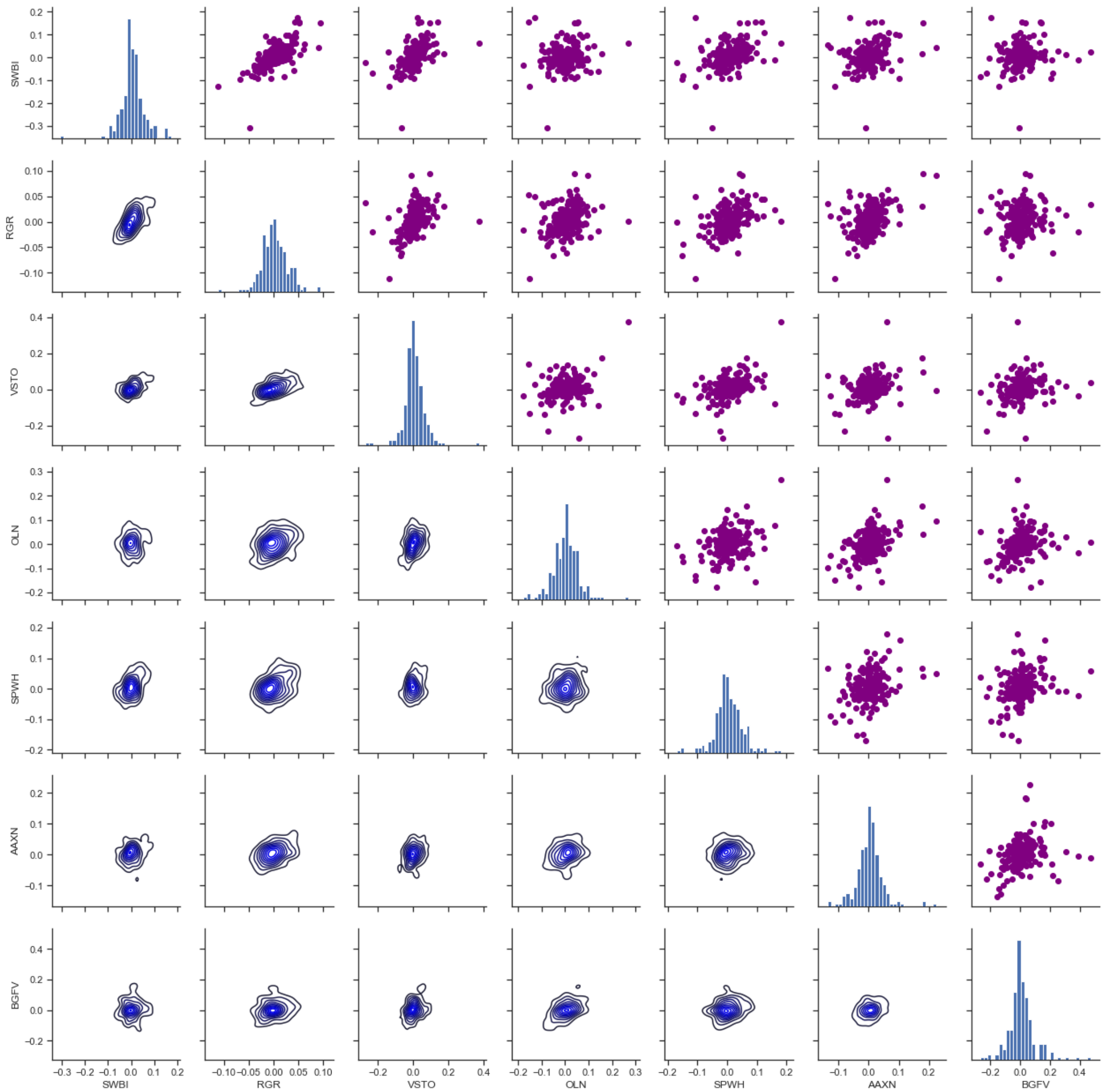
[17]: <matplotlib.legend.Legend at 0x2458d5c8390>



[18]:
```
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)
```

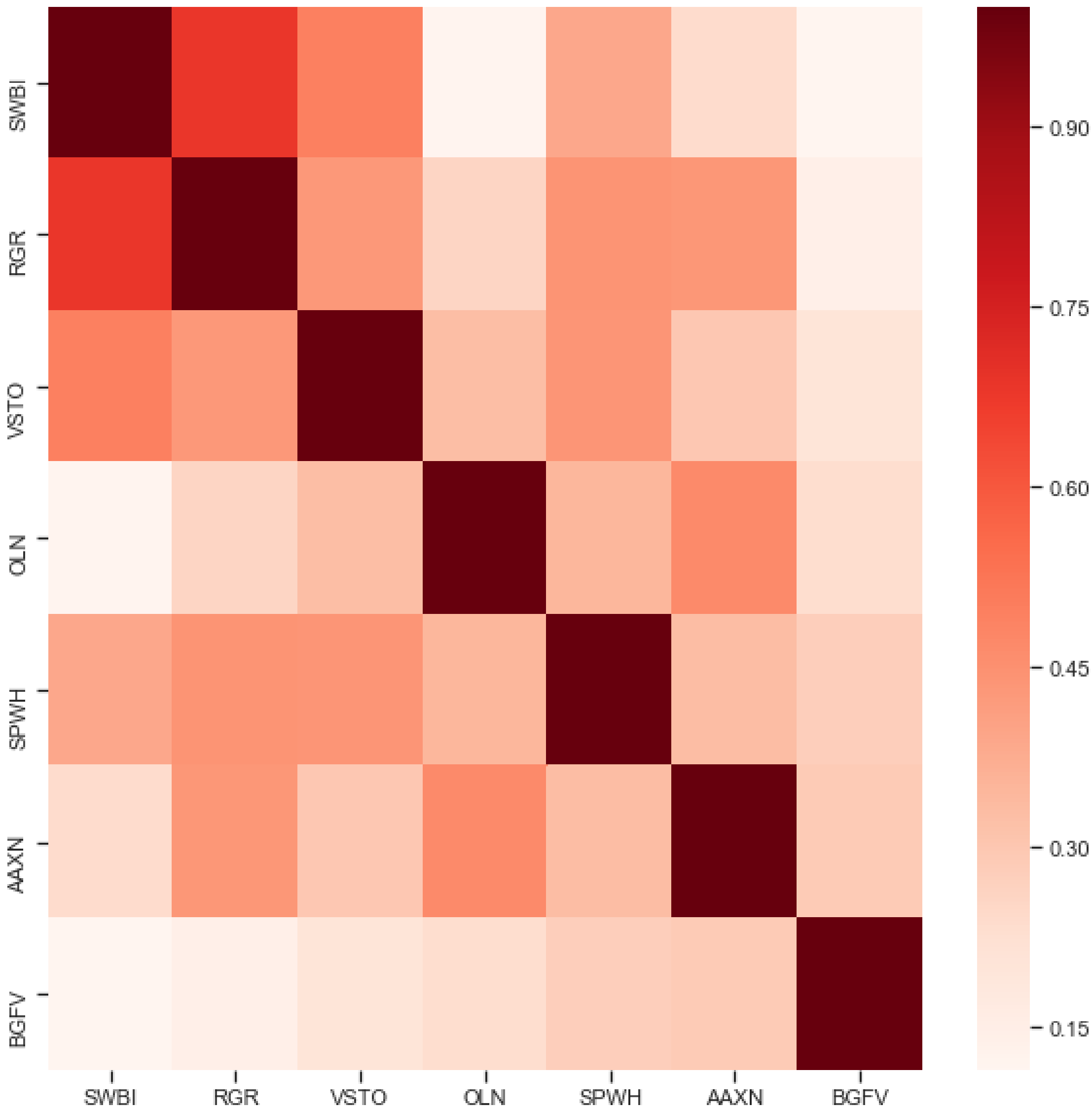



```
[19]: ax = sns.PairGrid(stock_rets)
      ax.map_upper(plt.scatter, color='purple')
      ax.map_lower(sns.kdeplot, color='blue')
      ax.map_diag(plt.hist, bins=30)
      for i in range(nplot) :
          for j in range(nplot) :
              ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)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



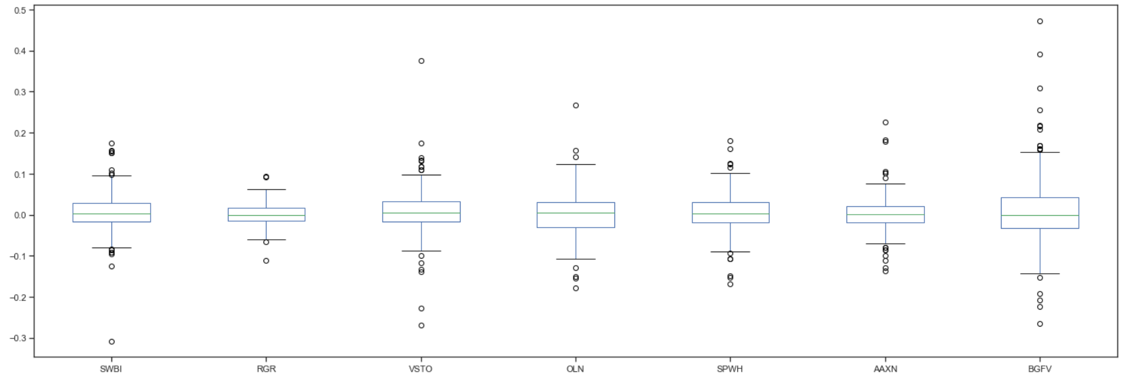
[20]:
```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

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

[20]: <matplotlib.axes._subplots.AxesSubplot at 0x2458f96dc88>

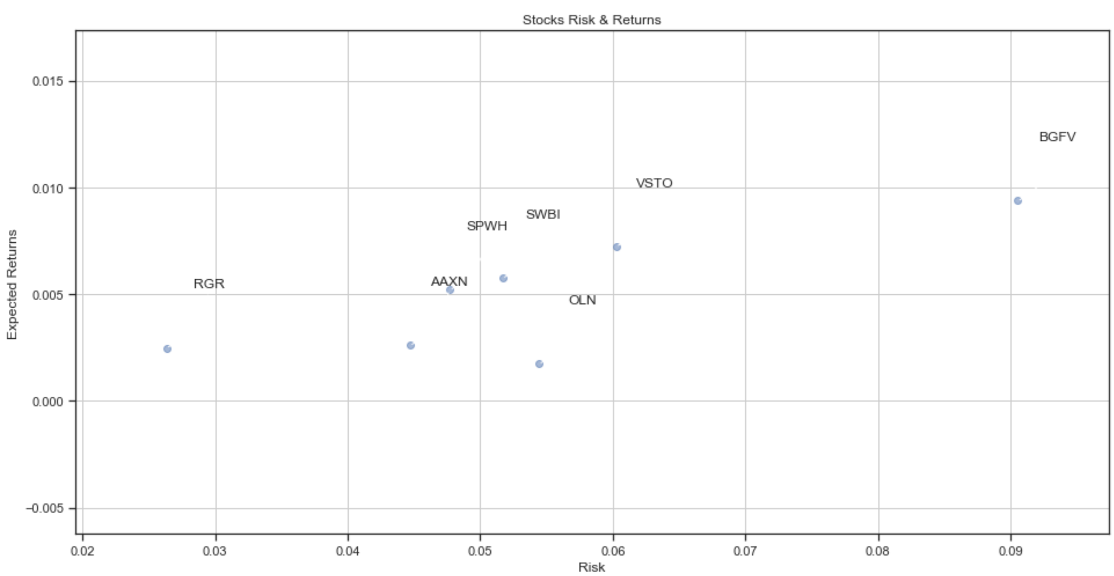


[21]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(24,8))
```

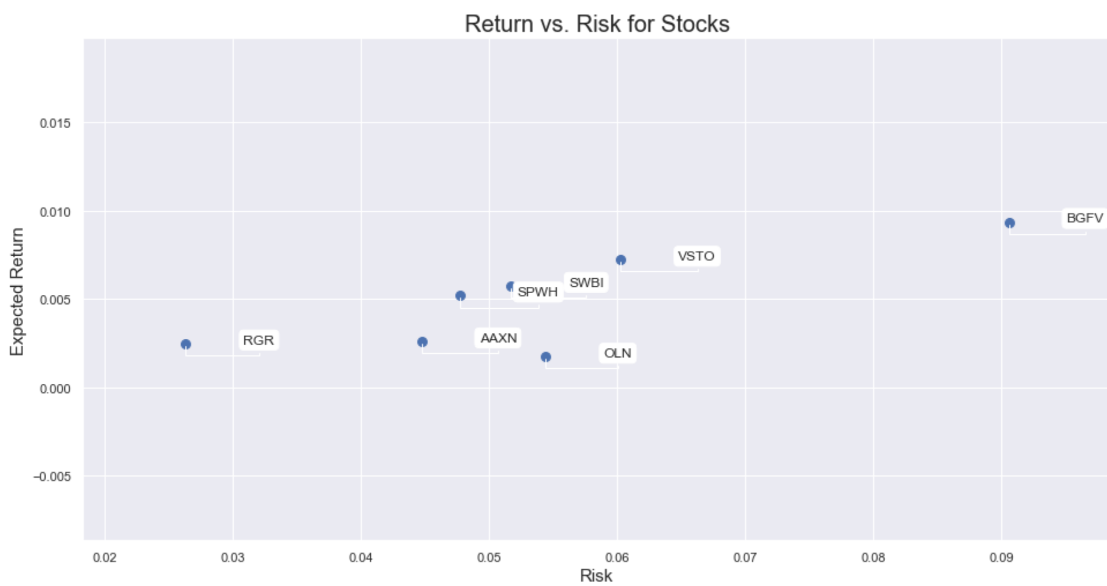
[21]: <matplotlib.axes._subplots.AxesSubplot at 0x2458f9f4c50>



[22]:
```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'))
```



[23]:
```python
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"))
```



[24]:
```python
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
```

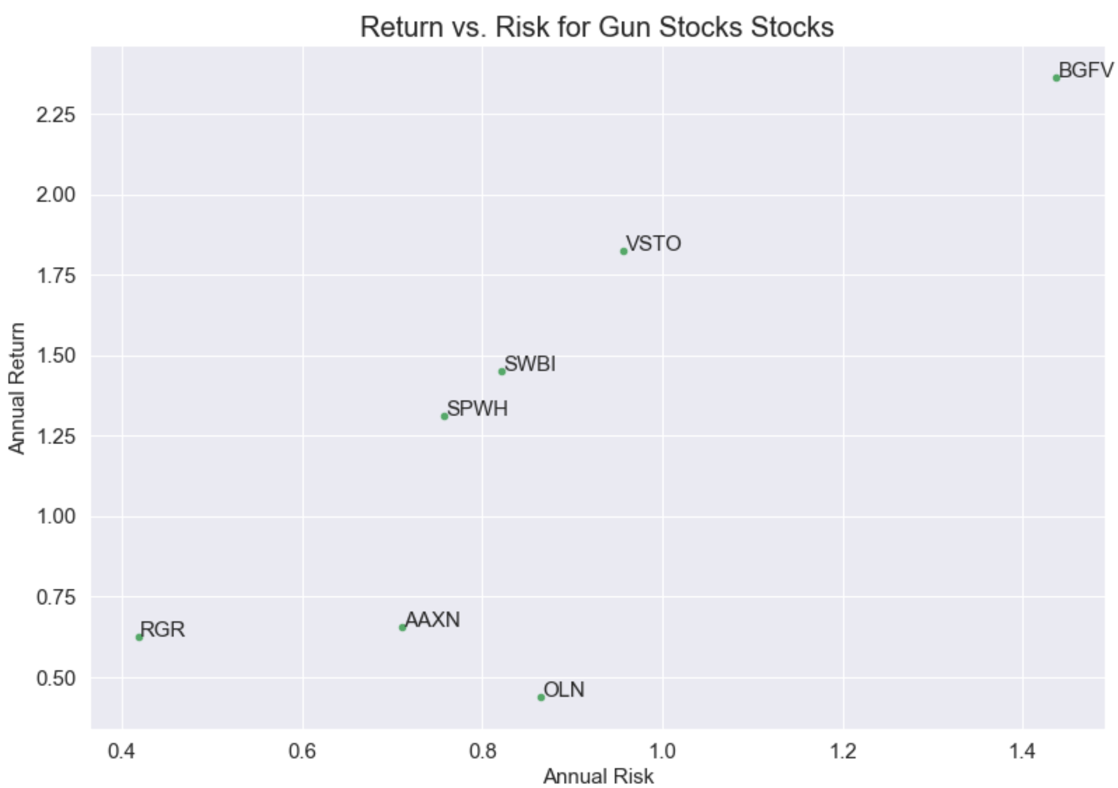
[25]:
```python
tradeoff = annual_risk_return(stock_rets)
tradeoff
```

[25]:

	Return	Risk
SWBI	1.449417	0.820663
RGR	0.625755	0.418085
VSTO	1.822841	0.956793
OLN	0.438754	0.864144
SPWH	1.310831	0.757645
AAXN	0.656083	0.709880
BGFV	2.361165	1.437576

[26]:

```
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()
```



[27]:

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

[27]:

```
BGFV  BGFV    1.000000
AAXN  AAXN    1.000000
RGR   RGR     1.000000
VSTO  VSTO    1.000000
SPWH  SPWH    1.000000
OLN   OLN     1.000000
SWBI  SWBI    1.000000
      RGR     0.684784
RGR   SWBI    0.684784
VSTO  SWBI    0.497898
SWBI  VSTO    0.497898
OLN   AAXN    0.468956
AAXN  OLN     0.468956
RGR   SPWH    0.441878
SPWH  RGR     0.441878
VSTO  SPWH    0.436748
SPWH  VSTO    0.436748
AAXN  RGR     0.432793
RGR   AAXN    0.432793
      VSTO    0.431892
VSTO  RGR     0.431892
SWBI  SPWH    0.388067
SPWH  SWBI    0.388067
      OLN     0.348395
OLN   SPWH    0.348395
SPWH  AAXN    0.329527
AAXN  SPWH    0.329527
VSTO  OLN     0.328790
OLN   VSTO    0.328790
VSTO  AAXN    0.300096
AAXN  VSTO    0.300096
      BGFV    0.289004
BGFV  AAXN    0.289004
      SPWH    0.277252
SPWH  BGFV    0.277252
OLN   RGR     0.257333
RGR   OLN     0.257333
SWBI  AAXN    0.238493
AAXN  SWBI    0.238493
OLN   BGFV    0.235032
BGFV  OLN     0.235032
VSTO  BGFV    0.201950
BGFV  VSTO    0.201950
```

```
RGR   BGFV    0.147055
BGFV  RGR     0.147055
OLN   SWBI    0.117901
SWBI  OLN     0.117901
      BGFV    0.114331
BGFV  SWBI    0.114331
dtype: float64
```

[28]:
```
# Normalized Returns Data
Normalized_Value = ((rets[:] - rets[:].min()) /(rets[:].max() - rets[:].min()))
Normalized_Value.head()
```

[28]:
```
                SWBI       RGR      VSTO       OLN      SPWH      AAXN  \
Date
2020-01-03  0.670819  0.585887  0.414759  0.354235  0.489663  0.281784
2020-01-06  0.696922  0.640723  0.449774  0.409711  0.697231  0.183083
2020-01-07  0.613226  0.519503  0.389082  0.402981  0.560619  0.417724
2020-01-08  0.645697  0.631184  0.399484  0.381593  0.551843  0.370384
2020-01-09  0.617399  0.496069  0.416944  0.378739  0.265476  0.399749

                BGFV
Date
2020-01-03  0.359814
2020-01-06  0.449334
2020-01-07  0.322025
2020-01-08  0.377091
2020-01-09  0.351285
```

[29]:
```
Normalized_Value.corr()
```

[29]:
```
          SWBI       RGR      VSTO       OLN      SPWH      AAXN      BGFV
SWBI  1.000000  0.684784  0.497898  0.117901  0.388067  0.238493  0.114331
RGR   0.684784  1.000000  0.431892  0.257333  0.441878  0.432793  0.147055
VSTO  0.497898  0.431892  1.000000  0.328790  0.436748  0.300096  0.201950
OLN   0.117901  0.257333  0.328790  1.000000  0.348395  0.468956  0.235032
SPWH  0.388067  0.441878  0.436748  0.348395  1.000000  0.329527  0.277252
AAXN  0.238493  0.432793  0.300096  0.468956  0.329527  1.000000  0.289004
BGFV  0.114331  0.147055  0.201950  0.235032  0.277252  0.289004  1.000000
```

[30]:
```
normalized_rets = Normalized_Value.corr()
normalized_pair_value = normalized_rets.abs().unstack()
normalized_pair_value.sort_values(ascending = False)
```

[30]:
```
BGFV  BGFV    1.000000
AAXN  AAXN    1.000000
RGR   RGR     1.000000
VSTO  VSTO    1.000000
```

```
SPWH  SPWH    1.000000
OLN   OLN     1.000000
SWBI  SWBI    1.000000
      RGR     0.684784
RGR   SWBI    0.684784
VSTO  SWBI    0.497898
SWBI  VSTO    0.497898
OLN   AAXN    0.468956
AAXN  OLN     0.468956
RGR   SPWH    0.441878
SPWH  RGR     0.441878
VSTO  SPWH    0.436748
SPWH  VSTO    0.436748
AAXN  RGR     0.432793
RGR   AAXN    0.432793
      VSTO    0.431892
VSTO  RGR     0.431892
SWBI  SPWH    0.388067
SPWH  SWBI    0.388067
      OLN     0.348395
OLN   SPWH    0.348395
SPWH  AAXN    0.329527
AAXN  SPWH    0.329527
VSTO  OLN     0.328790
OLN   VSTO    0.328790
VSTO  AAXN    0.300096
AAXN  VSTO    0.300096
      BGFV    0.289004
BGFV  AAXN    0.289004
      SPWH    0.277252
SPWH  BGFV    0.277252
OLN   RGR     0.257333
RGR   OLN     0.257333
SWBI  AAXN    0.238493
AAXN  SWBI    0.238493
OLN   BGFV    0.235032
BGFV  OLN     0.235032
VSTO  BGFV    0.201950
BGFV  VSTO    0.201950
RGR   BGFV    0.147055
BGFV  RGR     0.147055
OLN   SWBI    0.117901
SWBI  OLN     0.117901
      BGFV    0.114331
BGFV  SWBI    0.114331
dtype: float64
```

[31]:
```python
print("Stock returns: ")
print(rets.mean())
print('-' * 50)
print("Stock risks:")
print(rets.std())
```

```
Stock returns:
SWBI    0.005752
RGR     0.002483
VSTO    0.007233
OLN     0.001741
SPWH    0.005202
AAXN    0.002604
BGFV    0.009370
dtype: float64
--------------------------------------------------
Stock risks:
SWBI    0.051697
RGR     0.026337
VSTO    0.060272
OLN     0.054436
SPWH    0.047727
AAXN    0.044718
BGFV    0.090559
dtype: float64
```

[32]:
```python
table = pd.DataFrame()
table['Returns'] = rets.mean()
table['Risk'] = rets.std()
table.sort_values(by='Returns')
```

[32]:

	Returns	Risk
OLN	0.001741	0.054436
RGR	0.002483	0.026337
AAXN	0.002604	0.044718
SPWH	0.005202	0.047727
SWBI	0.005752	0.051697
VSTO	0.007233	0.060272
BGFV	0.009370	0.090559

[33]:
```python
table.sort_values(by='Risk')
```

[33]:

	Returns	Risk
RGR	0.002483	0.026337
AAXN	0.002604	0.044718
SPWH	0.005202	0.047727
SWBI	0.005752	0.051697

```
OLN    0.001741  0.054436
VSTO   0.007233  0.060272
BGFV   0.009370  0.090559
```

[34]:
```python
rf = 0.01
table['Sharpe Ratio'] = (table['Returns'] - rf) / table['Risk']
table
```

[34]:
```
       Returns      Risk  Sharpe Ratio
SWBI  0.005752  0.051697     -0.082178
RGR   0.002483  0.026337     -0.285412
VSTO  0.007233  0.060272     -0.045900
OLN   0.001741  0.054436     -0.151718
SPWH  0.005202  0.047727     -0.100536
AAXN  0.002604  0.044718     -0.165402
BGFV  0.009370  0.090559     -0.006960
```

[35]:
```python
table['Max Returns'] = rets.max()
```

[36]:
```python
table['Min Returns'] = rets.min()
```

[37]:
```python
table['Median Returns'] = rets.median()
```

[38]:
```python
total_return = stock_rets[-1:].transpose()
table['Total Return'] = 100 * total_return
table
```

[38]:
```
       Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
SWBI  0.005752  0.051697     -0.082178     0.175410    -0.307766
RGR   0.002483  0.026337     -0.285412     0.094001    -0.111491
VSTO  0.007233  0.060272     -0.045900     0.376271    -0.269072
OLN   0.001741  0.054436     -0.151718     0.266595    -0.177956
SPWH  0.005202  0.047727     -0.100536     0.180328    -0.169173
AAXN  0.002604  0.044718     -0.165402     0.225526    -0.136313
BGFV  0.009370  0.090559     -0.006960     0.472036    -0.265306

      Median Returns  Total Return
SWBI        0.002395      2.068127
RGR        -0.000192      2.446855
VSTO        0.004587      1.212415
OLN         0.004182     -2.050107
SPWH        0.002745      0.469483
AAXN        0.001919      4.377837
BGFV        0.000000      5.717753
```

[39]:
```python
table['Average Return Days'] = (1 + total_return)**(1 / days) - 1
table
```

[39]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns	\
SWBI	0.005752	0.051697	-0.082178	0.175410	-0.307766	
RGR	0.002483	0.026337	-0.285412	0.094001	-0.111491	
VSTO	0.007233	0.060272	-0.045900	0.376271	-0.269072	
OLN	0.001741	0.054436	-0.151718	0.266595	-0.177956	
SPWH	0.005202	0.047727	-0.100536	0.180328	-0.169173	
AAXN	0.002604	0.044718	-0.165402	0.225526	-0.136313	
BGFV	0.009370	0.090559	-0.006960	0.472036	-0.265306	

	Median Returns	Total Return	Average Return Days
SWBI	0.002395	2.068127	0.000071
RGR	-0.000192	2.446855	0.000084
VSTO	0.004587	1.212415	0.000042
OLN	0.004182	-2.050107	-0.000072
SPWH	0.002745	0.469483	0.000016
AAXN	0.001919	4.377837	0.000149
BGFV	0.000000	5.717753	0.000194

[40]:

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

[40]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns	\
SWBI	0.005752	0.051697	-0.082178	0.175410	-0.307766	
RGR	0.002483	0.026337	-0.285412	0.094001	-0.111491	
VSTO	0.007233	0.060272	-0.045900	0.376271	-0.269072	
OLN	0.001741	0.054436	-0.151718	0.266595	-0.177956	
SPWH	0.005202	0.047727	-0.100536	0.180328	-0.169173	
AAXN	0.002604	0.044718	-0.165402	0.225526	-0.136313	
BGFV	0.009370	0.090559	-0.006960	0.472036	-0.265306	

	Median Returns	Total Return	Average Return Days	CAGR
SWBI	0.002395	2.068127	0.000071	1.147430
RGR	-0.000192	2.446855	0.000084	0.452477
VSTO	0.004587	1.212415	0.000042	1.580454
OLN	0.004182	-2.050107	-0.000072	0.048864
SPWH	0.002745	0.469483	0.000016	1.032016
AAXN	0.001919	4.377837	0.000149	0.329131
BGFV	0.000000	5.717753	0.000194	1.608315

[41]:

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

[41]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns	\
OLN	0.001741	0.054436	-0.151718	0.266595	-0.177956	
SPWH	0.005202	0.047727	-0.100536	0.180328	-0.169173	
VSTO	0.007233	0.060272	-0.045900	0.376271	-0.269072	

SWBI	0.005752	0.051697	-0.082178	0.175410	-0.307766
RGR	0.002483	0.026337	-0.285412	0.094001	-0.111491
AAXN	0.002604	0.044718	-0.165402	0.225526	-0.136313
BGFV	0.009370	0.090559	-0.006960	0.472036	-0.265306

	Median Returns	Total Return	Average Return Days	CAGR
OLN	0.004182	-2.050107	-0.000072	0.048864
SPWH	0.002745	0.469483	0.000016	1.032016
VSTO	0.004587	1.212415	0.000042	1.580454
SWBI	0.002395	2.068127	0.000071	1.147430
RGR	-0.000192	2.446855	0.000084	0.452477
AAXN	0.001919	4.377837	0.000149	0.329131
BGFV	0.000000	5.717753	0.000194	1.608315