Stay_at_Home_Portfolio

September 29, 2021

1 Stay-at-Home

[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
# Online Gaming
title = "Stay-at-Home"
symbols = ['ZM', 'NET', 'BOX', 'DBX', 'AKAM', 'VG', 'EGHT', 'FSLY']
start = '2018-01-01'
end = '2020-06-26'
```

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

```
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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?
2 years
```

[5]:
```
number_of_years = delta.years
```

[6]:
```
days = (df.index[-1] - df.index[0]).days
days
```

[6]:
```
434
```

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

[7]:

Date	ZM	NET	BOX	DBX	AKAM	VG	EGHT	FSLY
2019-04-18	62.000000	NaN	18.840000	21.25	75.339996	9.30	22.330000	NaN
2019-04-22	65.699997	NaN	19.719999	23.16	76.690002	9.47	22.799999	NaN
2019-04-23	69.000000	NaN	20.260000	23.33	77.660004	9.49	23.170000	NaN
2019-04-24	63.200001	NaN	20.549999	23.40	78.139999	9.48	23.139999	NaN
2019-04-25	65.000000	NaN	20.129999	23.65	78.610001	9.53	23.650000	NaN

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

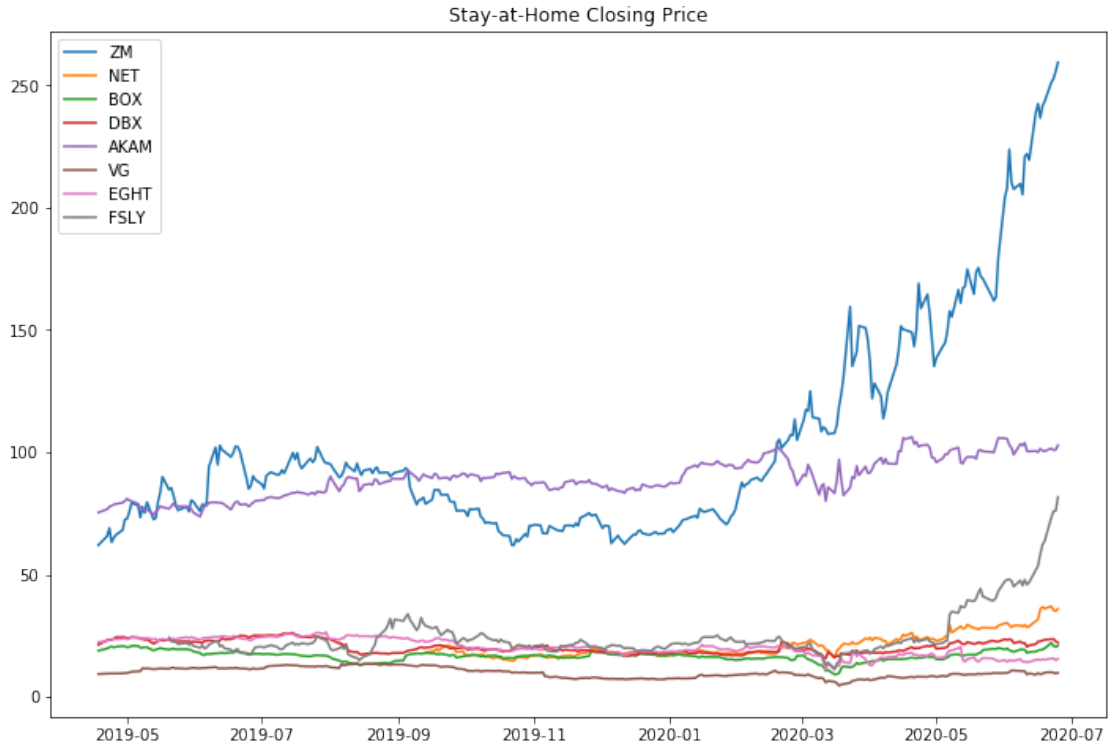
[8]:

Date	ZM	NET	BOX	DBX	AKAM	VG	EGHT	FSLY
2020-06-19	243.479996	36.000000	19.790001	23.299999	100.470001	9.90	15.15	63.689999
2020-06-22	251.270004	37.000000	22.059999	23.510000	101.589996	10.07	15.67	73.269997
2020-06-23	252.809998	35.400002	20.790001	23.650000	100.879997	9.83	15.71	75.900002
2020-06-24	255.899994	35.000000	20.330000	22.639999	100.970001	9.50	14.93	76.070000
2020-06-25	259.510010	36.000000	20.950001	22.160000	102.889999	9.82	15.51	81.669998

[9]:
```
plt.figure(figsize=(12,8))
plt.plot(df)
```

```
plt.title(title + ' Closing Price')
plt.legend(labels=df.columns)
```

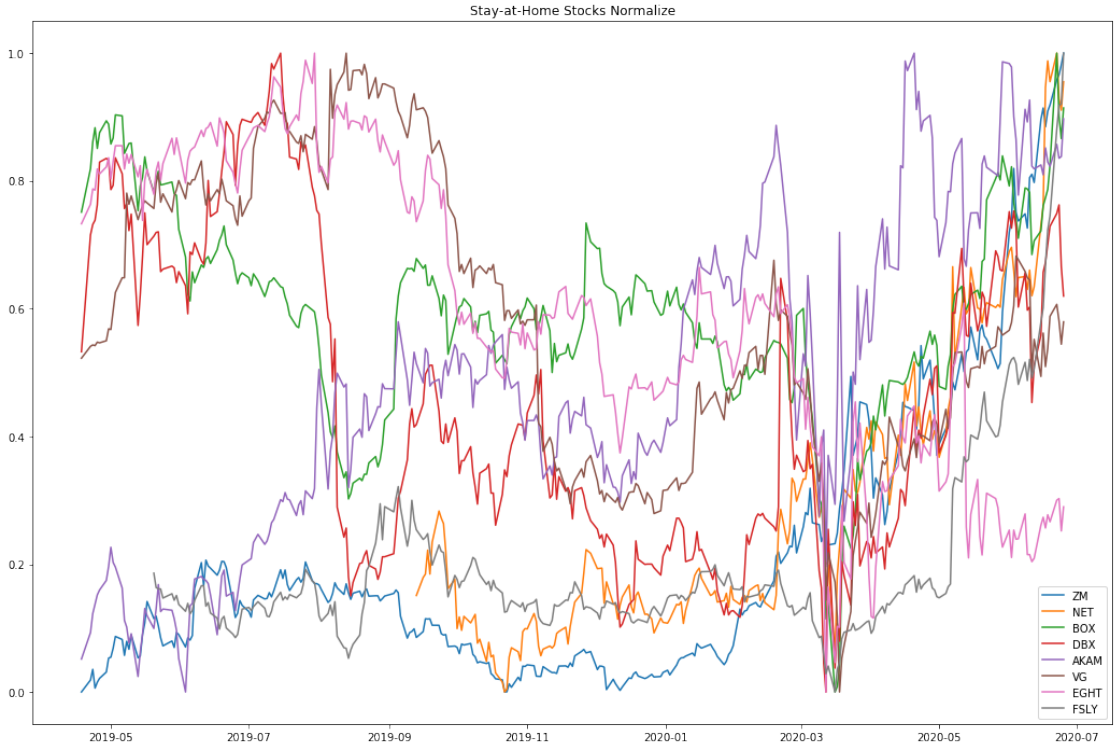
[9]: <matplotlib.legend.Legend at 0x22978bba898>



[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)
```

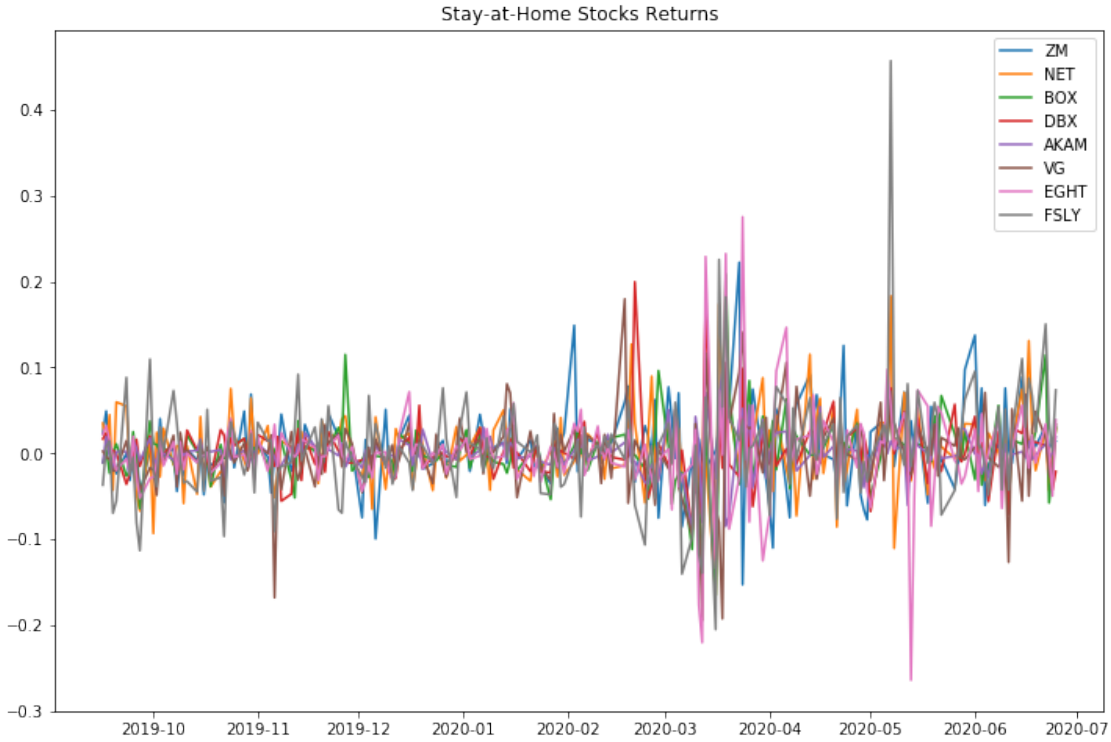
[11]: <matplotlib.legend.Legend at 0x2297f61eba8>



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

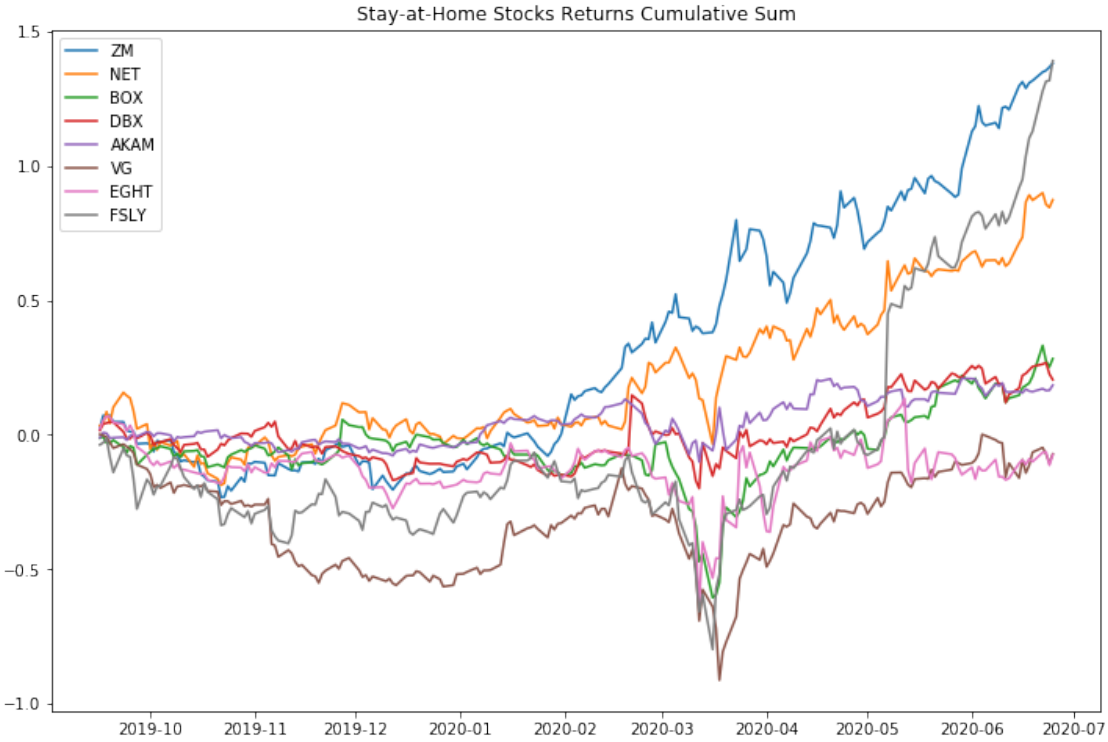
[13]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title(title + ' Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[13]: <matplotlib.legend.Legend at 0x2297f451630>

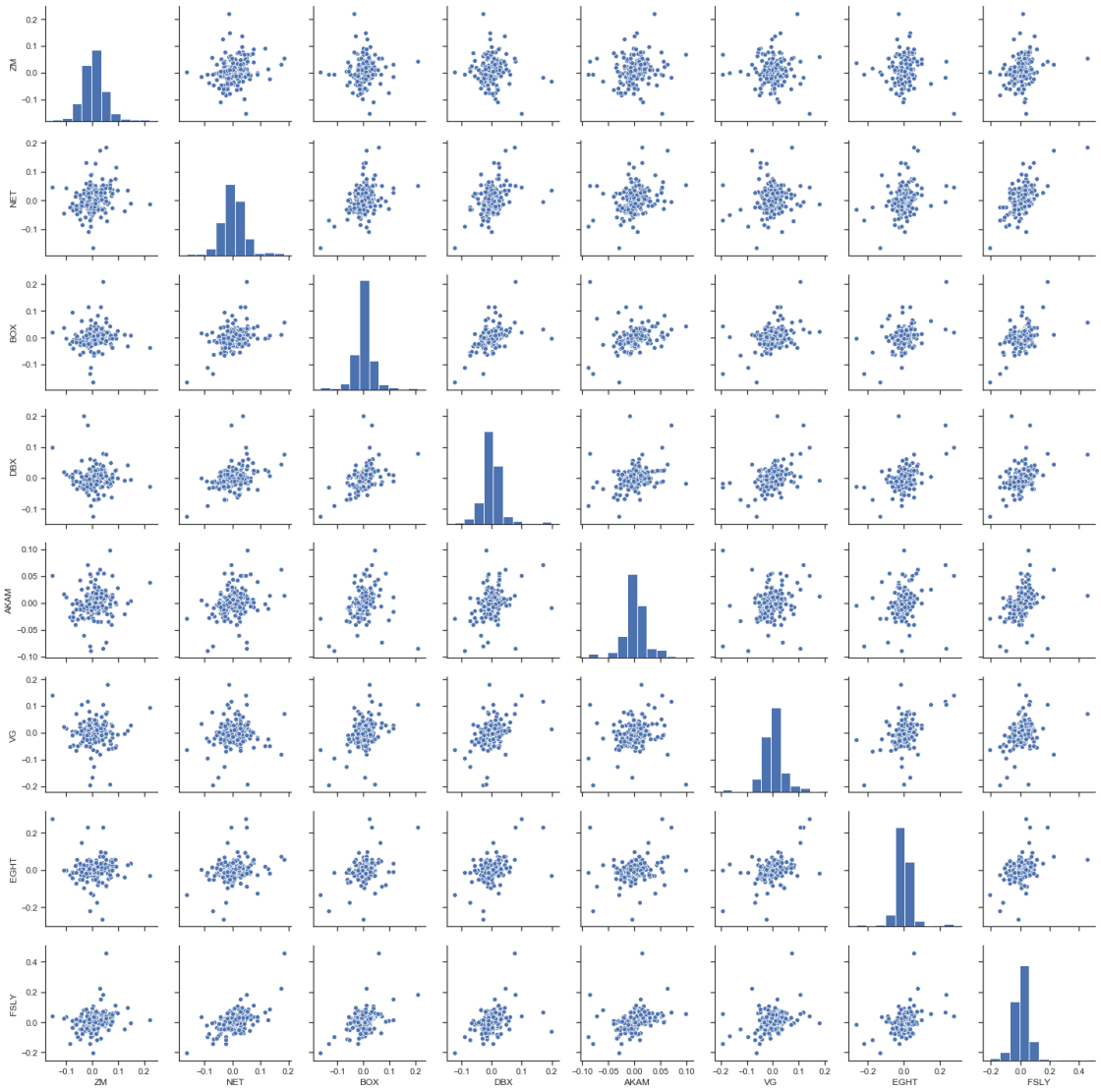


[14]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title(title + ' Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

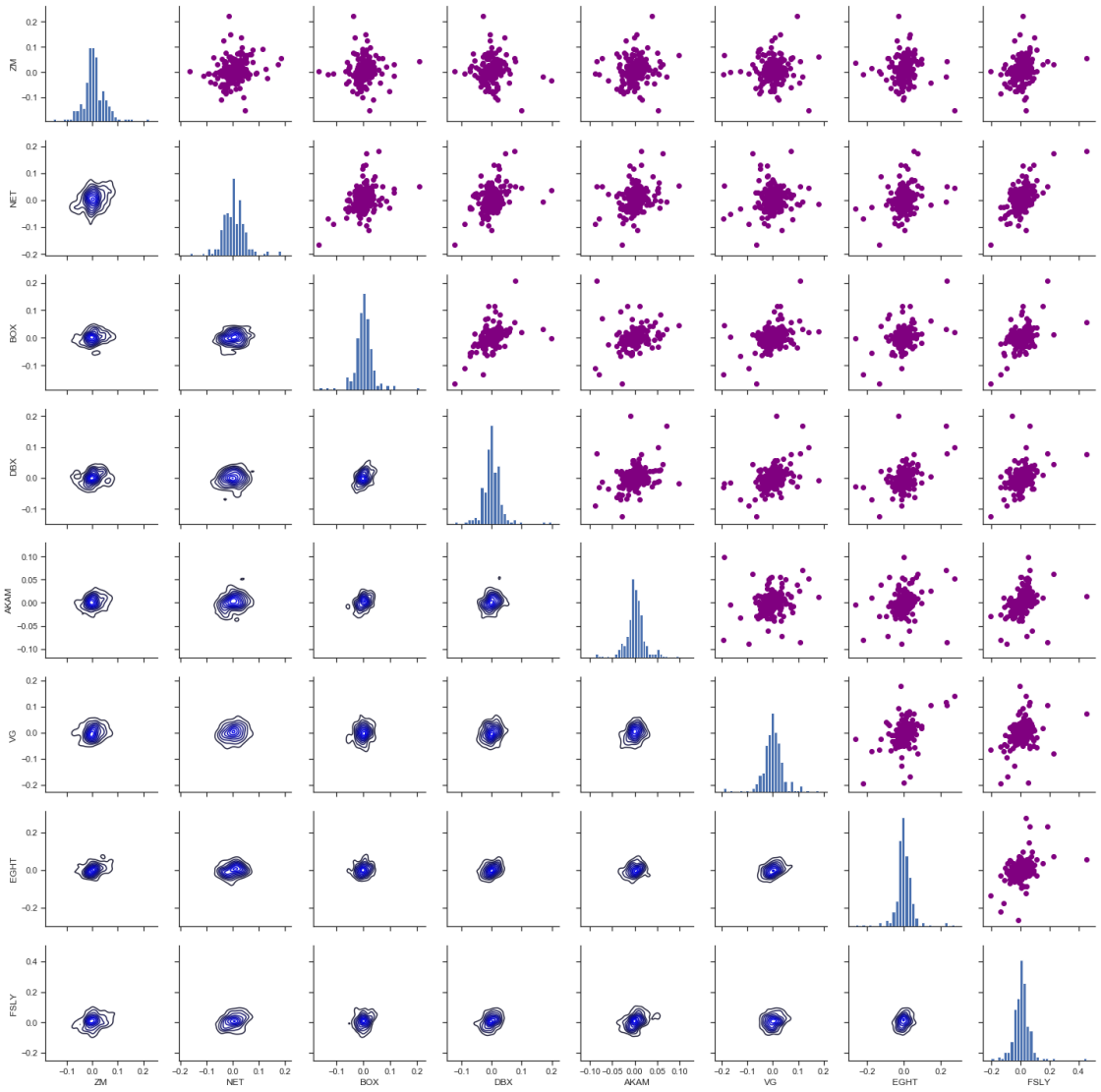
[14]: <matplotlib.legend.Legend at 0x2297f4b6b38>



[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)
```

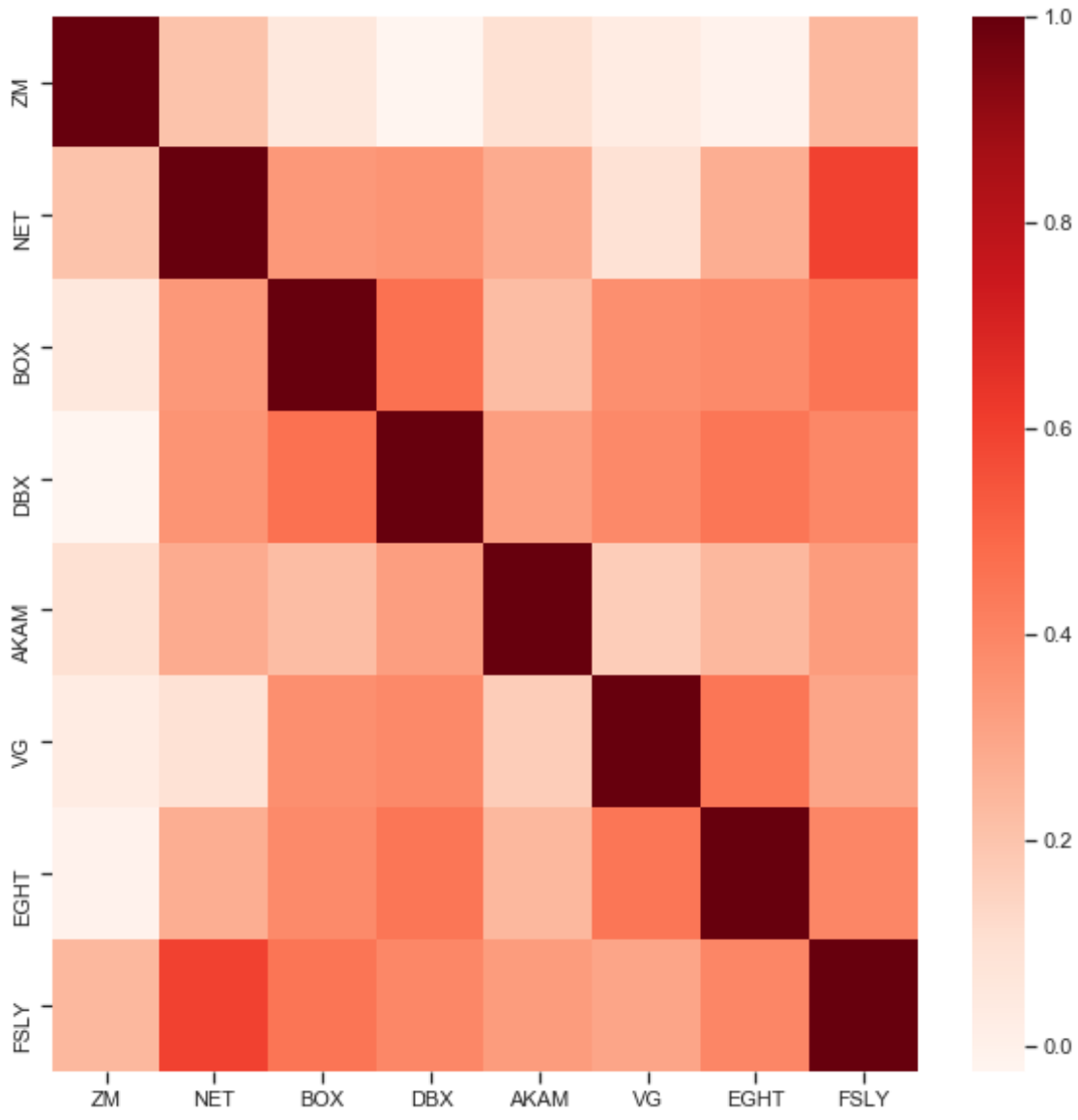


[16]:
```
ax = sns.PairGrid(stock_rets)
ax.map_upper(plt.scatter, color='purple')
ax.map_lower(sns.kdeplot, color='blue')
ax.map_diag(plt.hist, bins=30)
for i in range(nplot) :
    for j in range(nplot) :
        ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)
```



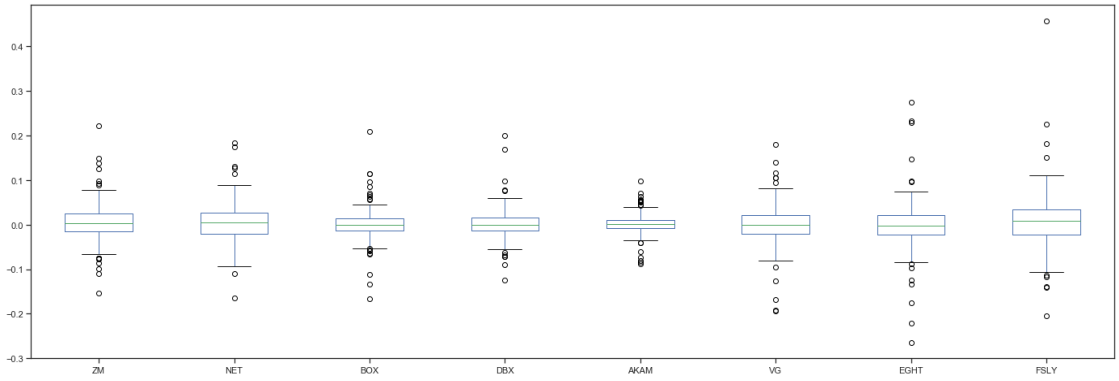
[17]:
```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

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

[17]: <matplotlib.axes._subplots.AxesSubplot at 0x22905f5b668>

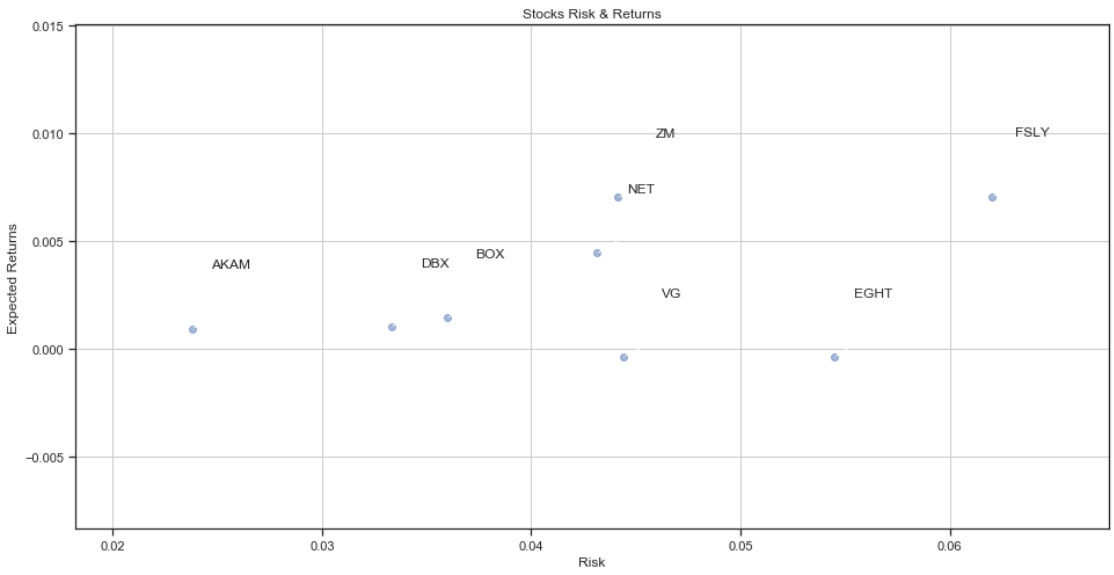


[18]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(24,8))
```

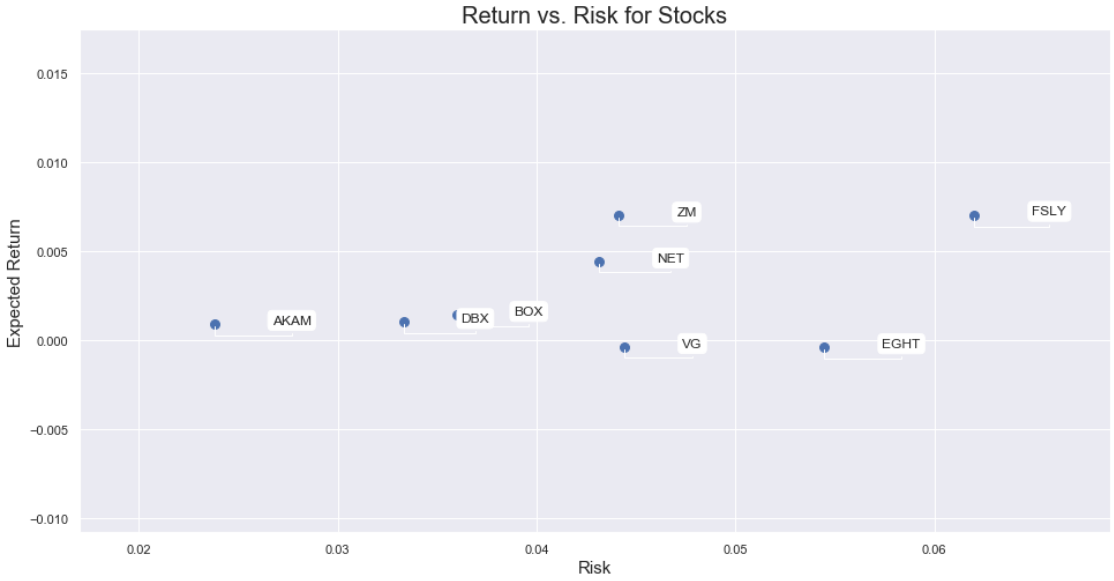
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x229060a5fd0>



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

[21]:
```
FSLY  FSLY    1.000000
EGHT  EGHT    1.000000
NET   NET     1.000000
BOX   BOX     1.000000
DBX   DBX     1.000000
```

```
AKAM  AKAM    1.000000
VG    VG      1.000000
ZM    ZM      1.000000
NET   FSLY    0.597302
FSLY  NET     0.597302
BOX   DBX     0.464662
DBX   BOX     0.464662
FSLY  BOX     0.454707
BOX   FSLY    0.454707
EGHT  VG      0.450575
VG    EGHT    0.450575
EGHT  DBX     0.447838
DBX   EGHT    0.447838
EGHT  FSLY    0.396175
FSLY  EGHT    0.396175
      DBX     0.391561
DBX   FSLY    0.391561
VG    DBX     0.390427
DBX   VG      0.390427
EGHT  BOX     0.386241
BOX   EGHT    0.386241
VG    BOX     0.368922
BOX   VG      0.368922
DBX   NET     0.352223
NET   DBX     0.352223
                …
AKAM  DBX     0.322401
DBX   AKAM    0.322401
VG    FSLY    0.299503
FSLY  VG      0.299503
AKAM  NET     0.281727
NET   AKAM    0.281727
      EGHT    0.273355
EGHT  NET     0.273355
FSLY  ZM      0.241868
ZM    FSLY    0.241868
EGHT  AKAM    0.239443
AKAM  EGHT    0.239443
BOX   AKAM    0.223804
AKAM  BOX     0.223804
NET   ZM      0.206576
ZM    NET     0.206576
VG    AKAM    0.167815
AKAM  VG      0.167815
ZM    AKAM    0.100535
AKAM  ZM      0.100535
VG    NET     0.094862
```

```
NET   VG      0.094862
BOX   ZM      0.057958
ZM    BOX     0.057958
      VG      0.031301
VG    ZM      0.031301
DBX   ZM      0.025090
ZM    DBX     0.025090
EGHT  ZM      0.007681
ZM    EGHT    0.007681
Length: 64, dtype: float64
```

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

[22]:
```
                 ZM       NET       BOX       DBX      AKAM        VG  \
Date
2019-09-16  0.468994  0.574123  0.412788  0.435089  0.415626  0.525974
2019-09-17  0.538675  0.492037  0.453225  0.455444  0.578825  0.509361
2019-09-18  0.404609  0.602292  0.380980  0.394512  0.459675  0.500988
2019-09-19  0.409652  0.350275  0.442654  0.392991  0.374653  0.465196
2019-09-20  0.344734  0.645215  0.471910  0.382660  0.484023  0.466201

                EGHT      FSLY
Date
2019-09-16  0.530976  0.254073
2019-09-17  0.548714  0.322171
2019-09-18  0.518605  0.331714
2019-09-19  0.482580  0.204650
2019-09-20  0.453054  0.225741
```

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

[23]:
```
            ZM       NET       BOX       DBX      AKAM        VG      EGHT  \
ZM    1.000000  0.206576  0.057958 -0.025090  0.100535  0.031301 -0.007681
NET   0.206576  1.000000  0.341690  0.352223  0.281727  0.094862  0.273355
BOX   0.057958  0.341690  1.000000  0.464662  0.223804  0.368922  0.386241
DBX  -0.025090  0.352223  0.464662  1.000000  0.322401  0.390427  0.447838
AKAM  0.100535  0.281727  0.223804  0.322401  1.000000  0.167815  0.239443
VG    0.031301  0.094862  0.368922  0.390427  0.167815  1.000000  0.450575
EGHT -0.007681  0.273355  0.386241  0.447838  0.239443  0.450575  1.000000
FSLY  0.241868  0.597302  0.454707  0.391561  0.331017  0.299503  0.396175

          FSLY
ZM    0.241868
NET   0.597302
BOX   0.454707
```

```
DBX   0.391561
AKAM  0.331017
VG    0.299503
EGHT  0.396175
FSLY  1.000000
```

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

[24]:
```
FSLY  FSLY    1.000000
EGHT  EGHT    1.000000
NET   NET     1.000000
BOX   BOX     1.000000
DBX   DBX     1.000000
AKAM  AKAM    1.000000
VG    VG      1.000000
ZM    ZM      1.000000
NET   FSLY    0.597302
FSLY  NET     0.597302
BOX   DBX     0.464662
DBX   BOX     0.464662
FSLY  BOX     0.454707
BOX   FSLY    0.454707
EGHT  VG      0.450575
VG    EGHT    0.450575
EGHT  DBX     0.447838
DBX   EGHT    0.447838
EGHT  FSLY    0.396175
FSLY  EGHT    0.396175
      DBX     0.391561
DBX   FSLY    0.391561
VG    DBX     0.390427
DBX   VG      0.390427
EGHT  BOX     0.386241
BOX   EGHT    0.386241
VG    BOX     0.368922
BOX   VG      0.368922
DBX   NET     0.352223
NET   DBX     0.352223
                 …
AKAM  DBX     0.322401
DBX   AKAM    0.322401
VG    FSLY    0.299503
FSLY  VG      0.299503
AKAM  NET     0.281727
NET   AKAM    0.281727
```

```
      EGHT    0.273355
EGHT  NET     0.273355
FSLY  ZM      0.241868
ZM    FSLY    0.241868
EGHT  AKAM    0.239443
AKAM  EGHT    0.239443
BOX   AKAM    0.223804
AKAM  BOX     0.223804
NET   ZM      0.206576
ZM    NET     0.206576
VG    AKAM    0.167815
AKAM  VG      0.167815
ZM    AKAM    0.100535
AKAM  ZM      0.100535
VG    NET     0.094862
NET   VG      0.094862
BOX   ZM      0.057958
ZM    BOX     0.057958
      VG      0.031301
VG    ZM      0.031301
DBX   ZM      0.025090
ZM    DBX     0.025090
EGHT  ZM      0.007681
ZM    EGHT    0.007681
Length: 64, dtype: float64
```

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

```
Stock returns:
ZM      0.007017
NET     0.004440
BOX     0.001439
DBX     0.001042
AKAM    0.000939
VG     -0.000360
EGHT   -0.000374
FSLY    0.007064
dtype: float64
--------------------------------------------------
Stock risks:
ZM      0.044142
NET     0.043151
BOX     0.035968
```

```
DBX     0.033302
AKAM    0.023795
VG      0.044427
EGHT    0.054481
FSLY    0.062025
dtype: float64
```

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

[26]:

	Returns	Risk
EGHT	-0.000374	0.054481
VG	-0.000360	0.044427
AKAM	0.000939	0.023795
DBX	0.001042	0.033302
BOX	0.001439	0.035968
NET	0.004440	0.043151
ZM	0.007017	0.044142
FSLY	0.007064	0.062025

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

[27]:

	Returns	Risk
AKAM	0.000939	0.023795
DBX	0.001042	0.033302
BOX	0.001439	0.035968
NET	0.004440	0.043151
ZM	0.007017	0.044142
VG	-0.000360	0.044427
EGHT	-0.000374	0.054481
FSLY	0.007064	0.062025

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

[28]:

	Returns	Risk	Sharpe Ratio
ZM	0.007017	0.044142	-0.067573
NET	0.004440	0.043151	-0.128854
BOX	0.001439	0.035968	-0.238014
DBX	0.001042	0.033302	-0.268983
AKAM	0.000939	0.023795	-0.380799
VG	-0.000360	0.044427	-0.233197
EGHT	-0.000374	0.054481	-0.190419
FSLY	0.007064	0.062025	-0.047334

[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	\
ZM	0.007017	0.044142	-0.067573	0.222214	-0.152795	
NET	0.004440	0.043151	-0.128854	0.183166	-0.164743	
BOX	0.001439	0.035968	-0.238014	0.208506	-0.165599	
DBX	0.001042	0.033302	-0.268983	0.199573	-0.123706	
AKAM	0.000939	0.023795	-0.380799	0.098044	-0.088281	
VG	-0.000360	0.044427	-0.233197	0.179713	-0.194483	
EGHT	-0.000374	0.054481	-0.190419	0.275236	-0.263957	
FSLY	0.007064	0.062025	-0.047334	0.456833	-0.205000	

	Median Returns	Total Return
ZM	0.003629	1.410714
NET	0.004199	2.857143
BOX	0.000000	3.049684
DBX	0.000000	-2.120139
AKAM	0.000584	1.901553
VG	0.000000	3.368418
EGHT	-0.001521	3.884795
FSLY	0.008060	7.361639

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

[33]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns	\
ZM	0.007017	0.044142	-0.067573	0.222214	-0.152795	
NET	0.004440	0.043151	-0.128854	0.183166	-0.164743	
BOX	0.001439	0.035968	-0.238014	0.208506	-0.165599	
DBX	0.001042	0.033302	-0.268983	0.199573	-0.123706	
AKAM	0.000939	0.023795	-0.380799	0.098044	-0.088281	
VG	-0.000360	0.044427	-0.233197	0.179713	-0.194483	
EGHT	-0.000374	0.054481	-0.190419	0.275236	-0.263957	
FSLY	0.007064	0.062025	-0.047334	0.456833	-0.205000	

	Median Returns	Total Return	Average Return Days
ZM	0.003629	1.410714	0.000032
NET	0.004199	2.857143	0.000065
BOX	0.000000	3.049684	0.000069

```
DBX         0.000000     -2.120139            -0.000049
AKAM        0.000584      1.901553             0.000043
VG          0.000000      3.368418             0.000076
EGHT       -0.001521      3.884795             0.000088
FSLY        0.008060      7.361639             0.000164
```

[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  \
ZM     0.007017  0.044142     -0.067573     0.222214    -0.152795
NET    0.004440  0.043151     -0.128854     0.183166    -0.164743
BOX    0.001439  0.035968     -0.238014     0.208506    -0.165599
DBX    0.001042  0.033302     -0.268983     0.199573    -0.123706
AKAM   0.000939  0.023795     -0.380799     0.098044    -0.088281
VG    -0.000360  0.044427     -0.233197     0.179713    -0.194483
EGHT  -0.000374  0.054481     -0.190419     0.275236    -0.263957
FSLY   0.007064  0.062025     -0.047334     0.456833    -0.205000

       Median Returns  Total Return  Average Return Days      CAGR
ZM           0.003629      1.410714             0.000032  1.296272
NET          0.004199      2.857143             0.000065       NaN
BOX          0.000000      3.049684             0.000069  0.063579
DBX          0.000000     -2.120139            -0.000049  0.024646
AKAM         0.000584      1.901553             0.000043  0.198364
VG           0.000000      3.368418             0.000076  0.032095
EGHT        -0.001521      3.884795             0.000088 -0.190723
FSLY         0.008060      7.361639             0.000164       NaN
```

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

[35]:
```
        Returns      Risk  Sharpe Ratio  Max Returns  Min Returns  \
DBX    0.001042  0.033302     -0.268983     0.199573    -0.123706
ZM     0.007017  0.044142     -0.067573     0.222214    -0.152795
AKAM   0.000939  0.023795     -0.380799     0.098044    -0.088281
NET    0.004440  0.043151     -0.128854     0.183166    -0.164743
BOX    0.001439  0.035968     -0.238014     0.208506    -0.165599
VG    -0.000360  0.044427     -0.233197     0.179713    -0.194483
EGHT  -0.000374  0.054481     -0.190419     0.275236    -0.263957
FSLY   0.007064  0.062025     -0.047334     0.456833    -0.205000

       Median Returns  Total Return  Average Return Days      CAGR
DBX          0.000000     -2.120139            -0.000049  0.024646
ZM           0.003629      1.410714             0.000032  1.296272
AKAM         0.000584      1.901553             0.000043  0.198364
```

NET	0.004199	2.857143	0.000065	NaN
BOX	0.000000	3.049684	0.000069	0.063579
VG	0.000000	3.368418	0.000076	0.032095
EGHT	-0.001521	3.884795	0.000088	-0.190723
FSLY	0.008060	7.361639	0.000164	NaN