Gold_Portfolio

September 29, 2021

1 Gold Portfolio Risk and Returns (Coronavirus)

[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
# Gold Stocks
symbols =␣
 ↪['AEM','AG','AGI','AU','AUG','AUY','AXU','BTG','CDE','CMCL','DRD','EGO','EXK','FNV','FSM','
start = '2019-12-01'
end = '2020-05-13'
```

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

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[4]:
```python
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]:
```python
number_of_years = delta.years
```

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

[6]: 162

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

[7]:
```
                 AEM     AG       AGI         AU    AUG       AUY   AXU  \
Date
2019-12-02  59.825211  10.91  5.628248  18.809914  1.310  3.644445  1.78
2019-12-03  61.448833  11.26  5.707799  19.843315  1.430  3.723888  1.96
2019-12-04  61.130085  11.03  5.648136  19.674393  1.450  3.733819  2.10
2019-12-05  61.179890  11.23  5.658097  19.714140  1.430  3.743749  2.02
2019-12-06  60.084190  10.47  5.369215  18.650928  1.424  3.535211  1.92

                BTG   CDE      CMCL  …   PLG    PVG        RGLD     SA  \
Date                                   …
2019-12-02  3.711770  6.60  7.852439  …  1.34  10.01  116.652649  12.68
2019-12-03  3.711770  7.22  8.236687  …  1.35  10.32  117.587624  13.37
2019-12-04  3.721748  7.29  8.177571  …  1.38  10.39  116.602921  13.20
2019-12-05  3.721748  7.24  8.246539  …  1.39  10.35  117.329018  13.29
2019-12-06  3.621969  6.79  8.098752  …  1.36  10.13  113.042068  12.69

            SAND  SILV   SVM   TMQ  USAU        WPM
Date
2019-12-02  6.72  5.72  5.08  1.77   8.4  27.750179
2019-12-03  6.92  6.11  5.25  1.79   8.2  28.158710
2019-12-04  6.80  6.11  5.25  1.81   8.3  27.939499
2019-12-05  6.88  6.17  5.36  1.92   8.3  27.959427
2019-12-06  6.66  6.04  5.13  1.96   8.2  27.172258

[5 rows x 40 columns]
```

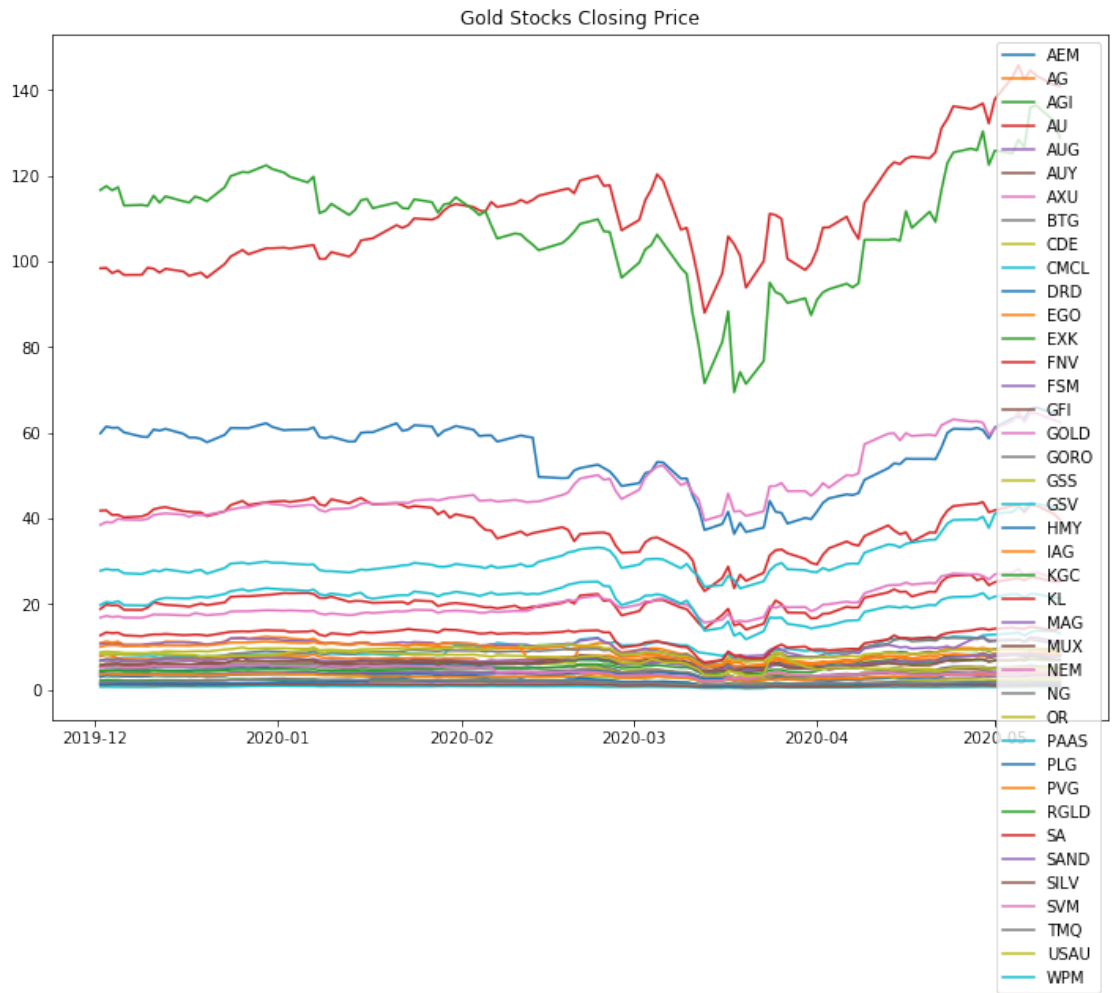
[8]:
```
df.tail()
```

[8]:
```
                 AEM    AG   AGI         AU   AUG   AUY   AXU   BTG   CDE  \
Date
2020-05-06  63.330002  7.94  8.23  25.549999  1.04  4.87  1.68  5.42  3.84
2020-05-07  65.540001  8.37  8.53  26.260000  1.08  5.07  1.79  5.67  4.06
2020-05-08  65.889999  8.28  8.27  26.170000  1.12  5.24  1.77  5.49  4.17
2020-05-11  64.550003  7.80  7.93  25.190001  1.14  5.07  1.75  5.21  4.21
2020-05-12  64.230003  7.91  7.84  25.290001  1.12  5.08  1.71  5.16  4.00

                CMCL  …   PLG   PVG        RGLD     SA  SAND  SILV   SVM  \
Date                  …
2020-05-06  12.604763  …  1.36  8.30  126.620003  14.22  8.21  7.11  3.83
2020-05-07  13.409957  …  1.39  8.64  135.970001  14.64  8.56  7.90  4.04
2020-05-08  13.737998  …  1.43  8.54  136.429993  14.50  7.99  7.65  4.17
2020-05-11  13.668414  …  1.40  8.26  132.839996  13.81  7.72  7.15  4.00
2020-05-12  13.141559  …  1.41  8.36  128.809998  14.48  7.85  7.00  3.90
```

```
              TMQ  USAU        WPM
Date
2020-05-06  1.60  5.04  42.020000
2020-05-07  1.65  5.11  43.730000
2020-05-08  1.76  5.10  43.380001
2020-05-11  1.79  5.01  42.630001
2020-05-12  1.79  4.85  42.340000

[5 rows x 40 columns]
```

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

[9]: <matplotlib.legend.Legend at 0x137ff40a160>



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

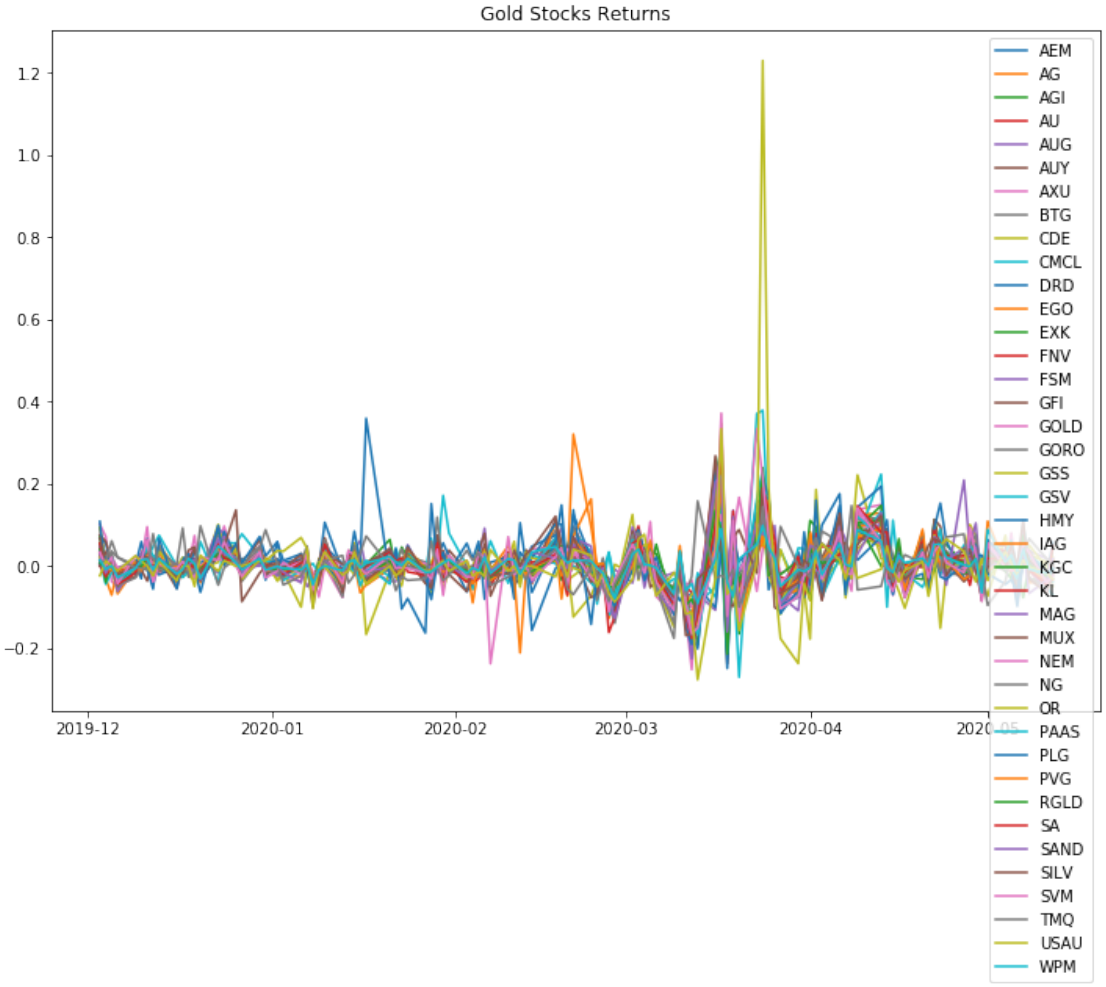
[11]:
```
plt.figure(figsize=(18,12))
plt.plot(normalize)
plt.title('Gold Stocks Normalize')
plt.legend(labels=normalize.columns)
```

[11]: <matplotlib.legend.Legend at 0x137ff49bcf8>

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

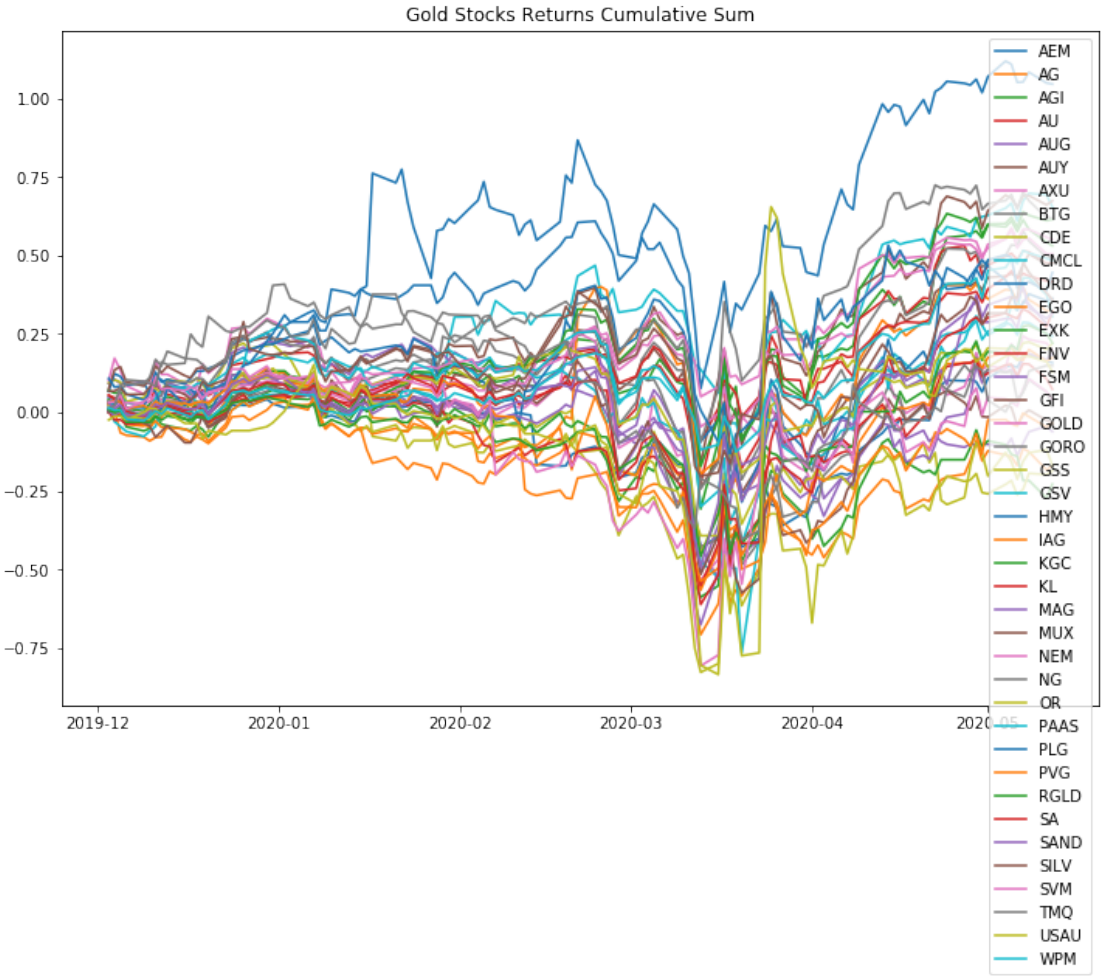
[13]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets)
plt.title('Gold Stocks Returns')
plt.legend(labels=stock_rets.columns)
```

[13]: <matplotlib.legend.Legend at 0x137ff57e4a8>

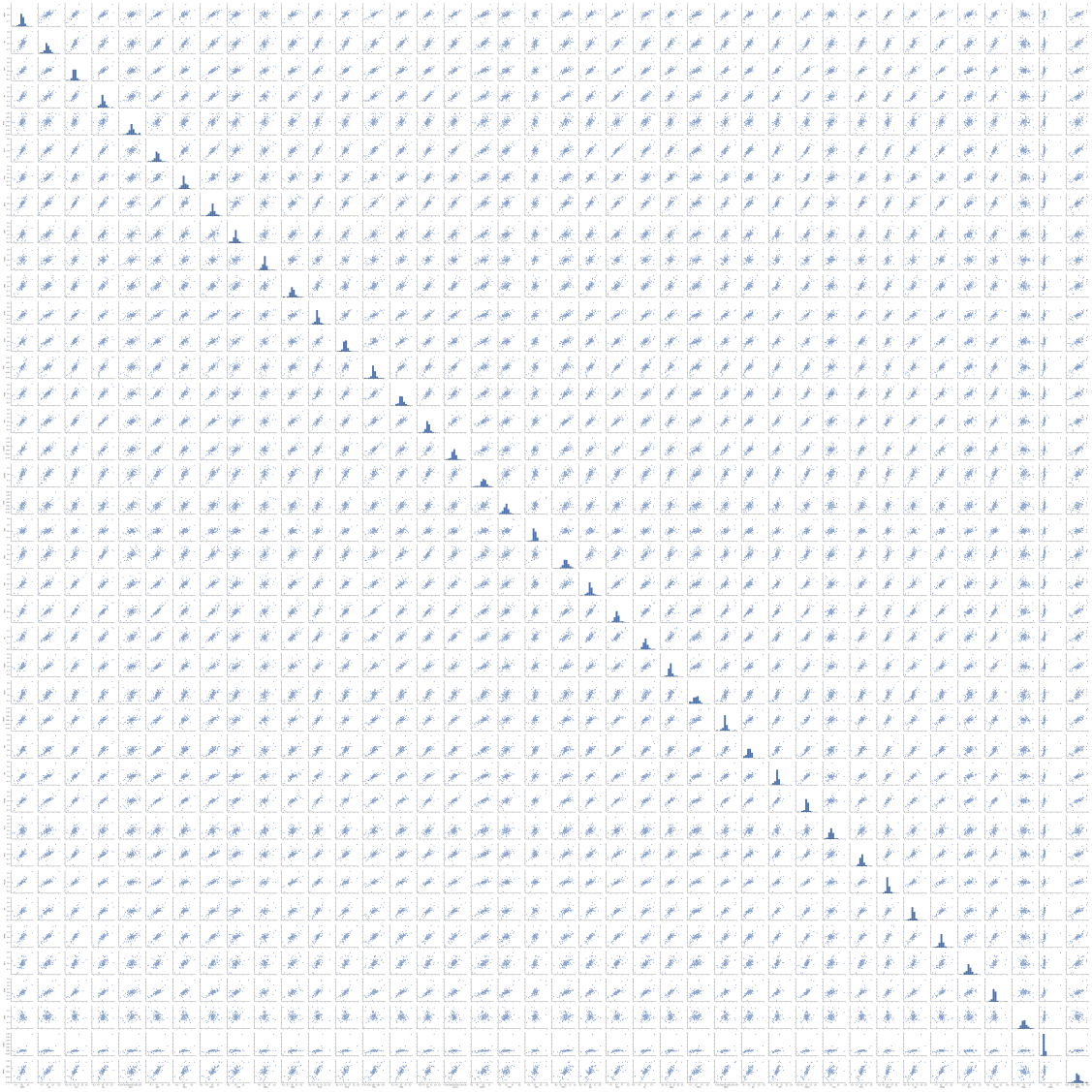


[14]:
```
plt.figure(figsize=(12,8))
plt.plot(stock_rets.cumsum())
plt.title('Gold Stocks Returns Cumulative Sum')
plt.legend(labels=stock_rets.columns)
```

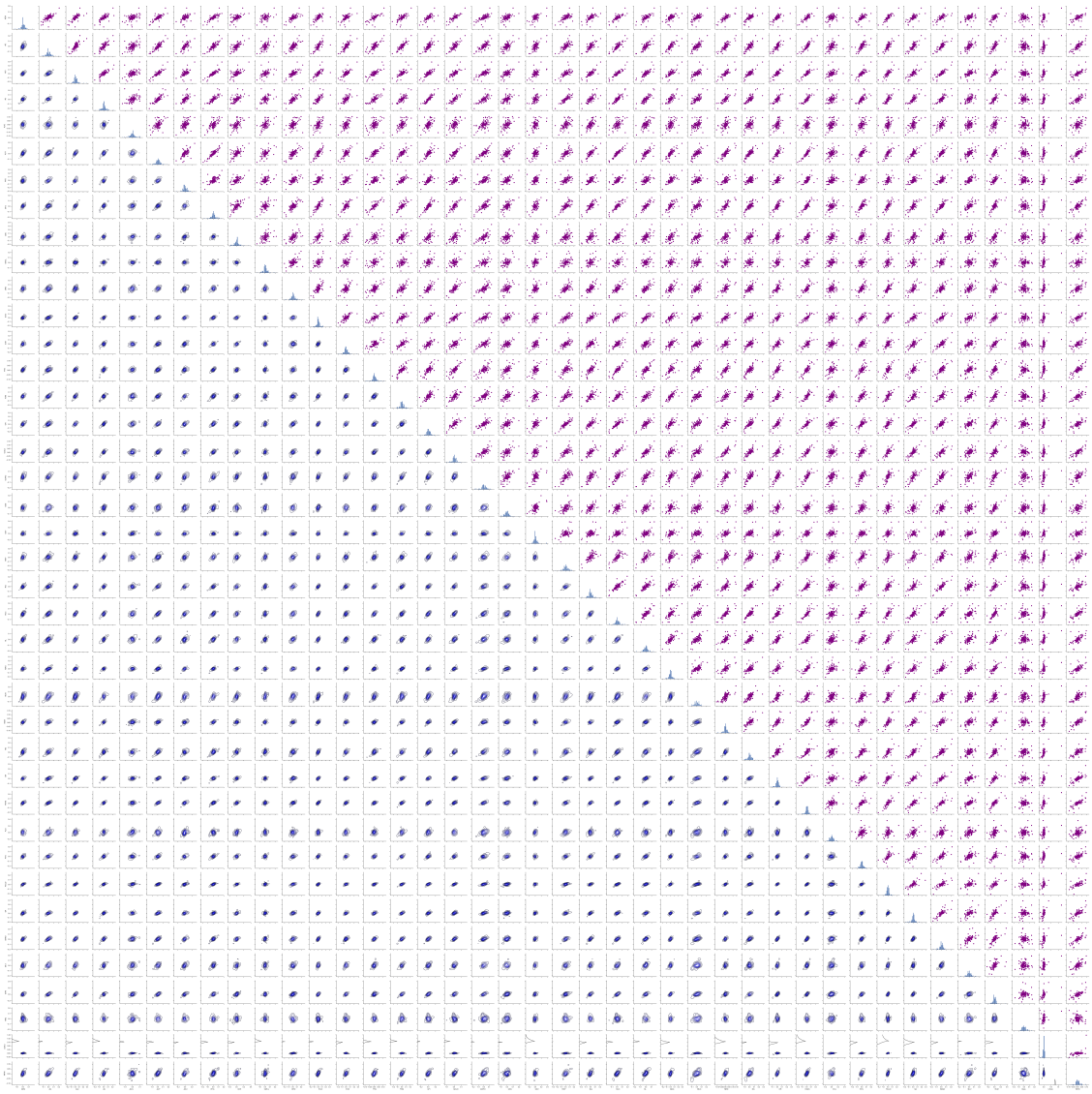
[14]: <matplotlib.legend.Legend at 0x137ff63be48>



[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)
```

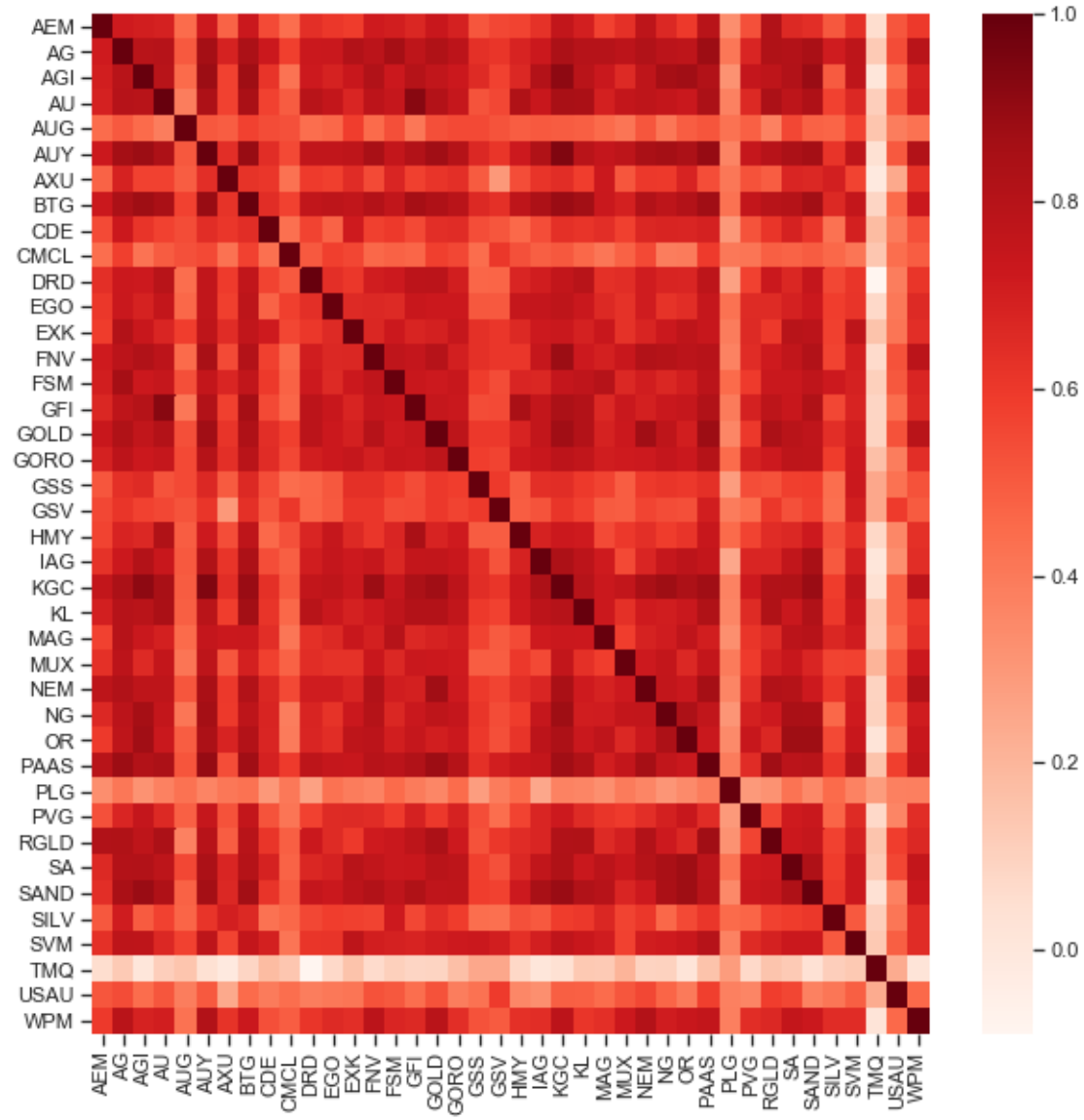


[16]:
```
ax = sns.PairGrid(stock_rets)
ax.map_upper(plt.scatter, color='purple')
ax.map_lower(sns.kdeplot, color='blue')
ax.map_diag(plt.hist, bins=30)
for i in range(nplot) :
    for j in range(nplot) :
        ax.axes[i, j].locator_params(axis='x', nbins=6, tight=True)
```



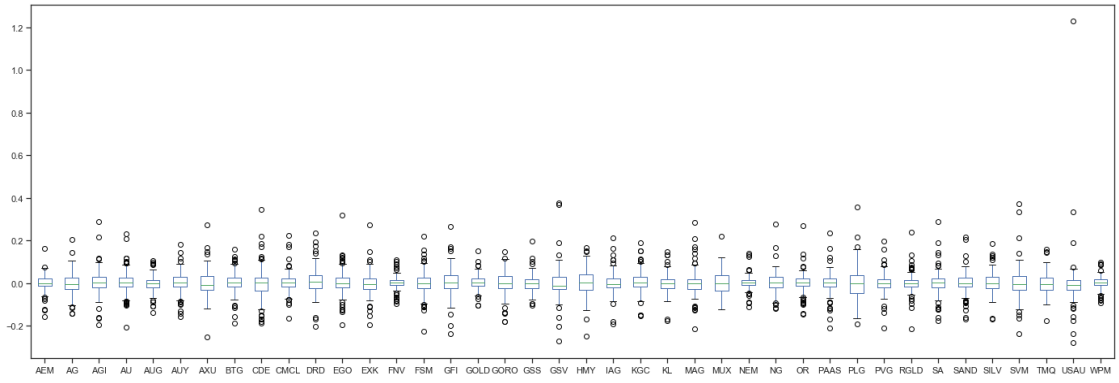
[17]:
```
plt.figure(figsize=(10,10))
corr = stock_rets.corr()

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

[17]: <matplotlib.axes._subplots.AxesSubplot at 0x137ae370ac8>

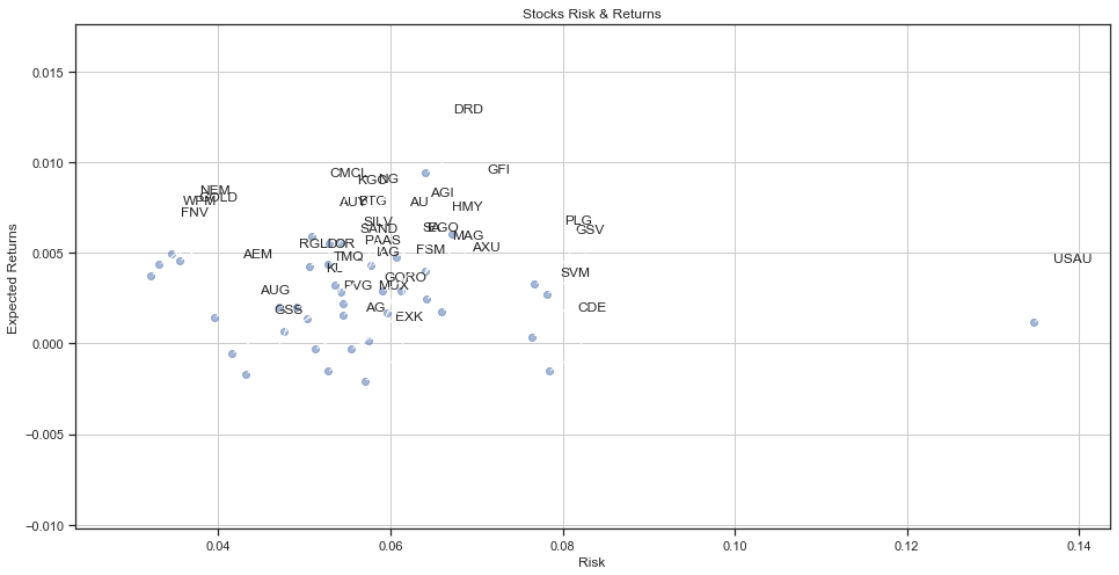


[18]:
```
# Box plot
stock_rets.plot(kind='box',figsize=(24,8))
```

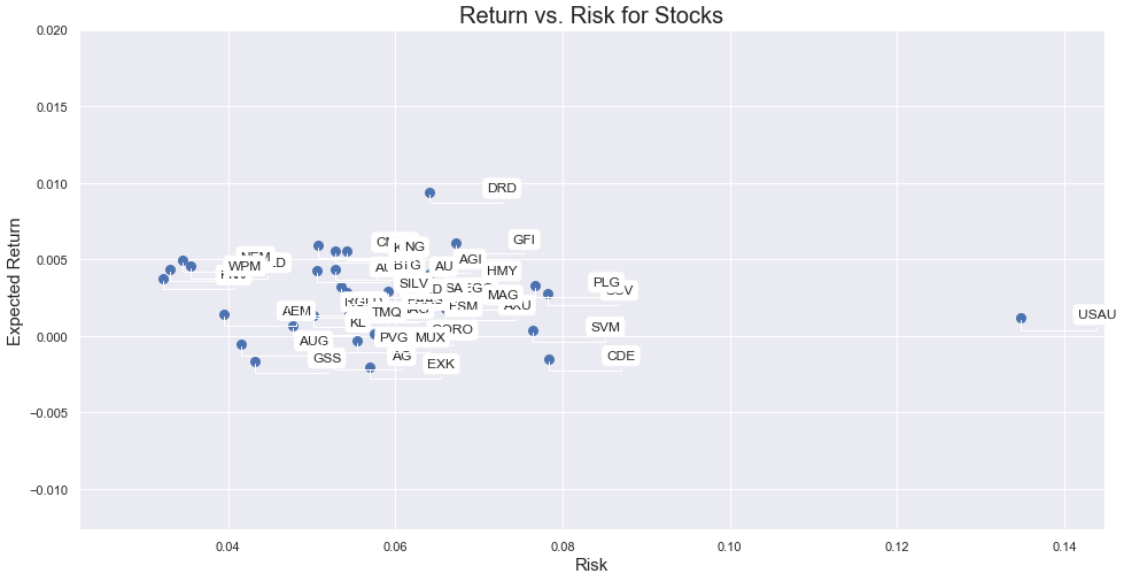
[18]: <matplotlib.axes._subplots.AxesSubplot at 0x137ba589f28>



[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]:
```
WPM   WPM     1.000000
OR    OR      1.000000
IAG   IAG     1.000000
KGC   KGC     1.000000
KL    KL      1.000000
```

MAG	MAG	1.000000
MUX	MUX	1.000000
NEM	NEM	1.000000
NG	NG	1.000000
PAAS	PAAS	1.000000
GSV	GSV	1.000000
PLG	PLG	1.000000
PVG	PVG	1.000000
RGLD	RGLD	1.000000
SA	SA	1.000000
SAND	SAND	1.000000
SILV	SILV	1.000000
SVM	SVM	1.000000
HMY	HMY	1.000000
GSS	GSS	1.000000
USAU	USAU	1.000000
CDE	CDE	1.000000
AG	AG	1.000000
AGI	AGI	1.000000
AU	AU	1.000000
AUG	AUG	1.000000
AUY	AUY	1.000000
AXU	AXU	1.000000
BTG	BTG	1.000000
CMCL	CMCL	1.000000
		…
TMQ	BTG	0.087340
BTG	TMQ	0.087340
TMQ	GFI	0.085255
GFI	TMQ	0.085255
HMY	TMQ	0.079441
TMQ	HMY	0.079441
	PVG	0.073869
PVG	TMQ	0.073869
EGO	TMQ	0.072637
TMQ	EGO	0.072637
	FNV	0.066144
FNV	TMQ	0.066144
TMQ	AEM	0.059039
AEM	TMQ	0.059039
TMQ	AUY	0.044645
AUY	TMQ	0.044645
TMQ	KGC	0.044411
KGC	TMQ	0.044411
TMQ	SAND	0.040304
SAND	TMQ	0.040304
OR	TMQ	0.023909

```
TMQ   OR      0.023909
      WPM     0.022105
WPM   TMQ     0.022105
AXU   TMQ     0.011575
TMQ   AXU     0.011575
      AGI     0.011411
AGI   TMQ     0.011411
TMQ   IAG     0.008734
IAG   TMQ     0.008734
Length: 1600, dtype: float64
```

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

[22]:

Date	AEM	AG	AGI	AU	AUG	AUY	\
2019-12-03	0.571671	0.501030	0.428014	0.595441	0.945628	0.526956	
2019-12-04	0.470938	0.349518	0.377195	0.450609	0.624919	0.470616	
2019-12-05	0.489641	0.460781	0.402445	0.474651	0.510137	0.470595	
2019-12-06	0.431295	0.213176	0.293272	0.346940	0.549793	0.298726	
2019-12-09	0.434410	0.391923	0.371957	0.466392	0.613556	0.454491	

Date	AXU	BTG	CDE	CMCL	…	PLG	PVG	\
					…			
2019-12-03	0.669396	0.538385	0.526586	0.550020	…	0.359858	0.594880	
2019-12-04	0.613100	0.546088	0.368366	0.404893	…	0.386737	0.535438	
2019-12-05	0.405463	0.538385	0.337276	0.445270	…	0.359464	0.509305	
2019-12-06	0.383833	0.461552	0.233424	0.377105	…	0.306963	0.466526	
2019-12-09	0.428315	0.546280	0.375051	0.382552	…	0.346268	0.540603	

Date	RGLD	SA	SAND	SILV	SVM	TMQ	\
2019-12-03	0.490616	0.497709	0.511746	0.667176	0.444942	0.560527	
2019-12-04	0.454441	0.352829	0.389839	0.475610	0.389981	0.560148	
2019-12-05	0.486670	0.394985	0.465168	0.503201	0.424392	0.708843	
2019-12-06	0.392278	0.282836	0.351960	0.416412	0.319507	0.589108	
2019-12-09	0.475838	0.344556	0.430834	0.480262	0.428399	0.511357	

Date	USAU	WPM
2019-12-03	0.167907	0.557826
2019-12-04	0.191822	0.438932
2019-12-05	0.183722	0.483825
2019-12-06	0.175719	0.331330
2019-12-09	0.199923	0.447125

[5 rows x 40 columns]

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

[23]:

	AEM	AG	AGI	AU	AUG	AUY	AXU	\
AEM	1.000000	0.716171	0.704508	0.691787	0.447281	0.726255	0.475904	
AG	0.716171	1.000000	0.791753	0.801603	0.504139	0.860556	0.686384	
AGI	0.704508	0.791753	1.000000	0.792343	0.452560	0.884097	0.574448	
AU	0.691787	0.801603	0.792343	1.000000	0.388629	0.830383	0.571879	
AUG	0.447281	0.504139	0.452560	0.388629	1.000000	0.509729	0.492305	
AUY	0.726255	0.860556	0.884097	0.830383	0.509729	1.000000	0.642051	
AXU	0.475904	0.686384	0.574448	0.571879	0.492305	0.642051	1.000000	
BTG	0.731054	0.835238	0.876508	0.844513	0.571070	0.890247	0.622609	
CDE	0.546997	0.724907	0.620540	0.572036	0.543673	0.646369	0.609493	
CMCL	0.440000	0.578958	0.422315	0.497586	0.529912	0.549600	0.425654	
DRD	0.638247	0.731286	0.720647	0.793615	0.440601	0.763533	0.595384	
EGO	0.608498	0.733566	0.686020	0.755511	0.462450	0.764409	0.579738	
EXK	0.589933	0.814630	0.740022	0.675852	0.586405	0.770802	0.646857	
FNV	0.714940	0.784162	0.820509	0.781988	0.454944	0.850646	0.548243	
FSM	0.703578	0.856621	0.724424	0.747326	0.533512	0.755080	0.675403	
GFI	0.669311	0.773480	0.806406	0.923740	0.412518	0.813501	0.577955	
GOLD	0.739557	0.822749	0.765809	0.810258	0.534085	0.870390	0.618280	
GORO	0.692809	0.782797	0.726417	0.745831	0.549462	0.807721	0.638217	
GSS	0.513602	0.633769	0.652766	0.520419	0.552001	0.664171	0.500986	
GSV	0.555216	0.612928	0.572814	0.553812	0.522862	0.615774	0.299868	
HMY	0.567740	0.683020	0.664781	0.824810	0.491876	0.720455	0.537887	
IAG	0.627314	0.727570	0.812365	0.738071	0.502259	0.825327	0.618069	
KGC	0.761611	0.837400	0.911490	0.850501	0.496708	0.943865	0.645598	
KL	0.701141	0.802880	0.789092	0.841998	0.488583	0.788042	0.586059	
MAG	0.571962	0.800495	0.732601	0.694199	0.451312	0.750378	0.731369	
MUX	0.632705	0.779181	0.658420	0.755333	0.420381	0.776790	0.512351	
NEM	0.775696	0.818786	0.773433	0.773589	0.511523	0.846247	0.602632	
NG	0.664483	0.786550	0.855963	0.755268	0.416079	0.861551	0.596541	
OR	0.598227	0.773634	0.869827	0.733543	0.493297	0.834563	0.681400	
PAAS	0.793424	0.878781	0.815309	0.835650	0.516562	0.896010	0.538443	
PLG	0.333989	0.410342	0.321479	0.376693	0.427806	0.368266	0.412043	
PVG	0.528840	0.675012	0.751575	0.661482	0.480939	0.746835	0.523543	
RGLD	0.818947	0.821534	0.772881	0.835494	0.377901	0.798605	0.491858	
SA	0.661417	0.812760	0.816042	0.776467	0.557340	0.837649	0.673928	
SAND	0.640156	0.846470	0.887098	0.827329	0.478749	0.860116	0.667365	
SILV	0.509744	0.710684	0.498064	0.571948	0.471873	0.619532	0.699218	
SVM	0.630430	0.776763	0.772822	0.665614	0.573457	0.776503	0.566359	
TMQ	0.059039	0.131902	0.011411	0.112267	0.146242	0.044645	-0.011575	
USAU	0.512706	0.543361	0.445851	0.510963	0.389957	0.504232	0.242945	
WPM	0.598790	0.787543	0.685765	0.705699	0.426671	0.816021	0.623129	

	BTG	CDE	CMCL	…	PLG	PVG	RGLD	\

AEM	0.731054	0.546997	0.440000	…	0.333989	0.528840	0.818947
AG	0.835238	0.724907	0.578958	…	0.410342	0.675012	0.821534
AGI	0.876508	0.620540	0.422315	…	0.321479	0.751575	0.772881
AU	0.844513	0.572036	0.497586	…	0.376693	0.661482	0.835494
AUG	0.571070	0.543673	0.529912	…	0.427806	0.480939	0.377901
AUY	0.890247	0.646369	0.549600	…	0.368266	0.746835	0.798605
AXU	0.622609	0.609493	0.425654	…	0.412043	0.523543	0.491858
BTG	1.000000	0.644435	0.573449	…	0.426625	0.756939	0.795214
CDE	0.644435	1.000000	0.437185	…	0.299316	0.520679	0.615682
CMCL	0.573449	0.437185	1.000000	…	0.407544	0.421160	0.486044
DRD	0.764820	0.569113	0.506124	…	0.269331	0.570324	0.728897
EGO	0.775172	0.473145	0.582517	…	0.426050	0.654860	0.655311
EXK	0.765607	0.718645	0.558906	…	0.393309	0.655595	0.599376
FNV	0.810536	0.576521	0.463739	…	0.373915	0.648895	0.717492
FSM	0.765160	0.598825	0.480492	…	0.452696	0.595344	0.734417
GFI	0.856051	0.551097	0.465341	…	0.396647	0.690593	0.776950
GOLD	0.827573	0.639052	0.581797	…	0.360620	0.604278	0.834743
GORO	0.791244	0.647857	0.553462	…	0.447396	0.688288	0.720796
GSS	0.661731	0.537670	0.445325	…	0.282134	0.539183	0.526046
GSV	0.631739	0.511994	0.605746	…	0.395719	0.441058	0.608464
HMY	0.773852	0.459611	0.529564	…	0.453382	0.569697	0.649294
IAG	0.832390	0.537507	0.487103	…	0.248060	0.676378	0.674594
KGC	0.885454	0.632974	0.506704	…	0.370641	0.721410	0.817601
KL	0.865551	0.621176	0.463356	…	0.362746	0.653294	0.825413
MAG	0.735069	0.639467	0.415006	…	0.331627	0.614129	0.655977
MUX	0.695784	0.575624	0.476715	…	0.397822	0.594653	0.700130
NEM	0.816490	0.668866	0.549845	…	0.365454	0.638657	0.815754
NG	0.775437	0.676808	0.387630	…	0.306546	0.695109	0.721870
OR	0.812745	0.674880	0.396004	…	0.344794	0.743209	0.671201
PAAS	0.869370	0.692184	0.592470	…	0.394784	0.646848	0.871735
PLG	0.426625	0.299316	0.407544	…	1.000000	0.297361	0.319991
PVG	0.756939	0.520679	0.421160	…	0.297361	1.000000	0.564952
RGLD	0.795214	0.615682	0.486044	…	0.319991	0.564952	1.000000
SA	0.806970	0.685951	0.473051	…	0.423920	0.717200	0.723545
SAND	0.867387	0.617200	0.496487	…	0.352560	0.732364	0.748147
SILV	0.663162	0.429700	0.461988	…	0.455028	0.470111	0.570344
SVM	0.755940	0.697452	0.418980	…	0.372465	0.651618	0.689535
TMQ	0.087340	0.181290	0.141618	…	0.287884	0.073869	0.153031
USAU	0.455042	0.396586	0.438943	…	0.379402	0.364181	0.585401
WPM	0.728408	0.532811	0.490253	…	0.383889	0.645217	0.665803

	SA	SAND	SILV	SVM	TMQ	USAU	WPM
AEM	0.661417	0.640156	0.509744	0.630430	0.059039	0.512706	0.598790
AG	0.812760	0.846470	0.710684	0.776763	0.131902	0.543361	0.787543
AGI	0.816042	0.887098	0.498064	0.772822	0.011411	0.445851	0.685765
AU	0.776467	0.827329	0.571948	0.665614	0.112267	0.510963	0.705699
AUG	0.557340	0.478749	0.471873	0.573457	0.146242	0.389957	0.426671

```
AUY   0.837649  0.860116  0.619532  0.776503  0.044645  0.504232  0.816021
AXU   0.673928  0.667365  0.699218  0.566359 -0.011575  0.242945  0.623129
BTG   0.806970  0.867387  0.663162  0.755940  0.087340  0.455042  0.728408
CDE   0.685951  0.617200  0.429700  0.697452  0.181290  0.396586  0.532811
CMCL  0.473051  0.496487  0.461988  0.418980  0.141618  0.438943  0.490253
DRD   0.672031  0.750502  0.556965  0.616802 -0.089271  0.388258  0.612824
EGO   0.689894  0.730827  0.583489  0.619751  0.072637  0.408054  0.658395
EXK   0.794217  0.786803  0.575660  0.775760  0.153267  0.417469  0.641858
FNV   0.764883  0.813606  0.566581  0.704589  0.066144  0.524603  0.786445
FSM   0.734560  0.766619  0.721989  0.692118  0.108947  0.506511  0.672481
GFI   0.738575  0.821797  0.553456  0.680976  0.085255  0.440393  0.660996
GOLD  0.788321  0.768845  0.640240  0.707939  0.093226  0.523623  0.790815
GORO  0.775176  0.774372  0.590985  0.719667  0.168669  0.391388  0.640997
GSS   0.581482  0.585813  0.441697  0.731631  0.250560  0.426606  0.526879
GSV   0.528275  0.571258  0.435291  0.702251  0.249432  0.594284  0.501335
HMY   0.664920  0.722817  0.530010  0.631430  0.079441  0.356501  0.632560
IAG   0.763422  0.848869  0.502691  0.701179  0.008734  0.327813  0.643590
KGC   0.823069  0.887149  0.588997  0.769065  0.044411  0.487644  0.779922
KL    0.735324  0.817787  0.603962  0.736522  0.132892  0.481284  0.616822
MAG   0.786680  0.799076  0.671585  0.713208  0.127837  0.449636  0.635647
MUX   0.741835  0.675618  0.569908  0.573989  0.207841  0.513034  0.727427
NEM   0.806181  0.721503  0.604616  0.708405  0.095422  0.556756  0.809567
NG    0.843842  0.840868  0.462009  0.717681  0.101921  0.470282  0.713559
OR    0.872597  0.874250  0.550910  0.736698  0.023909  0.400490  0.739686
PAAS  0.785521  0.792567  0.611917  0.802032  0.154941  0.580242  0.757556
PLG   0.423920  0.352560  0.455028  0.372465  0.287884  0.379402  0.383889
PVG   0.717200  0.732364  0.470111  0.651618  0.073869  0.364181  0.645217
RGLD  0.723545  0.748147  0.570344  0.689535  0.153031  0.585401  0.665803
SA    1.000000  0.827057  0.588066  0.728943  0.131347  0.557659  0.754304
SAND  0.827057  1.000000  0.605068  0.730795  0.040304  0.377682  0.729300
SILV  0.588066  0.605068  1.000000  0.503344  0.113847  0.415889  0.650873
SVM   0.728943  0.730795  0.503344  1.000000  0.134738  0.485607  0.648744
TMQ   0.131347  0.040304  0.113847  0.134738  1.000000  0.237951  0.022105
USAU  0.557659  0.377682  0.415889  0.485607  0.237951  1.000000  0.456016
WPM   0.754304  0.729300  0.650873  0.648744  0.022105  0.456016  1.000000

[40 rows x 40 columns]
```

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

[24]:
```
WPM   WPM     1.000000
OR    OR      1.000000
IAG   IAG     1.000000
KGC   KGC     1.000000
KL    KL      1.000000
```

MAG	MAG	1.000000
MUX	MUX	1.000000
NEM	NEM	1.000000
NG	NG	1.000000
PAAS	PAAS	1.000000
GSV	GSV	1.000000
PLG	PLG	1.000000
PVG	PVG	1.000000
RGLD	RGLD	1.000000
SA	SA	1.000000
SAND	SAND	1.000000
SILV	SILV	1.000000
SVM	SVM	1.000000
HMY	HMY	1.000000
GSS	GSS	1.000000
USAU	USAU	1.000000
CDE	CDE	1.000000
AG	AG	1.000000
AGI	AGI	1.000000
AU	AU	1.000000
AUG	AUG	1.000000
AUY	AUY	1.000000
AXU	AXU	1.000000
BTG	BTG	1.000000
CMCL	CMCL	1.000000
		…
TMQ	BTG	0.087340
BTG	TMQ	0.087340
TMQ	GFI	0.085255
GFI	TMQ	0.085255
HMY	TMQ	0.079441
TMQ	HMY	0.079441
	PVG	0.073869
PVG	TMQ	0.073869
EGO	TMQ	0.072637
TMQ	EGO	0.072637
	FNV	0.066144
FNV	TMQ	0.066144
TMQ	AEM	0.059039
AEM	TMQ	0.059039
TMQ	AUY	0.044645
AUY	TMQ	0.044645
TMQ	KGC	0.044411
KGC	TMQ	0.044411
TMQ	SAND	0.040304
SAND	TMQ	0.040304
OR	TMQ	0.023909

```
TMQ   OR      0.023909
      WPM     0.022105
WPM   TMQ     0.022105
AXU   TMQ     0.011575
TMQ   AXU     0.011575
      AGI     0.011411
AGI   TMQ     0.011411
TMQ   IAG     0.008734
IAG   TMQ     0.008734
Length: 1600, dtype: float64
```

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

```
Stock returns:
AEM     0.001426
AG     -0.001522
AGI     0.004778
AU      0.004299
AUG    -0.000550
AUY     0.004270
AXU     0.001783
BTG     0.004370
CDE    -0.001518
CMCL    0.005892
DRD     0.009417
EGO     0.002910
EXK    -0.002053
FNV     0.003750
FSM     0.001687
GFI     0.006066
GOLD    0.004556
GORO    0.000167
GSS    -0.001672
GSV     0.002743
HMY     0.004012
IAG     0.001567
KGC     0.005539
KL      0.000665
MAG     0.002446
MUX    -0.000310
NEM     0.004958
NG      0.005584
OR      0.001986
```

```
PAAS    0.002181
PLG     0.003272
PVG    -0.000308
RGLD    0.001991
SA      0.002890
SAND    0.002849
SILV    0.003237
SVM     0.000373
TMQ     0.001344
USAU    0.001165
WPM     0.004355
dtype: float64
--------------------------------------------------
Stock risks:
AEM     0.039499
AG      0.052698
AGI     0.060617
AU      0.057724
AUG     0.041567
AUY     0.050570
AXU     0.065967
BTG     0.052778
CDE     0.078391
CMCL    0.050785
DRD     0.064093
EGO     0.061169
EXK     0.056984
FNV     0.032165
FSM     0.059565
GFI     0.067190
GOLD    0.035489
GORO    0.057420
GSS     0.043186
GSV     0.078153
HMY     0.064018
IAG     0.054417
KGC     0.052840
KL      0.047669
MAG     0.064114
MUX     0.055404
NEM     0.034608
NG      0.054173
OR      0.049132
PAAS    0.054527
PLG     0.076743
PVG     0.051226
RGLD    0.047112
SA      0.059063
```

```
SAND    0.054221
SILV    0.053523
SVM     0.076470
TMQ     0.050266
USAU    0.134714
WPM     0.033102
dtype: float64
```

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

[26]:

	Returns	Risk
EXK	-0.002053	0.056984
GSS	-0.001672	0.043186
AG	-0.001522	0.052698
CDE	-0.001518	0.078391
AUG	-0.000550	0.041567
MUX	-0.000310	0.055404
PVG	-0.000308	0.051226
GORO	0.000167	0.057420
SVM	0.000373	0.076470
KL	0.000665	0.047669
USAU	0.001165	0.134714
TMQ	0.001344	0.050266
AEM	0.001426	0.039499
IAG	0.001567	0.054417
FSM	0.001687	0.059565
AXU	0.001783	0.065967
OR	0.001986	0.049132
RGLD	0.001991	0.047112
PAAS	0.002181	0.054527
MAG	0.002446	0.064114
GSV	0.002743	0.078153
SAND	0.002849	0.054221
SA	0.002890	0.059063
EGO	0.002910	0.061169
SILV	0.003237	0.053523
PLG	0.003272	0.076743
FNV	0.003750	0.032165
HMY	0.004012	0.064018
AUY	0.004270	0.050570
AU	0.004299	0.057724
WPM	0.004355	0.033102
BTG	0.004370	0.052778
GOLD	0.004556	0.035489

```
AGI   0.004778  0.060617
NEM   0.004958  0.034608
KGC   0.005539  0.052840
NG    0.005584  0.054173
CMCL  0.005892  0.050785
GFI   0.006066  0.067190
DRD   0.009417  0.064093
```

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

[27]:
```
        Returns      Risk
FNV   0.003750  0.032165
WPM   0.004355  0.033102
NEM   0.004958  0.034608
GOLD  0.004556  0.035489
AEM   0.001426  0.039499
AUG  -0.000550  0.041567
GSS  -0.001672  0.043186
RGLD  0.001991  0.047112
KL    0.000665  0.047669
OR    0.001986  0.049132
TMQ   0.001344  0.050266
AUY   0.004270  0.050570
CMCL  0.005892  0.050785
PVG  -0.000308  0.051226
AG   -0.001522  0.052698
BTG   0.004370  0.052778
KGC   0.005539  0.052840
SILV  0.003237  0.053523
NG    0.005584  0.054173
SAND  0.002849  0.054221
IAG   0.001567  0.054417
PAAS  0.002181  0.054527
MUX  -0.000310  0.055404
EXK  -0.002053  0.056984
GORO  0.000167  0.057420
AU    0.004299  0.057724
SA    0.002890  0.059063
FSM   0.001687  0.059565
AGI   0.004778  0.060617
EGO   0.002910  0.061169
HMY   0.004012  0.064018
DRD   0.009417  0.064093
MAG   0.002446  0.064114
AXU   0.001783  0.065967
GFI   0.006066  0.067190
SVM   0.000373  0.076470
```

```
PLG    0.003272  0.076743
GSV    0.002743  0.078153
CDE   -0.001518  0.078391
USAU   0.001165  0.134714
```

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

[28]:

	Returns	Risk	Sharpe Ratio
AEM	0.001426	0.039499	-0.217057
AG	-0.001522	0.052698	-0.218639
AGI	0.004778	0.060617	-0.086149
AU	0.004299	0.057724	-0.098757
AUG	-0.000550	0.041567	-0.253818
AUY	0.004270	0.050570	-0.113307
AXU	0.001783	0.065967	-0.124570
BTG	0.004370	0.052778	-0.106671
CDE	-0.001518	0.078391	-0.146934
CMCL	0.005892	0.050785	-0.080886
DRD	0.009417	0.064093	-0.009097
EGO	0.002910	0.061169	-0.115909
EXK	-0.002053	0.056984	-0.211511
FNV	0.003750	0.032165	-0.194307
FSM	0.001687	0.059565	-0.139564
GFI	0.006066	0.067190	-0.058546
GOLD	0.004556	0.035489	-0.153390
GORO	0.000167	0.057420	-0.171243
GSS	-0.001672	0.043186	-0.270279
GSV	0.002743	0.078153	-0.092857
HMY	0.004012	0.064018	-0.093535
IAG	0.001567	0.054417	-0.154973
KGC	0.005539	0.052840	-0.084430
KL	0.000665	0.047669	-0.195822
MAG	0.002446	0.064114	-0.117825
MUX	-0.000310	0.055404	-0.186097
NEM	0.004958	0.034608	-0.145691
NG	0.005584	0.054173	-0.081512
OR	0.001986	0.049132	-0.163122
PAAS	0.002181	0.054527	-0.143393
PLG	0.003272	0.076743	-0.087667
PVG	-0.000308	0.051226	-0.201224
RGLD	0.001991	0.047112	-0.170006
SA	0.002890	0.059063	-0.120377
SAND	0.002849	0.054221	-0.131878
SILV	0.003237	0.053523	-0.126360
SVM	0.000373	0.076470	-0.125894

```
TMQ   0.001344  0.050266     -0.172210
USAU  0.001165  0.134714     -0.065581
WPM   0.004355  0.033102     -0.170535
```

[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	\
AEM	0.001426	0.039499	-0.217057	0.164597	-0.156319	
AG	-0.001522	0.052698	-0.218639	0.205000	-0.141553	
AGI	0.004778	0.060617	-0.086149	0.290870	-0.192946	
AU	0.004299	0.057724	-0.098757	0.232181	-0.205929	
AUG	-0.000550	0.041567	-0.253818	0.104762	-0.137255	
AUY	0.004270	0.050570	-0.113307	0.182432	-0.157143	
AXU	0.001783	0.065967	-0.124570	0.275510	-0.251969	
BTG	0.004370	0.052778	-0.106671	0.161074	-0.187861	
CDE	-0.001518	0.078391	-0.146934	0.346008	-0.186441	
CMCL	0.005892	0.050785	-0.080886	0.222910	-0.163722	
DRD	0.009417	0.064093	-0.009097	0.234414	-0.201195	
EGO	0.002910	0.061169	-0.115909	0.320479	-0.193985	
EXK	-0.002053	0.056984	-0.211511	0.271930	-0.195804	
FNV	0.003750	0.032165	-0.194307	0.110634	-0.095818	
FSM	0.001687	0.059565	-0.139564	0.219828	-0.225564	
GFI	0.006066	0.067190	-0.058546	0.267813	-0.237589	
GOLD	0.004556	0.035489	-0.153390	0.151802	-0.103331	
GORO	0.000167	0.057420	-0.171243	0.146616	-0.180723	
GSS	-0.001672	0.043186	-0.270279	0.198157	-0.102459	
GSV	0.002743	0.078153	-0.092857	0.378378	-0.270270	
HMY	0.004012	0.064018	-0.093535	0.168067	-0.249097	
IAG	0.001567	0.054417	-0.154973	0.211268	-0.190476	
KGC	0.005539	0.052840	-0.084430	0.190000	-0.153846	
KL	0.000665	0.047669	-0.195822	0.148540	-0.175737	
MAG	0.002446	0.064114	-0.117825	0.286942	-0.212389	
MUX	-0.000310	0.055404	-0.186097	0.219472	-0.123905	
NEM	0.004958	0.034608	-0.145691	0.140182	-0.111161	
NG	0.005584	0.054173	-0.081512	0.276968	-0.117021	
OR	0.001986	0.049132	-0.163122	0.271357	-0.143855	
PAAS	0.002181	0.054527	-0.143393	0.234649	-0.210000	
PLG	0.003272	0.076743	-0.087667	0.358974	-0.190141	
PVG	-0.000308	0.051226	-0.201224	0.195804	-0.211076	

RGLD	0.001991	0.047112	-0.170006	0.238794	-0.214262
SA	0.002890	0.059063	-0.120377	0.287157	-0.176201
SAND	0.002849	0.054221	-0.131878	0.218415	-0.167969
SILV	0.003237	0.053523	-0.126360	0.186640	-0.169279
SVM	0.000373	0.076470	-0.125894	0.371429	-0.237452
TMQ	0.001344	0.050266	-0.172210	0.157895	-0.175676
USAU	0.001165	0.134714	-0.065581	1.228916	-0.276596
WPM	0.004355	0.033102	-0.170535	0.098425	-0.090875

	Median Returns	Total Return
AEM	0.000812	-0.495739
AG	-0.005413	1.410252
AGI	0.001764	-1.134927
AU	0.002628	0.396984
AUG	0.000000	-1.754384
AUY	0.004762	0.197234
AXU	-0.008130	-2.285712
BTG	0.004785	-0.959697
CDE	0.001678	-4.988124
CMCL	0.003802	-3.854547
DRD	0.006622	-0.323632
EGO	-0.001121	-0.112110
EXK	-0.005952	4.411760
FNV	0.003599	-0.233696
FSM	0.000000	1.863352
GFI	0.004862	1.270647
GOLD	0.002731	0.076866
GORO	0.000000	-4.627251
GSS	0.000000	1.214574
GSV	-0.011905	-7.042247
HMY	0.003135	5.763690
IAG	-0.003333	1.117317
KGC	0.004132	0.434779
KL	0.001385	-3.339018
MAG	-0.000918	-1.143361
MUX	0.000000	-0.949367
NEM	0.004134	-0.746626
NG	0.002328	0.000000
OR	0.002132	2.034257
PAAS	0.004337	-0.788131
PLG	0.000000	0.714285
PVG	-0.001940	1.210647
RGLD	0.001320	-3.033724
SA	0.003058	4.851550
SAND	0.001475	1.683939
SILV	0.000000	-2.097903
SVM	-0.005415	-2.499998

```
TMQ        -0.004386      0.000000
USAU       -0.008081     -3.193619
WPM         0.002732     -0.680274
```

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

[33]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns
AEM	0.001426	0.039499	-0.217057	0.164597	-0.156319
AG	-0.001522	0.052698	-0.218639	0.205000	-0.141553
AGI	0.004778	0.060617	-0.086149	0.290870	-0.192946
AU	0.004299	0.057724	-0.098757	0.232181	-0.205929
AUG	-0.000550	0.041567	-0.253818	0.104762	-0.137255
AUY	0.004270	0.050570	-0.113307	0.182432	-0.157143
AXU	0.001783	0.065967	-0.124570	0.275510	-0.251969
BTG	0.004370	0.052778	-0.106671	0.161074	-0.187861
CDE	-0.001518	0.078391	-0.146934	0.346008	-0.186441
CMCL	0.005892	0.050785	-0.080886	0.222910	-0.163722
DRD	0.009417	0.064093	-0.009097	0.234414	-0.201195
EGO	0.002910	0.061169	-0.115909	0.320479	-0.193985
EXK	-0.002053	0.056984	-0.211511	0.271930	-0.195804
FNV	0.003750	0.032165	-0.194307	0.110634	-0.095818
FSM	0.001687	0.059565	-0.139564	0.219828	-0.225564
GFI	0.006066	0.067190	-0.058546	0.267813	-0.237589
GOLD	0.004556	0.035489	-0.153390	0.151802	-0.103331
GORO	0.000167	0.057420	-0.171243	0.146616	-0.180723
GSS	-0.001672	0.043186	-0.270279	0.198157	-0.102459
GSV	0.002743	0.078153	-0.092857	0.378378	-0.270270
HMY	0.004012	0.064018	-0.093535	0.168067	-0.249097
IAG	0.001567	0.054417	-0.154973	0.211268	-0.190476
KGC	0.005539	0.052840	-0.084430	0.190000	-0.153846
KL	0.000665	0.047669	-0.195822	0.148540	-0.175737
MAG	0.002446	0.064114	-0.117825	0.286942	-0.212389
MUX	-0.000310	0.055404	-0.186097	0.219472	-0.123905
NEM	0.004958	0.034608	-0.145691	0.140182	-0.111161
NG	0.005584	0.054173	-0.081512	0.276968	-0.117021
OR	0.001986	0.049132	-0.163122	0.271357	-0.143855
PAAS	0.002181	0.054527	-0.143393	0.234649	-0.210000
PLG	0.003272	0.076743	-0.087667	0.358974	-0.190141
PVG	-0.000308	0.051226	-0.201224	0.195804	-0.211076
RGLD	0.001991	0.047112	-0.170006	0.238794	-0.214262
SA	0.002890	0.059063	-0.120377	0.287157	-0.176201
SAND	0.002849	0.054221	-0.131878	0.218415	-0.167969
SILV	0.003237	0.053523	-0.126360	0.186640	-0.169279
SVM	0.000373	0.076470	-0.125894	0.371429	-0.237452
TMQ	0.001344	0.050266	-0.172210	0.157895	-0.175676
USAU	0.001165	0.134714	-0.065581	1.228916	-0.276596

```
WPM   0.004355  0.033102     -0.170535     0.098425    -0.090875
```

	Median Returns	Total Return	Average Return Days
AEM	0.000812	-0.495739	-0.000031
AG	-0.005413	1.410252	0.000086
AGI	0.001764	-1.134927	-0.000070
AU	0.002628	0.396984	0.000024
AUG	0.000000	-1.754384	-0.000109
AUY	0.004762	0.197234	0.000012
AXU	-0.008130	-2.285712	-0.000143
BTG	0.004785	-0.959697	-0.000060
CDE	0.001678	-4.988124	-0.000316
CMCL	0.003802	-3.854547	-0.000243
DRD	0.006622	-0.323632	-0.000020
EGO	-0.001121	-0.112110	-0.000007
EXK	-0.005952	4.411760	0.000267
FNV	0.003599	-0.233696	-0.000014
FSM	0.000000	1.863352	0.000114
GFI	0.004862	1.270647	0.000078
GOLD	0.002731	0.076866	0.000005
GORO	0.000000	-4.627251	-0.000292
GSS	0.000000	1.214574	0.000075
GSV	-0.011905	-7.042247	-0.000451
HMY	0.003135	5.763690	0.000346
IAG	-0.003333	1.117317	0.000069
KGC	0.004132	0.434779	0.000027
KL	0.001385	-3.339018	-0.000210
MAG	-0.000918	-1.143361	-0.000071
MUX	0.000000	-0.949367	-0.000059
NEM	0.004134	-0.746626	-0.000046
NG	0.002328	0.000000	0.000000
OR	0.002132	2.034257	0.000124
PAAS	0.004337	-0.788131	-0.000049
PLG	0.000000	0.714285	0.000044
PVG	-0.001940	1.210647	0.000074
RGLD	0.001320	-3.033724	-0.000190
SA	0.003058	4.851550	0.000292
SAND	0.001475	1.683939	0.000103
SILV	0.000000	-2.097903	-0.000131
SVM	-0.005415	-2.499998	-0.000156
TMQ	-0.004386	0.000000	0.000000
USAU	-0.008081	-3.193619	-0.000200
WPM	0.002732	-0.680274	-0.000042

[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	Median Returns	Total Return	Average Return Days	CAGR
AEM	0.001426	0.039499	-0.217057	0.164597	-0.156319	0.000812	-0.495739	-0.000031	0.116850
AG	-0.001522	0.052698	-0.218639	0.205000	-0.141553	-0.005413	1.410252	0.000086	-0.393586
AGI	0.004778	0.060617	-0.086149	0.290870	-0.192946				
AU	0.004299	0.057724	-0.098757	0.232181	-0.205929				
AUG	-0.000550	0.041567	-0.253818	0.104762	-0.137255				
AUY	0.004270	0.050570	-0.113307	0.182432	-0.157143				
AXU	0.001783	0.065967	-0.124570	0.275510	-0.251969				
BTG	0.004370	0.052778	-0.106671	0.161074	-0.187861				
CDE	-0.001518	0.078391	-0.146934	0.346008	-0.186441				
CMCL	0.005892	0.050785	-0.080886	0.222910	-0.163722				
DRD	0.009417	0.064093	-0.009097	0.234414	-0.201195				
EGO	0.002910	0.061169	-0.115909	0.320479	-0.193985				
EXK	-0.002053	0.056984	-0.211511	0.271930	-0.195804				
FNV	0.003750	0.032165	-0.194307	0.110634	-0.095818				
FSM	0.001687	0.059565	-0.139564	0.219828	-0.225564				
GFI	0.006066	0.067190	-0.058546	0.267813	-0.237589				
GOLD	0.004556	0.035489	-0.153390	0.151802	-0.103331				
GORO	0.000167	0.057420	-0.171243	0.146616	-0.180723				
GSS	-0.001672	0.043186	-0.270279	0.198157	-0.102459				
GSV	0.002743	0.078153	-0.092857	0.378378	-0.270270				
HMY	0.004012	0.064018	-0.093535	0.168067	-0.249097				
IAG	0.001567	0.054417	-0.154973	0.211268	-0.190476				
KGC	0.005539	0.052840	-0.084430	0.190000	-0.153846				
KL	0.000665	0.047669	-0.195822	0.148540	-0.175737				
MAG	0.002446	0.064114	-0.117825	0.286942	-0.212389				
MUX	-0.000310	0.055404	-0.186097	0.219472	-0.123905				
NEM	0.004958	0.034608	-0.145691	0.140182	-0.111161				
NG	0.005584	0.054173	-0.081512	0.276968	-0.117021				
OR	0.001986	0.049132	-0.163122	0.271357	-0.143855				
PAAS	0.002181	0.054527	-0.143393	0.234649	-0.210000				
PLG	0.003272	0.076743	-0.087667	0.358974	-0.190141				
PVG	-0.000308	0.051226	-0.201224	0.195804	-0.211076				
RGLD	0.001991	0.047112	-0.170006	0.238794	-0.214262				
SA	0.002890	0.059063	-0.120377	0.287157	-0.176201				
SAND	0.002849	0.054221	-0.131878	0.218415	-0.167969				
SILV	0.003237	0.053523	-0.126360	0.186640	-0.169279				
SVM	0.000373	0.076470	-0.125894	0.371429	-0.237452				
TMQ	0.001344	0.050266	-0.172210	0.157895	-0.175676				
USAU	0.001165	0.134714	-0.065581	1.228916	-0.276596				
WPM	0.004355	0.033102	-0.170535	0.098425	-0.090875				

AGI	0.001764	-1.134927	-0.000070	0.674600
AU	0.002628	0.396984	0.000024	0.584840
AUG	0.000000	-1.754384	-0.000109	-0.216319
AUY	0.004762	0.197234	0.000012	0.676337
AXU	-0.008130	-2.285712	-0.000143	-0.060501
BTG	0.004785	-0.959697	-0.000060	0.669365
CDE	0.001678	-4.988124	-0.000316	-0.541128
CMCL	0.003802	-3.854547	-0.000243	1.227861
DRD	0.006622	-0.323632	-0.000020	2.574258
EGO	-0.001121	-0.112110	-0.000007	0.210574
EXK	-0.005952	4.411760	0.000267	-0.467793
FNV	0.003599	-0.233696	-0.000014	0.748085
FSM	0.000000	1.863352	0.000114	-0.014063
GFI	0.004862	1.270647	0.000078	0.930777
GOLD	0.002731	0.076866	0.000005	0.971097
GORO	0.000000	-4.627251	-0.000292	-0.230688
GSS	0.000000	1.214574	0.000075	-0.359784
GSV	-0.011905	-7.042247	-0.000451	-0.023121
HMY	0.003135	5.763690	0.000346	0.397169
IAG	-0.003333	1.117317	0.000069	0.017434
KGC	0.004132	0.434779	0.000027	1.048815
KL	0.001385	-3.339018	-0.000210	-0.078083
MAG	-0.000918	-1.143361	-0.000071	0.084323
MUX	0.000000	-0.949367	-0.000059	-0.270440
NEM	0.004134	-0.746626	-0.000046	1.124296
NG	0.002328	0.000000	0.000000	1.054380
OR	0.002132	2.034257	0.000124	0.151788
PAAS	0.004337	-0.788131	-0.000049	0.126419
PLG	0.000000	0.714285	0.000044	0.082430
PVG	-0.001940	1.210647	0.000074	-0.244365
RGLD	0.001320	-3.033724	-0.000190	0.166741
SA	0.003058	4.851550	0.000292	0.229353
SAND	0.001475	1.683939	0.000103	0.273505
SILV	0.000000	-2.097903	-0.000131	0.369069
SVM	-0.005415	-2.499998	-0.000156	-0.337137
TMQ	-0.004386	0.000000	0.000000	0.017632
USAU	-0.008081	-3.193619	-0.000200	-0.574459
WPM	0.002732	-0.680274	-0.000042	0.929395

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

[35]:

	Returns	Risk	Sharpe Ratio	Max Returns	Min Returns	\
GSV	0.002743	0.078153	-0.092857	0.378378	-0.270270	
CDE	-0.001518	0.078391	-0.146934	0.346008	-0.186441	
GORO	0.000167	0.057420	-0.171243	0.146616	-0.180723	
CMCL	0.005892	0.050785	-0.080886	0.222910	-0.163722	
KL	0.000665	0.047669	-0.195822	0.148540	-0.175737	

USAU	0.001165	0.134714	-0.065581	1.228916	-0.276596
RGLD	0.001991	0.047112	-0.170006	0.238794	-0.214262
SVM	0.000373	0.076470	-0.125894	0.371429	-0.237452
AXU	0.001783	0.065967	-0.124570	0.275510	-0.251969
SILV	0.003237	0.053523	-0.126360	0.186640	-0.169279
AUG	-0.000550	0.041567	-0.253818	0.104762	-0.137255
MAG	0.002446	0.064114	-0.117825	0.286942	-0.212389
AGI	0.004778	0.060617	-0.086149	0.290870	-0.192946
BTG	0.004370	0.052778	-0.106671	0.161074	-0.187861
MUX	-0.000310	0.055404	-0.186097	0.219472	-0.123905
PAAS	0.002181	0.054527	-0.143393	0.234649	-0.210000
NEM	0.004958	0.034608	-0.145691	0.140182	-0.111161
WPM	0.004355	0.033102	-0.170535	0.098425	-0.090875
AEM	0.001426	0.039499	-0.217057	0.164597	-0.156319
DRD	0.009417	0.064093	-0.009097	0.234414	-0.201195
FNV	0.003750	0.032165	-0.194307	0.110634	-0.095818
EGO	0.002910	0.061169	-0.115909	0.320479	-0.193985
TMQ	0.001344	0.050266	-0.172210	0.157895	-0.175676
NG	0.005584	0.054173	-0.081512	0.276968	-0.117021
GOLD	0.004556	0.035489	-0.153390	0.151802	-0.103331
AUY	0.004270	0.050570	-0.113307	0.182432	-0.157143
AU	0.004299	0.057724	-0.098757	0.232181	-0.205929
KGC	0.005539	0.052840	-0.084430	0.190000	-0.153846
PLG	0.003272	0.076743	-0.087667	0.358974	-0.190141
IAG	0.001567	0.054417	-0.154973	0.211268	-0.190476
PVG	-0.000308	0.051226	-0.201224	0.195804	-0.211076
GSS	-0.001672	0.043186	-0.270279	0.198157	-0.102459
GFI	0.006066	0.067190	-0.058546	0.267813	-0.237589
AG	-0.001522	0.052698	-0.218639	0.205000	-0.141553
SAND	0.002849	0.054221	-0.131878	0.218415	-0.167969
FSM	0.001687	0.059565	-0.139564	0.219828	-0.225564
OR	0.001986	0.049132	-0.163122	0.271357	-0.143855
EXK	-0.002053	0.056984	-0.211511	0.271930	-0.195804
SA	0.002890	0.059063	-0.120377	0.287157	-0.176201
HMY	0.004012	0.064018	-0.093535	0.168067	-0.249097

	Median Returns	Total Return	Average Return Days	CAGR
GSV	-0.011905	-7.042247	-0.000451	-0.023121
CDE	0.001678	-4.988124	-0.000316	-0.541128
GORO	0.000000	-4.627251	-0.000292	-0.230688
CMCL	0.003802	-3.854547	-0.000243	1.227861
KL	0.001385	-3.339018	-0.000210	-0.078083
USAU	-0.008081	-3.193619	-0.000200	-0.574459
RGLD	0.001320	-3.033724	-0.000190	0.166741
SVM	-0.005415	-2.499998	-0.000156	-0.337137
AXU	-0.008130	-2.285712	-0.000143	-0.060501
SILV	0.000000	-2.097903	-0.000131	0.369069

AUG	0.000000	-1.754384	-0.000109	-0.216319
MAG	-0.000918	-1.143361	-0.000071	0.084323
AGI	0.001764	-1.134927	-0.000070	0.674600
BTG	0.004785	-0.959697	-0.000060	0.669365
MUX	0.000000	-0.949367	-0.000059	-0.270440
PAAS	0.004337	-0.788131	-0.000049	0.126419
NEM	0.004134	-0.746626	-0.000046	1.124296
WPM	0.002732	-0.680274	-0.000042	0.929395
AEM	0.000812	-0.495739	-0.000031	0.116850
DRD	0.006622	-0.323632	-0.000020	2.574258
FNV	0.003599	-0.233696	-0.000014	0.748085
EGO	-0.001121	-0.112110	-0.000007	0.210574
TMQ	-0.004386	0.000000	0.000000	0.017632
NG	0.002328	0.000000	0.000000	1.054380
GOLD	0.002731	0.076866	0.000005	0.971097
AUY	0.004762	0.197234	0.000012	0.676337
AU	0.002628	0.396984	0.000024	0.584840
KGC	0.004132	0.434779	0.000027	1.048815
PLG	0.000000	0.714285	0.000044	0.082430
IAG	-0.003333	1.117317	0.000069	0.017434
PVG	-0.001940	1.210647	0.000074	-0.244365
GSS	0.000000	1.214574	0.000075	-0.359784
GFI	0.004862	1.270647	0.000078	0.930777
AG	-0.005413	1.410252	0.000086	-0.393586
SAND	0.001475	1.683939	0.000103	0.273505
FSM	0.000000	1.863352	0.000114	-0.014063
OR	0.002132	2.034257	0.000124	0.151788
EXK	-0.005952	4.411760	0.000267	-0.467793
SA	0.003058	4.851550	0.000292	0.229353
HMY	0.003135	5.763690	0.000346	0.397169