Stock_RiskAndReturn

September 29, 2021

1 Stock Investment Portfolio

1.1 Risk and Return

https://www.investopedia.com/terms/r/riskreturntradeoff.asp

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")

# fix_yahoo_finance is used to fetch data
import fix_yahoo_finance as yf
yf.pdr_override()
```

[2]:
```
# input
symbols = ['AAPL', 'MSFT', 'AMD', 'INTC', 'NVDA']
start = '2016-01-01'
end = '2019-01-01'
```

[3]:
```
df = pd.DataFrame()
data = []
for symbol in symbols:
    df = pd.merge(df, pd.DataFrame(yf.download(symbol, fields='price',
                           start=start, end=end)['Adj Close']),
                           right_index=True, left_index=True, how='outer')

    # Appends tickers which have data
    data.append(symbol)
```

```
[**********************100%**********************]  1 of 1 downloaded
[**********************100%**********************]  1 of 1 downloaded
[**********************100%**********************]  1 of 1 downloaded
[**********************100%**********************]  1 of 1 downloaded
[**********************100%**********************]  1 of 1 downloaded
```

[4]:
```
df.columns = data
df = df.dropna(axis='columns')
df.head()
```

[4]:

Date	AAPL	MSFT	AMD	INTC	NVDA
2016-01-04	99.117409	50.877312	2.77	30.827848	31.779432
2016-01-05	96.633583	51.109421	2.75	30.682732	32.289936
2016-01-06	94.742485	50.181000	2.51	30.002504	30.954752
2016-01-07	90.743942	48.435574	2.28	28.877863	29.727560
2016-01-08	91.223770	48.584122	2.14	28.578564	29.089418

[5]:
```
df.describe()
```

[5]:

	AAPL	MSFT	AMD	INTC	NVDA
count	754.000000	754.000000	754.000000	754.000000	754.000000
mean	143.945670	73.636410	11.618581	38.214060	144.361086
std	38.613411	20.694553	6.300744	7.864819	79.976451
min	85.976913	45.602867	1.800000	25.819912	24.759874
25%	106.077578	54.727212	6.852500	32.593547	65.523840
50%	147.849899	68.537289	11.585000	34.563229	146.256576
75%	170.957218	91.912092	13.820000	45.633894	220.887279
max	229.392090	114.200455	32.720001	55.684013	288.443909

1.2 Calculate Stock Returns

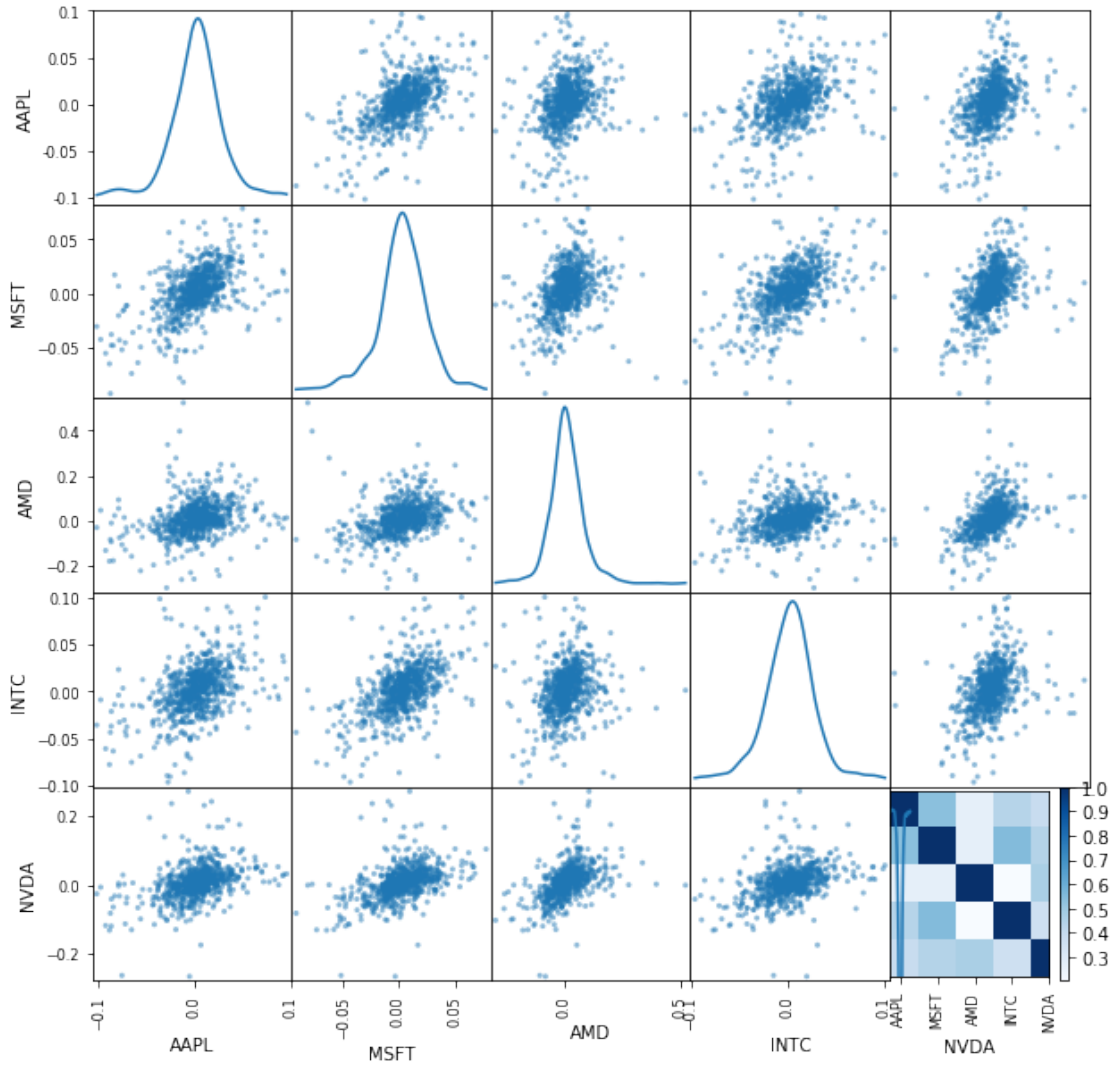
[6]:
```
from IPython.display import Latex, HTML

Latex(r"""\begin{eqnarray}r_t = \frac{AdjClose_t - AdjClose_{t-1}}{AdjClose_{t-1}} = \frac{AdjClose_t}{AdjClose_{t-1}} - 1 \end{eqnarray}""")
```

[6]:

$$r_t = \frac{AdjClose_t - AdjClose_{t-1}}{AdjClose_{t-1}} = \frac{AdjClose_t}{AdjClose_{t-1}} - 1 \tag{1}$$

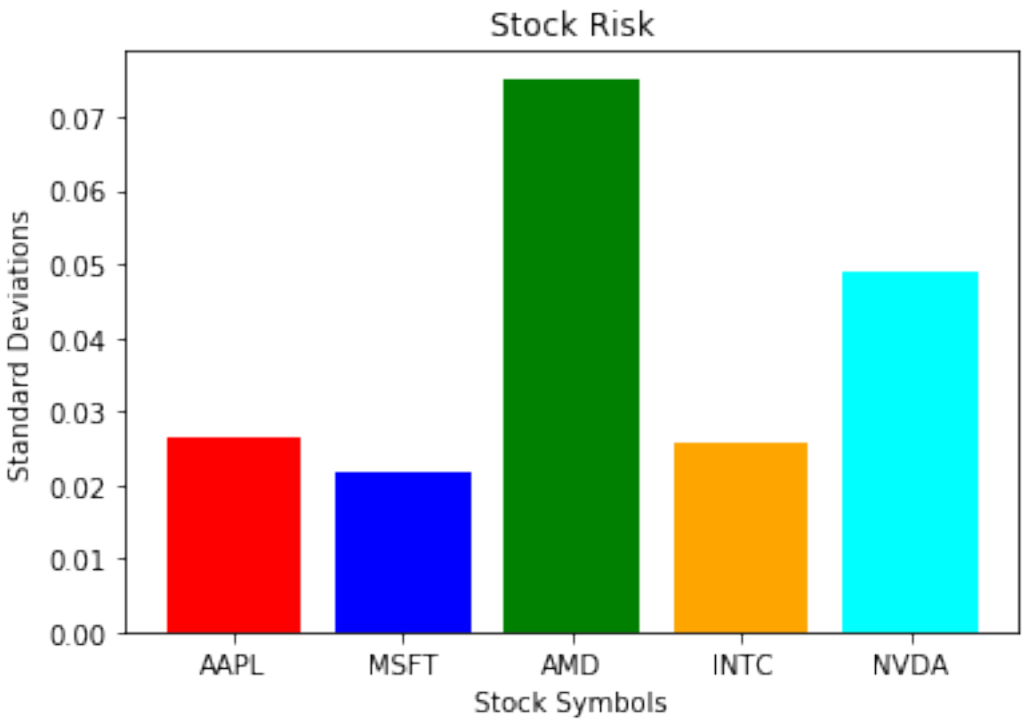
[7]:
```
from pandas.plotting import scatter_matrix

rets = df.pct_change(periods=3)
scatter_matrix(rets, diagonal='kde', figsize=(10, 10))
corr = rets.corr()
plt.imshow(corr, cmap='Blues', interpolation='none')
plt.colorbar()
plt.xticks(range(len(corr)), corr.columns)
plt.yticks(range(len(corr)), corr.columns)
```

[7]:
```
([<matplotlib.axis.YTick at 0x1901fcaf2b0>,
  <matplotlib.axis.YTick at 0x1901fcacb38>,
  <matplotlib.axis.YTick at 0x19021771eb8>,
  <matplotlib.axis.YTick at 0x19021771940>,
  <matplotlib.axis.YTick at 0x19021700320>],
 <a list of 5 Text yticklabel objects>)
```



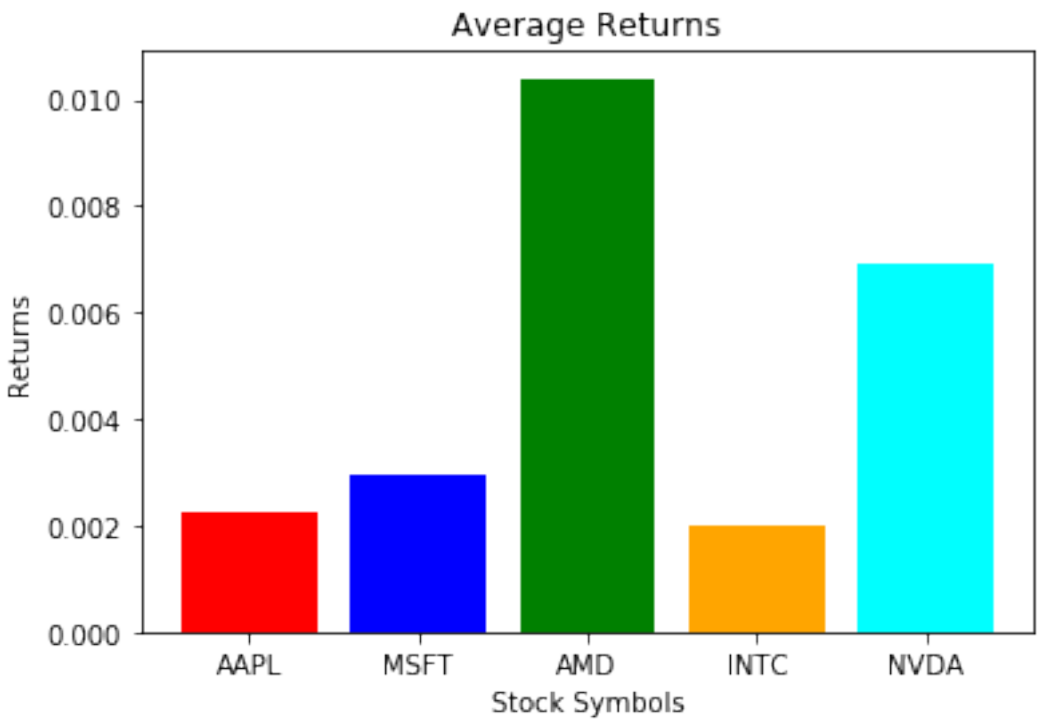
[8]:
```
plt.bar(rets.columns, rets.std(), color=['red', 'blue', 'green', 'orange',␣
 ↪'cyan'])
plt.title("Stock Risk")
plt.xlabel("Stock Symbols")
plt.ylabel("Standard Deviations")
```

[8]:
```
Text(0,0.5,'Standard Deviations')
```

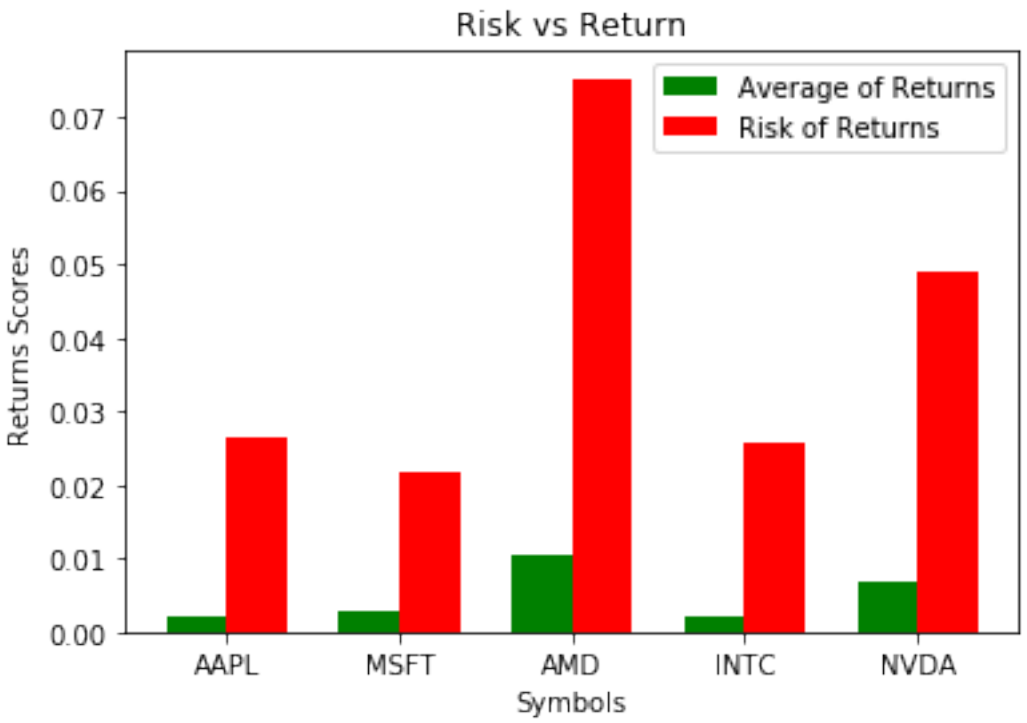


[9]:
```
plt.bar(rets.columns, rets.mean(), color=['red', 'blue', 'green', 'orange',␣
 ↪'cyan'])
plt.title("Average Returns")
plt.xlabel("Stock Symbols")
plt.ylabel("Returns")
```

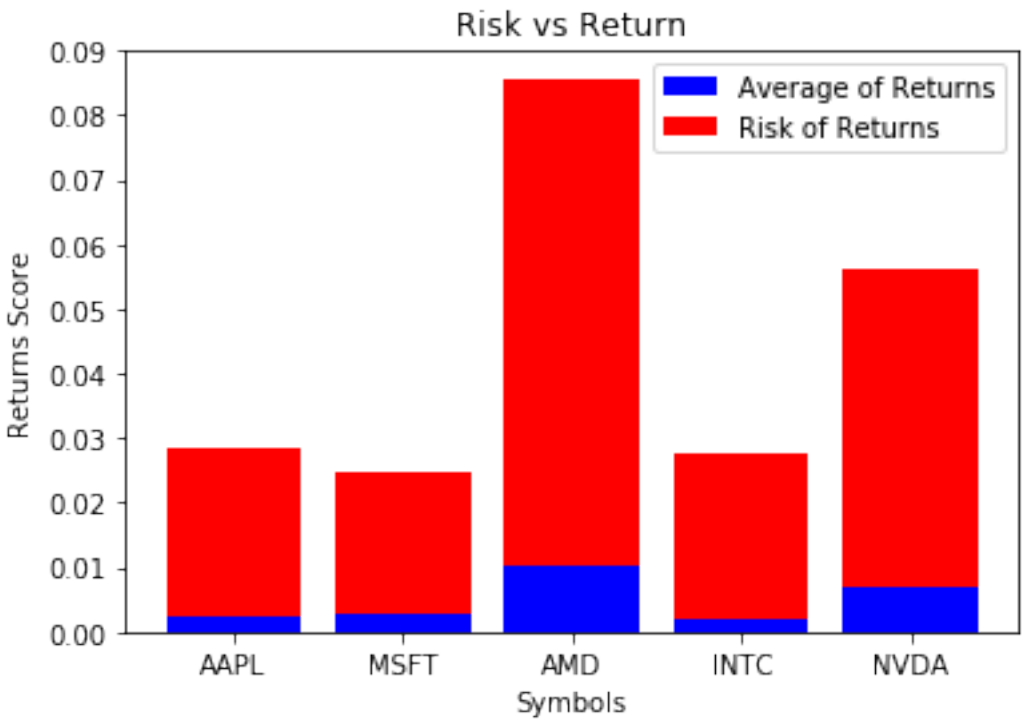
[9]:
```
Text(0,0.5,'Returns')
```



[10]:
```
ind = np.arange(5)
width = 0.35
plt.bar(ind, rets.mean(), width, color = 'g', label='Average of Returns')
plt.bar(ind + width, rets.std(), width, color = 'r', label='Risk of Returns')
plt.ylabel('Returns Scores')
plt.xlabel('Symbols')
plt.title('Risk vs Return')

plt.xticks(ind + width / 2, ('AAPL', 'MSFT', 'AMD', 'INTC', 'NVDA'))
plt.legend(loc='best')
plt.show()
```



[11]:
```
symbols = ['AAPL', 'MSFT', 'AMD', 'INTC', 'NVDA']
ind = [x for x, _ in enumerate(symbols)]

plt.bar(ind, rets.mean(), width=0.8, label='Average of Returns', color='b')
plt.bar(ind, rets.std(), width=0.8, label='Risk of Returns', color='r',␣
 ↪bottom=rets.mean())

plt.xticks(ind, symbols)
plt.ylabel("Returns Score")
plt.xlabel("Symbols")
plt.legend(loc="upper right")
plt.title('Risk vs Return')
plt.show()
```



1.3 Risk vs Expected Return

[12]:
```
plt.scatter(rets.mean(), rets.std())
plt.xlabel('Expected returns')
plt.ylabel('Risk')
for label, x, y in zip(rets.columns, rets.mean(), rets.std()):
    plt.title('Risk vs Expected Returns')
    plt.annotate(
        label,
        xy = (x, y), xytext = (20, -20),
        textcoords = 'offset points', ha = 'right', va = 'bottom',
        bbox = dict(boxstyle = 'round,pad=0.7', fc = 'yellow', alpha = 0.5),
        arrowprops = dict(arrowstyle = '->', connectionstyle = 'arc3,rad=0'))

d = {'Risk':rets.std(), 'Expected Returns':rets.mean()}
print('Table: Risk vs Expected Returns')
tables = pd.DataFrame(data=d)
tables
```

```
Table: Risk vs Expected Returns
```

[12]:

	Expected Returns	Risk
AAPL	0.002242	0.026369

```
MSFT            0.002963   0.021786
AMD             0.010391   0.075234
INTC            0.001983   0.025785
NVDA            0.006929   0.049038
```