QF 435 - Project 1

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Data

Our universe of stocks consists of the following 27 US equities:

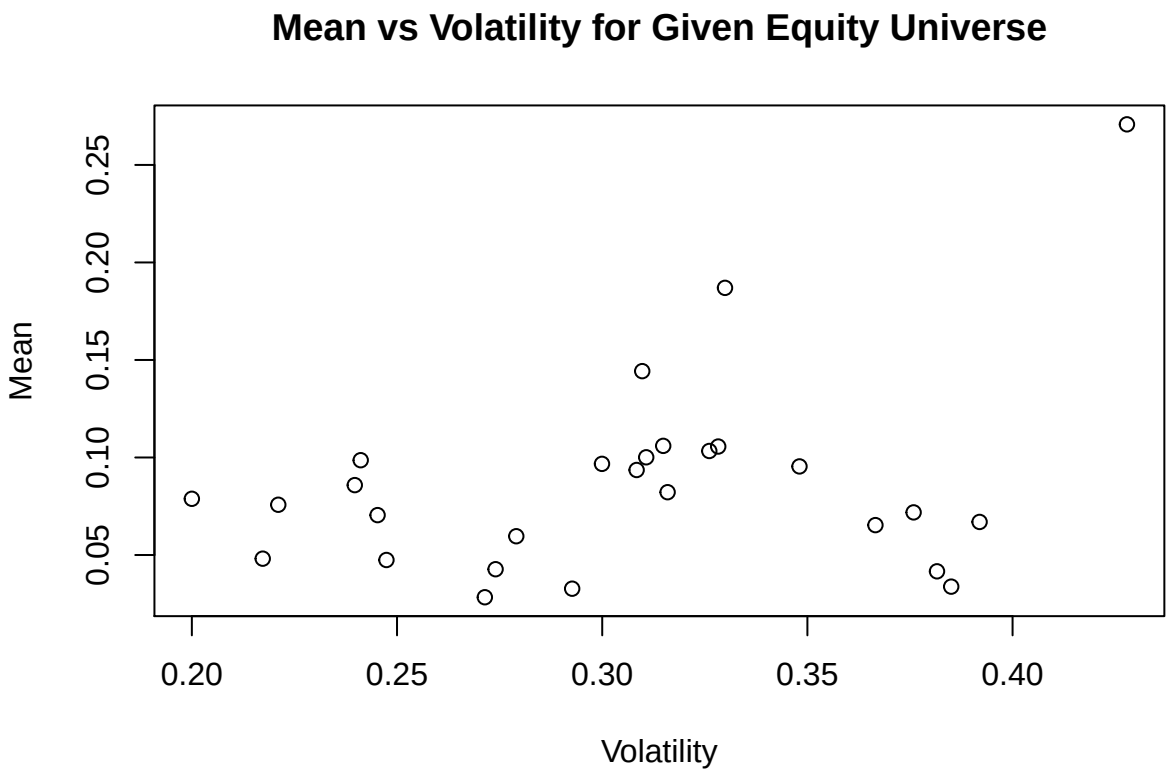
```
##  [1] "SPY"  "AAPL" "CSCO" "HON"  "KO"   "NKE"  "WBA"  "AMGN" "CVX"  "IBM"
## [11] "MCD"  "PG"   "WMT"  "AXP"  "DIS"  "INTC" "MMM"  "TRV"  "BA"   "GS"
## [21] "JNJ"  "MRK"  "UNH"  "CAT"  "HD"   "JPM"  "MSFT" "VZ"
```

Performance Summary

1. Among our 27 equities, the Min, Mean, and Max are listed for a few key metrics:

```
##                      Min       Mean       Max
## Log Returns  0.02834260 0.08640489 0.2708011
## Volatility   0.19999728 0.30555174 0.4278728
## Sharpe Ratio 0.08774196 0.28332973 0.6329009
```

2.



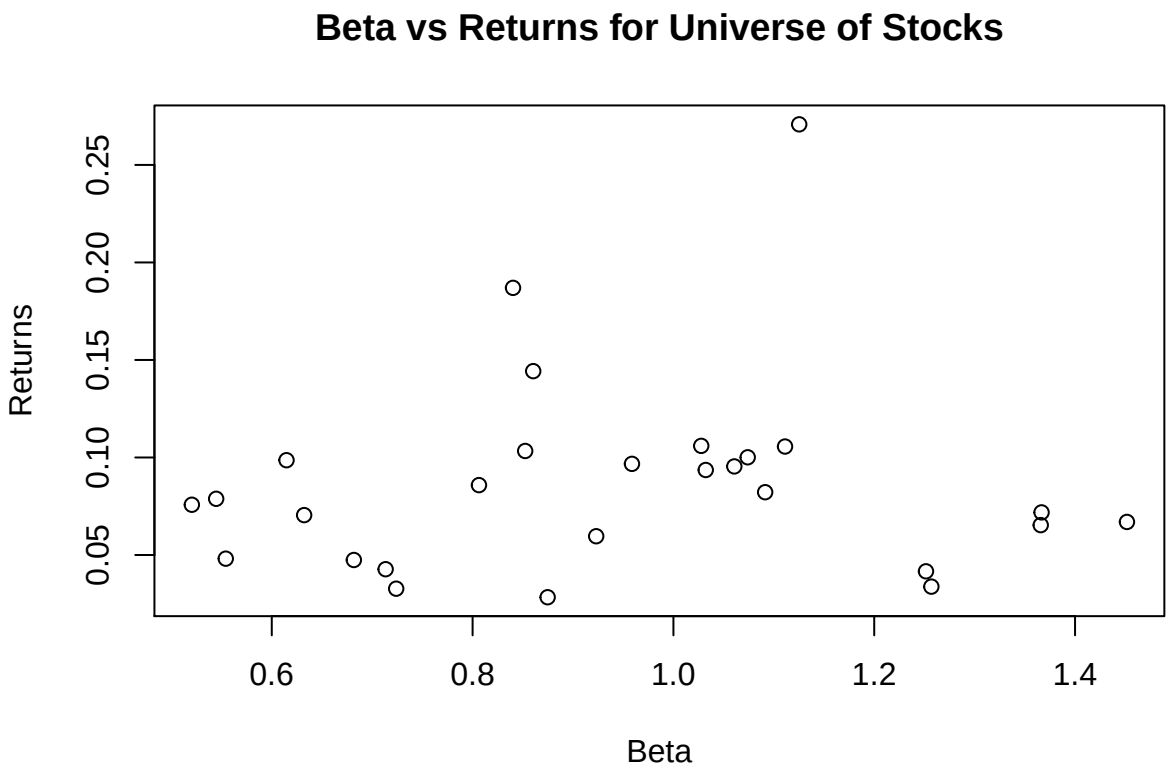
It seems that most of these companies have poor Sharpe Ratios. For several companies, a higher risk doesn't bring higher rewards as the cruve dips. There are 5 stock at the top of the curve that makes sense for each risk tolerance level.

3. Below is a table of metrics and their min, mean, and max among stocks in our Universe.

```
##                          Min       Mean       Max
## Jensen's Alpha    -0.04813652 0.02525942 0.1974594
## Beta               0.52038617 0.93763204 1.4517005
## Treynor Ratio      0.02687896 0.09755617 0.2406511
## Tracking Error     0.18275056 0.24672593 0.3660073
## Information Ratio -0.17772683 0.07908202 0.6664504
```

4.

```
plot(beta, rets_mean, main = "Beta vs Returns for Universe of Stocks", xlab ="Beta", ylab="Returns")
```



The data shows a weak relationship between beta and returns. At least for this small Universe of stocks, the returns seems to have no correlation with beta except for a few stocks (outliers) that outperform the rest.

Back-Testing

1. Split data into "In Sample" and "Out Sample" for back testing. Ranges listed below

```
## [1] "2017-01-03" "2018-12-28"
```

```
## [1] "2019-01-03" "2020-12-30"
```

2.

```
##    unif_weight vol_weight sharpe_weight
## 1     3.703704   2.439145    4.84282548
## 2     3.703704   2.924837    6.53011457
## 3     3.703704   5.784493    4.68644170
## 4     3.703704   9.039243    5.30574476
## 5     3.703704   2.113860    5.07931519
## 6     3.703704   2.483018   -2.18493625
## 7     3.703704   3.178937    5.12610700
## 8     3.703704   3.526622   -0.05488801
## 9     3.703704   3.234802   -5.02448756
## 10    3.703704   4.666275    8.85691624
```

```
## 11    3.703704   5.694351    3.36380951
## 12    3.703704   3.077369    5.71579047
## 13    3.703704   3.674886    4.68468138
## 14    3.703704   4.145188    1.20404870
## 15    3.703704   1.928875    3.85222211
## 16    3.703704   3.736599    2.08492818
## 17    3.703704   4.774352    0.73316776
## 18    3.703704   2.156034   10.36494846
## 19    3.703704   2.621884   -5.10660028
## 20    3.703704   4.438411    3.11013813
## 21    3.703704   4.319224    5.73164433
## 22    3.703704   3.771426    8.25989166
## 23    3.703704   1.861659    4.43710228
## 24    3.703704   4.019444    5.37723834
## 25    3.703704   3.679219    2.78479464
## 26    3.703704   2.739652    7.97549607
## 27    3.703704   3.970196    2.26354513
```

3.