1. Diversification and correlation

State of Economy	Probability	GE	HP	Pfizer	Apple	Ford
Recession	0.1	8.00%	-22.00%	28.00%	10.00%	-13.00%
Below Average	0.2	6.00%	-2.00%	14.70%	-10.00%	1.00%
Average	0.4	8.00%	20.00%	0.00%	7.00%	15.00%
Above Average	0.2	6.00%	35.00%	-10.00%	45.00%	29.00%
Boom	0.1	8.00%	50.00%	-20.00%	30.00%	43.00%

Understanding correlation will help you to know if your portfolios are properly diversified.
Lower correlation between two assets may have better diversification effect.
In the above table, we have five assets. We like to know which two assets can form a portfolio which has the best diversification effect.
Tasks:
1. calculate E(r), var(r) for each asset.
2. calculate correlaton of coefficient, r, for any two assets in the above table.
3. Please draw two assets portfolio diagram for any two assets.
4. Prove the statement, "Lower corrleation between two assets may have better diversification effect", based on your answers in 1, 2, and 3.

2.
Portfolio
The expected returns of four stocks and the variance/covariance matrix between them are given below:

		Variance/covariance matrix				
Expected return		Stocks	A	B	C	D
0.12		A	0.09	0.03	0.04	0.025
0.08		B	0.03	0.06	0.03	0.02
0.13		C	0.04	0.03	0.05	0.01
0.07		D	0.025	0.02	0.01	0.07

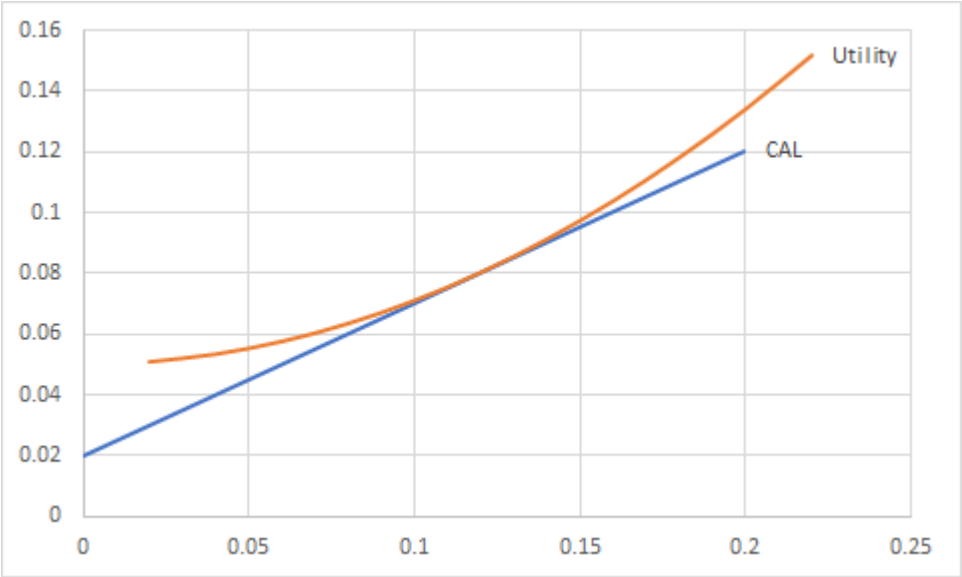
a. Construct the portfolio frontier for these four stocks.
b. Find out the minimum variance portfolio
c. Draw the efficient frontier
d. If there exists a risk free rate, rf=0.02, and according to the Two-Fund separation theorem,

investors will have a straight line portfolio frontier. Find out the line.

e. Mr. Smith's utility function is $U = E(r) - 2.1(s^2)$

Please find out his optimal portfolio.

f. Draw the graph below.



g. What is the key factors affecting Mr. Smith’s portfolio choice?