Empirical Asset Pricing: Assignment 2

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0.1 Exercise 1

In this Exercise, R is the mean of returns on 10 industries ($N \times 1$ matrix), σ is the standard deviation of returns on 10 industries ($N \times 1$ matrix), V is the covariance matrix ($N \times N$ matrix) and $\mathbf{1}$ is $(1\ 1\ ...\ 1)'$ ($N \times 1$ matrix).

0.1.1 Part A

The plot that contains the efficient frontier, the tangency portfolio, the MVP portfolio and the 10 industries are given below. The efficient frontier is parabola, and both the MVP and the Tangency portfolio land on the efficient frontier, but the 10 industries are on the right side of the efficient frontier.

- For MVP, the weights for individual assets are $W_{MVP} = \frac{V^{-1}\mathbf{1}}{\mathbf{1}'V^{-1}\mathbf{1}}$.
  - Based on the given dataset, W_{MVP} =

$$\begin{bmatrix} 76.88\% & -5.73\% & -13.72\% & 21.83\% & -10.56\% & 54.94\% & -5.58\% & 7.13\% & 7.32\% & -32.52\% \end{bmatrix}$$

  - $r_{MVP} = RW_{MVP} = 0.9204\%$, $\sigma_{MVP} = W'_{MVP}VW_{MVP} = 3.7286\%$.

- For TP, the weights for individual assets are $W_{TP} = \frac{V^{-1}(R-r_f\mathbf{1})}{\mathbf{1}'V^{-1}(R-r_f\mathbf{1})}$ given V is the covariance matrix and $\mathbf{1}$ is $(1\ 1\ ...\ 1)'$ ($N \times 1$ matrix).diff from BW's formula
  - Based on the given dataset, W_{TP} =

$$\begin{bmatrix} 83.77\% & 7.99\% & -17.61\% & 32.05\% & 3.19\% & 33.32\% & -4.70\% & 28.18\% & -3.43\% & -62.76\% \end{bmatrix}$$

  - $r_{TP} = RW_{TP} = 1.0320\%$, $\sigma_{TP} = W'_{TP}VW_{TP} = 4.0395\%$.

- The relationship between standard deviations and expected returns on the portfolios on the efficient frontier is $\sigma^2 = (r_p\ \mathbf{1})A^{-1}(r_p\ \mathbf{1})'$ where $A = (R\ \mathbf{1})'V^{-1}(R\ \mathbf{1})(2 \times 2$ matrix$)$. Suppose

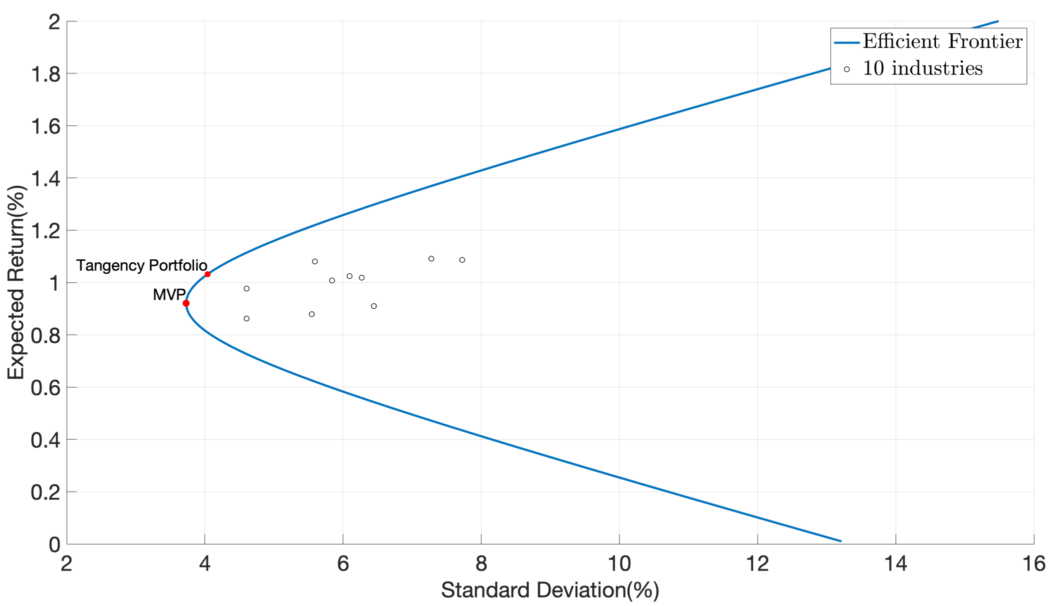

Figure 1: Efficient Frontier of the 10-industry portfolios

Table 1: The means and standard deviations of 4 equal-weight portfolios

Number of Stocks	5	10	25	50
Mean	1.5164	1.2326	1.2119	1.2107
Standard Deviation	9.8671	6.8118	5.5771	5.4281