Q No 4

Solution:.

N different opportunities to invest in "n" asset that is represented by "X_m"

$X_n \rightarrow$ fractions of savings.

$P_n \rightarrow$ estimated data of asset "n" historical data

$P_n = 1.12 \approx$ assets "n" has historical return of 12%

$\rightarrow$ Covariance matrix R for the assets given.

The variance of overall return is given by

$$\sum_{n=1}^{N} \sum_{m=1}^{N} R_{m,n} x_m x_n$$

expected return of at least 8%

we know the portfolio variance:

$$V_p(R_{m,n}, x_m, x_n) = \frac{\sigma^2 R_{m,n}^2}{\mu^2 \sum_{i,j=1}^{x_m} (x_n^{-1})_{ij}}$$

Here In the data we have Covarience matrix inverse corelation matrix is X_n^{-1}

the corelations of returns; the Pearson's formula is

$$x_{ij} := (R_i, R_j) - (R_i)(R_j) / \sigma_i \sigma_j$$

To bring that problem to the optimization problem which is in general as:

$$\underset{x}{\text{minimize}} \|y - Ax\|_2^2$$

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we have $\sum^{N} \sum^{N} R_{m,n} x_m, x_n$

$$V_j = \sum_{n=1}^{N} \sum_{m=1}^{N} R_{m,n} x_m, x_n$$

$$z_j = f_j h \left(\sum_{n=1}^{N} \sum_{m=1}^{N} R_{m,n}, x_m, x_n \right)$$

$$y_s = f_s \left(\sum_{j=1}^{N} R_{m,n} f_j (V_j) x_m, x_n \right)$$

$$F_s (x_1, \dots x_n)$$

So we have

$$\begin{bmatrix} y_1 \\ \vdots \\ y_m \end{bmatrix} = \begin{bmatrix} F_1 (x_1, \dots x_n) \\ F_m (x_1 \dots x_n \end{bmatrix}$$

minimize $\frac{1}{2} \sum_{j=1}^{M} (y - \hat{y})^2$

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