

1. Consider three assets with the following mean return vector and covariance matrix:

$$M = \begin{bmatrix} 0.1 & 0.2 & 0.15 \end{bmatrix}$$
$$C = \begin{bmatrix} 0.005 & -0.010 & 0.004 \\ -0.010 & 0.040 & -0.002 \\ 0.004 & -0.002 & 0.023 \end{bmatrix}.$$

- (a) Construct and plot the Markowitz efficient frontier using the above data.
 - (b) Tabulate the weights, return and risk of the portfolios for 10 different values on the efficient frontier.
 - (c) For a 15 % risk, what is the maximum and minimum return and the corresponding portfolios ?
 - (d) For a 18 % return, what is the minimum risk portfolio ?
 - (e) Assuming the risk free return $\mu_{rf} = 10\%$, compute the market portfolio. Also determine and plot the Capital Market Line.
 - (f) Find two portfolios (consisting of both risky and risk free assets) with the risk at 10% and 25%.
2. Obtain data (from online resources) for 10 stocks each with 50 data points all taken at the same dates (preferably spread over a year at equal intervals). Put this data and it's details in a single Excel/CSV file. Using the data and assuming 7% (*change this, if required*) risk free return:
- (a) Construct and plot the Markowitz efficient frontier.
 - (b) Determine the market portfolio.
 - (c) Determine and plot the Capital Market Line.
 - (d) Determine and plot the Security Market Line for all the 10 assets.

[Note: In all our assignments and exams, the rates quoted are always annual/per period rates.]