Let us assume there are three uncorrelated assets with equal variance = 1 and mean return = 1, 2, 3 respectively. what will be the optimal allocation of money for these three assets?

$$\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = 1 \text{ and } \sigma_{12}\ 0,\ \sigma_{13} = 0,\ \sigma_{23} = 0$$

$$L = \sum_{j=1}^{3} w_i w_j \sigma_{ij} - \lambda \left[\sum w_i r_i - \bar{r}\right] - \mu \left(\sum w_i - 1\right)$$

$$\frac{\partial L}{\partial w_1} = w_1 - \lambda - \mu = 0 \rightarrow (1)$$

$$\frac{\partial L}{\partial w_2} = w_2 - 2\lambda - \mu = 0 \rightarrow (2)$$

$$\frac{\partial L}{\partial w_3} = w_3 - 3\lambda - \mu = 0 \rightarrow (3)$$

$$\left(\because \begin{array}{l} r_1 = 1 \\ r_2 = 2 \\ r_3 = 3 \end{array} \right.$$

Further from derivative w.r.t constraints,

$$w_1 + 2w_2 + 3w_3 = \bar{r} \rightarrow (4) \quad (\bar{r} = \text{return of portfolio})$$

$$w_1 + w_2 + w_3 = 1 \rightarrow (5)$$

Solving (1) to (5) we will ~~get~~

$$w_1 = 4/3 - (\bar{r}/2)$$

$$w_2 = \frac{1}{3}$$

$$w_3 = (\bar{r}/2) - \frac{2}{3}$$

$$\sigma = \sqrt{7/3 - 2\bar{r} + \frac{\bar{r}^2}{2}}$$