Q5) Consider the following data for three different stocks.

Probability	Return k_1	Return k_2	Return k_3
0.1	0.3	0.08	-0.1
0.5	0.13	0.11	0.34
0.2	0.15	0.4	0.11
0.2	0.25	0.12	0.15

Among the attainable portfolios, find the one with the minimum variance. What are the weights of the three securities in this portfolio? Also compute the expected return and standard deviation of this portfolio.

Ans) For given correlation, $\rho = -1$ so, $\mu_{min} = \frac{\sigma_2\mu_1 + \sigma_1\mu_2}{\mu_1 + \mu_2}$

$= 0.0857 < 1$

$\mu_{min} = 8.5\%$

$w_1 = 1 - S_{min}$ and $w_2 = S_{min}$ where $S_{min} = \frac{\sigma_1}{\sigma_1 + \sigma_2} = \frac{0.05}{0.05 + 0.02} = 0.714$

$\rho = -1 \Rightarrow w_1 = 0.286$ & $w_2 = 0.714$

$S_{min} = 71.4\%$ $\mu_{min} = 8.314\%$

For $\rho = 0.5$

$w_1 = 1 - S_{min}$ and $w_2 = S_{min}$

$S_{min} = 0.7894$

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$W_1 = 1 - \sigma_{min} = 0.2106$

$H_{min} = (H_2 - H_1)\,\sigma_{min} + H_1$
$= 8.421\%$

$\sigma_{min} = 1.986\%$

$\rho = 0.5$ $W_1 = 21.06\%$ $W_2 = 78.04\%$
$H_{min} = 8.421\%$ $\boxed{\sigma_{min} = 1.986\%}$

This is the desired result

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