# Risk & Return

## Solution:

1. ***Calculation of expected rate of return:***

$\overline{R_A} = \sum P_A R_A$

= (0.25×0.20) + (0.50×0.28) + (0.25×0.32)

= 0.27 or, 27%

$\overline{R_B} = \sum P_B R_B$

= (0.25×0.18) + (0.50×0.26) + (0.25×0.26)

= 0.265 or, 26.50%

$\overline{R_C} = \sum P_C R_C$

= (0.25×0.28) + (0.50×0.24) + (0.25×0.20)

= 0.24 or, 24%

2. ***Calculation of standard deviation :***

$\sigma_A = \sqrt{0.25(0.20 - 0.27)^2 + 0.25(0.28 - 0.27)^2 + 0.25(0.32 - 0.27)^2}$

$= \sqrt{0.0019}$

= 0.0435 or, 4.35%

$\sigma_B = \sqrt{0.25(0.18 - 0.265)^2 + 0.25(0.26 - 0.265)^2 + 0.25(0.36 - 0.265)^2}$

$= \sqrt{0.004075}$

= 0.0638 or, 6.38%

$\sigma_C = \sqrt{0.25(0.28 - 0.24)^2 + 0.25(0.24 - 0.24)^2 + 0.25(0.20 - 0.24)^2}$

$= \sqrt{0.0008}$

= 0.0283 or, 2.83%

***3. Calculation of variance :***

$(\sigma_A)^2$ = $(0.0435)^2$ = 0.0019

$(\sigma_B)^2$ = $(0.0638)^2$ = 0.0041

$(\sigma_B)^2$ = $(0.0283)^2$ = 0.0008

***4. Calculation of portfolio return:***

$\overline{X_P} = \sum W_i \bar{X}_I$

= (0.333×0.27) + (0.333×0.265) + (0.333×0.24)

= 0.2581 or, 25.81%

***5. Portfolio standard deviation:***

$$\sigma_P = \sqrt{(w_A\sigma_A)^2 + (w_B\sigma_B)^2 + (w_C\sigma_C)^2 + 2w_Aw_bCOV_{AB} + 2w_Aw_bCOV_{BC} + 2w_Aw_bCOV_{CA}}$$

$$= \sqrt{\begin{matrix}(0.333 \times 0.0435)^2 + (0.333 \times 0.0638)^2 + (0.333 \times 0.0283)^2 + (2 \times 0.333 \times 0.333 \times 0.265) \\ +(2 \times 0.333 \times 0.333 \times -0.0018) + (2 \times 0.333 \times 0.333 \times -0.0012)\end{matrix}}$$

$=\sqrt{0.000672}$

=0.0259 or, 2.59%**.**

***6. Calculation of Variance:***

$(\sigma_p)^2$ = $(0.0259)^2$ = 0.00067

***Calculation of Co-variance:***

$COV_{AB} = \sum P_i\ (R_A - \overline{R_A})\ (R_B - \overline{R_B})$

= 0.25 (0.20 - 0.27) (0.18 - 0.265) + 0.5 (0.28 - 0.27) (0.26 - 0.265) +0.5 (0.32 - 0.27) (0.36 - 0.265)

= 0.00265

$COV_{AC} = \sum P_i \, (R_A - \overline{R_A}) \, (R_C - \overline{R_C})$

= 0.25 (0.20 - 0.27) (0.28 - 0.24) + 0.5 (0.28 - 0.27) (0.24 - 0.24) +0.5 (0.32 - 0.27) (0.20 - 0.24)

= -0.0012

$COV_{BC} = \sum P_i \, (R_B - \overline{R_B}) \, (R_C - \overline{R_C})$

= 0.25 (0.18 - 0.265) (0.28 - 0.24) + 0.5 (0.26 - 0.265) (0.24 - 0.24) +0.5 (0.36 - 0.265) (0.20 - 0.24)

= -0.0018