1. Portfolio management

① Return (%) = $\frac{\text{Inflow} - \text{outflow}}{\text{outflow}} \times 100$

② Expected return of Security

Using probability

$(R_1 \times P_1) + (R_2 \times P_2) + (R_3 \times P_3) \cdots$

Without using probability

$\frac{R_1 + R_2 + R_3 + \cdots}{n}$

③ Return of the portfolio

$[R_A \times W_A] + [R_B \times W_B] + [R_C \times W_C] + \cdots$

here R_A = Return of Security A

W_A = Weight of Security A.

④ Risk of Security (known as Standard deviation of security)

(a) Standard deviation (σ) = $\sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$

or

Standard deviation = $\sqrt{\Sigma[(x-\bar{x})^2 \times \text{Probability}]}$

or

Standard deviation = $\sqrt{\text{Variance}}$

(5) Coefficient of Variation = $\frac{\sigma}{\bar{x}}$

(i) Security having less Coefficient of variation would be less risky.

(6) Coefficient of Correlation $(r_{A,B})$ = $\frac{\text{Co-variance }(A,B)}{\sigma_A \times \sigma_B}$

If $r = 1$, perfect positive Correlation

$r = -1$, perfect negative Correlation

$r = 0$, no Correlation

(7) Co-variance (A, B) = $\frac{\Sigma[(x_A - \bar{x}_A)(x_B - \bar{x}_B)]}{n}$

(or)

$\Sigma\left[[(x_A - \bar{x}_A)(x_B - \bar{x}_B)] \times \text{Probability}\right]$

(or)

$r_{(A,B)} \times \sigma_A \times \sigma_B$

(or)

$\beta_A \times \beta_B \times \sigma_m^2$

⑧ Risk of portfolio

(Standard deviation of portfolio)

(a) According to markowitz

(i) $$\sqrt{(\sigma_A W_A)^2 + (\sigma_B W_B)^2 + 2(\sigma_A W_A)(\sigma_B W_B)\, r_{(A,B)}}$$

or

$$\sqrt{(\sigma_A W_A)^2 + (\sigma_B W_B)^2 + 2 W_A W_B \cdot \text{Co-variance}(A, B)}$$

(ii) when one security is risk free

$$\sigma_A W_A$$

(iii) when there are 3 securities

$$\sqrt{(\sigma_A W_A)^2 + (\sigma_B W_B)^2 + (\sigma_C W_C)^2 + 2(\sigma_A W_A)(\sigma_B W_B)\, r_{AB} + 2(\sigma_B W_B)(\sigma_C W_C)\, r_{BC} + 2(\sigma_C W_C)(\sigma_A W_A)\, r_{AC}}$$

(b) According to Sharpe Index Model

(i) Systematic risk of security

↓

$$\boxed{\sigma^2_A \times r^2_{(A,m)} \quad \text{(or)} \quad \beta^2_A \times \sigma^2_m}$$

(ii) Systematic risk of portfolio

↓

$$\boxed{\beta^2_{(portfolio)} \times \sigma^2_m}$$

(iii) Unsystematic risk of security

↓

$$\boxed{\sigma^2_{e(A)} = \sigma^2_A - \text{Systematic risk of } A}$$

(iv) Unsystematic risk of portfolio

↓

$$\boxed{\sigma^2_{e(portfolio)} = \sigma^2_{e(A)} W_A^2 + \sigma^2_{e(B)} W_B^2 + \ldots}$$

9 Systematic risk is also known as market risk, non-diversifiable risk or variance explained by market.

10 unsystematic risk is also known as unique risk, diversifiable risk, specific risk, Random error, residual variance.

11 Beta of a Security

$$\frac{\sigma_A \times r_{(A,m)}}{\sigma_m}$$

Or

$$\frac{\cancel{\sigma_A} \times \text{Co-variance}_{(A,m)}}{\sigma_m \times \cancel{\sigma_A} \times \sigma_m}$$

$$\Rightarrow \frac{\text{Co-variance}\,(A,m)}{\sigma_m^2}$$

Or

$$\frac{\%\ \text{change in Security Price}}{\%\ \text{Change in Nifty}}$$

Beta of risk free Security is 0

(12) Beta of Portfolio

$$(\beta_A \times W_A) + (\beta_B \times W_B) + (\beta_C \times W_C) + \cdots\cdots$$

(or)

$$\frac{\text{\% Change in Portfolio value}}{\text{\% change in Nifty}}$$

(13) Ratio for evaluating the performance of mutual fund

(a) Sharpe Ratio

(also known as Reward to Variability) $= \dfrac{R_A - R_F}{\sigma_A}$

(b) Treynor Ratio

(also known as Reward to volatility) $= \dfrac{R_A - R_F}{\beta_A}$

(c) Jenson Alpha

Alpha $= R_A -$ Expected return of A using CAPM model

(d) Morning Star Index

↓

Return of mutual fund − Risk of loss

(14) Capital asset Pricing model

(a) Fair return = Expected return = $R_F + \beta(R_m - R_F)$

(b) Risk premium = $\beta(R_m - R_F)$

(c) market risk premium = $R_m - R_F$

(15) Security market line

↓

Graphical representation of CAPM

↓

Expected return = $R_F + \beta(R_m - R_F)$

↓

$$Y = C + mx$$

here

C = Intercept = R_F

m = slope = $R_m - R_F$

x = Beta

(16) Capital market line

↓

Expected return = $R_F + \sigma_s\left(\frac{R_m - R_F}{\sigma_m}\right)$

here

R_F = Intercept , $\frac{R_m - R_F}{\sigma_m}$ = Slope

(17) Characteristics line

Expected return = Alpha + (β × Rm)

here Alpha = Intercept

β = Slope

(18) minimum portfolio risk (Consist only 2 securities)

$$W_A = \frac{\sigma_B^2 - \text{Co-variance}(A,B)}{\sigma_A^2 + \sigma_B^2 - 2\,\text{Co-variance}(A,B)}$$

$W_B = 1 - W_A$

(19) Arbitrage price theory

(a) Expected return $= R_F + \beta_1(R_{m_1} - R_F) + \beta_2(R_{m_2} - R_F) + \ldots$

here

β_1 = Sensitivity of factor 1

β_2 = Sensitivity of factor 2

R_{m_1} = market return in respect of factor 1

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(b) Expected return $= \lambda_0 + \beta_1\lambda_1 + \beta_2\lambda_2 + \cdots$

here

$\lambda_0 =$ Risk free return

$\beta_1 =$ sensitivity of factor 1

$\lambda_1 =$ Change in market return due to factor - 1'

(20) Return attributable towards the skill of manager

↓

Actual return of Portfolio − Expected return of Portfolio.

(21) Return attributable towards high risk assumed by manager

↓

Expected return − market return

(22) $$\beta_{asset} = \left[\beta_E \times \frac{Equity}{E + D(1-T)}\right] + \left[\beta_D \times \frac{D(1-T)}{E+D(1-T)}\right]$$

$\beta_E =$ Beta of Equity

$\beta_D =$ Beta of Debt

$E =$ Equity

$D =$ Debt

$T =$ Tax rate