Portfolio

classmate
Date
Page

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① → How to calculate return of a security?

• Mean of that = Avg (1-20, 2-30, 3-40, 4-50, 5-60)

$\frac{20+30+40+50+60}{5} = 40$ ↓ expected return

② Calculation of risk of security?

1-20, 2-30, 3-20, 4-25, 5-15

Year	X	$\bar{X}$	$X-\bar{X}$	$\Sigma(X-\bar{X})^2$
1	20	22 $\left(\frac{110}{5}\right)$	-2	4
2	30	22	8	64
3	20	22	-2	4
4	25	22	3	9
5	15	22	-7	49
			$\Sigma(x-\bar{x})^2$	130

$S.D\ (\sigma x) = \sqrt{\frac{\Sigma(X-\bar{X})^2}{n}}$

③ • If probability given then $\sqrt{\Sigma P(X-\bar{X})^2}$

④ portfolio → Group of securities.

expected return — Risk.

⑥ $\sigma p = \sqrt{(w_1\sigma x)^2 + (w_2\sigma y)^2 + 2w_1w_2\sigma x\sigma y\ r(x,y)}$

↓ S.D or risk of portfolio

⑤ r = Correlation = $\frac{cov(x,y)}{\sigma x\sigma y}$

$cov(x,y) = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{N}$

r correlation

- ↓ -1 perfectly negative — $x\uparrow\ y\downarrow$ twist/turn.
- ↓ -1 to 0 ↓ negative.
- ↓ 0 No correlation
- ↓ 0 to 1 ↓ positive.
- ↓ perfectly positive

(6) proportion of $x = \frac{\sigma_y}{\sigma_x + \sigma_y}$

proportion of $y = \frac{\sigma_x}{\sigma_x + \sigma_y}$

(7) Maximum risk of portfolio (correlation = 1) $\sigma_p = w_1\sigma_x + w_2\sigma_y$

Minimum risk of portfolio (correlation = -1) $\sigma_p = w_1\sigma_x - w_2\sigma_y$

(8) Markowitz Model of risk-return optimization
- A higher expected value of return and a lower risk ($\bar{e}$, S.D)
- A lower expected value of return and a same risk ($\bar{e}$, S.D)
- The same expected value but a lower risk (S.D, σ)

(9) securities market line $\Rightarrow K_e = R_f + \beta(R_m - R_f)$

(10) Capital market line $\Rightarrow K_e = R_f + \frac{\sigma_s}{\sigma_m}(R_m - R_f)$

(11) β (Beta)

$\frac{\text{change in security risk}}{\text{change in market risk}}$

$\frac{\sigma_s}{\sigma_m} \times r_{sm}$

$\beta = \frac{cov(sm)}{(\sigma_m)^2}$

$\frac{\sigma_s}{\sigma_m} \times \frac{cov(sm)}{\sigma_s \times \sigma_m}$

(12) Characteristic line is given by $Y = \alpha + \beta R_m$ (security constant)

$\Sigma y = n\alpha + \beta \Sigma x$ ① $\Sigma xy = \alpha \Sigma x + \beta \Sigma x^2$ - ②.

(13) when regression line is given

$\beta = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2}$ or $\beta = \frac{cov sm}{(\sigma m)^2}$

① → Systematic risk $= \beta_i^2 \sigma_m^2$

unsystematic risk = Total risk - systematic risk.