

PORTFOLIO MANAGEMENT (PM)

PM refers to managing a group of securities such that we earn maximum return @ min risk

Return (security)

Historic
Realised

Expected
return
(Risk $\checkmark$)

$$= \frac{D_1 + [P_1 - P_0]}{P_0} \times 100$$

$$= \sum (\text{Return} \times \text{Prob. of each return})$$

Risk of a security

Range

max-min

Variance

$$\sum [(x - \bar{x})^2 \cdot P_i]$$

σ^2

S.D

$$\sqrt{\text{Variance}}$$

σ

co-efficient
of variance

$\frac{\text{Risk}}{\text{Return}}$
(Risk per unit of return)

x - eup return
 $\bar{x}$ - avg/mean return
 P_i - probability

Return of a portfolio

Historic

expected

$$\sum (\text{historic return of secu} \times \text{prop}^n \text{ of inv})$$

$$\sum (\text{eup return} \times \text{eup prop}^n)$$

Risk of Portfolio

diversifiable
unsystematic

company specific

can be eliminated

undiversifiable
systemic risk (β)

market related

cannot be eliminated
more imp for PM

Risk of a portfolio (as per std deviation)

$$\text{Risk} = \sqrt{\sum (A^2 + B^2 + [2AB \cdot \text{Correl}(AB)])}$$

$$A = \sigma_A \times \text{prop}^n \text{ of A}$$

$$B = \sigma_B \times \text{prop}^n \text{ of B}$$

$$\text{rem: } (a+b)^2 = a^2 + 2ab + b^2 \quad [\sqrt{\cdot}; \text{correl}]$$

CORRELATION

$$\text{correlation} (x, y) = \frac{\text{co-variance} (x, y)}{\sigma_x \sigma_y}$$

$$\text{covariance} (x, y) = \sum [(x - \bar{x})(y - \bar{y}) \cdot P_i]$$

a) Perfect +ve = +1 (same direction & quantum)

risk = wtd avg risk

b) Perfect -ve = -1 (opp direc & same quantum)

(a) & (b) not possible

$\therefore$ co-relation always between +1 & -1

preferred as low as possible

propⁿ : portfolio :: prob : one secu diff site
invst decision = risk (std devⁿ) (silent)
& mention risk relative to mkt = β

Systematic Risk (Beta) (β)

volatility of secu return wrt to Δ in mkt return

β Type of co-
average

> 1 $\uparrow$ risk; aggressive
 < 1 $\downarrow$ risk; defensive/conservative

$$\beta = \frac{\Delta \text{ in secu ret}}{\Delta \text{ in mkt ret}}$$

$$\beta = \frac{\text{correlation (secu, mkt)} \times \sigma_{\text{secu}}}{\sigma_{\text{mkt}}}$$

$$\beta = \frac{\text{co-variance (secu, mkt)}}{\sigma_{\text{mkt}}^2 (\text{variance of mkt})}$$

$$\beta (\text{portfolio}) = \sum (\text{Beta (secu)} \times \text{prop}^n \text{ of secu})$$

CAPM model

$$\text{min ret } K_e = R_f + \beta (R_m - R_f)$$

$R_m - R_f$ = risk premium
 R_f = risk free return
SML = secu. mkt return line

$ER > \text{SML}$ - BUY (underpriced)

$ER < \text{SML}$ - SELL (overpriced)

$ER = \text{SML}$ - HOLD (perfectly priced)

Reward to risk ratio (TREYNOR RATIO)

$$\text{Reward to Risk Ratio} = \frac{R_{S1} - R_f}{\beta_1} = \frac{R_{S2} - R_f}{\beta_2} = \frac{R_{S3} - R_f}{\beta_3}$$

It will be same if secu lie on SML
i.e. perfectly priced securities

Diversification & risk

Proportion to get

zero risk

correlation -1

$$A = \frac{\sigma_B}{\sigma_A + \sigma_B}$$

$$B = \frac{\sigma_A}{\sigma_A + \sigma_B}$$

[A ↔ B]

minimum risk

correlation other than -1

$$\frac{\sigma_B^2 + \text{cov}(AB)}{\sigma_A^2 + \sigma_B^2 - 2\text{cov}(AB)}$$

$$\frac{\sigma_A^2 + \text{cov}(AB)}{\sigma_A^2 + \sigma_B^2 - 2\text{cov}(AB)}$$

How to check if PF will get risk reduction or diversification

$\frac{\sigma_{small}}{\sigma_{large}} > \text{correlation}$ - risk lean benefit

$\frac{\sigma_{small}}{\sigma_{large}} < \text{correlation}$ - PF doesn't get benefit of risk

Capital Market Line (CML)

Req return = $R_f + (R_m - R_f) \cdot \frac{\sigma_{secur}}{\sigma_{mkt}}$

$R_m - R_f$ = reward/premium/risk in market or market return & risk trade off of risk

ER > CML underpriced BUY

ER < CML overpriced SELL

ER = CML perfect HOLD

Arbitrage pricing model / multifactor model

Req return = $R_f + \left[\text{risk premium fac}_1 \right] \beta_1 + \left[\text{RP fac}_2 \right] \beta_2$

- all macro economic factors = int, GDP, inflation, taxes, bal of payment
- more appropriate
- risk premium = $R_m - R_f$

Expected return under market model

$ER = \alpha + \beta(R_m)$ - regression eqn or characteristic model

- used for finding α
- α is excess return when $R_m = 0$
- No R_f in this model. α is not Jensen α

- real rate + inflation = nominal rate. $NR = R_f$
 $(1+RR) + (1+\text{inflation}) = 1+NR$
- equilibrium price = perfect price
- correctly priced - find SML or alpha
- If R_m is not known use reward to risk ratio (the ratio must be same if secur is perfectly priced)
- wherever P_i is there: variance $(x-\bar{x})^2 \cdot P_i$
when P_i is not known take n i.e simple average
Variance = $(x-\bar{x})^2 / n$ S.D = $\sqrt{(x-\bar{x})^2 / n}$ cov = $\frac{\sum (x-\bar{x})(y-\bar{y})}{n}$
- β of debt = 0 if not given (always)
- proxy β = β of all firms. [average (simple)]
- R_m not known but PF is mentioned then assume market = PF then return of secur (wtd return) = R_m
- Risk premium of security = $(R_m - R_f) \times \beta$
- many R_f given (low, high) - take low or avg (x high)
- debt always net of tax

Variance of security

systematic market related = $(\text{correlation})^2 \times \text{variance of secur}$

unsystematic residual variance = $(1 - (\text{correlation})^2) \times \text{variance of secur}$

Total variance = systematic + unsystematic

(correlation)² = co-efficient of determination

Ratios to evaluate performance of PF

SHARPE	TREYNOR	JENSEN'S α
lowest return for assuming risk Secur: $\frac{ER_s - R_f}{\sigma_{secur}}$ PF: $\frac{ER_{PF} - R_f}{\sigma_{PF}}$ reward to variability ratio use S.D	$\frac{ER_s - R_f}{\beta_{secur}}$ $\frac{ER_{PF} - R_f}{\beta_{PF}}$ reward to risk or volatility ratio as per SML use β	$\alpha = ER - SML$ $\alpha > 0$ underpriced BUY $\alpha < 0$ overpriced SELL $\alpha = 0$ perfect HOLD

Overall β ; Asset β , Co β , wtd β

wtd $\beta = \left[\beta_d \times \frac{d}{d+E} \right] + \left[\beta_e \times \frac{E}{d+E} \right]$ (no tax)

$= \left[\beta_d \times \frac{d(1-\tau)}{E+d(1-\tau)} \right] + \left[\beta_e \times \frac{E}{E+d(1-\tau)} \right]$

When Δ in CS the overall β is same but equity β changes

Overall return / wtd avg return of Co

$= \left[R_d \times \frac{d}{d+E} \right] + \left[R_e \times \frac{E}{d+E} \right]$

net of tax if tax

debt: equity = 0.36 then 0.36:1

propn = $\frac{0.36(d)}{1.36}$ (d) $\frac{1}{1.36}$ (e)

if d:e is 36:1 then propn = 36:1 (d) 64:1 (e)