PREFACE

This summary notes doesn't guarantee passing the exam.

It is only meant to condense the huge content of ICMAI.

One needs to have a visualisation of connected questions with every concept studied here.

The visuals come only when you have practiced the connected sums at least 3 times after understanding the logic behind the concepts.

For effortless understanding of logic and practice of sums once, Join full classes of SFM with Satish Sir.

Exclusively taught as per CMA Final Course.
ICMAI Material Covered with all practicals and theories.

You will fall in love for finance, for sure

"I believe in - showing students how to cook rather than to give the food. Specially, I have also given sessions for preparing summary notes, where I am showing the process of how to summarise the big chapters. This would help you in all other subjects." - Satish Sir

Reviews of our regular classes of SFM

The books were great with regards to the content and coverage that has been provided. I really liked the numerous variation of sums that were provided to us in the entire course. I really loved the flow of the classes and the content was very well covered.

Thanking You.
Dipti Saraf

The content in the book is very good and well organized, there is extra space for page numbers and what is new is very useful and saves time for study, also the quality of the book is very good including the quality of paper and binding of the book.

Anjali Kumari Shaw

Portfolio Management

Portfolio Mgmt

Objective

1. Maximisn of Returns
2. Minimisn of Risk
3. Stability of Income
4. Marketability
5. Tax Savings

Types

1. Active P/F
2. Passive P/F
3. Discretionary PMS
4. Non Discretionary PMS

Phases

1. Sec Analysis
2. PF Analysis
3. PF Selection
4. PF Revision
5. PF Evalun

- P/F mgmt Theories
- Asset Pricing Theories
- Portfolio Performance Measures
- EMH

P/F Mgmt Theories

- Traditional Theory → Publicly available info → identify securities → allocate to various securities →
- Modern P/F Theory → Markowitz
- Capital Mkt Theory → William Sharpe

Naive Theory (N (1/N proportion)

Modern P/F Theory

Investor Satisfaction

- Same Return, low risk
- Same risk, high return
- Return as per Risk

⇓

Best P/f = Investor satisf^n is maximum

P/f Return

⇓

WA Return

P/F Risk

⇓

less than or equal to - WA Risk

Calculations

Return Calcul^n ✓

Risk Calculation ✓

Feasible & Efficient P/F

Corner Theory for Efficient P/F

SJC Institute

Capital Market Line or Capital Allocn Line

Return Calculation

Security

Ex Post → Historical data

Single Yr
No dividend!

Multi Yr
No div!

Ex Ante → Future data
$= \boxed{\Sigma p x}$

Portfolio
$\Downarrow$
WA Returns of Securities

Step 1: Return of Securities

Step 2: W Avg of Return of Securities

Weight: MV/BV

$$\boxed{HPR\ p.a = \frac{SV-PC}{PC} \times \frac{365}{n}}$$

$$\boxed{HPR = \frac{SV-PC}{PC} \times \frac{1}{n}}$$

n = no. of yrs

With dividend:

$$= \frac{(P_1 - P_0) + D_1}{P_0}$$

$$= \boxed{\text{Cap'tal Apprecn} + \text{Div Yield}}$$

With div:

$$\boxed{\text{Cap Appn} + \text{Avg Div Yield}}$$

Cap appn = HPR

or

CAGR ← more preferred

$$\boxed{P_n = P_0(1+g)^n}$$

Avg DY = DY p.a ka Avg

RISK CALCULATION

↓

Variance & SD

- Security
  - Single Sec
  - Pair of Securities
- Portfolio

S1. Variance

$$\boxed{\frac{\Sigma(x-\bar{x})^2}{n} \text{ or } \frac{\Sigma(x-\bar{x})^2}{n-1}}$$

OR

$$\boxed{\Sigma p(x-\bar{x})^2}$$

S2 SD

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

$= 0$ or positive

S1 Co-Variance

$$\boxed{\frac{\Sigma(x-\bar{x})(y-\bar{y})}{n}}$$

OR

$$\boxed{\Sigma p(x-\bar{x})(y-\bar{y})}$$

S2 Correl^n Co.eff

$$r = \frac{Cov(x,y)}{\sigma_x \cdot \sigma_y}$$

- r_{xy} = No units
  $= -1$ to 1
- $Cov(x,y)$ can be negative
- $\boxed{Cov(x,y) = r \cdot \sigma_x \cdot \sigma_y}$
- $r = 1 \Rightarrow x\uparrow \; y\uparrow$
  $r = -1 \Rightarrow x\uparrow \; y\downarrow$
  $r = 0 \Rightarrow x\uparrow \; y$ No change
- $Cov(x,y,z)$
  $= Cov(x,y)$
  $Cov(y,z)$
  $Cov(z,x)$

Two Securities P/F

Three Sec P/F

Imp of Correln Co-eff on P/F Risk

Zero Risk P/F

Min Risk P/F

Two Sec P/F

S1 Var of P/F $= \sigma_p^2$

$= (a+b)^2$

$= (W_x \cdot \sigma_x)^2 + 2 \cdot (W_x \sigma_x)(W_y \sigma_y) \cdot r_{xy} + (W_y \sigma_y)^2$

S2 SD of P/F

$= \sqrt{Var}$

Three Sec P/F

S1 Var of P/F $= \sigma_p^2$

$= (a+b+c)^2$

$= (W_x \sigma_x)^2 + (W_y \sigma_y)^2 + (W_z \sigma_z)^2$

$+ 2(W_x \sigma_x)(W_y \sigma_y) \times r_{xy}$

$+ 2(W_y \sigma_y)(W_z \sigma_z) \times r_{yz}$

$+ 2(W_z \sigma_z)(W_x \sigma_x) \times r_{xz}$

S2 SD of P/F

$= \sqrt{Var}$

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Importance of Correlⁿ Coeff

Case I

$\boxed{r = +1}$

$$\sigma_p^2 = (W_x\sigma_x + W_y\sigma_y)^2$$

$$\sigma_p = W_x\sigma_x + W_y\sigma_y$$

= WA Risk

Case II

$\boxed{r = -1}$

$$\sigma_p^2 = (W_x\sigma_x - W_y\sigma_y)^2$$

$$\sigma_p = W_x\sigma_x - W_y\sigma_y$$

= < WA Risk

Risk Ne Risk Ko

Kata

Bada - Chota

Case III

$\boxed{r = 0}$

$$\sigma_p^2 = (W_x\sigma_x)^2 + (W_y\sigma_y)^2$$

$$\sigma_p = \sqrt{(W_x\sigma_x)^2 + (W_y\sigma_y)^2}$$

Diversifⁿ Gain = % Redⁿ in P/F Risk = $\dfrac{\text{PF Risk new} - \text{PF Risk old}}{\text{PF Risk old}}$

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Zero Risk P/F

Condition ⇒ $r_{xy} = -1$

$\sigma_p = 0$

$W_x\sigma_x - W_y\sigma_y = 0$

$W_x = \dfrac{\sigma_y}{\sigma_x + \sigma_y}$

$W_y = \dfrac{\sigma_x}{\sigma_x + \sigma_y}$

$\dfrac{\text{Dusre ka SD}}{\text{Dono ka SD}}$

Min Risk P/F

Condition ⇒ $r_{xy} < 1$

σ_p = Minimise

$W_x = \dfrac{\sigma_y^2 - Cov(x,y)}{\sigma_x^2 + \sigma_y^2 - 2Cov(x,y)}$

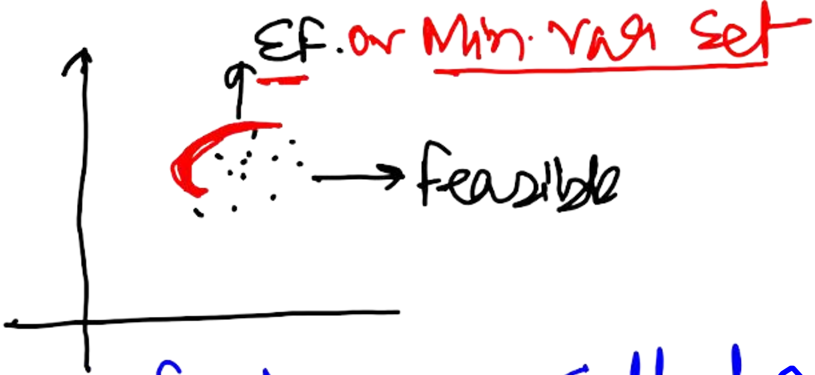
$\dfrac{\text{Doosre ka Var} - \text{Covar}}{\text{Dono ka Var} - 2 \times \text{Cov}}$

$W_y = 1 - W_x$

When $r = -1$, Min Risk P/F = Zero Risk P/F

Feasible & Efficent P/F as per MPT

- Combination of several risk & returns - lead to several P/F, called as Feasible P/F
- Upper boundary of feasible region = Eff Frontier



- Pf on Eff frontier are called as <u>Efficient P/f or Optimal Pf</u>
- Pf below the frontier = Sub optimal Pf
- Pf only differ in terms of weight.
- <u>How to Select Eff P/f</u>

<u>S1</u>: Similar risk P/f to be compared – select the one with more returns

<u>S2</u>: Similar returns P/f & Compare – Select the one with low risk

<u>S3</u> <u>left over</u> – are efficient P/f

<u>How to select the best one?</u>

1. <u>Risk appetite</u>

Risk averse = low risk

Risk agg = High risk

2. <u>Utility Score</u>

= Return of P/f – Risk Penalty

3. <u>Sharpe Ratio</u>

$= \frac{R_p - R_f}{\sigma_p}$

Risk neutral = I Diff.

Risk Penalty

$$= \frac{\sigma_p^2}{\text{Risk tolerance}}$$

Risk tolerance

a no. from 0 to 100

100 = High risk tolerance

Maximum utility score is best

(4) Co-eff of Varn

$$= \boxed{\frac{SD}{Mean} \times 100}$$

(5) Return per of Risk

$$\boxed{= \frac{Return}{Risk}}$$

Normally, If Rf is given - use Sharpe Ratio otherwise use Coeff of Varn.

Corner Theory for Eff P/F

There is a linear relship between weight of securities in efficient P/F

$$y = mx + c$$

$$W_A = m \times W_B + C$$

P/F					
1	✓	✓	✓	✓	
2	✓	✓	✓	✓	

] use eqns to find m & C

↓

& frame the eqn

Use the eqn ⇒ E.g $W_A = -2 \times W_B + 1.3$

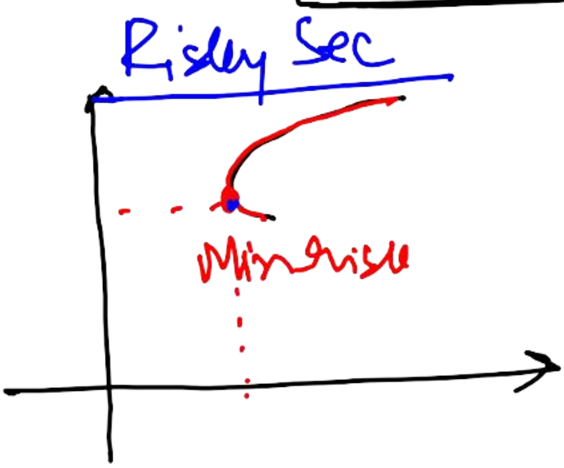
to find weight of another P/F

Assumptions	Criticism
1. No transn Cost, Dividend, CG tax	large no. of covar calculn when P/F has large no. of securities
2. No restn in lot size	
3. Identical expectn	
4. Investor/Arbitrager have same time horizon	

5. No influence of socio eco & psychological factors

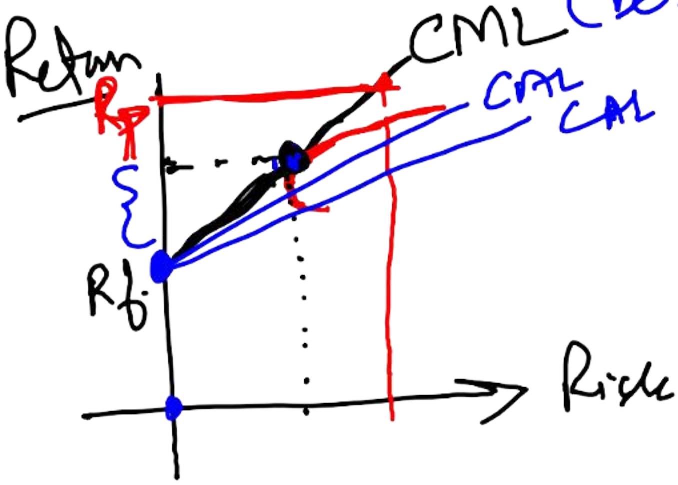
6. Risk depends on return only.

CML or CAL



→ How to create a P/F having lower risk than Min risk?

Construct P/F with Rf & Risky sec (Best of CAL)



Risky Sec + Rf

↓

Eff P/F

↓

Mkt P/F (Best one)

Market P/F => That has min risk & is well known to all the investor

$$\boxed{\text{CML Eqn: } R_p = R_f + \left(\frac{R_m - R_f}{\sigma_m}\right) \times \sigma_p}$$

correln between R_f & Risky asset is 0 $(r = 0)$

σ_p with R_f & Risky asset $= \sqrt{(W_x \sigma_x)^2 + (W_y \sigma_y)^2}$

σ_x → R_f → 0; σ_y → Risky assets

$= \sqrt{W_y \sigma_y^2}$

$= W_y \sigma_y$

$\frac{R_m - R_f}{\sigma_m}$ = Market Price of Risk = slope

= Market attitude towards risk

= Risk premium or risk reward

= Excess return per of risk

= λ (Lambda)

$$\boxed{R_p = R_f + \lambda \times \sigma_p}$$

This R_f & Risky assets concept by J. Tobin

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Capital Market Theory

Aim: Concept of Risk — SR / USR

Reln of Risk with Mkt

Jaisa Risk waisa Return

- Mkt P/F or Index
- Risk free Rate of return
- Mkt Rate of Return
- Characteristic Line
- TR, SR, USR
- P.F Beta Mgmt
- Sharpe Single Index Model

Mkt P/F / Index

⇓

formed by replicating mkt index

Rf Rate of Return

⇓

- Govt Securities
- Issued at disc & redeemed at par
- Avg Rf can be used
- Rf adj Nominal

Multiplicative   Additive

Mkt Rate of return

R_m = Avg Cap growth rate + Avg Div Yield

or

CAGR + Avg DY

or

$\frac{\text{Total returns}}{\text{Total Cost}}$ = WA Return

↓

$(1 + R_{f\,real})(1 + \text{Infln})(1 + \text{Risk Prem}) - 1$

↓

$(R_{f\,real} + \text{Infln} + \text{Risk Prem})$

↓

Sharpe assumed

Characteristic Line

or

Regression Line

Relationship between R_m & R_s

$$y = a + bx$$

$$\boxed{R_s = \alpha + \beta \times R_m + \epsilon}$$

α = R_s when R_m is 0 = +ve / -ve

β = slope = $\frac{\Delta R_s}{\Delta R_m}$

α & β are obtained using normal eqns!

$\alpha = a$, $\beta = b$

(i) $\Sigma y = na + b\Sigma x \Rightarrow a = \bar{y} - b.\bar{x}$

(ii) $\Sigma xy = a\Sigma x + b\Sigma x^2 \Rightarrow$ by putting a here,

$$b = \frac{Cov(x,y)}{\sigma_x^2}$$

$\therefore \alpha = \bar{R_s} - \beta \times \bar{R_m}$

$$\beta = \frac{Cov(R_s, R_m)}{\sigma_m^2} = r_{sm} \times \frac{\sigma_s}{\sigma_m}$$

(SR)

(Base mein market hai)

ϵ = Error term $\Rightarrow$ Act R_s vs Est R_s

(USR)

β can be negative,

Multiple values of β = select highest one

$\boxed{TR, SR, USR}$

$\boxed{\text{Security}}$

1. $TR = \sigma_s^2$

$\boxed{\text{Portfolio}}$

1. $TR = \sigma_p^2$

· (2 security)

$= (W_A \sigma_A)^2 + (W_B \sigma_B)^2$

2. $\underline{SR} = r_{sm}^2 \times \sigma_s^2$

r^2 = co-eff of determination

$= \beta_s^2 \times \sigma_m^2$

3. $\underline{USR} = (1 - r_{sm}^2) \times \sigma_s^2$

Residual variance $= \sigma_e^2$

$+ 2(W_A \sigma_A)(W_B \sigma_B) \times r_{AB}$

$$\boxed{\begin{aligned} r_{AB} &= r_{Am} \times r_{Bm} \\ Cov(A,B) &= \beta_A \times \beta_B \times \sigma_m^2 \end{aligned}}$$

3. $\underline{SR} = r_{pm}^2 \times \sigma_p^2$

$= \beta_p^2 \times \sigma_m^2$

$\boxed{\beta_p : \text{W Avg beta}}$

3. $\underline{USR} = (1 - r_{pm}^2) \times \sigma_p^2$

$= (W_A \sigma_{e_A})^2 + (W_B \sigma_{e_B})^2$

[Relate with r=0]

TR Calculation

MPT = Upto 3 securities - OK
Beyond 3 " - complex

CMT - No issue as such

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P/f Beta Mgmt

- P/f Beta = Wtg beta
- Can P/f beta be reduced? ⟹ by investing in Rf (Rf Beta = 0)

To reduce beta

Op1: Invest in Rf along with current investment

Op2: Sell current inv & invest in Risk free.

Sharpe's Single Index Model

$$R_s = \alpha + \beta \times R_m + \epsilon$$

$$R_p = \alpha + \beta_p \times R_m + \epsilon$$

With Rf inv → based on excess return

$$(R_s - R_f) = \alpha + \beta_s \times (R_m - R_f) + \epsilon$$

$$(R_p - R_f) = \alpha + \beta_s \times (R_m - R_f) + \epsilon$$

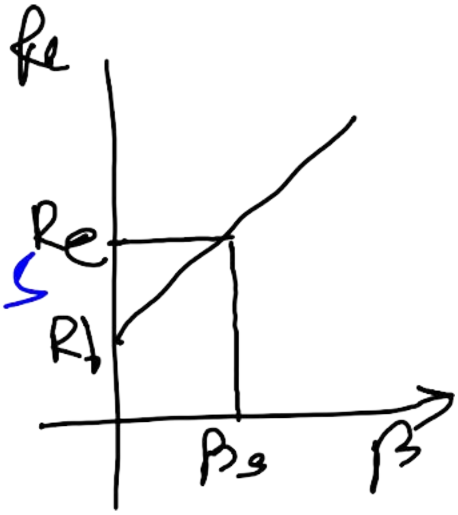
ASSET PRICING

- SML & CAPM
- Arbitrage Pricing Theory

SML & CAPM

- SML
- CAPM
- CAPM for P/F
- Assumptions of CAPM
- Tax Adj CAPM
- Levered & Unlevered Beta
- Pure Play Tech & Asset Beta

(a) SML



- $R_e = R_f + (R_m - R_f)\beta$
- Reln between beta & returns
- $R_f \Rightarrow$ Beta $= 0$
  $R_m \Rightarrow$ Beta $= 1$

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- Risk Premium / MP of Risk = $R_m - R_f$

(b) CAPM

CAPM eqn $\Rightarrow$ $\boxed{R_e = R_f + (R_m - R_f) \times \beta}$

objective = Fair Price / hurdle rate to evaluate the projects

To find fair price

Step 1: R_e = desired return

Step 2: Fair Price = $\frac{D_1}{R_e - g}$

AP < FP $\Rightarrow$ $E(R) > R_e$ $\Rightarrow$ underprice : Buy

AP > FP $\Rightarrow$ $E(R) < R_e$ $\Rightarrow$ Overprice : Sell

AP = FP $\Rightarrow$ $E(R) = R_e$ $\Rightarrow$ I/Diff = Neither buy / Nor sell

Alpha = addl return (diff from Characteristic Line)

$\boxed{= E(R) - R_e}$

α = positive : Buy = underpriced

ie $\boxed{E(R) = R_e + \alpha}$ (can be for both security / P/F)

(c) CAPM for P/F

$R_p = R_f + (R_m - R_f) \times \boxed{\beta_p}$

Or
= WAvg Re as per CAPM

If for diff yrs, diff α is coming, take **Simple Avg.**

Past Yr's Alpha = $\boxed{\text{Act Ret.}}$ − Re_{CAPM}

$\beta < 1 \Rightarrow$ Defensive

$\beta > 1 \Rightarrow$ Aggressive

(d) **Assumptions of CAPM**

1. Cap mkt is perfectly competitive
2. Homogeneous expectns, risk
3. No tax / div / CG
4. Same time horizon − investors & arbitragers

(e) **Tax Adjusted CAPM** − Michael Brennan

Tax rate	Preference
High	Low Yield, High Cap Gain
Low	High Yield, Low Cap gain

Eq price also depends on tax rate

S1 Tax factor :-

$$T = \frac{T_D - T_g}{1 - T_g}$$

T_D = Tax on dividend

T_g = Tax on LTCG

S2 Expected return under CAPM

$$\boxed{R_e = R_f(1-T) + \beta\left[R_m - R_f(1-T) - T \times D_m + T \times D_s\right]}$$

D_m = Div Yield on mkt

D_s = Div Yield on Sec.

T = Tax Factor

Q23

(b) Levered & Unlevered beta - Robert Hamada

Levered beta = Operating risk + fin risk

Unlevered beta : Operating risk

$$\boxed{\beta_L = \beta_{UL} \times \left[1 + \frac{D(1-t)}{E}\right]}$$

t = tax rate

(g) Pure Play / Asset beta / Project beta

$R_0 \Rightarrow$ WA Return of Re & Rd

$\Rightarrow Re = R_f + (R_m - R_f) \times \beta_e$

$Rd = R_f + (R_m - R_f) \times \beta_D$

usually 0, if given, use it

$$\boxed{WAvg = Re \times \frac{E}{D+E} + Rd \times \frac{D}{D+E}}$$

OR

$$\boxed{R_f + (R_m - R_f) \times \text{Asset beta}}$$

Asset beta $\Rightarrow$ $B_{Asset} = B_{Liab}$

Case 1

B/S	
Eq ✓	Assets ✓
=	=

$B_E = B_{Asset}$

= Op risk

= Unlevered beta

Case 2

B/S	
Eq ✓	PA ✓
	PB ✓
	PC ✓
=	=

B_E = WA beta of projects

= WA Op risk

= WA Unlev beta

Case 3

B/S	
Eq ✓	Assets ✓
Debt ✓	
=	=

B_E = levered beta

= Op risk + Fin risk

When no debt

β_E = Asset beta = Project beta

= Unlevered beta

$= \beta_{UL} \times \left[1 + \frac{D}{E}(1-t)\right]$

When there is debt

β_E = Levered beta = $\beta_{UL} \times \left[1 + \frac{D}{E}(1-t)\right]$

Valuation of Pvt Ltd Co. = Pure Play Technique

For valn of Pvt Co.s — Beta is not available.

So, we use proxy beta.

Step 1 Proxy firm = Similar firm in same business

- must be a listed Co.

Step 2 Proxy beta = Beta of proxy firm

⇓

This is a levered beta

Step 3 Unlever the Proxy beta

$\beta_L = \beta_{UL} + \left[1 + \frac{D}{E}(1-t)\right]$

Find this

↓

Op Risk

Proxy firm's

Step 4 Relever the unlevered proxy beta

$$\beta_L = \beta_{UL} \times \left[1 + \frac{D}{E}(1-t)\right]$$

β_{UL} ↑ $\boxed{\text{Step 3}}$

$\frac{D}{E}$ ↓ Pvt Ltd firm's

Step 5 Re of Pvt Ltd firm

$$R_f + (R_m - R_f) \times \boxed{\beta_L}$$

β_L ↓ Step 4

ARBITRAGE PRICING THEORY

– Stephen Rose

- Multi Index Model / Multi factors
- Risk Prem = Factor Premium = Factor Return − R_f
- $Re = R_f + (\text{Factor Prem}_1 \times \beta_1) + (FP_2 \times \beta_2) + \ldots$
- β_1 = Sensitivity of Returns with factor return
- Alpha = It doesn't exist longer because of arbitrage.

- Each investor invest in their unique P/F
- One Can Create Arbitrage P/F

Zero Inv, Zero Risk & positive Returns

Zero Inv → Long, Short/borrowings

- Beta of P/F

Case I - Long & Short

$W_A B_A - W_B B_B$

(Long) (Short)

Case II Long, Short & Borrowings

⇓

$W_A B_A - W_B B_B - W_C B_C$

Multifactor Macro Economic Model

APT	MFMEM
$Re = R_f + RP_1 \times \beta_1 + RP_2 \times \beta_2 + \ldots$	$Re = E(R) + (Shock_1 \times \beta_1 + Shock_2 \times \beta_2 + \ldots)$
	Shock = AR − Exp Return

PORTFOLIO PERFORMANCE EVALUATION

- Measures of Return
- Sharpe Ratio
- Treynor Ratio
- Jensen's Alpha
- Style Analysis
- Attribution Analysis

Measures of Return

Rupee weighted Rate of Return (RWROR)
OR
Money weighted Rate of Return (MWROR)

→ for P/F perf

$\boxed{\text{IRR of the P/F}}$

CF

$$(1000) = \frac{100}{1+r} + \frac{150}{(1+r)^2} + \frac{1500}{(1+r)^3}$$

Time Weighted Rate of Return (TWROR)

For Mgr's perf.

Investment

r = RwROR

CF are Reinvested

CF are withdrawn

$$\text{TwROR} = \frac{M_1}{M_0+C_0} \times \frac{M_2}{M_1+C_1} \times \frac{M_3}{M_2+C_2} - 1$$

M_1 = MV at Y_1

C_0 = CF or addl inc at Y_0

$$\text{TwROR} = \frac{M_1}{M_0-C_0} \times \frac{M_2}{M_1-C_1} \times \frac{M_3}{M_2-C_2} - 1$$

Sharpe Ratio	Treynor Ratio	Jensen's Alpha
$= \frac{R_p - R_f}{\sigma_p}$ or $\frac{R_s - R_f}{\sigma_s}$	$= \frac{R_p - R_f}{\beta}$	Alpha $= E(R) - R_e$ as per CAPM

$\sigma = SR + USR$

- To compare P/F / m/f or Securities performance.
- When investment is made in only One P/F / mf / sec

$\beta = S\text{Risk}$.

To compare a well diversified P/F [$\because USR = 0$]
or
actively managed P/F

Alpha = +ve
= good Return

Appraisal Ratio

$$= \frac{\text{Alpha}}{USR}$$

= Ability of P/F Mgr to diversify

Higher the value, better is the performance

Reward to Volatility Ratio : $\dfrac{\text{Excess Return}}{\text{Risk}}$

Risk → Sharpe: σ — follow this if Question is silent.

Risk → Treynor: β

Style Analysis

Selection Style

Picking the right Security & the amt to be allocated

Mkt timing Style

When to buy
⇓
depends on macro economic Conditions

Style Box

Holding Based

Morning Star allocn %

	Value	Growth	Blend
Large Cap			
Mid Cap			
Small Cap			

Return Based

Category	Bench mark Return	Act Return	Δ
Equity			
Large Cap			
- Growth	✓	✓	✓
- Value	✓	✓	✓
Mid Cap			
Debt	✓	✓	✓

Limits: It may become inconsistent

William Sharpe

$\boxed{\text{Attribution Analysis}}$

$\boxed{\text{Asset Allocn}}$ (% Δ in weight)

$$\left(\text{Act Weight \%} - \text{Benchmark weight \%}\right) \times \text{Benchmark Return}$$

↓

Like MVV

$\boxed{\text{Selection of Asset}}$

(% Δ in Return)

$$\left(\text{Act Return \%} - \text{Benchmark Return \%}\right) \times \text{Act Weight}$$

⇓

Live MPV

Liked our efforts?

The fees that you may pay to us is your REFERENCE.

Please refer your friends or family to take all classes of CA/CMA only from SJC Institute.

Thank You.