

MUTUAL FUNDS CLASS 4

CLASS WORK COVERAGE

To streamline our learning process, I've categorized the questions we'll tackle in class into four distinct groups:

1. **Classic:** *These questions are exactly as presented in your book, providing a familiar foundation.*
2. **Transformed:** *Here, we've converted book questions into multiple-choice format to enhance your analytical skills.*
3. **Adapted:** *These are similar to book questions but with altered numbers or names, presented as multiple-choice questions for varied practice.*
4. **Original:** *These are entirely new questions not found in your book, designed to challenge and expand your understanding.*

This structure will help us navigate through a range of problems, ensuring a comprehensive grasp of the material. Looking forward to our next session!

Q. No	Type	Book	Page No.
29	Classic	CW Q BOOK	87
30	Classic	CW Q BOOK	88
31	Classic	CW Q BOOK	88
32	Classic	CW Q BOOK	89
33	Classic	CW Q BOOK	89
35	Classic	CW Q BOOK	90

PART IV: PERFORMANCE EVALUATION AND OTHER TOPICS
Topic 14 PERFORMANCE APPRAISAL
Question 29: SSEI CW Book Page No. 87

Five portfolios experienced the following results during a 7- year period:

Portfolio	Average Annual Return (R_p) (%)	Standard Deviation (S_p)	Correlation with the market returns (r)
A	19.0	2.5	0.840
B	15.0	2.0	0.540
C	15.0	0.8	0.975
D	17.5	2.0	0.750
E	17.1	1.8	0.600
Market Risk (σ_m)	-	1.2	
Market rate of Return (R_m)	14.0		
Risk-free Rate (R_f)	9.0		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha
 (Source: ICAI)

ANSWER:

Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

Portfolio beta (β_p) = $\sigma_p r / \sigma_m$

Required portfolio return (R_p) = $R_f + \beta_p (R_m - R_f)$

Portfolio	Beta	Return from the portfolio (R_p) (%)
A	1.75	17.75
B	0.90	13.50
C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	Sharpe Method		Treyner Method		Jensen's Alpha	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

Question 30: SSEI CW Book Page No. 88

Consider the following information about the return on Classic Mutual Fund, the market return and the T-bill returns:

Year	Classic Mutual Fund	Market Index	T-bills
1994	17.1	10.8	5.4
1995	-14.6	-8.5	6.7
1996	1.7	3.5	6.5
1997	8.0	14.1	4.3
1998	11.5	18.7	4.1
1999	-5.8	-14.5	7.0
2000	-15.6	-26.0	7.9
2001	38.5	36.9	5.8
2002	33.2	23.6	5.0
2003	-7.0	-7.2	5.3
2004	2.9	7.4	6.2
2005	27.4	18.2	10.0
2006	23.0	31.5	11.4
2007	-0.6	-4.9	14.1
2008	21.4	20.4	10.7

The following additional information is available regarding the comparative performance of five mutual funds:

	Return (%)	Standard Deviation (%)	Beta	
Alpha	1.95	20.03	0.983	0.819
Beta	11.57	18.33	0.971	0.881
Gama	8.41	22.92	1.169	0.816
Rho	9.05	24.04	1.226	0.816
Theta	7.86	15.46	0.666	0.582

From the above information, calculate all the inputs required for determining the Sharpe's Ratio, Treynor's ratio and Jensen's ratio.

(Source: ICAI)

ANSWER:

Classic (R_i)	Market Index (R_m)	T-bills (R_p)	$R_i - R_p$	$R_m - R_p$
17.1	10.8	5.4	11.70	5.4
-14.6	-8.5	6.7	-21.30	-15.20
1.7	3.5	6.5	-4.8	-3.00
8.0	14.1	4.3	3.7	9.8
11.5	18.7	4.1	7.4	14.6
-5.8	-14.5	7.0	-12.8	-21.5
-15.6	-26.0	7.9	-23.5	-33.9
38.5	36.9	5.8	32.7	31.1
33.2	23.6	5.0	28.2	18.6
-7.0	-7.2	5.3	-12.3	-12.5
2.9	7.4	6.2	-3.3	1.2
27.4	18.2	10.0	17.4	8.2
23.0	31.5	11.4	11.6	20.1
-0.6	-4.9	14.1	-14.7	-19.0
21.4	20.4	10.7	10.7	9.7
Average 9.406	Average 8.267	Average 7.36		
Standard Deviation 16.40	Standard Deviation 17.126	Standard Deviation 2.815		

Sharpe's measure index $S = (R_p - R_f)/\sigma_p$

Where,

R_p = Average Return on portfolio

R_f = Risk-free rate of return

σ_p = Standard deviation of portfolio

Classic Mutual Fund- $S_p = R_p - R_f/\sigma_p = 9.407 - 7.360/16.4 = 0.125$

Market Index- $S_p = R_m - R_f/\sigma_m = 8.267 - 7.360/17.126 = 0.053$

Classic Mutual Fund is better on the basis of the Sharpe's measure.

Treynor's measure

$T = (R_p - R_f)/\beta_p$

β_p = Beta value of portfolio.

Using regression technique to find Beta

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$$

After making calculation by taking Market Index as (x) and Classic Mutual Fund as (y) the values are

Market Index (x)	(x) ²	Classic (y)	(y) ²	(xy)
10.8	116.64	17.1	292.41	184.68
-8.5	72.25	-14.6	213.16	124.1
3.5	12.25	1.7	2.89	5.95
14.1	198.81	8.0	64.00	112.8
18.7	349.69	11.5	132.25	215.05
-14.5	210.25	-5.8	33.64	84.1
-26.0	676.00	-15.6	243.36	405.6
36.9	1361.61	38.5	1482.25	1420.65
23.6	556.96	33.2	1102.24	783.52
-7.2	51.84	-7.0	49.00	50.4
7.4	54.76	2.9	8.41	21.46
18.2	331.24	27.4	750.76	498.68
31.5	992.25	23.0	529.00	724.5
-4.9	24.01	-0.6	0.36	2.94
20.4	416.16	21.4	457.96	436.56

$\Sigma x^2 = 5424.72$	$\bar{y} = 9.406$
$\Sigma y = 141.1$	$\bar{x} = 8.267$
$\Sigma y^2 = 5361.69$	$n = 15$
$\Sigma xy = 5070.99$	

Substituting values in the above equation

$$b = \frac{5070.99 - 15 \times 9.406 \times 8.267}{5424.72 - 15 \times (8.267)^2} = \frac{3904.59}{4399.57} = 0.88$$

$$a = \bar{y} - b\bar{x} = 9.406 - 0.88 \times 8.267 = 2.13$$

From above calculation Beta value of security = 0.88

Treynor's measure of Classic Mutual Fund - $T_1 = 9.407 - 7.360/0.88 = 2.32$

Treynor's measure of Market Index- $T_m = 8.267 - 7.360/1.00 = 0.907$

Jensen's performance measure

$$\bar{R}_{jt} - R_{jt} = \alpha_j + \beta_j (\bar{R}_{mt} - R_{ft})$$

Where,

\bar{R}_{jt} = Average return on portfolio j for period t

R_{ft} = Risk less rate of interest for period t

α_j = Intercept that measures the forecasting ability of the portfolio manager

β_j = A measure of systematic risk

\bar{R}_{mt} = Average return of a market portfolio for period t.

Substituting values in the above equation = $9.406 - 7.360 = \alpha_j + 0.88 (8.267 - 7.360)$

$$\alpha_j = 2.046 - 0.798 = 1.248$$

Question 31: SSEI CW Book Page No. 88

Following is the historical performance information is available of the capital market and a Tomplan Mutual Fund.

Year	Tomplan Mutual Fund Beta	Tomplan Mutual Fund return %	Return on market index %	Return on Govt. securities %
2001	0.90	-3.00	-8.50	6.50
2002	0.95	1.50	4.00	6.50
2003	0.95	18.00	14.00	6.00
2004	1.00	22.00	18.50	6.00
2005	1.00	10.00	5.70	5.75
2006	0.90	7.00	1.20	5.75
2007	0.80	18.00	16.00	6.00
2008	0.75	24.00	18.00	5.50
2009	0.75	15.00	10.00	5.50
2010	0.70	-2.00	8.00	6.00

- a. From above information you are required to calculate the following risk adjusted return measures for the measures for the Tomplan:
 - i. Reward-to-variability ratio
 - ii. Reward-to-volatility ratio
- b. Comment on the mutual fund's performance.

(Source: ICAI)

ANSWER:**Working Notes:**

(1) Calculation of average of these four variables

Year	Tomplan Mutual Fund Beta	Tomplan Mutual Fund return %	Return on market index %	Return on Govt. securities %
2001	0.90	-3.00	-8.50	6.50
2002	0.95	1.50	4.00	6.50
2003	0.95	18.00	14.00	6.00
2004	1.00	22.00	18.50	6.00
2005	1.00	10.00	5.70	5.75
2006	0.90	7.00	1.20	5.75
2007	0.80	18.00	16.00	6.00
2008	0.75	24.00	18.00	5.50
2009	0.75	15.00	10.00	5.50
2010	0.70	-2.00	8.00	6.00
Total	8.7	110.5	86.9	59.5
Average	0.87	11.05	8.69	5.95

Thus, the averages are as follows:

Mutual fund beta = 0.87

Mutual fund return = 11.05 per cent

Return on market index = 8.69 per cent

Return on Govt. securities = 5.95 per cent

(2) Standard deviation of returns of Tomplan Mutual fund

Year	Mutual fund returns (X)	X ²
1	-3.00	9.00
2	1.50	2.25
3	18.00	324.00
4	22.00	484.00
5	10.00	100.00
6	7.00	49.00
7	18.00	324.00
8	24.00	576.00
9	15.00	225.00
10	-2.00	4.00
Total	110.50	2097.25

$$\begin{aligned} \sigma_p &= \sqrt{\frac{N\sum X^2 - (\sum X)^2}{N^2}} \\ &= \sqrt{\frac{(10 \times 2097.25) - (110.5)^2}{10 \times 10}} \\ &= \sqrt{\frac{20972.50 - 12210.25}{100}} \\ &= \sqrt{87.62} = 9.36 \text{ per cent} \end{aligned}$$

(3) Standard deviation of returns on the market index

Year	Return on market index (X)	X ²
1	-8.50	72.25
2	4.00	16.00
3	14.00	196.00
4	18.50	342.25
5	5.70	32.49
6	1.20	1.44
7	16.00	256.00
8	18.00	324.00
9	10.00	100.00
10	<u>8.00</u>	<u>64.00</u>
Total	<u>86.90</u>	<u>1404.43</u>

$$\begin{aligned} \sigma_m &= \sqrt{\frac{N\sum X^2 - (\sum X)^2}{N^2}} \\ &= \sqrt{\frac{(10 \times 1404.43) - (86.90)^2}{10 \times 10}} \\ &= \sqrt{\frac{14,044.30 - 7551.61}{100}} \\ &= \sqrt{64.93} \\ &= 8.06 \end{aligned}$$

(a) (i) Reward to variability ratio or Sharpe ratio

For Tomplan Mutual Fund

$$SR = \frac{r_p - r_f}{\sigma_p}$$

$$SR = \frac{11.05 - 5.95}{9.36} = 0.545$$

For Market

$$SR = \frac{r_m - r_f}{\sigma_m}$$

$$SR = \frac{8.69 - 5.95}{8.06} = 0.34$$

(ii) Reward to volatility ratio or Treynor ratio

For Tomplan Mutual Fund

$$TR = \frac{r_p - r_f}{\beta_p}$$

$$= \frac{11.05 - 5.95}{0.87} = 5.86$$

For Market

$$TR = \frac{r_m - r_f}{\beta_m}$$

$$= \frac{8.69 - 5.95}{1} = 2.74$$

(b) Mutual fund performance

Ratios of the mutual fund and the market is as follows:

Ratio	Mutual fund	Market index
Sharpe ratio	0.545	0.34
Treynor ratio	5.86	2.74

Thus from above it is clear that the Tomplan Mutual fund has performed better than the market.

Question 32: SSEI CW Book Page No. 89

Following are the details of closed ended equity schemes of two mutual funds as on 31/08/2021:

Particulars	AJ Mutual Fund	RP Mutual Fund
NAV (p.u.)	₹ 80 (consisting 95% equity & remaining cash balance)	₹ 61 (consisting ₹ 60 equity & remaining cash balance)
Sharpe Ratio	1.5	3
Treynor Ratio	1.2	10
Standard Deviation	10	6

There is no change in portfolios during the September month.

Monthly cost is ₹ 0.50 per unit for each mutual fund scheme.

Share market rose by 2% in the month of September.

You are required to calculate Expected NAV p.u. as on 30/09/2021 for both the schemes.

(Source: ICAI)

ANSWER:**Working Notes:****(i) Decomposition of Funds in Equity and Cash Components**

	AJ Mutual Fund	RP Mutual Fund
NAV on 31.08.21	₹ 80.00	₹ 61.00
% of Equity	95%	98.36%
Equity element in NAV	₹ 76.00	₹ 60.00
Cash element in NAV	₹ 4.00	₹ 1.00

(ii) Calculation of Beta**(a) AJ Mutual Fund**

$$\text{Sharpe Ratio} = 1.5 = \frac{E(R) - R_f}{\sigma_{AJ}} = \frac{E(R) - R_f}{10}$$

$$E(R) - R_f = 15$$

$$\text{Treynor Ratio} = 12 = \frac{E(R) - R_f}{\beta_{AJ}} = \frac{15.00}{\beta_{AJ}}$$

$$\beta_{AJ} = 15.00/12 = 1.25$$

(b) RP Mutual Fund

$$\text{Sharpe Ratio} = 3 = \frac{E(R) - R_f}{\sigma_{RP}} = \frac{E(R) - R_f}{6}$$

$$E(R) - R_f = 18$$

$$\text{Treynor Ratio} = 10 = \frac{E(R) - R_f}{\beta_{RP}} = \frac{18}{\beta_{RP}}$$

$$\beta_{RP} = 18/10 = 1.80$$

(iii) Increase in the Value of Equity

	AJ Mutual Fund	RP Mutual Fund
Market rose by	2.00%	2.00%
Beta	1.25	1.80
Equity component goes up	2.50%	3.60%

(iv) Balance of Cash after 1 month

	AJ Mutual Fund	RP Mutual Fund
Cash in Hand on 30.09.21	₹ 4.00	₹ 1.00
Less: Exp. Per month	₹ 0.50	₹ 0.50
Balance after 1 month	₹ 3.50	₹ 0.50

NAV after 1 month

	AJ Mutual Fund	RP Mutual Fund
Value of Equity after 1 month		
$76 \times (1 + 0.025)$	₹ 77.90	-
$60 \times (1 + 0.036)$	-	₹ 62.16
Cash Balance	₹ 3.50	₹ 0.50
NAV	₹ 81.40	₹ 62.66

Question 33: SSEI CW Book Page No. 89

The returns of a portfolio A and market portfolio for the last 12 months are indicated as follows:

Month	Portfolio A	Market Portfolio
January	- 0.52	0.82
February	2.20	0.04
March	2.17	2.80
April	4.17	1.72
May	2.04	0.27
June	3.00	0.39
July	1.99	1.95
August	4.00	0.64
September	-1.38	1.53
October	2.67	2.70
November	3.99	2.52
December	1.86	2.09
Standard Deviation (σ)	1.6223	0.9498

- i. You are required to find out the monthly returns attributable to the sheer skill of the Portfolio Manager.
- ii. What part of the monthly return is attributable to the higher risk assumed by the Portfolio Manager?

Assume that the risk-free rate of return is 12% per annum and the portfolio is fully diversified.

(Source: ICAI)

ANSWER:

i. The monthly risk free rate of return = $(12\%/12) = 1\%$

January	-0.52	0.82
February	2.20	0.04
March	2.17	2.80
April	4.17	1.72
May	2.04	0.27
June	3.00	0.39
July	1.99	1.95
August	4.00	0.64
September	-1.38	1.53
October	2.67	2.70
November	3.99	2.52
December	1.86	2.09
	26.19	17.47
Average Returns	2.1825	1.4558

Average Portfolio Return (R_p) = 2.1825

Average Portfolio Return (R_m) = 1.4558

Portfolio Risk (σ_p) = 1.6223

Market Risk (σ_m) = 0.9498

Since portfolio A is fully diversified then it can be computed with a portfolio whose beta (β) can be found as follows:

$$\sigma_m^2 \times \beta^2 = \sigma_p^2$$

$$\beta = \frac{\sigma_p}{\sigma_m} = \frac{1.6223}{0.9498} = 1.708$$

Therefore, portfolio A is comparable to a portfolio whose Beta is 1.708.

Expected monthly returns on such portfolio can be calculated as follows:

$$R_p^1 = R_f + \beta(R_m - R_f)$$

$$= 1\% + 1.708 (1.4558\% - 1.0000\%)$$

$$= 1.7785\%$$

$$\text{Return due to the net selectivity} = R_p - R_p^1$$

$$= 2.1825\% - 1.7785\%$$

$$= 0.404\% \text{ per month}$$

ii. The returns due to higher risk assumed by the portfolio manager

$$= 1.7785\% - 1.4558\% = 0.3227\% \text{ per month}$$

Question 35: SSEI CW Book Page No. 90

A mutual fund's opening NAV is ₹ 20 and its closing NAV is ₹ 24. If the expense per unit is ₹ 0.50, what is the expense ratio?

(Source: ICAI)

ANSWER:

$$\begin{aligned} \text{Expense Ratio} &= (\text{Expense incurred per unit} / \text{Average NAV}) \\ &= 0.50 / (20+24) / 2 = 2.27 \end{aligned}$$