Managing Portfolio

Chapter-11

MANAGING PORTFOLIO

A portfolio of investment means combining investment into more than one assets. The basic idea behind forming a portfolio is to reduce investment risk. A portfolio can reduce risk sometimes even without sacrisfying the return.

The portfolio policy and objectives play an important role in asset allocation while forming the portfolios.

* Measurement of the performance of Investment vehicles:

The return performance of each individual investment is measured in terms of holding period Return (HPR). A holding period return is a total rate of return realized from investment over a period of time, usually one year or less. The holding period return contains two types of returns:

i. Cash Income

ii. Capital Gain

- HPR for Stocks and Bonds:

The holding period return from common stock contains both cash income received in the form of dividend and capital gain or loss resulted from the change in stock price at the end of period as compared to the beginning.

$$\therefore HPR = \frac{V_1 - V_0 + C}{V_0} \times 100$$

where,

V_1 = Ending value of investment

V_0 = Beginning value of investment

$V_1 - V_0$ = Capital Gain or loss

C = Current income (Dividend on stock or Interest on bond)

- HPR Again,

After tax HPR = HPR $(1-t)$

where,

t = tax rate

- HPR for Mutual Funds:

The holding period return on mutual fund contains investment income dividend and capital gain dividend. Note that investment income dividend and capital gain dividend distributed to investors are treated as current cash income since they are paid in cash.

$$\therefore HPR = \frac{NAV_1 - NAV_0 + ID_1 + CG_1}{NAV_0} \times 100$$

Where,

NAV_1 = Net Assets value at the end of the year.
NAV_0 = Net Assets value at the beginning of the year
ID_1 = Income dividend at the end of the year
CG_1 = Capital Gain at the end of the year.

- HPR for Options and Futures:

The only income that an options and futures holder realizes is the capital gain which results from the change in options or futures value at the end of period as compared to the beginning.

$$\therefore HPR = \frac{\text{Ending value} - \text{Beginning value}}{\text{Beginning value}}$$

- HPR for portfolio.

The holding period return on portfolio contains two types of income: ordinary or current income and capital gain. The current income comes from dividends and interest on the stocks and bonds respectively whereas capital gain comes from the change in market value of securities.

$$\therefore \text{HPR for portfolio} = \frac{RCG + UCG + C}{E_0 + \left(NF \times \frac{ip}{12}\right) - \left(WF \times \frac{wp}{12}\right)}$$

where,

RCG = Realized capital Gain
UCG = Unrealized capital Gain
C = Dividend and interest received
E_0 = Initial equity investment
NF = New Fund
ip = number of months in portfolio
WF = withdrawn funds
wp = number of months withdrawn from portfolio.

* Comparison of portfolio Return with overall Market Measures:

After measuring portfolio return it is compared with the broad market measure like NEPSE, S & P500 to conclude whether the portfolio is doing better than the market as a whole. Note that such comparison only takes into account the return but does not consider the risk.

So, we should use risk-adjusted measure of rate of return to compare the portfolio performance such as Sharpe's measure, Treynor's measure and Jensen's measure.

• Sharpe's Measure of portfolio performance:

Sharpe's measure of portfolio performance is developed by William F. Sharpe. This measure provides a portfolio performance index that compares a portfolio's risk premium to the total risk associated with the portfolio. The portfolio's total risk is measured by the standard deviation of portfolio's return.

$$\therefore S_P = \frac{R_P - R_F}{\sigma_P}$$

Where,

S_P = Sharpe's index of portfolio performance measure

R_P = Total rate of return on portfolio

R_f = The risk free rate of return
σ_p = The standard deviation of portfolio return

For Market:

Sharpe's measure for market portfolio:

$$S_m = \frac{R_m - R_f}{\sigma_m}$$

Where,
R_m = Return on market
R_f = Risk free rate
σ_m = Standard deviation of markets

- **Treynor's Measure of portfolio performance.**

Treynor's measure of portfolio performance is developed by Jack L. Treynor. This measure provides a portfolio performance index that compares a portfolio's risk premium to the systematic risk. It is measured by an index of systematic risk called beta.

$$\therefore T_p = \frac{R_p - R_f}{\beta_p}$$

Where,
β_p = The beta coefficient of the portfolio

For market:

$$T_m = \frac{R_m - R_f}{\beta_m}$$

Where,

T_m = Treynor's index of market performance measure
R_m = Return on market
R_f = Risk free Rate
β_m = Beta coefficient of market = 1

- Jensen's measure of portfolio performance:

Jensen's measure of portfolio performance is developed by Michel C. Jensen. Jensen's measure of portfolio performance calculates the Jensen's Alpha which is the excess of portfolio return above the required rate of return on the portfolio measured by CAPM.

$$\therefore A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$

Where,

A_p = Jensen's Alpha
R_p = Portfolio Return
R_f = Risk free rate
R_m = market return
β_p = Portfolio Beta

* Why sharpe's and Treynor's measure are different?

Sharpe's and Treynor's measure of portfolio performance differs with each other in terms of methodology and assumptions. Sharpe's measure takes into account total risk measured by standard deviation of portfolio while treynor's measure considers systematic risk measured by beta.

Problem 11.7

Soln

Given:

Return on portfolio (R_p) = 11.8%

Standard deviation on portfolio (σ_p) = 14.1%

Risk free Rate (R_f) = 6.2%

Return on market (R_m) = 9%

Standard deviation on market (σ_m) = 9.4%

a. Sharpe's measure for Yamuna's portfolio:

$$S_p = \frac{R_p - R_f}{\sigma_p} = \frac{11.8\% - 6.2\%}{14.1\%}$$

$$= 0.3972$$

b. The sharpe's measure for Yamuna's portfolio is 0.3972 where as of Rabina's portfolio is 0.43. Lower value of sharpe's measure for Yamuna's portfolio implies that it offered lower risk premium per unit of total risk as compared to that of Ravina's portfolio. So, Ravina's portfolio performed better.

c. Sharpe's measure for market portfolio:

$$S_m = \frac{R_m - R_f}{\sigma_m} = \frac{9\% - 6.2\%}{9.4\%} = 0.2979$$

d. The sharpe's measure for yamuna's portfolio is 0.3972 where as of market portfolio is 0.2979. Higher value of Sharpe's measure for Yamuna's portfolio implies that it offered higher risk premium per unit of total risk as compared to the market. Yamuna's portfolio has outperformed the market during the year just ended.

Problem 11.8

Soln

Given:

Portfolio Beta (β_p) = 0.90

Return on portfolio (R_p) = 8.6%

Risk free Rate (R_f) = 7.3%

Return on market (R_m) = 9.2%

a. Treynor's measure for Ashish's portfolio

$$T_p = \frac{R_p - R_f}{\beta_p} = \frac{8.6\% - 7.3\%}{0.90} = 1.44$$

b. The Treynor's measure for Ashish's portfolio is 1.44 and for Bishai's portfolio is 1.25. Higher value of Treynor's measure for Ashish's portfolio implies that it offered higher risk premium per unit of systematic risk as compared to that of Bishai's portfolio. Thus, Ashish's portfolio showed superior performance.

c. Treynor's measure for market portfolio,

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{9.2\% - 7.3\%}{1} = 1.9$$

d. The Treynor's measure for Ashish's portfolio is 1.44. which is lower than that of market portfolo 1.9. Lower value of Treynor's measure for Ashish's portfolio implies that it offered lower risk premium per unit of systematic risk as compared to the market. Thus, market portfolio has outperformed Ashish's portfolio during the year just ended.

Problem 11.9

Soln

Given:

Return on portfolio (R_p) = 17.60 %

Standard deviation of portfolio (σ_p) = 15.20 %

Beta of portfolio (β_p) = 1.2

Return on market (R_m) = 18.40 %

Standard deviation of market (σ_m) = 20.40 %.

Risk free Rate (R_f) = 5 %

a. Treynor's measure of the portfolio:

$$T_p = \frac{R_p - R_f}{\beta_p} = \frac{17.60\% - 5\%}{1.2} = 10.5$$

Treynor's measure for market:

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{18.40\% - 5\%}{1} = 13.4$$

According to Treynor's measure the portfolio performance is inferior than the market since its risk premium per unit of systematic risk is lower than that of the market.

b. Sharpe's measure of the portfolio:

$$S_p = \frac{R_p - R_f}{\sigma_p} = \frac{17.60\% - 5\%}{15.20\%} = 0.83$$

Sharpe's measure for market

$$S_m = \frac{R_m - R_f}{\sigma_m} = \frac{18.40\% - 5\%}{20.40\%} = 0.66$$

According to Sharpe's measure the portfolio has outperformed the market since its risk premium per unit of total risk is higher than that of market.

Problem 11.10

Sol^n

Given:

Return on portfolio (R_p) = 16.8 %

Beta of portfolio (β_p) = 1.10

Risk Free Rate (R_f) = 7.4 %

Return on market (R_m) = 15.2 %

Jensen's alpha of portfolio:

$$A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$

$$= 16.8\% - [7.4\% + (15.2\% - 7.4\%)\, 1.10]$$

$$= 0.82\%$$

Using Jensen's measure, portfolio has outperformed the market because it offers the positive excess rate of return above the CAPM required rate of return.

Problem 11.11

Sol^n

Given:

Beta of portfolio (β_p) = 1.3

Return on portfolio (R_p) = 12.9 %

Risk free rate (R_f) = 7.8%

Return on market (R_m) = 11 %

a. Jensen's measure for Indu's portfolio:

$$A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$
$$= 12.9\% - [7.8\% + (11\% - 7.8\%)1.3]$$
$$= 0.94\%$$

b. The Jensen's measure for Indu's portfolio (0.94%) is greater than that of Bindu's portfolio (-0.24). So, Indu's portfolio performed better.

c. Indu's portfolio has positive Jensen's alpha. It implies that Indu's portfolio has earned positive excess return during the year above the rate of return required on her portfolio.

Problem 11.12

Soln

a. Calculation of Sharpe's measure of five portfolios: (S_p)

Portfolios	Return on Portfolio (R_p)	Risk-free Rate (R_f)	Standard Deviation of portfolio (σ_p)	$S_p = \frac{R_p - R_f}{\sigma_p}$	Rank
M	7%	3%	3%	$\frac{7\% - 3\%}{3\%} = 1.3333$	2
N	10%	3%	8%	$\frac{10\% - 3\%}{8\%} = 0.875$	5

O	13%	3%	6%	$= \frac{13\% - 3\%}{6\%} = 1.67$	1
P	15%	3%	13%	$= \frac{15\% - 3\%}{13\%} = 0.923$	4
Q	18%	3%	15%	$= \frac{18\% - 3\%}{15\%} = 1$	3

Portfolio O performed the best according to sharpe's measure because its risk premium per unit of total risk is highest among all.

b. Calculation of Treynor's measure of five portfolio (T_P):

Portfolios	Average Return (R_p)	Risk free Rate (R_f)	Beta (β)	$T_p = \frac{R_p - R_f}{\beta_p}$	Rank
M	7%	3%	0.4	$= \frac{7\% - 3\%}{0.4} = 10$	2
N	10%	3%	1.0	$= \frac{10\% - 3\%}{1.0} = 7$	4

O	13%	3%	1.1	$= \frac{13\% - 3\%}{1.1} = 9.09$	3
P	15%	3%	1.2	$= \frac{15\% - 3\%}{1.2} = 10$	2
Q	18%	3%	1.4	$= \frac{18\% - 3\%}{1.4} = 10.71$	1

Portfolio Q performed the best according to Treynor's measure because its risk premium per unit of systematic risk is highest among all.

c. Sharpe's and Treynor's measure of portfolio performance differs with each other in terms of methodology and assumptions. Sharpe's measure takes into account total risk measured by standard deviation of portfolio while Treynor's measure consider systematic risk measured by beta.

Problem 11.13

Sol^n

Given:

	Portfolio X	Market
Average Return	$R_p = 20\%$	$R_m = 15\%$
Beta	$\beta_p = 1.20$	$\beta_m = 1.00$
Standard deviation	$\sigma_p = 22\%$	$\sigma_m = 20\%$

Risk free Rate (R_f) = 6%

Calculation of Sharpe's measure for portfolio X :

$$S_p = \frac{R_p - R_f}{\sigma_p} = \frac{20\% - 6\%}{22\%} = 0.64$$

Sharpe's measure for market

$$S_m = \frac{R_m - R_f}{\sigma_m} = \frac{15\% - 6\%}{20\%} = 0.45$$

Calculation of Treynor's measure for portfolio X

$$T_p = \frac{R_p - R_f}{\beta_p} = \frac{20\% - 6\%}{1.20} = 11.67$$

Treynor's measure for market

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{15\% - 6\%}{1} = 9$$

Both Sharpe's and Treynor's measure of portfolio X has outperformed the market because its risk premium are higher than that of market.

Calculation of Jensen's measure for portfolio X

$$A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$

$$= 20\% - [6\% + (15\% - 6\%)\,1.20]$$

$$= 3.2\%$$

Jensen's measure of portfolio X has also outperformed because it has positive excess return over its CAPM required return.

Hence, all the portfolio measures shows the superior performance of portfolio X over the market.

Problem 11.14

Sol^n

Given:

Risk free Rate (R_f) = 8.1%

	GEM's portfolio	Market portfolio
Rate of Return	$R_p = 12.8\%$	$R_m = 11.2\%$
Standard Deviation	$\sigma_p = 13.5\%$	$\sigma_m = 9.6\%$
Beta	$\beta_p = 1.10$	$\beta_m = 1.00$

a. Calculation of sharpe's measure of portfolio:

$$S_p = \frac{R_p - R_f}{\sigma_p} = \frac{12.8\% - 8.1\%}{13.5\%} = 0.3481$$

Sharpe's measure for market portfolio:

$$S_m = \frac{R_m - R_f}{\sigma_m} = \frac{11.2\% - 8.1\%}{9.6\%} = 0.3229$$

Gem's portfolio of sharpe's measure has outperformed the market because it offers larger risk premium per unit of total risk as compared to the market.

b. Calculation of Treynor's measure of GEM's portfolio:

$$T_p = \frac{R_p - R_f}{\beta_p} = \frac{12.8\% - 8.1\%}{1.10} = 4.27$$

Treynor's measure for market portfolio:

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{11.2\% - 8.1\%}{1.0} = 3.1$$

Treynor's measure of GEM's portfolio has outperformed the market because it offers larger risk premium per unit of systematic risk as compared to the market.

c. Calculation of Jensen's measure of portfolio:

$$A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$
$$= 12.8\% - [8.1\% + (11.2\% - 8.1\%)1.10]$$
$$= 1.29\%$$

The portfolio has positive Jensen's alpha. It implies that the portfolio has 1.29% excess return above the CAPM required return. Thus portfolio has earned excess return on both risk-adjusted and market adjusted basis.

Problem 11.15

Soln

Given:

T-bills Rate (R_f) = 6%

Average return of portfolio (R_p) = 10%

Standard deviation of portfolio (σ_p) = 18%

Beta of portfolio (β_p) = 0.6

Average return of market (R_m) = 12%

Standard deviation of market (σ_m) = 13%

Beta of market (β_m) = 1.0

a. Calculation of sharpe's measure for portfolio:

$$S_p = \frac{R_p - R_f}{\sigma_p} = \frac{10\% - 6\%}{18\%} = 0.2222$$

Sharpe's measure for market

$$S_m = \frac{R_m - R_f}{\sigma_m} = \frac{12\% - 6\%}{13\%} = 0.4615$$

Calculation of Treynor's measure for portfolio:

$$T_p = \frac{R_p - R_f}{\beta_p} = \frac{10\% - 6\%}{0.6} = 6.6667$$

Treynor's measure for market:

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{12\% - 6\%}{1} = 6$$

Calculation of Jensen's measure of portfolio:

$$A_p = R_p - [R_f + (R_m - R_f)\beta_p]$$
$$= 10\% - [6\% + (10\% - 6\%)\,0.6]$$
$$= 0.4\%$$

Jensen's measure for market:

$$A_m = R_m - [R_f + (R_m - R_f)\beta_m]$$
$$= 12\% - [6\% + (12\% - 6\%)\,1]$$
$$= 12\% - 12\%$$
$$= 0$$

b. According to Treynor's and Jensen's measure the portfolio X has outperformed the market because these values of the portfolio are higher than the market.

c. Sharpe's measure, Treynor's measure and Jensen's measure of portfolio performance differs with each other in terms of methodology and assumption.

Sharpe's measure takes into account total risk measured by standard deviation of portfolio while Treynor's measure and Jensen's measure consider systematic risk measured by beta.