Portfolio Construction and The Reduction of Diversifiable Risk

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Abstract

The study attempts to construct the optimum mutual fund portfolios by the open-ended mutual fund schemes (income & growth). The study also examines whether the newly constructed portfolios are able to reduce diversifiable risk and which type of mutual fund schemes is better. For the achievement of these objectives, monthly closing net asset values of the open-ended income and growth schemes have been considered and the data have been obtained from the website of Association of Mutual Funds in India (AMFI). Similarly, the yields of 7 years Gov. dated securities have been taken into account as the proxy of risk free rate and finally, the monthly index values of Bombay Sensitive index have been considered as market surrogate for this study. The study period has been considered from 2001 to 2010. It has been observed from the study that the diversifiable risk (unsystematic risk) of both types of schemes (Income & Growth) is in decline when new portfolios have been made. It has also been found that the unsystematic risk of the newly constructed portfolios of income as well as growth schemes is higher.

Keywords: Mutual Fund, Portfolio Construction, Diversifiable Risk, Market Index, Risk-Free Rate.

1. Introduction

Diversification of risk is a much studied topic in the literature of finance. In general, the investors are risk averse and expect a continuous flow of constant and secure returns from their investments. Sometime, the risk influences the mutual fund return implicitly. The risks are two types' namely systematic risk and unsystematic risk. Relatively, the systematic risk cannot be reduced by applying any mechanism because this type of risk is related with the market volatility. Whereas, the market cannot be predicted therefore the systematic risk cannot also be predicted. But, the unsystematic risk can be reduced by applying proper strategy. It is possible to reduce in a certain extent if a large number of securities are selected in a judicious manner and make an optimum portfolio or more than one portfolio by those securities/schemes. In this study it has been examined whether the unsystematic risk of the open-ended income and growth schemes can be reduced after the construction of new portfolios.

After introduction in section 1, the literature review has been presented in section 2. The objective of the study has been specified in section 3. Similarly, the data and research methodology have been presented in secton 4 and 5 respectively. The result has been demonstrated in section 6. Finally, the study has been ended with conclusion in section 7.

2. Literature Review

Truly speaking, the literature on mutual fund is vast. Some of the leading works have been discussed here in order to develop the basis of the present empirical study in the Indian context.

In 1965, Jack L. Treynor, developed a portfolio performance evaluation model which came to be popularly known as reward to volatility ratio. He proposed to evaluate the performance of a scheme on the basis of the risk premium per unit of systematic risk (volatility) and to assign rank to each scheme according to this ratio. In 1966, William.F.Sharpe extended the work of Treynor by introducing total risk in place of systematic risk. He proposed an alternative model which sought to measure the performance of a scheme on the basis of total risk

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(variability). For the purpose of testing his model he analyzed 34 open-ended mutual funds by considering annual return data of the funds from the year 1954 to 1963 and ranked them in ascending order according to their reward to variability (R/V) ratio and finally he compared the same with the Dow Jones industrial averages (Market Index). In 1966, another portfolio performance evaluation model was proposed by Treynor & Mazuy. In this model they sought to test the market timing abilities of the fund managers. In this empirical study, they analyzed 57 mutual fund managers' market timing performance. Finally, their study reported that the statistically significant market timing performance of the selected schemes were absent. In 1968, Michel Jensen developed another model for portfolio performance evaluation which came to be popularly known as Jensen Alpha (J) that was derived from CAPM [$(R_i - R_f) = \alpha + \beta (R_m - R_f)$]. His model basically focused on the measurement of predictive ability of portfolio managers through successful prediction of security prices. According to this model, if the portfolio managers have an ability to outguess the security prices correctly then the Jensen alpha will be positive and consequently, they can offer better return to the investors. But, if the information is publicly available, then the mutual funds will not be able to beat the market. If the managers have some specific valuable information on the basis of which only they can select the potential stocks then the mutual fund would out-perform the market. However, no such positive evidence could be found by them in the study. Evans and Archer (1968), on the other hand, examined the relationship between the extent of portfolio diversification and the reduction of the variation associated with portfolio returns. For proving this relationship, they finally considered 470 securities which were listed in the S & P index. Their study reported the presence of a relatively stable and predictable relationship between the extent of diversification and the level of dispersion. They finally put forward the economic justification of including more than ten (10) securities in the portfolio for reduction of risk through diversification. In 1972, Eugene F Fama developed an alternative model for evaluation of portfolio performance. The earlier works that had been done by Sharpe, Treynor, Jensen etc sought to evaluate performance on the basis of two dimensions of investments namely risk and return. On the other hand, Fama presented a model which was able to measure the stock selection performance, market timing, diversification and risk performance of investment. While, most of the previous works had performed the single period evaluation, Fama offered the model which could be applied for both single period and multi period purposes. In 1982, F. K. Reilly evaluated mutual fund performance over a 15 years period (1996 - 1980). He compared the fund return with the market rate of return and reported that the average return of all the funds were quite similar to that of the market return. According to him, most of the selected funds had been suffering from poor diversification. In 2005, S.M.Aamir Shah and Syed Tahirhijazi examined the mutual fund performance in Pakistan by using the data of equity and balanced funds. The result of their study reported that the overall performance of the mutual funds in Pakistan was adequate to provide higher return to the investors. In 2006, Naim Sipra examined the performance of mutual funds in Pakistan over a period from 1995 to 2004. She applied Sharpe's ratio, Treynor's ratio and Jensen's measures for her study purposes. The study reported that the average rate of return of mutual funds was lower than the market rate of return. The study also recommended that, in Pakistan's mutual fund market, ten (10) years' period is too short to maintain a good consistency in mutual fund performance. In his study, M. Joydev (1996), examined the performance of mutual fund schemes in India over a period from 1992 to 1994. He tried to evaluate the performance of two growth schemes on the basis of three dimensions namely, - diversification, market timing and selectivity. For this, he considered monthly NAV (Net Asset Value) and applied Jensen, Treynor and Sharpe models. The study reported that the performance offered by the selected schemes were very poor on all the three dimensions. In 1998, Gupta & Sehgal evaluated the return, stock selection and diversification performances of mutual fund schemes in India over a period of four (4) years (1992 - 1996). Their study reported that the stock selection performance and the diversification performance of selected mutual schemes were found to be very poor in India but they also reported that the mutual fund schemes had offered better returns to the investors. Another study by Narasimhan & Vijaylakshmi (2001), examined the diversification performance and the kind of investment strategies followed by the mutual fund managers in India by considering 76 mutual fund schemes over the period 1996 - 1999. The study reported that the diversification performance of the schemes were very poor and the study also reported that the fund managers had shifted their strategy to select best stocks but unfortunately, it was found that the mutual fund schemes had failed to get place in the top 100 stocks from the return

perspective. Similarly, in his study, Ramesh Chander (2002) examined different components of mutual fund performance over a period starting from January 1994 to December 1998. For this, he selected 34 Indian mutual fund schemes and he applied Fama's decomposition theory in order to test performances of the schemes. The results of his study showed that the performance based on the selectivity angle of the schemes, were satisfactory but the market timing performance of the schemes were reported negative. In their study, Panwar & Madhumathi (2006) examined the mutual fund performance basically on the differences with regard to the fund characteristics of assets holding and the variable effects on diversification performance over a period from 2002 to 2005. They concentrated on the selected public and private sector sponsored mutual funds and adopted both parametric and non-parametric statistical tests for evaluation purposes. The study reported that the mean rates of return of both the sectors were almost similar but in terms of variances both types of funds depicted different results. They also reported that the diversification performance of the selected public and private sector mutual funds were found to be statistically different. Another study by Rao & Ravindran (2001), examined the mutual fund performance by taking into consideration 58 open ended mutual fund schemes over a period from 1998 to 2000 (bear market) in India. Their study employed different models such as relative performance index (RPI), Treynor's model, Sharpe's model and Fama's model for this purpose. Finally, their study reported that, most of the mutual fund schemes were able to satisfy investor's expectation in terms of excess return over the expected returns which were based on both premium on systematic risk and premium on total risk. In 2005, Chander examined the stock selection performance of the mutual fund managers across the fund characteristics and also he made an attempt to measure the persistence of stock selection performance. The study reported that the mutual fund managers had offered positive stock selection performance. Similarly, (2006) Jain & Sandhi examined stock selection performance of selected 36 diversified equity schemes over a period of 1993 - 2002. The study reported that 20 schemes of them had offered positive stock selection skills but 15 schemes of them (20) only had offered statistically significant stock selection performance. In a study, Choudhary (2007) examined the mutual fund performance on different dimensions by taking into account selected 50 equity investment schemes over a period of eight (8) years (January 1998 - December 2005). He also applied Fama's decomposition theory for proving stock-selection, market-timing and diversification performances. The results of the study reported that the stock-selection and diversification performance were found to be positive but the market-timing performance of the schemes were found to be negative in India.

The previous research studies were based on performance evaluation of mutual funds on different aspects like risk-adjusted performance, selectivity performance, market-timing performance, diversification performance and so on. The mutual fund research relating to the construction of portfolio for the reduction of unsystematic risk is scanty. Present study, therefore, seeks to fill in this gap. Accordingly, the following section identifies the specific objectives of the study.

3.Objectives of the Study

The proposed study seeks to examine the following objectives:

1. Construction of portfolios by the open-ended mutual fund schemes (income & growth).
2. To examine whether the newly made portfolios can reduce diversifiable risk or not.
3. To examine whether the portfolios made by the income schemes are better or not than the portfolios made by the growth schemes in respect of diversifiable risk reduction.

4. Data

In order to conduct the study, first of all 273 open-ended income and growth mutual fund schemes have been considered. Finally, 143 open-ended mutual fund schemes have been selected after the exclusion schemes which are below the risk free rate. Now, the sample consists of 56 open-ended income and 87 open-ended growth schemes selected from different mutual fund companies. In this study, the month end closing net asset value has been considered that has been obtained from the website of Association of Mutual Funds in India (AMFI). Similarly, the monthly yields of seven years Government dated securities have been taken into account as risk free rate. This data relating to risk free rate has been collected from the website of Reserve Bank Of India. Finally, the month end index value of Bombay Sensitive Index has been taken into consideration as the proxy of the market rate of

return that has been gathered from the website of Bombay Stock Exchange. Lastly, the study period is between 2001 and 2010.

5. Methodology

In respect of methodology, some statistical calculations have been made and some hypotheses have been conducted. For statistical computations and hypotheses testing the required variables are monthly rate of return of the schemes as well as the market rate of return. The monthly rate of return (R_i) of the schemes has been computed as under:

$$R_i = \frac{\text{Nav}_t - \text{Nav}_{t-1}}{\text{Nav}_{t-1}} * 100$$

Where, Nav_t is the net asset value of the current month of the i^{th} scheme and Nav_{t-1} is the net asset value of the previous month of the i^{th} scheme.

Similarly, the monthly market return (R_m) has been computed as under:

$$R_m = \frac{\text{Market Index}_t - \text{Market Index}_{t-1}}{\text{Market Index}_{t-1}} * 100$$

Where, market Index_t is the monthly market return of the current month and $\text{Market Index}_{t-1}$ is the monthly market return of the previous month.

Similarly, in the same way the monthly risk-free return has been computed in this study.

In this study only unsystematic or diversifiable risk has been considered. The unsystematic risk can be estimated by means of running regression between R_i and R_m which is expected to bring out not only the values of and (simple regression) but also the value of ê (residual error or unsystematic risk) with the help of computer software package like SPSS (Statistical packages of social sciences). The regression equation may be written as under:

$R_i = \square_i + \square_i R_m + \hat{e}_i$ where, R_i, R_m, $\square_i$, $\square_i$ and $\hat{e}_i$ have their respective usual meanings under the CAPM framework.

Alternatively, the unsystematic risk (standard deviation) can be measured as under:

$$\sigma_i = \sqrt{\frac{R_i}{n} - \frac{\overline{R_i}}{n}}^2$$

Portfolio construction Process: At first, the open-ended income and growth schemes have been arranged in ascending order according to their unsystematic risk and accordingly rank has been given on both types (income & growth) of schemes separately. The first rank has been given to that scheme which acquired the lowest unsystematic risk and so on. After that, the new portfolios have been constructed to examine the extent of unsystematic risk. Therefore, the first new portfolio has been made by a single scheme that acquired lowest unsystematic risk and given rank one (1) according to the unsystematic risk. The name of the new portfolio has been given "A" and its new serial number is one (1). Similarly, the second portfolio has been constructed by the next two schemes which acquired rank 2 and 3 respectively in terms of unsystematic risk. The name of the portfolio is "B" and the new serial number is two (2). The third portfolio has been made by the combination of three schemes which acquired rank 2, 3 and 4 respectively according to their unsystematic risks and the name of the portfolio is "C". Actually, the mechanism of constructing the new portfolio is that the first portfolio has been made by taking into account the single scheme which has lowest unsystematic risk. Similarly, the second portfolio (B) has been made by taking into consideration the first scheme and the second scheme whose ranks are one (1) and two (2) respectively according to the unsystematic risk. After that, the third portfolio has been made (C) by the combination of first, second and the third schemes whose ranks are one, two and three respectively according to their unsystematic risks. Here, the unsystematic risk of the new portfolio is the average value of the unsystematic risk of the individual scheme. In this way, 56 new portfolios have been constructed by considering 56 open-ended income schemes. However, the new name of the portfolio of 27^{th} new serial number is A*, B* for 28^{th} portfolio and so on. Similarly, the new name of the portfolio belonging to the new serial number of 53^{rd} is given by A**, 54^{th} for B** and so on. Similarly, 87 new portfolios have been made in the same way by taking into account 87 open-ended growth schemes. After that, the newly constructed portfolios of the open-ended growth schemes have been given new name like A1 for portfolio belonging to the new serial number one (1^{st}), B1 for portfolio two and so

on. In the same way the portfolio belonging to the new serial number 27th is A2. Similarly, the new name of the portfolio belonging to the new serial number 53rd is A3 and so on. Similarly, new name of the portfolio belonging to the new serial number 79th is given by A4 and so on.

Finally, it has been examined whether the unsystematic risks of the newly constructed portfolios are lower than the unsystematic risk of the individual schemes or not. To test this hypothesis "z" test has been applied. The hypothesis as under:

H_0: The average unsystematic risk of the individual schemes before the construction of new portfolios = The average unsystematic risk of the schemes after the construction of new portfolios.

Ha: The average unsystematic risk of the individual schemes before the construction of new portfolios > the average unsystematic risk of the schemes after the construction of new portfolios.

The null hypothesis would be rejected against the alternative hypothesis at the 5% level of significance if the computed value of 'z' is greater than that of the table value. The 'z' value has been computed using the following formula:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma^2_{s1}}{n_1} + \frac{\sigma^2_{s2}}{n_2}}}$$

Where, $\bar{x}_1$ = Average unsystematic risk of the individual schemes before portfolio construction.

$\bar{x}_2$ = Average unsystematic risk after the construction of new portfolios.

σ^2_{s1} = standard deviation of the average unsystematic risk of the individual scheme before construction of new portfolio.

σ^2_{s2} = standard deviation of the average unsystematic risk of the individual scheme after construction of new portfolio.

n_1 and n_2 are sample one and sample two respectively.

Similarly, 'z' test has also been applied to examine whether there is any significance differences exist between the two means (means of unsystematic risk) after the construction of new portfolios for both types of schemes (income & growth) or not. Therefore, hypothesis has been formulated in this regard. The hypothesis as under:

H_0: The average unsystematic risk of the new portfolios of income schemes = the average unsystematic risk of the new portfolios of growth schemes.

Ha: The average unsystematic risk of the new portfolios of income schemes ≠ the average unsystematic risk of the new portfolios of growth schemes.

Therefore, "z" test has been applied here.

6. Result & Analysis

The reduction of diversifiable risk after the construction of new portfolios have been presented in Table 1 and Table 2 respectively. The heads of the table is as follows: column 1 presents serial number of the schemes, column 2 depicts the name of the schemes, column 3 presents the diversifiable risk of the schemes before the construction of portfolios, column 4 highlights the rank of the schemes, column 5 represents the new serial number, column 6 shows the diversifiable risk after the construction of new portfolios and last column reveals the new name of the portfolios.

It has been observed from Table 1 that the diversifiable risk of the new portfolio A is same before the construction of new portfolio because such portfolio has been made by the single scheme only. It has also been seen that the average diversifiable risk of the new portfolio B is 2.7796 which is lower than that of the individual risk of the schemes (2.8259 & 2.9165) by which portfolio B has been made. From Table 1 it has been observed that the diversifiable risks of the newly made portfolios are lower than the individual mutual fund schemes by which such newly portfolios have been constructed. It is interesting to observe that the diversifiable risk before the construction of portfolio is ranging between 2.7332 and 7.5246. It has been observed that the unsystematic risk of the newly constructed portfolios have been reduced and ranged between 2.7332 and 3.4855. The average diversifiable risk of the income schemes before the construction of portfolio has been found to be 3.485 but after the construction of new portfolios it has been found to be 3.0918 that is lower than that of the before.

Table 1: Rreduction of Diversifiable Risk After the Construction of New Portfolios

S.No	*Schemes' name*	*ê*	*Rank*	*New Sl.No*	*ê after const.*	*New Portfolio*
1	Alliance short term fund-gro	2.7332	1	1	2.7332	A
2	Alliance income fund-Grow	2.8259	2	2	2.7796	B
3	Alliance income fnd-54EA-G	2.9165	3	3	2.8252	C
4	Alliance income fnd-54EB-G	2.9255	4	4	2.8503	D
5	Alliance monthly income-Gr	2.9522	5	5	2.8707	E
6	Birla MIP-plan C (Gr)	2.9596	6	6	2.8855	F
7	Birla income plus-retail(Gr)	2.9819	7	7	2.8993	G
8	FT India mpnthly incom pl-gr	2.9944	8	8	2.9112	H
9	Templet monthly income pl-g	3.0384	9	9	2.9253	I
10	Templet India inc build a/c-gr	3.0635	10	10	2.9391	J
11	Templet India income fund-gr	3.0693	11	11	2.9509	K
12	Principal income fund-gr.pl-gr	3.0759	12	12	2.9614	L
13	Principal depo fnd-pl 54ea/eb	3.0827	13	13	2.9707	M
14	Uti senior citizen unit plan	3.1093	14	14	2.9806	N
15	Uti-mahila unit scheme(UMS)	3.1144	15	15	2.8027	O
16	Uti-bnd fnd-gr(rep.aft.6 mon)	3.1176	16	16	2.9975	P
17	Uti-retiremen benefit pens fnd	3.1839	17	17	3.0085	Q
18	Sbi magnum month inc pl-gr	3.2170	18	18	3.0201	R
19	Sbi magnum income fund-gr	3.2218	19	19	3.0307	S
20	Reliance mtf-retail-gr.pl-gr.op	3.2256	20	20	3.0404	T
21	Reliance short term fund-gr	3.2409	21	21	3.0500	U
22	Rel inc fnd reta pl-gr.pl-gr.op	3.2431	22	22	3.0588	V
23	Libra bond fund-dividend	3.2504	23	23	3.0671	W
24	Libra bond fund-growth	3.2542	24	24	3.0749	X
25	Il&fs bond fund-stp-growth	3.2557	25	25	3.0821	Y
26	Il&fs bond fund-bonus plan	3.2655	26	26	3.0892	Z
27	JM short term fund-growth	3.2998	27	27	3.0970	A*
28	JM income growth-bonus opti	3.2999	28	28	3.1042	B*
29	Prudnti icici fixd matrity pl-yr	3.3015	29	29	3.1110	C*
30	Prudentia icici fmp yrly series	3.3070	30	30	3.1176	D*
31	Pruden icici fixed mat pl-qr	3.3248	31	31	3.1242	E*
32	Prudential icici incom pl-gr.op	3.3287	32	32	3.1306	F*
33	Prudentian icici mip-div-quart	3.3384	33	33	3.1369	G*
34	Prudential icici mip-cum	3.3397	34	34	3.1429	H*
35	GSSIF-ST-Growth	3.3430	35	35	3.1486	I*
36	GSSIF-Growth	3.3622	36	36	3.1545	J*
37	Sun f&c monthly income-gro	3.3805	37	37	3.1606	K*
38	Sn f&c mo valu fnd-bnd opt-g	3.3877	38	38	3.1666	L*
39	HDFC income fund-growth	3.4178	39	39	3.1731	M*
40	HDFC short term pl-growth	3.4572	40	40	3.1802	N*

S.No	Schemes' name	ê	Rank	New Sl.No	ê after const.	New Portfolio
41	BOB income fund-div.plan	3.5044	41	41	3.1881	O*
42	BOB income fund-growth	3.5093	42	42	3.1957	P*
43	Can income – growth plan	3.5131	43	43	3.2031	Q*
44	Can cigo-growth plan	3.5793	44	44	3.2117	R*
45	Sahara income fund-growth	3.6222	45	45	3.2208	S*
46	Sahara short term plan-growth	3.6265	46	46	3.2296	T*
47	DBS chola triple ace-regul-cm	3.6468	47	47	3.2385	U*
48	Escorts income bond-dividend	3.6526	48	48	3.2471	V*
49	Escorts income bond-growth	3.6860	49	49	3.2561	W*
50	Escorts income plan-growth	3.7186	50	50	3.2653	X*
51	Kotak bond-deposit-growth	3.8147	51	51	3.2761	Y*
52	Kotak bond-regular-growth	4.2105	52	52	3.2941	Z*
53	LIC MF bond fund-growth	4.5159	53	53	3.3171	A**
54	Tata income fund-growth	5.0872	54	54	3.3499	B**
55	Sundarm bnp Pribas bnd sa-gr	6.7684	55	55	3.4120	C**
56	PNB debt fund-growth	7.5246	56	56	3.4855	D**

ê = diversifiable risk

It has been also examined whether the diversifiable risk of the income schemes before the construction of portfolios is statistically different or not than the construction of new portfolios. Therefore, 'z' test has been applied and the formulated hypothesis as under:

Before construction after construction

Sample 1 Sample 2

$\overline{X}_1 = 3.4855$ $\overline{X}_2 = 3.0918$

$\sigma_{s1} = 0.8142$ $\sigma_{s2} = 0.1608$

$n_1 = 56$ $n_2 = 56$

The test statistic 'z' as under:

$$z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{\sigma^2_{s1}}{n_1} + \frac{\sigma^2_{s2}}{n_2}}} = \frac{3.4855 - 3.0918}{\sqrt{\frac{(0.8142)^2}{56} + \frac{(0.1608)^2}{56}}} = \frac{3.4855 - 3.0918}{\sqrt{0.011838 + 0.000462}} = 3.5490$$

As Ha is one sided, one tailed test has been applied here for determination of the rejection region at 5% level of significance that comes to as under:

R: /Z/ > 1.96

It has been observed from the test that the computed value of 'z' is 3.5490 which falls in the rejection region and thus one may accept Ha at 5% level and thus it may be concluded that the average unsystematic risk of the income schemes after the construction of portfolios is lower than that of the individual schemes before the construction of portfolios.

Performance regarding reduction of diversifiable risk after new portfolios (Income Schemes)

Table 2 represents the quantum of diversifiable risk before the construction of portfolio as well as after the construction of new portfolios. The diversifiable risk of the newly made portfolio 'A1' remains the same as before. The average unsystematic risk of the second new portfolio is found to be 3.0367 (B1) which is the average value of unsystematic risks of two individual schemes (S.No. 1 & 2) that is lower than that of the individual schemes. This declining trend has been continued for all subsequent cases. The range of diversifiable risk of the individual schemes before the construction of portfolio is between 2.8602 and 16.7116 and after that it has reduced to 2.8602 and 6.5708. The highest risk of Prudential ICICI technology fund (87) before the construction of portfolio has been found to be 16.7116 but after the construction of new portfolios the highest risk has come down to 6.5708. Similarly, the average risk of the newly made portfolios has been found to be 4.9043 which is also evidently lower

Table 2: Quantum of Diversifiable Risk Before and After the Construction of Portfolios

S.No	*Name Of The Schemes*	*ê*	*Rank*	*New Sl.No*	*New Portfolio*	*ê after const.*
1	Alliance basic industries fund-dv	2.8602	1	1	A1	2.8602
2	Alliance basic industries fund-gr	3.2132	2	2	B1	3.0367
3	Alliance frontline equity fund-dv	3.5912	3	3	C1	3.2215
4	Bob growth fund-div.plan	3.8687	4	4	D1	3.3833
5	Bob growth fund-growth plan	4.0916	5	5	E1	3.5250
6	Dbs chola growth fund-cummula	4.1217	6	6	F1	3.6244
7	Dbs chhola growth fund-qurt.dv	4.2551	7	7	G1	3.7145
8	Canequity diversified-bonus	4.3038	8	8	H1	3.7882
9	Can equity diversified-growth	4.3085	9	9	I1	3.8460
10	Canequity diversified-income	4.3149	10	10	J1	3.8929
11	Can index-dividend	4.4017	11	11	K1	3.9391
12	Can index-growth	4.6423	12	12	L1	3.9979
13	Dbs chola mid cap fund-growth	4.6588	13	13	M1	4.0486
14	Dbs chola mid cap fund-div	4.6763	14	14	N1	4.0934
15	Jm equity fund-dividend	4.7779	15	15	O1	4.1391
16	Jm equity fund –growth	4.8408	16	16	P1	4.1829
17	Escorts growth plan-div.option	4.9443	17	17	Q1	4.2277
18	Escorts growth plan-gr.option	4.9477	18	18	R1	4.2677
19	Escorts opportunities fund-div	4.9814	19	19	S1	4.3053
20	Escorts opportunities fund-growt	5.0082	20	20	T1	4.3403
21	Ing vysya equity fund-div option	5.0115	21	21	U1	4.3724
22	Ing vysya equity fund-gr.option	5.0347	22	22	V1	4.4025
23	Dsp meril lynh top100 equity f-d	5.0413	23	23	W1	4.4303
24	Dsp meril lynh top100 equity f-g	5.0417	24	24	X1	4.4557
25	Sun f&c resurgent India equity fd	5.1205	25	25	Y1	4.4823
26	Bonanza exclusive gr.scheme	5.1490	26	26	Z1	4.5080
27	Franklin India fund-nifty plan	5.2718	27	27	A21	4.5363
28	Franklin pharma fund-growth	5.2759	28	28	B21	4.5627
29	Principal equity fund-growth	5.3417	29	29	C21	4.5895
30	Principal growth fund-div.opt	5.4003	30	30	D21	4.6166
31	Principal growth fund-gr.plan	5.4608	31	31	E21	4.6438
32	Prudential icici fmcg pl-dv.opt	5.5191	32	32	F21	4.6711
33	Prudential icici fmcg pl-gr.opt	5.5284	33	33	G21	4.6971
34	Prudetial icici power pl-growth	5.5301	34	34	H21	4.7216
35	Alliance buy India fund-div	5.5709	35	35	I21	4.7459
36	Alliance buy India fund-growth	5.6263	36	36	J21	4.7703
37	Alliance equity fund-dividend	5.6358	37	37	K21	4.9737
38	Alliance equity fund-growth	5.7378	38	38	L21	4.8186
39	Alliance new millennium fund-d	5.7410	39	39	M21	4.8422
40	Alliance new millennium fund-g	5.9366	40	40	N21	4.8696
41	Alliance front line equity fund-g	5.9933	41	41	O21	4.8970
42	BirlaIndiaOpportufund-plA(D)	6.0105	42	42	P21	4.9235
43	Birla India opport fund-pln B(g)	6.0224	43	43	Q21	4.9491

S.No	Name Of The Schemes	ê	Rank	New Sl.No	New Portfolio	ê after const.
44	Birla mnc fund-plan A (div)	6.0814	44	44	R21	4.9748
45	Birla mnc fund-plan B(growth)	6.1177	45	45	S21	5.0002
46	Birla advantage fund-planA(dv)	6.1317	46	46	T21	5.0248
47	Birla advantage fund-planB(GR)	6.1757	47	47	U21	5.0493
48	Dbs chola opportunities fund-cm	6.1891	48	48	V21	5.0730
49	Dbs chola oppor fund-regu qu dv	6.2439	49	49	W21	5.0969
50	Canexpo- growth plan	6.2493	50	50	X21	5.1200
51	Canexpo-income plan	6.2506	51	51	Y21	5.1421
52	Dsp merill lynch equity fund	6.2604	52	52	Z21	5.1636
53	Dsp merill lynch tech.com fund	6.2890	53	53	A31	5.1849
54	JM Basic fund	6.2939	54	54	B31	5.2054
55	Ing vysya select stocks fund-dv	6.3245	55	55	C31	5.2258
56	Ing vysya select stocks fund-g.o	6.3791	56	56	D31	5.2464
57	Kotak mnc	6.3827	57	57	E31	5.2663
58	Kotak tech	6.4999	58	58	F31	5.2876
59	Kotak 30- (dividend)	6.5757	59	59	G31	5.3094
60	Kotak 30-(growth)	6.6239	60	60	H31	5.3313
61	Sun f&c value fund-dividend	6.6438	61	61	I31	5.3528
62	Sun f&c value fund-growth	6.6455	62	62	J31	5.3737
63	Tarus discovery fund	6.6583	63	63	K31	5.3941
64	Tarus star share	6.6709	64	64	L31	5.4140
65	Uti-grand master 1993	6.7559	65	65	M31	5.4347
66	Uti-pef 95	6.7965	66	66	N31	5.4553
67	Tata pure equity fund-growth	6.8674	67	67	O31	5.4764
68	Tata select equity fund	6.9105	68	68	P31	5.4975
69	Tata life sciences&tech fund-gr	7.1483	69	69	Q31	5.5214
70	UTI Sunder	7.1899	70	70	R31	5.5452
71	Franklin fmcg fund-growth	7.1730	71	71	S31	5.5681
72	Franklin India bluechip fund-Div	7.5235	72	72	T31	5.5953
73	Franklin India bluechip fund-gr	7.6389	73	73	U31	5.6233
74	Franklin India growth fund	7.7526	74	74	V31	5.6521
75	Franklin India prima fund-dv	7.7925	75	75	W31	5.6806
76	Franklin India prima fund-grow	8.1369	76	76	X31	5.7129
77	Franklin India prima plus-div	8.5332	77	77	Y31	5.7496
78	Franklin India prima plus-growth	8.5761	78	78	Z31	5.7858
79	Franklin infotech fund-div	9.1174	79	79	A41	5.8280
80	Franklin infotech fund-growth	9.4986	80	80	B41	5.8738
81	Il&fs gr&value fund-annual dv.p	10.9266	81	81	C41	5.9362
82	Il&fs gr&value fund-gr.plan	13.0723	82	82	D41	6.0233
83	Lic mf growth fund	15.1211	83	83	E41	6.1329
84	Principal equity fund-dividend	15.2119	84	84	F41	6.2410
85	Prudential icici gr pl-dv.option	15.2418	85	85	G41	6.3468
86	Prudential icici gr.plan-gr.option	15.4635	86	86	H41	6.6529
87	Prudential icici technology fund	16.7116	87	87	I 41	6.5708

than that of the individual schemes (6.5708).

Similarly, it has also been tested that the unsystematic risk of the growth schemes before the construction of portfolios is statistically different or not than the construction of new portfolios. Hence, 'z' test has been applied here and the hypothesis as under:

Before construction	after construction
Sample 1	Sample 2
$\overline{X}_1 = 6.5708$	$\overline{X}_2 = 4.9043$
$\sigma_{s1} = 2.7184$	$\sigma_{s2} = 0.7823$
$n_1 = 87$	$n_2 = 87$

The test statistic 'z' as under:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma^2_{s1}}{n_1} + \frac{\sigma^2_{s2}}{n_2}}} = \frac{1.6665}{\sqrt{0.084939 + 0.007034}} = \frac{1.6665}{\sqrt{0.091973}} = \frac{1.6665}{0.303271} = 5.49508$$

As, H_a is one-sided therefore, one tailed test has been applied for determining the rejection region at 5% level of significance that may be specified as under : R : /z/ > 1.96

It has been found that the calculated value of 'z' is 5.4908 which is greater than that of the table value at 5% level of significance and thus one may accept H_a (alternative hypothesis) and concluded that the average diversifiable risk of the growth schemes after the construction of portfolios is lower than that of the individual schemes before the construction of portfolios.

Performance on reduction of diversifiable risk after of the new portfolios (Growth Schemes)

Finally, it has also been examined whether both types of open-ended (income & growth) schemes are equally stronger to reduce diversifiable risk after the construction of new portfolio or not. To examine this 'z' test has been applied and the hypothesis as under:

After construction	after construction
Sample 1	Sample 2
$\overline{X}_1 = 3.0919$	$\overline{X}_2 = 4.9043$
$\sigma_{s1} = 0.1608$	$\sigma_{s2} = 0.7823$
$n_1 = 56$	$n_2 = 87$

The test statistic 'z' as under:

$$Z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(0.1608)^2}{56} + \frac{(0.7823)^2}{56}}} = \frac{-1.8124}{\sqrt{0.0004617 + 0.0070344}} = \frac{-1.8124}{0.86580021} = -20.9332$$

As, H_a is two-sided, two tailed test has been applied here for determining the rejection region at 5% level of significance which may be specified as under : R : /z/ > 1.96

It has been found from the test that the calculated 'z' value is -20.9332 which is lower than that of the table value at 5% level. Hence, H_a (alternative hypothesis) may be rejected and consequently it may be concluded that extent of reduction of diversifiable risk of both types of schemes after the construction of portfolios are equally stronger or acceptable.

7. Conclusion

From the above discussion, it is evident that both types of schemes (income & growth) after the construction of new portfolios are able to reduce diversifiable risk significantly. It has also been observed that the average unsystematic risks of both types of schemes after the construction of new portfolios are also lower than those of the respective sets before the construction. Moreover, it has been found that the highest individual risks of the open-ended income and growth scheme has been partially eliminated and have come down to 3.4855 and 6.5708 respectively after the construction of new portfolios. It is also evident from the test that both types of schemes are equally acceptable from the point of risk reduction after the construction of portfolios and lastly, it may be concluded that if the investors can judiciously combine large number of schemes to form different portfolios then they would be able to bring down the unsystematic risk to a considerable extent.

This result is similar to the previous empirical studies conducted by various researchers in the Indian context. However, as the original population of the available mutual fund schemes is much larger than the volume of the data set used in this study, therefore the scope of diversification of risk is broader. This means that further improvement in the matter of risk reduction is possible by considering all available schemes together. Also, construction of portfolio by combining income and growth schemes may bring in additional benefits to the investing community. Further research on this issue may reveal encouraging results.

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