MUTUAL FUND PERFORMANCE---A RECONSIDERATION

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In a recent article Levy and Saranat, hereafter referred to as SL [6], raise the question of reconciling the phenomenal growth of mutual funds with the equally phenomenal evidence, produced by the studies of Jensen [5] and Treynor and Mazuy [11], to cite a few, that their risk return performance has not been superior to that of the unmanaged portfolios. SL attribute this paradoxical situation to comparison of mutual funds' performance against that of a highly diversified Standard and Poors Index of 500 stocks rather than to some alternative attainable by most investors. SL argue that this kind of comparison, and the conclusion based on it, is not relevant since the alternative of attaining the degree of diversification implicit in the 500-index is not attainable by most small investors with their limited resources. But then the conclusion that mutual funds offer a better alternative, and hence their phenomenal growth, based solely on the comparison of performance of eight arbitrarily selected mutual funds against the performance of eight arbitrarily chosen stocks is hardly valid either. We concede that the performance of mutual funds be considered against that of the alternative attainable by most individual investors, and, following this line of thought, we evaluate the risk-return performance of several alternatives, all easily attainable by the average individual investor. The alternatives evaluated in this study are the following: (a) investment in Growth and Price Appreciation portfolios recommended by the Standard and Poor's (b) investment in Safety and Income Portfolios recommended by the Standard and Poor's (c) investment in the stocks comprised in the Dow Jones Index (d) investment in mutual funds.

Transaction costs are taken into account in computing the comparative risk return variates from different alternatives with realistic limitations on the investment resources and the corresponding diversification levels. The method used to compare the risk return obtainable from different sources is simulation to be described in the next section.

II. SIMULATION MODEL

It is assumed in this paper that the investment objective of an individual can be expressed as a function of two quantities: the expectation of return and the variance of return.[1] It is further assumed that the investor is a risk averter and is seeking to maximize the expectation of return on his investment for a given level of risk. However, no attempt is made in this paper to determine the functional form of risk aversion for the investors. The average investor is a vague concept at best. The study considers a range of \$100 to \$10,000 available for investment classified into m investment levels such that $I_1, < I_2 <\ldots< I_m$. For any investment level I_j, there is a fixed number of stocks $C_j > 0$ which is the maximum number of issues in which I_j resources could be reasonably invested.[2] Since the number of different issues that the investor can expect to have in his portfolio is positively related to the investor's wealth, without getting into the question of optimality, let us postulate that $C_1 < C_2 <\ldots< C_m \leq N$ where N is the total number of issues that exist in the relevant alternative considered. Table II-1 summarizes the investment levels (I_m) and their corresponding diversification levels (C_m).

TABLE II-1

Investment and Diversification Levels (D.L.)

Investment (I_m)	\$10,000	9,000	8,000	7,000	6,000	5,000	4,000	3,000	2,000
Number of Stocks (C_m)	10	9	8	7	6	5	4	3	2
Investment (I_m)	\$ 1,000	500	100						
Number of Stocks (C_m)	1	1	1						

Thus, if a person has I_k dollars to invest, he will randomly select C_k stocks from the universe. Then each stock in the relevant universe will have an equal probability (C_k/N) of being included in this investo's portfolio, where N is the total number of stocks in the subuniverse. To further simplify the analysis, let us assume that the investor distributes his I_k dollars in the randomly selected C_k securities in equal proportion. Thus, if $X_1, X_2, \ldots X_n$ are the stock from which the investor is to choose and $X_i, X_j, \ldots X_k$ are the stocks randomly selected for his portfolio, then the amount invested in the stock X_i is $W_i I_k$ where W_i is the investment weight associated with stock X_i; and obviously if C_k is the number of stocks selected, then

$$W_i = W_j = \ldots\ldots = W_k = \frac{1}{C_k} \text{ and,}$$

$$W_i + W_j + \ldots\ldots + W_k = 1$$

$$W_i > 0, \; W_j > 0, \ldots\ldots, \; W_k > 0$$

If follows that N_i, the number of shares of the security X_i, bought by the investor is equal to

$$(2.1) \quad N_i = \frac{I_k/C_k}{P_i(t)}$$

where $P_i(t)$ is the price of stock X_i in period t. The rate of return on security X_i is given by

$$(2.2) \quad R_i(t) = \frac{P_i(t+1) - P_i(t) + D_i(t)}{P_i(t)}$$

where $P_i(t+1)$ is the price of the security X_i in period (t+1) and $D_i(t)$ is dividend received during the period. Then the portfolio return $J_k(t)$ is the weighted sum of the return on securities included in the portfolio, that is

$$(2.3) \quad J_k(t) = W_i R_i(t) + W_j R_j(t) + \ldots\ldots + W_k R_k(t)$$

In computer simulation, we used a modified version of equations (2.2) and (2.3) to take account of the transaction costs of constituting and liquidating a portfolio. The commission rates used were those in effect during the 1963-67 period. In the case of mutual funds the load fee and in the case of odd lot transactions, the odd lot differential was taken into account. For each investment level twenty random portfolios were generated and the expected return of the portfolio $E(J_k(t))$ and the variance of return $V(J_k(t))$ were computed, where,

$$(2.4) \quad E_j(J_k(t)) = \sum_j J_{kj}(t) \text{ and,}$$

$$(2.5) \quad V_j(J_k(t)) = \underset{j}{E}\,[J_{kj}(t) - \underset{j}{E}\,(J_k(t))]^2$$

Since $V_j(J_k(t))$ has been cross sectionally computed, it differs from Sharpe's concept of risk defined as standard deviation of a time series of returns. The $V_j(J_k(t))$ is, however, a measure of dispersion or uncertainty around the return from a portfolio $J_k(t)$ and, ceteris paribus, the lower the $V_j(J_k(t))$ the more certain is the return likely to be realized by an investor from his investment in the k^{th} alternative. Also, $V_j(J_k(t))$ for different alternatives (K = 1, 2, 3, 4) gives a comparative evaluation of the uncertainty of return from investment in portfolios drawn from these alternatives. The variance of return for different investment levels (I_m) within the same alternative gives a comparative picture of the uncertainty of return faced by investors with varied investment resources.

Thus, to illustrate the simulation procedure used in this model, for each level of investment the investor buys as many different stocks as are shown in Table I. The stocks are selected at random from the relevant subuniverse. For example, if $5,000 is to be invested, then five different stocks are selected which means $5,000/5 (or $1,000) is available to invest in each of the five different stocks. The number of shares (N_i) bought and the return realized (R_i) from each of the five stocks is computed using modified versions of equations (2.1) and (2.3) respectively. Then the return on the portfolio (J_k) is computed as a weighted average of the return from each of the five stocks. The process is repeated twenty times and the equations (2.4) and (2.5) give the mean and variance of return from investment in this alternative. The process is repeated for each of the four alternatives studied. Thus a total of 3,840 portfolios on IBM System/360 were generated for a four year period.

The four alternatives (definitely not exhaustive),[3] consistent with time, information and ready accessibility assumptions, evaluated in this study are: (1) investment in a portfolio of top rated mutual funds; (2) the 30 stocks comprising the Dow-Jones Industrial Average (DJ); (3) Standard and Poors' recommended stocks for "safety and income" (SI); and, (4) Standard and Poors' recommend stocks for "price appreciation" (PA) [5]. These opportunities were chosen because of their attainability to the average investor.

The stocks in these subuniverses are recommended by reputable agencies who have the funds to do research on the investment worth of these stocks which an average investor does not have. The investment results of portfolios chosen from these subuniverses are then compared inter sec.

A sample of the four year period from December 31, 1963 to December 31, 1967 has been studied.[4] The portfolio of stocks for "price appreciation" for any year has been taken from those recommended in the last quarter of the previous year so that the information used is available at the time of investment. The stocks recommended by Standard and Poors for Safety and Income do not change radically from quarter to quarter; hence the portfolio listed in 1963 has been used for the entire four year period. The mutual fund portfolio for a particular year is randomly selected from the funds rated by Forbes [1] the previous August.

The stock subuniverses (and the number of stocks contained in each) listed in Table II-2 have been studied in the indicated time periods.

TABLE II-2

Subuniverses, Stocks and Time Period

Year	S&P S&I	D.J.	S&P PA	Mutual Funds
63-64	37	30	188	16
64-65	37	30	151	16
65-66	37	30	136	16
66-67	37	30	121	16

III. RESULTS

The results of the simulation are presented in Tables III-1 and III-2 and have been graphed in Figures 1a through 1d. Table III-1 gives the mean percentage return and the standard deviation for portfolios generated from different alternatives for eight different levels of investment for the year 1963-64. It is evident that mutual fund portfolios continue to be efficient for all the investment levels in the sense of yielding the highest mean percentage return for a given uncertainty or offering the minimum uncertainty for a given mean percentage return. The price appreciation portfolios are efficient for only two of the eight investment levels. The Dow Jones portfolios become efficient only beyond a $5,000 investment. The safety and income portfolios show no regular pattern. But notice that only the mutual fund portfolios are efficient throughout the entire investment range.

TABLE III-1

Amount Invested and the Mean and Standard Derivation (in Parenthesis) of Percentage Rate of Return from Different Alternatives for Year 1963-64

Investment in $ Portfolios	100	1,000	2,000	3,000	5,000	7,000	9,000	10,000
D.J.	.04 (.06)	.08 (.13)	.12 (.12)	.11 (.08)	.16 (.05)	.13 (.04)	.13 (.03)	.13 (.03)
S&P (PA)	.04 (.14)	.16 (.16)	.08 (.11)	.10 (.07)	.10 (.11)	.09 (.08)	.10 (.07)	.12 (.06)
S&P (SI)	.02 (.09)	.09 (.09)	.13 (.08)	.13 (.07)	.12 (.04)	.12 (.04)	.12 (.04)	.11 (.03)
Mutual Funds	.039 (.06)	.056 (.02)	.052 (.008)	.05 (.004)	.05 (.006)	.051 (.006)	.049 (.005)	.051 (.004)

The Table III-1 also shows that initially the standard deviation of portfolio returns from all the alternative subuniverses decreases with increasing levels of investment and then tends to get stabilized. Also notice that the standard deviation of the mutual fund portfolios is less than that of all the other portfolios and for all levels of investment. The mean percentage return for the mutual fund portfolios is approximately same for most investment levels. For the other portfolios it tends to increase, although not in a strict orderly pattern. In general, the risk return combination available at higher level of investment, for all the alternative sources considered, tends to be superior to that available at lower investment levels. Also notice that the mutual funds offer a low risk low return investment opportunity. These opportunities are consistently efficient as compared to alternative opportunities available and may be very appealing to certain classes of individual investors.

Table III-2 gives for each of the four years from 1963 through 1967 the percentage mean return and the standard deviation of various portfolios for a fixed $5,000 of investment.

TABLE III-2

Diachronic Performance of Portfolios
Mean Return and Standard Deviation (in Parenthesis)
for $5,000 Investment

Portfolios	Year	1963-64	1964-65	1965-66	1966-67
D.J.		.16 (.05)	.12 (.14)	-.20 (.05)	.17 (.08)
S&P PA		.12 (.11)	+.14 (.10)	-.13 (.07)	.20 (.17)
S&P SI		.12 (.04)	-.04 (.03)	-.11 (.06)	.09 (.08)
Mutual Fund		.051 (.006	.098 (.04)	-.092 (.011)	.121 (.011)

Figures 1a through 1d graph the standard deviation of return against the mean percentage return, from alternative sources, for each of the four year periods studied. The graphs indicate that the mutual fund portfolios continue to be efficient[5] in each of the four years offering the maximum mean percentage return for a given uncertainty or offering the minimum uncertainty for a given mean percentage return. The portfolio from Standard and Poor's Safety and Income group are inefficient as compared to the mutual fund portfolios in three of the four years. It may further be noted that in 1965-66 mutual fund portfolios were the only portfolios in the efficient set and those from the Dow Jones were the most inefficient of all. In fact, portfolios from Dow Jones were efficient only 1963-64 and 1966-67. Only the portfolios drawn from mutual funds were efficient in all the years under consideration.

Investment Performance For A $5,000 Portfolio
From Alternative Sources

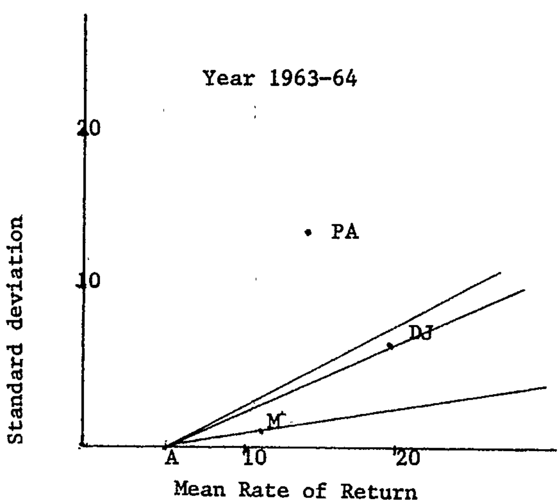


Fig.1a

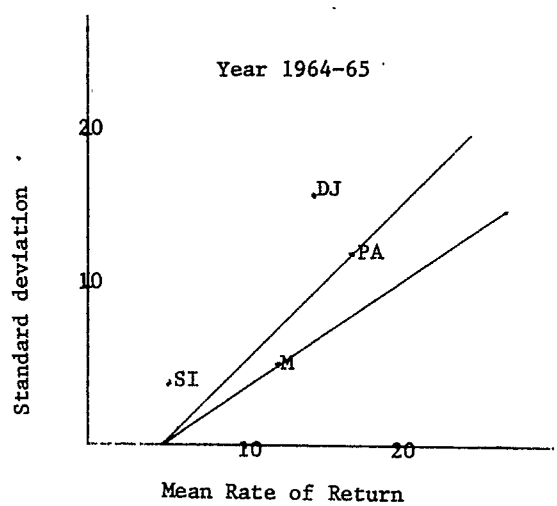
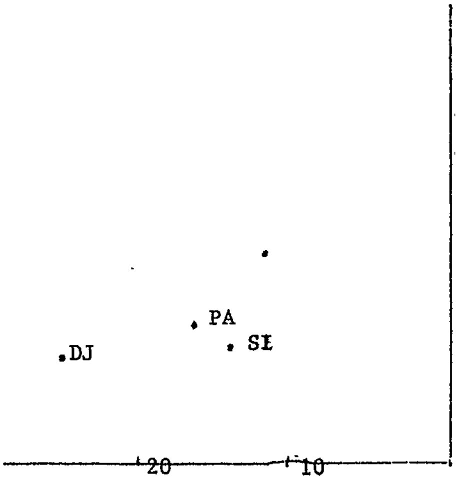


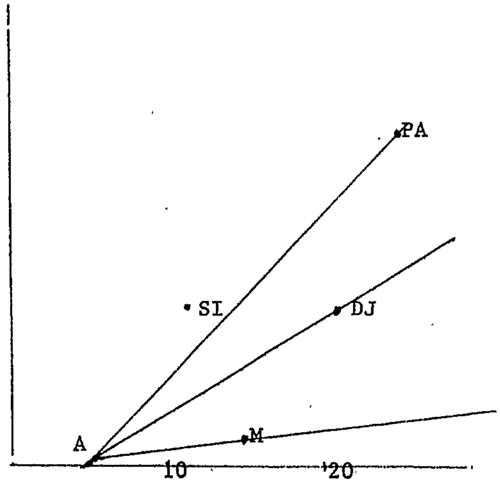
Fig. 1b

Year 1965-66



Mean Rate of Return
Fig. 1c

Year 1966-67



Mean Rate of Return
Fig. 1d

To further pin point the comparative performance of portfolios from alternative sources let us assume a riskless return rate of .04 and connect A with the risk-return points of the efficient portfolios in figures 1a through 1d.[6] The resulting investment lines give the combinations of risk-return available from part lending (or borrowing) and part investment in each alternative. Notice that the slope of the mutual fund investment line $d\sigma (M) / d\mu(M)$ is less than the slope of all the other investment lines for all the years.
It implies that the mutual fund portfolios yield more mean return per unit of uncertainty than the other portfolios. Thus, for all the years the risk-return combinations available from mutual fund investment, with/without leanding (or borrowing), are superior to those available from investment in the alternative sources.

Thus, the mutual fund portfolios continued to be efficient for all investment levels for all the years. As mentioned before, the diversification level C_j for each investment level I_j was varied and the results evaluated; but the basic conclusion that mutual fund portfolios continue to be efficient still remained valid.

In conclusion, when the practical considerations of commission structure, realistic diversification constraints, and ready availability of information are included in the analysis, mutual funds seems to offer a sensible outlet for investment to most individual investors with limited resources. Even if the mutual funds do not out-perform the 500 Standard and Poor's Index, as the studies of Treynor and Mazuy [11], Jenson [5] and others show so clearly, the investment opportunities offered by them may be attractive especially to those who have limited resources and are willing to put their money in low return low risk types of investment opportunities. This also offers at least a partial explanation for the mutual funds's poor performance and yet experiencing a phenomenal growth over the years, a question Levy and Saranat[3] raise so appropriately.

FOOTNOTES

[1]For objective functions involving other parameters such as the semi-variance and the covariance with the market, see Markowitz [7] and Sharpe [9], respectively. The empirical testing of the latter has, however, this not yet given satisfactory results, for example, see Friend and Blume [2].

[2]However, the diversification level (DL) for each investment I_j (except for the I_1 and I_2) was changed not to determine the optimal DL but to see its effect on risk-return attributes. Since the basic conclusions of the study remain invariant to such changes in DL, the results for only one DL are presented in the study.

[3]The other possible investment alternatives could include consideration of no-load and closed-end funds, M.I.P., etc.

[4]The study could be repeated for other periods without much difficulty. However, the years studied in this paper cover both the recessionary and the expansionary stages of the economy, and the easy and the tight monetary conditions. For the effects of the latter on business firms and lending institutions, see Gupta [4].

[5]For efficiency criterion, see Markowitz [7]. On the use of efficiency criterion in the capital budgeting framework, see Gupta [3].

[6]See Treynor [11] and Sharpe [8] on using riskless rate of portfolios.

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