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MUTUAL FUND PERFORMANCE AND THE THEORY OF CAPITAL ASSET PRICING: SOME COMMENTS

RICHARD R. WEST*

INTRODUCTION

IN TWO recent articles, William F. Sharpe has presented some results of a test of a theory of capital asset pricing.[1] The purpose of this brief paper is to demonstrate that Sharpe's "test" is, in fact, no test at all.

Sharpe's theory of capital asset pricing can be summarized as follows: If we assume investors are risk averters with (1) similar expectations about the future performance of financial assets and (2) the ability to borrow and lend funds at a pure (riskless) interest rate, "market prices of capital assets will adjust so that the predicted risk of each efficient portfolio's rate of return is linearly related to its predicted expected rate of return."[2] Specifically, all efficient portfolios will lie along a line

$$E_i = p + b\sigma_i ,$$

where E_i and σ_i are, respectively, the expected rate of return and predicted standard deviation of return on the ith portfolio, p is the pure rate of interest, and $b(> 0)$ is the risk premium.

To test this hypothesis, Sharpe compared the average annual rates of return and standard deviations of return on thirty-four mutual funds over the period 1954–63. His prediction was that if all funds were properly diversified, those with high average rates of return should have greater variability than those with low average returns. The data confirmed this prediction.

Nevertheless, because his original hypothesis was stated in terms of expectations concerning risk and return, Sharpe wisely noted that the use of ex post data for testing purposes was not strictly appropriate. He commented, for example, that, "strictly speaking, the implications of this theory cannot be tested practically, since the relationships refer to predictions concerning expected returns from assets and the associated risks. Clearly actual results may diverge considerably from the prediction made by investors at the time they purchase assets."[3]

The full limitations of the test, however, were not spelled out by Sharpe in either paper. On the contrary, his conclusions suggested that the study of the behavior of mutual fund data over the 1954–63 period provided a meaningful, if somewhat limited, test of his hypothesis. Consider, for example, the following statements drawn from the two papers:

> *If the theory is worth any consideration at all,* there should be such a relationship, it should be significant, and *funds experiencing greater variability should provide greater returns.*[4]

> This concludes the evidence. Although fragmentary, and not particularly novel, the data do lend considerable support to the theory *tested.*[5]

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[1] William F. Sharpe, "Risk Aversion in the Stock Market: Some Empirical Evidence," *Journal of Finance* (September, 1965), pp. 416–22; and "Mutual Fund Performance," *Journal of Business,* Suppl. (January, 1966), pp. 119–38.

[2] Sharpe, "Risk Aversion . . . ," p. 416.

[3] *Ibid.*, p. 416.

[4] *Ibid.*, p. 417; italics mine.

[5] *Ibid.*, p. 422; italics mine.

The relationship predicted by the theory of capital assets prices is clearly present—funds with large average returns typically exhibit greater variability than those with small average returns. Moreover, the relationship is approximately linear and significant.[6]

Unfortunately, an analysis of the returns and the variability of returns of mutual funds over the 1954–63 period is not a meaningful test of Sharpe's hypothesis. Meaningful tests of hypotheses are formulated in such a way that the observation of data that are inconsistent with the predictions of the hypotheses will cause the hypotheses to be rejected. Under a certain set of rather plausible conditions, Sharpe's test would almost certainly uncover evidence contrary to his predictions. Yet it is unlikely that this evidence would cause him to reject his hypothesis about capital asset pricing. Let me elaborate.

THE ARGUMENT

At one point in his article in this *Journal*, Sharpe commented that in a perfect capital market "all truly diversified portfolios will move with the overall market, giving high returns when the market in general provides high returns and low returns when the market provides low returns."[7] Moreover, he went on to argue that "the data bear out this hypothesis. During the period 1954–63, almost 90 per cent of the variance of the return of the typical fund in our sample was due to the co-movement with the return on the thirty securities used to compute the Dow-Jones Industrial Average."[8]

Thus, a graphic presentation of the relationships between the expected return on the Dow-Jones Industrial Average and the expected returns on five hypothetical funds might be expected to look like the curves in Figure 1. Jack L. Treynor has referred to curves such as these as "characteristic curves." This name seems rather appropriate in that the differences in the slopes of the curves primarily reflect differing fund objectives.

Let us now suppose that over some ten-year period all five funds are able to perform the task of diversification perfectly, so that in each year their returns fall on their respective characteristic curves. Under these conditions, each fund's average annual rate of return and standard deviation of return will be a function of one variable: the movement in the market (the Dow-Jones Industrial Average) over the ten-year period. To illustrate, let us assume two series of returns for the Dow-Jones average and then calculate the average annual rates of return and standard deviations of returns for the five funds.[9] The results of these calculations are plotted in Figure 2. As the reader can see, the points in Part *A* are positively sloped—that is, funds with relatively high average returns also had relatively high standard deviations of returns. The points in Part *B*, however, have a significantly negative slope. In this case, high average returns went hand in hand with relatively low variability of returns.

How are we to interpret these hypothetical results? In particular, are the data in Part *A* to be viewed as evidence supporting Sharpe's theory of capital asset pricing and the data in Part *B* as evidence opposing it? If so, then all that would seem to be required to refute his hypothesis would be a period during which the market exhibited no strong

[6] Sharpe, "Mutual Fund Performance," p. 123; italics mine.

[7] *Ibid.*, p. 127.

[8] *Ibid.*, p. 127.

[9] The two series are as follows: 44, 21, 2, −13, 34, 16, −12, 19, −10, and 17 per cent and −33, 20, −3, −13, −16, 8, 14, 12, 27, and −8 per cent.

trend and funds in differing risk classes performed their task of diversification well—that is, had returns that moved up and down with the over-all market—for under these conditions a scatter similar to that presented in Figure 2*B* would obtain. Indeed, the hypothetical returns for the Dow-Jones Industrial Average underlying the data in Part *B* closely approximate the actual performance of the average from 1937–46.[10]

Surely, however, neither Sharpe nor I would accept such evidence as a refutation of his hypothesis, for, as he pointed out, "actual results may diverge considerably from the predictions made by investors at the time they purchase assets."[11]

[10] Each year's hypothetical return was obtained by finding the percentage change in the Dow-Jones Industrial Average over the period 1937–46. In 1937, for example, the Dow-Jones Industrial Average fell from its December 31, 1936, close of 179.90 to its December 31, 1937, close of 120.85, a drop of approximately 33 per cent.

[11] Sharpe, "Risk Aversion . . . ," p. 416.

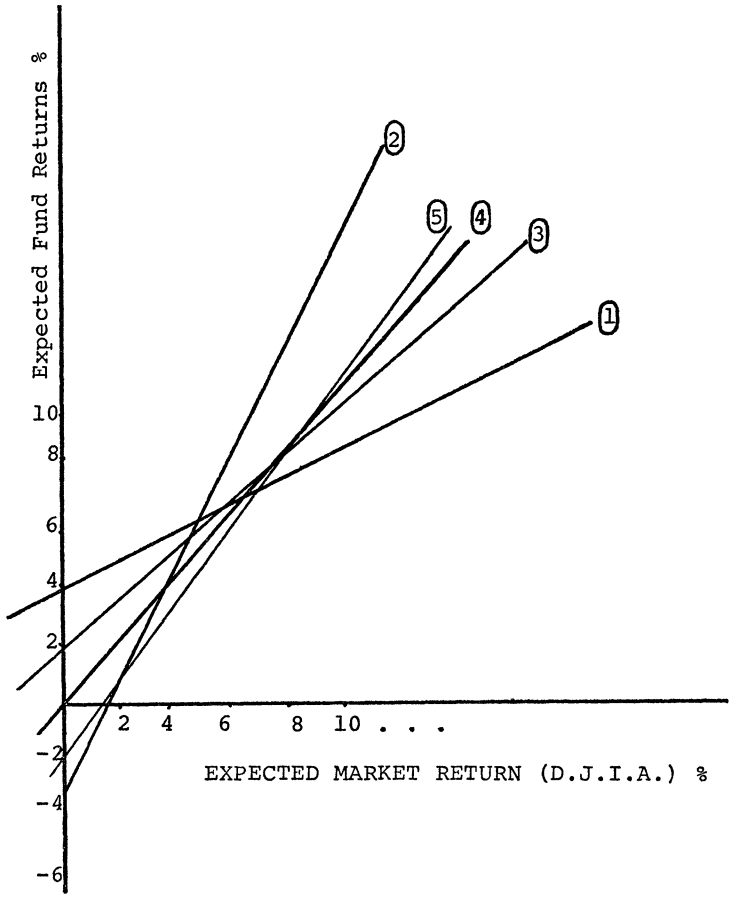

FIG. 1.—Relationships between the expected returns of five hypothetical mutual funds and the expected return on the Dow-Jones Industrial Average. The equations underlying these relationships are as follows: $Y_1 = 4 + 0.5$ DJ, $Y_2 = -3 + 2.0$ DJ, $Y_3 = 2 + 1.0$ DJ, $Y_4 = 1.1$ DJ, and $Y_5 = -2 + 1.5$ DJ.

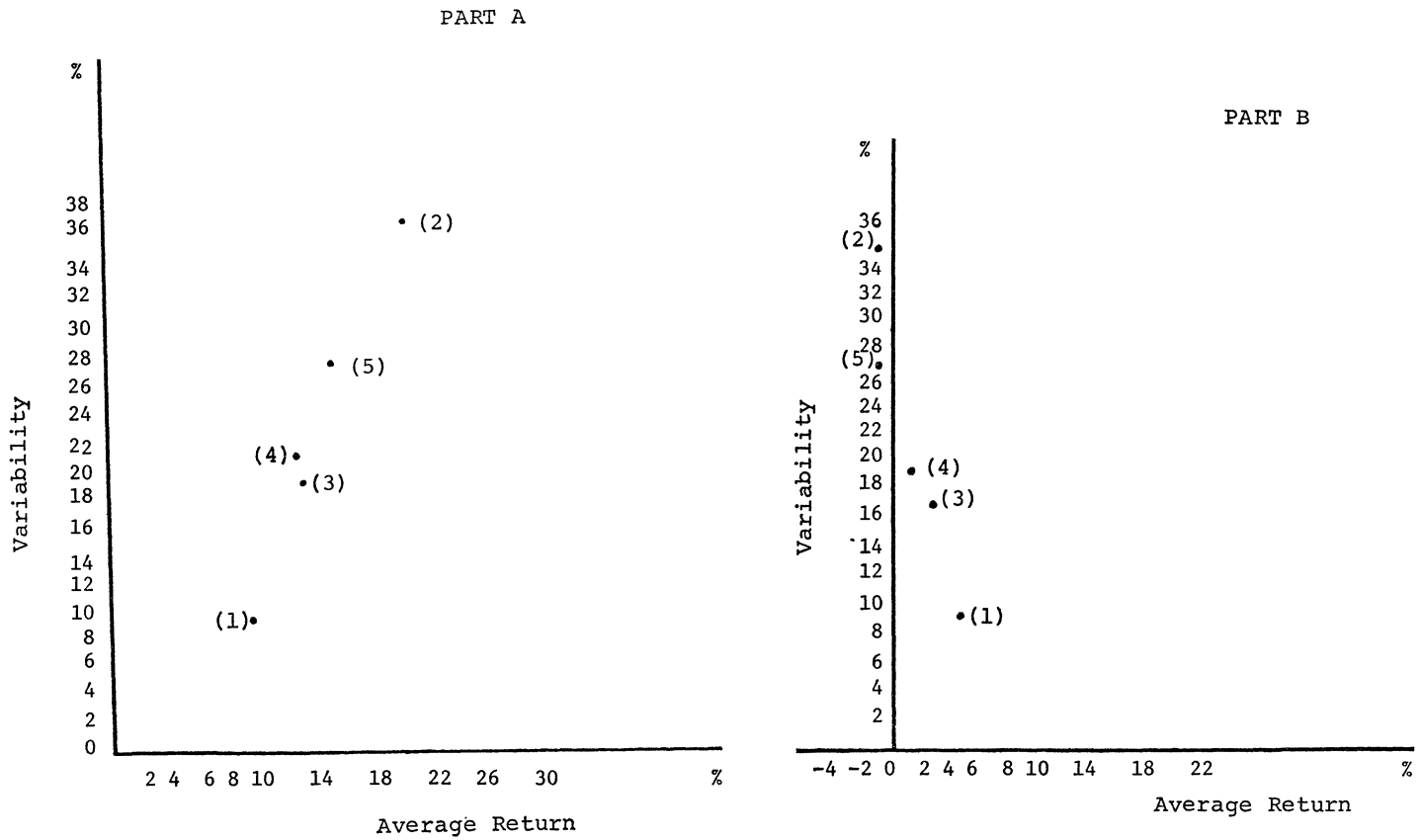

FIG. 2.—Average return and variability of return for five hypothetical mutual funds

But how then can we accept Sharpe's conclusion that the data on mutual fund performance for the 1954–63 period "lend considerable support to the theory tested"? The answer, I submit, is that we cannot. These data are simply the result of two factors: (1) the ability of funds with differing objectives to diversify successfully and (2) the sustained bull market of the 1950's and early 1960's. If the same funds were to perform their task of diversification equally well during a period in which the market had no strong upward bias, it is possible, indeed probable, that the data would refute Sharpe's hypothesis.

CONCLUSION

Sharpe's theory concerning the relationship between the expected risks and returns on efficient portfolios is intuitively pleasing; moreover, it is consistent with classical doctrine concerning the determination of capital asset prices. Unfortunately, however, examining the ex post values of returns and standard deviations of returns on mutual funds, particularly for a bull-market period like 1954–63, is not really a meaningful way to test the theory. Indeed, it is difficult to formulate meaningful tests of hypotheses involving relationships between the expected values of variables.