

just a proxy for the size effect. Given its longevity, it is not likely that it is due to a market inefficiency but it is rather evidence of a pricing model misspecification. To the extent that tests of market efficiency use data of firms of different sizes and are based on the CAPM, their results might be at least contaminated by the size effect.

One possible explanation involving the size of the firm directly is based on a model by Klein and Bawa (1977). They find that if insufficient information is available about a subset of securities, investors will not hold these securities because of estimation risk, i.e., uncertainty about the true parameters of the return distribution. If investors differ in the amount of information available, they will limit their diversification to different subsets of all securities in the market.¹⁵ It is likely that the amount of information generated is related to the size of the firm. Therefore, many investors would not desire to hold the common stock of very small firms. I have shown elsewhere [Banz (1978, ch. 2)] that securities sought by only a subset of the investors have higher risk-adjusted returns than those considered by all investors. Thus, lack of information about small firms leads to limited diversification and therefore to higher returns for the 'undesirable' stocks of small firms.¹⁶ While this informal model is consistent with the empirical results, it is, nevertheless, just conjecture.

To summarize, the size effect exists but it is not at all clear why it exists. Until we find an answer, it should be interpreted with caution. It might be tempting to use the size effect, e.g., as the basis for a theory of mergers — large firms are able to pay a premium for the stock of small firms since they will be able to discount the same cash flows at a smaller discount rate. Naturally, this might turn out to be complete nonsense if size were to be shown to be just a proxy.

The preceding discussion suggests that the results of this study leave many questions unanswered. Further research should consider the relationship between size and other factors such as the dividend yield effect, and the tests should be expanded to include OTC stocks as well.

¹⁵Klein and Bawa (1977, p. 102).

¹⁶A similar result can be obtained with the introduction of fixed holding costs which lead to limited diversification as well. See Brennan (1975), Banz (1978, ch. 2) and Mayshar (1979).

References

- Ball, Ray, 1978, Anomalies in relationships between securities' yields and yield surrogates, *Journal of Financial Economics* 6, 103-126.
- Banz, Rolf W., 1978, Limited diversification and market equilibrium: An empirical analysis, Ph.D. dissertation (University of Chicago, Chicago, IL).
- Basu, S., 1977, Investment performance of common stocks in relation to their price-earnings ratios: A test of market efficiency, *Journal of Finance* 32, June, 663-682.

- Black, Fischer, 1972, Capital market equilibrium with restricted borrowing, *Journal of Business* 45, July, 444-454.
- Black, Fischer, and Myron Scholes, 1974, The effects of dividend yield and dividend policy on common stock prices and returns, *Journal of Financial Economics* 1, May, 1-22.
- Black, Fischer, Michael C. Jensen and Myron Scholes, 1972, The capital asset pricing model: Some empirical tests, in: M.C. Jensen, ed., *Studies in the theory of capital markets* (Praeger, New York) 79-121.
- Brennan, Michael J., 1975, The optimal number of securities in a risky asset portfolio when there are fixed costs of transacting: Theory and some empirical evidence, *Journal of Financial and Quantitative Analysis* 10, Sept., 483-496.
- Brenner, Menachem, 1976, A note on risk, return and equilibrium: Empirical tests, *Journal of Political Economy* 84, 407-409.
- Fama, Eugene F., 1976, *Foundations of finance* (Basic Books, New York).
- Fama, Eugene F. and James D. MacBeth, 1973, Risk return and equilibrium: Some empirical tests, *Journal of Political Economy* 71, May-June, 607-636.
- Ibbotson, Roger G. and Carol L. Fall, 1979, The United States market wealth portfolio, *Journal of Portfolio Management* 6, 82-92.
- Ibbotson, Roger G. and Rex A. Sinquefeld, 1977, *Stocks, bonds, bills and inflation: The past (1926-1976) and the future (1977-2000)* (Financial Analysis Research Foundation).
- Klein, Roger W. and Vijay S. Bawa, 1977, The effect of limited information and estimation risk on optimal portfolio diversification, *Journal of Financial Economics* 5, Aug., 89-111.
- Kraus, Alan and Robert H. Litzenberger, 1976, Skewness preference and the valuation of risk assets, *Journal of Finance* 31, 1085-1100.
- Levi, Maurice D., 1973, Errors in the variables bias in the presence of correctly measured variables, *Econometrica* 41, Sept., 985-986.
- Litzenberger, Robert H. and Krishna Ramaswamy, 1979, The effect of personal taxes and dividends on capital asset prices: Theory, and empirical evidence, *Journal of Financial Economics* 7, June, 163-195.
- Mayshar, Joram, 1979, Transaction costs in a model of capital market equilibrium, *Journal of Political Economy* 87, 673-700.
- Reinganum, Marc R., 1980, Misspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values, *Journal of Financial Economics*, this issue.
- Roll, Richard, 1977, A critique of the asset pricing theory's tests: Part I, *Journal of Financial Economics* 4, Jan., 120-176.
- Stattman, Dennis, 1980, Book values and expected stock returns, Unpublished M.B.A. honors paper (University of Chicago, Chicago, IL).
- Theil, Henri, 1971, *Principles of econometrics* (Wiley, New York).
- U.S. Department of Commerce, Office of Business Economics, 1969, 1970, *Survey of current business* 49, May, 11-12; 50, May, 14.