This Week's Citation Classic

Markowitz H M. *Portfolio selection: efficient diversification of investments.*
New York: Wiley, 1959. [Rand Corporation, Santa Monica, CA]

Starting with the observation that the then-current financial theory failed to explain diversification common to financial practice, portfolio theory sought to minimize risk for given expected return. It is now widely used by large institutional investors. It also supplied premises for the Capital Asset Pricing Model (CAPM) which recast the economic theory of capital markets. [The *SSCI®* and the *SCI®* indicate that this book has been cited in more than 1,080 publications.]

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A Theory of Practice

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I was a student in the Economics Department of the University of Chicago, and a research fellow of the Cowles Commission, sitting outside J. Marschak's office, about to seek suggestions for a PhD dissertation topic. An older man was also waiting; we fell into conversation, and he identified himself as a broker and suggested I consider doing a dissertation on the stock market. When I spoke to Marschak, he thought the idea reasonable, recounted Alfred Cowles's[1] own work in the area, and suggested I consult Marshall Ketchum in the business school. Ketchum recommended readings including John Burr Williams.[2] The following thoughts occurred while reading Williams one afternoon at the library of the business school. Williams recommends that we value a stock by discounting its future dividends. Since the future is uncertain, this must mean that we value a stock by its expected present value; and similarly must value a portfolio of securities. But to maximize the expected value of a portfolio, one puts all one's money in the security with maximum expected return. I knew from common sense and invest-

ment practice that one should diversify to reduce risk.

Thinking of the present values of securities as random variables, it seemed obvious that one should seek high expected value and low variance on the portfolio as a whole. Since there were two criteria, the notion of a feasible set of E-V combinations, and the "desirable" or "Pareto Optimum" or efficient subset of the feasible set suggested itself. The business school library had a copy of J.V. Uspensky[3] that supplied the formula for the variance of a weighted sum of random variables. Perfect! To reduce variance for given expected return, one must consider not only the means and variances of securities, but also their covariances!

That afternoon set the direction. There were major problems to solve, such as how to compute efficient sets for large numbers of securities, and how to incorporate mean-variance analysis into a theory of rational behavior under uncertainty. My solutions to these were developed partly in preparing my dissertation and partly while writing my 1959 book, the subject of this commentary. Additional work is covered in my 1987 book.[4]

William F. Sharpe and I worked at the RAND Corporation when Bill was at UCLA seeking a dissertation topic. Fred Weston suggested he talk with me about doing a dissertation in portfolio theory. The result was Bill's 1963 article.[5]

There were few references to my 1952 article[6] during the 1950s. But the pace picked up after Sharpe published his Simplified Model for Portfolio Analysis,[5] his article on the Capital Asset Pricing Model,[7] and John Lintner published on the same subject.[8] Their Capital Asset Pricing Model (CAPM) analyzed a world in which all investors sought E-V efficiency, and certain other assumptions were true. The literature that flowed directly from the idea of E-V efficiency, and indirectly via CAPM, is quite large and continues to grow.

1. **Cowles A.** *Common-stock indexes.* Monograph 3. New Haven, CT:Yale University Press. 1938.
2. **Williams J B.** *The theory of investment value.* Cambridge, MA: Harvard University Press, 1938. (Cited 190 times since 1956.)
3. **Uspensky J V.** *Introduction to mathematical probability.* New York: McGraw-Hill. 1937. (Cited 190 times since 1956.)
4. **Markowitz H M.** *Mean-variance analysis in portfolio choice and capital markets.* New York: Blackwell, 1987.
5. **Sharpe W F.** A simplified model for portfolio analysis. *Manage. Sci.* 9:277-93. 1963. (Cited 290 times.)
6. **Marakowitz H M.** Portfolio selection. *J. Finan.* 7:77-91. 1952. (Cited 425 times since 1956.)
6. **Sharpe W F.** Capital asset prices: a theory of market equilibrium under conditions of risk. *J. Finance* 19:425-42, 1964. (Cited 1,045 times.) [See also: **Sharpe W** F. Citation Classic. *Current Contents/Social & Behavioral Sciences* 11(33):12. 13 August 1979. Reprinted in: *Contemporary classics in the social and behavioral sciences.* (Smelser N J, comp.) Philadelphia: ISI Press. 1987. p. 320.]
7. **Lintner J.** The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Rev. Econ. Statist.* 47:13-37. 1965. (Cited 715 times.)