PORTFOLIO MANAGEMENT RESEARCH
with. Intelligence

the journal of PORTFOLIO management

pm-research.com volume 50 number 8

special issue dedicated to

Harry Markowitz

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the journal of PORTFOLIO management

HARRY MARKOWITZ SPECIAL ISSUE • JULY 2024 • volume 50 number 8

the journal of PORTFOLIO management

Editors' Introduction: The Birth of Portfolio Theory

Frank J. Fabozzi, Bruce I. Jacobs, and Kenneth N. Levy

INTRODUCTION

Volume 50 | Issue 8

To grasp the impact of Harry M. Markowitz, you must consider what the investing world was like before his seminal 1952 paper, "Portfolio Selection" (1952a). At a recent conference,[1] his fellow Nobel laureates recalled that it was a primordial, prescientific state.

"It was all rules of thumb. Nothing. He was developing things in a vacuum.... The Big Bang Theory in finance really occurred in 1952," said Myron S. Scholes.

"Almost all of portfolio research begins with Markowitz," noted Robert F. Engle.

"I mark the beginning of finance science as the 1952 paper," added Robert C. Merton.

"Was Harry an economist, mathematician, or operations researcher? ... My answer is he was all three and excellent in every sense of those terms. Harry was a pioneer, mentor, and key contributor to financial economics," said William F. Sharpe.

"Portfolio Selection" and Markowitz's 1959 book expanding on his foundational theories, *Portfolio Selection: Efficient Diversification of Investments*, emphasized a portfolio approach to security selection and the importance of diversification. Markowitz showed how to construct investment portfolios on the "efficient frontier" to achieve the maximum expected return for any given level of expected risk. And he did so in a highly mathematical manner—unusual at that time. Campbell R. Harvey notes in this issue that *The Journal of Finance* issue in which "Portfolio Selection" appeared contained six articles, five of which had no equations, while Markowitz's offered more than 20. Markowitz's use of quadratic programming in portfolio optimization was another innovation. Jerome Benveniste, Petter N. Kolm, and Gordon RItter say that Markowitz arguably was the first to formalize a financial decision-making process as a mathematical optimization problem.

Markowitz was only 24 years old when he published the work that would later earn him a Nobel Prize. Rob Arnott observes in "Reminiscences on an Extraordinary Gentleman" that the 1952 paper and the 1959 book have been cited nearly 60,000 times. Markowitz's early insights have served as a remarkably tractable and fruitful framework for investment research, adapting to and shaping intellectual and technological advancements over the next seven decades.

[1] JOIM Spring Conference, Rady School of Management, University of California, San Diego, March 24–26, 2024.

The continuing relevance of his ideas and the breadth of their influence are the underlying themes of this special issue of *The Journal of Portfolio Management*, as is the affection that so many of his colleagues felt for Harry. Interspersed with their scholarly discussions of Markowitz's theories are numerous recollections of his wit, his warmth, his encouragement and support, and his insatiable curiosity.

Markowitz was a polymath whose mind was seldom at rest. His interests spanned multiple disciplines. His development of portfolio theory, advancement of simulation methods, including his creation of the SIMSCRIPT programming language, and his work on sparse matrix methods earned him the John von Neumann Theory Prize from the Institute for Operations Research and the Management Sciences, an award he treasured nearly as much as his Nobel Prize. Markowitz's portfolio theory was far more than merely an application of statistical methods to investing, notes Kenneth A. Blay in "From Portfolio Selection to Portfolio Choice: Remembering Harry Markowitz." It drew on philosophical and mathematical insights derived from game theory, utility theory, and statistics, he says.

All of the contributors to this special issue have collaborated with Markowitz in some way, whether to bounce ideas off of him, to pursue a line of research inspired by his foundational theories, or to coauthor a paper. "We found that one of the most intellectually satisfying experiences was to have a conversation with Harry that led to a question or problem for which none of us had an answer," recall Bruce I. Jacobs and Kenneth N. Levy. "We would challenge him, he would challenge us, and out of that would come something useful."

Martin J. Gruber, in "Markowitz Remembrance," tells how Markowitz's 1959 book and his encouragement led to the publication of a series of nine papers on solving portfolio problems under different conditions and constituted a major part of Gruber's early publications. Campbell Harvey, in "Eggs in a Basket: Harry Markowitz's Contribution and How I Achieved Erdős 3," describes several research streams inspired by Markowitz's 1952 paper and his pride in being an "Erdős 3" by virtue of having coauthored a paper with Markowitz.[2]

Markowitz mean–variance analysis was the foundation upon which Sharpe built the capital asset pricing model (CAPM). Sharpe writes, in his essay, "Portfolio Selection: Efficient Diversification of Investments, 1959," that the CAPM and the original argument for index funds were inspired by his asking the question, "What if everyone were doing what Harry had said they should do?" Sharpe adds that Markowitz's work shifted the focus of investors from individual stocks and bonds to portfolios of stocks and/or bonds, thereby furthering the growth of mutual funds.

Perhaps less well known is Markowitz's link to behavioral finance. In "Harry Markowitz's Two Intellectual Children: Mean–Variance and Behavioral Portfolio Theories," Meir Statman writes that Markowitz's depiction of the utility function "reveals profound insights into the thinking of normal investors." Investors formed their risk and return preferences based on a "customary wealth" specific to each individual, Markowitz argued in a second groundbreaking paper from 1952, "The Utility of Wealth" (1952b). This insight became a pillar of what would later be known as "prospect theory."

Despite its near-universal acceptance in portfolio construction, mean–variance optimization still draws criticism for a variety of shortcomings (and misconceptions), including its sensitivity to data errors and estimation uncertainty, its single-period focus, and its neglect of transaction costs, leverage risk, and higher moments such as skewness and kurtosis. Some of the articles in this issue debunk misconceptions and others provide solutions. Jacobs and Levy, in "Portfolio Insurance, Portfolio Theory, Market Simulation, and Risks of Portfolio Leverage," distinguish between portfolio insurance and portfolio theory, discuss the Jacobs Levy Markowitz Market Simulator,

[2] Think of the Erdős number as a mathematician's version of "Six Degrees of Kevin Bacon."

which can explain the behavior of security prices and find equilibrium expected returns, and extend portfolio theory to account for the unique risks of leverage, applying investor volatility aversion and leverage aversion to portfolio choice.

In "A Tribute to Harry Markowitz," Mark Kritzman recounts the story of how, with Markowitz's assistance, he allayed Paul Samuelson's concerns about the robustness of mean–variance analysis. (Markowitz later called such concerns the "Great Confusion.") Benveniste, Kolm, and Ritter, in "Untangling Universality and Dispelling Myths in Mean–Variance Optimization," show that maximizing expected utility and mean–variance allocation coincide for a broad range of distributional assumptions of asset returns and utility functions. Stephen Boyd, Kasper Johansson, Ronald Kahn, Philipp Schiele, and Thomas Schmelzer's article, "Markowitz Portfolio Construction at Seventy," offers extensions to the mean–variance methodology that address the uncertainty inherent in return statistics forecasting.

Delving further into the intricacies of mean–variance analysis, Haim Levy, in "Mean–Variance Analysis, the Geometric Mean, and Horizon Mismatch," examines the mismatch between the monthly rates of return used as inputs into the optimization model and the longer horizons of many investors. He finds a negligible economic cost for investors with horizons of less than one year and a substantial cost for longer horizons. Ganlin Xu and John Guerard explore an extension of a data-mining correction test developed by Xu and Markowitz to study the variance of mutual fund managers' skill in "Data Mining Corrections and Mutual Fund Performance." Chanaka Edirisinghe and Jaehwan Jeong propose a leverage constraint and portfolio cardinality control to address highly leveraged and fragmented mean–variance-optimal portfolios in "Data-Driven Mean–Variance Sparse Portfolio Selection under Leverage Control."

Markowitz's influence has extended even further as researchers have begun to apply his concepts of diversification and portfolio optimization to new problems. Florian Berg, Andrew W. Lo, Roberto Rigabon, Manish Singh, and Ruixun Zhang, in "Quantifying the Returns of ESG Investing: An Empirical Analysis with Six ESG Metrics," propose a portfolio approach to ESG (environmental, social, and governance) investing, aggregating the disparate output of ESG ratings agencies to overcome noise and measurement error. Moshe Levy reexamines the CAPM size anomaly in "Shrinking the Size Effect" and finds that it almost completely disappears when sample values of average returns and betas are shrunk toward their cross-sectional averages. Wesley Phoa, in "Further Applications of Mean–Variance Optimization," shows how mean–variance optimization can be applied to two contemporary issues: designing an optimal path for the evolution of stock–bond portfolio allocations as one approaches retirement and determining the valuation of illiquid portfolio assets. Sam Savage and Ben Ball describe in "The Markowitzatron: From Modern Portfolio Theory to Modern Petroleum Theory" how they applied Markowitz's concepts of optimization to portfolios of oil exploration and production assets.

Though his accomplishments were enormous, Markowitz never stopped pursuing his intellectual goals. He embarked on a four-volume explication of modern portfolio theory while in his eighties and completed three of them before passing away at age 95. His work will live on through the many researchers and scientists who are guided by it. Said Merton: "The ultimate immortality is when your work is alive. So I say this: Harry Markowitz is a member of an extremely super-rare set of scientists who have achieved immortality."[3]

This special issue is divided into two parts. The first part, which we have labeled "Legacy and Tributes," includes personal reminiscences, tributes, and reflections on Markowitz's impact on colleagues, students, and the field at large. It emphasizes the personal and human aspects of his life and work. The second part, "Scholarly

[3] JOIM Spring Conference, 2024.

Contributions," focuses on research articles that either build upon, critique, or expand Markowitz's body of work. It highlights the ongoing relevance and influence of his research and ideas within the academic community and beyond.

We hope you enjoy reading this special issue as much as we enjoyed creating it.

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