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# Modern Asset Allocation for Wealth Management

DAVID M. BERNS, PhD

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Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

Published simultaneously in Canada.

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*Library of Congress Cataloging-in-Publication Data is Available:*

9781119566946 (Hardback)

9781119567004 (ePDF)

9781119566977 (epub)

Cover Design: Wiley

Cover Image: © oxygen/Getty Images

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

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# Preface

**M**odern portfolio theory (MPT) is one of the most insightful tools of modern finance. It introduced the world to the first intuitive framework for portfolio risk and how one can optimally combine investable assets to form portfolios with high return and low volatility. The elegance and power of mean-variance (M-V) optimization garnered its inventor Harry Markowitz a well-deserved Nobel Memorial Prize in Economics and has always been a great personal inspiration for how quantitative insights can assist us all in our daily life.

The actual process of implementing MPT for clients can be challenging in practice, though. Setting client risk preferences, accounting for client financial goals, deciding which assets to include in the portfolio mix, forecasting future asset performance, and running an optimization routine all sound simple enough conceptually, but when you actually sit down to implement these tasks, the true complexity of the problem becomes apparent. This implementation hurdle forces many advisors either to outsource the asset allocation component of their process or deploy simple portfolio construction heuristics (rules of thumb) that are sub-optimal and lack connection to client preferences.

The financial ecosystem has also seen tremendous evolution since MPT was first introduced in 1952. The world has been introduced to non-linear investable assets such as options and certain alternative risk premia (AKA style premia, factor investing, or smart beta), which have rapidly become more available to retail investors over the past two decades. Additionally, our understanding of human behavior when it comes to decision-making under uncertainty has markedly shifted with the discovery of prospect theory (PT) in the 1970s. *Homo economicus*, the perfectly rational investor, is no longer the client we are building portfolios for. These evolutions cannot be handled in the MPT framework: non-linear assets cannot be represented by mean and variance and the M-V approach cannot capture the nuances of behavioral risk preferences.

While MPT is both practically challenging and theoretically antiquated, there are wonderful new methods available for both simplifying the challenging tasks in the asset allocation process and addressing the realities of human decision-making in today's markets. Unfortunately, this progress has

not been widely assimilated by the wealth management community, which includes both traditional advisors and robo-advisors. Most advisors still utilize the original formulation of MPT or deploy heuristic models that help avoid the challenges of implementation altogether. This book is a first step to bridging the gap between the original formulation of MPT and a more modern and practical asset allocation framework.

This book was written to enable advisors to more accurately design portfolios for real-world client preferences while conquering the complexities of the asset allocation process that often push advisors into sub-optimal heuristics or outsourcing. To empower advisors fully in being able to implement the framework catalogued in this book, the complete machinery is available as a cloud-based SaaS: [www.portfoliodesigner.com](http://www.portfoliodesigner.com). Just as the book is meant to provide a modern and intuitive system for creating portfolios, the software is also intended to provide an accurate and scalable solution for real-world asset allocation based on the methods presented here. And for those who don't want to deploy the primary framework of the book, the hope is that the materials presented here can minimally help advisors navigate the wide world of asset allocation solutions out there in a more informed and fiduciary manner.

While a primary goal of this writing is to provide a practical solution to asset allocation, I must warn you that the final framework falls short of being a simple solution. Any asset allocation solution that truly respects client preferences and the foundations of modern financial economics will require a certain foundation of knowledge and measured care for proper implementation. My hope is that, with education and practice, the refined perspective presented here will quickly become second nature to wealth management practitioners and ultimately lead to a scalable process that financial advisors can truly stand behind. To help streamline this education, I have decided not to present an encyclopedic review of asset allocation tools, but instead to focus on a limited number of tools for each step of the asset allocation process. To this end, I have consciously focused on the most accurate methods that were simultaneously practical, which includes elements that are undeniably optimal (and need never be replaced) and others that are clearly not optimal (and may warrant replacement). While the ultimately singular framework presented here indeed has its limitations, my truest intention was to create a modern yet practical process that the wealth management community could readily and confidently deploy today.

For the purposes of this book, asset allocation is defined as anything related to creating an investment portfolio from scratch. This includes setting client risk preferences, deciding which assets to include in client portfolios, forecasting future asset performance, and blending assets together to form optimal client portfolios. Following the first chapter, which reviews some key

preliminary concepts and presents the general framework pursued here, this book is organized in the order in which each asset allocation task is carried out when creating a client's portfolio in practice. Hence, Chapters 2–5 are meant to serve as a step-by-step guidebook to asset allocation, where the aforementioned software follows the exact same workflow. Below is a brief overview of what will be covered in each chapter.

*Chapter 1. Preliminaries.* Utility theory and estimation error, two key concepts that underlie much of the book's discussions, are introduced. Asset allocation is then defined as the maximization of expected utility while minimizing the effects of estimation error, which will ultimately lead to the book's modern yet practical process for building portfolios. MPT and other popular models are shown to be approximations to the full problem we would like to solve. Key concepts from behavioral economics are also introduced, including a modern utility function with three (not one) risk parameters, that can capture real-world client preferences. We then review how to minimize estimation error and its consequences to create a practical framework that advisors can actually implement. The chapter ends with a formal definition of the overall framework that is pursued in the remainder of the book.

*Chapter 2. The Client Risk Profile.* The chapter begins with a review of how to measure the three dimensions of client risk preferences (risk aversion, loss aversion, and reflection) via three lottery-based questionnaires. The concept of standard of living risk (SLR) is introduced to help determine whether these preferences should be moderated to achieve the long-term cash flow goals of the portfolio. SLR is then formally assessed with a comprehensive yet simple balance sheet model, which goes far beyond the generic lifecycle investing input of time to retirement, and leads to a personalized glidepath with a strong focus on risk management. The final output of the chapter is a systematic and precise definition of a client's utility function that simultaneously accounts for all three dimensions of risk preferences and all financial goals.

*Chapter 3. Asset Selection.* The third chapter presents a systematic approach to selecting assets for the portfolio that are simultaneously accretive to a client's utility and minimally sensitive to estimation error. By combining this asset selection process with the concept of risk premia, the chapter also introduces a new paradigm for an asset class taxonomy, allowing advisors to deploy a new minimal set of well-motivated asset classes that is both complete and robust to estimation error sensitivity.

*Chapter 4. Capital Market Assumptions.* This chapter justifies the use of historical return distributions as the starting point for asset class forecasts. We review techniques that help diagnose whether history indeed repeats itself and whether our historical data is sufficient to estimate accurately the properties of the markets we want to invest in. A system is then introduced for

modifying history-based forecasts by shifting and scaling the distributions, allowing advisors to account for custom forecasts, manager alpha, manager fees, and the effects of taxes in their capital market assumptions.

*Chapter 5. Portfolio Optimization.* In the fifth and final chapter, we finally maximize our new three-dimensional utility function over the assets selected and capital market assumptions created in the previous chapters. Optimizer results are presented as a function of our three utility function parameters, showcasing an intuitive evolution of portfolios as we navigate through the three-dimensional risk preference space. By comparing these results to other popular optimization frameworks, we will showcase a much more nuanced mapping of client preferences to portfolios. The chapter ends with a review of the sensitivity of our optimal portfolios to estimation error, highlighting generally robust asset allocation results.

There are three key assumptions made throughout this book to simplify the problem at hand dramatically without compromising the use case of the solution too severely: (1) we are only interested in managing portfolios over long-term horizons (10+ years); (2) consumption (i.e. withdrawals) out of investment portfolios only occurs after retirement; and (3) all assets deployed are extremely liquid. Let's quickly review the ramifications of these assumptions so the reader has a very clear perspective on the solution being built here.

Assumption 1 implies that we will not be focused on exploiting short-term (6–12 month) return predictability (AKA tactical asset allocation) or medium-term (3–5 year) return predictability (AKA opportunistic trading). Given the lack of tactical portfolio shifts, it is expected that advisors will typically hold positions beyond the short-term capital gains cutoff, and it can be assumed that taxes are not dependent on holding period, allowing us to account completely for taxes within our capital market forecasts. One can then assume there is little friction (tax or cost) to rebalancing at will, which leads to the following critical corollary: the long-term, multi-period portfolio decision can be reduced to the much simpler single period problem. Finally, the long horizon focus will help justify the deployment of historical distribution estimates as forecast starting points.

The first key ramification of assumption 2 is that we only need to consider “asset only” portfolio construction methods, i.e. asset-liability optimization methods with regular consumption within horizon (common for pension plans and insurance companies) are not considered. Additionally, it allows us to focus on the simpler problem of maximizing utility of wealth, rather than the more complex problem of maximizing utility of consumption.

Assumption 3 has two main consequences: (1) liquidity preferences can be ignored while setting the client risk profile; and (2) the liquidity risk

premium need not be considered as a source of return. This assumption also keeps us squarely focused on the average retail client, since they don't have access to less-liquid alternative assets (like hedge funds and private equity/real estate) that are commonly held by ultra-high-net-worth individuals.

I hope this book and the accompanying software empowers advisors to tackle real-world asset allocation confidently on their own, with a powerful yet intuitive workflow.

*David Berns*

New York

January 10, 2020

