Mean-variance portfolio theory, described by Harry Markowitz (1952), is the portfolio theory of standard finance, whereas behavioral portfolio theory, described in its initial form by Hersh Shefrin and Meir Statman (1987, 2000), is the portfolio theory of behavioral finance.

Mean-variance portfolio theory prescribes portfolios on mean-variance frontiers to investors whose wants extend no further than the utilitarian benefits of high expected returns and low risk, measured by the variance of portfolio returns. We call it “textbook” mean-variance portfolio theory because it is the mean-variance portfolio theory as presented in typical investment textbooks.

Behavioral portfolio theory describes portfolios on behavioral-wants frontiers and prescribes them to investors whose wants extend beyond the utilitarian benefits of high expected returns and low risk to expressive and emotional benefits such as those of demonstrating sincere social responsibility, high social-status, hope for riches, and protection from poverty (see table 1).

Markowitz (1999) noted that the benefits of diversified portfolios were known long before 1952: “What was lacking prior to 1952 was an adequate theory of investment that covered the effects of diversification when risks are correlated, distinguished between efficient and inefficient portfolios, and analyzed risk-return trade-offs on the portfolios as a whole.” Markowitz provided all that in textbook mean-variance portfolio theory.

Later, beginning in 1959, Markowitz sketched what he calls “game-of-life” portfolios that incorporate wants beyond high expected returns and low risk, such as caring for children and families. This sketch bears affinity to behavioral portfolio theory (Markowitz 1959, 1991).

Markowitz (2015) wrote: “[T]he simulated family’s enjoyment for the period would depend on the size of the family, whether it lives in a large house or small apartment, whether it now has to move because someone has a new job elsewhere, etc. The approach required here is both ‘behavioral’ and ‘rational.’ It should be behavioral in that it reflects plausible human choices. It should be rational, for example, in that the rational-decision-making family understands the
Portfolio consultants were asked to present an optimal portfolio to the board of a large U.S. public pension fund. They started the optimization process by eliciting from the fund’s managers estimates of the expected return and standard deviation of returns of each investment, and the correlation between the returns of each pair of investments—U.S. stocks, international stocks, bonds, real estate, alternative investments, and so on. Next, they modified the estimates to make them more reasonable and consistent with more general estimates. Last, they identified a mean-variance efficient portfolio, marked E in figure 2, with a standard deviation identical to that of the fund’s current portfolio D. The optimized mean-variance portfolio offered an extra 3.72 annual percentage points of expected return with the same standard deviation.

Yet the consultants did not proceed to recommend their optimized mean-variance portfolio to the board because they expected the board to find it “unpalatable,” prescribing allocations much different from current allocations in that pension fund and similar ones. For example, the pension fund allocated 33 percent of its portfolio to U.S. stocks and 20 percent to international stocks, but the mean-variance optimized portfolio prescribed zero allocation to U.S. stocks and 54 percent allocation to international stocks.

The consultants proceeded to place constraints on allocations in the mean-variance optimization process to make allocations palatable, such as a minimum allocation to U.S. stocks and a maximum allocation to international stocks. They recommended portfolio F, with a combination of expected return and standard deviation below the mean-variance frontier yet above the current portfolio D.

But why is portfolio E unpalatable, when it promises to deliver the highest expected returns and their wants for low standard deviations.

Actual mean-variance portfolio practice differs from its textbook description, embodying features of behavioral portfolio theory. Here is an example. Investment consultants were asked to present an optimal portfolio to the board of a large U.S. public pension fund. They started the optimization process by eliciting from the fund’s managers estimates of the expected return and standard deviation of returns of each investment, and the correlation between the returns of each pair of investments—U.S. stocks, international stocks, bonds, real estate, alternative investments, and so on. Next, they modified the estimates to make them more reasonable and consistent with more general estimates. Last, they identified a mean-variance efficient portfolio, marked E in figure 2, with a standard deviation identical to that of the fund’s current portfolio D. The optimized mean-variance portfolio offered an extra 3.72 annual percentage points of expected return with the same standard deviation.

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expected return at no higher standard deviation?

We find the answer in an analogy between investment portfolios and “food portfolios” we know as diets. In 1939, many years before he won a Nobel prize, economist George Stigler (1945) considered 77 food items, from wheat flour to sirloin steaks and strawberry preserves, and found that the lowest-cost diet consists of only five food items. A moderately active man weighing 154 pounds would have satisfied all his nutritional needs at an annual cost of $39.93. The diet consisted of 370 pounds of wheat flour, 57 cans of evaporated milk, 111 pounds of cabbage, 23 pounds of spinach, and 285 pounds of dried navy beans.

Textbook mean-variance diners perceive foods as no more than bundles of nutrients. Benefits and costs other than the utilitarian benefits of nutrition and its cost do not matter because all foods mix in the stomach, releasing identical nutrients whether from expensive steak or cheap hamburger.

Similarly, textbook mean-variance investors perceive investments as no more than bundles of expected returns, their standard deviations, and their correlations. Features other than these do not matter because all investments mix in the portfolio, whether shares of General Electric or General Motors.

Stigler’s diet is on the nutrition-cost frontier of food, depicted in figure 3. It provides the necessary nutrition at the lowest cost. Similarly, a portfolio on the mean-variance frontier of investments provides the necessary expected return at the lowest standard deviation of returns. But normal diners want more than diets on the nutrition-cost frontier of foods and normal investors want more than portfolios on the mean-variance frontier of investments.

Stigler compared his minimum-cost portfolio of foods to the portfolio of foods that dietitians described as providing the cheapest combination of foods that satisfy nutritional requirements. That food portfolio would have cost $100 in 1939, more than double the cost of Stigler’s food portfolio, placing it below the nutrition-cost frontier of foods in figure 3.

Why do the cheapest diets proposed by dietitians cost so much more than Stigler’s diet? The answer, wrote Stigler, is that dietitians consider the utilitarian benefits of high nutrition and low cost but also the expressive and emotional benefits of palatability, variety, prestige, and culture.

Primarily on such grounds, he noted, we can explain dietitians’ recommendation to include meat and sugar in minimum-cost diets. The same is true for portfolio recommendations by investment consultants.

The dietitians’ recommended food portfolio is on the behavioral-wants frontier in figure 3, accounting for diners’ wants for the full range of food benefits: utilitarian, expressive, and emotional. This is true even if these portfolios are below the nutrition-cost frontier of diners who want only the utilitarian benefits of food.

Similarly, investment portfolios on the behavioral-wants frontier are optimal for investors who want the full range of investment benefits, utilitarian, expressive, and emotional. The portfolio recommended by the consultants is on the behavioral-wants frontier of the managers of the pension fund, providing the utilitarian benefits of higher expected return than the current portfolio at the same standard deviation but also expressive and emotional benefits, including the benefits of conformity to the portfolio conventions of this pension fund and similar pension funds.

Investors’ Wants and the Behavioral-Wants Frontier

Portfolios are on the behavioral-wants frontier when they satisfy investors’ wants for utilitarian, expressive, and emotional benefits, free of cognitive and emotional errors. Portfolios on behavioral-wants frontiers are regularly below mean-variance frontiers. Examples of portfolios on the behavioral-wants frontier include those that provide the expressive and emotional benefits of social responsibility, patriotism and familiarity, pride and avoidance of regret, and convention.

Wants for Social Responsibility

Exclusion of stocks of nuclear companies from portfolios by socially responsible investors is puzzling within mean-variance portfolio theory. Why not separate portfolio production from portfolio spending, constructing portfolios that include stocks of nuclear companies if they yield the greatest wealth at the desired level of risk, and then spend the extra wealth in contributions to anti-nuclear campaigns?

Separation of production of wealth from its spending goals makes no sense to socially responsible investors. Neither does separation of utilitarian benefits from

![Figure 3: A Nutrition-Cost Frontier and a Behavioral-Wants Frontier](image-url)
expressive and emotional ones. Cheryl Smith of Trillium Asset Management, a company serving socially responsible investors, tells of an experience following a 1985 letter on social justice and the economy by the U.S. Conference of Catholic Bishops: “The letter spoke very powerfully to participants about the need to be involved ethically in the economic life of the country, and they kept asking, ‘Where does the archdiocese invest its money?’ It turned out that the archdiocese’s holdings included the stock of the company running the Rocky Flats Nuclear Arsenal, while its Peace and Justice Office was sending demonstrators to chain themselves to the arsenal’s fence” (Statman 2008).

Exclusion of stocks of nuclear companies from portfolios is not puzzling within behavioral portfolio theory. Such portfolios might well be on the behavioral-wants frontier, consistent with spending goals and their utilitarian, expressive, and emotional benefits. A survey by the Spectrem Group (RIJ Publishing 2012) revealed that 37 percent of investors with net worth of $1 million to $5 million consider social responsibility when they invest.

Geczy et al. (2005) compared optimized mean-variance portfolios constrained to include only socially responsible mutual funds to unconstrained optimized mean-variance portfolios including all mutual funds. The comparison found that the expected annual returns of constrained socially responsible portfolios fell below the unconstrained mean-variance frontier by more than 3 percentage points, under the assumption that expected returns are determined by the four-factor asset pricing model. Yet wants for the utilitarian, expressive, and emotional benefits of social responsibility might place constrained socially responsible portfolios on the behavioral-wants frontier, as illustrated in figure 4.

Some argue that mean-variance portfolios optimized without constraints are unpalatable because imprecise estimates of investment parameters lead to unpalatable extreme allocations to stocks, bonds, gold, or other investments. Extreme allocations, however, are inherent in mean-variance efficient portfolios constructed with precise estimates (Green and Hollifield 1992). A recommendation that investors accept optimized mean-variance portfolios, even if unpalatable, as their best portfolios has been rejected in the past, illustrated in the pension fund example, and will be rejected in the future.

Indeed, Harry Markowitz, who introduced mean-variance portfolio theory and its optimizer, describes constraints as useful judgment tools in the construction of good portfolios rather than diversion from them (Markowitz 2010). Estimates of mean-variance parameters involve judgment. Even a purely historical approach to estimation involves judgment in the choice of the estimation period, whether the most recent decade or the past four decades, whether derived from monthly or annual returns. Moreover, investor wants, including wants for the expressive and emotional benefits of adherence to convention, extend beyond the utilitarian benefits of high expected returns and low variance of returns. Constraints on allocations are a sensible way to incorporate judgment and wants into portfolios.

Behavioral Portfolio Theory in Practice

Central features of behavioral portfolio theory, reflected in portfolio practice, include investors’ wants and associated goals, portfolios as pyramids of mental accounts of wants and associated goals, risk as shortfalls from wants and associated goals, and avoidance of cognitive and emotional errors on the way to satisfying wants and reaching associated goals. Good portfolio practice also includes features shared by both standard and behavioral portfolio theory, such as diversification, low costs, and simplicity.

Advising programs such as by MoneyGuide-Pro and Wealthcare Capital are examples of practice that incorporates features of behavioral portfolio theory. So are programs...
by financial services companies such as Schwab, Fidelity, and Vanguard, and advisors working at financial services companies or independently.

MoneyGuidePro notes that clients’ financial goals are not mere expenses—they are hopes and dreams. MoneyGuidePro begins with these goals—education goals for ourselves and our children and grandchildren, pre-retirement goals such as renovating a kitchen, and retirement goals beyond day-to-day living expenses such as a new home and bequests to family and charities. Each goal is rated by importance on a scale where 8 to 10 corresponds to “needs,” 4 to 7 corresponds to “wants,” and 1 to 3 corresponds to “wishes.” Plan feasibility is assessed by simulation. Data-collection becomes a conversation about investors’ wants and goals. “Financial planning does not have to be like a session in the dentist’s chair,” writes MoneyGuidePro, “it can actually be fun.”

Wealthcare
The advising process of Wealthcare distinguishes clients’ wants and associated “ideal goals” from their “acceptable goals.” Russ Thornton, a financial advisor using Wealthcare’s program, described meeting two of his clients in June 2009, not long after the stock market hit bottom. The clients were hard-working, middle-class people in their late 50s with two adult children and three grandchildren. The husband was a former policeman now working in the private sector and his wife was an executive assistant. They were now able to satisfy all of their wants and associated goals at their ideal levels. It was time to think of new wants and associated goals. Thornton drew an annual travel budget that would satisfy his clients’ wants for an annual family vacation paid for by the clients. Next, the wife confided that she would love to retire one or even two years earlier so she could spend more time with her mother while they were both still in good health.

Reviewing the clients’ new wants and ideal goals relative to their financial resources, Thornton found that they could not satisfy every want and associated goal, but they were able to plan for the wife to retire a couple of years earlier than previously planned, something they wanted as their highest-priority goal. They also were able to satisfy their wants for lower investment risk and partially satisfy their want for an annual family vacation (Thornton 2009).

Behavioral portfolio theory prescribes portfolios on behavioral-wants frontiers to investors whose wants extend beyond utilitarian benefits of high expected returns and low risk, measured by the variance of portfolio returns or their standard deviation.

Behavioral portfolio theory prescribes portfolios on behavioral-wants frontiers to investors whose wants extend beyond utilitarian benefits, yet avoids cognitive and emotional errors. Examples of portfolios on the behavioral-wants frontier include those that provide the expressive and emotional benefits of promoting social responsibility, exhibiting patriotism, enjoying pride, and avoiding regret.

A central feature in behavioral portfolio theory rests on the observation that investors view their portfolios as sets of distinct mental accounting layers in a portfolio pyramid. Each mental account corresponds to a particular want, an associated goal, and the utilitarian, expressive, and emotional benefits. An optimal behavioral-wants portfolio is one that balances wants while avoiding cognitive and emotional errors.

In practice, frontiers and chosen portfolios, whether mean-variance frontiers or behavioral-wants frontiers, do not come solely from estimates of parameters placed in an optimizer. Frontiers are clarifying concepts more than formulaic applications—they clarify tradeoffs between expected returns and risk, whether measured as standard deviation as in mean-variance portfolio theory, or as shortfall from target wealth as in behavioral portfolio theory. And they clarify tradeoffs among wants, whether for social responsibility or social status. We should not be fooled by the elegance and apparent precision of the mean-variance optimizer. Application of mean-variance theory is much less formulaic than commonly perceived and much more attuned to investors’ wants, described in behavioral portfolio theory.

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