

Modern Portfolio Theory and Behavioral Finance

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Traditional finance assumes that we are rational, while behavioral finance simply assumes we are normal.

—Meir Statman¹

There is nothing quite like a Nobel Prize to focus the investing public's attention. Harry Markowitz developed the concept of mean variance optimization in the early 1950s,² but it wasn't until he was awarded the Nobel Prize in Economics in 1990 that most investors began to develop a keen interest in efficient frontiers. In 2002, Daniel Kahneman won the Nobel for his work in behavioral finance, and suddenly investors everywhere are looking at behavioral finance techniques to improve their risk-adjusted performance. In fact, Kahneman (and his colleague, Amos Tversky)³ did their key work back in the 1970s.⁴

Well, better late than never. The fact is that Markowitz' work revolutionized the way the capital markets operated and what the implications of that knowledge might be for the design and diversification of investment portfolios. Before mean variance optimization came along, our idea of diversification was to hold five stocks when one might have seemed to suffice. Markowitz pointed out that it isn't simply the *number* of different securities we own that matters—it is the *correlation* of those securities with each other that matters. Thus, if we own BP Amoco and Royal Dutch Shell, we are far, far less diversified than if we own

BP Amoco and Microsoft, simply because the factors that affect those two companies are, while not completely distinct, actually quite different. (In modern portfolio theory terms, the covariance of BP Amoco and Microsoft is lower than the covariance of BP Amoco and Royal Dutch Shell.)

And while it is too soon to say with certainty, it seems likely that the work of the behavioral finance professionals will similarly revolutionize the way we think about the design and management of our portfolios. Since Markowitz won the Nobel in 1990, we have tended to design our portfolios as though we were all mean variance optimizers, perfect little economic beings who always made the "right" decision in our own interests. The work of Kahneman, Tversky, et al. has blown this cozy little conceit to pieces. True, sometimes we behave like perfect economic beings. But other times we behave like, well, human beings. We make decisions on the basis of biases that don't reflect real world facts. We allow our responses to decisions to depend on how the questions are framed. We engage in complex mental accounting, ignoring the fact that our various asset baskets are all interrelated. We allow ourselves to be driven by hopes and fears, rather than facts.

So which is better—modern portfolio theory, which describes how markets work, or behavioral finance, which describes how people work? The answer, of course, is that we need both. MPT and behavioral finance

are both important tools in helping us design and manage successful investment portfolios. Both have advantages and disadvantages, however, and it is useful to review those pros and cons before we proceed to think about how combining the two approaches might work.

LIMITATIONS OF MPT AND BEHAVIORAL FINANCE

Limitations of Modern Portfolio Theory

*The heart has its reasons,
of which reason knows nothing.*

—Pascal

I have elsewhere⁵ identified the many issues presented by modern portfolio theory, especially when we try to apply its theories to the real world of investment portfolios. Suffice it to say that MPT is a theoretical construct that attempts to describe how capital markets operate, not a recipe for designing investment portfolios:

[M]odern portfolio theory is useful under certain prescribed conditions, some of which we know about and some of which we don't. We know, for example, that MPT assumes continuous pricing, a world in which markets are free, societies are free and stable, and investors are rational wealth-maximizers. Events that occur outside these conditions are not merely events that fall several standard deviations outside what MPT would predict. Instead, they are events that have nothing whatever to do with MPT, but are governed instead by very different rules that can be understood only by reference to very different theories.⁶

In other words, MPT is descriptive, not prescriptive. And even insofar as MPT can be said to be prescriptive, its predictive accuracy about how markets will behave in the future is unusably low within any kind of time horizon relevant to human investors. Finally, MPT's assumption that we are all and always rational wealth-maximizers is clearly incorrect.

As a result of these issues, when financial advisors attempt to communicate with clients about their portfolios using MPT constructs, communication largely ceases. As Statman hilariously puts it:

Conversations with clients often resemble the Gary Larson cartoon in which the man says to his dog, "Ginger, I have had it! Stay out of the garbage, Ginger. Understand, Ginger? Stay out of the garbage, or else!" And Ginger hears: "Blah blah blah, Ginger. Blah blah blah, Ginger. Blah blah blah, Ginger. Blah blah blah, Ginger. Blah blah blah, Ginger." Financial advisors say, "High returns cannot be guaranteed. No one can guarantee that high risk will bring high returns. No guarantee, you understand?" And clients hear: "Blah blah blah high returns. Blah blah blah no risk. Blah blah blah guaranteed!"⁷

Limitations of Behavioral Finance

In a sense, behavioral finance picks up where modern portfolio theory leaves off, completing the circle. It describes how investors actually behave, rather than how they should behave. It recognizes that we sometimes act in our own best economic interests, and that we sometimes don't. Assuming that modern portfolio theory largely correctly describes the way markets operate, behavioral finance describes how we might best profit from that knowledge.

The foundations of behavioral finance were established by the work of Daniel Kahneman and Amos Tversky, the founders of "prospect theory."⁸ Prospect theory suggests that, in making decisions (especially, but not exclusively, financial decisions), we tend to "irrationally" favor long shots, to avoid near-certain gains, to buy insurance against losses that are quite unlikely to occur, and to take large risks to win back large losses. The theory focuses especially on the fact that our attitude toward the risks associated with obtaining gains may be quite different from our attitude toward risks associated with losses.⁹

But there are serious issues associated with behavioral finance, just as there are with modern portfolio theory. Before proceeding, let's examine some of them.

Weather patterns don't know they are being studied.

Behavioral finance shares with other forms of psychological research the challenge of dealing with sentient research subjects. If a scientist is studying weather patterns, the weather patterns don't know they are being studied and don't change their behavior as a result of being involved in a research project. But human research subjects are maddeningly more complex. The very fact of knowing that we are involved in an experiment causes us to behave differently than we would behave outside the

laboratory context. Maybe we are answering questions honestly and without guile. But maybe we are trying to give the investigator the answer she wants to hear. Maybe we are annoyed at having been “strong-armed” into participating in the experiment (to pass Psychology 101, for example). Maybe we are nervous about appearing stupid and hence inadvertently give answers that we wouldn’t give in another context.

Human subjects don’t always play by the rules. Imagine that CNN has just reported the results of a large, longitudinal¹⁰ study of 10,000 subjects showing that people who ate bran muffins every day doubled their chances of developing brain tumors. Before we eliminate bran from our diets, we might be interested to know that since the study went on for 10 years, almost everyone in both groups cheated. In other words, those in Group A, who were supposed to eat bran muffins every day, didn’t—possibly because they got sick to death of bran muffins. And those in Group B, who were never supposed to eat bran muffins, did in fact eat them regularly—possibly because they liked bran muffins and possibly because they figured that since bran muffins were the subject of the research study they must be good for you. In other words, the two groups were a lot more like each other in the bran muffin habits than the researchers assumed.

The phrase “statistically significant” doesn’t necessarily mean much. Referring back to the study of bran muffins, when CNN tells us that the results of the study were “statistically significant,” we tend to hear “the results were valid and we should stop eating bran muffins.” Actually, there is a subtle but important distinction between statistical significance and, say, the likelihood that the results of the study can be applied to us. Statistical significance is a measure of the randomness of the data in a study. If the sample itself (the subjects selected to participate in the study) is biased in some way, the statistical tests for significance will be meaningless. Thus, it would be important to know that all the subjects in the bran muffin study were middle-aged female residents of the San Francisco Bay area who were paid to participate and who were unlikely to move away during the 10-year period of the study. In other words, “statistical significance” with respect to the bran muffin study probably means nothing more than that similar results would likely be generated if the study were repeated using 10,000 middle-aged female residents of the Bay Area (etc.). The relevance of the study to the rest of us remains a major unanswered question.

What about the other 40%? If the results show that

60% of the subjects in a behavioral finance experiment made the “wrong” choice on a financial test, what about the other 40%? As investors and financial advisors, can we simply assume that all our clients fall among the 60% who got it wrong?

Experience and education matter. All of us make bad decisions in areas we know little about, but that doesn’t mean that we will continue to make bad decisions once we have learned something about the subject. I might be a lousy bridge player, making one bad decision after another. But that’s because I don’t know much about bridge. If I played more often and studied the game, I would likely make much better decisions. And the same is true of many of the findings of behavioral finance theory: once investors understand that their decisions are bad ones, and why, they are likely to make much better decisions in the future.

Having something really at stake matters. It’s one thing to pop off with a quick answer in a laboratory setting. That answer might even be the “natural” answer we would make. But it’s another thing altogether to make a decision that affects, say, a \$100 million investment portfolio. In the latter case we are far less likely to “pop off,” or shoot from the hip. We are far more likely to think hard about what the right answers might be and to get some advice about them.

The experimenters’ expectations affect the outcome of their studies. Our worst fears about research studies have proven to be correct: researchers’ *expectations* of what they will find profoundly affect what they actually find. In one study, a group of teachers was told that the members of their class had scored in the “near-genius” range on a set of aptitude tests. Members of that class subsequently got excellent grades. A second group of teachers was told that members of their class had scored well below average on aptitude tests. Members of that class subsequently got poor grades. Needless to say, the members of both classes were the same. And this phenomenon of “finding what we expect to find” (or worse, finding what we *want* to find) extends even to non-human subjects. In another study, one group of experimenters was told that the strain of mice they were using had been bred to be especially intelligent. Those mice turned out to learn their way through mazes very quickly. Another group of experimenters was told that the strain of mice they were using was particularly dense. Those mice turned out to learn their way through mazes very slowly. The strains of mice in both groups were, of course, identical.¹¹ Thus, while experimenters do their best to structure their experiments

EXHIBIT

Comparing MPT and Behavioral Finance Portfolios

Asset Class	Behavior		
	MPT	Finance	Difference
US large passive	15.0%	30.0%	-15.0%
US small passive	5.0%	5.0%	0.0%
Non-US active	5.0%	5.0%	0.0%
Emerging markets equity active	5.0%	0.0%	5.0%
Directional hedge	15.0%	0.0%	15.0%
Absolute return hedge	15.0%	5.0%	10.0%
Private equity/venture	10.0%	5.0%	5.0%
Real estate passive	10.0%	5.0%	5.0%
High yield debt	*	0.0%	*
Bonds	17.0%	35.0%	-18.0%
Cash	3.0%	10.0%	-7.0%

*Opportunistic

carefully and to avoid allowing their own expectations to affect the results, investigator bias is always an issue.

Summary

In short, employing MPT techniques when we advise investors does tend to cause financial advisors to propose optimal portfolios, but the likelihood that clients will adopt those portfolios (or stick to them) is low. On the other hand, employing behavioral finance techniques when we advise clients tends to result in recommended portfolios that resonate well with the clients, but which are not likely to be optimal in terms of the relationship between risk and reward. In both cases, clients may ultimately be disappointed—in the first case because they failed to follow the advice and in the second case because they *did* follow the advice.

ITERATIVE COMBINATIONS OF BOTH THEORIES

MPT can be thought of as the “rational” approach to portfolio design. Despite its limitations, it looks unblinkingly at the way capital markets operate and suggests how we might optimally exploit those markets to our own advantage. Unfortunately, the investment strategies suggested by MPT are often unpalatable to investors, even when they are correctly understood.

Behavioral finance can be thought of as the “ara-

tional” approach to portfolio design. An “arational” approach is not necessarily “irrational.” Indeed, the “wrong” choices we make as investors may be suboptimal from a purely economic perspective, but those choices often serve deeper emotional needs.

It is interesting to speculate about the possibility of combining “rational” MPT and “arational” behavior finance approaches into one integrated advisory process. Suppose, for example, that we were to design the client’s portfolio in the traditional manner, using MPT-based strategic asset allocation techniques. At the same time, we can design the client’s portfolio using techniques informed by behavioral finance. We can then compare the two results in an instructive way.

Step One: Design the Traditional MPT Portfolio

Strategic asset allocation¹² represents the state of the art in MPT-influenced portfolio design, although in reality it is practiced by a surprisingly small group of elite advisory firms.¹³ In the Exhibit, the column labeled “MPT” suggests a portfolio that might have been designed using strategic asset allocation techniques. This portfolio is based on a forward-looking view of capital markets expectations and the degree of risk required to grow the family’s asset base faster than inflation, spending, taxes, and so on. It has the advantage of being likely to succeed in pure financial terms if the family will stick with the strategy.

But that is precisely the rub. The portfolio is “uncomfortable” for the family, partly because of the inclusion of asset classes they don’t completely understand (emerging markets, directional hedge), and partly because the portfolio will likely incur periods of short-term underperformance that will test the family’s investment patience. For these reasons, the likelihood that the family will, in fact, stick with the portfolio is small. Indeed, there is a serious possibility that the family will abandon the strategy at the very worst time. The MPT portfolio elevates risk-return optimality over investor comfort, with the result that the family is unlikely to meet its long-term needs.

Step 2: Design the Behavioral Finance Portfolio

Despite the 30-year history of behavioral finance, few investigators have suggested concrete ways to implement the learning of that branch of economics. Traditionally, in trying to get a sense of a client’s tolerance for investment risk, financial advisors have engaged in rule-of-thumb exercises or even more bizarre techniques. There was, for example, the approach we might call your-age-is-your-fate: subtract your age from 100 and that’s what your equity exposure should be. There were the pre-designed portfolios assigned to clients according to their age range: if you were between 30 and 40, you got Portfolio A; between 40 and 50, Portfolio B, etc. My personal favorites were the bizarre questionnaires investors were asked to complete: “Would you rather curl up with a good book or go bungee jumping?”

Recently, however, two more promising approaches have been suggested:

- Statman has suggested that an investment portfolio be viewed as a pyramid, with the lowest-risk goals (and associated investments) at the broad bottom and the highest-risk goals (and associated investments) at the narrow top.¹⁴
- Brunel has elaborated on Statman’s suggestion by converting Statman’s pyramid into a more traditional portfolio design framework: Brunel invites the investor to quantify the relative importance of the four traditional investment goals: liquidity, income, capital preservation, and growth.¹⁵

In the Exhibit, the column labeled “Behavior Finance” suggests a portfolio that might result from the use of the Statman/Brunel approach. It is a cautious port-

folio, reflecting behavioral finance’s findings about loss aversion. Since three of the four investment goals (liquidity, income, capital preservation) tend to lead inevitably toward cautious strategies, and only one goal (growth) tends to lead toward more aggressive strategies, the behavioral finance portfolio has the likely disadvantage of growing too slowly to preserve the family’s wealth over the years. But it has the advantage of being “comfortable” for the family, and representing a strategy the family is likely to stick with at least until they realize that their asset base hasn’t kept pace with their expectations. In other words, our behavioral finance portfolio has indulged the family’s inherent biases, but it may have resulted in a suboptimal portfolio that elevates comfort over investment success.

Merging the Two Approaches

Given this dilemma, how can we reconcile the capital markets strength of MPT portfolios with the human-centered strength of behavioral finance portfolios? One suggestion is to show the family both portfolios, being honest about the advantages and disadvantages of each. The game plan for the family would be to start with a portfolio that is closer to the behavioral finance model, but with the expectation that, over time, the family would iteratively evolve toward the MPT model.

Thus, the family might begin with the behavioral finance portfolio but with a five-year plan (or even longer) to move toward the MPT portfolio. The column in the Exhibit labeled “Difference” shows what the family would have to do to make this transition. Thus, the family will have to decrease its exposure to “comfortable” asset classes like U.S. large-cap, bonds, and cash, and will have to increase its exposure to less comfortable asset classes like emerging markets, directional (long/short) hedge, absolute return hedge, private equity, and real estate. In addition, when the spreads between high-yield bonds and Treasury bonds reach extreme levels, the family will opportunistically gain exposure to junk bonds, moving gradually out of that asset as spreads narrow.

To make this transition palatable to the family, it is necessary that they gain experience with less comfortable asset classes gradually. If the transition is expected to occur over a five-year period, for example, it may make sense to adjust asset class exposures at the rate of 20% per year. Thus, each year 3% of the beginning U.S. large-cap exposure will be sold off and invested in asset classes that need to grow.

The beauty of making the transition over time is that, while the initial goal may be to have made the complete transition in five years, there is no reason why this decision can't be revisited. If the family indicates concern about a particular asset class, investments in that category can slow down. If the family indicates comfort with a particular asset class, investments in that category can speed up.

Challenges Associated with Making the Transition

The challenges associated with the transition from a behavioral finance portfolio to an MPT portfolio are the same as the challenges associated with any significant portfolio transition, namely, taxes, market timing issues, and minimum account size problems (for smaller families). Regarding taxes, it is fortunately the case that most behavioral finance portfolios will prove to be too cautious. Therefore, the family will tend to be moving from lower-growth assets to higher-growth assets, minimizing problems associated with having to sell low tax cost basis investments. In the Exhibit, for example, the family will need to reduce its bond and cash portfolios most significantly, and that transition is unlikely to incur serious tax problems.

Market timing is always an issue in transitioning an investment portfolio. But by making the transition over an extended period of years, the family is not only getting used to uncomfortable assets, but is able to average-in and out of asset classes over time, minimizing the risk of bad market timing calls. More sophisticated families, of course, may wish to key the portfolio transition not to "time" but to "valuation," i.e., moving toward needed asset classes as they become undervalued and moving out of unneeded asset classes as they become overvalued.

Minimum account size issues can also arise, of course. If the family asset base is not large, it may be difficult to gain a small starting position in certain asset classes. If the family has \$10 million of investable assets, for example, it should not be difficult for the family to put \$1.5 million productively to work in directional hedge (via a fund of funds, for example). But if the family is moving from a 0% directional hedge exposure to a 15% exposure over five years, it may be more problematic to put \$300,000 to work productively each year. Fortunately, minimum account sizes are falling, even among some of the better funds of hedge funds, and in other asset classes it will be relatively easy to find an institutional mutual fund (or Delaware business trust) to invest in until the family meets the minimum size for a separate account.

SUMMARY

Modern portfolio theory represents the best learning we have about how capital markets actually operate, while behavioral finance offers the best insights into how investors actually behave. But markets don't care what investors think of as risk, and hence idiosyncratic ideas about risk and what to do about it are bound to harm our long-term investment results. On the other hand, Daniel Kahneman, Amos Tversky, and their followers have demonstrated beyond doubt that we all harbor idiosyncratic ideas and that we tend to act on them, regardless of the costs to our economic welfare.

By combining both MPT and behavioral finance models in our work with family investors, we stand the best chance of designing, implementing, and maintaining portfolios that will prove acceptable to our clients and that will prove productive to our clients' wealth.

ENDNOTES

¹Statman is the Glenn Klimek Professor of Finance at Santa Clara University. Quoted in Jean Brunel, "Revisiting the Asset Allocation Challenge Through a Behavioral Finance Lens," *The Journal of Wealth Management*, Fall 2003, p. 10.

²Harry Markowitz, "Portfolio Selection," *Journal of Finance*, 1952.

³Tversky had the misfortune to die in 1996. Nobel Prizes can only be awarded to living persons.

⁴See, e.g., Daniel Kahneman and Amos Tversky, "On the Psychology of Prediction," *Psychological Review*, 80 (1973), pp. 237-251; Amos Tversky and Daniel Kahneman, "Availability: A Heuristic for Judging Frequency and Probability," *Cognitive Psychology*, 5 (1973), pp. 207-232; Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," *Science*, 185 (1974), pp. 1124-1131; Daniel Kahneman and Amos Tversky, "Intuitive Prediction: Biases and Corrective Procedures," *Management Science*, 12 (1979), pp. 313-327.

⁵Gregory Curtis, "Modern Portfolio Theory and Quantum Mechanics," *The Journal of Wealth Management*, Fall 2002, pp. 1-7.

⁶*Ibid.*, p. 2.

⁷Meir Statman, "Financial Physicians," *AIMR's Investment Counseling for Private Clients IV* (No. 4, 2002), p. 5.

⁸The term "prospect theory" apparently derives from one's prospects of winning a lottery. Most people believe, however, that Tversky and Kahneman adopted the term mainly because it was catchy and would raise the profile of their work. See, e.g., Daniel Kahneman and Amos Tversky, "Prospect Theory: An Analysis of Decisions under Risk," *Econometrica*, 47 (1979), pp. 313-327.

⁹The most extensive treatments of behavioral finance are probably Hersh Shefrin's *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing* (Oxford University Press, 2002), and Richard H. Thaler's earlier *Advances in Behavioral Finance* (Russell Sage Foundation, 1993).

¹⁰A "longitudinal" study is one that continues over time, rather than being a one-off project. At one extreme, a large population may be studied over decades. At the other extreme, a longitudinal study might follow a relatively small group of subjects for a few days or weeks.

¹¹These studies were reported in the *Wall Street Journal*. See Sharon Begley, "Expectations May Alter Outcomes Far More Than We Realize," *Wall Street Journal*, November 7, 2003, p. B1.

¹²Defined by Brunel as an approach that "should cover all the multiple locations . . . through which a wealthy family holds their assets and be formulated through a multi-period process driven by after-tax results." Brunel, *op. cit.*, note 1, p. 10.

¹³A serious drawback of strategic asset allocation, insofar as the financial industry is concerned, is that it can only be accomplished by very senior investment professionals working one-on-one with clients in a highly customized manner. This is exactly the opposite of the mass approach that maximizes the profitability of the global financial giants.

¹⁴Meir Statman, "Behavioral Finance: Past Battles, Future Engagements," *Financial Analysts Journal*, November/December 1999, pp. 18-28.

¹⁵Brunel, *op. cit.*, note 1, pp. 11-18 *passim*.

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