PORTFOLIO STRATEGIES

The Real-World Lessons From Investment Theory

By William Reichenstein and C. William Thomas

Do investment academics live in a theoretical cloud divorced from real-world practices?

That accusation is sometimes leveled at the academic community, particularly by investors who are unfamiliar with the theories and how they have been applied in practice.

In fact, modern investment theory—or, to be more academically precise, Modern Portfolio Theory (MPT)—is the accepted approach to investment and portfolio management in today's day and age. Its investment implications are embedded in the portfolios of major mutual fund families and the advice given by well-known and respected investment advisers and scholars. You may even be following some of the implications yourself without even knowing it.

Just what is MPT?

The old joke is that if you say the letters fast enough, it comes out "empty." MPT's theoretical underpinnings do encompass complicated formulas (along with extensive academic jargon) that are of little practical use for individual investors. But MPT's investment implications are anything but empty.

This article has two major sections. The first, MPT: The Theory, provides a practical translation of investment theory and the most important investment lessons individuals need to learn from it. The second section, MPT in Practice, describes a practical investment approach any individual investor can use that is directly based on the principles of MPT.

MPT: THE THEORY

There are two major parts to MPT: portfolio formation theory and efficient markets theory.

- **Portfolio formation theory** describes how portfolios should be formed. It says a key to forming a good portfolio is to combine assets whose returns do not closely match, and whether an asset should be added to a portfolio depends as much on how its returns will vary from the other portfolio assets as it does on its own return prospects.
- The **efficient markets hypothesis** says there are so many smart people trying to find undervalued securities that security prices in general are fairly valued. The implications of this seemingly obvious statement are profound and explain, among many other things, why it is so hard for investors, including highly paid mutual fund managers, to produce market-beating returns.

Portfolio Formation Theory

Portfolio formation theory is centered around the idea that optimal portfolios are developed by focusing on how the various components perform relative to each other. It relies heavily on mathematical models, the centerpiece of which is known as the Capital Asset Pricing Model.

Over 50 years ago, Harry Markowitz wrote "Portfolio Selection," which described the framework for the model. It is no exaggeration to say that most of the advances in

investment management during the past 50 years have come from Markowitz's framework, for which he won the Nobel Prize. His key idea is that a good portfolio is not simply a collection of "good" assets that are assessed based on their own individual merits. Instead, Markowitz stated that a good portfolio needs to combine assets whose return patterns over time are dissimilar.

A simple example illustrates this idea.

Suppose an analyst's research suggests that the drug industry has the best stock prospects for the next year. Armed with this information, he invests one fourth of his portfolio in Eli Lilly, one fourth in Merck, one fourth in Schering-Plough, and one fourth in a savings account at a bank. Then he considers withdrawing the money from the bank and buying Pfizer stock. Is this a good decision?

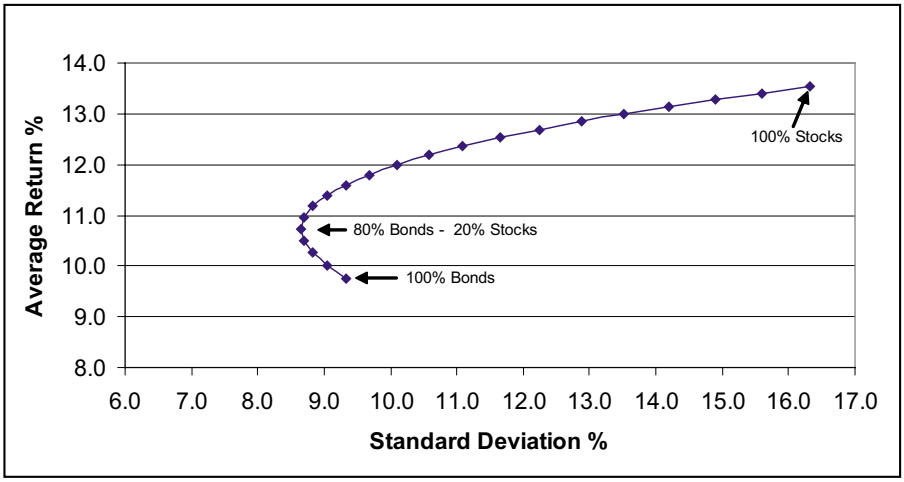
It does not take financial training to realize the problem with this portfolio. This analyst's stock portfolio contains only drug stocks, and drug stocks tend to rise and fall in tandem. Even if Pfizer's prospects look great, it would make a lousy addition to his portfolio. The conclusion that Pfizer would be a poor addition to the analyst's portfolio has nothing to do with Pfizer's return prospects. Rather, it would be a poor addition because its returns will vary closely with the returns on the other securities in the portfolio.

While it seems obvious now, Markowitz's work concentrated on a new concept at that time. Back then, the approach most investment professionals used was to focus on valuations in an attempt to find undervalued assets.

Markowitz's new approach, however, focused on evaluating how an asset would impact a portfolio's risk/return profile. Whether it makes sense to add a security to a portfolio depends as much on how the security's returns will vary with the returns of the other portfolio assets as on its own prospects.

Today, Markowitz's idea is applied using asset classes whose return variations are not closely related—for example, U.S. stocks and high-grade bonds—instead of individual securities. It is the underlying principle surrounding the importance that is currently placed on asset allocation.

Figure 1. Feasible Portfolios, 1980-2004



Source: Ibbotson Associates.

Suppose someone is considering changing a portfolio from 50% bonds and 50% U.S. stocks to 50% bonds, 40% U.S. stocks, and 10% international stocks. Whether this change makes sense depends as much on how closely international stock returns vary with, respectively, U.S. stocks and U.S. bonds, as on the risk and return prospects of international stocks when held alone.

The relevant principle is: Whether it makes sense to add an asset class to a portfolio depends as much on how the asset class' returns vary with the returns of the portfolio's other asset classes as on its own prospects when held alone.

Figure 1 illustrates Markowitz's framework. It presents the risk/return trade-off between bonds and stocks for 1980–2004. The stock portfolio is represented by the S&P 500 index, while the bond portfolio contains 60% five-year Treasury notes and 40% long-term Treasury bonds.

Figure 1 plots the average annual returns for 21 different portfolios along with each portfolio's corresponding risk measure. The portfolios range from one composed of 100% bonds, to 95% bonds/5% stocks, 90% bonds/10% stocks and all the way to one composed of 100% stocks (each portfolio is rebalanced annually to the original bond/stock weights). Average annual returns are plotted on the vertical axis, and risk is plotted on the horizontal axis. Risk here is defined by standard deviation (a measure of the portfolio's volatility of returns, with higher standard deviations indicating higher volatility and thus greater risk).

Which portfolios are best?

Although all 21 portfolios were feasible, Markowitz says that investors should only want portfolios on what he termed the "efficient frontier"—that is, those portfolios along a line that starts at the lowest-risk portfolio (80% bonds/20% stocks) and runs to the highest return portfolio (100% stocks). These portfolios are desirable because they are "efficient," offering the highest return at any given level of risk.

Any portfolios that are *below* that line are not desirable because at the same level of risk there is a higher-returning portfolio available. Look, for example, at the position of the 100% bond port-

folio on the blue curve in Figure 1. This portfolio is inefficient—you can see that it is below the "efficient frontier" (invisible) line, and that there is a portfolio above it that has the same level of risk but a higher return. Alternatively, an investor could move to an 80% bonds/20% stocks portfolio, selling less-volatile bonds and buying more-volatile stocks, and yet still experience a *decrease* in portfolio risk.

This concept is not immediately obvious, but it is at the heart of MPT. The key is that bond and stock returns do not behave similarly, so adding stocks to a 100% bond portfolio produces a more efficient portfolio.

What about a 100% stock portfolio?

While it is true that this portfolio is on the "efficient frontier" line, you must also examine the risk/return trade-off. At the 100% stock position in Figure 1, if you added only a small amount of less-volatile bonds you would decrease returns only slightly, while at the same time you could more substantially decrease risk. Once again, since bond and stock returns do not behave similarly, adding bonds to a stock portfolio allows you to achieve a more desirable risk/return trade-off.

Let's look at this concept more closely. Suppose Cautious Carla has an $80,000 investment portfolio that is invested in bonds.

Cautious—but lucky—Carla inherits $20,000 and considers whether she should invest it in stocks or bonds. Being conservative, she invests the $20,000 in bonds. After all, she figures, bonds are less risky than stocks.

However, her thinking ignores the lessons of Modern Portfolio Theory. Although bonds held alone are less risky than stocks held alone, the 80% bonds/20% stocks portfolio is not riskier than the 100% bond portfolio. Portfolio risk is not the same thing as the average risk of the assets held alone. Instead, the more conservative approach would be for Carla to invest the additional money in stocks.

Next, let's suppose Risky Ralph has an $80,000 investment portfolio and it is all invested in stocks. He inherits $20,000 and considers whether he should invest it in stocks or bonds. Since stocks have a higher expected return than bonds, he figures that the 100% stock portfolio would produce a higher return than a 20% bonds/80% stocks portfolio. So, he invests the $20,000 in stocks.

As Figure 1 indicates, for 1980–2004 the 100% stock portfolio had a slightly higher return than the 20% bonds/80% stock portfolio. However, the latter portfolio had a much lower risk—in other words, the 100% stock portfolio isn't providing much return bang for the risk buck. Unless Ralph is extremely risk tolerant, he should invest his additional money in bonds.

For Carla and Ralph, the best use of the $20,000 inheritance did not depend on the merits of bonds and stocks held alone. Rather, it depended upon the allocation of their other assets.

Here are some of the most important implications that you should draw from this theory:

- A good portfolio combines assets that have returns that do not vary closely together—for example, the combination of high-grade bonds and stocks.
- Investors should be concerned with overall portfolio risk, and not the risk of specific asset classes when held alone.
- A small exposure to a volatile asset class may not increase—and could even decrease—the risk of your portfolio, especially if its returns do not vary closely with the returns of the other assets in your portfolio.
- As stocks are added to an all-bond portfolio, portfolio *risk* initially decreases. As the stock weight increases, portfolio risk eventually starts to increase, but it increases disproportionately slow. Conversely, as stocks are added to an all-bond portfolio, average *returns* increase disproportionately quick.
- Every investor should seek a portfolio on the "efficient frontier." There are many portfolios to choose from along this line, and the optimal portfolio for you depends upon your risk tolerance. Less risk-tolerant investors will seek portfolios at the lower risk end of the efficient frontier, while more tolerant investors will seek portfolios at the higher-risk end of the frontier.
- An all-bond portfolio is not the lowest-risk portfolio and it is not on the efficient frontier.

For individual investors trying to understand the major implications of this theory, it is also instructive to look at some of its applications.

• What constitutes 'risky' assets?

Investment managers are held to the "prudent man" standard, which means they must manage funds held in trust as a prudent person would manage his or her own account.

At one time, junk bonds—bonds rated double B or lower—and stocks that had decreased their cash dividends within the past few years were automatically considered imprudent investments. However, this application meant that an asset's risk was being evaluated at the individual level. Today, that application has changed so that risk evaluation is applied at the portfolio level. Thus, a small exposure to junk bonds would be considered a prudent addition to a portfolio of high-grade bonds and stocks.

Similarly, an investor need not, and indeed should not, avoid a stock just because it decreased its dividend in the past few years.

Emerging market stocks are highly volatile when held alone. But a small exposure—for example, 5% of the whole portfolio or 5% of the stock portfolio—can be a prudent addition to a portfolio. Because their returns are weakly correlated with, respectively, high-grade bonds, U.S. stocks, and stocks of international developed markets, a small exposure to this volatile asset class can be considered prudent. This change in what is considered "prudent" should give you some idea of the radical change MPT has introduced, as well as today's universal acceptance of its principles.

Table 1. Distributions of Returns on Large-Cap Core Funds vs. S&P 500 Index and Vanguard 500 Fund

	Average Annual Return (%) Over the Last:			
	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Large-Cap Core Funds				
Top 5 Percent	0.85	10.62	13.21	12.97
Top 25 Percent	−2.23	9.58	11.35	11.90
Median	−3.00	8.62	10.59	10.76
Top 75 Percent	−4.34	7.38	9.61	9.53
Top 95 Percent	−7.30	4.96	7.22	7.70
S&P 500 Index	−2.71	9.85	11.58	12.49
Vanguard 500	−2.82	9.78	11.47	12.29

Returns through August 2005.
Source: Zephyr Large Core Universe (Morningstar).

• Marketers exploiting the concepts

From an individual investor's standpoint, not all applications of MPT are helpful. As an investor, you need to be aware that the framework can be used to tout alternative assets that are not necessarily useful or prudent additions to your portfolio.

Alternative investments are outside the typical investment stable of assets that have a long-term history and that most investors are familiar with. Alternative investments in this sense include the stocks of emerging markets, commodities, and hedge funds, all of which have extremely volatile returns.

Marketers of these assets like to claim that a small exposure to these assets may not increase portfolio risk because their returns are usually weakly correlated with returns to high-grade bonds and U.S. stocks. And many times these marketers make heavy use of MPT jargon ("low covariances," "mean variance optimization") to help sell the implication that their claims are solidly grounded in investment theory.

However, the application of investment theory to alternative investments is far from a settled issue.

In our opinion, the merits of a small exposure (5% to 10%) to an alternative asset rest largely on the merits of *the asset's* return prospects. Using this approach, emerging market stocks are a viable alternative asset class because a passive strategy of holding emerging markets stocks should produce healthy long-run returns.

In contrast, hedge funds are not really a separate asset class. Hedge funds use many different approaches to achieve their returns, including long-short market-neutral positions designed to produce positive returns in both up and down stock markets. However, the ability to achieve returns above the market's returns depends on the hedge fund manager's security selection skills. And these skills must be good enough to not only beat the market, but also to offset the typically high fees charged by these managers. [These problems were discussed in greater detail in "What Are You Really Getting When You Invest in a Hedge Fund?" by William Reichenstein in the July 2004 *AAII Journal*.]

Efficient Markets Hypothesis

The second major part of MPT is the efficient markets hypothesis.

According to this hypothesis, security prices should be fairly valued precisely because there are so many people trying to find undervalued securities. Those on the hunt for undervalued securities include highly paid professional investors, as well as individual investors.

The natural outcome of many people searching for undervalued securities should be a market in which securities are fairly valued.

With the advantage of hindsight, it is clear that individual securities and the stock market can be mispriced. But, since today's prices reflect the consensus opinion of all investors, such mispricing is never evident before the fact. The natural outcome of many people searching for mispriced securities should be a market in which it is inherently difficult to add value to client accounts by finding mispriced securities.

In his classic book that discusses modern investment theory in layman's terms, "Winning the Loser's Game," Charles Ellis sums up the quandary of active investors: "The problem is not that professional managers lack skill or diligence. Quite the opposite. The problem with trying to beat the market is that professional investors are so talented, so numerous, and so dedicated to their work that as a group they make it very difficult for any one of their number to do significantly better than the others, particularly in the long run."

Advocates of the efficient markets theory suggest that, instead of trying to find undervalued securities, investors should buy and hold "the market." In so doing, they would match the market's gross returns. Since expenses on buy-and-hold strategies are minimal, these investors would earn higher net returns than most investors.

This theory gave rise to index funds, which today have become extremely popular among investors.

Table 1 presents evidence supporting the long-run success of index funds. The figure presents the distribution of U.S. large-cap core stock fund returns for five, 10, 15 and 20 years through August 2005. It also presents the returns on the S&P 500 index and the Vanguard 500 fund.

For the past five years, the S&P 500 and Vanguard 500 fund beat the median large-cap core fund, although their relative returns were not overwhelming. However, as the time horizon lengthens, their relative performance improves. For the five-, 10-, and 20-year periods, the

Table 2. Four Steps to a Prudent Investment Strategy

Step 1: Determine your desired risk/return trade-off.
Step 2: Form a diversified portfolio by first selecting the asset classes in which you want to invest, and then determining your target asset allocation to these classes.
Step 3: Select individual securities or mutual funds to fill each asset class.
Step 4: Rebalance when necessary to keep to your target allocations.

S&P 500 beat an estimated 60%, 82%, and 88% of the surviving funds, while the Vanguard 500 fund beat an estimated 56%, 81%, and 85%. These results indicate that 15% or less of funds that began 20 years ago and survived to today could match the returns on the S&P 500 index and Vanguard 500 fund.

Actually, these results *understate* the case for low-cost index funds. There were numerous funds that began 20 years ago but do not exist today. Obviously, the non-surviving funds usually had poor records. Thus the S&P 500 index and Vanguard 500 fund probably beat more than 90% of all funds—surviving and non-surviving—that were in existence 20 years ago.

The history of index funds indicates that few professional fund managers can beat the market over the long run. And for those funds that did beat the market long term, you must ask yourself whether you would have picked that fund *before* it produced those winning returns. After all, in order to profit from a market-beating fund, you must find it and invest in it *before* it is known as a market-beating fund, and when it is indistinguishable from hundreds of other funds. If you do not have the ability to pick out a market-beating mutual fund manager, you are better off investing in a broad-based index fund.

In short, the history of index funds supports the efficient markets hypothesis, which encourages individual investors to buy "the market" while minimizing costs.

Two other important implications of the theory are:

1) Returns across different investment styles are largely unpredictable, and
2) Relative returns among funds with the same investment style are negatively related to their expense ratios.

Therefore, an investor should broadly diversify across styles and pay close attention to expenses.

The importance of diversifying across styles has also proven critical in practice.

In the 2000–2002 bear market, investors who concentrated their portfolios in large-cap growth stocks fared far worse than other investors. Large-cap growth stocks lost 55.6% for 2000–2002, while large-cap value stocks lost only 14.6% and small-cap stocks lost 21.0%. From peak to trough, the NASDAQ lost more than 75% of its value; it takes a 300% return to make up for a 75% loss.

Not surprisingly, theory and empirical studies indicate that, on average, mutual funds' net returns—which are the returns an investor reaps—decrease about 1% for each 1% increase in expense ratio.

Therefore, there is a lot to be said for investing the U.S. stock portion of your portfolio in either an exchange-traded fund, an index fund, or a low-cost active fund that benchmarks a total market index like the Russell 3000 or Dow Jones Wilshire 5000 indexes or, at least, a large-cap index like the Russell 1000 or S&P 500.

MPT IN PRACTICE: How to Manage Your Portfolio

Table 2 outlines a four-step investment management process that is consistent with MPT. This section discusses those steps in more detail.

Determine Your Risk/Return Preference

Some people mistakenly think that MPT suggests that they should buy and hold a low-cost stock index fund. It does not. Rather, it says that each investor should first determine his or her target asset allocation.

Of course, future returns are unknown and therefore the exact location of the future risk/return trade-off (depicted in Figure 1 using historical figures) is unknown. But you don't need Figure 1 to determine your asset allocation; it merely illustrates the principle. The important point is that portfolios composed of a mix of stocks and bonds will offer a better risk/return trade-off than portfolios composed primarily of bonds.

The amount you commit to stocks is a function of how much risk you can tolerate. The ability to keep your stock portion invested in the stock market during the 2000–2002 bear market may help you determine your ability to bear stock market risk.

Two guidelines that can help you determine your asset allocation mix are:

- In "Allocation Over Time: Life Cycle Mutual Funds" (November 2004 *AAII Journal*), John Markese summarized the target allocations to stocks, bonds, and cash at several major mutual fund companies for aggressive, moderate, and conservative investors. These represent "typical" investors in various age groups and can serve as usual allocation guidelines.
- In "Retiree Stock Allocation Recommendations: Do You Fit the 'Mold'?" (February 2004 *AAII Journal*), William Reichenstein discussed factors that could cause individuals to have "atypical" asset allocations compared to most individuals their ages.

Form a Diversified Portfolio

The first part of this step is to select the asset classes in which you wish to invest.

Which should you include? A review of model portfolios from Fidelity,

T. Rowe Price, Vanguard, and other well-known investment professionals suggests that the major asset classes are U.S. stocks, international stocks, and U.S. high-grade bonds (although in these portfolios bonds include cash). Furthermore, with the possible exception of portfolios for retirees, the model portfolios consistently recommended that international stocks should consist of between 15% and 30% of the stock portfolio.

While most model portfolios contain only these three asset classes, a fairly high fraction also includes low-grade or junk bonds and, less frequently, emerging market stocks. None of the model portfolios recommend allocations to hedge funds or international bonds.

The second step in forming a diversified portfolio is to determine your target allocation for each asset class. This target allocation can be limited to the three major asset classes. For example, it may be 45% U.S. stocks, 15% international stocks, and 40% high-grade bonds.

Alternatively, some individuals prefer to separate U.S. stocks into smaller sub-asset classes like large-cap growth, large-cap value, and small-cap stocks. However, MPT and history suggest that the U.S. stock portfolio should be broadly diversified across size (large-cap through small-cap) and styles (value and growth stocks). As discussed earlier, investors who had their portfolios in large-cap growth stocks from 2000 to 2002 learned the risk of style concentration. Similarly, international stocks should contain stocks in developed markets across Western Europe, Japan, and Australia.

Selecting Mutual Funds or Individual Securities

Although individuals can invest in individual securities or mutual funds, the latter is easier, so it will be emphasized here.

One prudent strategy is to invest your entire U.S. stock portion in an exchange-traded fund, an index fund, or a low-cost active fund that benchmarks a total stock market index fund like the Russell 3000 or Dow Jones Wilshire 5000 index.

Another prudent strategy would be to invest in separate index funds to create a portfolio tilt toward smaller or larger stocks. For example, the total U.S. stock market is weighted about 70% large-cap, 20% mid-cap, and 10% small-cap stocks. If you want to tilt your portfolio toward small- and mid-cap stocks, you might invest 60% in a large-cap stock fund, 25% in a mid-cap stock fund, and 15% in a small-cap stock fund. [For more on this approach, see "Capitalizing on the Index Fund Advantage," by John Markese in the November 2005 *AAII Journal*.]

Small tilts away from a size-neutral or style-neutral allocation are examples of tactical asset allocation, and are not considered imprudent.

International diversification can be achieved by investing in an exchange-traded fund, index fund, or active fund that benchmarks a total international stock index of the developed markets.

The U.S. bond market can be separated into investment-grade or better (henceforth, high-grade) and low-grade bonds. The Lehman Brothers aggregate index represents the high-grade bond market. One prudent strategy would be to invest in an exchange-traded fund, index fund, or low-cost active fund that benchmarks this or a similar index. Another prudent strategy would be to invest most of the U.S. bond portion in a high-grade fund and a smaller amount in a low-grade bond fund.

In short, it is not difficult to attain a well-diversified prudent portfolio. And once you have attained a well-diversified portfolio, you should stick to it. Which means …

Rebalance Periodically

MPT would suggest that investors rebalance their portfolios periodically.

The purpose of rebalancing is to allow you to maintain a stable risk exposure. For example, if your target asset allocation is 45% U.S. stocks, 15% international stocks, and 40% U.S. bonds then, unless something happens to cause you to change your target asset allocation, you should rebalance back to these weights periodically.

At what point is your portfolio considered out of balance?

One rule of thumb would be to rebalance whenever the actual asset allocation to a broad asset class varies at

Chasing Trends: The Road to Efficiency

What's the path to an "inefficient" portfolio?

Individuals who chase hot stocks and hot funds often end up with imprudent—and highly inefficient—portfolios.

For example, in the late 1990s, trend-chasers often had little, if any, invested in bonds and they had heavy concentrations in large-cap growth stocks, especially Internet stocks and other technology stocks.

By the end of the 2000–2002 bear market, trend-chasers were heavily invested in bonds and had either completely exited the stock market or were concentrated in smaller-cap and value stocks.

These trend-chasing strategies result in a lack of diversification across broad asset classes (U.S. stocks, U.S. bonds, and international stocks), a lack of diversification across styles, and excessive volatility.

In terms of Figure 1, trend-chasers have portfolios to the right of the efficient frontier.

MPT recommends that investors pre-determine their asset allocation among, for example, U.S. large-cap value, large-cap growth, and small-cap stocks, developed markets stocks, and U.S. bonds and then find a fund to fill each asset class. But the allocation to each asset class should not be dependent upon whether its returns have recently been hot or cold.

least 10% from the target allocation. For example, if your target allocation is 40% bonds and your bond allocation varies outside the 30% to 50% range, then rebalancing is in order. For narrower asset classes like international stocks, the range may be plus or minus 5%.

Rebalancing can be done by shifting funds from one fund to another. If the shift is in taxable accounts, then the tax consequences should be considered.

Another approach to rebalancing is to allocate new investment funds to the underweight asset class.

In addition, as you age, your target asset allocation may slowly become more conservative. If so, then you should rebalance your portfolio back to the slowly changing target allocations.

Summary

You don't need a Ph.D. in investment theory to benefit from the implications of MPT. But it is helpful to understand the general concepts.

According to MPT theory, security prices should be fairly valued. Therefore, when forming a portfolio, investors should give little attention to trying to find undervalued securities, and instead should:

- Determine their target asset allocation that is consistent with their risk/return trade-off;
- Form well-diversified portfolios across U.S. high-grade bonds, U.S. stocks, international stocks, and perhaps other asset classes;
- Minimize expenses; and
- Periodically rebalance the portfolio.

Of course, in the real world markets are not perfectly efficient. Therefore, there is nothing imprudent about studying portfolio managers' past success and investing in actively managed funds, especially those that are low-cost. But investors should be aware that past success in producing market-beating returns should be (and usually has been) a poor predictor of future success.

Similarly, there is nothing imprudent about tilting target asset allocations toward, for example, U.S. large-cap stocks. But these tilts or bets should be small, so that the portfolio never lacks diversification across broad asset classes like stocks and bonds and broad diversification within the stock portfolio.

One final note: The tax code does add a wrinkle in that individuals can add value to their accounts by arranging investments to take advantage of the Tax Code's more favorable provisions. That approach is entirely consistent with MPT, and has been the basis for the series of articles in the *AAII Journal* (by co-author William Reichenstein in the February, July, and November 2005 issues) on tax-efficient investment strategies. ▲

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