

Introduction and Overview

Modern Portfolio Theory suggests that you can maximize your investment returns, given the amount of risk (or volatility) you are willing to take on. This is the idea to be developed and evaluated during this 10-part series. Part One provides an introduction to the issues.

by **Donald R. Chambers**

We are inundated with advice regarding investment decisions from numerous sources (brokers, columnists, economists) and through a variety of media (television, magazines, seminars). But the suggested answers regarding investment decisions not only vary tremendously but often directly conflict with each other—leaving the typical investor in a quandary.

On top of this complexity, conditions change. Markets crash and firms once viewed as providing solutions, such as Merrill Lynch, are themselves in trouble.

But some investment philosophies claim or appear to be “timeless.” A popular AIER publication entitled “How to Invest Wisely” by Lawrence Pratt provides a concise summary of solid investment principles—as does literature by John C. Bogle, founder of the Vanguard Group. While these solid principles appear stable through time, even these sources differ in their prescriptions.

In the last 50 years extensive discoveries have been made in academia regarding how investment decisions should be made. Together, these advances are generally referred to as “Modern Portfolio The-

ory” or MPT. The most important point of MPT is that *diversification reduces risk without reducing expected return*. MPT uses mathematics and statistics to demonstrate diversification clearly and carefully.

This series focuses on relatively simple and easy-to-implement

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investment concepts. These concepts have changed little in the past and are unlikely to change dramatically in the future.

This is the first in a series of ten articles on implications offered by MPT with regard to the decisions of an individual investor. The goal of this series is to make the implications of MPT accessible to non-professional investors.

A Brief History of MPT. In the 1950s Harry Markowitz pioneered the use of math and statistics to describe diversification and the process of forming diversified portfolios. Previous analyses were qualitative and lacked precision and clarity.

In the mid-1960s two more major

advances emerged: efficient market theory and equilibrium pricing theory.

Led by Professor Eugene Fama, MPT pioneers established a framework for discussing the idea that security markets are informationally efficient. This means that secu-

rity prices already reflect available information and that it is therefore not possible to use available information to identify under-priced or over-priced securities.

In the wake of difficult times such as the financial crisis that began in 2007, the concept of market efficiency is sometimes criticized. However, while no market is perfectly efficient, the evidence suggests that behaving *as if* markets were highly efficient provides investors with a solid approach.

Led by Professors James Tobin, William F. Sharpe and others, MPT pioneers also constructed an equilibrium framework for theoretically linking expected return with a new measure of risk entitled “beta.” This work, highlighted by the Capital Asset Pricing Model (CAPM), provided an insight that investors should simply hold two assets: a “riskless” asset and a highly diversified “market portfolio.”

In the 1970s, MPT pioneers Fisher Black, Myron Scholes and others led advances in derivative

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models (options, futures, and so forth) that enabled understanding of derivative pricing and risk management techniques that revolutionized financial markets.

MPT does not describe or prescribe investing perfectly. Improvements or even corrections will be made. But even if it is not perfect, MPT has major implications that should be considered by every investor.

The purpose of this series is to clarify the major ideas of MPT that can and should be used by typical investors to manage their portfolios. We can begin with the two-asset model.

A Good Starting Point: The Asset Allocation Decision. How much of your portfolio should you place into various categories of investments? In a nutshell, this is the asset allocation decision. It concerns how much money to place into risky investments such as the stock market, and therefore how much remains to be placed in safe investments such as money market mutual funds and certificates of deposit.

In practice, many people view the asset allocation decision as determining investment levels in several categories of risky assets such as stocks, real estate and hedge funds. Some people may further subdivide a category such as stocks into sub-categories such as international vs. domestic, small cap vs. large cap, growth vs. value and so forth.

But for our purposes here, the asset allocation decision concerns just two major asset classes: risky investments and safe investments.

As a simplified example, consider Jaclyn, a 40-year-old professional with considerable wealth accumulated in retirement programs. She decides to allocate 60 percent of her money towards broadly diversified stock funds and the remaining 40 percent in a combination of short term investment-grade bond funds,

CDs, and money market funds. This 60/40 split is often considered to be the typical split for the pension money of a financially comfortable investor well prior to retirement. If the stock market quickly rises or falls 10 percent, her total portfolio will tend to move only 6 percent. Why? Her stock positions comprising 60 percent of her portfolio will rise or fall the same amount as the market, but her low-risk bond funds will barely move.

Granted, sometimes it is difficult to classify a total portfolio solely in terms of the percentage stocks and percentage bonds. But for our purposes it is helpful to assume for simplicity that each investor's portfolio can be approximated by a simple mix of stocks and low-risk bonds. This assumption is not as restrictive as it may initially seem. Almost every asset allocation can be viewed

For our purposes it is helpful to assume for simplicity that each investor's portfolio can be approximated by a simple mix of (risky) stocks and (low-risk) bonds.

as having an *exposure to the stock market* that is similar to the exposure of a particular combination of stocks and bonds.

In other words, an investor might hold multiple asset classes (e.g., corporate bonds, real estate), but the portfolio can still be viewed as having the same *market risk* as a pure stock and low-risk bond portfolio by answering the following question: "If the stock market were to fluctuate quickly either up 10 percent or down 10 percent, how much would the portfolio typically rise or fall?" A reply of "6 percent" is comparable in market risk to the previous asset mix of 60 percent stocks and 40 percent bonds.

For example, Rob, a newly retired, wealthy and somewhat aggressive investor may hold an extensive combination of assets including real estate investment trusts,

hedge funds, and some unusual stock and bond funds that specialize in particular asset classes such as low cap growth stocks and convertible bonds. Nevertheless, Rob has watched his portfolio and knows that on days when the stock market moves considerably, his portfolio tends to move about 60 percent as much as the overall stock market and in the same direction.

It can be useful to think of Rob's portfolio as having a level of *market risk* equivalent to a combination of a 60 percent stocks and 40 percent low-risk bonds even if his portfolio contains other types of assets and other types of risks. Thus, in this simplest representation, every portfolio can be viewed as having an asset allocation that has the same responsiveness to market fluctuations as a portfolio comprised of x percent stocks and $(100-x)$ percent low-risk bonds.

The analysis up to this point has focused on one type of risk: *market risk*. But responsiveness to stock market fluctuations is only one of the two types of risk. The following section contrasts this market risk with the other type of risk: *idiosyncratic risk*. For reasons you are about to see, this latter risk is also known as "diversifiable risk."

Market (Systematic) and Idiosyncratic (Diversifiable) Risks. Market or systematic risk is the tendency of the value of a portfolio to move in response to rapid movements in the overall market portfolio (i.e., an aggregation of all available risky investments). Idiosyncratic or diversifiable risks are all risks other than market risk.

There is an important difference between Jaclyn's holdings of 60 percent stocks and 40 percent money funds and Rob's holdings of a complex set of funds which would tend to rise and fall about 60 percent as much as the market. That difference involves all risks other than

systematic risk.

Idiosyncratic or diversifiable risks are all fluctuations in value due to anything other than overall market movements. Examples include a labor strike at a particular firm, an adverse legal ruling, a poor earnings announcement, or a failed pharmaceutical study. Jaclyn's portfolio of stocks and bonds contains little or no idiosyncratic risk—it is well diversified. But Rob's portfolio probably contains substantial idiosyncratic risk.

When the market suddenly drops 5 percent, Jaclyn has observed that her portfolio tends to drop almost exactly 3 percent (60 percent of 5 percent) because Jaclyn has a well diversified portfolio that is not subject to substantial idiosyncratic risks. Rob notices that when the market drops 5 percent his portfolio tends on average to drop 3 percent, but sometimes moves substantially lower, sometimes drops less and sometimes might even rise.

This deviation in Rob's returns is due to the idiosyncratic risks contained in his positions. The higher or lower returns are caused by events unrelated to the market's level that are causing profits or losses in some of his holdings. Perhaps one of his hedge fund investments collapsed, for example.

In summary, some portfolios adhere reasonably closely to the idea of being invested in two assets: low-risk bonds and a well diversified portfolio of risky assets. Other portfolios contain poorly diversified holdings. But considerable insight can be derived from viewing all portfolios as having a level of systematic risk that is equivalent to being some percentage, say x percent, in the overall stock market and therefore $(100-x)$ percent in short term, low default risk bonds (i.e., the so-called riskless asset).

This variable, " x " (expressed as a decimal such as 0.60 or 1.20), is

called the "beta" of the portfolio and is the measure of market risk. So a portfolio that has 60 percent stocks and 40 percent risk-free bonds, and any portfolio with a similar level of market risk, is said to have a beta equal to 0.60. A portfolio entirely invested in a broad stock market portfolio would be said to have a beta of 1.0. Money market funds have a beta of 0.0. The concept of beta can be applied to individual stocks, mutual funds and overall portfolios.

The "Market Portfolio" and the "Riskless Asset Portfolio." In MPT, the idea that investors should hold simply two assets, a diversified stock portfolio and a riskless bond portfolio, is known as the "two fund separation theorem." The diversified stock portfolio that is

Any portfolio has a level of systematic risk equal to " x ," the percentage of the portfolio held in stocks. This " x " is called the "beta" of the portfolio, and is a measure of the portfolio's market risk.

recommended is usually entitled the "market portfolio."

Strictly speaking, MPT specifies that the market portfolio is the portfolio of *all* risky assets found everywhere in the world. It is not limited to stocks and is not limited to the investor's home country. The market portfolio includes all investments that contain risk.

Further, the portfolio contains weights for each asset in direct proportion to that asset's *size*, as measured by its valuation. Thus, if IBM is 100 times larger than XYZ Corporation, then the market portfolio should contain a position in IBM that has 100 times the value as the portfolio's position in XYZ Corporation.

In practice the market portfolio is limited to *investable* assets, and few investors diversify into every

asset class. Similarly, few investors, especially outside the U.S., hold a proportion of domestic and foreign assets directly proportional to their aggregate values. Most investors have relatively large portfolio weights in the assets of their own country. (These issues are discussed in Parts 2 and 9 of this series.)

The prescription of MPT is clear: Investors should seek to diversify as much risk as possible by holding as many assets as possible and by holding those assets in proportion to their total market value.

The so-called riskless asset can not of course be truly riskless. Currencies contain risk of purchasing power fluctuations, and no asset has value if some event such as a comet destroys the earth. In research studies of U.S. markets, the riskless asset is often identified as very

short term (e.g., 3 month U.S. Treasury Bills. In practice it would include short term fixed income securities with little or no credit risk such as FDIC-insured CDs, money market mutual funds and money market accounts. Part 6 of this

series discusses the "riskless" part of the portfolio.

In sum, MPT provides a remarkably clear prescription for investing in risky assets. *MPT tells investors exactly which securities should be purchased (all of them) and in exactly what proportions (in proportion to their size)!*

But MPT does not answer the other key MPT question—the asset allocation decision—what percentage of one's wealth should be placed in the market portfolio rather than the riskless return.

Risk and Returns: The U.S. Record

Nobody knows what the future holds. We usually look to the past for some indications of the possibilities. U.S. investors who chose to bear the risks of stocks generally fared extraordinarily well in the 20th

century. From the summer lows of 1982 to the highs of 2007, the U.S. stock market rose over fifteen-fold even excluding dividends! But investors received a taste of devastating performance in 2008. What will the next 10, 25, or 50 years be like for U.S. investors?

Not all nations experienced the generally great stock markets that the U.S. experienced during the latter half of the 20th century. In some nations stock market investors lost everything when their country or government collapsed.

More recently, since late 1989, investors in Japanese stocks have seen their wealth decline by over 80 percent in the course of a generation. If the U.S. were to experience a similar decline from the highs of the Dow Jones Industrial Average (approximately 14,000 points) in the year 2007, it would mean that 20 years later the Dow Jones average would be trading at only 2,500. Ouch.

No one can predict the future returns of stocks with a high degree of accuracy. But MPT predicts that higher expected returns are available if and only if one bears higher levels of systematic (market) risk. The biggest question that all of us face as investors is this: “To what extent do we want to bear that risk in hopes of receiving added return?”

Act Your Age? Most investment performance is attributable to the asset allocation decision. A few decades ago a 50 percent stock and 50 percent bond allocation was considered standard for the retirement assets of a relatively young and affluent investor. Today, one of the simplest and most effective starting points for asset allocation decisions is that each person should “*invest their age as a percentage in bonds—and the rest in stocks.*” Thus, a 60 year old should consider holding 60 percent on bonds and 40 percent in stocks as a starting point for analysis.

Of course, this prescription needs to be adjusted to align with a person’s preferences and circumstances.

The allocation decision is not a “set it and forget it” decision. All of the circumstances that led to a particular asset allocation can change: wealth, income, estimated lifespan, risk tolerances, and so forth.

It is not too much to say that clarifying this decision-making process is the central objective of this series.

Where Do We Go from Here? We conclude this introduction by noting the difference in investment strategy as between MPT and security analysis. Security analysis investigates the valuation of individual securities. Judging by the quantity of advice offered on security selection, one might think that investment success is mostly driven by one’s ability to pick the right securities.

But as already noted, studies show that investment results are primarily determined by the asset allocation decision (i.e., which asset classes to emphasize). MPT provides the framework for making that decision.

As the table shows, the next two parts of the series focus on diversification and risk measurement. They explore what it really means to be fully diversified, what happens if one is not fully diversified, and how we can benefit from expressing

the amount of risk as the standard deviation of returns.

The fourth part lays out MPT’s “baseline” model that links risk and return. The baseline model describes how much additional expected return investors might expect from taking additional risk. The fifth part summarizes some of the challenges with applying the “baseline” model to one’s personal financial circumstances such as illiquid holdings and taxes.

Part six provides detailed and practical information regarding fixed income investing. The seventh and eighth parts of this series explore issues involved with changing one’s overall asset allocation through time, either in an attempt to time the market or in response to changes in the investor’s financial circumstances or goals.

Finally, the ninth and tenth parts explore some “outside the box” ideas such as alternative investments, behavioral or psychological issues, and multi-factor models.

Taken together, these ten parts are designed to help investors glean practical investment guidelines from MPT. MPT is not without its limitations and its critics. But many of the most common large investment mistakes are caused by failure to follow MPT’s most basic prescriptions.

MPT’s Lessons for Investment Management

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Diversification and the Market Portfolio

This is the second in a ten-part series exploring the implications of modern portfolio theory (MPT) for common investment decisions faced by individuals. This part focuses on two major concepts: diversification and the market portfolio.

by Donald R. Chambers

Modern Portfolio Theory provides a rigorous understanding of what diversification is and how it works to improve investment opportunities. MPT also shows how to create the portfolio that contains as much diversification as possible: the *market portfolio*. In doing so, MPT provides a powerful prescription that is applicable to virtually every investor. MPT tells us exactly which risky assets we should hold and in which proportions we should hold them!

Briefly, the market portfolio is that portfolio that contains all investable assets that contain risk—and holds them in proportion to their size.

An investor who implements this prescription from MPT for her investment decisions can ignore over 90 percent of the complexities, decisions, and wasted time of traditional investment analysis and can focus on the one unambiguously beneficial objective: diversification.

Market and Idiosyncratic Risks.

Part 1 of this series introduced MPT's distinction of two types of risk: idiosyncratic risk and market (systematic) risk.

Idiosyncratic risk is also known

as diversifiable, non-systematic, non-market or unique risk. Idiosyncratic risk is any fluctuation in an asset's return that is not caused by (or at least correlated with) the movements in the overall market. An example of idiosyncratic risk is when

The enormous breakthrough in MPT: Investors can optimize their portfolios by selecting from only two investment alternatives (the market portfolio and riskless assets).

a firm drops 10 percent because it announces bad earnings. When a firm drops 10 percent because the overall stock market plunged, it is market or systematic risk.

Market risk is also known as non-diversifiable, systematic or beta risk. The market risk of an investment is all fluctuations in the investment's value that are caused by or correlated with movements in the overall market.

Virtually all stocks of individual firms have both market risk and idiosyncratic risk—which combine to form their total risk. For most stocks, the idiosyncratic risk is substantially larger than the market risk. The market portfolio contains market risk—but by definition contains no idiosyncratic risk.

Diversification Defined. Most investment professionals use the term “diversification” to represent the spreading of one's wealth into a variety of investments. For example, a broker might say “I think stocks are getting a little overvalued now and it is time to diversify a little by placing some money in Treasury bills.”

MPT uses a more precise definition of diversification that is more useful for this

analysis. Diversification

is the spreading of one's wealth into risky assets that have some level of *imperfect correlation*. Imperfect correlation is when two variables have at least some chance of not always moving in the same direction and in the same proportion to each other.

Virtually all stocks are imperfectly correlated with each other and therefore provide at least some level of diversification when combined into a portfolio. The imperfect correlations mean that their differences in returns may at least occasionally offset each other to some degree if the assets are combined into a portfolio. That is the essence of diversification.

Putting it another way, diversification is unambiguously good. The idea is that the idiosyncratic risk (i.e., the diversifiable risk as introduced in Part 1) of one asset offsets at least some of the idiosyn-

cratic risk of another asset—causing idiosyncratic risk to disappear from the portfolio.

MPT predicts that investors can lower their risk without lowering their expected returns through diversification. It is the closest thing to the proverbial “free lunch” that a financial economist can find.

That is why diversification should be the primary goal of the investor.

The Riskless Asset Reduces Risk but Does Not Diversify. As explained in the first part of this series, MPT prescribes that investors should hold only two assets: the market portfolio and the riskless asset. (Formally, this idea is often referred to as the “two fund separation theorem.”)

Investing in T-bills (U.S. Treasury bills), money market funds, or money market accounts (i.e., riskless assets) reduces risk. But the returns of riskless assets are fixed (in the short run) and therefore they do not ever have unexpectedly high returns and—in the pure sense of the word—cannot provide diversification.

A T-bill might offer a positive return when all other risky assets decline, but it can not offer an *unexpectedly high* return. This seemingly minor point is actually an essential observation in establishing the enormous breakthrough in MPT that investors can optimize their portfolios by selecting from only two investment alternatives (the market portfolio and riskless assets).

Riskless assets such as T-bills do not have idiosyncratic risk. Therefore, riskless assets cannot offset the idiosyncratic risks of risky assets and make the risk “disappear” in a portfolio. Simply put, *riskless assets do not provide diversification.* Diversification can lower risk without lowering expected returns. MPT predicts that investing a riskless asset will lower risk, but only at the expense of lowered expected returns.

Perfectly Positively Correlated Assets Do Not Diversify. Usually, combining risky assets into a portfolio provides diversification. But to illustrate the principles involved, let’s first look at the extreme case where returns are perfectly correlated and there is no diversification.

The returns of one share of IBM are perfectly correlated with the returns of another share of IBM since they are identical. Any unexpectedly high or unexpectedly low outcomes in the one share are identical to the unexpected outcomes in the other share. Thus, holding a portfolio consisting only of many shares of the same stock does not provide diversification.

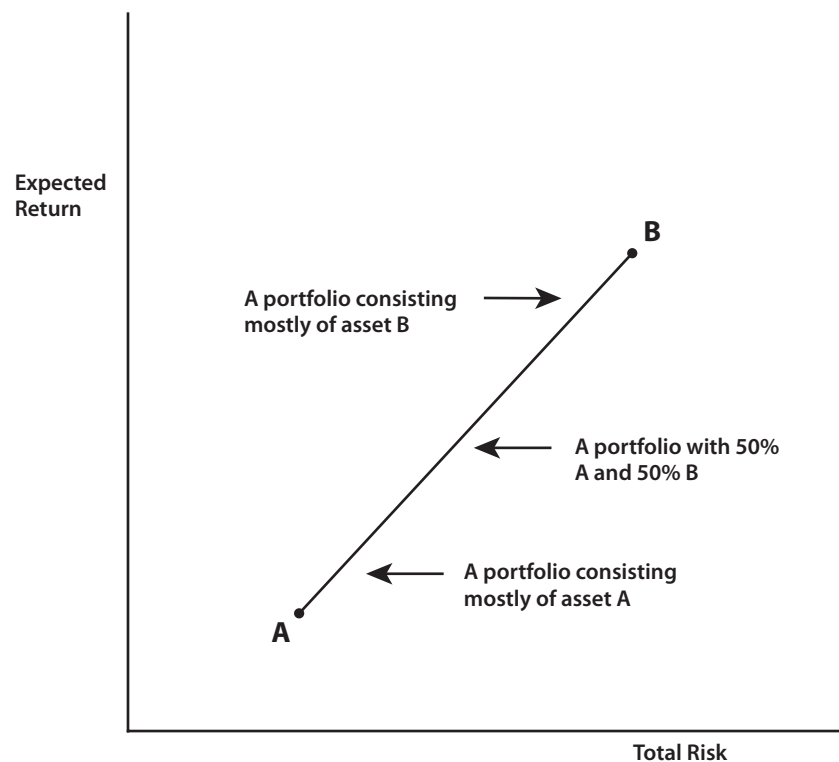
A less trivial example would be the combination of mutual funds or other products that closely track the same index such as an index of pharmaceutical stocks. Since those assets are nearly perfectly positively correlated, there would be virtually no diversification from combining them into a portfolio.

The idea that perfectly positively correlated assets do not provide diversification is illustrated with a solid line in Figure 1. Asset A has relatively low risk and low expected return. Asset B has higher risk and higher expected return. Perhaps asset A is an unleveraged investment in an S&P 500 fund and Asset B is an investment that uses leverage and also tracks the S&P 500 closely.

Notice that moving money from asset B to asset A lowers risk. But this risk reduction is not due to diversification. There are no idiosyncratic risks offsetting each other and disappearing. And MPT predicts that, unlike the risk reduction gained through diversification, this risk reduction will come at the expense of lower expected return.

Imperfectly Correlated Assets Do Diversify Risk. The diversification obtained by combining risky assets depends on the correlation of those assets. Generally, when the correlation is lower the diversification is

Figure 1. Perfectly Correlated Assets



greater. If an investor puts half his or her money in one risky asset with typical annual return fluctuations of 40 percent and the other half in another asset with the same general magnitude of fluctuations (i.e., 40 percent), the fluctuations of the resulting portfolio can be 0 percent, 40 percent or anywhere in between depending on how the assets *correlate* to each other.

The interrelationship of correlations and diversification can be demonstrated with the mathematics of risk and illustrated with charts. Figure 2 illustrates this concept with low correlation as illustrated by the dotted and curved line connecting assets C and D.

The curve labeled “low correlation” in Figure 2 illustrates the key concept of combining imperfectly correlated assets such as two typical stocks. Diversification is illustrated as the “bending” of the portfolio in the direction of less risk (left).

The key point being illustrated with the dotted curve in Figure 2 is

that risk is being reduced without lowering the expected return! MPT views the process of diversified investing as a battle for simultaneously reducing risk without reducing expected return.

Market Risk Is Rewarded, Idiosyncratic Risk Is Not! Here is the most single important prediction of MPT. Investors who bear systematic risk will earn higher expected returns. But investors who bear additional idiosyncratic risk will not earn higher expected returns. Bearing idiosyncratic risks will sometimes generate high returns, sometime generate low returns, but on average will not increase expected return.

The major prescription of MPT becomes clear. Avoid idiosyncratic risk by diversifying as much as possible.

Speculation. Many practitioners equate speculation with excessive risk. But a more meaningful definition is that it is an attempt to

earn high returns without a “valid” economic purpose or without reasonable financial expectations.

Consider Mr. Smart, who places most of his wealth in a diversified stock portfolio. Mr. Smart does not view the stock market as being wildly undervalued or overvalued. He views the stock market as being risky but on average expects that the stock market will outperform riskless investment opportunities.

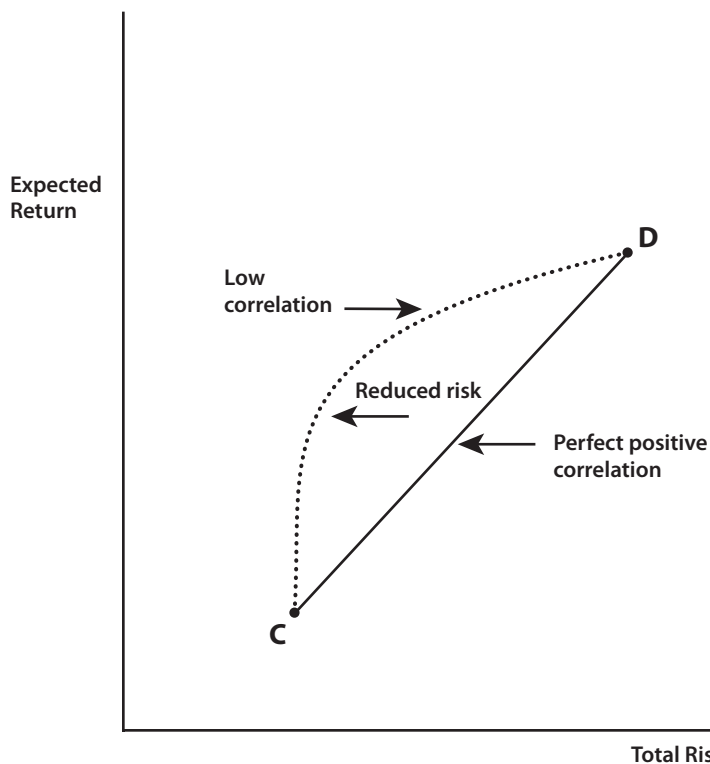
Mr. Smart is performing a valid economic function (bearing the systematic risk of an economy) and anticipates an appropriate potential reward. He has selected a level of risk based on his reasonable anticipation of higher expected return. Mr. Smart is bearing risk, and even if he is bearing a large amount of risk he is not speculating.

What is speculation? There are two major types. One is bearing idiosyncratic risks. The other is bearing the wrong levels of risk, whether too high or too low.

As an example of the first type, consider Mr. Stock-Picker. He decides not to diversify and therefore bears idiosyncratic risk. He puts a lot of his money in a handful of stocks that he thinks will outperform the market. Mr. Stock-Picker is hoping that he will be rewarded with high returns. But according to MPT he is speculating based on hope. He is like a casino gambler who places money on a roulette table but who has no rational reason to believe that the expected returns will be exceptional.

As to the second type, consider Mr. Market-Timer. Sometimes he bears great systematic risk through leverage (when he thinks the market is undervalued). Sometimes he places his money in cash (when he thinks the market is overvalued). Mr. Market-Timer should be viewed as speculating both when he is over-exposed to risk and even when all of his money is in cash! The reason is that his risk taking is based on unrealistic or unfounded return expectations.

Figure 2. Diversification



What Does the Market Portfolio Look Like? MPT establishes that the perfectly diversified portfolio—the *market portfolio*—holds every possible risky asset or security and holds each in direct proportion to its size. In theory this requires holding, literally, *all* risky assets: stocks, long term bonds, defaultable bonds, real estate, hedge funds, commodities, private equity, collectibles and so forth. In theory this also means holding every risky asset in proportion to its total size.

If Goliath Bank Corp. is one thousand times the size of Queasy Bakery Corp. then a perfectly diversified portfolio must have a position in Goliath Bank that is one thousand times the size of the position in Queasy Bakery Corp.

The idea of holding each security in proportion to its size also applies to types of assets and groups of assets. Thus, industry and sectors should be held in proportion to their sizes. Real estate, private equity, commodities and hedge funds should be held in proportion to their sizes. And assets grouped by country should also be held in proportion to their sizes. Note that the combination of all the portfolios of all investors in the world is the market portfolio. And all investors should hold the same portfolio.

One of the most controversial prescriptions of MPT is that every investor's portfolio should be invested in the securities of each country according to that country's relative economic size. Thus every portfolio should be the same as the market portfolio and should be 30 percent-40 percent invested in US based assets and only a few percentage points of assets should be invested in all of the countries of Africa and South America combined. MPT, in its simplest form, prescribes that a citizen of a small nation should invest less than 1 percent of their portfolio in assets

located in their own nation and over 99 percent in assets located outside their home country.

Another potential problem is that in practice including all assets is not always feasible since not all assets are investable. Queasy Bakery Corp. might be a family held business. Maybe Queasy Bakery Corp. is located in a country that does not allow foreign investment.

And holding a little of every asset that can be purchased is not practically feasible due to the transactions costs of assembling and managing such a massive number of positions. But increasingly there are some well-diversified and cost-effective investment funds that are providing impressive diversification. High levels of diversification are increasingly possible and cost effective.

But perfect diversification is not literally possible.

For all but the super-rich, a high level of diversification requires the use of diversified mutual funds, exchange traded funds, or derivative products.

So, the market portfolio described above is really just an ideal towards which each investor should aspire in the absence of rational reasons to do otherwise. In practice it means avoiding the temptation to intentionally take idiosyncratic risks, and it means investing in very large collections of assets (with individual asset weightings that are in proportion to size).

How Many Securities Does It Take to Be Well Diversified? For many investors, their risky portfolio is primarily comprised of securities such as stocks (for example, as held inside of mutual funds). While in theory, the portfolio should contain every stock and other security in the world, in practice this is too costly and the investor will hold a somewhat small sampling of those stocks.

One of the most common errors

regarding diversification is that a diversified portfolio can be obtained with perhaps 20 or 30 stocks. That is not quite the case.

A portfolio of 100 securities will eliminate about 90 percent of the idiosyncratic risks of the securities in the portfolio. But even a portfolio of 400 securities will still retain about 5 percent of its idiosyncratic risks.

Thus, excellent diversification should involve thousands of underlying positions. For all but the super-rich, a high level of diversification requires the use of diversified mutual funds, exchange traded funds, or derivative products that contain over a thousand underlying positions.

Conclusions. Diversification is the reduction of idiosyncratic risk through combining imperfectly correlated assets into a portfolio.

Perfect diversification is the elimination of all idiosyncratic risks. It is accomplished by holding the market portfolio. The market portfolio contains all investable assets and holds those assets in proportion to their available size.

MPT predicts that bearing systematic risks is the only way to increase expected returns. MPT implies that investors should focus on diversification and should eschew efforts to speculate on idiosyncratic risks.

The remaining parts of this series build on the concepts included in this discussion of diversification and the market portfolio. Risk is a key element of virtually all parts of MPT. And risk is best understood through the statistical measure known as standard deviation.

The purpose of the next (i.e., third) part of this series is to introduce and clarify the concept of standard deviation, and then build a solid, structured and precise understanding of risk and of the tradeoff between risk and expected return.

Managing a Portfolio's Risk

Using a four-step plan, you can select a portfolio allocation that generates the desired risk exposure. The more volatility (risk) you can take on, the higher your expected long-term returns.

by **Donald R. Chambers**

This is the third of a ten part series discussing the implications of Modern Portfolio Theory (MPT) for typical investment decisions faced by individual investors.

The previous two parts in this series explained how MPT provides a clear direction on diversifying into as many risky assets as is practically possible and investing in each asset in proportion to its size. In doing so, investors should receive the highest expected return per unit of risk. In other words: diversify as much as possible and in so doing eliminate idiosyncratic risk since it is not consistently rewarded.

Unfortunately, MPT leaves unanswered the key question of *how much risk to bear* (i.e., how much money to put into the market portfolio of risky assets rather than to hold in the risk-free asset). This decision is known as “the asset allocation decision” and is typically viewed as the most important investment decision facing an individual. The high volatility of the stock market over the past few years has emphasized the importance of having an appropriate asset allocation.

For deciding the asset allocation decision in practice, MPT uses a statistical measure of dispersion

known as the standard deviation—a measure of risk or “volatility.”

With any luck, by the end of this article you will be able to understand and appreciate the following sentence in the context of managing the risk of your portfolio:

“The annual standard deviation of the returns of the stock market is currently estimated to be about 20 percent. I have decided to allocate my portfolio such that its estimated standard deviation is about 15 percent. I’ll do this by putting 75

The concept of standard deviation is a critical piece of foundational material for measuring risk.

percent of my money into a fully diversified stock portfolio and the remainder in a money market fund.”

Understanding a statistical term such as standard deviation in the context of investment returns may initially appear to be an unnecessary detour. But the concept of standard deviation is a critical piece of foundational material for measuring risk and for making an informed asset allocation decision.

This article provides an explanation of the standard deviation,

detailing what standard deviation can tell us about the likelihood of various outcomes and how the standard deviation of the portfolio can be controlled. In the next part of the series, our understanding of standard deviation will be used to address the most critical question of the series: How can an individual determine an initial optimal portfolio allocation?

Background. Prior to the 1950’s, researchers discussed risk and

return in vague qualitative terms. Analyses of risk lacked clarity since terminology was often ambiguous. In the 1950’s Nobel Laureate Harry Markowitz created MPT

by analyzing the classic risk vs. return tradeoff using the precision implicit in mathematics and statistics. The centerpiece to Markowitz’s seminal work was expressing return with an asset’s average or expected return and risk with its standard deviation.

Most people intuitively understand the concept of an average or expected return. We know that the expected value of a variable, also known as its mean, is an indication of central tendency—a value towards the middle of the outcomes about which the remaining observations tend to be scattered.

However, few people intuitively

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understand and utilize the concept of standard deviation. Nevertheless, for our purposes, standard deviation is almost as easy to understand and use as expected value!

Standard Deviation and Typical Deviations. In the case of investment returns, standard deviation can be roughly approximated as “the typical amount by which an investment’s actual return deviates from its average.” Before applying standard deviation to financial returns, we can illustrate the concept with more familiar applications.

Let’s start with the example of professional baseball scores. Observers of baseball might estimate that an average number of runs for one team to score in one game might be five runs—and that a typical amount by which the outcomes tend to differ from this expectation (i.e., roughly its standard deviation) might be two runs. In other words, among the higher than average scores, a typical score would be seven runs, while among the lower than average scores, a typical score might be three runs.

As another example we might estimate that the average speed of cars on a given interstate highway would be perhaps 65 miles per hour and the standard deviation would be perhaps five miles per hour. Obviously some cars travel exactly 65 mph, some travel 80 mph, but a typical car that travels faster than the average travels near 70 mph and a typical car that travels slower than the average travels near 60 mph.

Standard Deviation of Returns. In most cases of investment returns, the concepts of “standard deviation” and “a typical deviation” are reasonably close.

Let’s take a look at a portfolio that has an annual expected return of 5 percent and a standard deviation of 2 percent. As in the case of baseball scores or vehicle speeds, we

should be able to develop a quick and easy intuitive feel for the range of outcomes. In a year of average performance, this portfolio will earn 5 percent. However, among those years with below average performance, a typically bad year would generate a return of about 3 percent—sometimes better and sometimes worse. Of those years with above average performance, a typically good year would generate a return of perhaps 7 percent.

If the standard deviation of the asset’s return fell to 1 percent, then we would understand that the returns were clustered closer to 5 percent with typically good years producing a return of 6 percent and typically bad years producing a return of 4 percent (each found by either adding or subtracting one

Computer spreadsheets and published statistical tables can be used to estimate the probabilities of various outcomes.

standard deviation to or from the expected return). Of course, returns could be much higher or much lower—indicating highly unusual circumstances in which the outcomes are many standard deviations from the average.

Once we have a familiarity with the concept of standard deviation we can use its mathematical properties to clarify the behavior of risk in a portfolio context and to sharpen our intuition. With a little practice, standard deviation becomes as easy to use as averages.

Standard Deviation and the Normal Distribution. The normal distribution is the classic “bell shaped” curve that is observed frequently in nature and can result from the culmination of numerous small effects. If a variable is exactly normally distributed, the standard deviation tells us a great deal about the possible outcomes. Although returns are not exactly normally distributed,

we can use this as an approximation to understand a lot about financial returns.

For example, for a normally distributed variable roughly two-thirds of the outcomes will lie within one standard deviation of the mean. Using an annual mean return of 10 percent for the market portfolio and a standard deviation of 20 percent, these statistics would tell us that approximately two-thirds of the time the market portfolio’s annual return will lie between -10 percent and plus 30 percent. One-sixth of the time the annual return will be greater than 30 percent and one-sixth of the time it will perform lower than -10 percent.

Ninety five percent of the time the annual return will lie within two standard deviations of the mean.

Thus, over a period of 50 years, a portfolio with a mean return of 10 percent and a standard deviation of 20 percent should experience perhaps one year with returns below -30

percent and one year with returns greater than 50 percent.

So, to the extent that stock returns are normally distributed, the standard deviation can describe for us the various probabilities of virtually any return level. Computer spreadsheets and published statistical tables can be used to estimate the probabilities of various outcomes.

Returns Are Not Normally Distributed. But investment returns are not exactly normally distributed. The returns of risky assets tend to have larger probabilities of extreme values than in a perfect normal distribution. For truly bizarre markets (such as those experienced during a financial crisis) extreme values have a probability of occurring that is hundreds or thousands of times greater than occur with a truly normal distribution. In the stock market crash of October 19, 1987, the stock market was estimated by some to have experienced a double-digit

standard deviation event—something that the normal distribution would predict would only happen once every few thousand years.

Nevertheless, except for very unusual market conditions with extremely high or low returns, the normal distribution provides a reasonable description of the returns of risky assets. In other words, we can use the probabilities associated with the normal distribution if we keep in mind that extraordinary events will likely happen in each generation of investors.

An Illustration of Risk. What does it mean to invest for one year in a portfolio that has a standard deviation of 5 percent, 10 percent or even 20 percent? While the previous paragraphs provide some insight, the chart below is designed to provide a more general view.

The chart focuses on the unexpected gains and losses that can happen to a \$100 portfolio over a one-year time horizon. Of course, anything is possible, so potential outcomes need to be associated with their probabilities. The horizontal axis lists the standard deviation of the portfolio for a range of 0 percent on the left-hand side to 30 percent on the far right-hand side.

The vertical axis lists the unexpected change in the value of the portfolio. The expected gain in the portfolio is not specified or included—perhaps it might be \$5, \$10 or even \$15. The lines simply show unexpected gains or losses relative to the expected growth.

Each line on the graph illustrates magnitudes of gains and losses for various levels of likelihood (probability).

For example, the top line, labeled 98 percent, shows the portfolio's unexpected profit if the portfolio is lucky enough to earn a return that is better than 98 percent of the other possible outcomes. Roughly, it is the return that will only be exceeded twice every 100 years or so. The larger the portfolio's standard

deviation (found on the horizontal axis) the larger the likely profits and losses. At the far right side of the figure we see that with a standard deviation of 30 percent the portfolio will unexpectedly rise almost \$90 higher than expected if the portfolio receives a return performance in the top 2 percent of possible outcomes.

At a portfolio standard deviation of 15 percent, the possible gains and losses are roughly half the size of the gains and losses with a standard deviation of 30 percent.

The second line up from the bottom line in the figure, labeled 5th percent, shows losses when returns are among the worst 5 percent of possible outcomes. An investor should expect that 95 percent of the time the portfolio will do better than that.

Comparing the third line from the top with the third line from the bottom will show the range of gains and losses (relative to an average) within which 80 percent of the outcomes will lie. 10 percent of the outcomes will lie above that range and 10 percent below that range. Put differently, on average 8 out of 10 years will lie within the range, 1 year in 10 will lie above the range and 1 year in 10 will lie below the range.

The upshot is that we can use this chart to think about the level

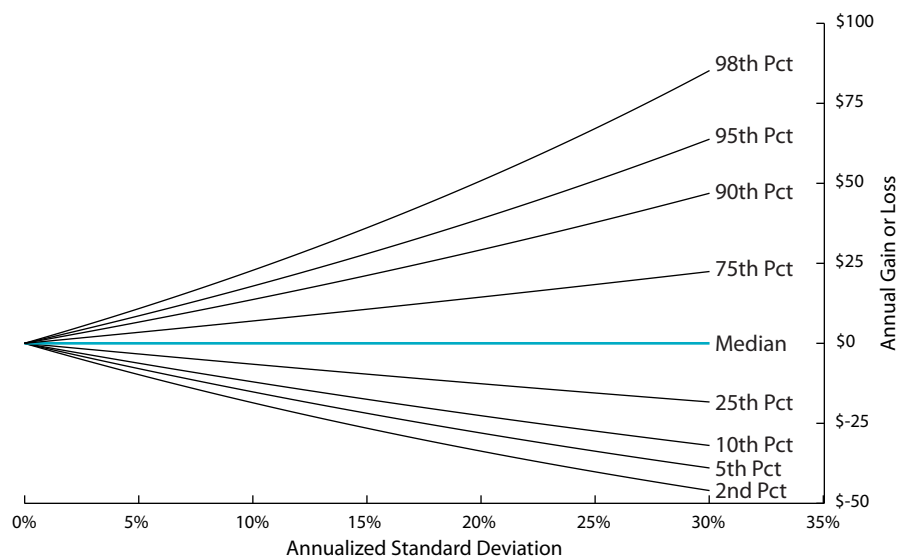
of risk that we are willing to bear in the search for higher return. Are you willing to take a 2 percent chance each year that your portfolio will drop by 50 percent or more? If not, then a standard deviation of 30 percent is too much for you.

This approach for determining an asset allocation involves “moving” along the horizontal axis in a diagram such as this chart until the annual dispersion is as large as an investor can reasonably tolerate. The next part of the series adds expected returns to the analysis to provide a tool for deciding between safety and higher average return.

Controlling a Portfolio's Standard Deviation. The beauty of standard deviation is that in this case the standard deviation of the portfolio is directly proportional to the amount invested in the risky assets. So an investor looking at the chart below and finding a reasonable level of annual standard deviation can then easily find a portfolio that provides the desired risk.

Let's assume that an investor's entire portfolio has two components. One is the market portfolio, a very broadly diversified portfolio of risky assets. The other is a low-risk or even “risk-free” short-term bond portfolio (such as a money market

Unexpected Gain or Loss per \$100 Invested



fund). Let's further assume that the standard deviation of the annual returns of the market portfolio is 20 percent. By definition, the standard deviation of the risk-free bond portfolio is 0 percent.

The punch line is that the standard deviation of the portfolio is simply $w \times 20$ where w is the percent of the portfolio allocated to the market portfolio. (Now you are getting the information you need to understand the mystery passage at the beginning of this article.)

If the mix is 50 percent/50 percent, the portfolio's standard deviation is 10 percent (because 50 percent of 20 is 10). Similarly, if the portfolio emphasizes risky assets with an 80 percent weight, its standard deviation would be 16 percent. The formula is:

$$\text{Std. Dev. of Portfolio} = \text{Std. Dev. of Market} \times \text{Percentage in Market}$$

The key is that the investor can select the desired risk exposure of the portfolio by simply adjusting the percentage in the market portfolio:

$$\text{Percentage in Market} = \frac{\text{Desired Std. Dev.}}{\text{Market Std. Dev.}}$$

Past Market Volatility. Over the last 100 years or so, the standard deviation of the U.S. stock markets has averaged around 20 percent per year. However, there is a danger with assuming that very long term historical averages are reasonable forecasts of the future. Do market volatility values from the early 20th century really give us insight into today's behavior? In 1995 and again in 2005 the U.S. stock market's annual volatility was near historically low levels such as 10 percent. But surrounding those dates were abnormally high volatilities close to 30 percent. So we can never be sure if volatility in the next few years will be like the relatively calm years or the highly volatile years.

At best we can have a reasonable forecast of what market participants expect the volatility will be.

We should then realize that actual volatility levels will often depart—sometimes substantially—from that expectation.

Fortunately, markets provide us with an objective measure of the volatility that investors anticipate. That measure is found in the “derivative markets,” which we can turn to now.

Forecasts of the Market's Standard Deviation. MPT asserts that market prices reflect all available information. To the extent that this simple assertion is true it means that we can use market prices to ascertain the best information available as it has been analyzed by countless alert and intelligent people. For example, a market price such as the price of a bushel of wheat reflects the multitude of information being collected and analyzed by thousands of informed and brilliant analysts and traders regarding their expectations of the supply of and demand for wheat.

Financial contracts have emerged in recent years that allow market participants to trade directly based on their forecasts of future stock market volatility. MPT (i.e., informational efficiency) implies that the market prices of these contracts provide the best indications of future market volatility. Hard-working investors and speculators throughout the world are betting their money on their predictions of market volatility. We can observe the predictions of volatility that emerge from this competition and we would be wise to use these forecasts rather than to rely on our own potentially biased opinions.

The premier trading vehicle for observing anticipated volatility is the S&P 500 VIX (“Volatility index”) futures contract on the CBOE (the Chicago Board Options Exchange). The VIX, sometimes referred to as the “fear index” reflects the annualized volatility of the S&P 500 anticipated over the next 30 days. To the extent that markets are efficient this

index provides a market consensus view of the annualized standard deviation of the stock market. By finding and examining longer term futures contracts, the anticipated volatility over the next year or two can be discerned.

While no one can be certain of the volatility of the market over the next year, the VIX prices provide a reasonable prediction of future volatility. Currently, values of the VIX can be found on the web at “Yahoo! Finance” and other quote providers using the ticker symbol [^]VIX. As of the fall of 2010, the VIX had declined to around 20 percent—which happens to be about equal to the historical volatility of the last 80-90 years. It should be noted that this is a measure of only the stock market and more precisely the large cap US stock market. An ideal measure of volatility would be more related to the view of the market portfolio discussed in Part 2: a global portfolio of all investable risky assets.

If markets anticipate volatility of about 20 percent, an investor desiring volatility of about 5 percent would then allocate assets with a mix of 75 percent safe and 25 percent risky assets, while an investor seeking returns commensurate with 10 percent volatility might select a 50 percent/50 percent mix.

Summary. Standard deviation is a helpful tool in applying MPT to portfolio allocation. The steps are: 1. to intuitively understand standard deviation, 2. to select a target risk exposure in terms of standard deviation, 3. to analyze the VIX or similar market values to forecast market volatility, and then 4. to select a portfolio allocation that generates the desired risk exposure. This article has focused on risk, but has only touched lightly on expected return. The next part of this series brings expected return into the analysis to describe how an investor can make a decision regarding the tradeoff between risk and return.

The Asset Allocation Decision

Investment choices should be based on realistic forecasts of the risk-return trade-off and the investor's personal preferences about how much risk to undertake.

by **Donald R. Chambers**

A key implication of Modern Portfolio Theory is that investors need keep their money in only two places: a highly diversified portfolio of risky assets (the market portfolio) and a selection of short-term assets that are virtually risk-free. In addition, the more of your money you place in the risky market portfolio, the higher your expected annual returns, on average.

As an example, Suzanne is a financially comfortable 60-year-old widow who has recently retired with a moderate pension and approximately \$1,000,000 in investable wealth. With a life expectancy of about 25 years, Suzanne could only tap her savings for about \$40,000 per year in today's dollars if she kept all of the funds in riskless assets (since there would likely be no earnings after taxes and inflation).

She uses financial tables and determines that if she could earn just two more percentage points each year on her savings she could increase her annual withdrawals to over \$50,000 per year in today's dollars.

But how can she get the extra 2 percent a year rate of return? According to MPT, she would need to place more of her investments into what we have called the market portfolio—and less in CDs, money-

market funds, and short-term bonds.

The problem? By moving more of her savings into the market portfolio she would be taking on more risk. By risk we mean volatility: the ups and downs of stock prices from year to year. The higher long-term average returns she can expect would come only at the price of greater year-to-year volatility.

Suzanne's situation illustrates two basic points from MPT. First, the only reason to bear risk is to receive higher expected return. Second, the only way to earn higher

Asset allocation should attempt to balance reasonable estimates of risk and reward—not attempt to outguess the market.

expected returns is by taking on more systematic risk. By extension, the decision of how much market risk to bear (how much money to place in the market portfolio) will depend on how much expected return results.

The Decision. How does an investor make that crucial decision as to how much risk to bear in the pursuit of higher return? This choice is known in MPT as “the asset allocation decision.”

The asset allocation decision is

typically the primary determinant of investment success or failure. It should be made in an attempt to balance reasonable estimates of risk and reward—not in an effort to out-guess others as to where the market might be headed. Otherwise, investors may over-allocate to risky assets during good economic times and over-correct into ultra-safe portfolios during bad economic times.

As a painful example, many investors reacted to the sharp drop in stock prices in late 2008 by selling their holdings at the stock market's nadir. (This turned on its head the old dictum: Buy low, sell high.) The result was that such panicked investors missed out on the substantial resurgence in stock prices that has occurred since the market

bottom.

The goal, in short, is to reach an asset allocation that reflects a balance of risk and return.

But how do we come up with a realistic view of that trade-off? How can you decide how much of your assets should be in risk-free investments and how much in the market portfolio?

The answer? It depends on you—and above all, on your appetite for risk. At this point, you may recall the old saying about investors in the stock market. To wit: You can either eat well or sleep well, but you can't do both. Why not? To eat well, you need high returns. But to

get the high returns over time, you will have to go through bull and bear markets, and that will keep you up at night. Experience suggests that preferences vary. Some people would rather eat well than sleep well, and vice-versa.

Balancing Risk and Return. What if you knew that you could invest your retirement money for the next year in a combination of only the two funds? A money market fund pays a fixed rate of 2 percent. A portfolio of risky assets earns, say, 8 percent on average, but with big swings in performance from year to year.

At this point, we need to get more specific about how to measure or estimate risk—which refers to the degree of year-to-year volatility in stocks, both domestic and foreign.

As we saw in the last article in this series (Part 3), we can borrow from the field of statistics the concept of “standard deviation” to measure the risk of investment returns. The intuition of standard deviation is that it serves roughly as a typical deviation of actual returns in any given year from average or expected returns.

Suppose the expected annual return of the market portfolio is 8 percent and that its standard deviation is 20 percent. A standard deviation of 20 percent means that roughly two out of every three years we should anticipate that our actual returns will lie within 20 percent of the expected return (-12 percent to +28 percent). Only about one in six years should show returns lower than -12 percent or above 28 percent (each being more than a full standard deviation from the expected return).

In extremely bad years, the return could fall two standard deviations below the expected return. That is roughly what happened in 2008, when the S&P 500 dropped over 35 percent.

The idea here is for investors to think about the range of risk that they would feel comfortable bearing in an attempt to earn higher return. Then each investor should select an asset allocation that achieves the preferred level of risk and return.

The good news is that an investor can control the standard deviation of his or her entire portfolio by adjusting the asset allocation (i.e., the mix of safe and risky assets). To achieve a target standard deviation of, say, 15 percent, an investor should use an estimate of the standard deviation of the market portfolio, which we are assuming is 20 percent.

The way to shrink the total portfolio’s standard deviation is to reduce the share of your investments in the market portfolio. To repeat, we assume the market portfolio has

The primary idea is to find a balance between the joy of higher expected return and the agony of higher risk.

a standard deviation of 20 percent.

Then the standard deviation of the entire portfolio will vary with how large a share of your investments is in the market portfolio. If the share is three-fourths (75 percent), the outcome would be as follows:

$$\text{Target Std. Dev.} = \text{Std. Dev. of Market} \times \text{Percentage in Market.}$$

Then, for a target of 15 percent:

$$15\% = 20\% \times 75\%$$

Similarly, if the goal is a total standard deviation of only 5 percent, reduce the share of your holdings in the market portfolio from 75 to 25 percent—or a third as much.

The other side of the coin is that you would hold a larger share of your portfolio in risk-free assets. You would be hedging against the high volatility of the market portfolio.

So much was covered in Part 3. Now we can move on to implications and refinements.

The Market Risk Premium. MPT teaches that investors who bear systematic risk (i.e., market or non-diversifiable risk) can expect to receive higher returns on average.

MPT refers to the added return from bearing systematic risk as the market risk premium or the equity risk premium. This premium is the expected return of the overall market minus the risk-free rate. If the market portfolio is expected to earn 8 percent (on average) and if the short-term money market yields are 2 percent, then the market risk premium is 6 percent.

So the premium is the added return investors demand for bearing the risk of being in the market portfolio rather than in riskless assets.

In this example, the question each investor faces is: How much systematic risk are you willing to bear if you are being rewarded with a 6 percent higher expected return on all of the money that is placed in the market portfolio rather than in riskless bonds? Of course, the answer would rarely be as much as possible or none. Instead it is usually some.

That answer needs to be translated into a specific portfolio allocation. However, MPT does not provide an objective estimate of the expected risk premium of the market. At a particular point in time, we do not know whether investors are expecting the market to outperform risk-free assets by 2 percent, 8 percent, or even 12 percent per year.

The Premium with a One-Year Time Horizon. Still, most scholars and industry experts tend to expect the long-term average returns of a highly diversified equity portfolio to exceed short-term riskless rates by perhaps 4 percent to 8 percent per year.

So let's settle on 6 percent as a moderate estimate of the risk premium. This 6 percent forecast is only an estimate of the expected return. Actual annual returns will likely vary tremendously, displaying huge losses during bear markets and huge gains during bull markets.

Another key issue in analyzing the risk-return trade-off is selecting an appropriate time horizon—the length of time into the future for which projections are being made in portfolio planning and analysis.

For simplicity, our analysis can use annual returns and a one-year investment horizon.

The Volatility of Market Returns. In an earlier example, we assumed a 20 percent standard deviation for the market portfolio. In theory, this figure could then be used to manage the volatility for a total portfolio. But where does such an estimate come from in practice? And how much confidence should we place in it?

We have two different ways to come up with a realistic expectation of the future annual standard deviation of the returns of the market portfolio. The first is simply to check the record of swings in the stock market over time. In other words, we can draw upon the historical evidence on stock market volatility.

The second approach is more technical. It uses financial derivatives (futures contracts) to measure market expectations of future volatility. The instrument in question is the Volatility Index (or VIX) for the S&P 500. Increases in the VIX mean that market participants expect the S&P 500 to display increased volatility. To that extent, the market portfolio can also be expected to display a higher standard deviation.

As of the fall of 2010, both historical evidence and data implied by the VIX derivatives contracts point to an expected standard deviation of annual returns of about 20 percent.

In short, it makes sense to use 20

percent as a forecast of the one-year standard deviation of stock-market returns—which is why we used that figure for the market portfolio's standard deviation in our earlier example. At the same time, an investor would be well-advised to keep an eye on the VIX. If it changes over a longer period of time, his or her estimate of the market portfolio's volatility might need to be adjusted accordingly.

Linking Expected Return and Risk. The question remains for an individual investor: How should I select the share of my total portfolio allocated to risk-free investments? This is the question, once again, of how much risk an investor is willing to take in exchange for a higher expected return.

So far we have said that this decision will vary in accordance with the individual investor's appetite for risk. Now let's explore the risk-return balancing act with a little more precision. We can continue to use a 2 percent short-term riskless return and an 8 percent expected annual return of the market portfolio (6 percent above a 2 percent riskless rate).

The chart below uses these values as well as the 20 percent figure for the standard deviation of the market

portfolio. It illustrates ranges of annual returns and their probabilities that investors might anticipate for various portfolio allocations.

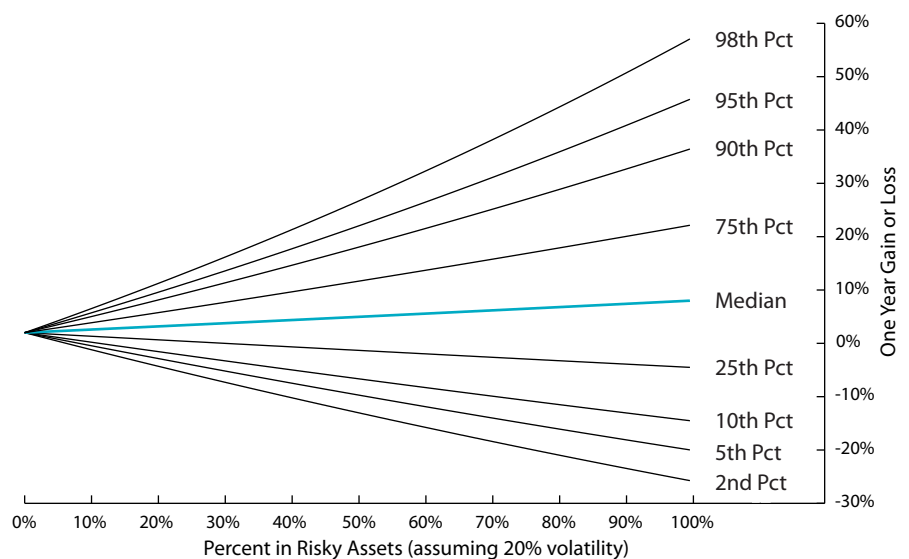
The risk-free extreme occurs at the far left of the chart, where all of the lines come together. This shows that if an investor puts 100 percent of her portfolio into riskless assets, it will generate the low but certain return of 2 percent per year. As already noted, history suggests that after taxes and inflation are considered, this would lead to no real gains.

A balanced alternative would find an investor allocating 50 percent to low-risk short-term bonds and 50 percent to risky assets. The chart shows the likely levels and volatility of annual returns that can be expected with various probabilities by locating 50 percent on the horizontal axis and examining the ranges above that point.

From left to right, the lines portray both higher variability and higher average return. The 6 percent risk premium described earlier is the reason the median (50th percentile) return tilts upward from left to right.

In other words, as the lines move from left to right they illustrate the risk-return trade-off. Higher average performance is accompanied by

Likely Gains/Losses with 6 Percent Market Risk Premium



greater variability or dispersion—i.e., greater risk.

To recap, the investor's asset allocation decision should be based on two things. One is realistic forecasts of the trade-off between risk and expected return. The other is personal preferences that reflect the investor's financial situation, financial objectives, and attitudes towards risk.

In that light, let's return to Suzanne's decision, as described at the outset of this article. She wants to raise her expected return to generate more for living expenses, but she is wary of taking on added risk. What use might she make of chart on the previous page?

She notes that if she puts more money into risky assets, the median (50th percentile) line of her hypothetical asset allocation drifts higher. As she examines the chart she sees that she would clearly be uncomfortable if the dispersion of her end-of-year wealth reached the level indicated for an allocation of 40 or 50 percent to risky assets. So she decides to place 33 percent of her investable wealth in risky assets and 67 percent in riskless assets.

What does this increase in risk get her? According to the chart, the median expected return on Suzanne's portfolio rises from the riskless 2 percent rate to about 4 percent a year when she resets her portfolio to hold one-third in risky assets. Based on financial tables, this increase in expected returns over time should allow her to increase her annual withdrawals to her goal of \$50,000.

The premise here is that the assumptions behind the chart are accurate. In reality, alternative projections for the expected return of the market and the standard deviation of the market are reasonable and common. Moreover, the chart also assumes that returns are normally distributed. As discussed in Part 3, in the past very bad returns have been more common than would be expected with a normal distribution. And history has shown that devas-

tating underperformance can persist for years or even decades.

Reality Checks: The Age Rule. Another way of selecting the right risk-return balance is to compare one's own decisions with the decisions of others facing similar situations in the last few decades.

The decisions of your peers can provide a reality check for people facing important decisions involving limited information and uncertainty. For example, a person considering the purchase of an auto or a house might well consider the following question as a starting point: What are other people in my circumstances deciding to do?

The idea of what a typical asset allocation should look like for various types of investors has changed through time. However, a rule-of-thumb worth considering is to invest your age as a percentage in bonds—and the rest in stocks. Thus, a 60-year-old should consider holding 60 percent in bonds and 40

percent in stocks.

This prescription needs to be adjusted for differences in risk tolerance, objectives, wealth, income, and so forth. So there would likely be a substantial difference between the appropriate asset allocation of a middle-class 60-year-old who has recently retired and a wealthy 60-year-old who is still enjoying a lucrative career.

Summary. The precise process of refining the asset allocation based on investor-specific issues is not clear, both because individual preferences toward risk differ and because the future is uncertain.

The chart uses projections of the expected return and standard deviation of the market portfolio to provide a somewhat simplistic but potentially revealing framework for setting an investor's key decision: the asset allocation decision. The primary idea is to find a balance between the joy of higher expected return and the agony of higher risk.

American Investment Services, Inc. (AIS), a wholly owned subsidiary of AIER, offers a Professional Asset Management Service (PAM) based on the tenets of Modern Portfolio Theory and is consistent with AIER's empirical research methodology.

Our research finds that portfolio returns can be explained by three factors. The first is that stocks are riskier than bonds and therefore have greater expected returns. Relative performance among stocks is largely driven by two additional dimensions: value and size. Many economists believe small cap and value stocks outperform because the market rationally discounts their prices to reflect underlying risk. The lower prices give investors greater upside as compensation for bearing this risk.

PAM is a low cost, discretionary investment service designed to capture this risk-return relationship by utilizing eight of our recommended asset classes to provide comprehensive diversification across capital markets. The service is for those who embrace structured, personalized asset management, but are not inclined to manage their own portfolio. AIS employs a simple and convenient process that focuses on maintaining investment discipline and adjusting your plan to manage choices in the face of uncertainty. We assume only the risk necessary to provide the highest probability of meeting your financial goals and objectives. To learn more, visit us at www.americaninvestment.com, call (413) 528-1216, ext. 3119 or e-mail us at aisinfo@americaninvestment.com.

Insurance and Risk in MPT

While there are limits on how fully investors can diversify the market portfolio, in practice insurance pools risk so that everyone can enjoy substantial diversification.

by Donald R. Chambers, PhD, Research Associate

In the first four parts of this 10-part series on Modern Portfolio Theory (MPT), we offered a concise prescription for investors. Put all of your wealth into a combination of two portfolios—a short term riskless portfolio and a fully diversified market portfolio.

But even if this two-portfolio approach is theoretically optimal, can it actually be implemented?

This fifth installment of the series confronts the practical challenges of achieving total diversification (holding only the market portfolio) when pragmatic realities such as home ownership seem to run counter to the theory.

At first the challenges and obstacles to diversification appear to prevent implementation of the MPT approach. How-

ever, the major lesson to be learned is that people can and do solve many of these problems—and in doing so they confirm the general prescription of MPT. That is, diversification is central to wise investing.

We begin by discussing real estate investing and then move on to other areas of major financial importance.

What about Real Estate Holdings?

Financial assets such as securities held in a brokerage account are relatively easy to diversify into a market portfolio using exchange-traded

funds or mutual funds. However, holdings of real assets such as real estate are usually poorly diversified. Therefore the biggest challenges to implementing the MPT approach arises with real estate, collectibles, automobiles and so forth.

Consider Bob, a 45-year-old lifelong employee of an oil company. Bob's major financial assets include his retirement and brokerage accounts.

In addition, Bob's wealth includes his house, currently valued at \$400,000. Even though Bob has a mortgage, its value is fixed. All of

Pragmatic realities such as home ownership seem to run counter to full diversification of the market portfolio.

the risk of the home ownership is borne through Bob's equity position in the house. Bob's total financial worth will fluctuate based on changes in the value of his house. In other words, *much of Bob's total financial risk is based on local and national real estate prices* rather than being solely dependent on the market portfolio.

Bob's assets are poorly diversified. At first blush, it would seem that MPT would lead Bob to hold only the market portfolio. The awkward implication is that Bob should sell his house, invest the proceeds in the

market portfolio, and rent a house.

Does MPT really mean that all investors should sell their homes and that home ownership by individuals is wasteful and inappropriate?

Insurance to the Rescue. Markets tend to provide reasonable solutions to important problems. Our point now is that insurance as an important tool for diversification.

As the last few years have shown, the primary risk of home ownership is fluctuations in local and national real estate prices.

But what about the other dangers of home ownership: fires, floods, storms, lawsuits, and so forth? The answer is: insurance. (See table on page EX—2.)

Insurance is MPT in action. Insurance companies offer protection against idiosyncratic risks and then pool those risks together to diversify them away. Consumers are able to own real estate with little or no exposure to most idiosyncratic risks of real estate. We may even take for granted that home ownership is safe without realizing that it is being accomplished through the diversification offered by insurance.

Home Equity at Risk? That said, insurance has not addressed Bob's problem. His house—his dominant asset in terms of worth—fluctuates with local and national housing prices. In actuality, Bob may not

be as exposed to this risk as it first appears.

This is because the wealth of individuals or corporations is the *net* of our assets and liabilities—our equity. Focusing solely on the risks of assets sometimes misses important components of true risk. To see our true risk, we need to remember that our liabilities change with circumstances.

Bob needs shelter—a nice place to live. Buying a house locks in much of the cost of having this housing for many years to come. If Bob were to rent a house, it would be likely that the annual rental charges would rise substantially if housing prices rose. By owning the house, Bob has purchased his shelter needs in advance. Therefore Bob is hedged against real-estate price fluctuations.

Conversely, when housing prices soar, it may be tempting to think that a homeowner has made a lot of money. But that is not true if the homeowner still needs a comparable place to live.

In sum, there are solid economic

reasons for many people to own their own home. People who own their own home tend to take better care of their property. Many of the idiosyncratic risks of home ownership can be diversified away through insurance. To the extent that home ownership represents an advance purchase on shelter needs, the house can be considered to be a hedged investment—and to a major extent the fluctuations in the house’s market value are offset by fluctuations in the cost of needed shelter. Net wealth is little changed.

So real estate purchased to meet anticipated need for shelter is not nearly as risky as it may initially appear. It therefore does not drive most investors too far away from the prescriptions of MPT.

By contrast, buying a much larger house than you need or purchasing multiple houses *because* you think housing prices are going to rise is indeed contrary to MPT.

Human Capital. The previous sections focused on real estate. But in the case of young and middle aged

workers, their biggest asset is their human capital. (See table this page.)

Human capital is our ability to produce—and to earn income. It is important to see our human capital for the large asset that it is and for the large portion of our wealth that it represents. For many, human capital consists primarily of our potential career earnings. A 40-year-old earning \$75,000 per year in wages and benefits should value his or her human capital well in excess of \$1,000,000, based solely on the present value of projected career earnings.

Bob’s career is subject to all sorts of idiosyncratic risk that needs to be hedged. First, his ability to be productive depends on his maintaining physical and mental health along with the desire and ability to serve the firm. Second, his career is highly dependent on the financial success of his employer—and perhaps is dependent on the usefulness on Bob’s line of work and the projects on which he works.

Whether he knows it or not, Bob has already taken decisive steps in applying the principles of MPT. For example, although Bob is partially covered for disability through Social Security, Bob’s employer offers an additional voluntary disability plan that Bob has opted to fund. By making disability insurance payments, Bob has hedged the idiosyncratic risk of his human capital with respect to disability—the loss of his ability to work and earn income. He entered into an insurance contract that costs money when he is healthy and pays money when he is disabled.

Then there is life insurance. It is one of the most cost-effective and common solutions to the idiosyncratic risk of human capital. Bob has purchased substantial term life insurance at very cost-effective rates so that his lost wage income would be replaced for his family in the event of his premature death. Life insurance is another way of hedging the idiosyncratic risk of our human

Summary of Hedging Tools

Hedging the Idiosyncratic Risks of Tangible Wealth

<i>Risk</i>	<i>Hedge</i>
Losses to house through fire, storm, theft, etc.	Homeowner’s insurance
Losses to car through accident, theft, etc.	Car insurance

Hedging the Idiosyncratic Risks to Human Capital

<i>Risk</i>	<i>Hedge</i>
Loss-of-health effect on career and earnings	Disability insurance
Lost wages from premature death	Life insurance
Living too long in retirement	Annuities
Outliving ability to care for oneself	Long-term care insurance

Hedging the Idiosyncratic Risks of Concentrated Financial Positions

<i>Risk</i>	<i>Hedge</i>
Losses from specialization by sector or nation	Diversification
Losses from concentrated positions in one’s employer’s stock	Financial derivatives such as put options

capital. We protect our heirs from the risk of our premature death so that lost future wage income can be replaced.

Disability and life insurance companies pool the idiosyncratic risks of their policyholders and in doing so meet the desires of people to diversify as MPT suggests. MPT is common sense—if you are exposed to a substantial risk try to protect yourself. If a risk can be diversified away at a reasonable cost, then do so.

The Risk of Living Too Long! Living too also long poses a financial risk. When a person lives far beyond her ability to produce income, she runs the financial risk that she will outlive her savings. Insurance companies provide annuities in order to protect investors from the financial demands of unusually long life spans. A typical annuity promises a particular cash flow stream for as long as the recipient lives. The annuity pays most when the recipient lives longest and therefore needs the most money. The insurance company pools or diversifies this risk across its clients—such that everyone can reduce or eliminate the financial risks of uncertain life spans.

Another idiosyncratic risk is when people outlive their ability to care for themselves. In the previous section, human capital focused on career earnings. But our ability to care for our own daily needs (such as meals, dressing and bathing) is valuable and expensive to hire done. In the terminology of this article, old age can cause a large sudden decline in human capital that is manifested by the need for long-term health care. Long-term health care can easily cost \$100,000 per year. This risk is entirely diversifiable using long-term care insurance, and therefore it represents still another way that investors can move their risk exposure towards the MPT ideal.

Other Risks to Human Capital.

Then there is the risk that our career will be damaged by the financial struggles of our employer or the field in which we work.

Not all career risks can be eliminated, but often some of the risks can be mitigated. An employee should consider reducing the exposure of his or her other assets to the same risks inherent in his or her career. For example, returning to Bob, since Bob works in the oil industry, Bob should avoid investments in that or related industries and should consider taking offsetting positions using derivatives. For example, exchange-traded funds can be used to generate profits from falling oil prices and losses from rising oil prices. Bob might be able to use some of this strategy to hedge his career exposure to falling oil prices.

In 2001, Enron employees simultaneously lost both their jobs and most of their financial worth in the same bankruptcy.

What about Financial Assets?

Positions in financial assets such as stocks, bonds, and mutual funds can also raise challenges for full diversification. (See table on page EX—2.)

One problem is when our greed and our human nature lead us away from full diversification. A common problem is that some investors intentionally take large idiosyncratic risks (such as concentrated stock holdings) even when their long-term common sense tells them otherwise. By way of analogy, it is similar to our tendency to overeat even though our long term goal is to maintain a healthy weight.

For example, Bob has a large position in Dunlap, Inc., shares in his brokerage account. Bob first purchased shares in Dunlap based on the recommendation of an analyst on TV and then added to the position as the shares fell in price through the years. Bob keeps hoping to win back the lost money and

vows to sell the shares and diversify if he can ever get out of the position without too large of a loss.

Bob has completely violated the prescriptions of MPT with respect to his brokerage account. He has been trapped in an error that many investors make when they sell shares that generate profits and hold onto or double up in shares that have declined.

There are thousands of investment opportunities available. Human nature is to examine them and try to find the ones that are most attractive. MPT suggests that most or even all of the time the investor will make errors and will end up over-investing in those opportunities about which they were most poorly informed (most mistaken).

Bob should liquidate his holding and purchase a product that offers high diversification with minimal annual fees and other costs.

So sometimes we intentionally but erroneously get highly exposed to idiosyncratic risks in financial assets that could easily be diversified. At other times our idiosyncratic risk exposures in financial assets are due to other reasons— notably, employer matching of retirement contributions.

Retirement Plan Risk. Bob's 401(k) is substantially invested in his employer's stock rather than a well-diversified portfolio of stocks. He purchased so much of his employer's stock so he could receive matching contributions from his employer. Although matching stock contributions and employee stock option plans can be valuable to an employee, the experience of Enron employees in 2001 demonstrated the toxic reality. Enron employees simultaneously lost both their jobs and most of their financial worth in the same bankruptcy.

Another problem with 401(k) and other retirement plans is that they may have limited investment

options. For example, Bob's 401(k) investment options do not include international stocks, which are an important part of the market portfolio.

Both of these problems may be viewed as *concentrated positions*. A concentrated position is any holding that contains a disproportionate exposure to one or more assets relative to a fully diversified portfolio.

Concentrated holdings should be addressed with a three-step process:

1. Diversify as much as is feasible given the constraints and costs.
2. Reduce holdings of those assets in other accounts.
3. Consider using derivatives to offset the concentrated holdings.

Regarding the first step, Bob may find that after a particular number of years the employer's matching stock contributions are vested—and that he can sell the shares without consequence and invest the proceeds in more diversified holdings. So, whenever cost-effective to do so, concentrated positions should be

liquidated to pursue diversification. Maybe he can move his retirement money to a plan with more flexible options.

Bob may find that in some cases he can adjust portfolios in his other accounts so that the combination of all of his accounts is well diversified. For example, if his 401(k) plan does not offer international stock funds, he may wish to concentrate another account, such as his brokerage account, in international stocks so that the combination of accounts is properly balanced between domestic and international stocks.

More technically, derivatives can occasionally be appropriate to hedge highly concentrated and large positions. Bob could consider purchasing long-term put options on his employer's stock in his brokerage account that would provide protection against large declines in the market price. Put options are sophisticated contracts and should be used with great care.

Some upper management employees can work with investment banks on structured products that

can be tailored to their need for protection due to the idiosyncratic risks of highly concentrated holdings.

Insurance and the Market Portfolio. MPT implies that you can pick your level of risk by dividing all your assets into a risk-free portfolio and a market portfolio.

When it comes to the market portfolio, MPT prescribes total diversification. There are limits on the extent to which investors can fully implement this strategy. However, for most risk exposure, where there is a will there is a way.

Insurance is the ultimate MPT device: pooling of risks so that everyone can enjoy diversification. Insurance companies offer protection beyond those issues discussed above—from automobile accidents to umbrella liability policies that can provide protection against damages from lawsuits.

As for your risk-free assets (near-cash instruments and short-term bonds), the next part of this series provides guidelines on how to manage them.

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Managing the Riskless Portfolio

An investor can limit risk by reducing the portion of her wealth exposed to the risky market portfolio and increasing her holdings in the riskless portfolio.

by **Donald R. Chambers, PhD, Research Associate**

The first five parts of this series on Modern Portfolio Theory (MPT) have focused on the importance of diversification and on the concept of the “market portfolio” of risky assets. These are the assets that, over time, give us powerful financial rewards—even though from one year to the next, they may decline in value.

Now we shift gears. MPT prescribes that this fully diversified market portfolio should be paired with a “riskless portfolio” containing extremely safe and very short-term fixed-income investments.

The purpose of having both the market portfolio and the riskless portfolio is to allow investors to tailor their total risk exposure to their circumstances and preferences. A young and bold professional with a solid career might only place a minor fraction of her wealth in the riskless portfolio, while a conservative and retired person of modest financial means might invest in nothing other than the riskless portfolio.

MPT demonstrates that using a combination of a market portfolio and a riskless portfolio allows for full risk-management in pursuit of any given target rate of return.

So far, so good. But what sorts of specific investment opportunities

are appropriate for inclusion in the riskless portfolio? And how should the portfolio’s funds be allocated amongst the riskless opportunities?

To address these concrete, operational problems, we can zero in on five key issues. One is whether any investments can be entirely risk-free. A similar question can be asked about a portfolio with only dollar-denominated assets. The third issue is interest-rate timing—and in particular the futility of trying to predict future interest rates. The fourth concerns the “yield

“Riskless” investments include FDIC-insured CDs and money-market funds, Treasury bills, savings bonds, and TIPS.

curve,” which compares short- and long-term interest rates at any given time. The fifth and most practical topic is how to pursue a strategy of “laddering” the riskless portfolio by using CDs of varying maturities.

Is Anything Truly “Riskless”? To begin with, what are some standard investments to include in the riskless portfolio? For U.S. investors a riskless portfolio would typically contain one or more of the following types of securities: FDIC-insured certificates of deposit (CDs), U.S. Treasury bills, U.S. Savings Bonds,

Treasury Inflation Protected Securities (TIPS), and FDIC-insured money-market accounts. Also, the portfolio can include investment vehicles that *contain* these securities such as money-market funds and short-term bond funds.

You may notice that bonds (including short-term Treasury bills) play a prominent part in this market basket of safe investments. The fact is, bonds can be risky. But short-term bonds are likely to be much less risky than long-term bonds. Let’s see why.

Bonds entail three major kinds of risk: default, price inflation, and interest rates.

Defaults happen, whether by governments or companies. But bond mutual funds reduce default risk by diversifying across a spectrum of bond issues. That is why short-term bond mutual funds are good candidates to include in the riskless portfolio.

As for inflation, short-term bonds can be traded in financial markets without much worry over the long-term decrease in the purchasing power of the bond’s face value—simply because the price level is not likely to rise by much over, say, one year.

Similarly, when market interest rates rise, any bonds you hold will be worth less than before. If you need to sell your bonds before they mature, you will take a capital loss.

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But holders of short-term bonds need only wait until the bond matures, in a few weeks or months. They are much less likely to have to sell the bond at a reduced price.

That said, we should acknowledge that no investment is truly riskless. Even an insured cash holding is subject to the risk of loss due

to inflation or a catastrophe (global nuclear war). There is nothing we can do with our money to be 100 percent sure that it will provide us with a guaranteed economic benefit in the future.

In short, the riskless portfolio can be viewed as a collection of fixed-income assets that contains

very little risk from credit failures or stock-market fluctuations. A U.S. Treasury bill (or T-bill) with only a few weeks or months to maturity is often used to represent the concept of a riskless security. Further, the portfolio should be invested with times to maturity that reflect the investor's anticipated cash needs.

From Consols to Junk Bonds

In the time of the Napoleonic Wars (1814) the British government issued debt instruments called consols that paid interest in perpetuity—but never arrived at maturity. In other words, buyers of the consols received their annual or periodic interest payments, but that's all. There was no redemption value to factor into the rate of return.

The consol (aka a "perpetuity") offers a classic illustration of the inverse link between interest rates and the prices of existing bonds. With no redemption value, how much would a bond buyer pay for a consol paying 1,000 pounds every year forever? It depends on the current market rate of interest.

For a consol paying 1,000 pounds a year (the coupon rate), if the market rate of interest is 5 percent, how much would an investor pay? The relevant equation:

$$1,000/.05 = 20,000 \text{ because } 1,000/20,000 = .05 \text{ or } 5 \text{ percent.}$$

But if the market rate of interest rises to 10 percent, then to get someone to buy the consol, the price of the consol has to come down accordingly:

$$1,000/.10 = 10,000 \text{ because } 1,000/10,000 = .10 \text{ or } 10 \text{ percent.}$$

In other words, when market interest rates double, the price of the bond must fall by half if it is to attract lenders.

In financial markets today, calculations are messier because the redemption value at maturity factors into the rate of return. But the same logic applies: When the market rate of interest rises, existing bond issues can only be sold at lower prices.

The closest parallel to a consol today may be a high-yield or junk bond, so termed because it has a high probability of defaulting before it reaches maturity. In that case, the price that will be paid for the bond is largely determined by the size of the annual payments.

Using the "law of 72," a junk bond paying 12 percent only has to survive six years to pay off the price paid for it. (The law says that \$1 will double in value over a time-span obtained by dividing 72 by the rate of compound interest—in this case 12.) After that, any further returns are gravy.

Foreign Bonds and the Riskless Portfolio.

But now we come to a caveat. Keeping all of one's fixed income securities in a particular currency may overexpose the investor to losses in the purchasing power (i.e., real value) of that currency. An unexpected decline in the value of that currency can cause large losses in true value.

Should a U.S. investor only invest in assets denominated in U.S. dollars? One of the most important but difficult and neglected areas of investments is international investing in general and investing in foreign-denominated assets in particular. Should a U.S. investor's riskless bond portfolio include only the bonds of the U.S. or should it be internationally diversified with resulting exposures to a variety of foreign currencies?

The issue boils down to whether wealth should be measured in a particular currency. In general, if an investor places funds in short term bonds denominated in a variety of currencies, the investor is diversified against currency fluctuations. Moreover, the longer-term an investor's time horizon, the more the investor should strive to hold her fixed income assets in a portfolio diversified into a variety of currencies.

In a practical sense, diversification across currencies can be accomplished through mutual-fund holdings of short-term, low-credit-risk, international bond portfolios. While the portfolios may appear risky when their values are reported in U.S. dollars, the true effect may be to reduce the real risk of a person's total wealth.

Interest-Rate Timing. Perhaps the two most fundamental rules of bond investing are the following. (1) Fixed-income investments such as traditional bonds fall in value when interest rates rise. (The box “From Consols to Junk Bonds” explains why.) (2) The prices of long-term bonds fluctuate more than the prices of short-term bonds.

Indeed, there have been times when long-term bond prices fluctuated even more than stock prices. In the early 1970s investors in long-term U.S. Treasury securities saw their bond values decline by almost 40 percent when interest rates skyrocketed.

The conventional wisdom in bond investing is that one should study interest rates closely. Then when interest rates are “high” (i.e., expected to fall) the thing to do is to invest longer term, so as to lock in the higher rates. By the same token, when interest rates are “low” (i.e., expected to rise), invest shorter term, increasing your liquidity.

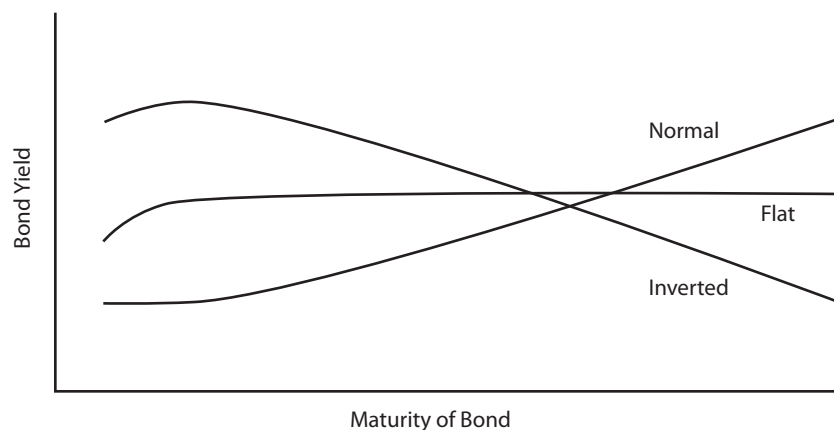
But what if bond markets are efficiently priced—meaning that on any given day, bond prices already reflect all available information about future interest rates? Then trying to follow your own instincts about future interest rates can actually be harmful. To that extent, investors are not just wasting their time trying to forecast interest rates, they are allowing their forecasts to interfere with maintaining a proper level of risk.

If bond markets are efficient, investors should simply focus on risk management and liquidity (cash-flow) management rather than attempting to beat the market by speculating on interest-rate directions.

The Yield Curve. Much of our discussion of the riskless portfolio concerns the pro’s and con’s of short-term vs. longer-term bonds. Bonds with longer maturities normally tend to offer higher yields

Three Classic Term Structures

To compensate lenders for higher risks, longer-term bond yields normally exceed yields for short-term issues.



than short-term bonds, in part because they are viewed as more risky.

This relationship between current interest rates and their times to maturity can be seen in a graphic called the yield curve (also known somewhat awkwardly as “the term structure of interest rates”). A familiar example of it is the pattern that investors see at a bank when they observe that CDs with different maturities offer different yields. As to the actual yield curve, at the time of this writing it was steep. Two-year Treasury issues fetched about one percent, vs. about four percent for ten-year Treasury bonds.

Because lenders are typically risk-averse, the normal yield curve has a positive slope, meaning the longer the maturity the higher the interest rate. *Lenders* prefer short-term bonds viewing them as less risky. By contrast, *borrowers* generally would prefer to lock in the cost of their capital by issuing longer-term bonds. To induce lenders to buy longer-term bonds, borrowers must offer a higher expected return. Accordingly, long-term bonds normally tend to offer higher yields and higher expected returns than short-term bonds.

The position or “height” of the yield curve depends on the general level of interest rates.

But the slope (the steepness) of

the yield curve can change when expectations change. For example, the prospect of high inflation in an over-heated economy will tend to generate expectations of rising interest rates. Lenders will prefer to stay liquid and to buy short-term bonds, driving up their prices and reducing their yields. This in turn will lead to a steeper positive slope, reflecting a larger spread between long- and short-term bond rates.

Yield curves can also have other shapes, as the chart above shows. When there is no consensus that interest rates are more likely to move in one direction or the other, the yield curve is likely to be flat beyond maturities of a year or so.

The third curve in the chart is called an inverted curve and is somewhat rare. Except for the first few months, it is downward sloping and occurs when there is a general consensus that interest rates are more likely to decline than to rise. For example, anticipation of a recession and correspondingly lower interest rates would lead investors to lock in higher rates by buying longer-term bonds, driving their prices up and their rates of return down. In that event short-term bonds could offer higher returns than longer issues. Accordingly, an inverted yield curve is often viewed as an indicator of an impending recession.

The Sweet Spot: One to Five years.

From what we have said so far, it would seem that investors should rely on very short-term bonds as the centerpiece of a riskless portfolio. Now we need to modify this view in light of the historical evidence.

Long-term bonds have consistently generated higher average returns than short-term bonds. Very short-term, riskless securities such as T-bills have generated average returns that have barely kept pace with inflation, and have generally fallen in real value (i.e., after inflation) when taxes are considered.

The record comes down in favor of holding fixed-income securities that have maturities of up to one year rather than those with extremely short maturities such as a few weeks. The evidence also indicates that there is relatively little added expected return (compared to the risk) of investing in longer term maturities such as in excess of five or ten years.

Here is the key: Bonds with longer maturities offer higher average returns than bonds with shorter-term maturities regardless of the slope of the yield curve. Even if long term yields are lower than short term yields, it is likely that the long term bonds will offer higher expected returns because interest rates are more likely to fall than to rise.

So, one strategy is to focus on buying bonds of one to five years to maturity. A variation is to buy bonds with maturities slightly longer than one's "horizon point." Thus, if I am investing for a tuition payment due in exactly two years, I might buy a bond with a maturity of closer to three years. The idea is to keep as much money as possible in the "sweet spot" of the maturity spectrum (one to five years) and to avoid having too much money that is long term or very short term. If history repeats itself, maturities of one to five years will offer a slightly better

combination of risk and return.

A Laddered CD Strategy. The idea here is to hold CDs somewhat evenly across a spectrum of maturities. Suppose that Rob has \$300,000 to invest in "the riskless asset." Rob starts by investing \$50,000 in six CDs with maturities ranging evenly from six months to three years. As the CDs mature, Rob reinvests the money after searching for the best three-year rate.

Six months later the shortest-term CD has matured and Rob reinvests the \$50,000 in another three-year CD. The previously purchased CDs all now have six months' less maturity than when originally purchased. The process continues so that Rob has a CD maturing every six months but is always obtaining three-year rates on his reinvestments. This strategy can make sense if banks set CD rates *in-*

The record comes down in favor of holding fixed-income securities of up to one year rather than a few weeks.

efficiently such that three-year rates consistently exceed very short-term rates. Of course the strategy might be implemented with intervals other than every six months and with an initial maturity of more or less than three years.

A laddered strategy makes cash available at regular intervals—reducing the need for keeping money in an ultra-short term account such as a money-market fund or money-market account.

For those who are financially disciplined, another source of liquidity can be a home equity line of credit that can provide low-rate, tax deductible funds for emergency needs. The key is to avoid maintaining large balances in accounts that offer immediate access but low interest rates.

CDs and Savings Bonds. Throughout this series the perspective has

been that markets are efficiently priced such that investors are waiting time (and money) when they attempt to time markets or pick stocks. However, yields on CDs are set by institutions, not markets. It is often the case that higher CD yields can be found by searching for higher rates on insured CDs.

Also, U.S. savings bonds sometimes offer exceptional rates of return and tax benefits. Some of the most attractive savings bonds opportunities are limited in size or the tax benefits are limited to particular income levels. But time spent carefully studying the rates and terms of savings bonds can generate substantial benefits to a riskless portfolio strategy.

Implications. Putting MPT into practice is not a "one size fits all" exercise. Issues regarding different currencies and appropriate

portfolio maturities can be complex. But it is important to keep the larger perspective in focus.

The primary message of MPT is that extreme diversification should be vigorously pursued. An investor should limit risk by reducing the portion of her wealth exposed to the market portfolio—not by trimming the components of the market portfolio that are high risk.

To close with an example, suppose that Jenny, a successful accountant, has decided to retire and wishes to substantially reduce the risk of her total portfolio. The point of MPT is that she should reduce her risk by evenly reallocating some of her wealth away from her diversified (market) portfolio and into her riskless portfolio. She should not analyze her diversified portfolio of risky assets and sell off only those investments that appear highly risky. To do so would be to lower the level of diversification that she is achieving—and according to MPT that would be a very expensive way to reduce her risk.

Market Timing and Stock Picking

Trading strategies are like casino gambling. You pay your money and you take your chances. But there are more reliable ways to build your portfolio.

by **Donald R. Chambers, PhD, Research Associate**

The message so far is to rely on diversification of your investments through a buy-and-hold strategy covering all available assets. Many people reject this advice by either practicing market timing or stock picking. This seventh part of the series addresses these two topics.

Market timing is the attempt to earn higher rates of return by altering one's risk exposure or asset allocation through time. Typically, this means attempting to increase risk exposure before the financial markets rise and attempting to lower risk exposure before the markets falls. The changes in risk exposure may involve "getting into and out of the market," alternating between long and short positions, rotating between sectors, and so forth.

Stock picking is the idea of trying to improve a portfolio by selecting from among all available risky assets those assets that offer the most attractive combinations of risk and return.

Stock picking is another form of market timing—it is deciding to "time in and out" of various stocks based on predictions of when the individual stocks are going to go up or down.

But all such efforts—from the most detailed level of picking stocks to the most general level of trying to time the direction of the overall market are variations of the same

Table 1: Casino Outcomes Summary

	<i>Mr. All-or-Nothing</i>	<i>Mr. In-Between</i>	<i>Mr. Small-Stakes</i>
Number of Bets	1	50	100
Size of Each Bet	\$100	\$2	\$1
Total Amount Bet	\$100	\$100	\$100
Expected Profit	\$1	\$1	\$1
Chance of Losing \$10+	50%	24%	18%
Chance of Losing \$20+	50%	10%	3%
Chance of Losing \$50+	50%	<.001%	<.0001%

basic theme: trying to acquire a free lunch. The purpose of this seventh part of the series is to set forth the argument that all such efforts are fools' errands.

Market Timing: A Casino? The idea of market timing is to try to be "in" the market when it is more likely to rise and "out" of the market when it is more likely to fall. This contrasts to a buy-and-hold strategy that remains equally exposed to the market through time. Our conclusion will be that the buy-and-hold strategy is the best strategy.

Let's explore an analogy between market timing and casino gambling. Consider a crazy casino that instead of offering bets in favor of the house, offers all bets in favor of the gamblers by offering a gain of 1 percent on every bet. Each bet has a 50 percent chance of returning \$2.02 for each \$1 gambled, and a 50 percent chance of returning \$0 for each losing bet.

We have three gamblers: Mr. All-or-Nothing, Mr. Small-Stakes and Mr. In-Between. All three gamblers place \$100 worth of bets and then leave the casino with whatever money they win.

Mr. All-or-Nothing bets all \$100 on his first and only bet. If he wins he takes home \$202, if he loses he takes home \$0. His expected return is \$101 for an expected profit of \$1.

Mr. Small-Stakes places 100 bets of \$1 each. Each bet either returns \$2.02 or nothing, with an expected value of \$1.01. Together these 100 bets have an expected return of \$101 and a profit of \$1—just like Mr. All-or-Nothing.

But Mr. Small-Stakes is taking much less risk. This is illustrated in Table 1.

Mr. All-or-Nothing has a 50 percent chance of losing everything since he places only one big bet. Mr. Small-Stakes bets 100 times and will probably win somewhere between 40-60 times and will lose 40-60 times. As Table 1 shows, he is somewhat unlikely to lose more than \$10 and highly unlikely to lose more than \$20.

To complete the analogy, now consider Mr. In-Between. He makes 50 bets of \$2 each. He has a level of risk that is much lower than Mr. All-or-Northing but is considerably higher than Mr. Small-Stakes. The reason is that his risk is spread among 50 uncertain events rather than one or 100. Table 1 shows that his chance of losing \$10 or more is a third higher than that of Mr. Small-Stakes, while his chance of losing \$20 or more is three times as high.

The point of this casino example is that a gambler who places many small bets takes less risk than a gambler who places one larger bet. But both gamblers experience the same expected profit (or in a real casino, an expected loss). So if the expected gain is the same, the wise and risk-averse bettor should keep the bets as small as possible.

Fewer but Larger Bets. This section wraps up the casino example by drawing the parallels between the betting strategies and the returns of a person following a market timing strategy. We wish to compare the risks and returns of a market timer (Mr. Market-Timer) with a person adhering to a fixed allocation between risky and riskless assets (Mr. Buy N. Hold).

Let's assume that there are 250 trading days per year and that the stock market offers an expected return that is 0.02 percent per day higher than is received from being in the money market fund. For simplicity, let's assume that Mr. Market-Timer places all of his money in the market 125 days per year (i.e., half the time) and all of his money in a money market fund the other 125 days. Mr. Buy-and-Hold places half

of his money in the market and half his money in the money market fund every day.

To make the math easier, we assume that there are no transactions costs or tax consequences involved and that the money market fund earns no interest. When we look carefully at the numbers, this is what we find: *If Mr. Market-Timer is completely unable to guess which way the market is headed, then the expected return of the two investors is equal, but Mr. Buy N. Hold has lower risk!*

The reason that the expected returns are equal is that each investor has an average exposure to the market that is the same: 50 percent. Mr. Market-Timer has an average market exposure of 50 percent because he is 100 percent in the market half the time. Mr. Buy N. Hold has an average market exposure of 50 percent because he is 50 percent in the market all the time. These numbers are illustrated in Table 2.

In terms of expected returns, Mr. Market-Timer has an annual expected gain of 2.5 percent (found from investing 100 percent in the market for 125 days with an expected gain each day of 0.02 percent). Mr. Buy N. Hold also has an expected gain of 2.5 percent (found from being 50 percent in the market for 250 days with an expected gain of 0.01 percent per day). Mr. Buy N. Hold's expected daily return is also 0.01 percent (or 2.5 percent in all) because he is equally invested in the market and the money market fund each day.

At first glance, it may appear that both investors have the same risk since they both are in the market the same amount on average. It might

seem that being completely in the market half the time is equally risky as being half in the market all the time. But that is not true. The bottom panel of Table 2 shows that Mr. Market-Timer is almost four times as likely to suffer a 12 percent or greater loss relative to his expected return. In effect, Market-Timer is placing 125 "full-sized bets" each year while Mr. Buy-and-Hold is placing 250 "half-sized bets" each year (by being half in the market every day). Placing 250 small bets is better diversified than placing 125 large bets.

Our previous analogy to casino gambling made it clear that placing many small bets is safer than placing a few large bets. So, the first point is this: Market timing is a riskier strategy than buying and holding. Some arguments for market timing show that by avoiding a few of the worst days of being in the stock market, a market timer can earn stunningly higher returns than a buy-and-hold investor. That is true. It is also true that by *missing the best days of being in the market* a market timer can have stunningly lower returns than a buy-and-hold investor. And that reinforces the point. Market timing is risky relative to a buy-and-hold strategy.

In any case, our example assumed that Mr. Market-Timer did not have skill. And everybody who uses market timing believes that they have skill.

The Biggest Myth. The biggest myth about market timing is that market timers as a group or as a whole perform better than other market participants. That claim is untrue for any time interval past, present, or future.

The proof takes some time to follow but is actually simple. Logically speaking there can only be two types of market participants: market timers and non-market-timers (buy-and-hold investors). Further, the market timers trade only amongst themselves. The reason is that mar-

Table 2: Market Timing Outcomes Annual Summary

	<i>Mr. Market-Timer</i>	<i>Mr. Buy N. Hold</i>
Number of Days in Market	125	250
Amount in Market Each Time	100%	50%
Daily Average Market Exposure	50%	50%
Expected Profit over Money Fund	2.5%	2.5%
Chance of 4% + Lower Outcome	36%	28%
Chance of 12% + Lower Outcome	11%	3%

ket timers can only trade with other market timers since the buy-and-hold investors do not actively trade.

The full picture can be understood in this light. Let's assume that all investors in the world could temporarily be gathered together into a single room and divided into two types: market timers and buy-and-hold investors. Let's assume that whether the investors are market timers or buy-and-hold investors, they hold perfectly diversified portfolios—the market portfolio—and money market funds.

For simplicity, let's start this experiment assuming that the total size of the market portfolio is \$10 trillion. Finally, let's assume that at the start of the experiment the two groups are equal in size so that the two types of traders hold equal amounts of wealth and have equal total amounts in the market portfolio. So market timers stand on one side of the room holding \$5 trillion of the market portfolio while buy-and-hold investors hold the other \$5 trillion of the market portfolio and stand on the other side of the room.

The experiment begins with market timers furiously altering their risk exposures through time and with buy-and-hold investors keeping their funds in place. But the market timers can only transact with one another—they cannot trade with the buy-and-hold investors because the buy-and-hold investors don't trade! Instead, the money flows back and forth among the market timers just as it does for gamblers at a roulette table.

Years later, the total market portfolio might rise to \$20 trillion or fall to \$5 trillion, but regardless, the buy-and-hold investors must still own exactly half of whatever the total value is. Why? Because the buy-and-hold investors by definition have not changed their portfolios.

So, what would happen to the market timers? Combined together they must also always be holding the other 50 percent of the market

portfolio. This is the simple, logical result of the fact the market timers merely trade amongst themselves.

Clearly, on an individual basis some market timers win and some lose. But any abnormal gains to one market timer must come at the expense to another market timer. A market timer cannot “out-time” a buy-and-hold investor since the buy-and-hold investor does not trade and is therefore assured the return of the market portfolio.

The point is this: Market timers are involved in a “zero sum game” among each other. They cannot—as a group—earn more money or less money than the buy-and-hold investors. *But as individuals they will tend to bear more risk!* The reason was detailed above. Market timers take a small number of large bets by being very aggressively in the market for a small number of days. That is riskier than being moderately in the market everyday.

In sum, market timing is a risk-increasing exercise that on average generates no added return.

Two More Reasons.... There are actually three reasons why the odds are against market timers: added risk, added transactions costs, and lost tax options. The previous sections detailed the idea that market timing is riskier. Obviously, market timing causes higher transactions costs. Even market timing with mutual funds causes investors to have to select mutual fund families that allow market timing—and those fund families tend to have higher expenses. And when an investor makes buy and sell decisions based on market timing, he is less able to exploit tax-motivated transactions. Thus, tax planning becomes a lower priority to market timers, and they therefore are less tax efficient.

Whether because of luck or skill, there will only be a few winners amongst market timers who earn enough higher return to compensate them for the higher risk, cover their transactions costs,

and compensate for the increased taxation. Many people will fool themselves into believing that their strategy will be successful. Many people will even deceive themselves into believing that their past efforts were successful. Casinos make a lot of money each year on just such people.

Market timing is very tempting. Most investors have tried it to one extent or another. The upshot of this article is that it should not be attempted by 99.9 percent of investors. There might be one person in a thousand who can actually consistently benefit from attempts to market time. For all others, it is a bad idea! Unfortunately, most investors who think that they will benefit from attempting to time the market will fail.

The message is clear. Market timing is an uphill battle. When an investor varies her risk exposure through time, she ends up taking more risk, on average, for each dollar of expected return compared to an investor who holds a steady risk exposure.

Ditto for Stock Picking. This article is also about stock picking—the idea of concentrating one's portfolio in assets believed to offer superior returns rather than holding a fully diversified portfolio. At first glance, stock picking may sound like a completely different concept from market timing. But in reality they are virtually identical.

First, stock pickers face the same three problems that market timers face: higher risk, higher transactions costs, and higher taxes. The higher risk comes from the fact that stock pickers, by definition, are not fully diversified. Instead, they are concentrated in those stocks they perceive as winners, and they avoid those stocks that they perceive as losers. That means less diversification than holding the market portfolio.

Stock pickers move from stock to stock as their investment forecasts do or do not materialize. That

causes transaction costs. And like market timers, when the focus is on trading opportunities, there will be less focus on tax minimization. Stock picking is market timing on a micro level.

But Aren't Some Stocks Better than Others? The converse of being a stock picker is being a diversifier. If we divide the world into stock pickers and diversifiers, the myth of stock picking can be seen. The stock pickers only trade with each other because the diversifiers keep constant proportions of their wealth in every asset.

As a group, stock pickers earn the same returns as diversifiers. But some of the stock pickers earn higher returns, and some earn lower returns. Thus, they take more risk than diversifiers because in addition to taking on market risk, they are

taking on the idiosyncratic risk of whether or not they are successful at picking stocks.

False Promises. Market timing and stock picking are the enemies of wise investing for 99.9 percent of investors. So why do so many people try? The answer is actually quite simple. Everyone wants to be successful and earn higher returns. They search for ways to succeed. In fact, they look at lots of ideas and listen to many, many people talking about how to succeed at earning higher profits.

Usually, they can see the fallacy in a get-rich scheme. But people are imperfect—they make mistakes no matter how smart they are. Sometimes they are too positive or optimistic, and sometimes they are too negative or pessimistic. But eventually, they will find a stock picking

strategy, a market timing strategy or another get-rich-quick scheme that they believe will work.

Everyone who looks for a get-rich-quick scheme will eventually find a strategy that they think will work. The bigger the mistake, the more exciting the strategy will appear. Investors who search for the free lunch of low risk and high returns will be drawn towards those ideas that they least understand. In other words, they end up speculating in those ideas for which their analysis is most mistaken. Thus, people invest in the assets that they most over-value.

This series has advocated diversification and has laid out a plan of asset allocation based on appropriate risk taking. It is not a strategy that generates goose-bumps, but it is a strategy that maximizes the chance for good decision making.

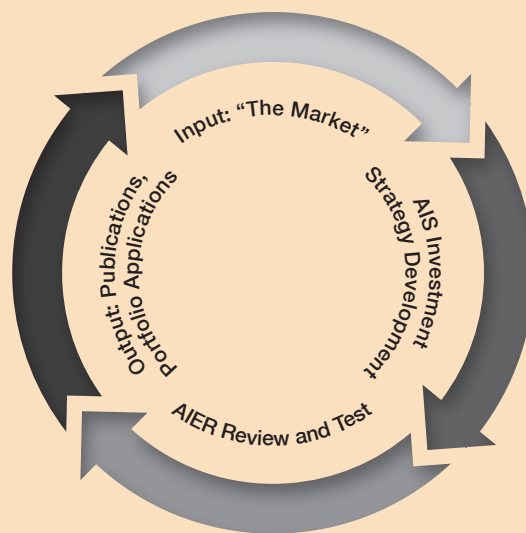
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Our high-yield Dow (HYD) investment strategy provides a good example of the practical benefits of this collaborative process. AIER and AIS developed the HYD model strategy to accommodate the Institute's dual objectives of income and growth for its charitable giving program. AIER sought a combination of consistent income for trust beneficiaries and long-term capital appreciation to fund its mission. Unlike other popular but simplistic "Dogs of the Dow" methods, our HYD model is based on an exhaustive review of the monthly prices, dividends, and capital changes for each of the stocks in the Dow Jones Industrial Average beginning in 1962.

HYD has proven to be a successful large-cap value strategy for income-oriented investors. For a thorough discussion, we recommend AIER's book, *How to Invest Wisely*.

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Dynamic Asset Allocation Strategies

There are only two reasons to reconsider target allocations. Neither are determined by outside circumstances.

by Donald R. Chambers, PhD, Research Associate

Implementing the prescriptions of Modern Portfolio Theory for personal investments is easy except for one difficult decision: How much wealth should an investor allocate to the fully diversified market portfolio—and therefore how much will remain to be placed in a riskless or near-riskless short-term account.

Previous parts in this series have discussed how to make this decision. But the asset allocation decision is not a one-time “set it and forget it” decision. All of the circumstances that led to a particular asset allocation can change. Accordingly, as circumstances change—and perhaps as financial market conditions change through time—the investor’s optimal asset allocation also will tend to change.

Two key factors can cause investors to need to reconsider their allocations. One is changes in personal circumstances. The other is changes in financial markets.

Changes in personal circumstances. As time passes we grow older, and age is often and properly cited as a characteristic that should be considered in asset-allocation decisions. As we age, we should *regularly* reconsider our asset allocations. But other factors can change quickly. These include our prospects for

future wage income, our anticipated expenses, our wealth level, and even our psychological tolerance for risk.

The asset allocation decision needs to be re-evaluated periodically and each time there is a major change in our personal circumstances. For example, a very serious time to revisit the asset allocation

A focus on past gains and losses can cause emotions to replace careful analysis in the determination of how much risk to bear.

decision is before making an irrevocable decision to retire or a major investment decision such as buying a second home.

How a person gets to a particular decision point should not be important. Decision making should be forward-looking. In theory, whether a person has exactly \$1,000,000 because they won the lottery or because they previously had \$2,000,000 and lost half through an investment collapse should not matter.

A focus on past gains and losses (other than for tax-planning purposes) can cause emotions to replace careful analysis in the determination of how much risk to bear.

Plan for market volatility. The second reason to revisit an asset-allocation decision is a major change

in markets—specifically a large rise or fall in the market portfolio. The central message of this article is to have a plan for how to react if—or when—there is a major change in the level of the market.

As recent history showed, don’t wait until a financial collapse to think through how to react. Investment decisions can be governed by fear, greed, or evidence. Plan future decisions based on a thoughtful analysis of the evidence rather than an emotional reaction based on fear or greed.

So here in a nutshell is the conclusion that I have reached based on evidence: When the market experiences a large downward shock (or even a large rapid rise), I should not adjust my asset allocation (i.e., my holdings of risky assets such as stock). Instead I should “stay put” with a “buy and hold” strategy. I believe that to do anything else would be an unwarranted speculation on my part.

When the market makes a large and sudden move, my holdings are automatically adjusted to where they should be. When the market portfolio (e.g., equity markets) rises or falls, my proportion of wealth in risky assets automatically rises and falls in a manner that generally leaves me with the risk exposure I should probably have. Let’s begin with a concrete example to illustrate how asset allocations automatically adjust to new market levels.

How the market changes allocations. Consider Denae, a middle-aged investor with \$1 million of accumulated wealth. Denae recently decided to allocate 50 percent of her wealth to the market portfolio (i.e., risky assets) and 50 percent to short-term bonds as summarized in the table below:

Denae's portfolio now:

	Percent	Amount
Total	100%	\$1,000,000
Market	50%	\$500,000
Bonds	50%	\$500,000

Now, let's take a look at what happens if the market portfolio drops by 20 percent. Her \$500,000 in the market portfolio falls to \$400,000, her short-term bonds stay at \$500,000, and so her total wealth drops to \$900,000. As shown below, the allocations in Denae's portfolio automatically change as market levels change.

Denae's portfolio after big market drop

	Percent	Amount
Total	100%	\$900,000
Market	44.4%	\$400,000
Bonds	55.6%	\$500,000

That big market drop would automatically shift Denae's asset allocation from 50 percent in the market portfolio to only 44 percent in the market portfolio. So, as Denae's wealth drops, her risk exposure also drops. The automatic result appears appropriate since the less money a person has, the less money they should risk.

Conversely, if the market had risen 20 percent rather than fallen 20 percent, Denae's allocation in risky assets would have risen to 56 percent from 50 percent rather than have fallen to 44 percent.

Should Denae accept these automatic adjustments to her percentage portfolio allocations? Or should she intervene to rebalance her portfolio allocation back to its original value or to some other level?

Responding to market moves. Let's

think about three types of responses an investor can make when market prices experience large increases or decreases.

1. Do nothing: Buy and Holders
2. Decrease risk during bull markets and increase risk during bear markets: Rebalancers
3. Increase risk during bull markets and decrease risk during bear markets: Trenders

These three strategies are labeled with terminology that is important to understand: Buy and Holders, Rebalancers, and Trenders.

Rebalancers pick a target portfolio mix such as Denae's 50 percent/50percent mix. They quickly rebalance their portfolio to return to the target mix whenever the actual mix deviates from the target.

Trenders intentionally move more money into the market as the market appears to be in an upward trend and move money out of the market in a downward trend.

In a bear market, should Denae be a Rebalancer by buying risky assets to bring her asset mix back to 50 percent/50 percent? Should she be a Trender by selling risky assets to reduce her holdings of risky assets? Or should she be a buy-and-hold investor and not move any money?

Reasons to buy and hold. I believe there are three good reasons to be a buy-and-hold investor (not making any transactions until and unless there are changes in personal circumstances).

First, the more money a person has the more they should be willing and able to risk. Investors should place a higher percentage of their wealth in risky assets when their wealth rises in a bull market and a lower percentage when their wealth falls in a bear market. This happens automatically as shown in the example.

So, the best strategy may be to let these automatic asset reallocations caused by market movements

provide the needed changes in risk exposures.

Second, reallocating typically involves transactions costs and higher income taxes. The higher income taxes are usually caused by the execution of transactions for the purpose of reaching a desired risk exposure rather than focusing on tax deferral and tax reduction.

Third, whenever one person decides to reallocate their portfolio from the market to riskless bonds, someone else has to be on "the other side of that trade" moving their money in the opposite direction. Thus, for every dollar moved into the market to increase one investor's risk there must be a dollar moved out of the market to decrease another investor's risk.

The average decision is to do nothing—to buy and hold. This implies that being a Rebalancer or a Trender is riskier than maintaining a buy and hold strategy.

The three strategies. Rebalancers transact to keep a target-asset mix. Rebalancers buy additional risky assets in the face of losses and sell risky assets after experiencing gains. Rebalancers usually do this to bring the portfolio allocation mix back to a target—not to try to time the market.

But the problem with keeping a target mix is that when a person's wealth changes their target mix should change. Denae's original preference for a 50 percent/50 percent mix would likely be too aggressive after a major market decline. With the resulting lower level of wealth, Denae should be less tolerant of risk and should prefer a lower allocation to the market portfolio.

Rebalancing in a bear market means moving money from riskless accounts into risky assets in the face of losses. It is therefore a little like a gambler "doubling up" his gamble after bearing a loss.

Trenders take the other extreme. They buy even more risky assets in an upward market and sell risky

Table 1: Summary of Actions and Performance

Strategy	Transaction in a		Performance when market:	
	Bull Mkt	Bear Mkt	Reverts	Trends
Rebalancer	Less risk	More risk	Win	Lose
Buy and Holder	None	None	Average	Average
Trender	More risk	Less risk	Lose	Win

assets in a bear market. This trend-following approach bets that the market will continue to trend in a particular direction.

But if Denae leaves her portfolio alone when the market drops 20 percent, the new 44 percent market allocation might be appropriate for her new and lower level of wealth.

Table 1 summarizes the three asset allocation approaches. The second and third columns summarize the transactions of each of the strategies in upward and downward markets. The fourth and fifth columns depict the success or failure of each strategy based on subsequent market conditions.

When markets trend (a bull market is followed by continuing gains and a bear market is followed by continuing losses), trenders win. When markets revert (market gains followed by losses or vice versa), rebalancers win.

But in all cases, the buy-and-hold investors perform between the two extremes. Buy-and-hold investors keep their performance closer to average.

Betting on market regimes. Table 1 demonstrates that strategies other than buy-and-hold can be viewed as speculations on future market conditions.

There are three major types of market conditions. Trending markets persist in a particular direction. Mean-reverting markets tend to return to previous levels. Random-walk markets are where markets do not consistently trend or mean-revert.

So an investor's portfolio reallocation strategies may be viewed as a bet on the future direction of the market as shown in Table 2.

Do markets trend or revert? Yes. Markets generally either trend or revert! The evidence is generally that it can not be consistently predicted which will occur.

The theory of efficient markets implies that markets follow random walks so that they do not persistently trend or mean revert. Investment decisions should be based on evidence.

The problem is that the evidence based on analysis of decades of market data is unclear. The evidence as to whether markets trend or revert seems to generate conflicting signals depending on the data used. Some people analyze price changes over very short periods such as every market trade (tick-by-tick). Others look at returns over long terms such as years.

In the short run, such as days or months, many markets generally seem to trend slightly. But in very long time periods such as decades, markets seem to revert back towards gently upward sloping levels.

Results also differ by the time periods studied.

Using very long sample periods such as 50-100 years provides lots of data. But the problem with using very long sample periods is that it assumes that price behavior from 50-plus years ago is indicative of how more modern economies behave.

The problem with focusing on recent data is that short-term studies may lack sufficient observations to form reliable forecasts.

With so much data being

studied by so many analysts, truly remarkable findings are difficult to distinguish from coincidences. Most people have heard of strong reported correlations between which football conference wins the Super-bowl and whether the stock market rises or falls in the ensuing year.

Surely such results are coincidences, but other observed correlations are harder to evaluate as being real or coincidental (spurious).

Results also differ by the market being analyzed. Some markets such as currency exchange-rate markets appear to have experienced trends that are remarkably significant in a statistical sense. The tendency of currency markets to trend is sometimes attributed to intervention by large central banks.

Activities by very large institutions may prevent the random walk that efficient market theory suggests would be created in markets with numerous small traders.

The problem of past correlations.

There seems to be reasonable evidence that some markets have exhibited patterns that are more than just statistical coincidences or outliers. But even if a market has very clearly exhibited a particular pattern in the past such as trending, there may not be adequate evidence to convince us that the pattern is likely to continue.

The problem with speculating on past patterns is that as soon as a pattern becomes established enough to be easily and clearly recognized, the attempt of speculators to exploit the pattern will actually destroy the pattern.

Simply put, by the time that a pattern or market anomaly has been given a name and described in books on investments, it is almost

Table 2: Summary of Wins and Losses

Market Condition	Trenders	—Results Based on Strategy—	
		Buy and Holders	Rebalancers
Markets Trend	High returns	Average ret.	Low returns
Markets Changes Random	Average ret.	Average ret.	Average ret.
Markets Mean-Revert	Low returns	Average ret.	High returns

surely no longer reliable.

Consider a fictional example in which the market almost always rises on the day preceding a particular holiday. Upon observing this tendency for enough years to be perceived as being reliable, investors will place lots of buy orders two days before the holiday and liquidate the positions after the holiday.

But these trades will tend to cause prices to rise two days before the holiday rather than one day. Thus the recognition of a pattern ends up destroying the pattern.

Similarly, enormous effort has been devoted in predicting whether markets will trend or revert. Even if patterns are observed that appear reliable in the past, it is highly speculative to predict that the patterns will continue. A buy-and-hold portfolio allocation avoids these speculations and their accompanying risks.

The strategy that appears most consistent with wise investing is to adjust asset allocations based on

changes in individual circumstances, not in attempts to time the market.

Making decisions on emotion. Fear and greed are powerful emotions—and they tend to be the major emotions that drive spontaneous decisions regarding asset allocation. The buy-and-hold strategy (except when personal circumstances change) can be difficult to maintain in the face of huge losses.

In the huge market declines of 2008, those investors that did not panic eventually found that equity prices and other risky asset prices generally recovered. There may be a tendency to think that it is possible to take advantage of huge market swings by setting profit levels and loss levels at which asset allocations should be changed.

For example, in retrospect, it would seem that selling when the Dow was over 12,000 and buying when the Dow dipped below 8,000 would have been obvious and highly profitable decisions. But retrospec-

tive analyses can be deceptive.

Generally, people who look for upside levels at which risky assets should be liquidated will miss major bull markets. In 1996 when the Dow was under 7,000, Alan Greenspan, then chairman of the Federal Reserve, claimed that the U.S. stock market reflected “irrational exuberance.”

Investors selling on his comments would have missed the huge profits that accrued in the subsequent 10 years when the Dow almost doubled. Analogously, at the worst of the recent financial crisis, there were many financial experts predicting further and even apocalyptic losses.

People should calmly and thoughtfully develop asset-allocation plans keeping in mind that markets are reasonably efficient. There will likely be good times and bad times in the future. Finding an appropriate asset-allocation mix and sticking to a buy-and-hold strategy can form a solid foundation on which to weather the uncertainties of financial markets.

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To learn more, visit us at www.americaninvestment.com, call (413) 528-1216, ext. 3119 or e-mail us at aisinfo@americaninvestment.com.



Alternative Investments

Non-traditional investments can strengthen individual portfolios. But they must satisfy three key criteria.

by **Donald R. Chambers, PhD, Research Associate**

Alternative investing is receiving a lot of attention as an effective source of diversification. Lately much of that attention has been focused on alternative investments available to ordinary investors. Exchange traded funds (ETFs), in particular, have emerged to make alternative investments available to non-institutional investors.

But alternative investments include more than ETFs. The term refers to all investment categories except the most traditional such as cash, stocks, and bonds. Some of the largest and most commonly cited categories of alternative investments are hedge funds, real assets, private equity, structured products and collectibles.

This part of the series on Modern Portfolio Theory (MPT) discusses two somewhat distinct topics: alternative investing and international diversification. At first glance, alternative investments seem to offer the broad diversification that is MPT's primary prescription. We begin with alternative investing and raise the three key issues that should be satisfied before attempting to diversify into one of these new products.

Does the investment offer true diversification? Some alternative

investments offer true diversification—the ability of an investor to benefit from adding exposure from investing in underlying assets that are not available through traditional securities. A great example of true diversification is investing in private equity.

Private equity is comprised of shares of common stock just like the shares of common stock available

Many hedge funds do not truly diversify because their underlying investment strategies utilize traditional investments.

in the public stock markets. The difference is that private equity is not publicly traded and is held by limited numbers of shareholders (such as a few families).

Since MPT extols diversification, MPT would prescribe investing in private equity for diversification purposes. By purchasing shares of private equity, an investor can diversify into a variety of businesses, especially venture capital and small businesses that offer enormous growth potential.

Hedge funds are another example of private investments—securities that are not purchased and sold in public markets. Hedge funds are somewhat like mutual funds except that they are designed to conform

to specific legal requirements in order to avoid heavy regulation designed for investments available to the public. Despite their name, most hedge funds are not fully “hedged”—most contain moderate levels of risk.

In the past, hedge funds were designed primarily for use by institutions and the wealthy, and were not available to ordinary investors.

More recently, products are emerging that are designed for small investors. In particular, ETFs are being created that either invest directly in hedge funds or attempt to

directly manage security portfolios based on popular strategies implemented by large hedge funds. In both cases, the underlying securities are publicly traded.

Hedge funds offer new opportunities for investors to participate in sophisticated trading strategies. But not all new opportunities offer true diversification in the MPT sense. Many hedge funds do not truly diversify a portfolio because their underlying investment strategies utilize traditional investments. Even though the hedge fund may utilize an exotic trading strategy that virtually eliminates the correlation of their returns with stocks and bonds, the investor is not receiving the type of true diversification espoused by MPT.

MPT advocates diversifying into virtually every available underlying

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asset in proportion to its size. Hedge funds tend to tremendously overweight some securities and take short positions in other securities. The net result can cause over-concentration rather than diversification.

The key to further diversifying an existing portfolio is to extend into investments that are distinct from the portfolio's original investments—into categories such as private equity. A portfolio that only holds U.S. large cap stocks, for example, can be diversified better by buying non-U.S. stocks and small stocks. Investing in a hedge fund that took large bets on various U.S. large cap stocks would not provide the diversification recommended by MPT to a portfolio already containing large U.S. stocks.

A vegetable analogy and true diversification. The idea that some alternative investments do not truly enhance diversification from an MPT perspective even though they offer unusual returns is complex. Let's consider an analogy.

Suppose that you are trying to eat a well balanced diet including lots of different foods. The doctor asks you to describe what types of vegetables you eat, and you reply, "Corn and lima beans." The doctor comments that those two vegetables do not offer enough variety, and that you should add another vegetable to your diet.

Now suppose that the vegetable you add is succotash, and this succotash is not a fancy succotash. This succotash is just like the type my mother made me eat when I was a kid: 50 percent corn and 50 percent lima beans (and 100 percent bad tasting to a kid).

The question is: has adding this third vegetable truly diversified your diet. Of course the answer is "No." We can "look through" the succotash, and see that it is really just corn and lima beans, so that your vegetable intake continues to

really only have two underlying vegetables.

The analogy to investments is straightforward. If a person diversifies fully into stocks and bonds, it probably is not necessary to add a hedge fund that invests in stocks and bonds. The hedge fund is simply a mixture of the same underlying assets that you already own. But worse yet, the hedge fund probably takes large bets on some securities and takes negative bets (short sells) other securities. The net result is a less diversified portfolio from an MPT perspective.

Not all hedge funds have underlying assets dominated by stocks and bonds. Many hedge funds diversify into investments that are typically not available to the small investor. But the new ETFs being offered tend to fall into the category of not offering the type of diversification

Ordinary investors can access various types of traditional real estate properties through REITs.

that ordinary investors should be pursuing according to MPT and as discussed in earlier parts of this series.

Does the investment have reasonable fees and expenses? Institutions and other large investors have the resources and size to invest directly in alternative assets. They also have the expertise to analyze sophisticated opportunities carefully including expenses and fees. Large investors may even be able to negotiate improved deals through lower fees.

Most ordinary investors must access hedge funds and several other alternative assets using publicly traded investment vehicles such as ETFs. The reasons that small investors may be unable to directly assemble portfolios of alternative investments are that many alternative investments have very high initial minimum investments and require

very sophisticated analysis.

Many popular ETFs offer attractive investment opportunities with reasonable fees. But some ETFs, like some mutual funds and other products, have management fees and other expenses that are high and likely erode any advantages offered by their underlying portfolios.

Hedge funds and private equity funds often have large fees. Typical fees are 2 percent of assets each year and 20 percent of profits. This contrasts unfavorably with low cost traditional mutual funds that charge less than .5 percent of assets per year and 0 percent of profits. However, hedge fund and private equity managers with truly superior skills are well worth their high fees when they can implement tremendously successful trading strategies and pass huge gains onto their investors.

The question is whether truly superior managers will ply their trade for the benefit of ordinary investors rather than for the benefit of super wealthy and sophisticated institutions, sovereigns, and families. I would not bet on it. But can an ordinary investor successfully identify the most talented fund managers especially when there are limited performance histories available?

Some types of alternative assets are available through well known, popular, and cost-effective investment vehicles. An example is real estate investment trusts (REITs). Ordinary investors can access various types of traditional real estate and even newer opportunities such as timberland through REITs. Investors can easily compare expense ratios and invest directly in REITs or can access portfolios of REITs selected by investment companies by purchasing ETFs or mutual funds of REITs.

Generally speaking, investment opportunities available to small investors that have high fees are not

a good bet. The key is to do your homework about management fees and total expense ratios for each investment product being considered

Trust mostly in investments with observable market prices. Many alternative investments are not publicly traded, and so investors can not observe reliable prices set by intense competition in financial markets.

Competitive trading in public markets provides a number of benefits. First, it is nice to buy a security knowing that there are thousands of very intelligent investors and speculators who are regularly buying and selling the same asset at the same price. When I buy shares of stock in a large U.S. stock, I can take comfort in knowing that if the stock were clearly and tremendously overpriced, there would be tons of experts making a big fuss about how overpriced the stock is and exerting all sorts of downward pressure on its price by establishing massive short positions. Second, I can watch the price through time to develop an indication of its risk. So I am unlikely to buy the proverbial “pig in a poke.”

In the 1980s, Wall Street firms sold billions of dollars of limited partnerships that were marketed to ordinary investors as offering the benefits of investing in real estate, oil and gas ventures, and just about any other “hot” idea. The investments appeared to offer diversification and exposure to a sector that was generating great returns. In most cases of these products that were sold to the public, small investors ended up with disastrous losses.

I have examined many of these limited partnerships very closely. In my opinion, many of them were scams or “fee traps.” The fees were so numerous, large, and multi-layered that they made the chance of receiving a competitive return almost nonexistent. The conflicts of interest between the investment

managers and the limited partners were severe. In some cases, it was simply common sense that the worst properties that the “smart money” owned would be dumped into the partnerships’ portfolios and pawned off to the public at inflated prices.

There have clearly been some frauds in recent years in the alternative investments space. Most famously and recently, the Ponzi scheme perpetrated by Bernard Madoff involved an estimated \$50 billion of investors’ money. However, most products in alternative investments have been reasonably well designed and reasonably successful. One of the best ways to minimize the risk of falling into a fraudulent or overpriced scheme is to invest in securities that are publicly traded.

More and more alternative investments are likely to be offered, sometimes quite attractively, to ordinary investors. The wise

One way to minimize the risk of falling into a fraudulent or overpriced scheme is to invest in securities that are publicly traded.

investor should carefully consider adding each opportunity to obtain diversification—if and when that opportunity can be obtained cost-effectively and reliably.

The start of an era. Alternative investments span a broad and ever-changing spectrum. One of the most sophisticated types is structured products.

Structured products refer to innovative products such as securitized assets, derivatives, and special purpose vehicles (e.g., the notorious CDOs involved in the subprime meltdown). Structured products containing underlying loans, mortgages, and other receivables can offer competitive returns and true diversification, and are entirely appropriate even for the typical investor. However, as with some other types of alternative investments, the analysis required is

highly complex, and there are few small investors with the time and necessary expertise.

Unfortunately, new alternative investments and investment companies have been slow to offer safe and cost-effective access to the products for small investors. And there’s not a lot of good information about them out there. However, Vanguard, an investment company with an excellent track record, and Morningstar, a popular investment information company, are helping to make alternative investments understandable and accessible to the ordinary investor.

Finally, alternative investments include collectibles—which can be everything from rare coins and stamps to antique automobiles and artwork. There is no doubt that collectibles diversify. But there are two problems with investing in them.

First, collectibles can often be overpriced. In competitive financial markets, there are natural forces that tend to prevent absurd pricing levels. But there are few if any such mechanisms in practice that can prevent gross overpricing of collectibles.

One of the most often cited examples of ridiculously high price levels occurred in Holland in the early 17th century when tulip bulbs became a collectible investment craze. More recently, various collectibles catch the interest of the public causing dramatic price rises, frenzied interest, and eventual price collapses and disappointment.

The second problem is that collectibles offer some or all of their return in the intangible form of the pleasure of their ownership. Collectible prices reflect the pleasure of ownership—so people buying collectibles need to enjoy the items as collectors and not only for their potential price appreciation. To the extent that a person is willing to pay the price of a collectible purely for personal pleasure, then it makes

sense as a form of consumption, but not as a form of investment on which one depends for future income.

Alternative investing for ordinary investors is in its infancy. In most cases, the time has not yet come for ordinary investors to make bold moves into alternative investments. However, innovative products are beginning to make additional alternative investments more available and more attractive for small investors.

International Investing MPT tells investors to diversify into every competitively priced asset that can be cost-effectively accumulated and managed. It also says that every asset should be held in proportion to its total value. An asset such as shares of Apple, Inc., for example, should be a much larger part of each investor's portfolio than shares of a small firm.

But even the most ardent supporters of MPT struggle with the idea of holding foreign stocks in proportion to their size. For U.S. investors, this means placing about 35 percent of one's portfolio of risky assets into U.S. investments and 65 percent into foreign assets. For a resident of a small nation, it means putting 95 percent or more of risky assets into foreign stocks since their nation's stocks represent a tiny portion of the global market portfolio.

Investing in foreign stocks appears to subject an investor to enormous risks of foreign currency exchange rate fluctuations. But a stock is more of an investment in future profits than it is in a particular currency. Does it really matter whether you invest in an automotive company that is domiciled in the U.S. and sells its cars in U.S. dollars or in an automotive company that is domiciled abroad and sells its cars in other currencies? In each case, what matters most is the profit potential, not the currency.

International investing is clearly a wise move according to MPT and from a perspective of enhancing diversification. The prescription from MPT is clear: Invest in all available regions, countries, and individual assets in proportion to their size. If the stock market of Japan is 10 times the size of the stock market in Australia, for example, then the perfectly diversified market portfolio should contain 10-times more exposure to the Japanese market than the Australian market.

There are numerous cost-effective mutual funds and ETFs that offer excellent diversified exposure to international investing much in line with the prescriptions of MPT. Unlike alternative investing, international investing in traditional securities is well developed and appropriate as a major source of potential diversification even for relatively small and unsophisticated investors.

There also is the political risk that the host government will restrict a foreign investor from free access to his or her assets.

The Home Country Bias The home-country bias is the universal tendency of people to invest more of one's wealth in the currency and risky assets of one's home country rather than to allocate the wealth throughout the world based on relative sizes. There are rational reasons for a home-country bias.

One reason is fear of political risks. One political risk is that a host nation will nationalize the underlying assets of an investment or otherwise confiscate or prevent the transferring of the wealth of investors, especially foreign investors. There also is the political risk that the host government will restrict a foreign investor from free access to his or her assets. The same thing could happen in an investor's home country, but generally nations are more likely to confiscate assets of foreigners. Political risk also includes adverse

economic outcomes in particular nations because of events such as political turmoil.

The second reason for a home-country bias involves fear of the unknown and overconfidence in the value of one's knowledge about investing in one's home country. Some investors feel that they can do better by buying stocks and investing in markets with which they are familiar. There is not much logic to this. Remember, the idea of MPT is to diversify into everything that is competitively traded, offers true diversification, and is cost-effective. I really don't need to know much about the U.K., Germany, Japan, or Switzerland to invest there. I simply purchase the international mutual funds of an investment company that I trust that has a history of very low fees and competent management.

Finally, a reason for a home-country bias is to ensure that your wealth level varies more in tandem with the people around you. Researchers note that financial satisfaction depends more on peoples' wealth relative to others than their absolute wealth. In other words, investors feel best when their investments perform at or above the level of their neighbors, friends and colleagues.

Many Americans today are unhappy with their current income and wealth even though their standard of living (food, shelter, clothing, entertainment, health care, etc.) vastly exceeds the standards of living of most of the other people in the world today. Their unhappiness with their finances occurs when their standard of living compares unfavorably with their contemporary fellow countrymen.

The home-country bias can be linked to our attempt to match the investment performance of the people around us to ensure that our investment returns are in line with our primary comparison groups.

Investment Management for Mortals

Overconfidence and self-deception are part of human nature. But knowing this opens the way to better decisions and wiser allocations.

by **Donald R. Chambers, PhD, Research Associate**

Having taught finance full time for 30 years, it is difficult for me to finish a long series without offering the readers a quiz. But this is a fun quiz. The quiz on page EX—2 contains 10 questions. There are no trick questions, and the questions are not difficult. They are selected from a wide spectrum of topics about which all of us have some knowledge but few of us have great knowledge.

Please take a few minutes to grab a pencil, read the instructions carefully, and fill in the 20 blanks. Then please use the answer key on page EX—4 to find out what your answers reveal about yourself.

Interpreting your results. This quiz does not seek to measure how knowledgeable a person is with regard to the subject areas. It is all about measuring a person's level of confidence in their answers: Is a person overconfident, underconfident, or appropriately confident.

The quiz estimates how likely you actually are to be correct when you believe that you are 90 percent likely to be correct. With 10 questions, the ideal outcome is that one the 10 true answers would lie outside of the ranges. If a person accurately perceives their level of knowledge, then the expected num-

ber of true answers lying outside the specified ranges should tend towards one in 10. If you scored zero, one, or two answers outside the range, you did not exhibit substantial overconfidence. Results with three or four answers outside the ranges indicate likely overconfidence, and answers of five or more outside the ranges indicate extreme overconfidence.

I have given this quiz to many undergraduate students, with five

Most people assume that they can predict and control their financial outcomes more than they actually can.

(extreme overconfidence) being the typical score. Males tend to exhibit more overconfidence than do females, and students interested in finance are more confident than other students. Researchers have found that in many ways we are confident that we know things that we really do not know. Their findings are important for investors. People with limited information about a particular investment will act as though they make good predictions about how the investment will perform. Therein lies a powerful explanation for why people pursue foolish financial strategies and repeat their mistakes without any apparent recognition of the need to revise their

thinking. The old saying applies: "Frequently wrong, but seldom in doubt."

In investments, most people assume that they can predict and control their financial outcomes more than they actually can. Further, they do not seem to change their beliefs despite evidence that they are consistently wrong.

Behavioral issues. MPT uses reason to prescribe the behavior

that investors should follow: Diversify fully by investing in the market portfolio. If people were driven entirely by logic, it would probably be easy to embrace MPT and stick to its investment approach.

In practice, the human mind is surprisingly poor at making decisions in the face of some types of uncertainty. Many investors, for example, believe that most investment professionals can consistently pick stocks and time markets better than untrained people. The investment industry fuels this notion because it helps the industry attract clients. But I believe that there are very few investment professionals with the talent to earn consistently superior returns. The few investment professionals that have that talent work for hedge funds, the super wealthy, or for themselves, not for the common investor.

It is human nature to hope to be a winner in the investments game. It

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is human nature to hope that there are easy paths to higher investment returns. These types of hope can be dangerous.

Imagine that a person is confronted with 100 different types of complex gambles, but that all of the gambles have been carefully de-

signed to offer expected payoffs that are less than the amount gambled. In other words, imagine that a person walks into a casino.

The typical visitor will search all 100 gambles looking for one that offers him or her an edge. If we were perfect and rational analysts,

we would know we cannot consistently beat the casino. But nobody is perfect. People make errors in analyzing the 100 opportunities, and many will think they can find some attractive gambles—especially if played at the right time with the right system.

The gambler will select a favorite bet and will begin to devise strategies to increase his or her chances even further. Of course, the gambler has not found a superior bet, he or she has simply made a mistake in analysis. In fact, the bet the gambler chooses is the bet that they have most misunderstood!

When typical investors search efficient financial markets for superior opportunities, they will examine a lot of them and correctly conclude that they offer ordinary returns based on their risks. The investors will keep searching until they find an investment that appears to offer great returns and minimal risk. But they have not found a superior investment. Rather, they have just sunk money into the investment they most misunderstood.

Even after investors have been burned, they are likely to interpret the events in a way that denies their mistakes and perpetuates their hopes for the future. For example, even though the investment only earned 5 percent when the market rose 25 percent, they will tell themselves, "I made a profit, didn't I?" Or they will modify trading systems each time the old system fails, claiming, "I simply bought too late or sold too early and will do better next time."

The four principles of MPT. MPT prescribes that investors buy and hold a well-diversified portfolio and stop making speculations through stock picking and market timing. MPT implies that investors should focus on four simple principles. They should diversify. They should maintain an appropriate level of aggregate risk. They should minimize transactions costs and management

Confidence Interval Quiz

For each question, provide a **lower value** and an **upper value** between which you are 90 percent confident that the true answer lies. Select the lower value for which you believe there is only a 5 percent chance that the actual answer is even lower. Select the upper value for which you believe there is only a 5 percent chance that the actual answer is even higher.

For example, consider a 90 percent confidence interval for the largest single-day drop in the Dow Jones Industrial Average. A financial expert might be 90 percent confident that the answer lies between -700 and -800. An inexperienced investor might be 90 percent confident that the answer lies between -100 and -1000. But this is not a survey of how much expertise you have in various areas. It is about confidence intervals.

With 90 percent probability, the actual value lies between these bounds

	<i>lower bound</i>	<i>upper bound</i>
1. How many people died in the sinking of the Titanic?	_____	_____
2. What is normal body temperature in degrees Celsius? (to the nearest one-tenth)	_____	_____
3. How many square miles are in Kansas? (to the nearest ten)	_____	_____
4. What year was Elton John born?	_____	_____
5. How many states did the U.S. have in 1825?	_____	_____
6. What is the height of the Washington Monument? (to the nearest foot)	_____	_____
7. What year was Harvard University founded?	_____	_____
8. How many air miles separate L.A. and Boston?	_____	_____
9. What is the world record men's one-mile run? (in minutes and seconds)	_____	_____
10. How many liters are in one U.S. gallon? (to the nearest one-hundredth)	_____	_____

When you are finished, please check the answers on page SI—4.

fees. And they should carefully consider tax implications.

Following the prescriptions of MPT helps investors and performs a role that is beneficial to the overall economy. In free markets, people serve each other by doing what they do best. I am a terrible plumber. I perform better as a teacher, and I am paid more to teach than to fix plumbing. When people pursue their interests, they make society a better place by contributing those skills that society values the most.

Financial speculation should be left to people with incredible analytical skills who can devote enormous hours to their analyses. Ordinary investors best serve themselves and others by being diversified. Somebody in society needs to bear the systematic risks generated by a modern economy. Investors who choose to do so are playing just as valid a role in society as the plumber and the teacher.

Some investors decide to keep all of their money in a safe place such as a bank. That is their right. Other investors opt to invest in the market in the hope of receiving, on average, a reward above the riskless rate. They may win. They may lose. But they definitely have contributed to society by bearing risk.

Holistic asset allocation. A common approach to investments is to hold a variety of accounts with various purposes and to hold securities in each account that satisfy those purposes. Retirement accounts might emphasize stocks for their long-term growth, and a vacation fund might hold short-term, low-risk bonds.

Investors might be wise to consider an alternative view of which securities to place into which accounts: Allocate a portfolio into various asset classes based on risk considerations. Then place those assets in various accounts based on issues such as taxation and transaction costs.

Doing this means following three

steps. First, decide on an overall asset allocation (e.g., 60 percent in the market portfolio and 40 percent in the money market). Then, place stocks in accounts that are best for investments that offer capital gains such as taxable brokerage accounts. Finally, place bonds in accounts such as retirement accounts that are best for shielding interest income from taxes.

I label this a holistic approach to asset allocation. The idea is to manage risk through overall asset alloca-

tion according to a big picture. Since risk is controlled through allocation, the decisions of which assets to place in which accounts can focus on tax savings and other benefits.

Most investors do just the opposite. They tend to place bonds in taxable accounts that they view as short term and appropriate for safe assets. They place stocks in retirement accounts that they view as appropriate for longer term but riskier investments. The problem with this is that the taxation of retire-

Tax Advantages of Stocks

Stocks typically offer a substantial portion of their returns in the form of capital gains. This is the appreciation in the stock's price from the time it is purchased to the time it is sold.

In the U.S., stockholders do not pay federal income taxes on gains until the year in which the securities are sold. If the stock has been held long enough, the gains may be taxed at lower rates designed for long term capital gains.

The seemingly minor tax advantage of capital gains can substantially lower the present value of federal income taxes paid and, in most states, lower the state income tax paid. Here are seven tips for minimizing taxes for stocks held outside retirement accounts:

1. Time capital gains to occur in years when income tax rates are relatively low because of low income or in years prior to announced or anticipated legislative tax increases.
2. Time capital losses to occur in years when income tax rates are relatively high.
3. Defer capital gains to later years to take advantage of delayed taxation and the positive time value of money.
4. Subject to limitations, take capital losses soon. The resulting tax shield can provide immediate tax savings that can be reinvested.
5. Donate stocks with substantial gains in lieu of cash in order to receive full tax deductions without having to pay income taxes on the unrealized gains.
6. Pass stocks through the taxpayer's estate. Heirs can sell the stock and pay income taxes only on the gains made subsequent to the date of inheritance.
7. Gift stocks to children and others in lower tax brackets in lieu of cash from the proceeds of selling the stocks and paying taxes while in a high bracket.

ment accounts occurs at withdrawal and does not differentiate between income and capital gains. The tax advantages to capital gains are lost.

The tax advantages to stocks should not be treated lightly. In addition to the potential for preferred tax rates on long-term capital gains, stocks offer seven other advantages from capital gains timing as the box on page EX—3 indicates. Under current federal income tax laws, most stocks offer qualified dividends that are taxed at a lower rate than bond interest. Bonds are highly taxed and tend to be appropriate for retirement accounts (as long as equity returns are not enormously higher than bond returns).

On bubbles and panics. It is dangerous when people dismiss past price movements as bubbles or panics. This view tends to suggest that bubbles and panics can be predicted.

In classroom settings, I often play a game that illustrates my view of so-called speculative bubbles and panics. I tell my students that I am thinking of a number of dollars and that I want them to guess it. After each guess, I tell them whether the number they guessed was too high or too low.

I usually pick a number around \$50 billion. The guesses almost always begin with an upward trend that goes something like this: \$20, \$100, \$1,000, \$100,000, \$10 million, \$10 billion, \$100 trillion. At that point, I finally say that the number is too high and the remaining guesses go something like this: \$1 trillion, \$1 billion, \$100 billion, and so forth.

When these numbers are placed on a graph with dollars on the vertical axis and time on the horizontal axis, it almost always forms the same pattern as the so-called classic stock market bubble followed by a so-called panic. There is a long steep and increasing slope followed by a massive decline and then a narrowing zigzag pattern.

My students are not in a speculative frenzy or a widespread panic. They are simply making rational estimates in the face of high uncertainty.

I do not pick a number near \$50 billion at random. I pick it as a ballpark approximation of the median value of the 100 or so largest firms in the U.S. The students' guesses more or less echo the expectations of a typical investor looking at a new company. Maybe the company will grow to be worth \$50 billion, maybe it will fail.

The pattern of guesses that I obtain in class reflects rational responses by the students. But when we observe the same price pattern in financial markets, many of us succumb to our overconfident human nature. We assume that we can detect price patterns before they are complete and by doing so beat the market.

When investors look at market prices in retrospect they can mistakenly see bubbles and panics that they think are predictable. That is one reason why people are reluctant to buy and hold well-diversified portfolios. If investors fail to implement the advice of MPT they run the risk that their emotions will swing between fear and greed, that they will take needless speculations, overtrade, generate transactions costs, and miss tax-saving opportunities.

Final remarks. Financial markets play a powerful role in facilitating the incredible lifestyles enjoyed by most citizens of modern economies. But sophisticated economies can be a double-edged sword.

In 1986, I was asked to serve as an expert witness in two litigations that involved the terrible decision by a broker to recommend the purchase of call options for two retirement plans. Shortly afterward, in October 1987, the stock market crashed. Soon I was being contacted by many attorneys searching for an experienced expert witness.

Over the next decade or two I was asked to consult on perhaps 200 potential legal disputes regarding investment losses. I saw massive losses generated by options, futures contracts, margin debt, junk bonds, churning, and poor diversification. I saw ruined retirements, shattered dreams, and strained marriages. What I saw led me to devote much of my subsequent professional efforts to informing investors about how to avoid major investment mistakes.

This 10-part series, which concludes with this installment, is a formal exposition of the approach I believe offers increased chances of long-term investment success with decreased chances of major losses.

Happy investing.

Grading the Quiz

Use the correct answers to determine which answers lie within the range you provided and which answers lie outside that range. Count how many times the correct answer was *outside* your lower and upper bounds. (Some of these numbers are rounded and some differ slightly by source.)

1. 1,517 people
2. 37.0 degrees
3. 82,280 sq. miles
4. 1947
5. 24 states
6. 555 feet
7. 1636
8. 2,600 miles
9. 3:43 minutes
10. 3.79 liters